JUNE 1986 • Volume 9 • Issue 6

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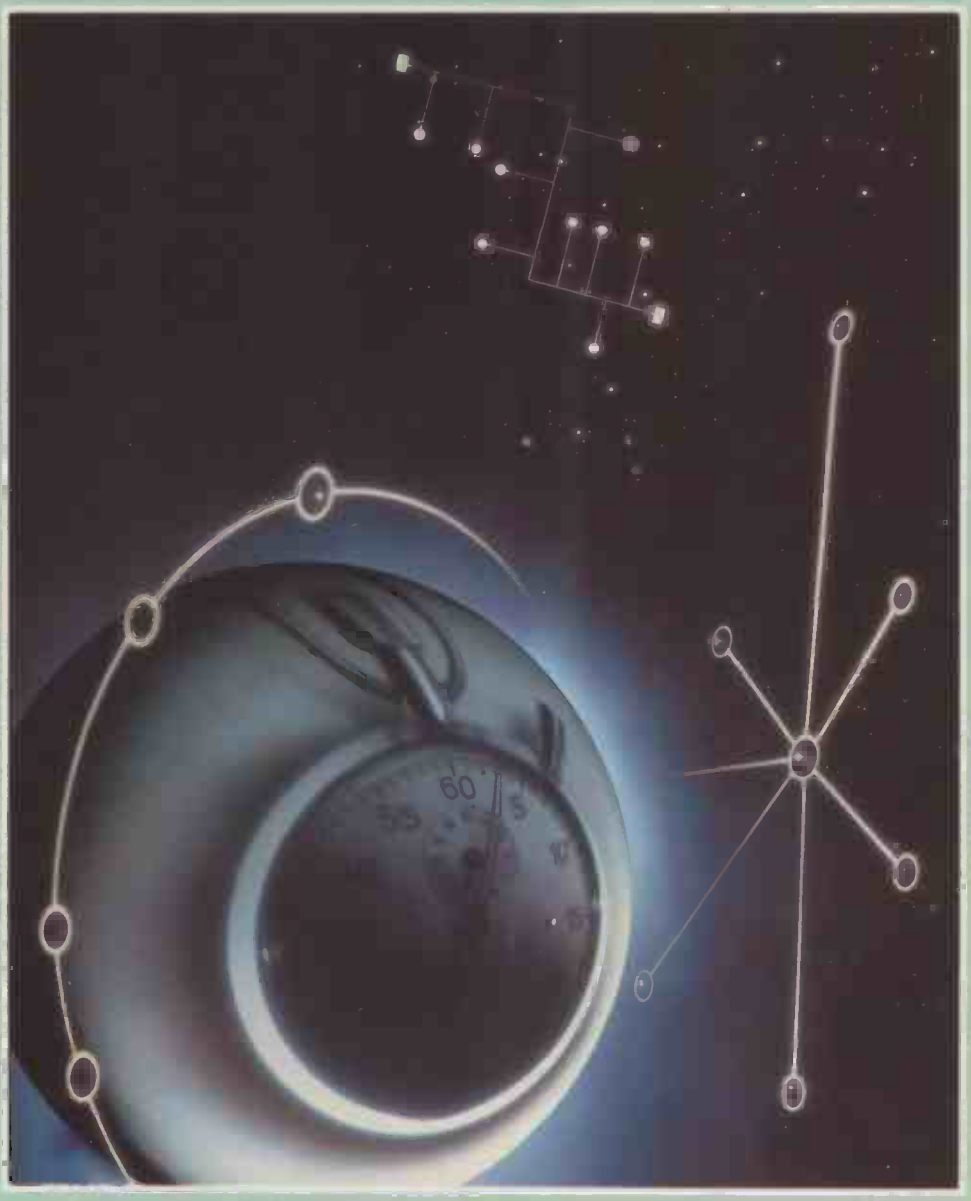
PRACTICAL COMPUTING

FOR BUSINESS AND PROFESSIONAL MICRO USERS



NETWORK BENCH TESTS

HARDWARE The new IBM desk-top PC

Olivetti M-28 • Non-QWERTY keyboards

SOFTWARE Recall • Boxes and Arrows

PLUS The hazards of VDUs

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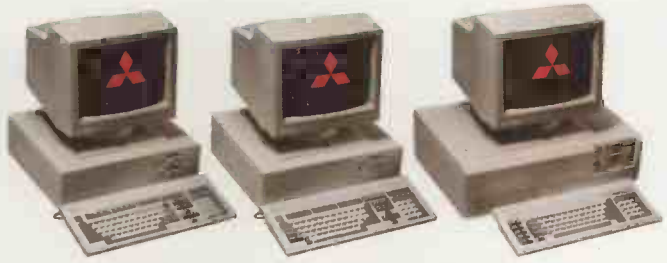

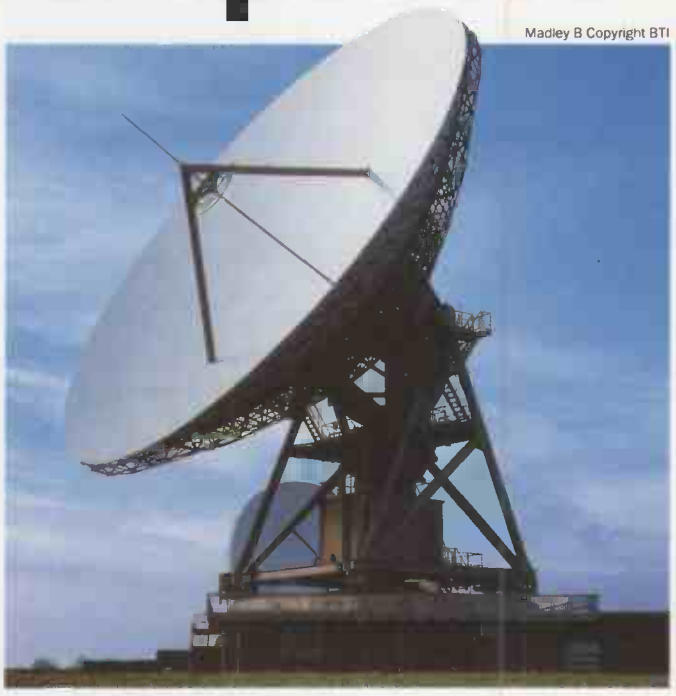

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COVER FEATURE

NETWORK BENCHTESTS

Everyone knows the theory of local area networks, but what are they like in practice? We investigate the whole process of installing and using two first-generation networks. After an introduction to the field by *Glyn Moody*, on page 92 we look at MS-Net running on RM Nimbuses. Then on page 96 we try out the Appletalk system with a Laserwriter. On page 98 *Ian Stobie* finds out just how much software is available to run on networks, and we conclude with a comprehensive listing of LANs on page 103 **91**

INSIDE

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PRACTICAL COMPUTING

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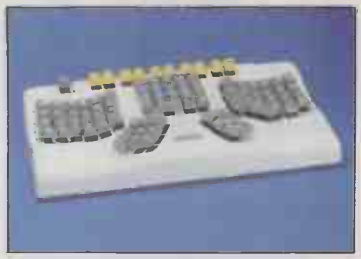

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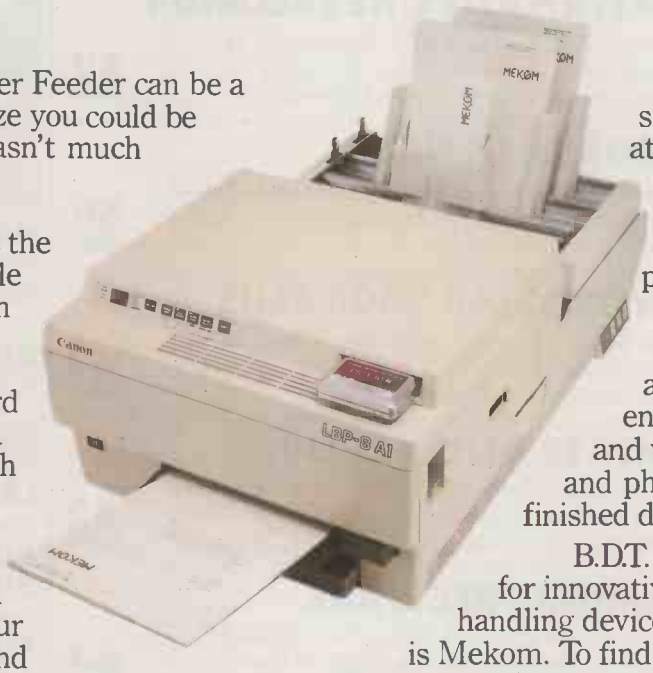
NEWS

OPEN FILE

REGULARS

The big bin feeder.



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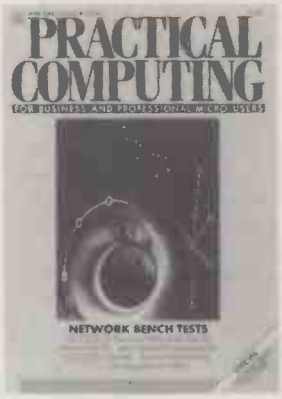

PHOTO: SPENCER ROWELL

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ALL TOGETHER NOW

Software houses have started playing a new game. It is called portfolio and the rules go something like this. You are one of the top five micro software publishers in the world. You have one or possibly two strong products which rake in the money. Using the large cash reserves which this generates you have to build up a complete portfolio of software products before your rivals do. Whoever achieves this first is the winner and gains the prize of world domination of the micro software market.

The main players in this game — or market as it is usually called — are Ashton-Tate, Lotus and Microsoft, with Borlandcoming up fast.

Ashton-Tate is a good example of a company which started playing some time ago and has really got the hang of it. After the initial success of dBase II and III it cast about for a follow-up success. It came up with the powerful integrated package Framework. Or rather it came up with a small unknown company Forefront, which was bought by Ashton-Tate along with its product Framework. The trick went down so well that Ashton-Tate did it again with Multimate to gain a word processor. More recently it announced a distribution deal for the spreadsheet Javelin.

Nor is Ashton-Tate likely to stop there. The essence of this acquisitive approach is that you have to secure a complete portfolio. "Complete" in this context means all the canonical applications like spreadsheet, database and so on for the IBM PC and the same again for the Apple Macintosh. Ashton-Tate's absence from the Apple world is likely to be remedied by future products like Glass, the code name for a Mac spreadsheet, a package of the dBase III type and a Mac word processor.

Of couse Lotus, the micro software company with the biggest turnover, has not been idle. It has produced its own monster Mac program, Jazz, as a follow-up to 1-2-3. But perhaps more significant are the acquisitions over the last year or two which have not yet given rise to products. These include companies like GNP, which was developing a natural-language interface for 1-2-3; Isys with its on-line services software; and Infocenter Software with its mainframe link called I-Link. Like Ashton-Tate, Lotus is rumoured to be preparing new progams, including a word processor and a database with an extensive AI element.

Perhaps the main contender in this game is Microsoft. It has just offered its first shares to the public, and their current stock-market price places a value of over $700 million on the company. Bill Gates, Microsoft's founder, owns just under half of this. And not all of it is paper money: at the end of 1985, Microsoft's working capital was $57 million.

Gates knows as well as anyone that it would be foolish to put too much reliance on the highly lucrative IBM connection to sustain this kind of success. As a result, Microsoft has started playing the same portfolio game. Almost surreptitiously it has introduced Multiplan, Word and more recently Excel for the Mac and IBM. There is also a comms package called Access, and outside the U.S. it distributes the Rbase 5000 database. Products about to be launched include Macworks. Microsoft's answer to Jazz.

Ashton-Tate, Lotus and Microsoft are clearly well placed to engage in what could be a bloody battle. The stakes are high. There is probably room at the top for no more than two packages in each of the main market sectors. Anyone who can offer a complete suite of programs for the IBM and Mac will be in a strong position to ease out less well-armoured opposition. In particular, the one-product houses could find their position increasingly untenable.

The costs of developing and marketing the monster-sized packages which are coming through today make this pattern of acquisition and portfolio building particularly attractive. In the short term, this approach is likely to mean a greater diversity of high-quality products for the IBM PC and Mac. The long-term prospect is less promising. There is a real danger that we could be witnessing the birth of the micro software equivalent of IBM, where total solutions sometimes border on totalitarian ones.

5 YEARS AGO...

Prime Minister Margaret Thatcher has thrown her weight behind a plan to put a microcomputer in every secondary school by the end of next year. Speaking at the Department of Industry, she declared: "We want to be in this world of microcomputers and we want to be in it big".

In cash terms, what this amounts to is a £10 million program by the Department of Education to improve teachers' familiarity with the micro and a £4 million contribution from the Department of Industry to help schools buy micros. Local education authorities, helped by parents, are, however, expected to share the costs equally.

The Department of Industry estimates that about one-quarter of the secondary schools in Britain have a micro and aims to have one in every school by the end of 1984. The Department is known to favour the Research Machines 380Z, but realises that the BBC/Acorn Proton microcomputer may provide a less expensive alternative.

PC Volume 4 Issue 6

The truth about Kermit

ALTHOUGH for most people the name Kermit conjures up an image of a popular TV frog, when applied to the file-transfer protocol of the same name it is an acronym for KL-10 error-free reciprocal micro interchange over TTY-lines. The KL-10 is the CPU for Digital Equipment Corporation's DEC system 10 and DEC system 20 36-bit time-sharing mainframes to which the Columbia students had access.

The authors of the article on Kermit which appeared in the May issue may have been unaware of this, and consequently omitted these mainframes from the list of machines supported.

J RICHARDSON
Ipswich,
Suffolk.

Times Network Systems

I HAVE just read the somewhat dismissive comments about TTNS in Jack Schofield's article on email in the April issue. I am rather concerned about a reviewer who seems to be making a standpoint from a position of ignorance about the needs of educational users, and apparent ignorance about the system itself.

To those who can only manage a cursory look at TTNS from a distance then a colour screen may look like the "appalling Prestel". There are two points to consider here. Firstly, "appalling" is a subjective statement which is a matter of taste, and although I myself do not rave about Prestel there are more such systems around the world than any other. Secondly, TTNS offers educational users not one screen format but three. Educational users have the ability to choose which format is best for which application, rather than being forced into one format which cannot always be suitable. If you look at the Derbyshire database, for example, you will see "80-character line" screen, "high-resolution graphics" screens and "viewdata screens".

As for logging-on at 300/300 baud, only users who should not have access to the system will log on at that speed since TNNS has equipped all its users with 1,200 baud modems. The only legitimate users on at 300/300 baud are those with large amounts of data to transmit and who are using the PSS network.

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,
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THE BEST OF BOTH WORLDS

D SAUNDERSON'S letter, A Bad Deal for Dealers, in the April issue of *Practical Computing* makes some sweeping points about dealer support and cheaper computers and software; I would like to comment on some of them.

The Osborne computer is directly responsible for the introduction of most portables. There is still a vast user base, and CP/M portables are still being manufactured in vast numbers. Most MS-DOS portable machines use the same basic arrangement of monitor, drives and keyboard pioneered by Osborne.

The Taiwanese manufacturers of PC clones may well also be the manufacturers of many IBM components. Admittedly some Taiwanese equipment is bad, but IBM's early PC drives and power supplies set records for noise and unreliability.

In the U.S. Borland has an excellent name for user support, and in the U.K. I've had very good responses from Borland distributors. As yet I have had no dealings with KGB Micros, so I cannot say if its support is better or worse than normal.

Most cookery books cost much less than £50 to £100. By and large an error in a cookery book does not make the entire book useless, or cause hundreds or thousands of pounds worth of damage. Book publishers frequently supply errata slips or make changes to later editions. When TV sets and washing machines costing £100 or less come with a year's maintenance guaranteed, it isn't unreasonable to expect some support for software costing similar amounts, where maintenance requires no more than new media or a page correction.

While much of the Osborne software range seems poor and badly documented, other software at similar prices offers good documentation, a wide range of functions, excellent help facilities and can be used without tuition.

Mr Saunderson seems to want to have the best of all worlds, in which he can decide whether or not software is worth supporting, irrespective of the policies of manufacturers and other dealers. The idea that software costing £100 or more is still cheap, and doesn't deserve any support, is one of the main reasons why software piracy flourishes. While the laws of copyright seem to help software manufacturers and distributors, the Sale of Goods Act doesn't seem to be giving their customers much protection from this attitude.

MARCUS L ROWLAND,
London W2.

On the question of Como files, Como is not the command used to create local database structures. The correct command is Co.

Someone reading your article could well be given the wrong opinion about TTNS, which by the way stands for "The Times Network Systems", and has done for some months. When did your reviewer last see it in operation?

ALAN WALKER,
Ripley Mill Hill School,
Derbyshire.

JACK SCHOFIELD REPLIES: The Times Network was not the main subject of my articles on Telecom Gold in *Practical Computing*, but was merely mentioned in passing. I do not claim to be particularly knowledgeable about it either, my experience being limited to a half-hour demonstration from the chief executive, Gordon Jones.

I would have preferred to be loaned a box to try — a facility extended by both Microlink and Textnet, but not by TTNS.

Your observation about Co files is obviously correct. I am sorry for the slip. Your observation that TTNS offers users not one screen format but three is interesting, but Telecom Gold itself offers the facilities to select from a wide range of terminal types or to configure the system to suit a particular terminal using the Term command — as I mentioned briefly in my article in the February issue.

The statements that TTNS looks like Prestel and at 300 baud it is even slower are correct. I did not say you had to log on 300 baud.

I am keen to see TTNS succeed. I am sorry TTNS has made mistakes in the past, and is now reduced to flogging off what must presumably be spare capacity to the readers of a popular computer magazine — a phenomenon which contrasts oddly with the wildfire growth of Telecom Gold itself, where the main problems have been those of trying to expand capacity fast enough.

Paintbox

WE WERE very disturbed to notice in the article entitled Image Processing by Simon Beesley, onpages 94 and 95 of *Practical Computing*, that the expression "paintbox" was used on several occasions as a generic expression describing computer-graphic systems. We were especially disturbed by the case of "paintbox" in relation to Fairlight CVI equipment. We also notice further use of the expression "paintbox" on page .71 in relation to graphic systems.

We would like to remind you and your readers that "Paintbox" is our trademark, registered as of 1981 in respect of "electrical and electronic apparatus and instruments and parts thereof . . . for use with the production or reproduction of colour images." It is well known as denoting our colour video graphic equipment.

A B LOGAN,
Quantel,
Newbury,
Berkshire.

Audio training

WE THINK your letter entitled Audio Tutorials in the April issue probably refers to Head-Line Communication. Although Head-Line started by writing and producing user manuals, we have pioneered the user of cassette-based tutorials for computer

systems over the last six years or so. Increasingly we are specialising in training on low-margin products such as the Amstrad business software. But the principle is the same: audio works best where the cost of any other means of effective training is out of proportion to the price of the software.

Of course interactive audio is not the universal panecea for computer training and it works better with some systems than with others. But we are always happy to look at any application and give our professional opinion.

JIM GATTEN,
Head-Line Communication,
Friar House,
9 Friar Street,
Hereford HR4 0AS.

Star printers

ON PAGE 13 of last month's issue we referred to a new nine-pin dot-matrix printer from Star Micronics as the NB-15. The correct name for this printer is in fact the NL-10.

Datachat

THE PRICE of the Datachat 1223A modem mentioned in the table on page 100 of the April issue is £124.69, not £125.69 as printed. The Modem Division sales department of GEC which distributes the Datachat modems is at GEC. Telecommunications Ltd, PO Box 53, Coventry CV3 1HJ. Telephone: (0203) 446331.

Turbo Pascal

I HAVE recently purchased a copy of Turbo Pascal, and run it on the Apricot PC. As I am a novice in this language, I was pleased to see the listing on pages 23 and 24 in your April issue as part of Mike Lewis's article on expert systems.

I tapped it in, corrected the inevitable mistakes and proceeded to test it out. To my surprise, it did not work as expected. The program prompted for the first question and awaited response. It then correctly prompted the next question but did not wait for a response. This error continued displaying the questions down to a null pointer statement and then exited.

After much playing around, I discovered that the problem was that the statement to read from the keyboard was acting peculiarly in that the Carriage Return was not being accepted. In fact if I entered a sequence of Ys and Ns at the first prompt and then entered Carriage Return, the correct sequence of prompts would appear. It appeared that the

```
READ (TRM,RESPONSE)
```

statement was behaving like the Basic Inkey$ function after the first read, and not awaiting keyboard input.

I got over the problem by surrounding the line in question and its successor with a

```
REPEAT-UNTIL RESPONSE IN
  ['Y','N']
```

But I am curious. Have I set up Turbo Pascal incorrectly? Is it an oddity of the Apricot? Is something else wrong? I would be very grateful for some constructive comments.

J M CROSS,
London W4.

MIKE LEWIS REPLIES: Reading from the TRM device is in fact like Basic's Input$ rather than Inkey$. It does wait for input, but it does not require a Carriage Return. The program accepted the Carriage Return at the end of your first input, and used it as the reply to the second question, which it interpreted as N. I do not understand why it then continued to the end of the path — it certainly does not on my IBM — unless, of course, there were exactly two questions in the path. If you do not mind having to pressing Return each time, try changing the TRM to CON.

Sharp string inequality function

IN THE Open File section of the March issue Jack Levett offers a method of simulating a string-inequality check. An even simpler method of simulating string inequality when using sharp SP-5025 Basic is

```
100 IF (NAME$ = "FRED") + 1
  THEN PRINT "NAME$ IS NOT
  FRED"
```

A series of statements requires SGN to compensate for summation of the logical – 1s which each statement generates if it is true

```
100 IF SGN
  ( (NAME$ = "FRED") +
  (NAME$ = "TOM") ) + 1 THEN
  PRINT "NAME$ IS NEITHER
  FRED NOR TOM"
```

J KEELING,
Brockhampton,
Hereford.

NEXT MONTH

SPECIAL SECTION

INTEGRATED PACKAGES

A year or two ago, integrated packages were all the rage. Everyone was competing to produce the biggest program with the greatest range of features. Now there has been a swing towards the modular approach. In our special section we look at what's happening in this exciting end of the software market.

HARDWARE

The DRS-300 is another powerful 80286 machine, this time from Britain's very own ICL. We find out how it stands up to the world competition. There's also a look at Kaypro's latest, a PC-compatible with a difference.

SOFTWARE

In addition to the many powerful packages in our Integrated Software section, we will be reviewing some of the first business programs for the Atari 1040ST.

FEATURES

Where can you turn when you want independent advice about buying a new micro? We look at the world of consultancies, and at some of the unusual organisations which are joining the bandwagon.

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DBASE II	**237** RRP	395	**–40%!**
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FREE SOFTWARE

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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	ODIN	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
COMPUTE!	MAINTHINK CORP	PLANNER	TK COMPUTER PRO
CROSSBOW MUSIC	MAP COMPUTERS	PLANTIR	TOP EXPRESS
DATABENCH	MARK of UNICORN	PROGRESSIVE	TOWNGATE
DATACODE SYS	MARK WILLIAMS	PROSPERO	TYNESOFT
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.

1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX
117 Orpington High Street, Orpington, Kent, BR6 0LG
Lion House (1st floor), 227 Tottenham Court Rd, London, W1
Selfridges (1st floor), Oxford Street, London, W1A 1AB

£799

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.

SILICA SHOP

WE ARE THE UK's No1 ATARI SPECIALISTS

At Silica we have been successfully dedicated to Atari ever since their products first appeared on the UK market. We can attribute our success largely to the Atari specialisation which we practice and to the user back-up we provide. Rest assured that when you buy a piece of Atari hardware at Silica you will be fully supported. Our mailings giving news of software releases and developments will keep you up to date with the Atari market and our technical support team and sales staff are at the end of the telephone line to deal with your problems and supply your every need. With our specialist bias, we aim to keep stocks of all the available Atari hardware, software, peripherals and accessories. We also stock a wide range of Atari dedicated books and through us, the owners on our list can subscribe to several American Atari dedicated magazines. We can provide a full service to all Atari owners and are now firmly established as the UK's NUMBER ONE Atari specialists. Here are just some of the things we can offer to our customers.

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If you would like to be registered on our mailing list as an Atari computer owner, or as a person interested in buying an Atari machine, let us know. We will be pleased to keep you up to date with new Atari developments free of charge. So, return the coupon today and begin experiencing a specialist Atari service that is second to none.

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SILICA SHOP LTD, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

SEND FOR FREE ATARI ST LITERATURE

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Address: .....

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Postcode: .....

Do you already own a computer
If so, which one do you own? .....

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TEL NO: _____

olivetti peripherals

XT-Compatible 20 Megabytes £995

We'll sell you a 20 megabyte hard disk for £995 – and throw in the computer for free.

Bristol Micro Traders have been selling 20 MB hard disk upgrade kits for £549 for some time, but we've noticed that the competition is still charging nearly a thousand pounds for the same product. (We won't even mention the prices from Big Blue!) So we decided that for this special offer we would *match their prices* – but add a little value.

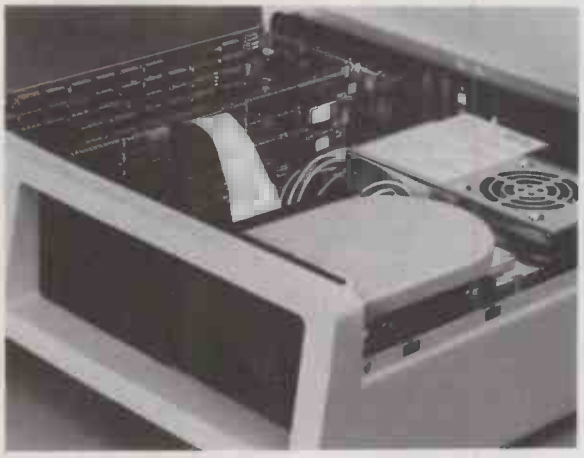
Included with the 20MB upgrade kit is our Micro 20, *a full IBM PC compatible*, running all of the standard software (Flight Simulator, 1-2-3, Sidekick, Framework, etc), and the usual hardware accessories as well. It's so compatible that you can use it with IBM's PC/DOS, as well as MS/DOS and CP/M86.

It's *a complete system*, supplied with keyboard, monochrome monitor, printer port, 360K floppy disk drive, and documentation.

And it's *a full-size system*, with a heavy duty power supply and 8 expansion slots.

We're sure you'll agree that above all, it's *an amazing bargain*.

How can we do this at such a low price? Bristol Micro Traders buy and sell in volume. We bring in parts from all over the world, test and assemble the resulting kit here in the West Country – and then *sell directly* to you. We don't buy from middlemen, and we don't sell through middlemen – so you don't have to pay for their advertising budgets and expensive High Street store fronts.



Maintenance. A delicate subject. We do thoroughly test drives and systems before shipping them out, but should the unthinkable occur, we also provide *a full twelve month parts and labour warranty* on the entire system. Alternatively, you will find that the PC compatible has become such a standard that trained repairmen are found on every High Street, and machines can be serviced through nationwide maintenance organizations.

How do you order one? Give us a ring on (0272) 279499. Send an order to Bristol Micro Traders, Systems Group, Maggs House, 78 Queens Road, Bristol BS8 1QX. Or just stop in and chat with our sales staff. We look forward to hearing from you.

The Bristol Micro 20 System includes
- *256K RAM, expandable to 640K on the motherboard*
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- *enhanced 5150-style keyboard*
- *IBM standard 360K floppy disk drive*
- *20 MB hard disk drive*
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The data protector.

(A SOFTWARE LOCK ON YOUR MICRO)

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

If the answer to either of these questions is NO then you need CLAM from MICROFT TECHNOLOGY. CLAM, as the name implies, provides a software 'shell' around your computer to prevent unauthorised access to programs and data. Once the simple task of setting up CLAM has been completed on any disk, the data can only be accessed through the user defined menus. (The menu system offers all the facilities of MICROFT's popular menu system MENUGEN.)

On starting the computer users are asked for a password. They then see on their menus only those options for which they have authority. If no valid password is entered at the third attempt no more tries are allowed until the computer has been switched off and then on again.

CLAM works by locking subdirectories. Users can only access those subdirectories for which they have authority. Only the copy of CLAM that locked a subdirectory can unlock it. Access is not possible by loading an operating system from another disk.

MAIN FEATURES

1. All data held on a hard or floppy disk can be kept secure from unauthorised access. 2. Security is by default. Once CLAM has been set up the user does not have to take any positive action to secure data. 3. Access to all activities is via user defined menus within CLAM. 4. Each user is given a user name and password. These determine which menu options the user will see. Each user needs to remember only one password. 5. Even those with access to the DOS prompt can be limited to some (or no) subdirectories. 6. A complete audit trail of all use of the system is kept.

CLAM is available for most micros with PC/MS DOS version 2.0 or later: These include the IBM PC and all compatibles. CLAM is available until 30th June at an introductory price of £98 + VAT. Site and corporate licences are available. Existing MENUGEN users may upgrade to CLAM for £60 + VAT. CLAM may be purchased from MICROFT TECHNOLOGY LTD. The Old Powerhouse, Kew Gardens Station, Kew, Surrey TW9 3PS or from most dealers. To order or obtain further information telephone 01-948 8255.

CLAM

COMBINES THE FRIENDLIEST POSSIBLE 'FRONT END' WITH COMPLETE SYSTEM SECURITY.

CLAM is a Trade Mark of Microft Technology Ltd and is a British product.

13

All above board

INTEL and Lotus have collaborated to create an expansion path for the IBM PC family beyond the 640K maximum currently available.

The fruits of the collaboration are available in the form of Above Board, which provides an additional 2Mbyte of memory. It can be configured either as a print buffer, RAM disc or system memory. Two boards can be fitted into a PC and four into a PC/XT. Piggybacking allows 4Mbyte to be fitted in a single PC/AT slot and up to four of these boards can be fitted within an AT, giving a total memory capacity of 16Mbyte.

The great advantage of the system is that it is being supported by many of the large software companies as well as by Intel. Lotus's 1-2-3 and Symphony and Ashton-Tate's Framework have been customised to make use of the system, and other companies are expected to follow.

The U.K. distributor for Above Board is First Software. Details from First Software, Intec 1, Wade Road, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 463344.

Centronics printers

CENTRONICS DATA COMPUTERS has launched a series of colour dot-matrix printers and a laser printer. The colour printers are called Printstations 250 and 260. Both can produce high-resolution graphics with four primary and seven process colours available.

In text mode the printers are capable of speeds of 200cps in draft mode and 40cps in NLQ. The Printstation 250 can print up to 80 columns, whereas the 260 is capable of up to 136 columns.

The Centronics Laser 8 printer is priced at £1,995. It can handle A4 and B4 paper sizes plus envelopes, labels and transparencies. The printer can emulate the Diablo, IBM Proprinter and Epson FX-80 formats and has modules for serial, parallel and IEEE interfaces.

Centronics says that the Laser 8 will be available in the U.K. in July. Also available will be an add-on giving the Laser 8 1.5Mbyte of RAM.

Further details are available from Centronics Data Computer (U.K.) Ltd, Petersham House, Harrington Road, London SW7 3HA. Telephone: 01-581 1011.

IBM LAUNCHES LAP PORTABLE AND UPGRADES AT

THE LAST few weeks have seen a flurry of activity from IBM. The company has launched the lap-portable Convertible in the U.S. and has introduced a number of enhancements to its existing PC range. IBM has also released upgrades of Topview, Xenix and the PC local area network.

In a major break from the accepted PC standard, the Convertible is the first computer marketed by IBM in the U.S. and Europe to be fitted with Sony-type 3.5in. floppy-disc drives. The two-double-sided drives built into the Convertible have a maximum formatted capacity of 720K each.

Based around the 80C88 processor, the Convertible features a detachable 80-line by 25-character LCD display, a full-size keyboard and 256K of RAM, expandable to 512K.

Two types of monitor are available for the Convertible, to be used in place of the detachable LCD screen. The composite-video monochrome monitor has two text and two graphics displays. The RGB colour monitor has two text modes and one graphics mode. A CRT display adaptor is being provided for the Convertible, which will allow it to run the Convertible monitors or the standard PC display when the computer is being run from the mains adaptor.

The Convertible weighs under 13lb. and can be powered either from batteries or from a mains adaptor. IBM says that the batteries will last around six hours, although this will vary depending on disc-drive use. The U.S. price for the Convertible is around $2,000.

IBM has also announced that 3.5in. internal and external disc-drive options will be available for the PC/XT and PC/AT ranges. The drives are fully compatible with the current Microsoft 3.5in. standard. To support the 3.5in. format PC-DOS 3.2 has been released, as explained in a separate article on page 80 of this issue.

IBM U.K. has announced upgrades for many of its existing models. An expanded version of the PC/AT, known as the PC/ATX, has an 8MHz clock speed, bringing it into line with a number of the more successful AT clones. The machine also has a half-height 5.25in. 1.2Mbyte floppy drive, a serial/parallel adaptor and a 30Mbyte hard disc as standard. The ATX is also fitted with 512K of memory, expandable to 2Mbyte by means of 512K expansion cards.

There are two new models in the XT series, forming a new slim-line S range. They feature half-height 360K floppy drives and are fitted with 640K on the motherboard as standard. The SDD model has two floppy drives, while the SFD model has one floppy and a 20Mbyte hard disc. IBM has also decided to upgrade the standard PC. The new standard model will now be fitted with 256K of memory.

Along with the new models, IBM has announced that the new keyboard fitted to the 6150 reviewed on page 45 of this issue will be made available generally. It features an improved layout and has 12 function keys. IBM sees this keyboard as being of particular value when PCs are used as terminals. It is priced at £175.

The price of the PC/ATX system unit is £3,763. For the XTS range the prices are £2,056 for the SFD and £1,569 for the SDD. The upgraded version of the PC costs £1,104.

Among the software enhancements announced is Topview 1.10 which features batch-file support, program swapping and the ability to boot programs automatically. A Topview Programmer's Toolkit is also available. Xenix 2.0 offers increased multi-tasking and multi-user capabilities and improved compatability with the Aix operating system used by the PC/AT. Version 1.1. of the PC local area network runs under DOS 3.2, supports sharing of printers and applications and is fully compatible with the enhanced version of Topview.

For further details contact IBM (U.K.) Ltd, 76-78 Upper Ground, London SE1 9PZ. Telephone: 01-928 1777.

Dual speeds for Epson PC Plus

FOLLOWING the successful launch of the Epson PC, the company has gone one stage further and has produced a PC/XT-compatible micro. The new micro, to be called the PC Plus, was launched at the Hanover Fair at the end of March.

The PC Plus comes with 640K of memory and will be available fitted with either a single 360K floppy-disc drive, twin floppies or a single floppy drive and a 20Mbyte hard disc. The PC Plus is expected to be priced at around £1,900.

The machine is based around the NEC V-30 processor, which the company claims is fully 8086-compatible. The chip has switchable clock speeds, allowing it to run either at the standard 4.77MHz or at 7.16MHz. Epson says this gives the machine a speed equivalent to that of Olivetti M-24.

As an incentive Epson has followed the lead of a number of other compatible manufacturers and included as standard a number of features, including IBM monochrome/colour graphics, Hercules graphics-card emulation and serial and parallel interfaces. All these features are built on to the motherboard, leaving the five I/O slots available for further expansion.

Details are available from Epson (U.K.) Ltd, Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892.

More than a modem

DACOM SYSTEMS has launched a telephone receiver with a built-in modem. The Dataphone 1-3 looks like a standard push-button telephone but has additional buttons on top to select the modem protocols. It also has two leads, one to a computer and the other for the telephone socket.

The modem has two preset modes of V-21 or V-23 and can be configured to other settings. No terminal software is provided with the Dataphone 1-3, although there is a basic terminal driver within the modem. The Dataphone 1-3 is priced at £245.

For more details contact Dacom Systems Ltd, Sunrise Parkway, Linford Wood, Milton Keynes MK14 6LU. Telephone: (0908) 675511.

Olivetti ships 10-Net

OLIVETTI has begun shipping its own 10-Net local area network to its U.K. dealers. The system is fully IBM compatible and is priced at £595 per node.

The price includes the interface board for the micro, cabling, software and a connection box. At present, each node on the network has to be booted individually but Olivetti plans to release software which can be used to boot the whole system.

Olivetti's 10-Net is a bus system built around segments which can support up to 32 nodes. However, any number of segments can be connected together, so theoretically an unlimited number of users can be supported. Any PC on the network can be used as a server and 10-Net can accommodate as many servers as required.

Details available from British Olivetti, PO Box 89, 86/88 Upper Richmond Road, London SW15 2UR. Telephone: 01-785 6666.

The new series of compatible machines from Mitsubishi cover the full IBM range from PC to AT.

MITSUBISHI JOINING IN

THE JAPANESE industrial giant Mistubishi has entered the U.K. personal-computer market with three micros compatible with the IBM PC range. The company has also launched a photographic-quality colour thermal printer.

The PC compatible, called the Model 816, is based around the 8088 processor and has twin 360K floppy discs. The Model 816N is PC/XT compatible and has a single floppy disc and a 20Mbyte hard disc as standard. The micros are priced at £1,700 and £2,400 respectively.

Costing £3,400, the AT clone is the Model 816F, based around the 80286 processor. It is fitted with a single 1.2Mbyte floppy-disc drive and a 40Mbyte hard disc. The 816F is unusual in that it runs either at 4.77MHz or 7.16MHz, rather than the 6MHz or 8MHz generally found on AT compatibles. All machines have 512K RAM and serial and parallel interfaces as standard. The 816 and 816N come complete with a 12in. monochrome monitor; the 816F has a 14in. colour monitor included in the price.

The G-500 is a high-speed graphics printer capable of printing high-resolution 240 dot/in. graphics to an area of 8.5in. by 9in. The printer uses thermal-transfer techniques and can produce a full-colour print from the screen in under three minutes. A video-interface box is currently under development which will allow prints to be made from an RGB output socket from a TV or monitor. An A3 version of the printer is also under development. The G-500 is priced at £3,933.

All machines are available now and Mitsubishi is selling them directly rather than through distributors. For further details contact Mitsubishi Electric U.K., Hertford Place, Maple Cross, Rickmansworth, Hertfordshire WD3 2BJ. Telephone: (0923) 770000.

Add-on boards for memory and speed

INTELLIGENT SOFTWARE has developed an add-on board for the IBM PC which it claims can produce an increase in speed of over 1,600 percent. The Software Engine is based around the Motorola 68020 32-bit processor and comes with an extra megabyte of RAM. Prices for the board begin at around £1,500. Further details are available from Intelligent Software, 37 Bedford Square, London WC1B 3HW. Telephone: 01-636 7016.

Quin Systems has launched an expansion board for the IBM PC family which contains a 68000 or 68010 co-processor and an additional 1Mbyte of memory. Also included in the package is the OS-9/68 operating system. Details are available from Quin Systems, 35 Broad Street, Wokingham, Berkshire RG11 1AU. Telephone: (0734) 783114.

Micro-APL seems to have gone one better with its Aurora supermicro. While Intelligent Software and Quin seem to be happy with one processor, the Aurora is a multiple-processor machine. The entry-level machine has a single 68020 CPU and two 68000s to handle the I/O and disc control respectively. Details from Micro-APL Ltd, Unit 1F, 87 Kirtling Street, London SW8 5BP. Telephone: 01-622 0395.

HARDWARE SHORTS

● Bull Peripherals has launched a magnetographic printer, known as the MP-6090, which can utilise forms and founts designed on IBM-compatible PCs. The data can then be loaded on to the printer's own fixed disc and utilised directly. Details on (0990) 23491.

● TIS Computing has begun distributing the Fortune Unix co-processor for the IBM PC/XT and PC/AT. The processor is a plug-in module which comes complete with Fortune's Unix operating system, a word processor and a work-station keyboard. More details on (06285) 24999.

● Hewlett-Packard has announced price reductions in the PC/AT-compatible Vectra Personal Computer series and a range of peripherals. The Vectra Standard now costs £2,495, the Model 25 is £2,990 and the Executive £2,595. For details phone (0895) 72020

● Unity is a modem on a plug-in card for the IBM PC. Supporting the V-21 and V-23 standards, the Unity is Hayes compatible, allowing it to be used with a number of standard packages. It can also be purchased either with Vicom or Datatalk software. Details on (0908) 675511.

● Grid has upgraded its Gridcase 2 portable computer with a new LCD screen, which the company claims is the most readable so far. The screen has been introduced with no increase in the price of the Gridcase 2. Details on (07372) 41211.

● The Video One is a graphics card which can produce both monochrome and colour graphics on the IBM PC. The card generates up to 16 colours on an IBM-compatible monitor or 16-shade colour emulation on a monochrome monitor. Details on 01-833 1867.

● Mountain Computer Inc. is planning to market its 30Mbyte hard disc on a card worldwide. It was exhibited at the Hanover Cebit show, and shipments of the Drivecard 30 have already begun in the U.S. It will be available elsewhere through local distributors. For details phone (U.S. area code 408) 438-6650. PC

LOTUS DEVELOPMENTS

LOTUS DEVELOPMENT has introduced version 1A of its best-selling 1-2-3 package for the Apricot Xen. It is essentially the same as the Apricot XI version released in 1984, but with different drivers.

Lotus says it is currently having discussions about transferring version 2.0 to the Apricot range, although no immediate announcement is planned. Lotus 1-2-3 for the Xen costs £395 and is available now from Lotus dealers.

In a separate move, Lotus has extended until 31 December the time limit for existing users of IBM versions of 1-2-3 who wish to upgrade to version 2.0. Lotus says this is because customers have been requesting the extension so that the upgrade can be assimilated by companies in an orderly fashion. The rate of orders for the upgrade has not altered since Christmas, and Lotus estimates that more users will have version 2.0 than earlier versions by the end of the year.

Further details are available from Lotus Development (U.K.) Ltd, Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 840281.

SOFTWARE SHORTS

- Lotus has announced that release 1A of Jazz is now available. The cost has also been reduced from £450 to £295. More on (0753) 840281.
- Ashton-Tate has cut the price of Multimate 3.3 from £450 to £375. Details on (0628) 33123.
- Impressionist is a new business-graphics package from Execucom. The cost is £850 for the IBM PC version. More on 01-633 0121.
- Pocket WordStar for the Amstrad PCW-8256 series has been cut in price to £49.95 including VAT. Details on 01-879 1122.
- T-Safe is an encryption program for email. The cost is £395. More information from Sophos Partners on (0865) 853668.
- Wordcraft version 2.50 is now available in the U.K. Among the new features are spooling, background printing and print scheduling. Details on (0206) 561608.
- Lapdos from Traveling Software allows IBM PCs and clones to share Tandy or Brother disc drives for the Tandy, NEC and Olivetti lap portables. At present the software is only available in the U.S. where it is priced at $89.95. For details phone (U.S. area code 206) 367-8090.
- Xat Softare has launched Padlock, a data-protection program for Lotus files. Sensitive data is guarded by a password system which sounds an alarm if three incorrect passwords are entered. Details on (0634) 814931.

Graph in the Box

THE MARCH of the memory-resident packages continues with the launch of Graph in the Box, a graphics utility which will work with other application programs such as spreadsheets or word processors. It will run on the IBM PC and AT.

Graph in the Box is loaded in the usual way before other applications and is invoked by pressing Alt and G simultaneously. You select the starting point for the capture of data and the program then constructs a chart. It is claimed that it will work with all the standard packages including Sidekick, which is also memory-resident.

Graph in the Box has been written in the U.S. but is distributed by the Swedish company Arcad Technology. It is available in the U.K. for £95 from Zygos International Ltd, Suite 9A, Intec 2, Wade Road, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 25927.

Microsoft bundles Ready with Word

MICROSOFT has bundled the Ready outline processor with version 2.01 of its Word WP package. Ready is a memory-resident program which enables users to structure a program and add notes without having to exit the word-processing application.

Supplied as a separate package to Word, Ready is also compatible with other products in the Microsoft range such as Multiplan. This bundled offer is only for version 2.01. Version 3.0, which is expected to be released in the U.K. in May, will include an outline processor within the application. Available for the IBM PC and compatibles, Word 2.01 and Ready occupy 383K of memory. The package retails at £400.

Word 2.01 is an enhanced version of the earlier Word releases and will drive more printers, including the Canon Laser, IBM Pagewriter and Colour Jet printer. Details are available from Microsoft, Excel House, 49 De Montfort Road, Reading, Berkshire. Telephone: (0734) 500741.

Atari ST CP/M software

FOLLOWING the announcement of a CP/M emulator for the ST range — see *Practical Computing* May 1986 page 16 — the first products to run under the new format are beginning to appear. The ST emulator is now being bundled with new STs, and is available to registered owners through local dealers.

The Software Toolshop has transferred its entire range of CP/M languages and utilities to the 3.5in. disc format used by the ST. Among the programs available are Tubo Pascal, the Hisoft Devpac and the Digital Research CBasic compiler. All prices are the same as those offered for Amstrad users, with the exception of the Prospero range of languages which are under a special offer on the Amstrad range.

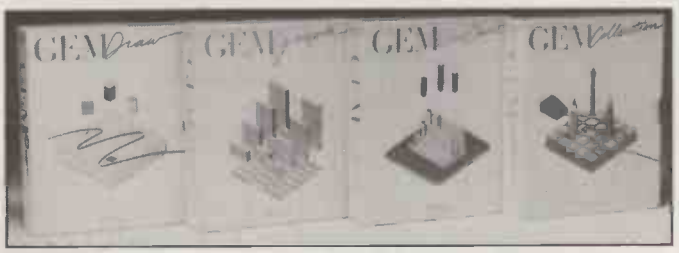
For further details contact The Software Toolshop Ltd, 180 High Street North, Dunstable, Bedfordshire LU6 1AT. Telephone: (0582) 699657.

Tasword on PCW range

TASMAN SOFTWARE has developed a customised version of its popular Tasword WP program for the Amstrad PCW-8256 and 8512 machines. The program will be officially launched at the Amstrad User Show in London on 13 June.

The new version, known as Tasword 8000, will cost £24.95 and features a full 90- by 32-character screen, mail merge and two founts. The program is also able to take advantage of all the free memory available within the computer.

For details contact Tasman Software, Springfield House, Hyde Terrace, Leeds LS2 9LN. Telephone: (0532) 438301.



IBM Convertible software

IN RESPONSE to those cynics who doubted whether any software would appear for the new IBM Convertible, Lotus has already announced that 1-2-3 and Symphony will be available. Lotus 1-2-3 will appear in the summer, and Symphony in the autumn of this year.

Another interesting move is the licensing agreement IBM has signed, under which it will market Digital Research's Gem applications in the U.S.

Lotus application models

ICOS LTD has announced a range of ready-made templates for Lotus 1-2-3. They are supplied on disc and are available for profit and loss cash-flow forecasting, project appraisal, time recording, statistics, corporate planning and management accounting.

Each template costs £200 and is available from ICOS Ltd, 37-43 Sackville Street, London W1X 1DB. Phone: 01-734 2813. PC

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IBM Quietwriter (45cps)	£999.00

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All prices include Keyboard, Monitor & DOS.

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Because now there's a machine that puts real wordprocessing power within everyone's reach.

The Amstrad PCW 8256 is a complete wordprocessor and a powerful computer in one unit.

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It's a complete wordprocessor

The PCW 8256 is totally equipped for wordprocessing. It has a high resolution screen with 90 columns and 32 lines of text.

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There's also an optional combined serial and parallel interface that gives you access to modem, additional printers and other peripherals. And you can even add an extra 1 M byte drive.

Training

The PCW 8256 comes with a comprehensive user guide that tells you, in simple language, how to master its wordprocessing and computer capabilities.

But if you want to get to grips with it even quicker, there are now a great number of training courses available throughout the country.

On-site maintenance

Amstrad computers are exceptionally reliable.

But many business users find it reassuring to know that nationwide on-site service and maintenance contracts can be arranged.

The 82 key keyboard is specifically designed for wordprocessing. Its special function keys allow you to refer to 'pull down' menus as you work, so you don't have to memorise complicated codes.

And the PCW 8256 has an integrated printer with compatible software that gives you a choice of letter quality and high speed drafting capabilities.

Finally, there's an automatic paper load system, as well as tractor feed for continuous stationery.

It's a powerful computer

The PCW 8256 is also a purpose built computer with an enormous 256k memory.

For computer buffs, the Mallard basic, Dr Logo and GSX Graphics system extensions will mean you can write your own programs.

All of which puts the ordinary office typewriter firmly in its place.

The place featured on the opposite page.

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BT record profits

BRITISH TELECOM has announced that it made a pre-tax profit of £1,333 million in the first nine months of the financial year beginning April 1985. This is an increase of £263 million over the same period for the previous year. Turnover for the period was £6,160 million, an increase of 10 percent over the corresponding period last year.

At the same time as it turned in the record profits, BT also announced that it had gained government approval for the acquisition of a 51 percent interest in the Canadian telecomms manufacturer Mitel at a cost of £160 million. The company sees this acquisition as an important foothold in the vital North American market.

Further details are available from British Telecom Centre, 81 Newgate Street, London EC1A 7AJ. Telephone: 01-726 4444.

One to One broadens its appeal

ONE TO ONE, the popular electronic-mail service, has introduced a bulletin-board system for subscribers. It has also been adapted for viewdata terminals.

The noticeboard, called 121 World, will provide a free service through which customers can advertise, offer goods for sale, ask for help or pass on general information. It will also be able to support special interest groups.

The 121 World noticeboard can be accessed from One to One's mail service by entering

ON-LINE 121 WORLD

The addition of viewdata lines means that the many businesses which use viewdata terminals will now be able to access One to One. It offers fast keyword searching, as well as the conventional menu-driven system.

One to One says the improvements are part of a general plan to generate additional usage, and are not intended as an assault on Prestel. It sees the Sigs as being attractive to high-tech companies, hotels, insurance groups and the travel business.

Further details can be obtained from One to One, 102 Sydney Street, London SW3 6NL. Telephone: 01-351 2468.

THE FUTURE OF SINCLAIR

FOLLOWING the sale of its computer business to Amstrad, Sinclair Research now plans to concentrate on research and development. The present plan is to relaunch the company as Sinclair Research Labs, which will become a holding company with three sub-divisions.

One of these divisions is likely to be hived off as a separate company to deal with computers and allied products. They include the Pandora lap portable, which is rumoured to have a launch date set for some time in 1987. This machine will probably be manufactured, sold and marketed by Amstrad, albeit under the Sinclair name. This is in keeping with the announcement which said Amstrad had gained "worldwide rights to sell and manufacture all existing and future Sinclair computers and computer products together with the . . . intellectual property rights."

There seems to be less certainty whether Amstrad has first option on other products, such as those derived from Sinclair's research on wafer-scale integration. All that Amstrad and Sinclair will say is that a number of details of the agreement are "still under negotiation". Financial backing for the wafer-scale integration project is initially being provided by Barclays, and the hope is that production of the 40Mbit wafers will begin next year.

The second branch of Sinclair Research will undertake research for the other companies. Like the computer products division, it is to be based in Cambridge. A contract research division of this kind could be a valuable source of revenue to Sinclair.

The third arm of Sinclair Research Labs will be based in Winchester and will concentrate on the development of telecommunications devices. These will include the small pocket radiophone which is currently under development.

Copyright law changes proposed

THE GOVERNMENT has published a White Paper that reviews the whole field of copyright law. Its main proposals as they affect computer users are a restatement that computer programs are covered under the copyright acts, and the introduction of a 10-year protection of original design for parts and other objects which are not considered artistic works.

The White Paper also makes proposals that will affect the computer-games industry. Although some home taping is to be made legal, this will not apply to computer programs and videos.

The White Paper *Intellectual Property and Innovation* is published by HMSO and costs £6.70. Further details from the Department of Trade and Industry, 1 Victoria Street, London SW1H 0ET. Tel: 01-215 7877.

SHORTS

● The increasing interest in artificial intelligence has spawned a specialist magazine on the subject. *AI Expert* is a monthly magazine aimed at professionals developing AI applications for commerce and industry. It sets out to examine and explain the range of practical applications of the technology that are now becoming available, and to provide a forum for those engaged in work in the field. *AI Expert* will be officially launched in July and will be published monthly from October. For further details contact CL Publications, 650 Fifth Street, Suite 311, San Francisco, Ca 94107, U.S.A. Telephone: (U.S. area code 415) 957-9353.

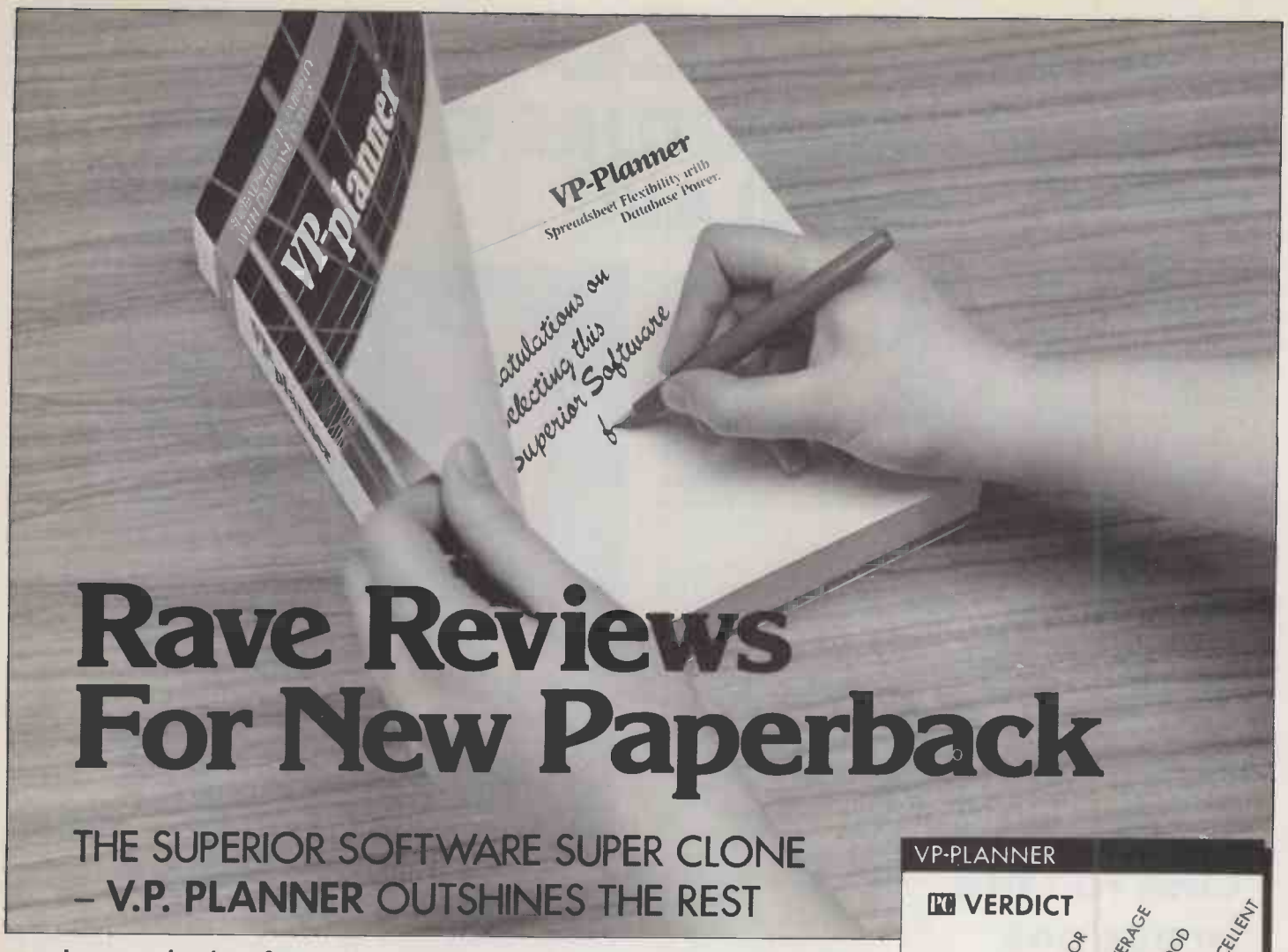
● The National Computing Centre is updating its index of suppliers of computing and communications equipment. The index is used by the NCC to supply enquirers with a list of companies able to provide particular services. The NCC says that last year over 9,000 enquiries were received. The cost of joining the index is £15 per address. Details from the National Computing Centre Ltd, Oxford Road, Manchester M1 7ED. Telephone: 061-228 6333.

● Micronet 800, the micro-users' section of Prestel, is introducing an accounting service within the Bizznet area of the database. The service is provided by MAS and allows users to enter their accounts information at a terminal. The information will then be processed by MAS to provide audits and VAT reports, purchase and sales ledgers and analysis of expenditure. Further details from Micronet 800, 8 Herbal Hill, London EC1R 5EJ. Telephone: 01-278 3143. MAS, Stockeld Park, Wetherby, West Yorkshire LS22 4AH. Telephone: (0937) 63778.

Encryption devices for PC family

A NEW encryption key has been launched for the IBM PC family. Called the Data Sentinel, the key slots into the parallel printer port and encodes information on the hard disc. At the end of a session the Sentinel can be locked away, preventing unauthorised access to information. Details from California Software Products, Shirley Lodge, 470 London Road, Slough, Berkshire SL3 8QY. Telephone: (0753) 41278.

The Techland encryptor is intended for high-speed data transfers. The encryptor is said to use a complex coding algorithm instead of the more normal fixed-pattern scrambler. The encoder costs £795 for the synchronous version and £645 for the asynchronous model. Further details are available from Techland Systems International, Weybridge House, Cores End Road, Bourne End, Buckinghamshire SL8 5HH. Telephone: (06285) 26535. PC



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Ease of use	☐	☐	■	☐
Documentation	☐	☐	☐	■
Value for money	☐	☐	☐	■

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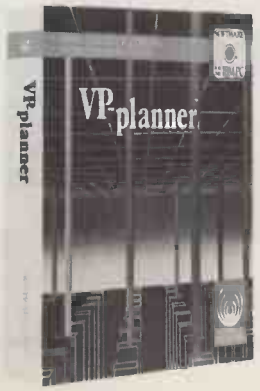

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BY MIKE LEWIS

THE COMPLETE BINARY TREE

Sorting a changing set of data into an ordered sequence is made less cumbersome using this method.

If you have been a devoted reader of this column since it started you will be either completely at home in the world of sorting, or thoroughly confused by the whole subject. We have looked at a bewildering variety of sorting techniques all with the same basic aim: to take a set of unordered data, to operate on it in some way, and to end up with the same data in sequence.

But there are many programming problems which, while requiring values to be in some specific order, cannot be solved simply by sorting the list in advance. Often you need to get at the current highest value, even though the list is growing and changing all the time.

As an example, consider a program that simulates flight movements at a busy airport. Aircraft arrive at irregular intervals, circle above the airport until a runway is available, and eventually land. The flight controller gives landing permission, not on a simple first-come, first-served basis, but according to a set of priorities. These might be based on factors such as the amount of fuel on board the aircraft and the time needed to make it ready for its next flight.

CHANGEABLE DATA

Within a given period, the number of aircraft arriving will probably not be the same as the number landing. Therefore the queue is constantly growing and shrinking. Also, priorities are liable to change and some aircraft might even disappear from the queue altogether as they are diverted to other airports.

The usual way of handling this type of situation in a program is to set up a priority queue, where the objects to be processed are retrieved in key sequence. Compare this with an ordinary queue, where the next item to be retrieved is always the oldest, or to a stack, where it is the newest.

One example of a priority queue is an unordered list, where new items are added to the end as they arrive. Unfortunately, retrieving the next value would always be slow because it would involve looking at every item in turn. Alternatively, you could maintain a sorted list, inserting each new item in sequence and retrieving the highest item from the top of the list. In this case, retrieval would be fast but insertion slow.

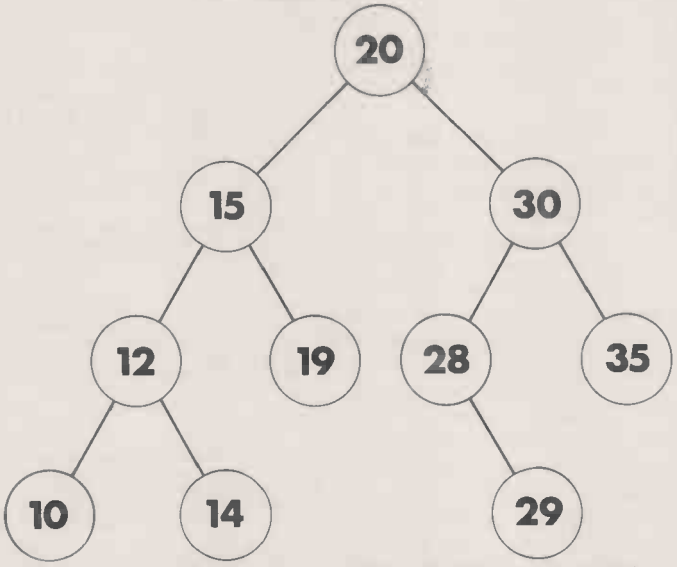

Figure 1. A conventional binary tree. The left successor of each node contains a value lower than that of its predecessor. The right successor contains a higher value.

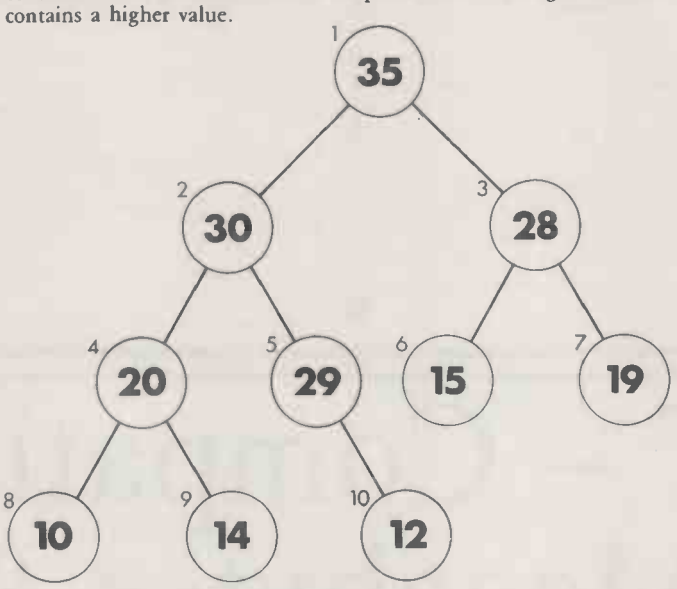

Figure 2. A complete binary tree. Here both successors have values lower than their predecessor, the highest value being in the root.

Fortunately, there is a compromise in which insertion and retrieval are both reasonably fast, as is deleting items and altering existing values. It makes use of a data structure known as a complete binary tree. At first sight this looks like any other kind of binary tree but there are important differences.

In the traditional binary tree shown in figure 1 values are stored in nodes. Each node has at most two children, or successors. The left successor always contains a lower value than its predecessor; the right successor always has a higher one.

The complete binary tree is similar in that every node has up to two successors. But both successors must contain values lower than their predecessor's. This does not mean that every node at a given level has a value higher than all nodes at a lower level, as a glance at figure 2 will verify. However, since no node can contain a higher value than its parent, it follows that the highest value in the tree must be contained in the root.

One advantage of this type of structure is that it is easy to represent as an array. You store the nodes in the order in which they appear in the tree, starting at the root and working downwards and to the right. Figure 3 shows how this might look. The node numbers shown in the diagram are translated to table addresses, or subscripts.

Node number	1	2	3	4	5	6	7	8	9	10
Contents	35	20	28	20	29	15	19	10	14	12

Figure 3. A complete binary tree translated to a one-dimensional array. The tree can be traversed by means of arithmetic on the subscripts, rather than by using pointers.

The beauty of this is that you do not need to store any pointers. Any node's predecessor can be found by halving its address and dropping any remainder. Similarly, the two successors of the node at position n can always be found at 2n and 2n + 1 respectively. This would not work with an ordinary binary tree because there would be gaps in the array and it would not be complete.

The basic operations that need to be performed on this structure are: inserting a new item; retrieving the highest item; deleting an arbitrary item; and changing an item. You might also need to build the list from scratch and join two lists together, although these are really higher-level applications of the insert function. You should use the most obvious method in performing all these operations even though this might destroy the parent/child relationships within the tree, and worry about repairing the damage later.

For example, the obvious way of inserting a new item is to allow the array to grow by one element, and to place the newcomer at the end. Of course, this might violate the fundamental property of the structure, that every node must contain a lower value than its predecessor. If it does you can fix it by swapping the newly inserted value with that of its parent. This means that the value might be higher than its new parent, so you keep

(continued on next page)

(continued from previous page)

repeating the process until the tree is correct.

This is not as time-consuming as it sounds because you only ever have to swap a small fraction of the total number of entries. At worst each insertion involves log N swaps, where N is the size of the array. Keeping an ordinary list in sequence would involve up to N swaps per insertion.

Since the original value is always one of the two items being compared, you can speed up the swapping by postponing the replacement of this value until you are sure that the process is finished. To prevent the program running off the end — or rather the beginning — you need to store an artificially high value at the very start of the table. In Basic, element zero can be used for this — see the listing opposite.

Retrieving the highest item in the queue is a similar procedure. This item can always be found in the root, but once it has been removed you need to put something in its place, otherwise there would be a gap in the tree.

The easiest option is to move the last item in the table to the root, decreasing the size of the table by 1. This leads to a violation of the basic parent/child relationship, so once again you have to go through repairing the damage. However, this time you start the swapping process at the root and work downwards.

In the listing the two repair operations have been coded in separate subroutines. This is because, as they stand, the insert and retrieve functions do not need to know anything about the structure of the binary tree. If you decide to change to another type of priority queue you only need to rewrite the repair routines.

For example, if you want to store the array as an ordinary sorted list, the upward repair function would pick up the out-of-sequence value, locate its rightful place in the table, and move everything below that place down one position. Similarly, the downward repair routine would remove the relevant item, moving the entire list up one place to make room for it. The insert and retrieve subroutines would not need changing.

The same applies to the procedure for deleting and changing arbitrary values in the array. There is not enough space here to print the listings of these, but they can both be coded very simply, independently of the tree structure, calling the repair routines as before. PC

```
1000    'Subroutines for processing a complete binary tree. The tree is
         held in the array TREE(). Other variables used are:
1010    '  MAX      Maximum number of entries
           SIZE     Current size of the tree
           MAXINT   Constant of 32767
1020    '  FALSE    Constant of 0
           TRUE     Constant of -1
           Note that all variables are defined as integers
1030    'Entry 0 in TREE() contains the 'sentinel' value, MAXINT

3000    'Routine to insert a new value, which is contained in NVAL
3010    SIZE=SIZE+1: TREE(SIZE)=NVAL              'Insert value at end of tree
3020    PNT=SIZE: GOSUB 4000                      'Repair tree upwards
3030    RETURN

3500    'Routine to extract the highest value, which is returned in HVAL
         (Note: for this to work properly, there must be at least one
         value in the tree.)
3510    HVAL=TREE(1)                              'Highest node is the root
3520    TREE(1)=TREE(SIZE): SIZE=SIZE-1           'Replace root with value
                                                   from end of tree
3530    PNT=1: GOSUB 4500                         'Repair tree downwards
3540    RETURN

4000    'Repair tree upwards. PNT points to the node at which the repair
         operation is to start
4010    HOLD=TREE(PNT)                            'Extract pointed-at value
4020    WHILE TREE(PNT\2)<=HOLD:
            TREE(PNT)=TREE(PNT\2): PNT=PNT\2:
        WEND                                      'Move higher values downwards
4030    TREE(PNT)=HOLD                            'Replace original value
4040    RETURN

4500    'Repair tree downwards. PNT points to the node at which the repair
        operation is to start
4510    HOLD=TREE(PNT)                            'Extract pointed-at value
4520    DONE=FALSE                                'Flag to say when finished
4530    WHILE (PNT<=SIZE\2) AND NOT DONE:
            SUCC=PNT+PNT                          'SUCC is left successor
4540        IF SUCC<SIZE THEN
                IF TREE(SUCC)<TREE(SUCC+1) THEN
                    SUCC=SUCC+1                   'SUCC is now the higher of
                                                   the two successors
4550        IF HOLD>=TREE(SUCC) THEN
                DONE=TRUE
            ELSE
                TREE(PNT)=TREE(SUCC): PNT=SUCC
4560                                              'If original value less than
                                                   this successor, move current
                                                   value down, and point to it
4570    WEND
4580    TREE(PNT)=HOLD                            'Replace original value
4590    RETURN
```

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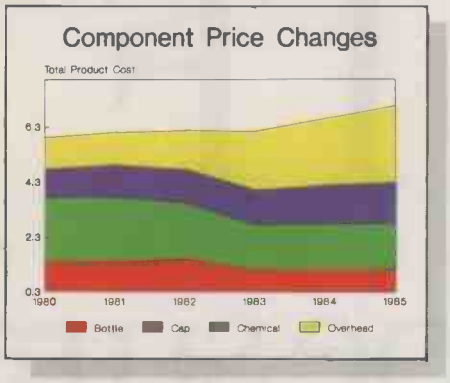

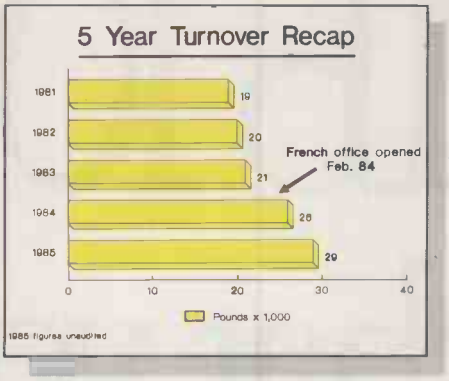

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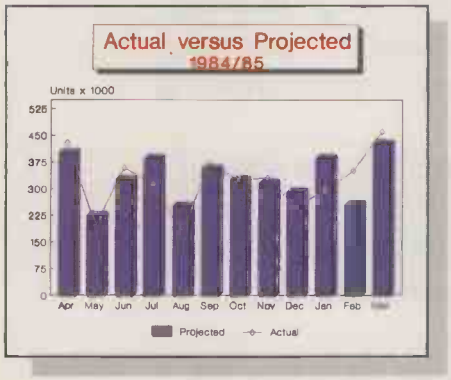

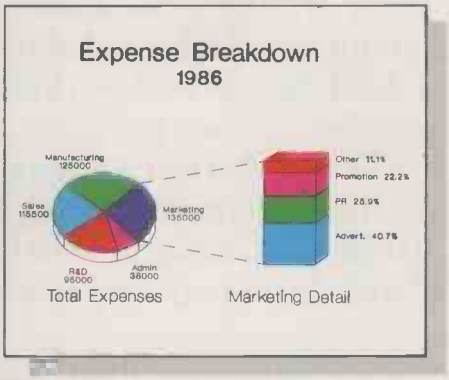

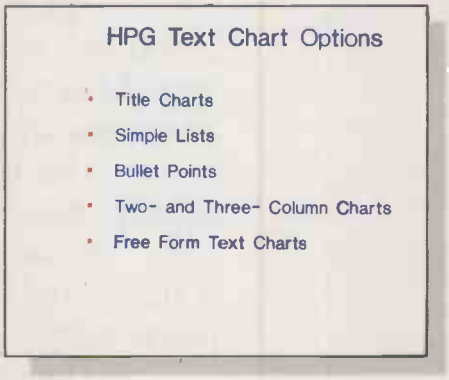

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BY RAY COLES

MEGABITS AND MICROBUCKS

Cheaper RAM chips have done a lot to boost the latest powerful software packages. Now RAM is getting even cheaper.

The march of semiconductor progress rumbles relentlessly on despite the recent slump in the sales of chips. At the sharp end, as usual, is dynamic-RAM technology. If anything, the pace of innovation in this lucrative but risky business area is accelerating as the competition mounts.

The price of 256Kbit dynamic-RAM chips took a suicidal plunge in 1985, which wiped more than two billion dollars off their world-wide sales total. But no sooner do the semiconductor manufacturers breathe a sigh of relief as the price flattens out again than they are forced to face up to the fact that they are already up to their necks in the battle for dominance of the market for the next generation of 1Mbit devices.

At least a dozen manufacturers now claim to have 1Mbit dynamic-RAM designs available. About half of them are already able to provide samples for designers to evaluate in their next-generation systems. Notable names include Fujitsu, Hitachi, Mitsubishi, Toshiba, NEC and Texas Instruments, all eager to reserve a slice of a market estimated to be worth at least five billion dollars by the end of the decade.

In Europe the giants Philips and Siemens have joined forces under the auspices of a billion-dollar project partly funded by the Dutch and German governments. It is aimed at equipping European industry with the technology needed to build devices, including 1Mbit RAMs, which can compete in future world markets.

LICENCE DEALS

After spending considerable sums on trying to develop its own 1Mbit capability Siemens has now decided to license Toshiba technology. It looks as though Philips will follow a similar path, at least inititally, but neither company has devices ready at the moment. Britain's only real chance, Inmos, was badly hit by the 1985 slump and has no immediate plans for a 1Mbit commodity part.

The companies left in the race can look forward to an uncomfortable roller-coaster ride before they reach the final straight. Samples of the available megabit chips are currently commanding premium prices of between 50 and 100 dollars apiece. By the end of 1986 this will be down below 20 dollars and by some time in 1987 it should drop past the 10 dollar barrier. At that point it will be directly competitive on a bit-for-bit basis with 256K devices.

What happens after that is anybody's guess, but prices per bit will be measured in micro-dollars. The survivors will have to be very, very good at shaving their production costs to the bone if they expect to stay profitable and still continue to invest in the next generation of 4Mbit devices.

To make the 1Mbit competition more interesting, the change from the current 256Kbit standard is not as straightforward as previous changes from 16K to 64K to 256K have been. The standard 16-pin package, because of its low cost, has been adapted by means of increasingly sophisticated pin-shaving arrangements to handle every memory generation from 256 bits in the early 1970s right up to today's 256Kbit chips. But it has finally had to be pensioned off because the 1Mbit generation needs at least 18 pins.

PACKAGING OPTIONS

What the final standard package will turn out to be is by no means certain. Although a conventional dual-in-line 18-pin design is the safe bet, a number of more radical alternatives are now available. The trend towards the surface mounting of components on circuit boards may favour the leadless chip carrier (LCC) package. But for conventional circuit-board applications there are other options which increase packaging density, including the single-in-line (SIP) or the zig-zag in-line (ZIP).

Quite apart from the relatively straightforward packaging options, it is not yet certain what basic semiconductor technology will become the standard. Until recently NMOS technology has been the norm because it is simple and inexpensive. But already there are CMOS versions of the 256K part available at somewhat higher prices. Some manufacturers feel that it will take over completely at the 1Mbit level.

The attractive low-power advantage of CMOS designs takes on a new significance as the circuit density increases. There is an inherent problem in keeping a memory chip cool as the bit count increases on a given die size using the less efficient NMOS process. The shift to CMOS is accelerating in all areas of digital circuitry, including microprocessors and glue logic, as the CMOS process is improved to give higher speeds and smaller geometries in addition to its traditional low power consumption.

Nearly all memory manufacturers expect to introduce CMOS 1Mbit parts eventually. But some, like Hitachi and Texas Instruments, are putting their shirt on CMOS right from the start. If they can compete with the inherently lower costs of the NMOS fabrication process by producing a more reliable, more friendly CMOS chip with a smaller die size which is easier to package, then the overall selling price of the CMOS device may actually end up lower than that of its NMOS competitors.

But if giants like Fujitsu and NEC are ready to stay with NMOS despite access to appropriate CMOS technology, then I for one will not be wagering the family silver. Another factor still to be decided is the best organisation to use for the megabit DRAM. Up to the 256K generation, the lowest-cost option has always been ×1. Parts offering a ×4 or ×8 organisation have been available only at a premium price due to an increased package size and lower sales volumes.

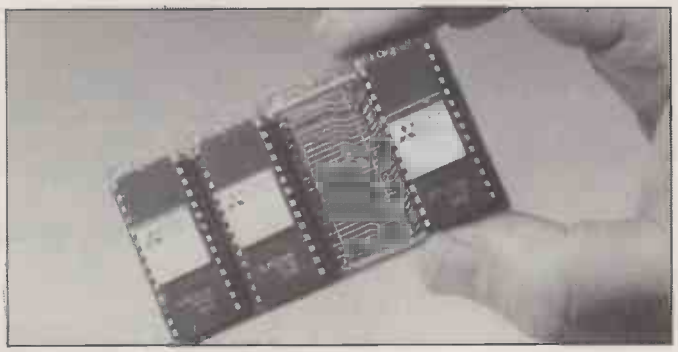
At the 1Mbit level a 256K ×4 part appears to be an attractive option, because the market for systems requiring, say, 1Mbyte of memory organised as eight 1Mbit ×1 chips, must surely be smaller at the moment than the market for systems requiring, say, 256K of memory organised as two 1Mbit×4 chips. But despite the attraction of a low-cost ×4 organisation for today's designs, the ×1 design will certainly win in the end as the markets for mainframe supercomputers, 32-bit micros sophisticated graphics displays and digital TV receivers start to take off.

Some readers may remember that when I used this column to announce the imminent arrival of 256K DRAMS, one of the design problems being faced at that time was an increased susceptibility to soft errors. This arose from the ease with which the tiny bit charge in a memory cell could be knocked out by the arrival of a stray alpha particle generated by cosmic or local background radiation. In 1Mbit devices the bit cells — and therefore their stored charge — will be smaller still, and the problem could be increased.

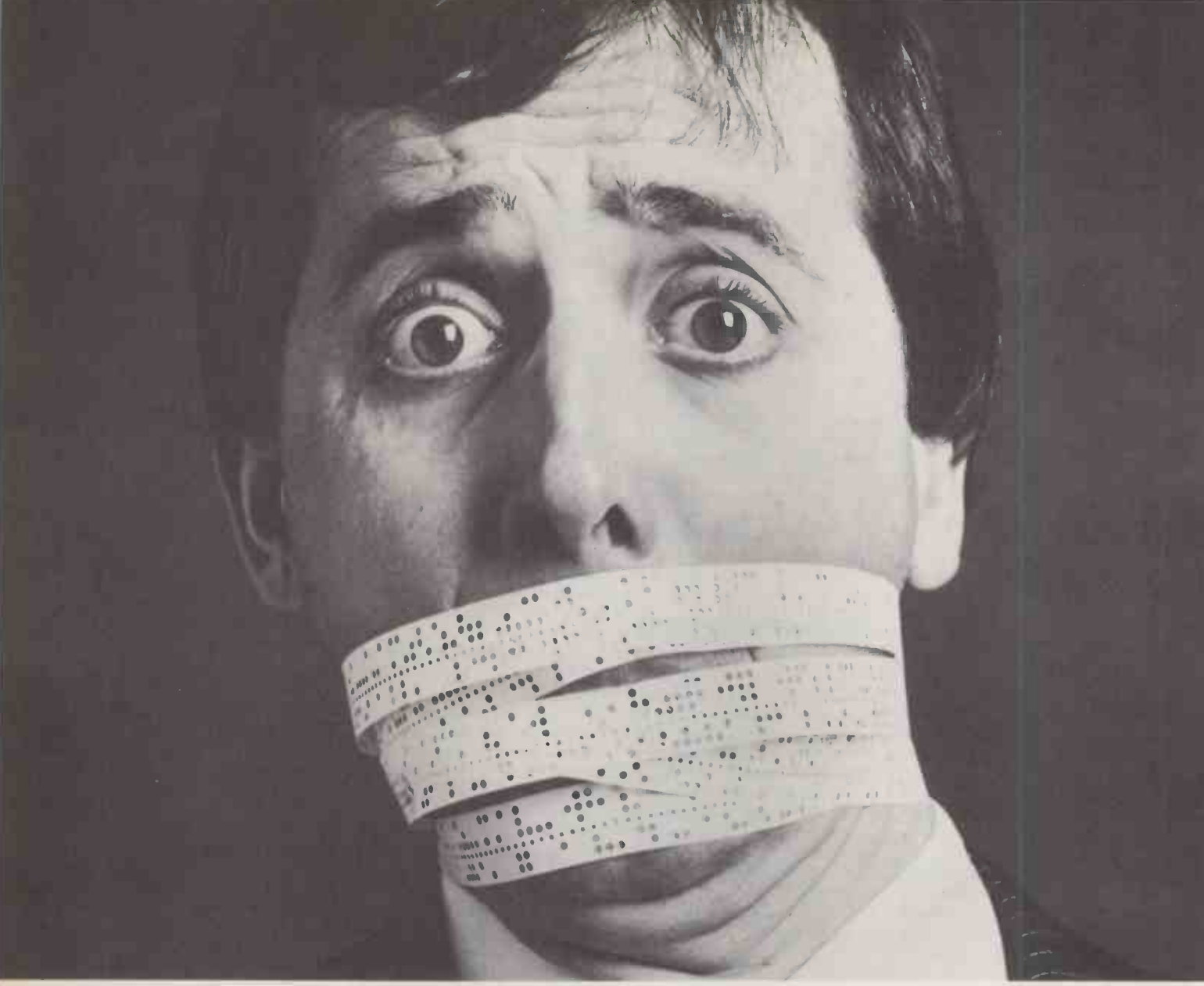
To overcome the conflicting requirements for a smaller chip area along with a healthy bit charge, manufacturers such as Texas Instruments and NEC are using a trench rather than a traditional planar design for their bit capacitor. The U-shaped trench is tricky to achieve in manufacture but it increases capacitance while keeping the surface area to a minimum.

Other manufacturers are achieving a similar result by building upwards from the chip surface to produce a so-called stacked capacitor. Yet another hopeful, Micron Technology in the U.S., plans to keep the memory cell design simple while adding 27 percent more bits and an automatic error detection and correction scheme which will also cope with hard errors.

If all this seems a long way off, I should also report that Toshiba has just announced that it has 4Mbit ×1 and ×4 designs already working in the laboratory. I am already looking forward to my next headline: Gigabits and Nanobucks. PC



More pins are required as chip capacities increase.



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BY BEN KNOX

A HELPING HAND

Ashton-Tate and Lotus are providing user support via Telecom Gold.

User support is a problem for software houses. Providing such a service is labour intensive, but does not make money.

A good support system will provide users with a way of answering enquiries, details of software updates and how to get hold of them, technical documentation for more sophisticated users, details of supplementary software and information on new products.

As much of the information would be applicable to all users, it could be put on a database which users could call into. Accordingly, two software houses, Lotus and Ashton-Tate, have recently introduced user-support systems on Telecom Gold, the electronic-mail service.

The Lotus system is called World of Lotus and is invoked by entering

LOTUS

at the Telecom Gold > prompt. You are presented with a menu of seven options. Option 1 is called Introduction: What to Find and Where to Find it. It gives an explanation of the information which can be found by selecting the various menu choices from the main menu.

Option 2 is Additions for this month. It lists all the changes and additions on the service for the current month.

Option 3 is News and Feature Stories — Past and Present. It contains a feature story on a selected Lotus product, news bulletins about Lotus Development Corporation and its products plus archives of Lotus product information.

Option 4 is Listings of Books and Complementary Software. It consists of lists of books and third-party products which complement Lotus software.

Option 5 is Technical Product Information/Supported Peripherals. It gives technical notes, answers to questions commonly asked and a list of supported computers, printers and others hardware.

Option 6 is Electronic Distribution — Drivers, Add-ins and Spreadsheets. It gives free software developed by Lotus which enhances existing programs.

Option 7 is User Forums. This area is provided for World of Lotus Users to keep in contact with each other by writing messages and posting them on a noticeboard. There are forums for 1-2-3, Symphony and Jazz users.

The World of Lotus uses Telecom Gold's standard database software as used by services such as the *Infomatics Daily Bulletin*. On the whole, this is fairly easy to utilise for the first-time user, but there did not seem to be any obvious way of jumping directly to areas of interest.

Lotus seems to be the first company to utilise the Xmodem, file-transfer system on Telecom Gold. This will maximise the number of people able to download the free software, using programs such as Crosstalk, or a public-domain communications program, or the communications utilities which are built into some Lotus integrated packages.

Telecom Gold also offers an error-free system called Rap which lets you upload and download mail. But as there is only one package which uses the Rap protocols, and this is fairly expensive, there does not seem much point in providing the service at all.

The Lotus User Forums are a good idea, as often other people have already solved a problem which you might be having. If all World of Lotus users ensure that they post their solutions in the relevant sections, then it will not take long for a fairly extensive hints database to grow. Once again, the Telecom Gold software makes posting and reading messages a clumsy operation.

Ashton-Tate's Serviceline was started only recently so the database is fairly bare. Like World of Lotus, it uses the Telecom Gold database software.

Ashton-Tate's Serviceline is entered by typing

ATLMENU

at the Telecom Gold > prompt. There are six options on the Serviceline main menu. Option 1 is News from Ashton-Tate. It displays the latest press releases from Ashton-Tate.

Option 2 is Sales Information. It gives a list of all Ashton-Tate's authorised dealers and details of software updates.

Option 3 is Services. It provides information under three areas: publications, for periodical and books; training, including authorised training centres, course schedules and training manuals; and marketing information.

Option 4 is Products. It gives descriptions of Ashton-Tate's software products.

Option 5 is Booking Forms. Here you can order technical manuals and register for training courses.

Option 6 is Helpline. It gives explanations on how to move quickly between Serviceline menus. It also details the company's support policies and gives mailbox numbers for various departments in Ashton-Tate. The company says that it plans to retrieve mailboxes frequently throughout every working day and, where possible, to reply within 24 hours.

Both user-support services provide quite comprehensive facilities. Unfortunately, they are unwieldy to use because of the software they run under.

It is likely that in the future many more companies will provide support on systems like Telecom Gold — in fact Ashton-Tate has a Serviceline on the One to One mail system too. However, this form of support will never replace the telephone hotline because for many users even a 24-hour service time is too long. PC

WORLD OF LOTUS

```
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of 5p per

     minute; this is on top of the standard or cheap rate for connect time.

       OPTION      DESCRIPTION

       * 1         Introduction -- What to Find & Where to Find It

       * 2         Additions for this month

       * 3         News and Feature Stories -- Past and Present

       * 4         Listings of Books and Complementary Software

       * 5         Technical Product Information/Supported peripherals

       * 6         Electronic Distribution - Drivers, Add-Ins and
spreadsheets

       * 7         User Forums


     Example message from User Forum:


     Subject:  Read only Lotus files

     From: GT1011          Posted:  Mon  3-Mar-86  15:00  Sys 76


     Does anyone know how I can make Lotus 123 spreadsheets become
read/copy

     only.  I have several spreadsheets that I want other members of
staff

     to copy, but I don't want anyone to corrupt the original.  Is there

     anyway of doing this in lotus 2  ???
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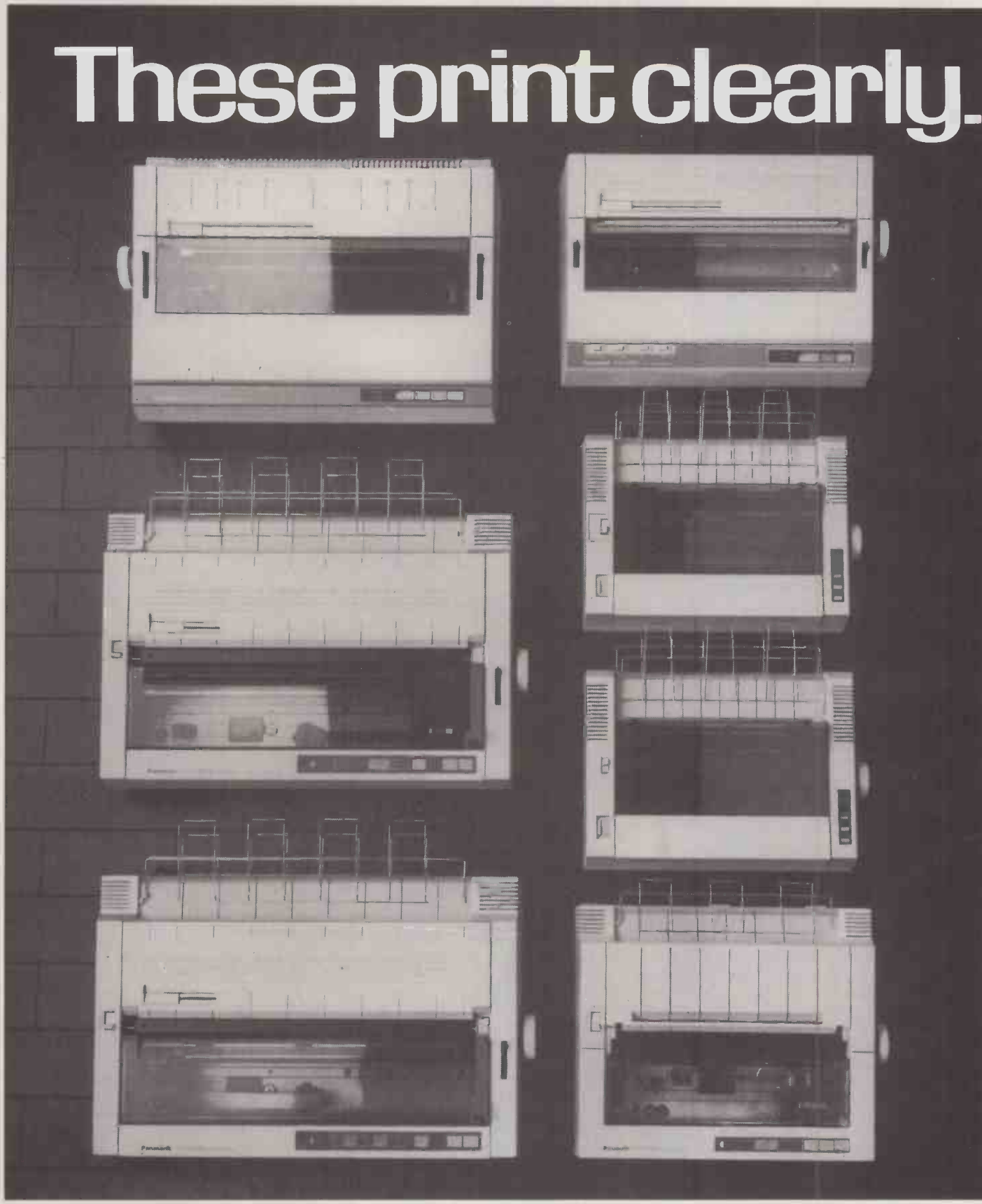

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KX-P1592 180cps, 136 col.	KX-P1091 120cps, 80 col.
KX-P1595 240cps, 136 col.	KX-P1080 100cps, 80 col.
	KX-P1092 180cps, 80 col.

*Daisy wheel printers. The rest are Dot matrix printers.

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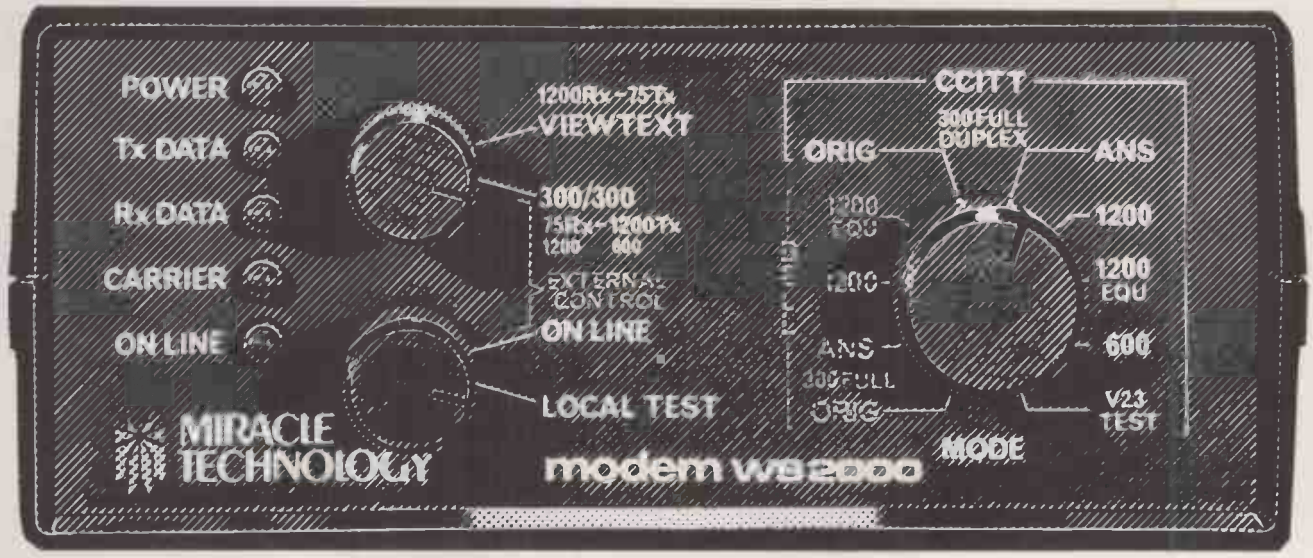

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Q I am having difficulties running Lotus 1-2-3 and WordStar using an IBM look-alike fitted with a 10Mbyte hard disc. Lotus works OK from a floppy disc in drive A, but not from the hard disc. I have WordStar in the root directory, but it will not work in the sub-directories. Can you explain what is wrong, and tell me how to cure these problems?

M DAVIES

A In their efforts to stop illegal copying of Lotus 1-2-3 the authors have built in a feature that requires the original floppy disc to be present in drive A when the program is run. It is understandable that a firm should try to prevent illegal copying but it is another matter to interfere with legitimate users who are prevented from copying an expensive program on to their hard disc to make it more convenient to use. A program called Fix-123 allows you to run Lotus off your hard disc. It costs £15 from S&S Enterprises, 31 Holloway Lane, Amersham, Buckinghamshire HP6 6DJ. Telephone: (02403) 4201.

If you have copied the WordStar files WS.Com, WSOvly1.Ovr and WSMsgs.Ovr in the root directory on your hard disc then you will be able to run WordStar normally, provided you are attached to the root directory. Similarly, if the WordStar files were present in one sub-directory, the program will run if you are attached to that particular sub-directory. But if you are attached to one of the other sub-directories, the operating system will not be able to find WordStar when you type WS.

You can, of course, use a Path command, preferably in the Autoexec.Bat file, so that the operating system will search through a list of named sub-directories for a given file. With most programs this should work, but WordStar does not understand root directories and sub-directories. Even though a Path command will allow DOS to the find the program WS.Com in another directory, the WordStar program itself expects to find the two overlay files WSOvly1.Ovr and WSMsgs in the sub-directory which you are currently attached to.

Fortunately a fix for this problem exists so that WordStar will work properly from any sub-directory. This is available from the IBM PC Users Group, PO Box 593, London SW1V 2PG. Membership of the Users Group costs £30. Members can get a program called DPath on library disc number 91 for £5 plus postage.

DEFECTIVE HARD DISCS

Q I have heard that many makes of hard disc, including those used in the IBM PC/AT, have faults on their magnetic surfaces, and that these are not found when the disc is formatted. It is said that eventually a catastrophic crash will occur, with the loss of a great deal of data, when this part of the disc is used. Is there any truth in this?

S DAVIDSSON

A All hard discs, regardless of who makes them or sells them, are likely to have some defects in the magnetic surface on which you store data. If faulty sectors are present, the disc will probably work perfectly until you try to use a faulty part, but at this point the operating system rejects either the file or the entire disc. It may prove to be impossible to read not only the faulty file, but also good files too. But provided that the bad sectors are located and stored in a garbage file, thus preventing you from trying to use the faulty parts, then you will not even know that they are there.

The Format program should flag media defects, and thus stop you from using bad sectors. However, the Format program provided with PC-DOS version 2.0 does not do this correctly, if at all. If PC-DOS 2.0 were used to Format the hard disc it could go wrong months later when a bad sector was used.

IBM tried to put this right with PC-DOS 2.1. This correctly maps out defective sectors and thus stops you using them, up to a maximum disc size of 16Mbyte. In the days of 10Mbyte Winchesters this was sufficient, but on a 20Mbyte disc some 4Mbyte may not be checked. So once again the disc could go wrong months after it was put into use. If the disc is divided into two or more logical drives, then each would be smaller than 16Mbyte, and so would be formatted separately and checked properly. Plainly the problem is even more acute with higher-capacity drives.

In its early days, the IBM PC/AT did not enjoy a good reputation over hard discs for this and other reasons, but these problems should now be history. Several commercial programs now exist to test hard discs. Disk Test in Norton Utilities, and the DFixer program sold by Microway are two of them.

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Q I use WordStar version 3.3 on an IBM PC. I have changed a number of the default values to make it give the layout I require automatically, but the footer margin is still set to two blank lines between the last line of typing on a page and the page number. I would like to have just one blank here, and while I can get this by typing the a dot command. FM 1 at the beginning of every document I would prefer to patch WordStar so that the footer margin is set to one line by default. Please can you tell me if this is possible, and how to do it.

S MILNER

A This particular feature is not included in the fairly extensive list of features you can alter easily from the menu in the WordStar installation program. however, you can patch WordStar to make this change quite easily. Run the installation program Winstall, and rather than typing a letter to choose to install a terminal, printer, or WordStar features, type + to get to the patcher program. When asked to type the address, type

:INITPF+11

The value of this byte and the next 15 will be displayed. When asked if this is the correct byte, reply yes. You must change the next three bytes.

The first byte contains the footer margin in lines, followed by two bytes containing the footer margin in 1/48ths of an inch. These two bytes are arranged low byte first, followed by the high byte. Since the printer gives six lines to the inch — or 1/6th of an inch for one line — two lines corresponds to 16/48ths of an inch. The default value is therefore 16, which must be converted into hexadecimal, giving 10 hex. Thus the second of the three bytes contains 10 hex, and the third byte contains 00.

You would like a footer of one line, so the first byte must be changed from 02 to 01. Now for the second and third bytes. One line corresponds to 8/48ths of an inch, so the second byte should be changed from 10 hex to 08 hex. The third byte is left unchanged at 00. To show that changes are complete, type a dot, press Return.

Q I have recently acquired the Bascom compiler for Microsoft Basic, which I run on a CP/M-80 Superbrain The problem is that I have no manual except for Bascom. I followed the instructions, and saved the program in ASCII form on the disc. I then run Bascom by typing

BASCOM=PROGRAMME

This worked and gave me a Programme.Rel file on the disc. Then I tried to link load it by typing

LINK80 PROGRAMME/N,
PROGRAMME/E

This then gave me an error

?LOADING ERROR.

When I received Bascom it did not have a link loader with it. All that was included was Bascom.Com and Baslib.Rel. I have already got Microsoft's Assembler Macro-80 with which the link loader Link 80 is supplied, and according to the manual it can link any relocatable file created by a Microsoft compiler. Link 80 is version 3.34, the Basic is version 5.2 and Bascom is version 5.3.

S HUGHES

A The problem arises from the Link 80 program, not the compiler. You are quite right in thinking that the command line

LINK80 PROGRAMME/N,
PROGRAMME/E

should work. We have had difficulty with this before. Try entering the following lines separately

LINK80
PROGRAMME/N
PROGRAMME
/E

This should do exactly the same, but it seems to work. PC

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COMMS COLLECTION

Glyn Moody gives a rundown on some of the books offering advice on how to communicate with other users.

THE NEW HACKER'S HANDBOOK is an updated version of the mildly notorious volume which threw the more staid parts of the computing fraternity into a tizzy last year. Despite its sensationalist title it is rather a moral book, duly stressing what is and is not cricket in the world of hacking. Along the way it provides one of the most readable introductions around to the field of communications.

After a prefatory first chapter, the second chapter provides a brief history of telecommunications. The third chapter, grandly entitled "Hackers' Equipment", turns out to be a rundown on modems. The following chapter, "Targets", is about on-line services, and "Hackers' Intelligence" is a saunter through the highways and byways of bulletin boards.

Up to this point *The Hacker's Handbook* is about as subversive as a CP/M manual. Only in the sixth chapter, entitled "Hackers' Techniques", does the author get down to the nitty-gritty. Sections cover logging on, passwords, programming and hardware tricks. Mostly this amounts to common sense: do not use words like "test," "demo", "fred" or "sex" for passwords.

By the seventh chapter, we are back to CP/M manuals, with an excellent discussion of networks, particularly the PSS. Unsurprisingly, the chapter entitled "Videotex Systems" is about videotex, and contains some little-known, though hardly earth-shattering details about Prestel.

One of the biggest changes from the first edition is the expansion of the section on radio computer data, although it is probably only of marginal interest to most micro users. In his introduction, the author notes that other changes have been made because "some material had to be removed for legal reasons". What is left is pretty toothless, but very entertaining nonetheless.

If you want a completely painless introduction to most aspects of communications, written with some style and wit and at a reasonable price, you are unlikely to do better. But you can think again if you hope this book is going to take you inside the mainframe of your local bank.

On the ethical side of hacking, the author's position seems reasonable, if not watertight. He holds the view that restrained hacking is doing system builders a favour by finding the chinks in their armour. He suggests that limited hacking of this kind may be covertly encouraged for just this reason. A sense of rather old-world fair play pervades the book, even to the extent of clues to the true identity of the pseudonymous Hugo Cornwall being dotted throughout. Happy hacking!

There are no such mysteries about the author of *Hotline*, who is well known to *Practical Computing* readers. Ben Knox has produced an all-in-one guide to practical comms that gives you most the details you are likely to need. There are chapters on modems, RS-232, software matters and security. A chapter on bulletin boards gives a full listing of U.K. boards. After information on Prestel and basic PSS, there is an interesting discussion of some of the more advanced features of the PSS. This leads on to Telecom Gold, and chapters dealing with the two main U.S. on-line systems, Compuserve and The Source.

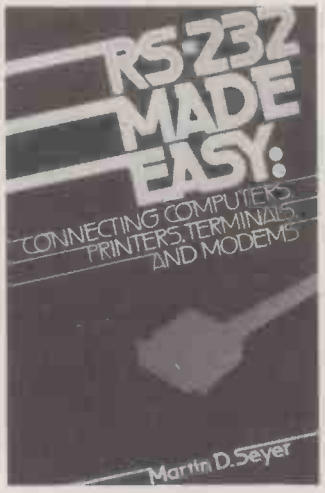
The book concludes with appendices giving a partial listing of on-line services, details of RS-232 and ASCII, various glossaries and an index. If it lacks the panache of *The Hacker's Handbook*, it does possess the virtue of being clear and unfussy.

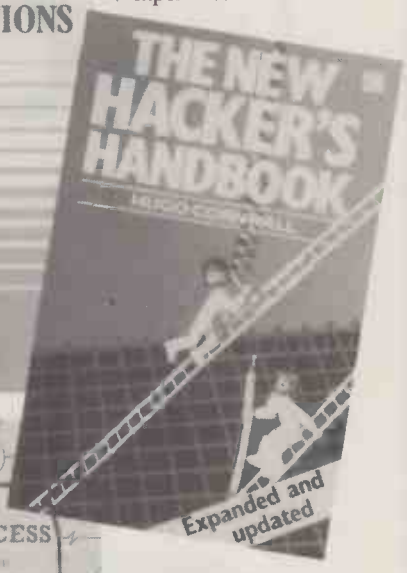
An Introduction to Computer Communications by R A Penfold is in fact more of a beginner's guide for those with machines at the lower end of the market. The emphasis is on do-it-yourself, with a few short programs and some circuit diagrams.

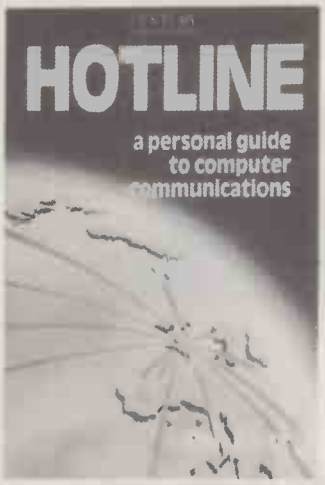
There are only three chapters in what is already a short book at 72 pages. The first deals with modems and related topics, though not in a structured way. The second treats what it calls local area networks, though these turn out to be more DIY projects. The last chapter is about radio data transmission.

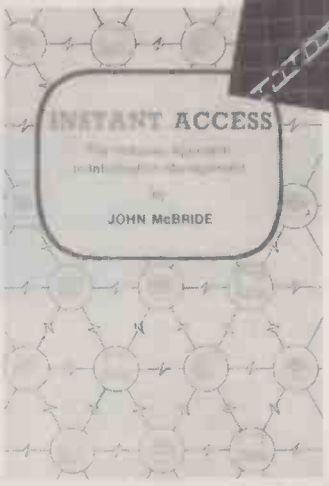
Generally, the book is rather unappealing to look at, the style is woolly and the structure is weak. There is no index. The book's main virtues are that it is cheap and pocket-sized.

C P Clare's *A Guide to Data Communications* is different in approach to the books mentioned previously. It is written with computer-science students in mind, and is more technical and more rigorous. However, the general business-micro user will find much of interest. The book is particularly strong on analogies — obviously a legacy of the author's teaching experience.









The book starts from basics, looking at bits, the difference between analogue and digital, how multiplexers work and suchlike. There is also some discussion of the problems involved in hooking up several computers together.

Perhaps the main achievement of the book, and a good reason to buy it, is its clear exposition of

(continued on next page)

BOOK REVIEWS

(continued from previous page)

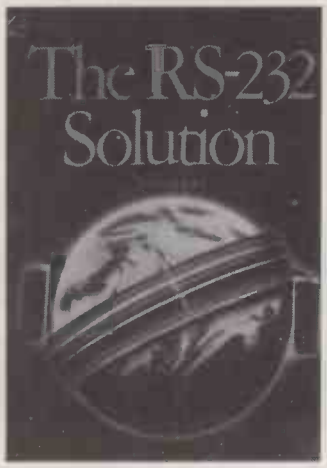
the International Standards Organisation model for networks. Clare negotiates this mental assault course skilfully, and makes this bureaucrats' dream look almost possible. The book closes with a rather pointless chapter entitled "More New Developments" which does not say very much. There is a useful index.

Even more technical, but still very approachable, are two books from the U.S. giving detailed information on the RS-232 interface. You may find it hard to believe that there is enough for two books; but as both authors show, the RS-232 interface is a true can of computer worms, with no two manufacturers implementing it in the same way. *RS-232 Made Easy* is probably the better of the two: it uses a the metaphor of a train to get the salient points across. There are questions at the end of each chapter. *The RS-232 Solution* is better written, but less usefully structured.

Moving in the opposite direction to this nuts and bolts approach is *Micro to Mainframe*, again from the U.S. The authors look at the whole process of linking up micros to corporate computing environments, either directly, via LANs or using PABXs. It is full of very sane advice on how to do this, and whether to opt for this route at all. Although it is written from an American viewpoint, most of its points are relevant for anyone who may be using communications to integrate micros with mainframes.

A more specialised but very full book has been written by John McBride on viewdata. *Instant Access*, subtitled "The Videotex Approach to Information Management" must be the last word on viewdata, or videotex, systems. As well as a worldwide history of the subject, there are details on setting up viewdata systems, the business applications and an analysis of current business uses. There is a full chapter on micros and viewdata, plus a detailed breakdown on the costs involved. An impressive 15 checklists for prospective viewdata users are provided, along with a directory of suppliers, bibliography, glossary and index. This paperback is not cheap, but it does give you everything you are likely to want to know about viewdata.

Finally, it is worth noting that a short guide to the basics of communications is available free of charge from Case Communications Ltd, PO Box 254, Caxton Way, Watford Business Park, Watford, Hertfordshire WD1 8XH. Phone: (0923) 58000. PC



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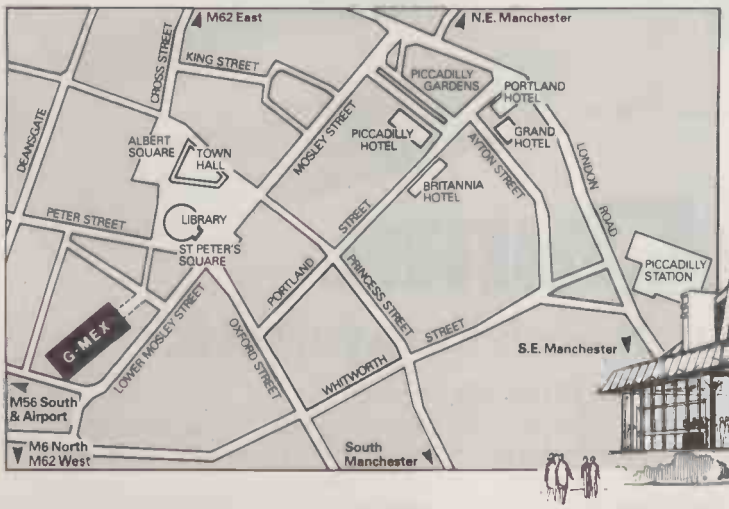

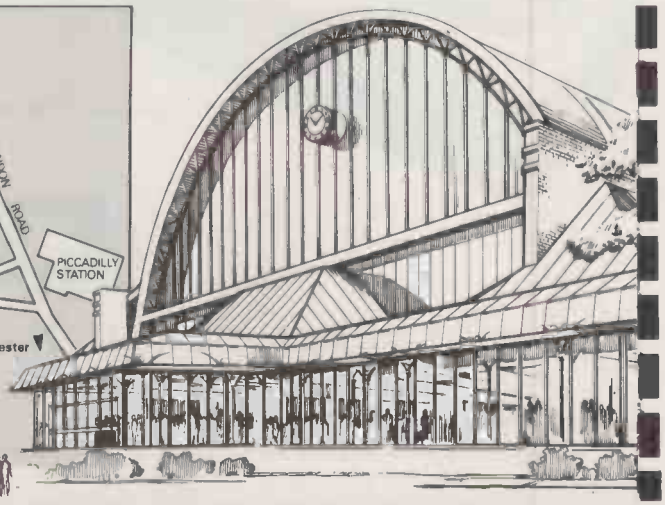

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IBM 6150
THE MULTI-USER WAY

By Glyn Moody

Offering multi-user capability and an operating system based on Unix, IBM's newest micros seem destined to appear in offices as well as research establishments and CAD installations.

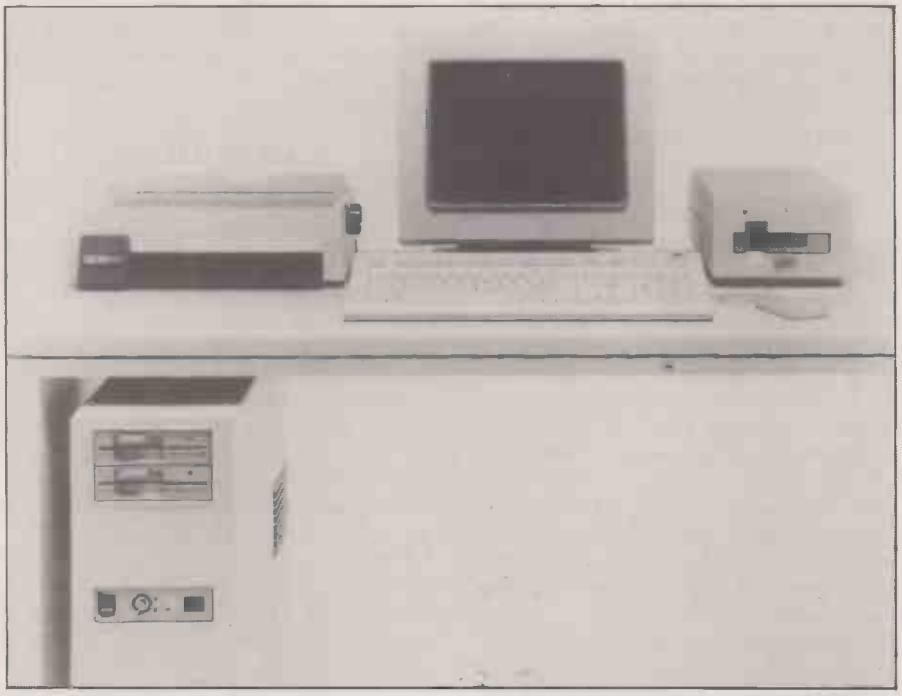
IBM's latest desk-top computer is called the RT PC in the U.S., but by the rather grey name of the 6150 in the U.K. This is a pity, because RT PC expresses clearly where it fits into the IBM range. It is a top-end multi-user micro offering significantly more power than the PC/AT. Its basic operating system is Aix, a variant of Unix. There is also an interesting co-processor option which allows you to run AT software.

Prices for the 6150 start at £9,043, which works out to a more reasonable figure per user as you hook up a couple of terminals. It is aimed initially at vertical markets like scientific, engineering and drafting. However, several business application packages have been ported across already, and it seems likely that the new machine will increasingly find its way into the office.

The 6150 comes in a desk-top and a floor model. The main difference between them is in the hard-disc capacity: the 6151 desk-top is about the same size as the AT and comes with a 40Mbyte Winchester, whereas the larger 6150 can take up to three Winchesters providing up to 210Mbyte of storage. The desk-top model has 1Mbyte of RAM, the floor model 1Mbyte or 2Mbyte as standard, both expandable by another 2Mbyte. In addition the 6150 has two serial ports as standard. The desk-top version looks remarkably similar to the AT; in addition to a lock at the front there is a small LED indicator which is used during power-up to show the error checks being carried out.

At the heart of the new machine is a new proprietary 32-bit processor known as the Romp. This is a convoluted acronym derived from research OPD micro processor, where OPD stands for the IBM Office Products Division. It uses what is known as Risc architecture, which in turn stands for reduced instruction set chip. It is this approach which gave rise to the name RT, or Risc technology PC.

The basic idea of Risc is that today's super-chips are too complicated. Processors like the 80286 and 68000 have huge numbers of commands which allow you to carry out relatively complicated operations.



Both the floor-standing 6150 (above) and the desk-top 6151 (below) run IBM's new Risc technology chip.

The penalty is that the very simplest operations are slower than they would be with a simpler chip. Effectively, Risc architectures take a step back to go forward; they have drastically simplified instruction sets which allow most operations to be carried out more quickly and efficiently.

The price you pay for this is a loss of conventional compatibility. Where the Intel family of chips was designed to take advantage of previous software written for earlier incarnations, Risc architectures are totally idiosyncratic. Learning a new architecture is a strong disincentive for programmers who might otherwise want to port existing software across.

IBM has addressed this problem by producing the Virtual Resource Manager, which provides a standard set of hooks that programmers can use just as if they were dealing with an ordinary, large instruction set processor. The VRM software emulates what is normally hardware, setting up a virtual chip which programmers can cope with far more readily than the exotic Risc approach.

A consequence of this approach is that since IBM is publishing all the details of the VRM interface, and VRM insulates programmers from the nitty-gritty of the Romp, there is no reason why a rival manufacturer could not design a completely different Risc device and write its own VRM look-alike with the same virtual machine interface. Then any software written for the IBM 6150 should, theoretically, also run on the rival machine. One of the potential advantages of the Risc approach over standard chips like the Intel family is that you can lock software and users into the machine; yet IBM has chosen an apparently open approach.

This is matched by the physical architecture, which is also open and bus-based, as with the earlier PCs. The main processor and memory cards use 32-bit buses. Alongside them there are slots for 16-bit AT cards as well as eight-bit PC cards. IBM has designed the system to run with existing expansion cards without modificiation. The desk-top version has six free slots and the floor unit eight, one of which is required for

(continued on next page)

(continued from previous page)

the disc controller and another for serial and parallel ports. A wide range of VDUs is available, from the standard PC monochrome monitor to 1,024- by 768-pixel 15in. screens.

The 6150 comes with a new keyboard which is to become the standard for the PC family. The redesign is quite radical. There are now 12 function keys grouped in fours and placed horizontally along the top rather than to the left. The cursor keys are separate from the numeric pad, as is the group of Insert, Delete, Home, etc. There are two Alt keys, one either side of the space bar, and a new Action key. The overall feel of the keyboard is excellent; it is slightly lighter than those on the PC and AT, and markedly quieter.

The Action key calls into play one of the more significant features of the 6150. It is bound up with the VRM system. Under Aix or other operating systems one user may be able to set several computational processes running simultaneously. Normally it is very hard to view all these processes at once. On the 6150, pressing the Action key with the Alt key lets you scroll through the screen associated with each process in turn. This is very like the Switcher utility for the Mac and Carousel for the IBM PC, both of which allow you to switch almost instantaneously from program to program. The big difference with the 6150 is that the processes keep going when they are in the background.

Clearly this facility lends itself to a Unix-type environment where you may set several processes running concurrently. It allows you to keep tabs on different computations, or cross-refer between them. It is also in addition to the tasks which can be run by extra terminals at the same time as the main unit, called the console.

The Aix, or Advanced Interactive Executive operating system, was derived from AT&T's Unix System V and incorporates some of the Berkeley extensions. It represents some 1.5 million lines of code. As well as the full glory of Unix, IBM has constructed two friendly front ends to the system which allow naive users to gain access to applications without worrying about shells and suchlike.

SPECIFICATION

CPU: 32-bit Risc architecture, with 170 nanosecond cycle time
RAM: 1Mbyte in 6151, 1 Mbyte or 2Mbyte in 6150; both expandable by 2Mbyte
Dimensions: 6150 measures 635mm. (24.9in.) x 210mm. (8.3in.) x 614mm. (24.2in.); 6151 measures 160mm. (6.3in.) x 540mm. (21.2in.) x 424mm. (16.7in.)
Weight: 6150, 38.2kg. (84lb.); 6151, 23kg. (51lb.)
Display: range of VDUs available, including standard PC monochrome monitor
Keyboard: new layout, with separate numeric keypad and cursor controls
Mass storage: one 40 Mbyte Winchester plus one 5.25in. 1.2Mbyte floppy; expandable on 6150 to three 40Mbyte or 70Mbyte Winchesters plus two floppies
Interfaces: two RS-232 standard on 6150
Software in price: none
Hardware options: AT co-processor board; floating-point accelerator, cartridge tape streamer
Software options: Aix operating system
Prices: £9,043 for 6151; £11,009 for 6150 excluding monitors or software
Manufacturer: IBM U.K. Ltd, PO Box 31, Birmingham Road, Warwick CB34 5JL. Telephone: (0926) 32525
Available: now

USABILITY

The first system is called Usability, and is based on a simple menu approach. On powering-up, an initial window with two panes is presented, one listing the installed applications which are available and the other any tasks which are active. The installation procedure is conducted from Aix itself. It consists simply of assigning a start-up sequence to the name which is displayed on the initial Usability screen. You can select options using a mouse — which you have to buy separately. There is a small menu of options along the top of the screen which are used to run applications.

One of the applications which you can run from the Usability window is the DOS window. This lets you use a Unix system as if it were a PC-DOS one. So when you type

```
DIR
```

you get a listing of the current directory without having to use arcane commands. The DOS window acts as a translator between the two environments.

Although less sophisticated, this approach of masking some of the complexities which lie at the heart of Unix is reminiscent of the Torch Triple X, reviewed in the February 1986 issue of *Practical Computing*, the Triple X uses icons to provide a simple way into Unix applications. This is an indication that the 6150 is by no means aimed purely at the technical and scientific markets, as the machine's high spec and initial marketing might suggest.

This impression is further reinforced by the AT co-processor option. You effectively get an AT on a card which plugs into one of the 16-bit expansion slots. It is invoked as a process either directly from Aix or via the Usability interface. Once an AT program is running concurrently with other processes the Action key can be used to view it in the usual way from the console. A useful utility enables you to transfer data between IBM PC and Aix formats, so if you were running the same package under the two operating systems you could swap data between them directly. Partitions dedicated to the co-processor can be set up both in the RAM and on the hard disc.

If judging the performance of a multi-user Unix machine is hard, judging it on the basis of the co-processor is grossly unfair since there are a number of intermediate translation processors going on which slow things down. Nonetheless, it is instructive to see how the co-processor fares in the standard Benchmarks. Running the Basic Benchmarks produced an average time of 17.3 seconds, which compares with 17.7 seconds for the IBM PC and 6.8 seconds for the PC/AT. The disc Benchmarks were even worse.

Tests on compatibility produced some interesting results. IBM says the 6150 should run programs which do not make direct calls to hardware. The list of supported software includes Lotus 1-2-3, dBase III and WordStar 2000. Microsoft's Flight Simulator appeared to load, but would not run. Borland's Sidekick appeared not to load, but the machine managed to intercept the standard double-Shift to display the Sidekick menu. However, pressing the two Shift keys again did not bring back the DOS environment but a blank screen with a flashing underline. Pressing Return then restored the program to its original state.

You would need to investigate compatibility on a program-by-program basis if it is important to you, but clearly the co-processor option is not seriously intended to replace the AT. Instead it is a useful option for transferring data from mainstream programs or for preserving continuity.

HEAVY READING

The manuals which are available for the 6150 form a daunting library: we saw 15 fat volumes, and were told there are more to come. Most of them are not included in the price of the machine but are available for those with particular needs. They are well produced, uncluttered and relatively easy to follow, which is yet another testimony to IBM's desire to keep the machine firmly in the non-specialist markets.

The 6150 is an interesting product, not least because its ultimate place in the computer scheme of things is not entirely clear. Its computational power and graphics capabilities mean that it will be a strong contender in the price CAD market. Personal publishing is also a likely use. But the real developments are likely to be in the office environment, where it is used as a multi-user machine. Although the multi-user market is still young, there is evidence that for four to six work stations it will provide a simpler and cheaper solution than networking. IBM's entrance into this market and the backing implicity given to Unix may well be the fillip this sector has been waiting for.

CONCLUSIONS

- The IBM 6150 is a top-end multi-user, Unix-based machine with a price to match.
- It is notable as IBM's first real Unix machine and it first real multi-user system. The use of Risc technology is also significant as a first step along a road which will prove increasingly important.
- The AT co-processor option is useful for porting data but should not be regarded as a substitute for the AT itself. Its performance is very sluggish.
- IBM has made concessions to the naive user in its front end to Aix. PC

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OLIVETTI DESK-TOPS
THE GREAT AND THE SMALL

By Glyn Moody

Two additions to Olivetti's range of business micros, the M-19 PC clone and the M-28 AT-alike, may well put Olivetti in line for the corporate market.

Last month we looked at the new Olivetti M-22, a high-performance battery portable with a back-lit LCD. Olivetti has also launched two other micros which may not be as technologically exciting but have their points of interest.

The first of these is the M-28, which is the long-awaited successor to the M-24. However, where the M-24 was launched soon after the IBM PC and went well beyond it in terms of performance, the M-28 has taken some time to appear and tracks the IBM PC/AT much more closely. The tardy arrival is in part understandable. After all, if you have produced a PC clone which gives much the same performance as the IBM PC/AT, there is little need to offer one of those too.

But there is a price to be paid for this. Now that the PC/AT product has reached a certain maturity, IBM has made one of its periodic upgrades. As a result, the speed advantage which the new M-28 enjoyed over the old 6MHz AT has now been largely lost with the launch of the new 8MHz AT. The announcement of the IBM Convertible and the option of 3.5in. discs for the AT have also taken the wind out of the opposition's sails.

CORPORATE BUYERS

That said, there are still very good reasons for going the Olivetti way. Apart from any lingering desire to find an alternative to Big Blue, Olivetti offers a particularly comprehensive range of business micros which will be attractive to corporate users wishing to buy totally integrated solutions.

The M-28 itself offers the standard functionality of the IBM PC/AT, but in an idiosyncratic packaging. Prices start at £4,190 for a standard configuration. Unlike the PC/AT, which is a markedly bigger beast than the PC, the M-28 is the same width as the earlier M-24, though higher and longer. The distinctive Olivetti styling of ribbing and punched holes in the fascia is retained.

At the front of the machine there are indicators for power, hard-disc accessing and whether the unit is locked or not. Like the AT, the M-28 has a physical key. A small Reset button and a knob for adjusting the volume are also located here. The on/off switch is to the right, below the disc drives.

The vent for the large but quiet fan lies at the back of the machine, along with the outputs for the expansion slots. The keyboard socket is located awkwardly below the power in and out. Releasing five screws along the back, and sliding the lid forward and up, reveals a neat interior. On the review machine there were three 16-bit slots free and two eight-bit slots. The motherboard lies along the bottom of the unit.

OLIVETTI M-28

PC VERDICT

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

☐ Not as exciting as the M-24, but still a safe corporate buy.

OLIVETTI M-19

PC VERDICT

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

☐ A rother curious hybrid, mainly of interest for those who want a slim, intelligent terminal.

The monitor is of the standard box type, with tilt and swivel; the characters are well formed and legible. Unfortunately, the keyboard has the same layout as that of the M-22. That is, it has a small right Shift key, placed perilously close to the Return key, and it is all too easy to strike the latter instead of the former. The feel of the keyboard is light but acceptable.

On booting-up the system there is an extensive series of diagnostic routines. As you might expect, the M-28 proves fleet of foot in operation. Its average time for the standard Basic Benchmarks was 4.2 seconds, which is a touch ahead of the Compaq Deskpro's 4.2 seconds and only slightly behind the Apricot Xen's 3.7 seconds. The Bagshaw disc Benchmarks are less impressive: the hard disc clocked up 109.3 seconds, and the floppy disc a more lethargic 671.6 seconds. This compares with 47.8 seconds and 250.3 seconds respectively for the Compaq Deskpro, and 60.3 seconds and 284.8 seconds for the IBM PC/AT. As far as compatibility goes, the M-28 runs the standard tests like Lotus 1-2-3 and Flight Simulator.

So unlike the M-24, the M-28 does not represent any great performance gains over the IBM model. Neither is it a new option like the lap-portable M-22. However, it is a solidly made machine from a manufacturer which is fast becoming Europe's — and possibly the world's — sole bastion against the rising Blue tide.

It may well be that the M-28 is most successful in corporate environments which care more about the name of a machine than its price. Olivetti is offering Xenix on the new machine, which will be attractive in such situations. Its penetration in these markets is also likely to be aided by the simultaneous launch of the M-19.

NOT QUITE A CLONE

The Olivetti M-19 is a curious machine, neither flesh nor fowl. It is designed as an IBM compatible but it is not a straight clone. This is obvious from its appearance: the main unit is slim and only a few inches high. Such surprising compression has been achieved by the sneaky expedient of stowing the power supply in the monitor unit and powering the systems box from there — a reversal of the usual technique. The basic unit comes with one 5.25in. 360K floppy, 256K RAM, and a serial and a parallel interface. Prices start at £1,306.

One drawback of such an approach is that it is not possible to add standard expansion cards within the main unit. Clearly, Olivetti is targeting this machine at the entry-level user who will be content with the basic functionality. For those who need to progress beyond this level there is a separate expansion box which can accommodate standard IBM PC cards. Otherwise, two slots for proprietary expansion cards are provided. One option will be for an 8MHz upgrade card.

As you might expect from a product aimed at the low-end or first-time user, the

OLIVETTI M-28

CPU: 80286 running at 8MHz
RAM: 512K expandable to 1Mbyte on motherboard, 7Mbyte in total
ROM: 32K containing bootstrap and diagnostics
Dimensions: 388mm. (15.3in.) x 185mm. (7.3in.) x 485mm. (19in.)
Display: monochrome or colour, 80 columns by 25 lines, 640 by 400 pixels maximum resolution; green, amber or white monochrome available.
Keyboard: standard QWERTY with function keys and numeric/cursor pad
Mass storage: one 1.2Mbyte floppy, optional second 1.2Mbyte or 360K floppy; standard 20Mbyte disc with options up to 70Mbyte
Ports: serial and parallel
Software in price: MS-DOS
Hardware options: 80287 maths co-processor, mouse, LAN boards
Price: £4,130 for basic system
U.K. distributor: British Olivetti, Olivetti House, PO Box 89, 86-88 Upper Richmond Road, London SW15 2UR. Telephone: 01-785 6666
Available: now

OLIVETTI M-19

CPU: 8088 running at 4.77MHz and 8MHz with the addition of extra board
RAM; 256K expandable to 640K
ROM: 16K bootstrap
Dimensions: 322mm. (12.7in.) x 82mm. (3.2in.) x 382mm. (15in.)
Display: as for M-28
Keyboard: same layout as for M-28
Mass storage: one 360K 5.25in. floppy as standard; second floppy and 10Mbyte hard-disc options
Ports: serial and parallel
Software in price: MS-DOS
Price: £1,306 for basic configuration
U.K. distributor: as for M-28
Available: now

performance is hardly stunning. The average Basic Benchmark time was much the same as on the M-22, around 15 seconds, while the disc Benchmark clocked up a total of 780 seconds. The former is better and the latter worse than figures for the basic IBM PC. Like the M-28 and M-22, the M-19 ran the usual IBM programs.

I must confess to some scepticism regarding the M-19. It seems to be neither cheap enough to capture the very cost-conscious clone market being attacked by Epson and Tandy, nor to offer significant advantages over conventional IBM-compatible machines. Certainly the slim-line approach is attractive, and if desk space is at a premium it may well be a strong factor in its favour. In other areas the combination of a respected name with IBM functionality in a compact format could well swing a lot of intelligent-terminal contracts in Olivetti's direction.

But for the mainstream business-micro user the M-19 has only limited charms. Neither is the M-28 quite the stunning machine that the M-24 was, nor the technological delight represented by the M-22. It will be interesting to see if Olivetti responds to the gauntlets recently flung down by IBM with its Convertible and its adoption of 3.5in. formats. It would be understandable if Olivetti held back again from launching new products which might interfere with sales of the latest models. But just as the M-28 and M-19 might have benefitted from being launched a few months earlier, so Olivetti runs the risk of getting caught out again.

CONCLUSIONS

- The M-28 is a high-quality, compact AT-emulator offering a speed premium over the old IBM PC/AT.
- The M-19 is designed as a slim-line desk-top machine for low-level users. It is too small to take standard expansion cards.
- Both machines use keyboard layouts which have a dangerously small Shift key; for touch-typists this is a serious drawback.
- The performance of the M-28 is excellent in terms of processor speed, but disappointing as regards discs. The M-19 is not for speed fiends anyway, and turns in appropriate timings.
- Both machines come into their own as corporate purchases; the M-28 as a sturdy and reliable top-end AT-alike, and the M-19 as a low-power introductory machine for occasional users or those who need a neat, intelligent terminal. PC

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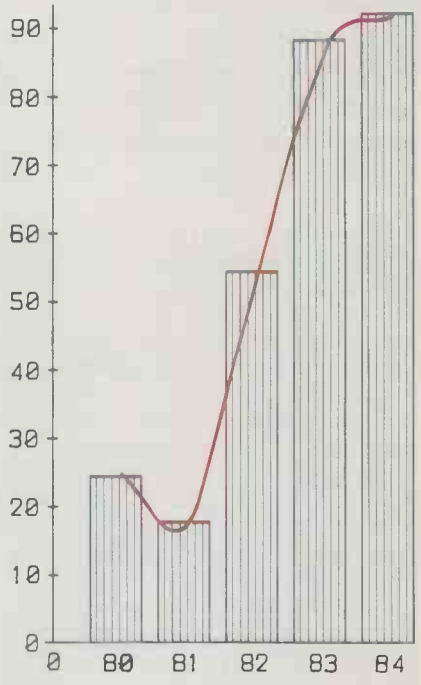

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ALTERNATIVE KEYBOARDS
GOODBYE TO QWERTY?

By Ian Stobie

The familiar typewriter keyboard layout arose almost by chance a century ago. Now there are other arrangements which are designed to be easier and quicker to use.

Alternatives to the QWERTY layout have been around since the time of the first typewriters. In the early days each manufacturer tended to have its own patent layout. QWERTY came on the scene in the 1870s, only gradually coming out on top. Even today it is not totally dominant: French-speaking countries prefer the AZERTY layout, for example.

The apparent irrationality of the arrangement of the QWERTY keyboard makes more sense when you remember that it was designed to meet the engineering needs of a century ago. The keys are staggered in a diagonal way because that made it easier to attach them by mechanical links to the rest of the typewriter. To stop the keys jamming, QWERTY's inventor tried to separate the most commonly used sequences of letters as much as possible. He was not setting out to design the quickest or the easiest keyboard; his aim was simply to produce a typewriter that would work reliably.

It is therefore not surprising that as the available technology has developed there have been attempts to devise improved layouts. Most of these systems have failed on simple marketing grounds. QWERTY works reasonably well and is the established standard so people are reluctant to try anything else. Computers and other text-handling machines usually come equipped with a QWERTY keyboard anyway so there seems little point in buying another one.

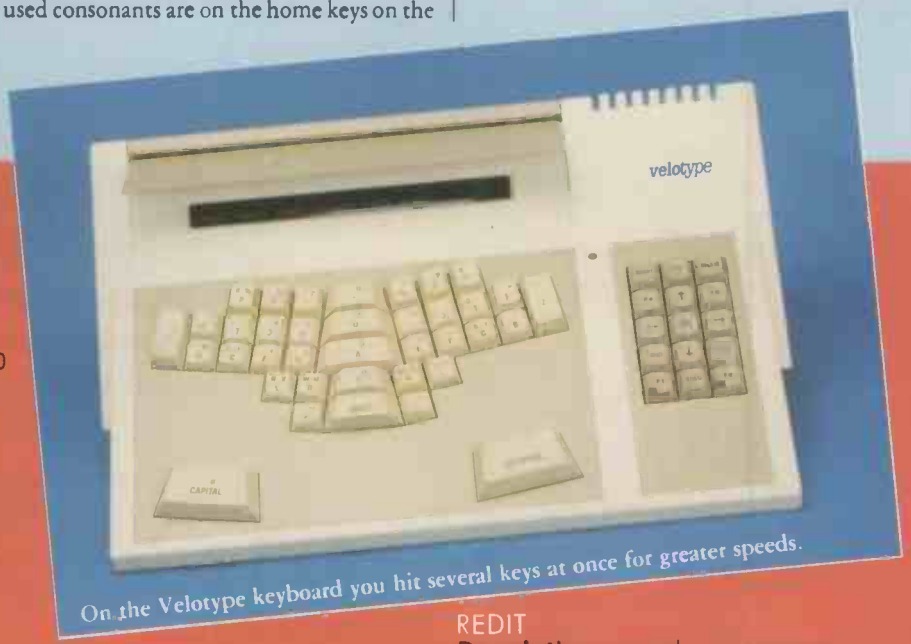
The Dvorak layout gets round some of these objections. It uses the machine's existing keyboard; all you need is a software utility to change the letter assigned to each key. The layout was invented by August Dvorak, who was a Professor of Statistics at the University of Washington. His aim was to reduce unnecessary movements to cut fatigue and increase speed.

In the Dvorak layout all the vowels are placed on the home keys of your left hand, so you have AOEUI in place of ASDFG under your fingers. The most commonly used consonants are on the home keys on the right hand. This means that you can type common words like "and", "the" and "that" without having to move your hands away from the home keys. The other keys are also laid out by frequency, with more common keys going on the top row and the least common along the bottom. The little finger is given less work to do, with the full stop moving to the middle finger of the left hand.

SPEEDS IMPROVED

Proponents of the Dvorak system claim great speed improvements. In fact one world speed record is held by a Dvorak typist, Barbara Blackburn, at 170 words a minute. However, the *Guinness Book of Records* also lists a QWERTY typist using a conventional manual typewriter as going at 176 words a minute, and has another QWERTY typist going at 216 words a minute.

The Dvorak layout has become quite popular in America, and some computers support it directly. U.S. models of the Apple IIc, for instance, come equipped with a Dvorak/QWERTY switch. Unfortunately,



On the Velotype keyboard you hit several keys at once for greater speeds.

SPECIFICATIONS

VELOTYPE
Description: intelligent high-speed keyboard
Interfaces: IBM PC and compatibles, BBC and Amstrad; AES, Wang, Philips and other word processors; various typesetting machines
Price: £1,250 for keyboard alone, £150 for interface box; complete system with Amstrad PCW-8256 and two-week training course is £2,200
Manufacturer: made in Holland by Special Systems Industry BV, Lange Voorhout 45a, 2514 EC Den Haag, Holland. Telephone: (010 31 70) 659912/3
Availability: now; U.K. distribution still to be finished

SUPERKEY
Description: memory-resident keyboard enhancer and file-encryption program
Runs on: IBM PC
Price: £69.95
Supplier: Altor Computers, 11A Anderston Centre, Glasgow G2 7PH. Telephone: 041-226 4211
Available: now

MACTYPE
Description: typing-tutor program for either QWERTY or Dvorak layout
Runs on: 128K or 512K Macintosh
Price: £49.95
Supplier: Palantir Ltd, 23-24 High Street, Woking, Surrey GU21 1BW. Telephone: (0486) 229144
Available: now

REDIT
Description: general-purpose resource editor for the software developer, capable of redefining keyboard to Dvorak layout
Machine: Macintosh
Price: nominal charge only
Supplier: Apple dealer or Mac User Group, 55 Linkside Avenue, Oxford OX2 8JE. Telephone: (0865) 58027
Available: now

machines sold in Europe do not support this feature.

We tried the Dvorak layout out on the Apple Macintosh and on the IBM PC, redefining the keyboard by software in both cases. If our experience is anything to go by, the Dvorak layout is marginally quicker to learn. But there is not much difference between the two methods in the speed we eventually arrived at.

To learn the Dvorak layout we used Palantir's excellent Mactype typing-tutor program for the Macintosh. You can use Mactype to learn both the QWERTY and the Dvorak layouts. After 35 sessions totalling 16 hours I achieved an accurate Dvorak speed of 26 words a minute. It took me 20 hours to reach the same QWERTY touch-typing speed even though I was obviously more familiar with the layout to start with. The Dvorak layout probably is slightly easier to learn.

Since a normal office may contain typewriters and other machines which it is not possible to change to the Dvorak layout, one problem is that you may still sometimes have to use QWERTY devices. Switching between the two layouts initially caused some confusion to my touch-typing. But I was surprised to find that after about 10 minutes with either layout I found myself back to my usual speed and accuracy.

Once you have learnt the Dvorak layout the next task is to set the system up so that you can use it with ordinary application packages such as Macwrite or Microsoft Word. The simplest approach would be to buy a utility specifically designed for keyboard redefining. Mac Qwerty from Paragon Courseware does the job for the Mac. It is distributed in the U.S. but no one seems to be bringing it into the U.K.

Another approach would be to write your own keyboard redefiner. The December 1984 issue of the American magazine *Mac World* carries a suitable short program written in Basic. You simply run it at the start of each session to redefine the keys. However, since the Macintosh does not come with a language included in the price the majority of Mac users would have to go out and buy one before they could even start writing the program.

REDIT UTILITY

A cheaper solution is to use Redit, a rather obscure Apple system utility aimed at commercial software developers. Most Apple dealers will put it on a disc for you. It lets you alter the system file in all sorts of ways and is explained in an article by John Lewis on page 119 of this issue.

We found Redit hard to use as it is not documented, and so you have to indulge in some extremely tedious trial and error. Redit works like a machine-code monitor. You alter the start-up settings for the area of memory where the keyboard is assigned, so if you feel like improving on Dvorak and inventing your own layout there is nothing to stop you. In fact it is hard not to, as the keys are not mapped in strict sequence so it is difficult to find the exact location of every key. Having changed the system file on one disc you simply drag it across to any other Mac start-up discs you want to use with the Dvorak layout.

With the IBM PC things are a lot easier, at least if you use Superkey, a £70 memory-resident utility from Borland. Superkey is most commonly used for setting up keyboard macros for use in applications like Lotus 1-2-3 and WordStar, and for putting security encryption on files. But it also lets you redefine your keyboard, and it comes with the Dvorak layout pre-defined.

Superkey is not copy protected so you can install it on the same disc as other software. It took us no more than five minutes from opening the manual to having it installed on our hard disc. We set up Superkey to run automatically with the Autoexec.Bat file. We were then able to change the keyboard layout at any time, either before or after entering an application program.

The procedure is to type

Alt /

which brings Superkey up on to the screen, and then to type

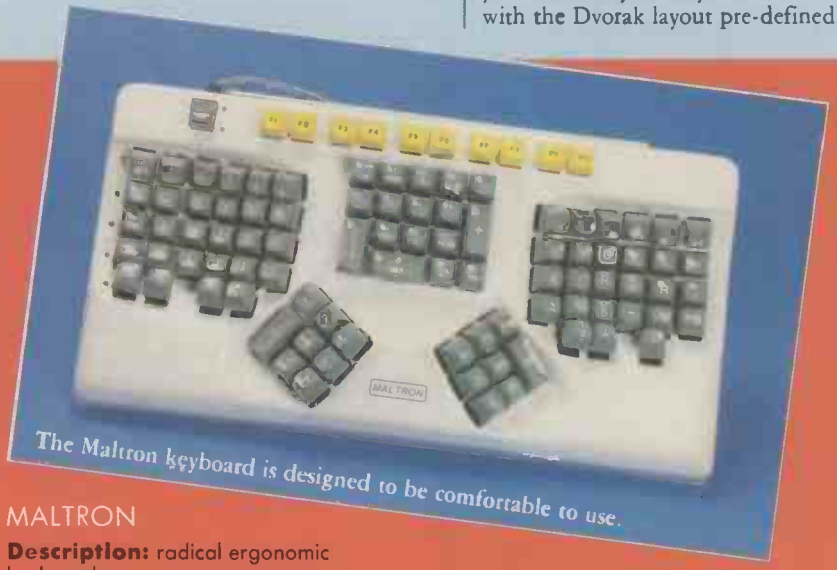
LL Dvorak

which redefines the keyboard. You can revert to normal QWERTY layout at any time simply by closing down Superkey.

If the software approach sounds too complicated you may be able to buy the Dvorak layout in the physical form of a replacement keyboard. Keytronic is one of a number of suppliers who make them for the IBM PC, but we were unable to find anyone routinely bringing them into the U.K. It would be a matter of putting in a special order to a firm like Ceratech.

Where the hardware approach really comes into its own is for truly radical keyboards such as the Maltron that differ fundamentally from the QWERTY standard. The Maltron keyboard was designed in the late 1970s to overcome the ergonomic shortcomings of the conventional flat keyboard. The argument is that while the QWERTY keyboard once made good engineering sense, it imposes unneccessary strain on the human user. The electrical switch has now banished most of the physical constraints on keyboard design, so it should be possible to make comfort and ease of use the prime design goals.

The Maltron's keys are laid out on a sculpted, curving surface which bears little resemblence to the usual flat, rectangular



The Maltron keyboard is designed to be comfortable to use.

The QWERTY layout (above) is not designed for speed, whereas commonly used keys are reached easily on the Dvorak layout (below).

MALTRON

Description: radical ergonomic keyboard
Interfaces: BBC, Apple II, IBM PC and other popular micros
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Manufacturer: PCD Maltron Ltd, 15 Orchard Lane, East Molesey, Surrey KT8 0BN. Telephone: 01-398 3265
Available: now

OTHER SUPPLIERS

Ceratech Electronics Lenten House, 20 Lenten Street, Alton, Hampshire GU34 1HG. Telephone: (0420) 88674
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(continued on page 55)

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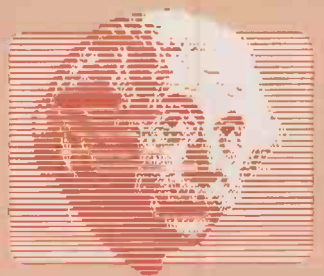

COMPUTER-AIDED-SCIENCES CONFERENCE & EXHIBITION

42137

(continued from page 53)
keyboard. The keys are divided into five main groups. The two largest groups are placed near the left and right edges of the keyboard, and consist of most of the common alphanumeric keys. These are struck by the fingers of each hand.

Two smaller groups of keys go under the thumbs. In the QWERTY layout the thumbs are under used, but the Maltron designers give each thumb eight keys to deal with. A separate numeric pad for pure figure work is located in the centre of the keyboard.

As there are no mechanical linkages there is no need to stagger the keys, so they are laid out in straight rows. Only your index fingers, which are the most flexible, are required to reach diagonally for a key. Diagonal finger movement is apparently tiring and potentially bad for health, and so is one of the worst aspects of the QWERTY system.

The two main groups of keys are sited in concave depressions in the keyboard, shaped to take account of the different length of each finger. The thumb pads are tilted slightly sideways to the angle most easily reached by the thumb. Under each palm the casing of the keyboard bulges up so that it provides a rest for your hand when you are not typing.

At first the Maltron design seems a bit odd, but it quickly begins to feel more comfortable than a conventional keyboard. In particular, the wide separation of the two main groups of keys means that you type with your hands much further apart than usual. As a result you no longer have to bend your wrists; more important, the shoulders naturally adopt a much more relaxed posture.

REASSIGN KEYS

The principles embodied in the general shape of the Maltron keyboard are largely independent of the assignment of characters to particular keys. You could keep the keys in something resembling the QWERTY layout, or reassign the keys according to some more rational principle.

We tried out a version of the Maltron keyboard for the IBM PC, which costs £295. It comes with a Maltron/QWERTY switch, allowing you to choose between a standard and a Maltron layout, but in practice we went for the Maltron option. Since the keyboard looks so weird anyway you might as well go the whole hog and learn a new layout. The QWERTY option is helpful for occasional users or if you get totally stuck.

The Maltron key assignments are, like the Dvorak, based on analysis of frequency. This time the letters ANIS lie under the fingers of the left hand, THOR under the right. E is the most common letter in English, so it rests under the home position of the left thumb, which also takes care of the frequently used Backspace and full stop. The right thumb rests on Space, and also takes care of Control and Return.

Claims of moderate speed improvement are made for the Maltron layout, but we were unable to achieve anything startling in the time we had available. What is more significant for computer users is the fact that common keys like Backspace are in easy reach. The Maltron layout seemed fairly easy to learn compared to QWERTY.

Using the keyboard with the IBM proved easy. It plugged straight into the normal keyboard socket and configured itself automatically when we booted-up the system. Our only criticism of the IBM implementation is that the set of 10 function keys is put along the top of the keyboard. We would have preferred them in the normal place along the left-hand side, as many software packages come with the templates that assume you have this configuration.

QWERTY UNITS ROBUST

One problem with using unorthodox kinds of keyboard is that they are usually heavily patented, so you have a very restricted choice of supplier. Although conceptually the Maltron makes quite a lot of sense, the standard of construction seems to be low. We knocked one key off within a few minutes, and the indicator lights next to the QWERTY/Maltron switch stopped working. Although neither problem stopped us using the keyboard, the units in the highly competitive QWERTY world are generally more robust.

While the Maltron keyboard exploits the design freedom offered by the electric switch, Velotype goes one step further and employs logic circuitry. It takes advantage of the fact that you can put a great deal of intelligence inside the keyboard itself, and it goes all-out for speed.

The ideas behind the Velotype keyboard originated in Holland in the 1930s. The basic principle is similar to shorthand: instead of forming a word letter by letter you do it in syllable-sized chunks.

On a real machine this means you do away with the process of striking the keys sequentially. Ideally you would bang down a whole group of keys at the same time, leaving it to the keyboard to sort out the order according to a set of pre-programmed rules. Velotyping principles were taken up in earnest in the 1970s when it looked like the technology to implement the designers' ideas was finally beginning to arrive.

The current Velotype has been on sale in Holland for three years. According to the manufacturer it has been selling well, especially into the typesetting industry, and also into law courts, where it is used for verbatim reporting.

We tried out the IBM version, which has just been launched in the U.K. It costs £1,200 and plugs via an adaptor box into the normal IBM keyboard port. The keyboard has its own built-in 40-character single-line display. You can also buy memory modules which allow you to use the Velotype on its own as a portable mains-powered text-entry device.

The Velotype keyboard divides logically into three sections. The left- and right-hand sides are mirror images of each other, comprising the same set of consonant keys; in the middle are the vowel keys. You use the left-hand group of keys for the initial consonants, the right-hand keys for the final consonants. The machine sorts out the order.

With some words this is easy. With "stop", for instance, you hold down the S and the T with the left hand, the O with either and the P with the right. The machine normally assumes a space at the end of each group of simultaneously pressed keys, and so will give you the word "stop" followed by a space when you release the keys. You type long words section by section, hitting the No Space key after each section to suppress the space.

Other words are more difficult because they involve possible ambiguity — "post", for instance. If you hold down PO with the left hand and ST on the right you could mean "post" or "pots". In this instance the machine will give you "post" because it follows a rule in its built-in firmware to prefer ST. If you want to "pots" you must hold down TZ with the right hand.

Learning to use the Velotype therefore consists of getting to know the rules the keyboard employs, as well as mastering the keys. You are eventually able to type any sequence of letters with Velotype, but obviously you learn the common ones first.

It rapidly became clear to us that the Velotype is potentially very quick. We were immediately able to produce some words at high speed, but because of the way you learn the sysem we would have to stop and puzzle out how to get other ones. Like learning shorthand, you progressively add new combinations to your repertoire.

According to the manufacturer's literature, it takes two weeks full-time training to learn the system. A formal two-week course is available for £350 including VAT from JHP Training. The course is designed to get you to 30 words a minute, about the same speed of a newly trained QWERTY typist. You are then meant to be able to get to over 180 words a minute, putting you in the world-record QWERTY class, after another 400 hours of practice.

CONCLUSIONS

■The result of looking at all these alternative keyboards has been to renew our interest in QWERTY. It comes bundled free with most computer systems and an experienced operator can attain speeds of 60 to 80 words a minute.

■The advantage of the Dvorak keyboard layout is that you can often implement it purely with software on your existing kit, changing between Dvorak and QWERTY whenever you like. It is worth trying for fun, but do not expect any major speed improvement.

■The Maltron is a thoroughly redesigned keyboard, likely to please ergonomics specialists. But you need to buy a special keyboard, and ours was not very well built.

■The Velotype can provide really fast typing speeds for experienced operators. At the moment the Velotype system is expensive, and it is difficult for untrained operators to use at all. Worth considering for the power word processor, but not for the general PC user or spreadsheet specialist. PC

MOBILE OFFICE
CELLULAR-RADIO COMMS

By Steve Malone

A truly portable work station is made possible by linking a lap-portable micro to the cellular-radio mobile phone system.

Thorn EMI's Mobile Office systems offer a range of equipment for computing on the move. The system we were able to look at in detail provides an additional degree of mobility by linking a light, battery-powered work station to the cellular-radio mobile-telephone network. The work station is thus linked to a mainframe database or another micro, but is not bound by a fixed telephone line. It also has a useful stand-alone capability.

The central unit in the system is a neat lap-portable computer known as the Magnum, which is designed and built in Australia. It has been imported into the U.K. by Professional Micros Ltd, and the same company has developed the system that is being marketed by Thorn EMI.

The Magnum is based around the 80186 processor and comes as standard with 96K of RAM. It has no built-in disc drives. All software comes on the 128K of ROM supplied with the machine.

When closed up for carrying the Magnum measures 325mm. by 285mm. by 58mm. and fits comfortably inside a briefcase. To open it up you press down on two clips on either side of the main box. You can then fold up the LCD screen to reveal the keyboard.

QWERTY KEYBOARD

The keys are arranged in the conventional QWERTY layout, with a row of function keys running along the top, and the usual control keys around the sides. The only unusual features are the positioning of the cursor-control keys in two pairs at either side of the space bar, and the prominent on/off and Reset keys directly under the display panel. The keys themselves are adequate, although their texture and restricted travel give them a curiously dead feel. You have to hit them fairly hard to make sure that the characters register.

The Magnum's display is provided by an 80-column by 16-row LCD screen. An alternative eight-row version is also available, and the manufacturer hopes to have a full 24-row version soon.

Professional Micros says the machine has full IBM compatibility, but as we were unable to get hold of a disc drive we could not verify this. But in any case, an IBM-compatible lap portable really needs a full 80-by-24 screen. With a short screen some applications packages only display the top lines and cut off the bottom ones. This can be a terrible nuisance when dealing with packages that display vital information on the bottom lines of the screen.

The Magnum is bundled with a number of applications packages, including a phone book, a word processor, a spreadsheet and a terminal-emulation package. Microsoft Basic 5.28 is also included. All of these, including the MS-DOS 2.11 disc operating system, are held in ROM. The application-software ROMs are installed in easily accessible cartridge slots, so applications can be exchanged easily. Professional Micros says that it can install the customer's own software on ROM, if necessary.

MOBILE OFFICE/MAGNUM

PC VERDICT

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

☐ If you need a mobile computing facility it is a worthwhile system. Otherwise it is an expensive toy.

The operating system configures the memory into logical disc drives, with MS-DOS and the majority of applications programs on drive A. Under MS-DOS it is possible to access the RAM discs in the same way as a floppy-disc drive.

The terminal software has a number of features which enable the data to be configured for transmission. Thus the baud rate, parity and start and stop bits can be set from software. The system also allows files to be loaded and retrieved from the silicon disc. In practice it is unlikely that anyone will be doing a great deal of terminal configuration. Cellular data comms is in its infancy and few networks are, as yet, capable of handling the kind of transmissions required.

The second major component of the system is, of course, the modem. The Transam M1 is the only unit that is currently BABT approved for cellular-radio communications, so it rather selected itself for the job of radio data communications in Mobile Office. Like the cellular-radio equipment, the modem has to be specially fitted into the boot or some other convenient place in a car. The Transam M1 communicates using the Racal Vodaphone network.

When the time came to test out the system on the road the Vodaphone network seemed to be having a particularly bad day.

SPECIFICATION

CPU: 80186 running at 6MHz
RAM: 96K fitted as standard, expandable to 256K internally plus a further 256K externally
ROM: 128K, including the MS-DOS operating system; space for two 128K ROM expansion packs for applications programs
Dimensions: 325mm. (12.8in.) x 285mm. (11.2in.) x 58mm. (2.3in.)
Weight: 4kg. (9lb.)
Display: choice of two LCDs displaying 80 columns and either eight or 16 lines
Keyboard: QWERTY with 12 function keys, four cursor keys, On/Off, Reset and Help
Mass storage: no integral mass-storage device; battery-backed RAM only
Interfaces: 60-way expansion bus, parallel I/O port, RS-232 serial port, composite video
Software in price: MS-DOS 2.11, Magwriter , Magcalc, Magterminal, Microsoft Basic 5.28
Modem: Tandem M1 modem and cellular radio interface
Protocols: 1,200/1,200 baud full-duplex, 1,200/75 baud half-duplex and 300/300 baud; autodial and auto-answer facilities built-in but not implemented
Price: complete system including NEC phone, cables and fitting £3,548
Distributor: Thorn EMI Dataphone Ltd, Apex House, Twickenham Road, Feltham, Middlesex TW13 6JQ. Telephone: 01-894 5644
Available: now

CELLULAR RADIO

The cellular-radio systems now available in the U.K. have been designed to make the best possible use of a limited range of radio frequencies to provide mobile phone services for as large a number of subscribers as possible. It is projected that there will be 50,000 people wishing to use mobile phone systems by the end of 1986 and at peak times the number of users who wish to be on the air will exceed the number of frequencies available.

The plan is therefore to restrict the power of the fixed and mobile transmitters to no more than a few miles. In that way the same frequency can be used for a number of different conversations taking place some distance apart. In order to allow customers to contact telephone subscribers outside this narrow range the U.K. has been divided into a number of cells.

A cell may be anything from a few hundred yards across to several miles. Each one is governed by a computer — known as a "switch" — which monitors the airwaves within it. When the switch detects a call from a cellular radio it searches the 300 bands it has available for an empty channel, and then directs the calls through it.

Once the call is directed through the channel, the switch connects the radio channel through the standard telephone network to the receiver. Even if the call is to another cellular radio system it is routed through the phone lines to another switch, where the process is reversed.

It is not only the switch that monitors the calls. The mobile personal radios also poll the surrounding cells to see if there is a better signal. If a mobile radio finds a stronger signal coming from one of the adjacent cells it will transfer to that cell in mid-call. Obviously this is useful when you are moving between cells, but there are other factors which might influence the switching from one cell to another. If there is overcrowding within one particular cell the radio may switch to an adjacent cell carrying less traffic. Also the surroundings have a big influence on the quality of transmission; large obstructions such as hills can interfere with the radio waves.

So far cellular radio is anything but cheap, with prices for the hardware starting at around £900. Having the system installed in your car will cost another £150, and the connection charge to the network a further £80. In addition there are standing charges and the cost of the calls.

There are currently two cellular-radio systems in use in the U.K.: Cellnet run by British Telecom, and Vodaphone which was developed and operated by Racal. Each system has its own network of cells and aerials, and although there are plans to allow a cellular radio to move between the two systems, depending on signal strength, this has not yet been implemented.

The modem has to be specially fitted into the car.

The standards governing cellular-radio communications are set by Total Access Communications Systems (TACS). This states that there should be a capability of 1,000 users per cell, although at present the government only allows a maximum of 300 to be used. The restriction is in part due to a scheme to develop a pan-European cellular-radio network.

Cellular radio poses particular problems for data transmission. Some interference is inherent in all radio communication, and reception is likely to be momentarily interrupted as the cellular system changes cells. Such breaks could prove catastrophic if they happen while digital data is being transmitted.

To provide reliable computer-to-computer communication in conjunction with cellular radio, a modem has to be intelligent in order for it to adjust to the changing conditions, particularly if the computer is actually moving. Thorough error checking is paramount. The Transam M1 which forms part of the Mobile Office system shows every sign of setting the standard in the U.K. for radio data communication.

The handset's Service light, which indicates that a cell is ready to receive a transmission, only worked intermittently for the first 20 minutes. The network also suffered from crossed lines, and the phone was actually cut off at one point. Racal later explained that a new processor fitted to the main London switch had gone live for the first time that morning, and the company was in the process of ironing out the bugs.

Despite these difficulties the Mobile Office worked satisfactorily. We sent out a 4K file from the Magnum to a One-to-One mailbox and then requested it back again. The information was eventually received back at the computer in its entirety. The only problem arising from the bug-ridden phone network was that the modem took some time to receive the complete data blocks.

To achieve this solid performance under such adverse conditions the Transam M1 has to operate rather differently from a conventional modem. Instead of being transmitted in a steady stream, the information is divided into packets. At the front of each packet is a character informing the receiving modem that a packet is about to arrive. This is followed by an eight-bit sequence number which is incremented by the transmitting modem when each packet is sent out. Thus, if a packet fails to arrive at its destination, the receiving modem can ask for it to be retransmitted. The next part of the packet consists of three bits which say whether the information is a command or data. The data block itself can be up to 27 bytes long, and is followed by two bytes that provide a check to ensure that all the preceding data has been received correctly.

None of the cellular telephones currently on the market have been designed to cater for data transmission; a modem interface is required to link the cellular phone to the modem itself. Another limitation is that the phone equipment cannot yet cope with automatically answering incoming calls.

The kind of instant access provided by the Mobile Office system has a wide range of potential applications. For example, a sales rep could place an order for goods and services immediately the sale is concluded without having to find a fixed telephone.

One problem that might worry potential customers is that of security when confidential information is broadcast into free space. But in fact the nature of cellular radio makes breaking into the network even more difficult than unauthorised access into conventional transmission systems. Any hacker would need sophisticated radio tracking equipment to search and lock on to a channel which might change instantly if the signal is transferred to a different net.

CONCLUSIONS

- The Mobile Office computer system is a practical, if expensive, solution to those who want computing on the move.
- The all-important data-communications systems worked well, particularly under the adverse conditions under which it was tested.
- At present the system shows all the signs of being an initial version with a number of the frills such as auto-answer being left to later devopment. PC

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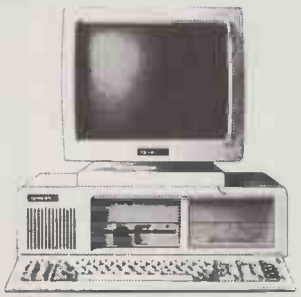

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WORDSTAR 2000 PLUS

WP PLUS COMMS

By Kevin Townsend

Micropro's latest upgrade combines word processing with an electronic-mail facility to provide comprehensive text-processing package.

Word processing, closely followed by the spreadsheet, was the great microcomputer software success of the early 1980s. A package like WordStar could turn any old eight-bit microcomputer into a fully fledged word processor — and WordStar was used in its millions. But now the WP market has begun to reach saturation level as fewer new users are coming into the market. Indeed Micropro, the publisher of WordStar, reported a loss of $1.3 million in the six months ending February 1985.

Word processing remains one of the most important micro software applications, but there is a greater choice and competition is fierce. WP suppliers need to offer something more than just another word-processing package.

In response to market demands, Micropro launched WordStar 2000, which forms the basis of the company's future strategy. WordStar itself is now reaching the end of its life cycle and cannot be much further expanded, but WordStar 2000 is at the beginning of its evolution and is designed for the new generation of micros.

WordStar 2000 is beginning to prove itself, and in the six months ending February 1986 Micropro has reversed the financial trend and announced earnings of $1.5 million. New additions and options have begun to appear for the basic product with the latest release of WordStar 2000 Plus. MailList, Starindex and Telmerge have been added to the list of WordStar 2000 options. They form an integral part of WordStar 2000 Plus, or can be added as an upgrade to WordStar 2000 version 2.

SPECIFICATION

Description: word-processing package with additional modules, including communications, indexing and DCA conversion
Hardware required: IBM PC, PC/AT and compatibles with at least two drives; hard disc is desirable
Copy protection: none
Price: WordStar 2000, £465; WordStar 2000 Plus, £549; WordStar 2000 upgrade, £119
Supplier: Micropro International Ltd, Haygarth House, 28/31 High Street, London SW19 5BY. Telephone: 01-879 1122
Available: now

TELMERGE COMMUNICATIONS MENU

Enter	Service	Description
BTG	Telecom Gold	Email service
EAS	Easylink	Email service
MCI	MCI Mail (U.S.A.)	Email service
MPR	Micropro	Micropro information service
ONE	One to One	Email service
PSS	Packet Switch	International packet switch
DIAL 1	Personal autodialling	Dialling a number
DIAL 2	Personal autodialling	Using personal telephone directory
DIAL 3	Personal autodialling	Viewing personal telephone directory
PCL	Direct PC Link	IBM PC to IBM PC RS-232 link
PMS	Personal mailbox	Personal mailbox service

```
If =ONE
Cls
Say          ONEtoONE Electronic Mail Service
Say          ------------------------------
{ Service information
Logfile      ONE.LOG
Logging      ON
Number            { Enter the Phone Number.
Attention    ^M
Response1         { Enter your user I.D. and Password
End
Endif
```

Telmerge.Sys file for One to One.

Telmerge is the most interesting of the new features. It combines word processing with electronic mail and comms facilities. The importance of this should not be underestimated, for personal computers are now becoming the executive work station within a corporate environment that is usually based on the concept of distributed processing. Clearly, this is only possible where suitable communications exist between the different locations.

All of the WordStar 2000 Plus options are accessed from the second page of main menu options. Pressing A enables the user to access Telmerge, and displays the Telmerge communications menu. The options available are shown in the table on this page. All the detail of the communications option becomes an automatic operation. The Telmerge communications menu is also held in this file as straightforward text. If you have only one email system you could easily tailor the Telmerge.Sys file to show email as the only EM option, rather than leave it showing a series of choices. You do not need to delete the options themselves but can hide them by removing the entry from the menu in case other EM options are acquired later.

But communications alone is not enough for distributed processing. Most large system users will have a central mainframe, and nearly all of the company personal computers will be able to communicate with it. If the company has standardised on IBM or IBM-compatible mainframes, the text standard will be IBM's document content architecture (DCA). WordStar 2000 Plus therefore includes a new WordStar-to-DCA file-conversion utility.

WORDSTAR 2000 PLUS

PC VERDICT

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

☐ Could become the standard word processor in the corporate environment.

CONCLUSIONS

■ WordStar 2000 Plus is beginning to provide the extras to WordStar 2000 Plus to make it something special.

■ WordStar 2000 could easily become to executive personal computers what WordStar was to eight-bit microcomputers; WordStar 2000 Plus puts the product into mainstream corporate word processing.

■ WordStar 2000 Plus is easy to use and very well documented. It will soon be just as powerful as its predecessor. PC

BOXES AND ARROWS
GOING IN THE RIGHT DIRECTION?

By Steve Malone

The combination of schematic graphics and computational ability allows you to represent complex models as a kind of visual spreadsheet.

Boxes and Arrows is intended to provide a visual representation of complex systems to enable easier understanding of the relationships involved. The idea is that when you have a series of calculations to make, representing each step of the calculation by a box, with lines leading to the next stage, makes the whole formula easier to grasp. Inner Loop Software, the program's publisher, claims that it has a wide range of applications, from schematic diagrams and budget forecasting to circuit design and dynamic systems. The program runs on the IBM PC and compatibles and requires 384K of memory. No U.K. distributor has yet been appointed, but Inner Loop is happy to sell direct from the U.S.

The program is arranged on a Cartesian grid system with the x and y axes having maximum values of 32,767. This means that to have each co-ordinate held in memory would take up over a megabyte in storage alone. The program gets around this by condensing the workspace area, known as the focus, to an area very much less. The size of the focus depends how much free memory is available, but using the minimum 384K configuration allows for a focus of 128K.

AMPLE SPACE

However, running out of focus area is unlikely unless you are planning gigantic diagrams. It is possible to jump from one end of the range to the other to draw boxes as the program will ignore the empty space in between. Problems will only start to arise if the focus begins to run out of space. With the full 640K of memory the program is able to handle up to 700 objects, which includes lines and points as well as boxes.

Boxes and Arrows is a completely menu-driven program. The menu commands are displayed at the bottom of the screen and are accessed either by using the Tab functions or by pressing the first letter of the command. The menus are easy to use and for the most part self-explanatory. If you do make a mistake, the error and correct procedures are displayed at the bottom of the screen. If you still manage to get lost there is a separate Help command available.

Diagrams are created on-screen primarily by using the Generate command. This transfers you to a sub-menu which allows the creation of either boxes, lines or points. Once created, an object can be moved anywhere within the permitted range. What appears on-screen occupies ~~only~~ a small amount of the total focus area, and in order to view areas of the diagram which lie outside the current display the screen window can be moved via the cursor keys.

If a program calls itself Boxes and Arrows, it is unsurprising to discover that the only process symbols it can create are boxes. However, it is a pity that the program cannot generate other shapes which would enable it to be used in a wider range of applications. For example, a systems analyst uses a whole variety of different shapes such as circles and triangles to design a system. Likewise, Boxes and Arrows does not support symbols which an electrical engineer would use to represent electrical components. The fact that Boxes and Arrows does not cater for these small but important areas will severely reduce its appeal to technical users.

BOXES AND ARROWS

PC VERDICT

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

☐ Does not have any features that are not better implemented elsewhere.

Once a box is defined, you can copy it to another position within the grid by means of the Copy command on the main menu. Once selected, the command asks which of the objects on-screen you want to move. You select it by moving the on-screen cursor. However, the program only recognises an object if the cursor rests on its outline. It will not, say, recognise a box as a movable object if the cursor is inside it.

Once you have set up your boxes you can then add lines to join them together. You select the Line command from the Generate menu and specify the points to be connected; the program will automatically draw a line.

SPECIFICATION

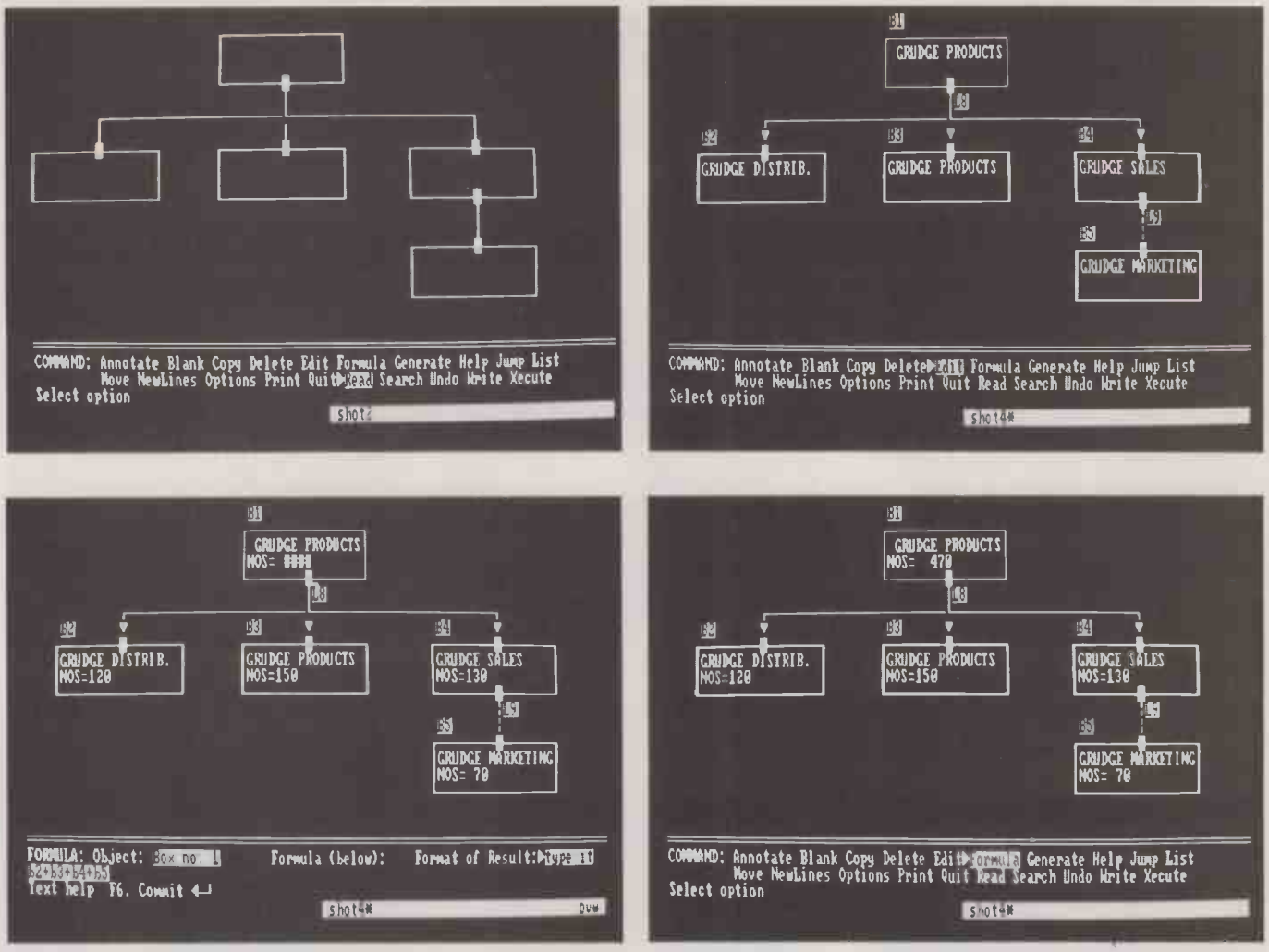
Description: allows graphic representation of systems and their relationships
Hardware requirements: IBM PC or compatible running under DOS 2.0 or higher and with 384K RAM
Copy protection: master disc must be present when booting up; two copies of master disc are provided with the package, further master discs available for $10 each
Price: $395
Supplier: Inner Loop Software, 5456 McConnell Avenue, Los Angeles, California 90066
Available: now, direct from Inner Loop

Line drawing is one of the cleverest features of the program. Where there are other lines or boxes between the line's origin and destination, the program plots a line around the various obstructions until it is completed. One line will not cross another unless instructed to. If a connection cannot be made without crossing a box or line, the program says so and invites you to make the two points more accessible.

Once you have created an intricate diagram, you can then start adding some fancy embellishments. You do this using the Edit command. For example, if the PC has a colour card fitted you can change the colours of the lines and boxes to one of eight choices, with a further eight colours available for background. If you are using a monochrome monitor, the colours are restricted to the usual kinds of bold shading. There are other facilities within the Edit command which you can use to change the thickness of lines, change to broken lines or add arrows to indicate the direction which the logic flows in.

Within the Edit command you can add titles to each of the boxes, but you have to place them in the box. For example, if you try to put the title on top of the box outline the underlying line will be erased and will not be replaced if you move the word. Furthermore, if you move the box a title written on top of its outline will not be moved with it and it will be erased, while a title lying within the boundaries of a box will be transferred along with the box.

As well as simply drawing diagrams, you can use Boxes and Arrows to perform calculations along the flow of the diagram by entering data or formulae at appropriate points. In this way it can operate almost as a



Top: You start by creating boxes and the lines connecting them (left), and then add labels and box numbers (right). Above: Formulae operate on numerical data in the boxes, as shown before execution (left) and after (right).

visual spreadsheet. The graphics and computational sections of the program are not linked, however, and it is entirely up to the user to ensure that the form of the diagrams displayed by Boxes and Arrows reflects the logic of the calculations.

You can enter data logic into the boxes either directly or by setting up alphabetic or numeric fields, represented by @ and # respectively, where variables can be assigned via the Formula command. You introduce variables by entering spreadsheet-type formulae, but instead of entering cell addresses you enter box numbers.

For example, supposing a company sells packets of bibs and tuckers. The price of bibs is held in box 1, B1, and the tuckers in box 2, B2. You want to display the retail price of bibs and tuckers in box 3, B3.

SETTING UP FORMULAE

Entering the Formula menu presents you with three options. The first is to determine where the formula is to be held, so you position the cursor on the required box, B3. Pressing the Tab key moves the menu cursor to the next field, which requests the formula. You want the prices held in B1 and B2 added together, with perhaps 15 percent VAT so you enter the formula

(B1+B2)*1.15

This is the simplest method of entering data, particularly where multiple calculations have to be carried out. There is an alternative method which involves making use of the program's built-in functions which are characteristically preceded by the @ sign in the formula field. So in order to add the results of boxes B1 and B2 the formula in B3 would be

@sum(B1,B2)

Apart from the usual arithmetic operators, Boxes and Arrows also supports the Boolean operations Or, Not and And as well as expression lists. As an added bonus the program also incorporates a number of commonly used mathematical functions, including trigonometric functions, exponent, random and modulus.

Pressing the Tab key again brings you to the next field which asks where the relevant numeric field is to go. Moving the screen cursor and typing

# # # #

allows a four-figure number to be entered. When you press Return the computation will be performed automatically and the answer appears in the designated field.

When entering data, it is important that the field set aside for the result is large enough to hold any possible number. If the number is too big it will flash until you make the field large enough to contain it. You can justify the numbers to the right or left of the field for a more attractive appearance.

Boxes and Arrows also features several expressions to control the flow of formulae and their computation. For example, the expression

@if(SALES)=$1200,x1,x2)

means that if the condition is true then calculate the formula x1 otherwise calculate x2. This can be adapted to read

@if(B1=1200,B2,B3)

where control is passed to a formula in a particular box, depending on the result in an earlier calculation. Another useful feature is the ability to return the number of times that the formulae used in the diagram have been executed. Overall the computational capabilities of the program are on a par with the kind of macro language found in the average spreadsheet.

CONCLUSIONS

■ Boxes and Arrows is a program in search of a niche. The combination of calculation facilities and block diagrams may seem a good idea, but the overall concept and implementation seems woolly minded.

■ The major markets that have been targeted by Inner Loop will probably be unimpressed by the package. Engineers will find the package not specialised enough, while people who are interested in spreadsheets and presentation graphics will find other products offer better facilities. PC

AMIGA FREEWARE
A LITTLE HELP FROM ITS FRIENDS

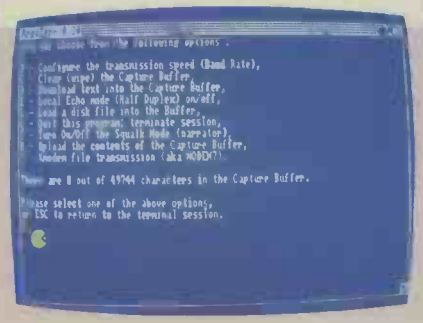
By Francis Jago

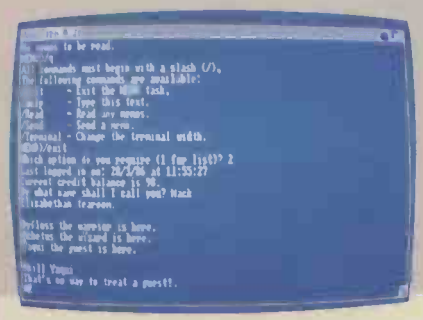
The enthusiastic band of followers for Commodore's powerful new machine have been busy writing some useful utilities and applications programs.

Speechtoy translates input words into phonemes.

The Amiga's wide range of colours permit some subtle effects.

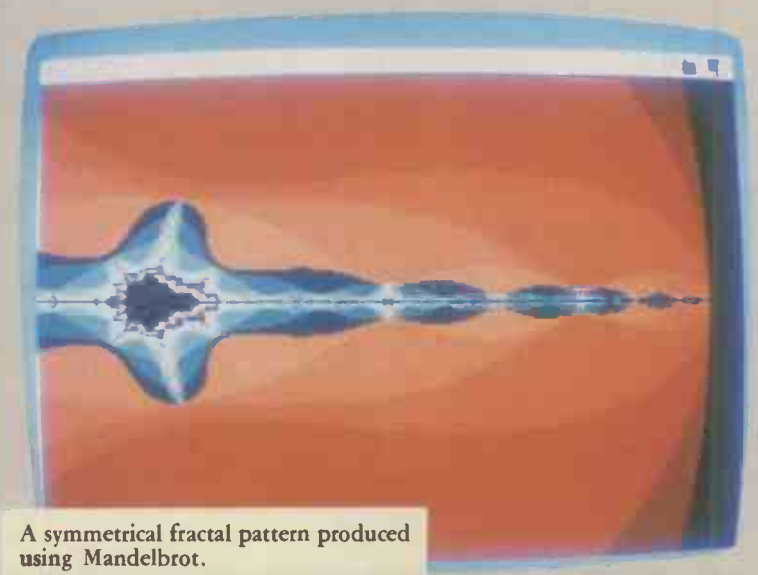
Setting up the system parameters on Argoterm.





Argoterm's basic command menu.

The Amiga allows you to create detailed graphics drawings.



A symmetrical fractal pattern produced using Mandelbrot.

SOURCES

London Underground Xmodem 300/300 or 1,200/75 baud. Telephone: 01-863 0198.
Argonaut software for a comprehensive list of American freeware send an SAE to Fred Fish, 345 Scottsdale Road, Pleasant Hill, Ca 94523, U.S.A.
Software list available from the author at 31 Rivermead Court, Ranelagh Gardens, London SW6 3RU.

With Mandelbrot you can produce fractal-like images.

The Amiga's colour facility generates complex patterns with Mandelbrot.

Nobody disputes that the Amiga is a wonderfully sophisticated computer. The problem, as with any new machine, is that software is hard to come by. But in addition to the commercial programs now coming through — three of them were reviewed in the April issue — a selection of free software is appearing on the better bulletin boards.

The first piece of really good freeware I received was a very early version of Charlie Heath's Ed. This is an excellent text editor that can be used to read a variety of files and to edit programs. The very early beta-test versions are available free. Later versions cost $39, although this includes a manual, and updates when they are finished.

In the U.S. one man, Fred Fish, has taken it upon himself to collect as much freeware as possible and then distribute it to people who send him a small copying fee. Fred's first eight discs hold a variety of useful, fun and educational programs. A couple of small demo programs each show off a certain aspect of the Amiga. The first of these, Colorful, shows how a method called Hold and Modify (HAM) can be used to put up to 4,096 colours on-screen simultaneously. A small program called Freedraw, written entirely in 68000 machine language, uses the Amiga to draw lines unbelievably fast, and is combined with a basic art program.

Anyone who is interested in programming graphics on the Amiga will appreciate the next program, GFXmem. It provides a continual update as to how the machine's memory is allocated between graphics and text. Charlie Heath is the author of Palette. As its name suggests, this program allows you to define the colours which you wish to appear on a palette.

SPEECH SYNTHESIS

Of all the freeware programs I have seen on the Amiga, the one I find the most amusing is Speechtoy. It translates any input words into phonemes, then lets the Amiga use its speech synthesis to the full. Speechtoy is programmed by David M Lucas, and an especially good point is that you can alter both the normal text and the phonetic translation.

As well as giving you total control over phonemes, Speechtoy offers other novel features. You can choose between male and female voices, and by clicking on a face icon, you are shown a neat face which animates brilliantly any input speech.

If you have a graphics printer you will be able to make use of the comprehensive printing utility on Fish's discs. They have mainly been ported from other computers that run C and are therefore not very fast, but at least they are efficient.

Languages have been catered for well, with an excellent implementation of Forth by Allan Pratt, together with an older and less good version of Lisp. Both of these are very portable, which is excellent for people who wish to convert programs from other machines.

For anyone who wants to convert data to work on the Amiga it will come as a relief to hear that there is a Kermit file-transfer program on the Fish discs. It is not very complete, and lacks the Connect facility, but it is still a useful piece of software.

MANDELBROT

My favourite of all the free software I have seen is Mandelbrot, a program that allows you to produce fractal-like self-squared images. As the source of this program is provided you can examine the maths it employs and thereby learn quite a lot. Otherwise it can be linked with Commodore's Graphicraft to add a colourful background with a quasi three-dimensional effect.

A full-screen fractal takes between 10 and 25 minutes to produce, but you can speed the routines up dramatically. This is one advantage of being let loose on the source listings.

I found it refreshing to discover that there is some British freeware too. As it happens it is the best of the lot! Called Argoterm, after its programmer's company, Argonaut, it is an excellent and comprehensive terminal-emulation program. Although it does not use the Amiga's Intuition front end, and therefore has to be used from the command-line interface, it has a very complete Help screen and is simplicity itself to use. Written by Jez San, a wizard on the 68000, it has all the basic and accepted functions, together with Xmodem upload and download correction protocols — they are essential for any serious downloading — and a squalk mode which makes the Amiga speak the text that appears on the screen. I have been using this program for some time and have found it reliable right up to 2,400 baud.

For the artist there are plenty of files around which are copyrighted to no one and will load into either Graphicraft or Electronic Arts' Deluxe Paint. Even bored executives are catered for with a ported game by John Toebes called Hack. PC

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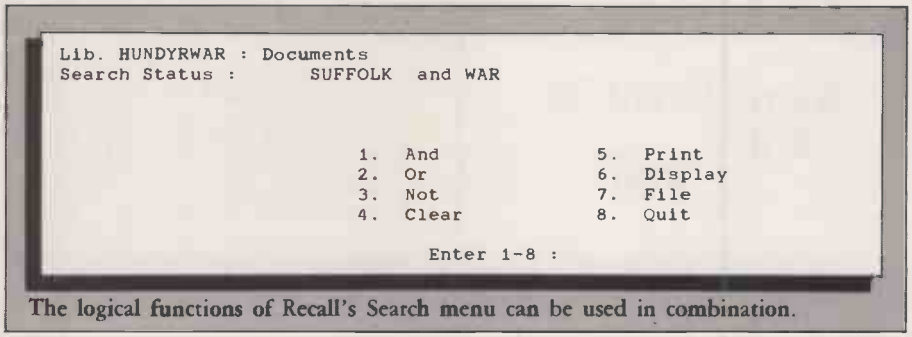
RECALL
SEEK AND YOU SHALL FIND

By Susan Curran

If you make frequent searches for keywords within a large body of free text this program is worth considering.



The logical functions of Recall's Search menu can be used in combination.

Recall is a text-retrieval system designed to provide a flexible and very rapid search facility. Though it is marketed as an adjunct to a word processor it is best considered as a separate system. It comes on a single, unprotected floppy disc, with a manual in standard IBM slip-case format. We tested version 2.3 on an IBM PC/XT with 640K of RAM.

What Recall does is to provide a flexible and very rapid search facility for use with unstructured documents. The only structuring recognised by Recall is a grammatical one, and it defines words, sentences, paragraphs and documents in a fairly standard though inflexible way. Recall allows you to search for words, but not for phrases or longer items. It has a stem wild-card facility: for example, you can use

comput*

as the search string. But there is no full wild-card option, so you cannot search for single wild-card characters in the middle of words. Searches are automatically case insensitive, with no alternative available.

Most usefully, the results of individual searches can be combined using the logical functions And, Or and Not as many times as is necessary to produce a manageable list of references. The proximity of the combined criteria can be controlled so that you can, for instance, search for a sentence that contains both "computer" and "bureau", or a paragraph that contains "Theft Act" but not "1968".

Though the raw data that Recall uses is provided by documents created on word processors, Recall works entirely independently. You have to set up a completely new library of indexed documents on which the program will perform its searches. There is no direct way of returning from the Recall document to the original document and the word-processor program.

Once Recall has located the occurrences of a reference you can browse around them to explore their context in more depth. You can also display them, print them on to paper or save them to disc. The program does not contain any word-processing elements, and it does not allow you to modify the text files in any way. The only way to update a file is to delete it and replace it by a new version. Recall does not do any sorting or arithmetical processing of selected items, and is in no way a substitute for a full-featured database.

To use Recall you begin by setting up a library. There can be up to five libraries on a system, and each one can hold up to 1,000 documents, which should be more than enough to cover normal applications. Each library is essentially a dictionary that contains all the words in all the documents, with the exception of common words like "and" and "the". You can edit the list of words that it excludes. You have to set an initial size for the dictionary, though it can later be increased or decreased. But it is important to size the dictionary correctly because it eats up disc space: for example, a 31,000-word dictionary consumes 1.5Mbyte in addition to the space occupied by the text files. It also takes around 15 minutes to create the dictionary on disc.

DOCUMENT STORAGE

The next step is to store documents in the library. Documents must be in WordStar or ASCII format, so users of other word processors must first stop to create ASCII files of their documents. Recall recognises the end of a sentence by a full stop followed by two spaces, and expects paragraphs to be separated by a blank line. If your idea of these things does not match Recall's you will have to adapt your documents accordingly.

To enter documents you simply give their names and then leave the system to index each one. This takes ages: something like two minutes per single-spaced A4 page seems to be the norm. Recall does not use the ASCII or WordStar files directly, but instead stores all documents in two different formats to allow quick and easy searching and browsing. This step, too, is extremely greedy for disc space. I started with six documents of around two pages each and a modest 5,000-word dictionary. They proved to take up more than 350K on disc in addition to the Recall program files.

Recall's appetite for disc space is a major drawback of the system. For me it would be a decisive factor against using it on a permanent basis. It is hard see how any worthwhile database could be created on a 360K floppy disc, and I imagine most hard-disc users are, like me, tight on space.

Once the documents are indexed you can order a search. Recall carries out its searches through an entire library each time, and there is no way of narrowing its field manually. Even the Title Search routine does not limit its search to words in titles only: it searches every document, but just provides

SPECIFICATION

Description: text-retrieval system for use with unstructured text files
Hardware required: IBM PC, PC/AT or compatible, DEC Rainbow or Apricot with MS-DOS 2.0 or later and at least 256K RAM
Copy protection: none
Price: £195
Publisher: Insoft, 35 King Street, Bristol BS1 4DZ. Telephone: (0272) 28893
U.K. distributor: P&P Micro Distributors, Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire. Telephone: (0706) 217744
Available: now

```
Matched Search

Search £2


So far your search comprises...

     ORLEANS  and SUFFOLK
This combination occurs 4 times .


Document 6 Paragraph 5 Sentence 1

 Suffolk (with orleans??)


Document 6 Paragraph 2 Sentence 15

While waiting for Suffolk,   Orleans and Rene had
exchanged valentine's day poems.


Document 6 Paragraph 2 Sentence 13

 Suffolk had asked to be excused on grounds of
friendship with Orleans et al.


Document 1 Paragraph 2 Sentence 15

1444/5   truce negotiated by Suffolk and Orleans

situation in Maine:   had long been in English domain.
```

The results of a sentence search; you can also search by paragraph.

```
Document 6 Paragraph 4 Sentence 15


Orleans had played major part in persuading HVI to meet
for peace s of Calais and not in English territory

Among issues to discuss,  final release of John of
Orleans, Charles' brother, now in Cherbourg waiting for
permission to go and obtain last of his ransom

Blois:   vast castle.




 1.Back  2.Forward  3.Roll(B)  4.Roll(F)  5.Expand  6.Print  7.End :
                Press spacebar for next item/screenful
```

A Recall sentence where full stops were not used in the original document. A menu is displayed at the foot of the screen.

titles as output. As you would expect from Recall's indexing arrangement, searching is admirably fast, though the program slightly mars the effect by spreading the search routine down several layers of slow-moving menus.

The screen display is neat and plain. Search words are highlighted, and you can browse through the extracts or expand them. Printer support is basic in the extreme. Text is sent to the printer in an uncontrolled ASCII stream. If you do not use continuous stationery you will be in trouble. There are no options for sending initialising or other codes to the printer, and if you want neat output you have to save a text file on disc and re-access it with a word processor.

One other niggle is that the system retains no memory whatsoever of the original name of the document. It works instead with document numbers and with titles consisting of the first sentence. This is annoying when you want to find a reference and then return to the document within a word processor. Unwanted or updated documents must be deleted and then properly removed by a very slow garbage-collection routine.

I am not at all sure what anyone would use Recall for. Since Recall libraries are so slow and cumbersome to set up there is no question of using the program on an ad-hoc basis as a utility with a word processor. It is only suitable for the development of fairly large text bases which you will want to search regularly, and which consist of documents that will only rarely be updated.

The manual lists a vague selection of applications, including general correspondence, memos, technical specifications and contracts. Using the system for general correspondence seems to me a very dubious idea. You would need a lot of spare disc space and a great deal of computer and operator free time to feed all correspondence into a Recall library. The obvious use is for specialised, unstructured knowledge bases. Examples might be to provide references in technical manuals that have been generated in-house, references to files of contracts, and so on.

My own day-to-day work is hardly a typical office application but it may give some insight into how Recall works. I write historical novels which involve me in building up large files of reference material, and I tend to develop them using a word processor. The examples accompanying this review show the system at work on part of my file of material on the Hundred Years' War, and within its limitations it did the job very well.

LOOK NO FURTHER

The trouble is that to check on a reference I need to exit my word processor, call up Recall and work through at least three menus before specifying my search. There is then no easy way of feeding the information Recall produces back into a WP document. I would only find it worthwhile doing that if I built up a library so large and disorderly that I could not viably search through it using the very flexible facilities in Word Perfect. I do not have the disc space to contemplate such an arrangement, though if this is the task you want done and Recall's extensive requirements do not bother you, you need look no further.

RECALL

PC VERDICT

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

☐ Too cumbersome for most people, but effective for a few specialised applications.

CONCLUSIONS

■ Recall is workable in its own right as a knowledge-base program, but is too cumbersome to be used as a utility with a word processor.
■ It is a great pity that it is so hungry for disc space.
■ Though its facilities are modest, it functions speedily. PC

dBASE III PLUS
A LONG WAY FROM VULCAN

By Mike Lewis

Ashton-Tate's latest upgrade brings a front-end menu to the leading database development package.

It is now five years since the late George Tate took in hand a scruffy program called Vulcan, smartened it up and sent it back into the world as dBase II. Since then the program has remained the undisputed leader among database managers. The latest version, named dBase III Plus, has enough new features to keep it ahead of its rivals for a good while yet.

The most visible change is that, at last, there is a workable alternative to the much criticised dot prompt. Now, when you invoke the program, you are greeted by a comprehensive set of pull-down menus. The menus give easy access to the 49 most important commands, and are accompanied by clearly worded explanations and prompts.

Equally welcome is a status line showing such details as the database in use, the record pointer and the number of records on-file. There are also several new forms of Create, including one which allows users to set up filter conditions without having to remember any complicated syntax. Filters can now be saved to a file for later use in much the same way as report and label specifications. All these aids can be switched off at any time.

It is in the dBase programming language where you will find the most interesting enhancements. There are around 50 new features, including functions for finding the amount of free disc space, the physical size of a file and the date of its last update.

Two new functions which give programmers much greater control over the keyboard are Inkey and Readkey. Inkey lets you test for a keystroke without having to suspend execution, while Readkey returns the key that was used to exit from a full-screen operation.

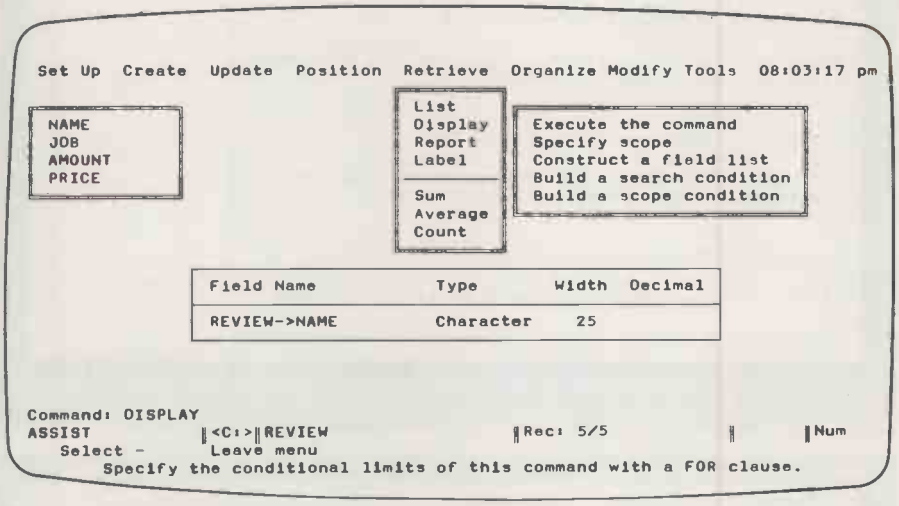
Another welcome addition is the command history, a stack of recently executed commands which can be accessed from the dot prompt via the cursor keys. It allows you to run a short series of commands many times without having to retype them or place them in a file. You can also do on-the-spot editing.

The history is also a valuable debugging tool. You can display it when a program crashes, thus providing a trace of the program's path. You can then alter the commands that caused the crash, and type Resume to continue execution. This gives program testing in dBase the same convenience as in interpreted Basic.

Also dBase now fully supports networking. This is handled by a program called dBase Administrator, which is installed on a server. You also need dBase Access on each work station. Administrator and one copy of Access are included with the package. You have to buy further copies of Access, available in a dBase III LAN Pack, for any additional work stations.

By default each user on the network has exclusive use of any files which he or she opens, so existing programs should run without change. New functions are available for file and record locking to provide shared access under program control. There are also extensive security features.

dBase still lacks some essential features, including some form of array handling and a construct like Basic's For-Next loop. Also on the negative side, the documentation continues to grow bigger and more daunting with each new release, and it is a pity that we still have the nuisance of copy protection. Nevertheless, dBase III Plus is a significant advance on its predecessors.



Most of the dBase commands are now easily accessible via a set of pull-down menus, prompts and dialogue boxes.

SPECIFICATION

Description: database manager and high-level programming language
System required: IBM PC, PC/AT or compatible; for single-user working 256K RAM and MS-DOS 2.0; for networking PC-Net, Torus, 3-Com or Novell network, 640K RAM for server, 384K RAM for each work station
Copy protection: one copy only can be installed and later un-installed; a backup floppy is supplied
Price: £595 for single user or for server and one work station; £795 for each additional three work stations; £99 to upgrade from dBase III
Publisher: Ashton-Tate, 1 Bath Road, Maidenhead, Berkshire SL6 4UH. Telephone: (0628) 33123
Available: now

dBASE III PLUS

PC VERDICT

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

☐ If you have dBase III the upgrade is strongly recommended. If not, now is the time to take another look.

CONCLUSIONS

■ This new version of dBase III has plenty to offer to both end-users and application developers.
■ Many people will especially apppreciate the new easy-to-use front end.
■ It has brought dBase significantly closer to being a general-purpose programming language. PC

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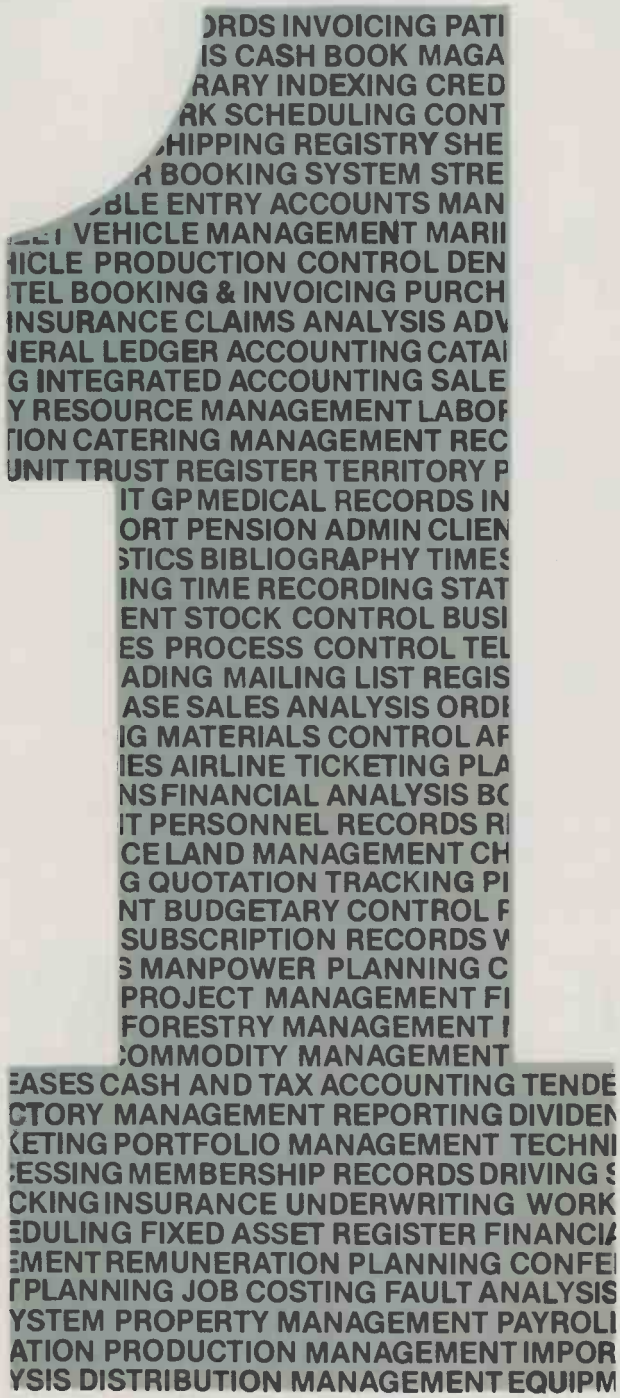

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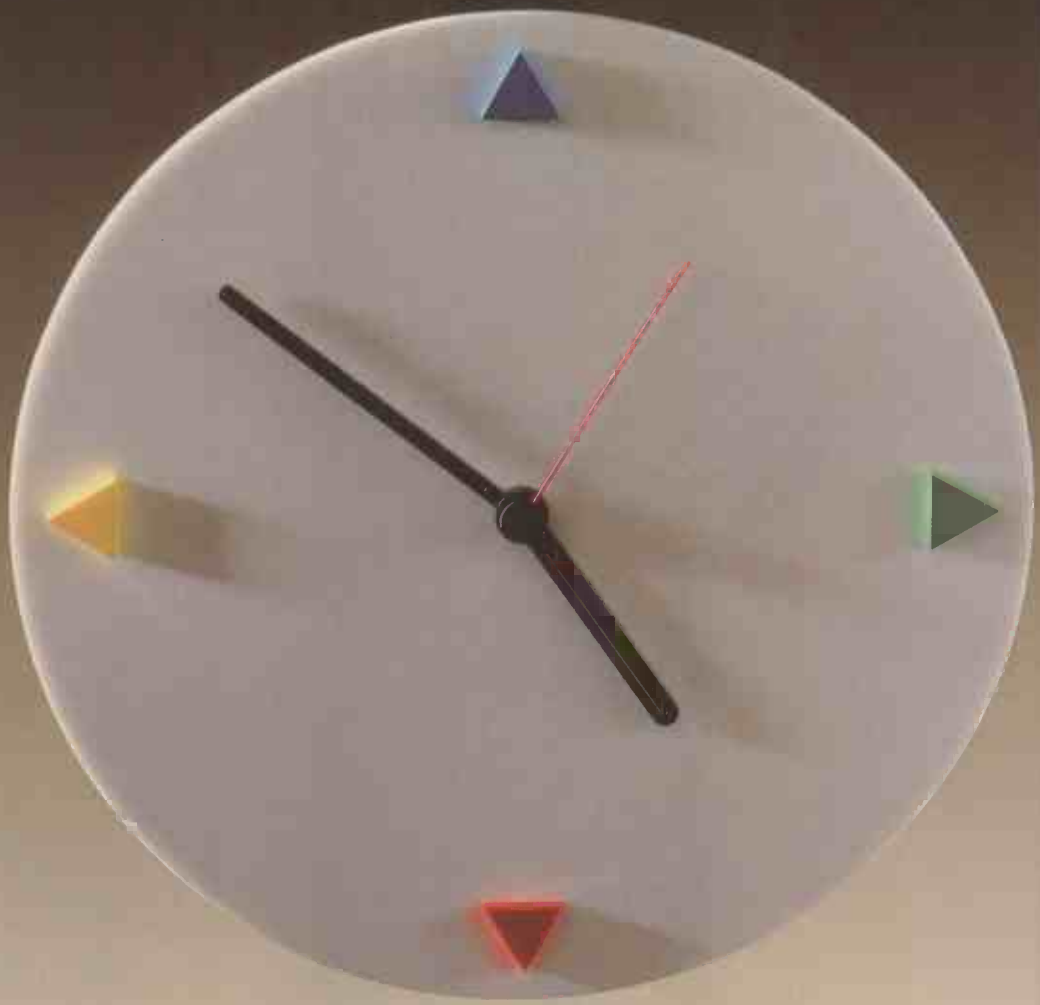

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TONY BRANCH

THE HAZARDS OF VDUs

Can it really be healthy to sit hunched in front of a computer for most of your working day? **Carol Hammond** assesses the evidence and looks at the issues still to be addressed.

Earlier this year the *Wall Street Journal* reported research findings which suggested that VDUs could cause congenital malformations. Researchers at the Karolinska Institute in Stockholm had exposed pregnant mice to magnetic pulses similar to those generated by VDUs, and these mice subsequently produced foetuses that were malformed.

Shortly afterwards the Swedish Board of Occupational Safety said there was "pretty strong evidence that there was no risk". But just a week later further press reports appeared saying that the Swedish state purchasing agency was responding to the Karolinska findings and would in future require all VDUs to emit less electromagnetic radiation, and to eliminate electrostatic fields associated with VDUs. At the same time Ericsson Information Systems was saying that the press got much more excited about these matters than anyone else, and that Ericsson's business in Sweden had not been adversely affected by these reports.

This incident is typical of the cycle of allegation and denial associated with reports of potential dangers from new technology. Yet lack of clear evidence of harmful effects on humans does not allay VDU users' fears. People hear conflicting reports, and are left bemused as allegations and denials fly back and forth. There are now around 2,000,000 VDUs in the U.K. and consequently a lot of worried people using them. And as more people come to use VDUs, there are fewer non-VDU users left. Time is running out for comparative research.

The design of the workplace where a VDU is used and the nature of the equipment itself are both directly associated with the most reported problems that arise from working with VDUs: video blues, or eyestrain and related visual problems. Such problems include loss of visual acuity, burning, watering and itchy eyes, double vision, change in colour perception, tiredness and irritability, headaches and migraine, and cataracts. *Health and Safety at Work* magazine found 70 percent of workers using terminals reported eyestrain.

The term "eye strain" is commonly used to describe any kind of visual discomfort. In fact, eye strain is muscular fatigue of the ciliary muscle in the eye. Staring at a VDU for long periods can overwork this muscle. In 1984, IBM itself said in its report, *Human Factors of Workstations and Visual Displays*

(continued on next page)

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that VDU use "can result in a temporary reduction of visual ability. For example, a person who focuses on a near object for a long time may require several seconds or even minutes to regain good distance vision. These effects can appear after only two hours of VDU work and may sometimes persist into the evening and following morning."

The Health and Safety Executive and various unions have issued advice on how to eliminate and reduce the problems which can arise. Useful suggestions include ensuring that the lighting and VDUs are positioned to avoid glare, and that walls, floors, equipment and desks have matt surfaces where possible. The size of the characters on the screen should be such that they are clearly legible, and the colours displayed should have similar levels of brightness. The flicker effect of characters should be minimised by operating VDUs at a refresh rate of at least 50Hz.

ACHES AND PAINS

It is a sensible precaution to provide eye tests for staff before they start work on a VDU for the first time, and to retest regularly thereafter. Quite apart from any damage caused by VDUs, the extra concentration and focusing effort required when working with a VDU means that existing but previously unnoticed visual defects become apparent. It is also advisable to rest the eyes by taking a five- to 10-minute break from VDU work every hour.

Eye strain and other visual problems are not the only ill that may afflict VDU users. There are also reports of aches and pains resulting from muscle fatigue and stress. VDU operators may work in isolation for several hours without interruption. Physical movements are restricted as attention is directed exclusively towards the screen and the keyboard. Restricted postures result in long-term static contraction of the muscles. This reduces the blood flow in the muscles and causes local fatigue. The direct symptoms are tiredness, pain and cramps. These postural problems can be made worse by bad design in the workplace: say, where the keyboard is too low.

An additional problem experienced by some VDU operators is injury to the muscles and tendons. Repetitive strain injury (RSI), as these problems are called, may affect the hands, wrists, shoulders and neck. Symptoms include numbness, pain, swelling, wasting of the muscles and the loss of sensation in hands and fingers.

Admittedly RSI is not new among industrial workers: over 2,000 people get DHSS compensation for disability from tenosynovitis. In the past it has been prevalent in jobs which force workers to make repeated movements of the shoulder, arm or wrist. What is new is the spread of RSI to white-collar workers. Among VDU operators it is caused by continuous keying.

A study by the National Communications Union found that many users had chairs with fixed back rests and insufficient room to stretch their legs. The report also noted that professional workers, who used VDUs infrequently, had far better accommodation than those who work a full day doing repetitive duties.

A major cause of RSI highlighted by the study is the high productivity demands placed on the workers in question. Those experiencing the highest levels of muscular and RSI problems were those expected to work to a higher productivity level. Proficiency rates for workers in some of the units examined ranged from 10,000 to 12,000 keystrokes per hour.

Since the late 1970s there have been reports of pregnancy and reproductive problems among VDU workers. As well as a high incidence of miscarriages there have been reports of stillbirths and birth defects including club feet, cleft palate, misplaced hip bone, webbed hands and feet, and abnormalities in a number of other organs.

There have been 11 reports of groups of women VDU workers in the U.S. and Canada who have experienced a higher than average level of pregnancy and reproductive problems. These instances have been studied by Dr J Purdham of the University of Toronto Occupational Health Unit. He concludes that although the clusters of adverse pregnancy could be explained by chance alone, and that is a possible explanation, it is not necessarily the right one. Well-designed epidemiological studies with adequate statistical power are required to determine whether there is a genuine association between work on VDUs and adverse pregnancy outcome.

"If there is a radiation hazard responsible for birth defects then VDUs are also damaging for men."

In the U.K. two recent industrial tribunals have supported the fears of those concerned about pregnancy and VDUs. In September 1984 a pregnant library worker won a case against unfair dismissal when she refused to work with a VDU and her employer refused to transfer her to non-VDU work. The tribunal ruled that her fears over the possible health hazards of VDUs were "by no means ill-founded". As it turned out her child was born with ancephaly, a neural tube defect. The cause of the defect remains unknown, of course, but she has refused to work with VDUs again.

In the second case, in March of this year, a firm of solicitors was ordered to reinstate a secretary who was dismissed after she asked for rest periods from working at VDUs. She had suffered two miscarriages at a time when she had been operating VDUs for up to seven hours at a stretch. She feared that radiation from the screen could affect her chance of becoming pregnant again.

There is no firm evidence to prove there is a link between VDUs and adverse pregnancy outcome, but in the light of these rulings employers would be well advised to allow pregnant women to transfer to non-VDU work. There is always the chance that should it ever be proved that there is a link, employers could be in for some hefty law suits.

However, the consequences of this could be catastrophic on the work force should employers become reluctant to employ women of child-bearing age. Just as there is no evidence to show if VDUs have a harmful effect, so there is none to suggest when the most harm would be done during pregnancy.

Neither can the problem be solved by replacing female operators by men. If there is a radiation hazard responsible for miscarriages and birth defects, then VDUs are potentially damaging for men too. A study sponsored by the journalists' trade union in the U.S., the Newspaper Guild, found proportionately more birth defects among the children of male VDU users than of women VDU users.

Research in this area is thin on the ground and, again, there is no conclusive evidence to suggest that a connection exists between VDUs and male reproductive problems such as low sperm count and defective sperm. However, it has been shown that because the male reproductive organs are external, men

RADIATION FROM VDUs

VDUs work by projecting an image on to the screen by a cathode ray tube (CRT). In the CRT a high voltage is applied to a heated negative electrode to produce a stream of electrons, which are focused electrostatically and electromagnetically to form a narrow beam.

In the raster technique used by most VDUs, the electron beam scans repeatedly across the surface of the tube. Images are created on the screen through selective horizontal and vertical movements of the beam. VDUs emit ionising radiation in the form of ultraviolet and soft X-rays, and non-ionising radiation in the form of infrared, radio frequencies and extra low frequencies.

Although the CRT used in a VDU is identical to that of a television set, the effects of watching television are different to those of working with a VDU. First, VDU users tend to look at the screen for much longer periods than TV viewers. Also the images presented on television are varied, which a VDU screen is made up of lines of text or figures and requires sustained concentration. Further, a typical VDU operator sits approximately 18 inches from the screen for prolonged periods — much closer than most TV viewers.

are more sensitive to radio-frequency exposure than women. Could lead pants soon become the chic VDU protective garment, rather than the lead aprons now marketed for pregnant women?

Professor Gary Cooper of Manchester University has suggested that miscarriages could be caused by the stress of working on a VDU. This is a reasonable hypothesis, given that VDU work can be highly stressful. General muscle fatigue is one cause of stress.

Some workers may experience stress as their work becomes repetitive and boring and they are enslaved to their machines. Some worry about their level of attainment and job security as they are monitored for their speeds, error rate and time away from the machine.

In some cases a change in someone's job to VDU work may alter the job content in such a way as to cause them to worry about their job prospects — systems programmers work just as long as data-entry operators but rarely report health problems. And worry about the health risks of VDU work itself may be a cause of stress.

The Health and Safety Executive in its booklet *Working with VDUs* opines that localised high incidences of health problems are due to statistical chance, and that anxiety itself can cause problems for pregnant women. It cites the National Radiological Protection Board (NRPB) as a responsible body that does "not consider that the emissions from a VDU will put either you or your unborn children at risk . . . even if you work full-time at a VDU during your pregnancy you will receive radiation which in effect is no higher than the natural background level."

What the Health and Safety Executive omits to say is that natural background radiation, while unavoidable, may itself be hazardous. It is also on the increase. Human activities such as uranium mining and nuclear weapons testing have all contributed to it. Any radioactive material released into the environment is classified as part of the background radiation after one year.

BACKGROUND RADIATION

The Health and Safety Executive also points out that the level of ionising radiation, such as X-rays, produced by VDUs is much lower than the natural background level, but this too may be little comfort. Dr Rosalie Bertell, who has done extensive research into the connection between radiation and cancer, asserts that there is no safe level of exposure to ionising radiation. All that can be done is to set a permissible level where health is played off against the benefits of people being in employment, the availability of electric power, military protection and so on.

As more evidence has emerged about the effects of radiation on human health, standards have been modified over the years. In 1925 the international standard of occupational exposure to radiation was 52 rems per year; now it is 5 rems per year. Assurances that emissions from VDUs fall within current acceptable standards do not mean much if current standards are themselves unsafe. Research carried out by the British Medical Association in conjunction with the U.K. Atomic Energy Authority indicates that current acceptable levels of exposure in Western countries are too high. For example, the permissible exposure to radio-frequency energy in the U.K. and North America is 100 times higher than that considered safe in the Soviet Union.

One of the reasons no firm evidence has yet arisen could be because the wrong questions are being asked. For example, congenital defects could result from defective sperm in the father which in turn could be the result of exposure to VDUs. Studies of women workers alone would not pick this up. Questions have also been raised regarding the possible cumulative effects of radiation, and the combined effect of radiation with other substances, such as drugs taken by the operator or other chemicals they are exposed to. The NRPB itself confesses to the difficulty of knowing what kind of research to conduct. The Principal Scientific Officer of the NRPB, Frank Harlen, said in March 1985: "We don't know what we are looking for."

"There may be a lack of firm evidence because the wrong questions are being asked."

While it is known how to reduce some of the hazards of VDUs, manufacturers and employees may put them into operation in a rather piecemeal way. A recent survey by the Institute of Manpower Studies at the University of Sussex discovered that firms tended to follow Health and Safety Executive and British Standard Guidelines concerning the colour of the display, size of letters, flicker rates, etc. In a few cases regular eye tests were carried out at the expense of the company.

However, the attitude towards ergonomics was less promising. Despite the fact that a large amount of time was spent by both management and unions discussing office design the survey found that little was done in practice in most cases because of the cost involved. In general, managements were reluctant to be committed to rest periods of a specific length. In some instances such stipulations were felt unnecessary because the equipment was not in constant use. In others presumably management felt it would reduce output to an unacceptable degree.

In his book *Terminal Shock: The Health Hazards of Video Display Terminals* Bob de Matteo, research officer for the Ontario Public Service Employees Union, points out that in a report for IBM, Dr Arthur Guy recommends that VDUs be shielded to prevent exposure from potentially harmful radiation emissions. Matteo says that this recommendation was conveniently omitted from IBM's official summary of Dr Guy's report when it was released to the public.

Dr Guy concludes in his report by saying "The localised electrical fields at the surface of an unshielded cover of a VDT nearest the fly-back transformer can reach extremely high values as a result of the associated voltage and close proximity of the transformer to the cover. Since these fields have a capability of inducing much greater currents in an exposed user of the device than the relatively low magnetic field emissions, it is certainly desirable to shield the cover of the VDT. Since such shielding is relatively inexpensive the benefit to cost ratio is large."

A spokesperson for IBM denied that the company had tried to suppress any information in the report. IBM takes the position that the report was originally intended for internal use only, and that Dr Guy's summary letter was "not a recommendation *per se*." The fly-back transformer can be shielded for £10 to £30. If done at the manufacturing stage it costs much less.

And so the game of statements and denials continues. The condescending attitude of government, industry and many employers towards VDU operators is exemplified by the head of a department of VDU operators at large London bank. She told me she was doubtful about giving her staff the Health and Safety Executive's booklet in case it prompted workers to start complaining. Perhaps if the manufacturers and official bodies would admit that there may be a risk, workers would be less suspicious; many may even decide that the benefits of new technology and employment outweigh any possible dangers. PC

VDU BOOKS

No Immediate Danger by Rosalie Bertell. Published by The Women's Press, £5.95. ISBN 0 7043 3934 X

Your Job in the Eighties — a Women's Guide to New Technology by Ursula Huws. Published by Pluto Press, £2.50. ISBN 0 86104 3650

Health Hazards of VDTs edited by B G Pearce. Published by John Wiley, £16.50. ISBN 0 4719 0065 6

Terminal Shock by Bob de Matteo. Published by NC Press, Toronto, £5.95. ISBN 0 920053 33 5

The Small Screen with Big Problems. Published by the National Communications Union, £2. ISBN 0 951117 0 2

TUC Guidelines on VDUs. Published by the TUC, £1. ISBN 1 85006 084 3

VDUs, Health and Jobs. Published by the Labour Research Department, £1.10. ISBN 0 900 508 82 5

Working with VDUs. Published by the Health and Safety Executive. ISBN 0 11 883685 4

Technology Agreements in Practice: the experience so far. Published by the Institute of Manpower Studies, University of Sussex, £7.50. ISBN 1 85184 009 5

The RISKS OF BUYING CHEAP

The asking price of IBM clones from the Far East makes them almost irresistible. **Glyn Moody** explains what to look out for to avoid getting stung.

Everybody loves a bargain, but there is always the risk that you will get what you pay for. This is the dilemma currently facing anyone who contemplates buying an IBM clone. The rewards are great: instead of paying over £2,000 for a full-price IBM PC you can pick up the same kit for well under £1,000 from a host of clone makers. Unfortunately, the risks are also great: apart from the problems of reliability and maintenance if or when the kit goes down, for the corporate buyer there are questions of propriety and even legality.

TWO CLASSES OF CLONE

A distinction should be made between two quite separate classes of clone makers. One is represented by Compaq, the first company to climb aboard the IBM PC bandwagon. The Compaq portable and its successors are premium products, designed as added-value competitors to IBM's offerings. Many other established micro manufacturers have followed the Compaq route and produce IBMulators sometimes with added features, and often cheaper. Lately we have seen this approach taken to its logical conclusion with well-known names like Tandy, Epson and Tandon producing high-quality clones for very low prices.

Against this background there has sprung up a plethora of new clone makers. Typically they will have been set up specifically to produce and market their clone and will have little or no previous experience in the industry. They will be small operations, often with limited funding. Their products are sourced mostly from Taiwan.

The massive growth in both the U.K.-based clone makers and the Taiwanese component manufacturers is due to the particular nature of the IBM PC. First, by definition, this de facto standard is fixed; it is not subject to endless upgrades and refinements which would thwart the conservative and essentially parasitic clone makers. Secondly, when IBM produced the PC design — reputedly in a great rush — it opted for a highly modular approach using standard components, which had the advantage of being easy to build and source. Given the unparalleled demand for the machine, this was probably wise.

But such an approach has proved to be a two-edged sword. Just as it helped IBM knock out over a million machines, so it has enabled practically anyone to put together their own IBMulator.

All you need to do is buy a motherboard, a couple of disc drives, a keyboard and a monitor, together with a couple of boards for graphics and ports, and you have a PC. In Taiwan there are over 100 manufacturers of PC motherboards alone. The majority of these are family businesses, stuffing components on to the boards in their homes.

Needless to say, the prices for these and other PC products are rock-bottom. Unhampered by Western concerns for paying royalties or competitive wages, costs are cut to the minimum. U.K. entrepreneurs have not been slow to exploit this resource. As the table shows, there is now a wide range of British clone makers. Most of them draw on Taiwanese products, though the assembly is usually carried out in the U.K.

WHERE TO GO

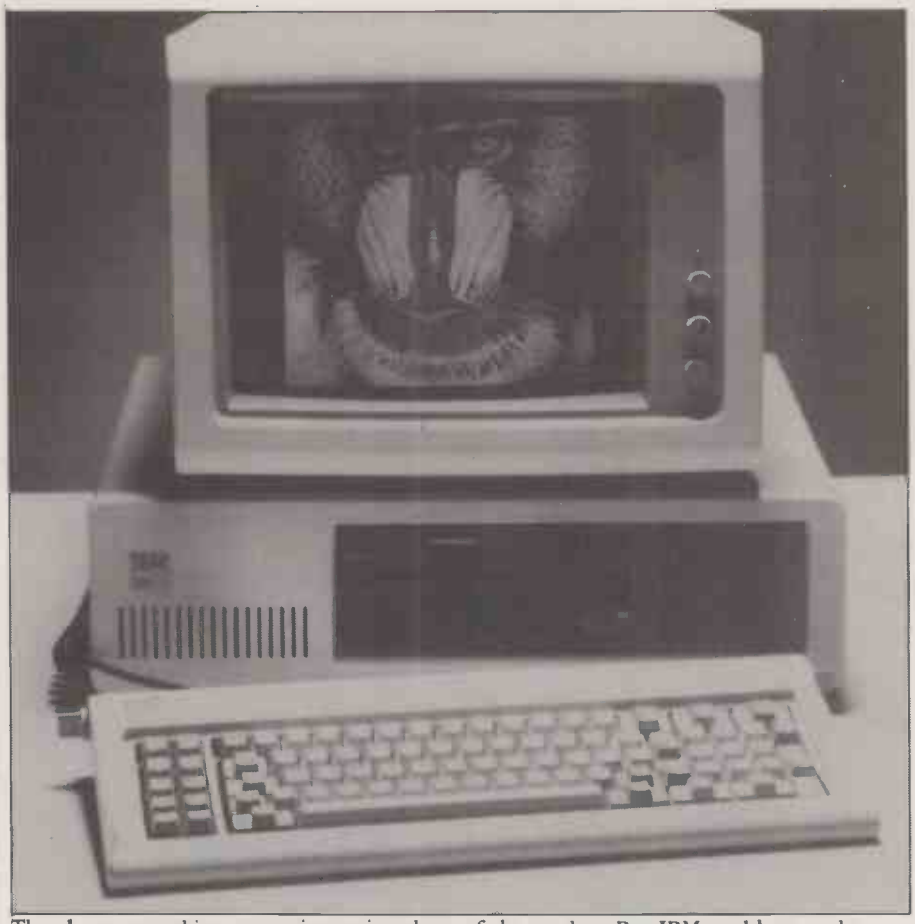
There are a number of possible routes for the budding cloner. You can go to Taiwan and visit the component manufacturers yourself — obviously advisable, but not always possible. You can go to big shows like the Hanover Fair, at which 120 motherboard manufacturers were represented last year. You can contact manufacturers by writing: one U.K. clone maker sent 57 telexes before choosing its suppliers. Then there are personal contacts, together with numerous trade magazines advertising Far Eastern sources.

Many U.K. importers find that they have to change their suppliers after a while. This is not so much a problem of quality, as to do with the lead times involved. By their very nature, clone makers are susceptible to cash-flow problems. They need to sell machines to pay for the next batch of components. If components arrive late, their bank balance may quickly turn unhealthy.

But there is a more serious problem with components than arriving late. The problem is to do with their legality, and the component most affected is the BIOS ROM. This chip contains the heart of the IBM PC, but it is impossible to reproduce it exactly without infringing IBM's copyright. Instead, various manufacturers have dev-

MANUFACTURER/MODEL	PRICE
B & W Technology BWT XT	£950
Bristol Micro Traders PC-20	£695
Centaur Centaur PC	£720
Comcen DIY XT	£750
Computopro Compro 88	£995
Control Alt Deli Boss	£700
HAT Peacock	[1]£800
Icarus Alternative PC	£1,350
Interam PC+ Turbo	[1]£780
IMC PC Dynamic	£720
Logical Progression ICT	£599
PCC IV-VIII	[3]£995
Qubie BT XT	£975
Walters International Walters PC	£715

[1] 640K RAM standard [2] estimated figure



The clones are taking up an increasing share of the market. But IBM could yet make a monkey out of the clone makers by coming down hard on copyright infringements.

eloped a BIOS which mimics the IBM version closely enough for most practical purposes. Only the most seriously misbehaved program — that is one which makes direct calls to the IBM BIOS addresses — will fail to work.

Hitherto these alternative ROMs have been made by U.S. companies, and are fairly pricey for a cheap clone. The best-known of them is probably that from Phoenix. Recognising this problem for its clone manufacturers, the Taiwan government commissioned its Electronics Research Standards Organisation to produce a BIOS which would not infringe copyright and could be sold relatively cheaply. Many clones now use this ERSO BIOS.

Nonetheless there are still many clone products which use pirated versions of the IBM ROM, or pirated versions of Microsoft's DOS. IBM and Microsoft are increasingly coming down on such infringements, particularly as the clones start clocking up significant market shares.

For example, IBM recently had words with two British clone makers, PC Compatibles, and Walters. Walters has now announced that it has signed an agreement with IBM, as a result of which changes have been made to the casing and BIOS of its clone. These are likely to be the first of many such discussions for clone makers. IBM has issued a statement that sounds mild enough: "IBM welcomes fair competition, but where it is clear that our copyright has been infringed we must take the action necessary." In practice it means that if you go over the borderline you will have a $50 billion company come down on you like a ton of bricks.

RULES TO FOLLOW

As far as the user is concerned, there are some basic rules that should be applied if you are looking at clones. Above all, do not part with money until the machine exists and is in your grasp. Find out as much as you can about the company and its product. In particular, get a categorical statement that the ROM is legal. The table below is intended to provide a rough guide on these matters for most of the current clone makers. However, you should always ask questions on the spot.

If you are paying half the official price for a machine, do not expect much hand holding. Clones are probably best bought as second or 22nd machines in a company which already has IBMulators. They are particularly useful as backup machines or auxiliaries.

Although the players in the clone game will change almost on a monthly basis, the clone concept is becoming an accepted fact of micro life. IBM and Microsoft may blast a few pirates out of the water from time to time, but if you shop around the survivors will offer some exceptional PC bargains. PC

PC COMPATIBLES AND MANUFACTURERS

	LAUNCHED	NUMBER SOLD	COMPONENT SOURCING	ROM	COMPANY FORMED	NUMBER OF EMPLOYEES	TURNOVER LAST YEAR (£1,000s)	TELEPHONE
	Oct 1985	150	Taiwan, Japan, U.K.		Apr 1985	6	100	(0753) 49029
	Feb 1985	10	Taiwan, U.K.	[4]Phoenix	Aug 1985	4	130	(0272) 279499
	Oct 1985	20	Taiwan, Japan	Datanet	Oct 1985	6	[2]100	(0222) 390714
	Oct 1985	400-500	Taiwan	Xor	1977	15	1,250	(0792) 796000
	Nov 1985	500	Japan, Singapore		1983	24	[2]3,600	01-439 1819
	Sep 1985	1,500	Taiwan	Remos	Sep 1985	5	[2]1,000	(0908) 662759
	Dec 1985	150	Taiwan, Far East		1979	5	300	(0963) 24551
	Jul 1985	200	Far East		1979	15	1,200	01-267 6732
	May 1985	40	Taiwan, India	ERSO	Jul 1977	6	1,100	01-879 1888
	Nov 1985	180-200	Taiwan	ERSO	1976	350[5]	[5]16,000	01-368 9658
	Jan 1986	6	Taiwan	Sundox	June 1985	5	[2]200	(0344) 779026
	Dec 1985	700	Taiwan, U.S., Japan	Mega BIOS	Dec 1985	20	[2]7,000	01-979 7921
	Jan 1986	200	U.S., Taiwan	ERSO	1956 (U.S.) 1983 (U.K.)	150[5]	[5]10,000	01-871 2855
	Jan 1985	300-400	Taiwan	Phoenix	1981	40	3,500	(0494) 32751

[3] 512K RAM and 20Mbyte hard disc standard [4] optional alternative [5] company based in Taiwan; figures refer to company worldwide

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DOS TO DOS

The key to the current generation of PC software is Microsoft's MS-DOS. **Steve Malone** examines its origins and looks at the directions in which it is now developing.

Since its adoption as the operating system for the IBM PC, MS-DOS has undergone a number of metamorphoses. What began as a CP/M-style operating system of dubious reliability has developed into a mature product which Microsoft expects to become a key element of the next generation of computers.

To many people Microsoft was a curious choice for IBM as the supplier of the PC's operating system. The company's reputation had been built on languages, in particular the industry-standard Basic. Operating systems had, until that time, been considered the preserve of Digital Research whose CP/M-80 operating system had come to dominate the eight-bit business market.

The product that IBM licensed from Microsoft was originally written for a company called Seattle Computer Products by Tim Patterson, an ex-employee of Digital Research. The system was therefore dubbed SCP-DOS, although its nickname QDOS — short for Quick and Dirty Operating System — was perhaps a more accurate description of its capabilities. Microsoft bought SCP-DOS and began work on turning Patterson's code into a more serviceable product.

The renamed MS-DOS version 1.0 was essentially a rewrite of CP/M for the Intel 16-bit 8086 family of processors. Some of the commands had been tidied up to make the product a little more user friendly, but that was about all. Everything else, down the A> prompt for the default drive, was derived from CP/M.

After licensing the operating system, IBM made one or two changes to it which have been cursed by clone manufacturers ever since. IBM took a jump table which addressed part of the Input/Output, moved it down two pages in memory from 600 hex to 400 hex and incorporated it in ROM as part of the BIOS, and thus subject to IBM copyright. Anyone wishing to make an IBM clone has since had to find some way round this idiosyncrasy.

Subsequent developments of MS-DOS have been driven by two factors. Either the hardware altered, requiring the expansion of the operating system to take account of the new features, or Microsoft itself has added extra features to improve functionality. The introduction of version 2.0 was a response to both these factors.

NEED TO DEVELOP

It became clear soon after the launch of the IBM PC that MS-DOS would have to develop away from its CP/M origins. The original PC was equipped with just 64K of memory — the same as the maximum addressable under CP/M-80. But the power of business micros was beginning to expand rapidly and the price of memory was starting to fall. Amounts of memory that were previously only available on minicomputers were becoming a practical proposition for micros.

It was generally agreed that Unix was among the best professional operating systems on the market, and it just so happened that Microsoft had its own version of the system in Xenix. It therefore came as little surprise when the updated version of MS-DOS contained Unix-type features.

The major innovation introduced with MS-DOS 2.0 was the concept of hierarchial directories. This allowed for much simpler file management than was previously possible. Other features were also added to support this hierarchial file management. Paths, redirections and pipelines were all borrowed from Unix and incorporated into the revamped version 2.0. Some time later, DOS 2.1 was introduced — originally just to support the PC jr home computer. This version quickly became the standard for stand-alone micros.

The launch of the PC/AT brought a further stage in the development of MS-DOS. Built around the 80286 processor, the computer was IBM's first fully 16-bit computer, and with it the company ushered in the prospect of multi-user facilities. The new version of MS-DOS therefore incorporated file- and record-level locking so that users sharing the computer could ensure that their files remained secure from interference by others on the system.

The move toward multi-user systems was just one aspect of a trend which was becoming pronounced in the business community. The fall in the price of components was not being matched by the rise in computer power. As businesses began to provide more and more of their employees wtih micros, the need to share resources was becoming urgent. The solution was to connect everyone within a local area network so that resources could be shared. This led to the emergence of version 3.1 Essentially 3.1 was identical to 3.0 except that it could support the MS-Net local area network software.

This year shows every sign of being a watershed in the evolution of MS-DOS. Changes in the industry and clamour from the increasingly large user base have meant that Microsoft has been presented with several demands for enhancements. To begin with, it is obvious that the days of the 5.25in. floppy disc are numbered, especially now that the major U.S. companies have agreed, at least in principle, to standardise around the 3.5in. disc. IBM has recently made its long anticipated move in this direction with the launch of the lap-top Convertible, the first mainstream IBM machine to have the 3.5in. drives. To aid the swift and widespread adoption of the new disc format, IBM is providing 3.5in. drives as an option for its current range and has introduced an external 3.5in. drive for machines fitted with 5.25in. drives.

IBM COMPATIBILITY

To cater for the new format Microsoft has introduced DOS 3.2. The new version is intended solely to accommodate the new drives, and the IBM version of the new format conforms exactly to the Microsoft standard. This means that machines such as those from Apricot, Data General and Research Machines which use the 3.5in. standard are now able to read IBM data discs directly, and if provided with a suitable BIOS may be able to achieve a degree of IBM compatibility.

Some companies have already taken steps towards greater compatibility with IBM. Apricot has introduced so-called soft cloning programs on the Xen that translate IBM call addresses into those of the host computer. The result is that IBM software will run on an otherwise incompatible micro.

In introducing the new DOS, Microsoft has taken the opportunity to add two more commands to the growing list. XCopy is a superset of the standard Copy command and is written in the format:

XCOPY d:\d:\/s/e

The command copies all files in the current directory, but unlike the earlier Copy command it will also copy the files in lower directories if required. This facility is signalled to DOS by the S and E switches. S tells the DOS to copy any sub-directories, and E causes them to be copied even if they are empty.

The second new command, Replace, also allows automatic access to lower directories. You use it where you have the same file in a number of directories, since all of them can be updated by the use of a single command from the root directory of the form

REPLACE filename d:\/s/d

As with XCopy, with S switch refers to the lower sub-directories. The D switch means that only versions of the file prior to the current date will be updated.

Microsoft has changed its policy regarding OEMs, and will now supply them with a version of the operating system that includes additional utilities such as Diskcopy. They have previously been available only on the

Chairman and founder of Microsoft, Bill Gates. Inset: Because of its ability to multi-task, many have opted for Windows.

IBM Supplemental Programs disc, and this has been a sore point with OEMs and their customers for some time as they either had to write their own programs or do without.

Microsoft is also able to provide the device drivers for manufacturers of clones. Previously Microsoft supplied the operating system, leaving manufacturers to go elsewhere for the driver software. The reason for this is mainly historical. When Microsoft began selling MS-DOS licences there was no such thing as a clone. Each machine was different, and so manufacturers had to tailor the drivers to the architecture of their own machine. But now that the majority of MS-DOS licences are for IBM clones, Microsoft has decided to provide IBM-compatible drivers with the software.

This is the position at present, but it also looks as if Microsoft may release a new version of DOS in the near future. One of the straws in the wind is the curious case of the Apricot DOS 4. The story begins with the launch of the Xen at the end of last year. At the launch, Apricot promised that the machine would be capable of true multi-tasking. It is no secret that Microsoft has been working on a multi-tasking version of DOS for some years. It has also been widely forecast that the multi-tasking DOS was expected this year under the name MS-DOS 4.0. Thus, when rumours started circulating that Apricot was to release a multi-tasking MS-DOS for the Xen this spring, everyone jumped to the conclusion that this was DOS 4.0.

However, both Microsoft and Apricot deny that this is DOS 4.0 and instead prefer to refer to it as multi-tasking DOS. The situation is unlikely to be clarified yet. Apricot hopes to begin shipping multi-tasking DOS at the end of May, when an announcement is expected from Microsoft. Among the features supported by the Apricot DOS is multiple printer support, allowing more than one printer to be run on a network simultaneously. Also, multi-tasking DOS will permit all users of the system to have access to a single modem connected to the file server.

So if the Xen DOS is not DOS 4.0, when will it arrive? The answer from Microsoft seems to be: not yet. Several reasons are given for the delay, but most answers seem to lead back to Microsoft Windows. Microsoft is pushing Windows hard, and claims to have sold something like 3,000 individual packages in the U.K. since its launch in the middle of December.

MULTI-TASKING WINDOWS

Part of the attraction of Windows, apart from providing a friendly front end to MS-DOS, is that it offers a degree of multi-tasking. Users can switch between programs, and run one program in the foreground while other applications run concurrently in the background. This kind of ability is what many people regard as multi-tasking; they will buy Windows to provide multi-tasking rather than wait around for DOS 4.

Microsoft itself seems in no hurry to introduce a new version and the company is thought to have changed the original specification considerably since it was first mooted. Microsoft has said that it plans to develop a different approach to that which it has previously used for multi-tasking.

Most multi-tasking systems work in one of two ways. The first is time sharing, where each of the applications is allocated a set amount of time. Alternatively the program performs a set amount of work, like accessing a disc drive, before telling the operating system it is OK to move on to another application. Microsoft, on the other hand, is developing a real-time processing system that will allow applications to access the operating-system kernel simultaneously. So, for example, it will be possible to have hard-disc and floppy-disc access happening at the same time.

The increasing size and complexity of some business packages — in particular spreadsheets — has meant that PC-DOS urgently needs to be freed from its 640K straitjacket. Add-on memory cards like Rampage and Above Board go some way towards solving this problem, but OEMs and users are demanding a software solution. Rumours abound that a new version of DOS under development will have a maximum addressable memory space of 16Mbyte.

Another hardware problem that Microsoft is grappling with is the dual-mode 80286 processor. At present the 80286 can be configured to run either in 8086 mode or in 286 protected mode. The vast majority of users have machines that operate in the 8086 mode, so very little software is being written which makes full use of the power of the PC/AT. Microsoft is now addressing the problem, and the next full version of MS-DOS should be able to run the 80286 in 8086 and protected mode.

Looking further into the future is harder, as much depends on what IBM intends to do. At the moment it seems fairly certain that the next generation of PCs will run the 80386, which runs in 8086 and 286 modes as a matter of course. What is definite is that Microsoft will be supplying the operating system. What price MS-DOS 5.0? PC

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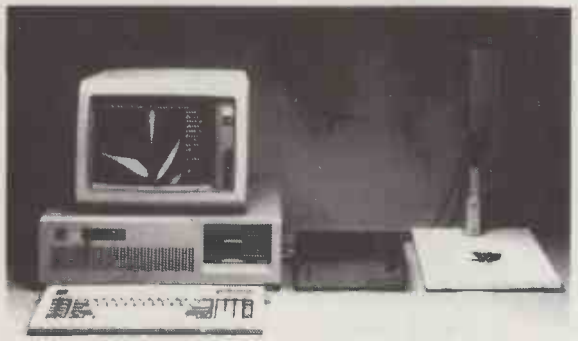

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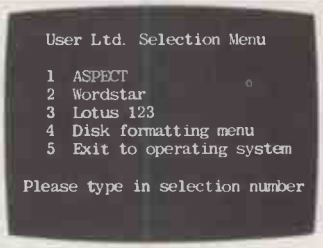

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INTERVIEW

IAN McNAUGHT-DAVIS

Managing Director of Comshare

INTERVIEWED BY CAROL HAMMOND

Ian McNaught-Davis is Managing Director and Group Vice-President of Comshare. After graduating from Manchester University with a degree in mathematics he joined BP as a geophysicist, and in 1961 he became data-processing manager for BP. He went on to become sales and marketing director of De la Rue, which was taken over by U.S.-owned General Electric soon after. McNaught-Davis fulfilled his ambition to run his own company in 1970 when along with five others he set up Comshare's U.K. operation. He is probably best known for his role as presenter of the BBC TV programme *Micro Live*.

What significant micro trends do you see over the next five years?
WE'RE going to see a lot more micros with much, much more power. Already we can see the AT beginning to lack power. We're going to see computers much easier to use, much more powerful micros, and of course linked into large-scale machines.

Of course, everybody will have a word processor and these will get more and more powerful. We're going to see many more portable computers. People are going to want to take home exactly the same machine as they have in their office. There's a tremendous market for someone who produces a cheap compatible machine for the IBM AT which you have in your office.

So you think that IBM is going to continue to dominate the markeplace.
NO. I think they have set a standard. But they set a standard with open architecture and there isn't such a thing as a standard PC or an AT because you can plug in all sorts of boards. So it's not necessarily true that one PC is exactly the same as another. There will be a lot of plug compatibles. I think IBM already are getting hurt at the PC level by the plug compatibles which will come out very, very cheaply.

The price of that machine needs to come down — and it will happen — and that will open up a whole new marketplace. It will become very clear what machine to have because what the industry wants is standardisation. In the general business sense, you just want something that is cheap and works well and does the job for you.

How do you see the British micro industry fitting into this sort of perspective?
AMSTRAD have done extremely well because Sugar is smart. He knows how to market and he knows exactly how to get his machines made very cheaply. I would imagine that he's going to produce a fully configured IBM PC compatible for under £1,000.

Apricot have tried that, but it's not truly compatible. Now with IBM adopting the 3.5 inch disc, that may pay back Apricot who took the lead in 3.5 inch discs. I would think Apricot has a future. They're a very clever company.

How do you see the British software industry shaping up in the future?
THERE is a lot of guff talked about the British software industry. One, they haven't produced a major operating system for any micro; the operating systems are all written in the States. There's no compiler that's ever got off the ground and done very well. What is it that they have done in a generic sense that has broken through into the micro area?

I can't think of any real example of a piece of British software which has been accepted worldwide on a micro and sold in vast quantities. In very specialised markets they've made an impact but there's no major British spreadsheet, database-management system, major graphics package or telecomms package that's sold very well. None of them have achieved a standard.

Do you see that happening in the future?
NO, because I don't think they've got the marketing clout anyway, and they're up against very major United States competition. Some of the U.S. companies will actually use British programmers to code their stuff for them. In specialised markets people will write very smart software. It's not that Britons can't write good software, but marketing is very hard.

Do you think the British software industry is going to be swallowed up then?
NO, I think the British in general set their targets too low; they're quite happy to make a few hundred thousand pounds and then call it a day. They're not interested in multi-million businesses. Therefore they're quite happy being in a very small, specialised area where they make reasonable returns.

They don't necessarily want to take the risks of marketing worldwide. By worldwide I mean marketing in the U.S.: that's where the big software market is and it's ferociously competitive. And if you don't get into the U.S. with a product you're going to be always selling it in a very small way.

Could the government be doing more for the software industry?
OF COURSE there is the Alvey Report which recommended that the government should invest in certain sections of the industry. But you've got to go through all this palaver to get any money out of them, and many people don't know how to do it. The tendency has been to put the money into already existing companies, so new companies would have great difficulty in getting into that business.

I've never been too favourably inclined towards the government putting money into things. Who is going to judge what it is they're putting the money in? How do you convince them? And if you've got a very smart idea you don't necessarily want to brew it around too much into that sort of environment. I would feel very uncomfortable that maybe it would leak back to somebody elsewhere. PC

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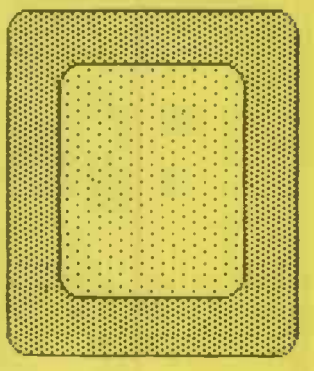

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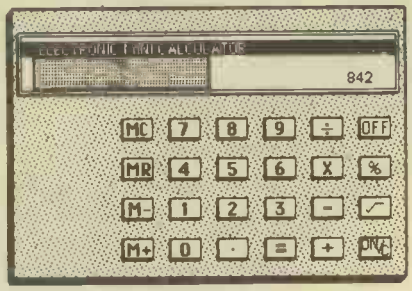

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TOP 10

More and more manufacturers are competing in the cheaper end of the business micro market. **David Barlow** introduces our selection of 10 good-value systems.

Over the past year the small business sector of the microcomputer market has been transformed. Prices have tumbled and quality improved to such an extent that there now seems little excuse for any business looking towards improved profitability not using a micro in some capacity.

This month's Top 10 covers equipment with prices ranging from £499 to £1,499 for a complete ready-to-run system which in many cases includes software. It also covers a wide spectrum of technical sophistication ranging from eight-bit equipment, epitomised by the Kaypro 2X, to state-of-the-art machines like the Atari 1040STF. All the systems offer good value, and they are either bundled with suitable software or the necessary applications packages are widely available at a reasonable price. A further criterion for inclusion is that they should be reasonably easy to set up and use.

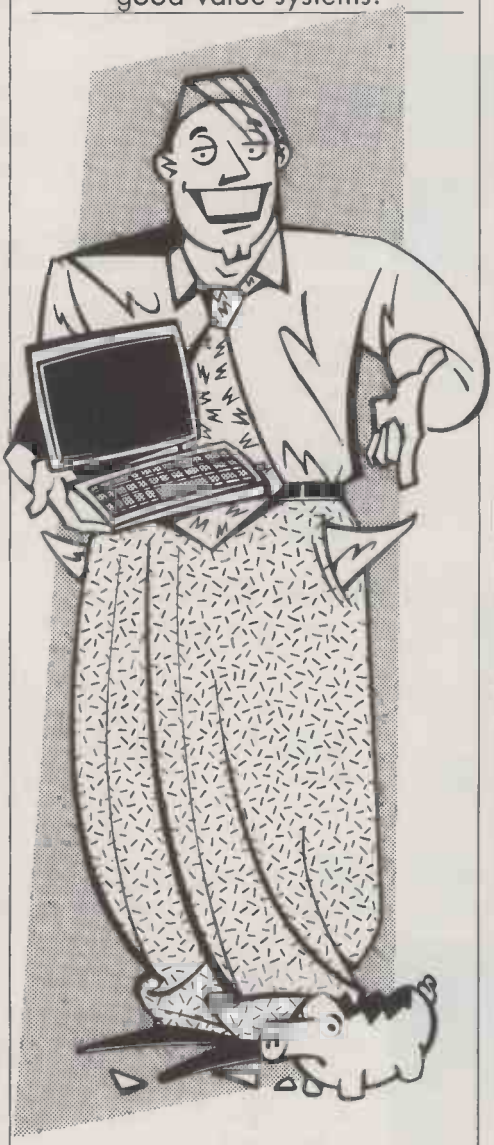
It is not hard to spot the reason for the transformation of the market. The £500 to £1,200 sector has been subject to a two-pronged attack. First manufacturers more normally associated with home computers have moved upmarket in the hope of finding fatter profits. Although Atari and Amstrad look set to succeed in this area, other manufacturers, such as Commodore, seem to be struggling to make any impact.

The one problem they all face is shedding the home-computer image. This kind of stigma is unlikely to disappear overnight, so Amstrad and Atari have used different ploys to win over the more serious user. Amstrad is offering a complete business system at a home-computer price, whereas Atari is selling what could be described as third-generation equipment into a market dominated by first-and second-generation machines.

IBM CLONES

The second prong of the attack has come from the more respectable IBM PC sector of the market. In the last year there has been a flood of very cheap IBM compatibles imported from the Far East by U.K. distributors, as reported in a separate article on page 76 of this issue. Although none of these are included in our Top 10 they have forced other manufacturers to rethink their pricing policies. So the Top 10 includes competitively priced PC compatibles from Epson and Tandy, and a near-compatible MS-DOS micro from Sanyo. Of course there are cheaper compatibles available. Personal Computer Compatible, for example, is offering the dual-speed PCC IV-VIII 512K machine with 20Mbyte hard disc, graphics board and monitor for £995.

We include some old timers, too. The Apple and the Kaypro earn their position because they are cheap and come bundled with useful software. They also have a massive library of software for users to fall back on. In fact the Kaypro is a machine based on CP/M, an elderly operating system given a much needed shot in the arm by Amstrad's fast-selling machines. As ever, the Acorn contribution remains very much the oddball machine, resolutely refusing to conform to any industry standard. But its software base and the flexibility of the hardware, especially in the new Master Series, make the BBC machines an interesting but relatively expensive choice for business users.



MIKE GORNALL

No matter which computer you opt for, there are basic rules that should be applied if the machine is destined for business use. The first concerns data storage. You should budget for at least one or preferably two floppy discs on any business system. Machines that make extensive use of ROM for program storage like the BBC Master Series or the Atari may function adequately on one drive, but they are the exception rather than the rule.

GRAPHICS COMPATIBILITY

RAM may also be limited by the hardware you select. IBM compatibles nowadays have 256K as standard, but you may want more. Also make sure the machine is fitted with a recognised graphics board which is either IBM or Hercules compatible.

Two of the machines in this survey include printers in the asking price, and this should be taken into account when comparing value for money by allowing around £250 for a comparable unit. Unless stated otherwise, the prices shown are for a dual-floppy system with adequate memory and a monitor.

The best advice is probably to decide how much you wish to spend, allowing for essential peripherals, and then consider which machine has the software which best suits your intended application. Finally, before parting with any cash, arrange to see demonstrations of all the machines on your short list. PC

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AMSTRAD PCW-8512 £499

The PCW-8256 has taken the small business market by storm, which is hardly surprising. It is a ready-to-use package including a Z-80 based 256K CP/M-compatible computer with disc drive, keyboard, monitor, dot-matrix printer and competent word-processing software for only £399. The recently announced PCW-8512 is probably a better bet for business as it includes a second 720K disc drive to supplement the measly 180K unit found on its smaller sibling. Unfortunately, Amstrad insists on using the less common 3in. disc format for its drives. The bundled word-processing software is good and software houses are currently falling over themselves to produce new titles for the PCW range.

FOR Sensational value. Good software availability.

AGAINST Very flimsy by professional standards. Non-standard disc format.

APPLE IIe and IIc £865

Despite their fall from prominence, Apple's old-timers still have a lot to offer. The software base for the IIc and IIe is enormous, though a little dated when compared to state-of-the-art IBM packages. There is also a tremendous range of hardware enhancements to choose from. Although Apple has switched its marketing effort to the Macintosh there are some good deals on the compact and versatile IIc. The cheapest of these includes an Apple IIc with 128K RAM and an integral disc drive, and additional external disc drive, mouse, monitor, stand and the Appleworks integrated software, all for £865. If portability is important the same package with an additional LCD flat screen costs £1,213.

FOR Large software base. Special offers are good value.

AGAINST Outdated technology. Little new software appearing.

APRICOT FAMILY £1,499

Although Apricot has officially withdrawn from the cheap end of the home/business market it is offering an interesting deal based on the F-2 and F-10 micros. The former includes the F-2 with green-screen monitor, Gem software and a dot-matrix printer for £1,499. Despite being eclipsed by the current obsession with IBM clones, the Apricot F-2 is a very competent micro offering significantly better performance and graphics capabilities. The F-2 boasts two 720K 3.5in. floppy discs and 512K RAM. The easy-to-use Gem Desk Top operating environment is included along with Gem Write for word processing and Gem Paint for free-form sketching. The F-10 has a 10Mbyte Winchester in place of one of the floppies. It costs £1,999.

FOR Complete package. Fast. Well equipped.

AGAINST Not IBM compatible.

ATARI 1040STF £799

One look at the specification of the 1040STF or the 520STM and you realise just how sophisticated these new Ataris are. A Motorola 68000 chip coupled to 1Mbyte of RAM and a 720K double-sided disc drive is impressive judged by any standards. The display system is also up with the best of the IBM clones, offering 640 by 400 pixels in monochrome or 640 by 200 pixels in four colours. The TOS operating system and the Gem Desk Top operating environment are stored in ROM, which speeds up operation enormously and leaves the floppy disc free for applications and data. Independent software which does justice to such an advanced machine is still thin on the ground, but the current software list from Atari includes 110 business-orientated packages.

FOR Very powerful. Superb value.

AGAINST Home-computer background. Software not yet abundant.

BBC MASTER SERIES from £434

The BBC Master Series answers most of the criticisms levelled at the BBC model B. A variety of processor configurations, including the Intel 80186 and the National Semiconductor 32016, ensure that first-rate performance is available for all application environments. Improvements have been made to the keyboard by adding a separate numeric keypad and moving the Break key a safe distance away from the function keys. The basic Master 128 is supplied with 128K RAM plus the wealth of ports and interfaces that has made the model B legendary. It is supplied with 128K of ROM-based software, including the View word processor, Viewsheet spreadsheet, Basic 4 and various utilities. The major snag is the price, which does not include a monitor or disc drives.

FOR Software and peripherals base. Upwards compatibility. Flexibility.

AGAINST Price. Not in the mainstream of business computing.

EPSON PC — £989

Epson's first fully IBM-compatible micro is compact, attractive and well put together. It is available in three versions: single floppy, dual floppy and hard disc. The basic spec of all models includes 256K RAM, serial port, parallel port and colour graphics board, but no monitor. The keyboard is an excellent unit with a layout akin to that of the IBM PC/AT. Performance is no more than adequate, and expansion facilities are limited to two slots on the dual-floppy machine. Compatibility is excellent thanks to the Intel 80C88 processor and the standard graphics board. Epson's new graphics-based front end, Taxi, is available as an optional extra. This has advantages over DR Gem and MS Windows but does not include applications modules.

FOR Looks. Packaging. IBM compatibility.

AGAINST Indifferent performance. Limited expansion.

FERRANTI PC-860 — £1,250

Originally based on the Advance 86B, the PC-860 is a more attractive proposition with a smaller footprint and less severe appearance. It is supplied as standard with 256K memory, dual 360K floppies, a graphics board, and serial and parallel ports; 10Mbyte and 20Mbyte hard-disc versions are also available. What sets the machine apart from most PC compatibles is the use of the full 16-bit 8086 processor, which runs at the same speed as the IBM's 8088 but provides better performance. Expansion facilities are also improved with both eight-bit and 16-bit slots vacant for user cards. The PC-860 is bundled with the Perfect II suite of software, which includes word-processing, spreadsheet and database modules. The price includes an on-site warranty but no monitor.

FOR Fast. Bundled software. On-site warranty.

AGAINST Price.

KAYPRO 2X — £1,177

Based on the eight-bit Z-80 processor, the transportable 2X is supplied as standard with 64K RAM, dual 392K 5.25in. floppies, two serial ports, a Centronics-compatible parallel port and a 9in. green-screen monitor. Graphics capabilities are included in addition to the usual 80-line by 25-character display. The keyboard features 18 user-programmable keys. The 2X weighs 29lb. Although based on outdated technology, the 2X wins its place here by virtue of its bundled software, which includes WordStar, Calcstar and the useful dBase II. The Kaypro 10 has a 10Mbyte Winchester in place of one of the floppies, but at £2,300 it is no bargain.

FOR Bundled software. Transportable format.

AGAINST Outdated technology. Kaypro does not have U.K. operation.

SANYO 555-2 — £999

Sanyo's 550 series has been around for two years and has proved a consistent seller thanks to its highly competitive pricing. Although its specification seems to follow closely that of the IBM, it is not IBM compatible. However, there is an optional graphics board that enables it to run some IBM packages. Recent price reductions make the range even better value. The 555-1 now includes 256K RAM, twin 160K floppies, serial port, parallel port plus the complete Micropro suite of WordStar, Datastar, Calcstar, etc., for just £799. The 555-2 is identical to the 555-1 except that it includes twin 360K discs and costs £200 more. Neither price includes a monitor; the cheapest unit from Sanyo is a 13in. green screen costing £110.

FOR Bundled software. Value for money.

AGAINST Not IBM compatible. Low-capacity drives on series 1.

TANDY 1000 — from £695

Tandy's budget PC compatible is in many ways a similar proposition to the Epson PC. It uses an almost identical processor configuration and, as with the Epson, its smaller than average footprint results in limited expansion potential. The Tandy has an additional problem in that it will not take full-length IBM cards. Fortunately, a colour-graphics display driver is included as are serial and parallel ports. Compatibility is good but restricted by the use of a keyboard that does not use the traditional IBM PC or PC/AT layout. Performance is mediocre but the machine is backed by a company with a long tradition in micros and is supported by excellent documentation. The 1000 package also includes Deskmate, a simple, easy-to-use integrated package.

FOR Packaging. Deskmate software.

AGAINST Indifferent performance. Limited expansion.

IMPORTANT NOTICE

TO ALL PROSPECTIVE USERS OF LOCAL AREA NETWORKS

Following increasing use of the CLEARWAY range of Local Area Networking equipment the manufacturers, RTD Ltd. of Farnborough, Hampshire, have issued the following warning to anyone contemplating installing a LAN.

SOME LANs CAN SERIOUSLY DAMAGE YOUR HEALTH!

Reports have shown that some people have paid many thousands of pounds to instal a network system only to find out they could have done it at a fraction of the cost!

Some have even bought relatively untried products from new companies with only a few installations and then found the unreliability sickening?

Other companies have suffered the trauma of fighting their way through the jungle of networking without any assistance or planning service offered by the manufacturer!

The remedy for all these problems is CLEARWAY. Launched in 1981 as the very first vendor-independent LAN, CLEARWAY now has well over 15,000 installations throughout the UK and Europe. In fact CLEARWAY is already being used by a large number of well known organisations such as the Stock Exchange, British Telecom, National Westminster Bank, Courage Brewery and many more.

The flexibility afforded by Clearway's innovative approach to networking is clearly demonstrated by interlinking a host of widely regarded diverse and incompatible computers and data communications devices in one Clearway ring. Information can be automatically passed between users and all peripherals such as printers, plotters, modems etc. can be shared by everyone on the ring. All this is made possible as Clearway only relies upon the commonly used RS232 interface, straightforward co-axial cable and an extremely efficient ring transmission medium.

"Clearway has been designed to provide a universal approach to low-cost, local area networking with the emphasis always being on simple installation and ease of operation," explains Neil Irwin, RTD's Products Director. "We offer a total networking service from network planning and a three node starter pack — at £630 the most competitive on the market — through to multiple node solutions for large corporates requiring communications between numerous pieces of equipment including minis and mainframes.

The Clearway range has a selection of different node systems with facilities unique to Clearway. These include a new Liquid Crystal Display model providing status and diagnostics in plain English and a pushbutton keypad for instant selection of destination on the ring. There is also a 19" rack mounted version capable of housing ten nodes and power supply to fit neatly into a standard computer cabinet.

Requiring no special expertise, the installation of Clearway is simple, enabling for example a three node starter pack to be set up in around 15 minutes. Up to 99 Clearway nodes with different peripherals can be linked to the ring network with up to 800 metres between nodes.

All the electronics to drive the LAN are contained in each node and there is no need to install special cards or boards in the equipment connected to it. Neither is there any need for a central controller as used in star networks. Information is passed from one Clearway node to the next until it reaches its destination.

For further information on the Clearway networking range of products ring 0252 546213 or circle the enquiry number below.

→ circle 144 on enquiry card ←

LOCAL AREA NETWORKS SPECIAL

With micros becoming a normal part of working life the need for networks to share resources is becoming more pressing. **Glyn Moody** reviews the current confused state of networking, and pinpoints some trends for the future.

Time to Connect

The first wave of the microcomputer revolution was the introduction of micros themselves. This saw the move away from the departmental mainframes and minis towards a system of distributed computing power which gave everyone a truly personal computer. Local area networks are part of the second wave.

As the power of micros grew, and with it the range of applications they could tackle, so the isolation of these systems became a disadvantage. Micros became such an integral part of the way many professionals worked that they needed to be able to mirror another aspect of their working patterns, that of exchanging information among co-workers.

The obvious solution was to join them together, but such a simple idea has proved difficult to implement. As a result, LANs have failed to take off in the way everybody has been predicting for the last few years.

The U.K. currently leads Europe in the installation of networks. According to a recent survey by the International Data Corporation, of the 10,700 LAN nodes shipped in Europe in 1984, 6,900 were in the U.K. A node is simply a micro-to-LAN connection. By 1990 a total of 617,000 nodes are expected to have been installed, of which 138,000 will be in the U.K. The same survey also claims that the U.K. has the highest percentage of micros installed in networks: currently 9.1 percent, rising to 14 percent in 1990.

The large installed based of networked micros in the U.K. is probably due to two causes. First, the U.K. market has traditionally been more mature than its European counterparts and tended to follow U.S. developments with less of a time lag. Secondly, the widespread use of Acorn's BBC Micro, particularly in schools, has led to the proliferation of its proprietary LAN, Econet, which is rarely found abroad.

In 1984 Econet accounted for some 15 percent of all LAN nodes installed in the U.K. DEC's Ethernet also clocked up a similar penetration, followed by Nestar with seven percent. Across Europe, Nestar came first with 15 percent, followed by DMS with 14 percent and Corvus with eight percent.

This variation reflects the confusion which exists in the LAN market at present, a factor which further impedes widespread acceptance of the technology. In addition to the

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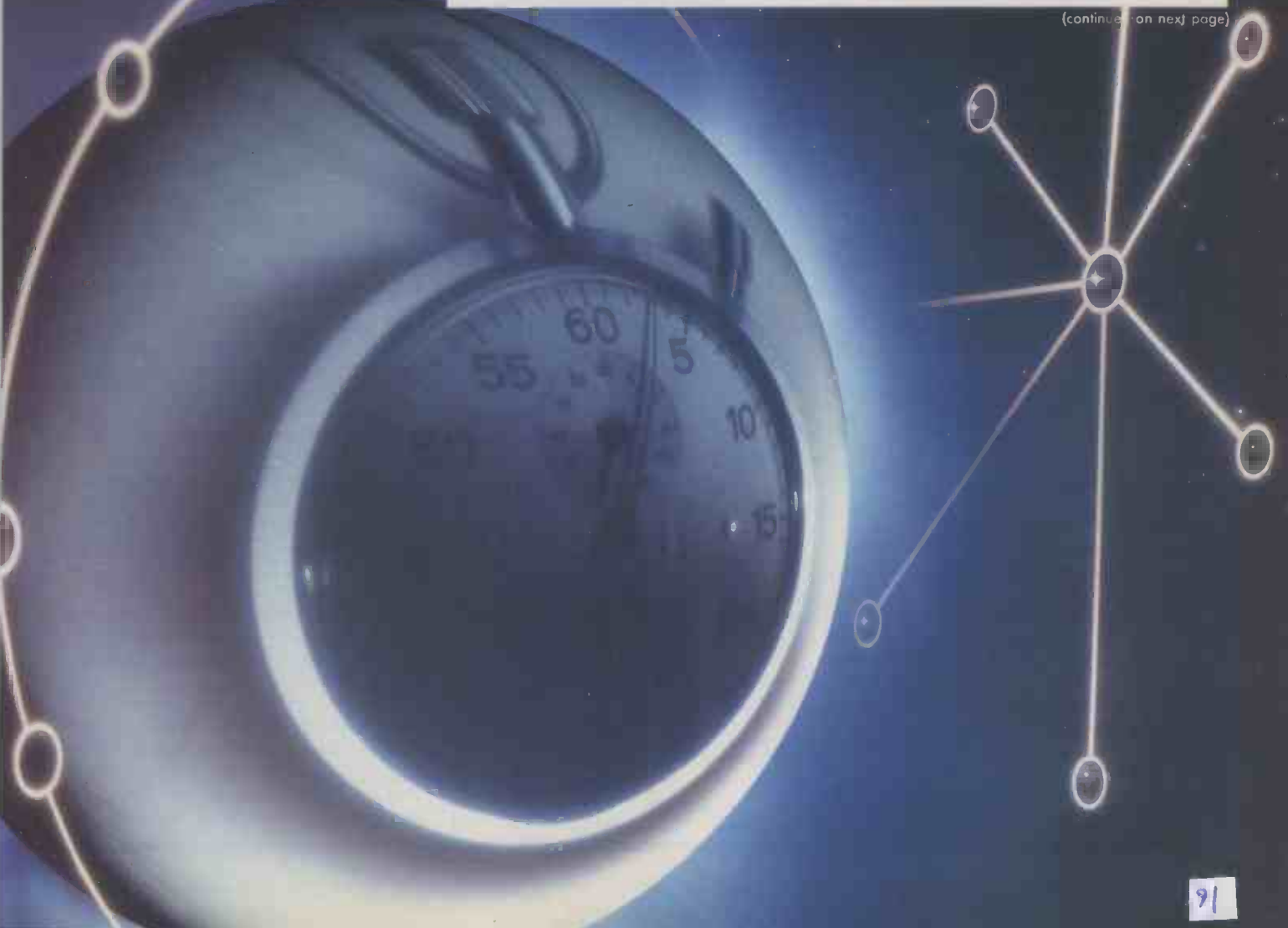

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seemingly infinite variety of solutions to the software side of networks — determining how data is bundled up and passed around — there is also a range of hardware systems which sit under the software.

There are three topologies, or ways of connecting micros together. In the ring topology all the PCs sit on a complete ring, around which data is passed. In a star network each micro is connected to a central node. The bus network works by stringing networked PCs along a wire like washing on a line.

Some of the blame for the confusion in the market can be laid at IBM's door. Inevitably, manufacturers and users are waiting to see which way IBM will jump before committing themselves to what will be a costly decision, and one which is difficult to reverse. The problem is that IBM has already jumped in two different directions, and people are concerned in case it goes for the hat trick.

CONFUSION REIGNS

IBM has justified its position by claiming that the bus-based PC Net is for cheap installations, while its more recent Token Ring system — which will not be available until the autumn — caters for larger setups. This is no doubt true, but viewed from a strategic perspective the chosen systems look something of a muddle. There is even a suggestion that IBM wants it this way. After all, if IBM brought out a full-specification network letting you hook up five or 10 IBM PC/ATs there would be little point forking out several hundred thousand pounds for one of IBM's minicomputer systems. Moreover, once you have bought such a network, there is no reason why you should buy IBM machines exclusively; cheap clones would be particularly attractive

Though the full panoply of LAN systems has yet to be implemented, some lower-level solutions are beginning to find favour. We look at two of them in detail in the following two articles. As Ian Stobie reports on page 98, networks are also bedevilled by compatibility problems. Once again, the definitive entry of IBM is likely to tidy things up considerably.

Another force working towards international harmonisation, at least in theory, is the International Standards Organisation. For some time it has been pushing the Open Systems Interconnection (OSI) standard, which lays down an agreed structure for network systems. Unfortunately, the terms of this standard are opaque, and networks which conform to them at some levels can still be completely incompatible.

Manufacturers of LANs, LAN software and software which runs on LANs may disagree on most things, but on two they do concur. First, they are convinced of the importance of local area networks in the development of micros and the corporate computing environment generally. Secondly, they agree that however much of a mess things may be at the moment, LANs are not going to go away.

MS-Net

Steve Malone tests Microsoft's widely used network operating system running on Research Machines' Nimbus Network.

Most pundits agree that 1986 is the year of the LAN. Anyone who attended the Which Computer Show in January could hardly fail to notice the profusion of local area networks exhibited.

The reason is that the price of processing power has fallen precipitously, and the dream of a micro on every desk is well on the way to becoming a reality. However, other machines, particularly those with mechanical parts such as printers, have not fallen in price nearly as dramatically. The obvious solution has therefore been to connect several microcomputers within a network and allow them to share expensive peripherals such as laser printers and Winchester discs.

One of the first companies which got into LANs was Research Machines (RM). This is not surprising, as the company specialises in systems destined for educational institutions, where there have long been large numbers of budget-conscious users wishing to access limited resources simultaneously. RM is now one of the leaders in the field.

MS-Net is capable of linking up to 64 work stations within a single LAN. The network uses the bus layout, which allows one machine to be removed from the network without bringing the entire system to a halt.

Controlling the system is the file server. This is a micro, usually with a hard disc fitted, which stores all the files required by the work stations. Normally the server will also have a printer connected to it which produces hard copy from the work stations.

At present RM offers two machines for use as file servers, the XN-16 and XN-40. Both have a single 3.5in. 720K floppy-disc drive and a hard disc — of 16Mbyte capacity in the case of the XN-16 and of 40Mbyte on the XN-40. It is also possible to use one of the PCN-2 twin-floppy Nimbuses as a file server, although it will be limited by its disc capacity.

Any micro within the Nimbus range can be used as a work station within the network. Although the PC-1 and PC-2 do not have the network interface card fitted as standard, extra cards can be bought separately. If you intend to buy machines which will be permanently fixed into the network it is probably worth getting the TN work station, which is a dedicated machine without disc drives but with the network interface fitted as standard.

The system used for this review was an XN-16 file server, a PC-1, a PC-2 and a TN work station. The original installation was performed with the help of RM's sales support team, and the system was up and running within 45 minutes. Assembling the network was surprisingly easy. At the rear of each Nimbus is a standard bayonet socket similar to those found at the back of most video recorders. A coaxial cable is attached to the socket via a three-way T-piece.

T-PIECE ADVANTAGE

The cable itself forms the bus, with the branches on each of the T-pieces connected to a work station. One of the advantages of the Nimbus system is that the T-pieces do not need to be attached to a machine to allow the network to function correctly. To install another machine on to the network you just connect the computer to an existing empty T-piece, or fit another coaxial cable.

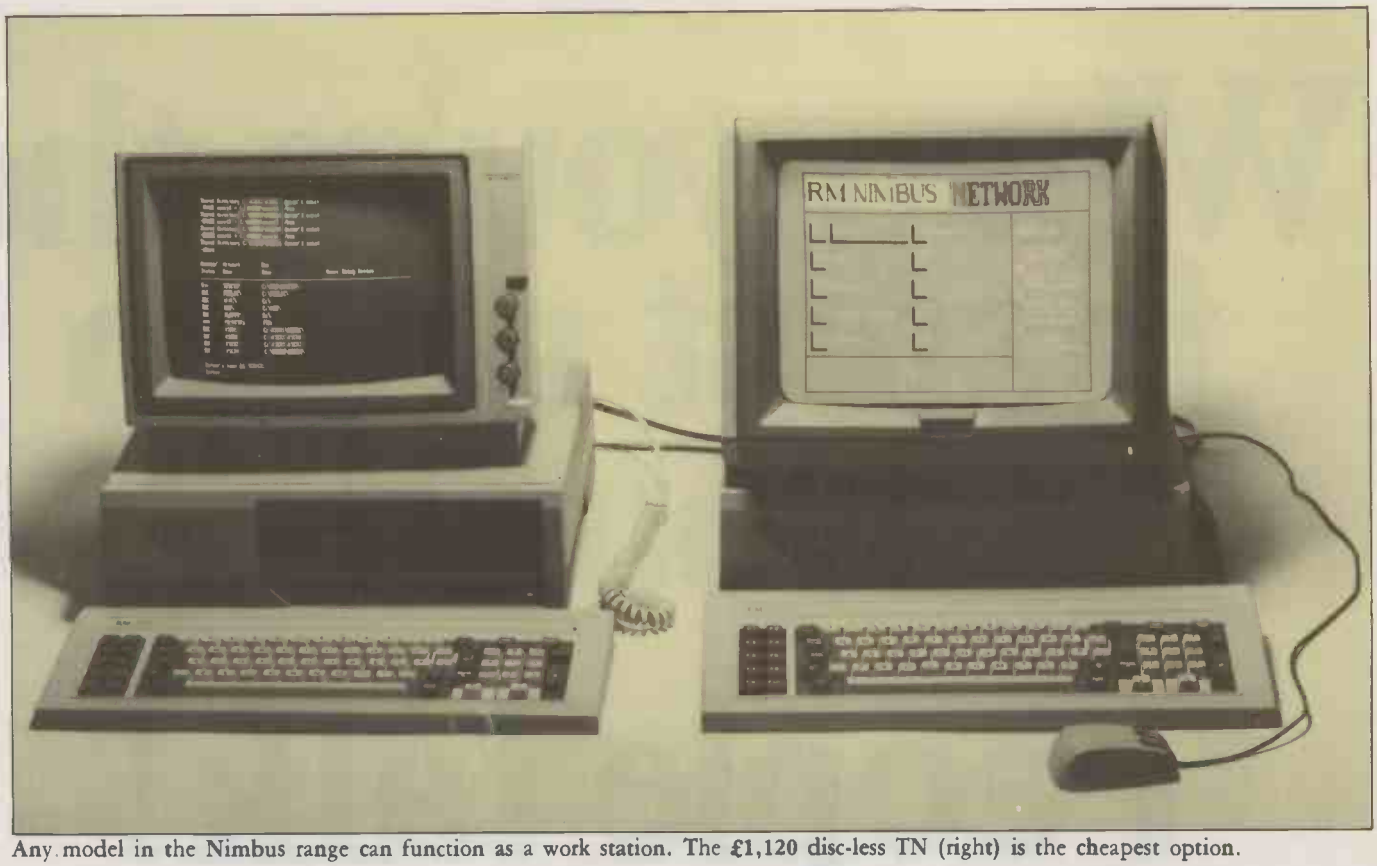
The Nimbus network uses 50Ω coaxial cable, which is available in two types. Standard cable allows a maximum length of 300 metres, but if your network is longer you can use a low-loss cable, which allows a total length of 1,200 metres.

To run the network software you first put the MS-DOS 3.1 systems disc into the file server's floppy-disc drive. This will load the operating system and run an Autoexec.Bat file, which will look on the hard disc for the MS-Net programs and execute them. The network is set up via the server directory, which in turn supplies each of the work stations with a local operating system. The server software also contains customised files which configure the network for each of the possible users, specifying which peripherals they are allowed to use and what priority of access to files they might have.

Simple T-pieces are used to make connections into the RM bus.

SPECIFICATION

Network speed: 0.8Mbit/second
Maximum number of nodes: 64
Maximum cable length: 1,200 metres
File servers available: 576K RAM with either 16Mbyte or 40Mbyte hard disc, 128Mbyte hard-disc version available summer 1986
Price: RM Nimbus network server SXN-16, 16Mbyte model £3,750, SXN-40, 40Mbyte version £5,250, RM Nimbus TN network station £1,122.50; 4m. cable £16.25, 10m. cable £18.75, including T-piece and connectors
Manufacturer: Research Machines Ltd, Mill Street, Oxford OX2 0BW. Telephone: (0865) 249866
Available: now



Any model in the Nimbus range can function as a work station. The £1,120 disc-less TN (right) is the cheapest option.

MS-DOS is often criticised for its unfriendly system of Unix-type directories and paths, but on a network system these features come into their own. The network is divided into a series of directories, beginning with the root directory of the hard disc, drive C. Below this there are four sub-directories.

Perhaps the most important of these directories is the manager, which contains a number of tools to control and manipulate the network. These include functions such as as adding new users and organising the directories and access. The manager also contains the Offers file which enables files and peripherals to be shared between a number of users.

The Users sub-directory, logical drive N, is the one that will be used most often as this is where most users will log on. Each person has their own directory, which can be sub-divided into further directories. However, although most users will only use this directory, they have access to the public directory, logical drive P, which contains the applications programs and MS-DOS commands.

Although all the applications programs are kept on drive P, because a series of paths connect drives N and P, it is possible to access all of the files held on the public directory directly from the user directories.

The final directory is dedicated to the server. From here you can monitor the activity of each of the work stations and control the operation of the printer. You can build in passwords at all levels of the user directories, but no passwords are required to enter the server directory, which is the most vital area of the network. So if you feel that some network users may be tempted to tamper with the system software, you should remove the boot disc as soon as the programs have loaded, otherwise you may find yourself locked out of the system.

One of the problems we encountered was an unfortunate tendency of the system to hang up. We eventually traced the problem to the actions of users at the work stations. If you are used to a stand-alone micro, the simplest way to quit an application and log back in to the system is simply to switch the machine off. But if you do this on a network work station any files which are open at the server are not closed. As there are only a limited number of files that can be open at any time, the system soon becomes clogged and hangs up. Users have to learn to log off from MS-DOS to close their files.

Installing or modifying the network is a different kettle of fish altogether from standard network monitoring, and should be left to someone who is experienced in using MS-DOS. Configuring the system is probably too complex for the beginner, and there are not many safeguards to protect you from your mistakes. To its credit, RM has recognised this and had hinted in the MS-Net manuals that a more user-friendly installation program may appear.

However, the horrors of MS-DOS should hold no fears for the average user. The work-station operating system has been designed to be entirely menu-driven, which enables you to move between applications and directories with the minimum of fuss. Providing you use the standard applications and keep within your own directories, there is little difference between using the software in a networked system or in stand-alone mode.

The only noticeable delays occur either in printing, where the documents are spooled while waiting to be printed, or else when several people try to access a document simultaneously. The delay is barely a few seconds when only two work stations are attempting to read the hard disc, but will increase if more calls are being made to the disc. In the unlikely event of all 64 stations attempting to read the disc drive at once, the delay could be significant.

The business software which came bundled with the review network included Word, Multiplan and Windows, all of which are produced by Microsoft, the publisher of MS-Net. We expected the applications to be tailored to run under MS-Net, but this did not seem to be the case. The software performed adequately on the network, but none of it had been customised to take full advantage of the opportunities the system offers. The programs were the stand-alone versions, tweaked where necessary to use the appropriate peripherals but with no special

MS-NET

PC VERDICT

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

☐A competitively priced system that offers reliability and high performance.

(continued on page 96)

When you're the fastest micro around-

People talk!

"Not only does this machine leave the AT for dead in terms of performance, it also undercuts it by up to a staggering £1600 without even taking into account bundled software. The XEN offers incredible value for money, particularly considering its speed. Its response to commands is almost instantaneous and loading software seems to take a fraction of the time taken by more mundane micros."

What Micro? - December 1985

"The Apricot XEN is a pleasure to use. It's fast and effective - showing off both the 80286 built-in processor and Windows software to their best advantage... This is the best machine the company has ever produced."

Which Computer? - January 1986

"As the benchmarks show, in terms of processing power and disk accessing, the XEN is a superb piece of engineering which can outrun most things on the market. For computationally intensive applications it looks to be a very good buy."

Practical Computing - January 1986

"It was the speed of the system which impressed me the most... you can forget just how much work the machine is really having to do."

PCW - January 1986

apricot *XEN*

There's a lot of talk about the new Apricot XEN. Experts, normally restrained in their praise, are becoming unusually enthusiastic.

Phrases like "in a league of its own" and "incredible value for money" are being used.

So why is Apricot XEN so special?

Because of its astonishing performance, for one thing. Apricot XEN has come out on top in every test so far. In an article measuring computer power, the Guardian decided that something called "processor → memory bandwidth" was the most accurate yardstick. Naturally, Apricot XEN achieved the highest score, even beating one of the leading minicomputer systems to the mark.

And when you look at XEN's storage capabilities, it's clear that they are just as impressive as its processing power.

XEN's disk drives have broken all the benchmark records too. So whether it's the XEN FD with twin 720K floppy drives, or the XEN HD with a 20 Megabyte hard disk, a XEN won't keep you waiting.

And if, as the gentlemen of the press say, the XEN floppy disks are faster than the IBM hard disk, just imagine what our hard disks can do.

But what has really caught the imagination of the computer industry is how little this powerful machine costs.

With multi-tasking Microsoft Windows as standard, a twin floppy disk XEN FD with 512K of RAM and a monitor can cost as little as £2494, while the XEN HD with a 720K floppy drive, 20 Megabyte hard disk and a full 1 Megabyte of RAM is an astonishing £3494.

When Apricot offers this kind of value, the competition will have to take a long look at their own prices – if they expect you even to glance at them.

Choosing even the basic XEN configuration can mark the beginning of a long and fruitful partnership.

The memory of an Apricot XEN can be expanded to 5 Megabytes. You can add a second 20 Megabyte hard disk. Soon, telephone and modem communications, and even an expansion box to make use of specialist IBM cards, will be available, as will a tape cartridge back-up system.*

And XEN's open architecture means it can run on Apricot Networks, and even run as a multi-user system under the Xenix operating system.

Expansion facilities like these will keep an Apricot XEN user sweet for a long time to come.

And so will the back-up. Only the top Apricot dealers and ComputerWorlds are allowed to sell XEN, so you will always have access to professional support.

To find out more fill in the coupon or call us on Freefone Apricot (via the operator) and we'll send you a free brochure.

Enough said?

The only alternative is to pay more for less

Please send me a free information pack on the Apricot XEN.
To Apricot UK Limited, FREEPOST
Halesowen, West Midlands, B63 1BR.

Name _____ PC 3

Position _____

Company _____

Address _____

_____ Tel _____

→ circle 127 on enquiry card ←

*Tape unit, Apricot XP IBM compatible expansion box and telephone available Spring 1986. All prices ex. VAT.

(continued from page 93)

facilities to allow multi-user file access beyond loading a file from a common directory.

Some of the patches which are used on the programs do some strange things. For example, if you spool a document to the printer from Word and want an immediate printout, you have to press Ctrl-Alt-Prt Scr. The document appears at the printer at once, but you also get the error message

Key Code Not Defined

accompanied by a loud beep. This is actually no error, as RM points out in its documentation, but it doesn't inspire a great deal of the confidence in the thoroughness of the implementation.

Of the business packages available for the Nimbus, the only one that had been fully customised for MS-Net was the Superfile database, which is provided under licence from Southdata. Of all the four common business applications, the database is the most in need of a multi-user capability on a network; Superfile meets the requirements, allowing a number of users to access and search through the same file without interfering with each other, although there is a reduction in speed when several people are logged on.

IMPROVE MAILING

Apart from a basic message system available to the network manager, the Nimbus network system has no general messaging, mailing and document-transfer facilities, though they are becoming increasingly important in integrated office networks. This is particularly the case in businesses where the network may be distributed throughout several rooms in a building. This type of work station to work station transfer has not been a priority for RM's educational customers, but if the company hopes to gain a foothold in the lucrative integrated office business it will have to think seriously about providing a worthwhile mailing system.

Where RM has always scored heavily is in the training and documentation it provides for users. For example, it provides a one-day training course at its headquarters in Oxford to give potential network managers a feel for the system. Like most RM manuals, those provided for the network contains nearly all the information that you are likely to need. I would have preferred the manuals to be a little more tutorial-based but then I did not attend the one-day course.

CONCLUSIONS

■The Nimbus network running under MS-Net is smooth and efficient, though the network server is not sufficiently protected against illicit access.

■MS-Net allows you to use the full power of MS-DOS 3. The hierarchial structure of the operating system is ideal for this kind of application.

■The multi-user capability of the network is hampered by the lack of suitable software. It provides an effective means of sharing resources, but it is not the kind of integrated office system demanded by business users.

Appletalk

Do networks really have to be complicated? **Ian Stobie** finds that Apple's LAN is as easy to use as the Mac.

At £50 per connection Appletalk is a very cheap network. It is also intended to be easy to set up and use. Not surprisingly, this means you have to accept some limitations.

Appletalk is Apple's own local area network for the Macintosh. It allows you to connect several Macintoshes together and share, say, an expensive laser printer or hard disc between them. With the appropriate software it also lets you swap documents directly between users.

As networks go, Appletalk is slow at 230Kbit per second. Also, you are limited in the number of devices you can connect together; theoretically you can connect 32, but in practice a dozen Macs would probably be pushing it. Apple itself does not yet offer a proper file server to go with the system, so little genuine multi-user software has been developed for it.

In comparison to most of the LANs for the IBM PC, and even the low-cost Nimbus network reviewed in the preceding article, Appletalk is a low-performance LAN — but maybe cheap, simple networks are exactly what users want.

Appletalk is designed to be easy to set up on a do-it-yourself basis. The £50 price per node gets you one Appletalk connector kit. You need one kit for each Mac or other network device, so to make a LAN consisting of three Macs and a Laserwriter printer, for example, you would need four kits at a total cost of £200.

Each kit contains a connection box, a two-metre length of cable and a small cable extender for joining cables together. If you need it, extra cable is available in 10-metre lengths costing £50. The connection box is about the size of a matchbox, with two sockets at one end and a short length of cable terminating in a nine-pin plug at the other. It looks very simple, and in fact it is little more than a three-way junction box. The network circuitry is already inside the Mac.

Most of the functions of Appletalk were designed into the Mac from outset. Every Mac ever built, from 128K Mac to 1Mbyte Mac Plus, is almost a network station already, which is why Appletalk is so cheap.

The Appletalk connection box plugs into the printer port at the back of the Mac. You can move any printer already present to the comms port. Both ports were built to run at 230Kbit per second which — by no co-incidence — is the speed of Appletalk.

You plug a connection box into each of the devices you want on the network, then join the connection boxes together with the cable supplied. Appletalk is a bus-structured network, which means it topologically forms a straight line rather than a loop.

We found that Appletalk was very simple to set up, and the process does not take long. It is also easy to add new devices to the network at a later date. The Appletalk manual explains everything you need to know in just 25 pages; it is well illustrated and up to the usual high standard of Apple documentation.

All of the Macs connected to the network are available for running applications; you do not lose one of them as a file server. Appletalk limits you to 32 devices, but in practice performance deteriorates as you put more devices on the network. Appletalk is really designed for the sort of office where a work group of perhaps four or five Macs is required — certainly under a dozen. With more complex types of LAN someone gets saddled with the task of being network manager, but Appletalk should be simple enough to let you get away without this unless you are doing something ambitious.

APPLETALK

PC VERDICT

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

☐ A simple, low-cost network for undemanding tasks. What it does do it does well, and it is very easy to use.

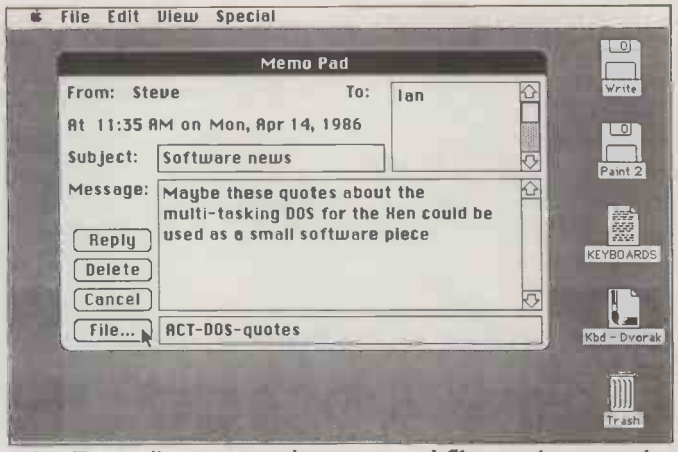
The most obvious thing to do with Appletalk is to share Apple's Laserwriter between all the users on the network. This £4,995 laser printer has a resolution of 90,000 dots per square inch, which is near typeset quality, and it supports a wide variety of proper typesetting founts. It is finding favour with users for personal-publishing applications as well as for high-quality correspondence work. Since such tasks tend to be co-operative they are ideal applications for a network.

The Laserwriter plugs directly into Appletalk via the standard connection box. It was designed with Appletalk in mind, so installing it on the network is straightforward. The Laserwriter manual explains the process; once again it is one of the best we have seen.

You do not lose a Macintosh as a print server because the printer is a network station in its own right. The Laserwriter contains as much computing power as a Mac, and has a full interpreter in ROM for the Postscript language.

Postscript is designed for describing type

Macserve lets network users share a hard disc; two private partitions and one shared are being used here.



Using Top Mail you can send messages and files to other network users.

founts and graphics. The Mac can send a type fount or page description to the Laserwriter more compactly as a Postscript program than as a bit image. Obviously all this is handled automatically by the system. All you have to do is put the Laserwriter driver on your start-up disc.

Printing is fastest if you use one of the default founts already built into the printer. The standard Laserwriter has four founts built-in, and you can add a further seven by fitting the optional Laserwriter Plus enhancement board. With these founts it is not necessary to download a fount description across the network, a process that can take several minutes. Using the built-in founts, we found it took just under one minute for the first page of a 3,000-word Macwrite document to emerge, and then 17 seconds for each of the subsequent pages.

A more serious problem for network users is that the Laserwriter does not spool, which means that while you are waiting for a document to finish printing you cannot use your Mac for anything else. Furthermore, if someone already has a printing job in progress when you try to print your document the system is not capable of queueing. You get a message such as "Macwrite is unable to print this document" on the screen. If two users both try to start printing at the same time they both get the message, so neither job goes through.

SPOOLING REQUIRED

Despite these limitations we judge sharing the Laserwriter across Appletalk a big success. But Apple must provide a simple way of spooling, since with several users on a network competition for the printer could cause a severe bottleneck.

Spooling may be a problem on a basic Appletalk system because there is nowhere obvious to store the documents while they are waiting to be printed. More expensive networks make you set aside at least one PC equipped with a hard disc as a file server, which can be used for this. A file server is also necessary if you want to run a true multi-user database or accounting software.

Apple does not yet offer a file server for the Mac, although it plans to introduce one later this year. Cadmus Computer Systems sells a full Unix-based file server in the U.S., and Corvus, Zilog and 3-Com offer simpler products in the U.K. An advantage of going this route is that some of these products allow you to mix Mac and IBM work stations on the same network.

But the cheapest way of sharing a disc between network users is Macserve, a software product from Infosphere. It costs £219 and has been selling well in the U.S. for some time; U.K. distribution has just been announced by P&P. Macserve is compatible with several different brands of Mac hard disc; we tried it with Apple's own HD-20 unit.

Macserve offers fewer facilities than a full-blown file server, and is best described as a disc server. A disc server lets you divide up a hard disc into partitions, and specify which users can use which partitions. You can have several users reading from the same partition, but only one is permitted to write to it. File servers are more sophisticated and can handle the clashes that occur when several users are allowed to write to the same part of the disc and the same files.

Macserve is fairly easy to install. You put the Macserve Manager program on to a Mac which has a hard disc attached. You use this program to divide up the disc into partitions of whatever size you require, and specify which users have access rights to which partition.

You then install a Macserve desk accessory on the start-up disc of each network user. You do not lose the use of the Mac attached to the hard disc, so this machine can be a network user too, running an ordinary application, while Macserve does its work in the background. The disc whirs occasionally when another Mac user accesses it but there is no obvious degradation in performance.

EXCLUSIVE ACCESS

Other network users get at the hard disc by clicking on the Macserve desk accessory which appears on the Apple menu. This lets them open the partitions they are permitted access to as either private volumes, which gives them exclusive write access, or as shared read-only volumes. The partitions appear on the desk top as volume icons which you can open and use in the same way as any other Mac disc.

Generally, we liked Macserve. Access times across the network to the hard disc were quicker than using a local floppy disc. We found it best to use shared read-only areas of the disc to hold application programs and private volumes for data files.

Unfortunately, Macserve cannot be used to spool print jobs for the Laserwriter. By way of compensation it allows you to share an Imagewriter matrix printer across the network and spool jobs to it. This is a neat trick, as normally the Imagewriter can only be used as a local printer for one work station, not as a network device at all.

There is virtually no true multi-user software for the Macintosh, a fact which reflects the lack of an established standard file server for the system. Omnis 3, a database from Blyth Software, will take care

(continued on next page)

Network circuitry is built into the Mac; you just need one £50 connector kit for each device.

SPECIFICATION

Description: bus-structure network designed for straightforward resource-sharing applications
Speed: 230Kbit per second
Maximum number of nodes: 32
Maximum cable length: 300 metres
Price: £50 per node for a connection box and two metres of cable; extra cabling costs £50 for a 10-metre cable length; for big networks there is a custom wiring kit with 100 metres of cable
U.K. supplier: Apple Computer (U.K.) Ltd, Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ. Telephone: (0442) 60244

MAC BENCHMARKS

	Hard disc via network	Internal floppy
Load Macwrite	26	29
Load 5K Macwrite document	9	16
Load 15K Macwrite document	10	33

We compared a 512K Mac accessing a remote hard-disc drive via Appletalk with another one running in stand-alone mode from its internal floppy drive. Using the hard disc was much quicker, which means that Appletalk transmits data fast enough to make sharing hard discs a sensible proposition. The precise performance you get depends on the brand of hard disc, the network software used and whether you are doing anything else on the network at the same time as accessing the disc. We used an Apple HD-20 hard disc and a beta-test version of Macserve, with the network otherwise unoccupied.

Mix and Match

Setting up a LAN opens up a whole new set of operational and compatibility problems. **Ian Stobie** prefaces our selection of appropriate software and network systems with a warning that all may not be plain sailing.

Setting out to buy software for a local area network is to enter a minefield of complexity. Things are still at the stage where people are willing to tell you that virtually any package will run — it is not until you have paid your money and started using it that you notice the problems. Worst of all, especially if you get into a dispute with your supplier, it may be quite correct to say the package runs; it all depends what you are trying to do with it.

Using a network just to share resources, spreading the cost of a hard disc and decent printer across several users, is a good deal simpler than getting several stations working together in an integrated way. It is not too difficult to get most packages installed on the network hard disc, and from there booting them up to individual stations. After the initial effort of installation you may find everything goes smoothly if you stick to simple resource sharing.

The problems come when several people want to work on the same data. Imagine a user starts working on a document or spreadsheet model, for instance. A second user comes along and innocently starts working on the same file. User 1 saves his or her changes and goes and has a cup of tea. User 2 then does the same, and in the process destroys the first person's work. Worst of all, no one has noticed the disaster.

FILE LOCKING

This scenario is quite plausible, and does not necessarily imply any fault in the software. It could happen with almost any unmodified package originally designed for single users. Take Lotus 1-2-3, for example, a single-user package of the highest repute. Once you have loaded a model into your individual station Lotus closes the file. It only reopens it when the time comes to save. There is nothing to stop someone else coming along and opening the same file with another copy of 1-2-3. The problem can be avoided if the package itself provides some way of locking the file while it is in use. So one thing to look out for when buying LAN software is file locking.

This approach is generally fine for applications like spreadsheets or word processors. But for many accounting and database applications it is too restrictive. While one user on the network is using a customer file

(continued on page 100)

(continued from previous page)

of the multi-user problems of file and record clashes when run on a suitable hard disc. The situation is unlikely to change until Apple launches its own file server. Apple will probably launch a multi-user accounting suite at the same time. But unless you are doing an application which requires simultaneous access by several people to the same body of data you do not need multi-user software. We were using single-user software on our system, and found it adequate for our needs.

You can tie single-user applications together more effectively with a network mail package. Mail on a network is about more than just sending simple memos to other users. You can attach completed documents to the memos and send them direct to other users' discs or even send programs across the network.

We had a look at Top Mail, a £250 network mail program developed by a Cambridge-based company, Top Express. The installation process works on similar lines to Macserve. You put a mail-server program on one Mac where it runs in the background, so once again you can still use the Mac for normal work. You then put mail desk accessories on to the start-up discs of all network users.

Top Mail was a real pleasure to use. We tried it with simple messages and used it to send Macwrite, Macpaint and other documents across the network, as well as programs. You can use Top Mail while running another application such as Macwrite. You click on the Top Mail desk accessory, which brings up a display of your in-tray with a list of the current messages by subject. You can also set up the system to alert you with a message when new mail arrives, whatever else you are doing.

You send mail by typing into a memo form. You can attach a file simply by typing in the file name, or you can look through all your discs till you find the file you want, which you then click on.

Until your recipient accepts the file it resides on one of the discs of the Mac being used as the mail server. The reader can rename the file and change discs, so receiving a file need not interfere with any application that happens to be running.

Top Mail does not do anything particularly complex, but what it does works well. Compared to a long-distance mail system like Telecom Gold the user interface is a triumph of simplicity. We also found it used few resources. As long as you are not sending massive documents which clutter up the disc space of the mail server, you do not need a hard-disc system to use it.

You can accomplish many of the functions of network mail just by handing people discs and talking to them. But network mail lets you send things to people when they are out, as messages stay on the mail server until the recipient logs on. If your Appletalk network spans any sort of distance this is a convenience that is well worth having.

There are several products on the market, or on the way, which enable you to link up an Appletalk network to the wider world. PC Macbridge from Tangent Technologies is an expansion card for the IBM PC which lets you have an IBM as a station on Appletalk. The card has an Apple-style nine-pin socket on it, and you just plug the standard Appletalk connector box on to it. Tops is a more powerful product which works on similar lines, allowing you to link IBM PCs or DEC Vax systems to Appletalk. Other products let you use several Macs simultaneously as terminals to IBM, DEC and ICL mainframes.

CONCLUSIONS

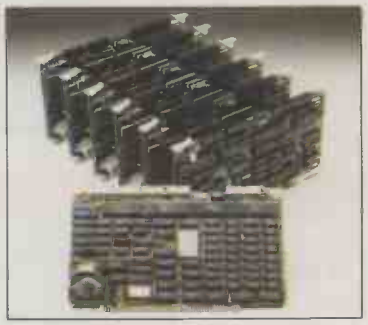
- Appletalk succeeds in what it sets out to be: it is a simple, effective local area network ideal for linking small groups of users. It is easy to set up without outside help. Anyone with more than one Mac should investigate what it can offer them because it is very cheap.
- The Laserwriter comes into its own when shared on a network, as the price per user falls. It makes most sense on networks with only a few users, as Apple does not provide a means to spool or queue print jobs.
- Macserve is a cheap, simple way of sharing a hard disc between net users. The fact that it offers fewer facilities than a true file server does not matter since there is little genuine multi-user software available yet for the Mac.
- Until Apple brings out a proper file server later this year, the Macintosh/Appletalk combination cannot hope to compete with IBM PC networks when it comes to running multi-user accounting and database applications.
- Network mail provides a good way of sharing data produced with conventional single-user Macintosh application software. The Top Mail package is a triumph of simplicity.

Multi-user networking in style

The new Minstrel 4

The designers of Minstrel 4 were given a simple brief: produce a world-beating, cost-effective and practical multi-user system.

And do it with style.



Minstrel power – 80186 master and HTS 186 dual processor slaves.

They passed the latter test with flying colours. But looks aren't everything. Inside this beautifully engineered chassis, you'll find a close coupled TurboDOS† network that holds the key to all your multi-user computer projects.

Now, and for the future.

Minstrel 4 is a multiprocessor machine – every user of the system gets a DEDICATED CPU and 512 Kb RAM. This virtually eliminates the response time degradation you often find on timeshare minicomputers and so-called supermicros.

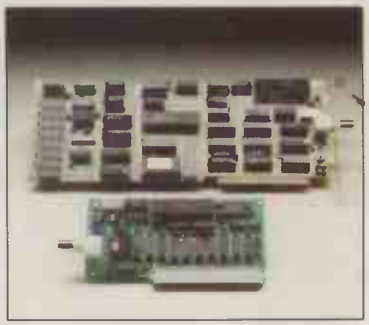
Minstrel 4 is more powerful than most minis, even in its most basic state. You can start with two users, but a full blown 16 user system will give you 9 MBytes dynamic RAM and 17 CPUs with 80186 instruction sets, running concurrently at 8 MHz. With that sort of power, we're confident that you won't run out of steam.

Minstrel design – fast tape back-up for safety and convenience.

Minstrel workstations – come complete with function keys and business graphics potential.

Minstrel 4 has unprecedented networking capability. The Winchester controller has built in ARCnet. You can network IBM PCs, ATs, Apricots, Olivettis and all lookalikes if required. Gateways to IBM and ICL mainframes are available. Most important, you can network Minstrel 4s together – 255 of them to be precise.

Minstrel 4 supports CP/M, MP/M, MS DOS (including version 3.1 with file and record locking) and has PC DOS emulation, so you can run nearly all the popular business packages.



You can even network stand-alones into the Minstrel System, using Minstrel ARC net cards.

Storage capacity is only limited by your budget. A single Minstrel 4 holds up to 160 MBytes formatted disk capacity, with onboard streaming back-up of up to 60 MBytes. Direct memory access means you can download 20 MBytes onto tape in less than 4 minutes. Higher capacity drives can be supplied.

A two user Minstrel 4 system, complete with tape back-up and terminals will cost you less than £7,000. Additional workstations, just over £1,000 per user, a price/performance package you'll find unbeatable.

At last there is a serious alternative to the minicomputer, with the sort of costs and flexibility you'd associate with a micro. It's called Minstrel 4, and you should find out more about it. Write or call us for details.

With Minstrel, expansion is integral, not an afterthought.

† TurboDOS™ Registered trademark of Software 2000 Inc.

IBM/PC is a trademark of International Business Machines Inc
Apricot is a trademark of Apricot plc.
MS DOS is a trademark of Microsoft.
Minstrel is a registered trademark of HM Systems Limited.
Arcnet is a trademark of Datapoint Inc
Olivetti is a trademark of Olivetti.

HM Systems Limited, 220 The Vale, London NW11 8HZ
Telephone: (01) 209-0911 Telex: 266828-HMS G Easylink: 19001060

HM Systems
Designed and built in Britain.

→ circle 145 on enquiry card ←

	NETS SUPPORTED	DESCRIPTION	PRICE	SUPPLIERS
ALL-IN-ONE				
Intuitive Solution	Novell, PC Network, Torus	generates applications with Mac-like interface; built-in database, WP, mail and mainframe links	£1,440 for eight users, £50 each extra user	Intuitive Systems
Network Xchange	Novell, PC Network, Torus	integrated database, word processor, spreadsheet and graphics modules	£1,290 for 10 users	Psion
Open Access	Novell, PC Network	tightly integrated set of modules comprising database, spreadsheet and word processor	about £980 for three users	Softsel, SPI
QED +	3-Com, DMS, Nestar, Novell, PC Network, Torus	all-in-one office-automation product incorporating time management, project planning, address book, WP and filing	£500 for two users, £225 each extra user	Quantec Systems
Samna +	3-Com, Novell, PC Network	based around Samna Word III word processor with additional text-retrieval system and spreadsheet	£1,225 for three users, £2,495 for six	Mercator, Softsel, Thorn EMI
Smart System	3-Com, Novell, PC Network, Torus	complete set of Smart modules, comprising database, spreadsheet and word processor, all tightly integrated	£1,395 for three users, £450 each extra user	Paradigm, Softsel, Software Limited
DATA				
Aspect	Novell, PC Network, Torus	database/application generator	£950 for five users, £100 each extra user	Microft Technology
BOS/Finder	Corvus, DMS	database; requires BOS/LAN operating system costing £950 for three users, £1,500 for 12	£400 for three users, £650 for 12	BOS
Dataflex	3-Com, Corvus, DMS, PC Network, Torus	database/application generator; WP available as option	£1,295 for unlimited users; run-time licence £475	Dataflex U.K.
dBase III Plus	3-Com, Novell, PC Network, Torus	database/application generator	£595 for two users, £200 each extra three users	Ashton-Tate
Delta 4	Corvus, Novell, PC Network, Torus	database/application generator; includes data encryption and five-level password	£995 for three users, £195 each extra user	Compsoft
LAN Data Store	Corvus, Nestar	database	£995 for 63 users	Vistek
MDBS Kman/2	3-Com, Novell, PC Network	database/application generator	£1,795 for 10 users	Database Experts
Open Access Database	Novell, PC Network	database/application generator; links to other Open Access modules	not yet finalised; probably similar to dBase III Plus	Softsel, SPI
PC Focus	Nestar, PC Network	database/application generator with graphics and financial modelling	£4,000 for eight users	Information Builders
Revelation	3-Com Corvus, DMS, Nestar, Novell, PC Network, Torus	database/application generator; closely modelled on Pick mainframe OS, with a similar query language	£1,500 for four users, £750 each extra four users	Cosmos
Sensible Solution	3-Com, DMS, Novell, PC Network	database/application generator	£800 for five users, £1,600 for 10	Xitan
Smart Database	3-Com, Novell, PC Network, Torus	database; links to other modules in Smart system	£795 for three users, £245 each extra user	Paradigm, Softsel, Software Limited
Superfile	3-Com, Corvus, PC Network, Torus	database/text-retrieval system	£980 for five users, £300 each extra five	Southdata
NUMBERS				
BOS/Planner	Corvus, DMS	spreadsheet; requires BOS/LAN operating system costing £950 for three users, £1,500 for 12	£400 for three users, £650 up to 12	BOS
Open Access Spreadsheet	Novell, PC Network	spreadsheet with model locking and built-in graphics; links to other Open Access modules	not yet finalised; probably similar to Smart	Softsel, SPI
Smart Spreadsheet	3-Com, Novell, PC Network, Torus	spreadsheet with built-in graphics; links to other modules in Smart system	£795 for three users, £245 each extra user	Paradigm, Softsel, Software Limited
WORDS				
Microsoft Word 2.0	3-Com, AST, Nestar, Novell, PC Network	managerial WP; supports laser printers and handles multiple founts	£1,195 for five users; £239 each extra user	Microsoft
Multimate Advantage	3-Com, Novell, PC Network	secretarial-style WP with mail-merging and list-managing functions	£895 for three users, £225 each extra user	Ashton-Tate
Samna Word III	3-Com, Novell, PC Network	secretarial-style WP with mail merging and arithmetic capability; also supports maths and foreign character sets	£995 for three users, £1,495 for six, £4,595 for 30	Mercator, Softsel, Thorn EMI
Smart Word Processor	3-Com, Novell, PC Network, Torus	managerial-style WP with spelling checker and built-in arithmetic functions; links to other Smart modules, including spreadsheet/graphics	£595 for three users, £175 each extra user	Paradigm, Softsel, Software Limited
Word Perfect	3-Com, AST, Corvus, Nestar, Novell, PC Network, Torus	managerial-style WP with built-in spelling checker, thesaurus and indexing; optional spreadsheet	£1,000 for three users, £130 each extra user	Sentinel
WordStar 2000	3-Com, Novell, PC Network	secretarial-style WP with spelling checker	£465 for one user, £225 each extra user	Micropro

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no one else would be able to get at it. What is needed here is a more detailed kind of protection which only locks the record in use, while permitting other users to get at the rest of the file. So if you are looking for a LAN database or accounting package bear in mind that it will not be any good for simultaneous multi-user operation unless it has record-level locking.

It may be that for your application you do not need either form of locking. Different users may never want to get at the same document or spreadsheet. If this is the case you may well be able to get away with ordinary single-user software, perhaps giving each user their own private partition on the hard disc to keep their own files in to avoid any problems with names clashing.

HAVOC FOR USERS

But even here it pays to be cautious. Many programs create temporary files, unknown to the user, while doing things like sorting or preparing output for the printer. If your program creates such a file two users can still create havoc with each other's jobs.

Copy-protected programs can create yet more problems for the unwary network user. Often a master disc has to be present in the work station's floppy drive when you load the application from the network hard disc. This is fair enough, you might think, if the aim is to stop illicit copying. But some packages self-righteously crash the system without warning if you forget to put the floppy disc in, which will not please other users who happen to be on the network at the time.

To avoid these problems it is always wise to probe very deeply before running anything in earnest on a network. With a network all your eggs are in the same basket, so any disasters are correspondingly more serious.

In the table opposite we list software which has been specially written or adapted for LANs. We have concentrated on multi-user software for the IBM PC and its clones, which is where there are the most products and where the confusion is most pronounced. With other brands of machine such as the Apricot Point 32, Research Machines Nimbus or Apple Macintosh it is fairly easy just to ask the manufacturer for an approved list of software.

Some networks such as 3-Com, Corvus and Nestar allow you to mix fundamentally different computers on the same network. Obviously you need software which works on the specific type of machine — say, a Mac or IBM PC. A network is just a way of transporting software and data between physically separate machines.

We have not included vertical-market and accounting software in this survey. Here the question you should ask first is: Does it suit my business? People's requirements are too different for specific recommendations to make much sense.

Unfortunately, even among generic software packages for the IBM market things are not quite as simple as we have suggested so far. File and record locking requires co-operation between the application package and the network it is running on.

Not all packages work with all networks; sometimes they work with reduced facilities or do not run at all. If you are not yet committed to any particular brand of network it is a good idea to ask suppliers for their directory of approved software. Not only will this show how many packages seem to be available, you can also get a good feel for how honest the company is in the way difficulties with particular packages are reported.

We have concentrated here on what seem to us to be the leading LANs for the IBM PC out of the very large number that are available. Software companies are continually adding to the list of networks their packages support so it is worth checking any interesting package to see if it is now supposed to work on your kit.

Thankfully it does appear as if some standards are beginning to emerge. IBM's own low-cost LAN offering is PC Network. This uses software from Microsoft, and the MS-Net/PC Network combination looks like becoming very well supported with software.

At present, though, there are probably more Novell networks installed, many of them licensed under different names. Novell's record-locking and security procedures have a good reputation for working effectively, which is a big plus.

AST, 3-Com, Corvus, DMS, Nestar and Torus supply other networks which were mentioned favourably and frequently by the software companies we contacted. Torus appears to be getting a good reputation in the U.K., partly because its network software employs Macintosh-like concepts which are said to make the LAN easier to use.

DIFFICULT CHOICE

There are nearly 100 LANs currently available in the U.K. Choosing between them can be an impossible task. Apart from the sheer range, there is an impenetrable forest of jargon. The table that begins on page 103 is intended to provide at least a starting point.

The table gives details of the topology of the network, the type of cabling it uses and the access method. The access method determines how collisions of data being sent through the network are avoided, or at least noticed.

Other figures give the transmission speed, an important factor in establishing how fast information is transferred, the maximum length of the network cabling, and the maximum number of nodes which can be attached. Some networks also allow you to use them for voice transmission.

The main thing to check when choosing LAN hardware is that it will work with the micros you already have. This needs two things: the right cards and the right software. Once you have established which LANs are appropriate you can start to compare details.

SOFTWARE SUPPLIERS

Ashton-Tate 1Bath Road, Maidenhead, Berkshire SL6 4UH. Telephone: (0628) 33123
BOS Software 87-89 Saffron Hill, London EC1 8QU. Telephone: 01-831 8811
Compsoft Compsoft Manor, Farncombe Hill, Godalming, Surrey GU7 2AR. Telephone: (04868) 25925
Cosmos Europe 29 Thetford Road, New Malden, Surrey KT3 5DP. Telephone: 01-942 7788
Database Experts 1 Thame Street, Windsor, Berkshire SL4 1QP. Telephone: (0753) 840197
Dataflex 16 Anning Street, New Inn Yard, London EC2A 3HB. Telephone: 01-729 4460
First Software Intec 1, Wade Road, Basingstoke, Hampshire RG23 0NE. Telephone: (0256) 463344
Information Builders Station House, Harrow Road, Wembley, Middlesex HA9 6EB. Telephone: 01-903 6111
Intuitive Systems Wye Lodge, 66 High Street, Stevenage, Hertfordshire SG1 3EA. Telephone: (0438) 317966
Mercator South Bank House, Black Prince Road, London SE1 7SJ. Telephone: 01-735 8171
Microft Technology The Old Powerhouse, Kew Gardens Station, Kew, Surrey TW9 3PS. Telephone: 01-948 8255
Microsoft Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741
P&P Micro Distributors Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744
Paradigm Computer Group (U.K.) Ltd, Southampton House, 192-206 York Road, London SW11 3SA. Telephone: 01-228 2207
Psion Psion House, Harcourt Street, London W1H 1DT. Telephone: 01-723 9408
Quantec 230-236 Lavender Hill, London SW11 1LE. Telephone: 01-228 7507
Sentinel Software Wellington House, New Zealand Avenue, Walton-on-Thames, Surrey KT12 1PY. Telephone: (0932) 231164
Softsel Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-586 8866
Software Limited 2 Alice Owen Technology Centre, 251 Goswell Road, London EC1N 7JQ. Telephone: 01-833 1173
SPI Software Products International, 13 Horseshoe Park Estate, Pangbourne, Berkshire RG8 7JN. Telephone: (0735) 74081
Southdata 166 Portobello Road, London W11 2EB. Tel: 01-727 7564
Thorn-EMI Computer Software Thompson House, 296 Farnborough Road, Farnborough, Hampshire GU14 7NF. Telephone: (0252) 543333
Vistec Corvus Division, Duffield Road, Little Eaton, Derbyshire DE2 5EG. Telephone: (0332) 833330
Xitan Xitan House, 27 Salisbury Road, Totton, Southampton SO4 3HX. Telephone: (0703) 871211

(continued on page 103)

HYPER-MICRO

THREE COMPUTER ARCHITECTURES COMBINED TO GIVE THE BEST ADVANTAGES OF EACH

MULTI PROCESSING | **TIME SHARING** | **NETWORKING**

The Bromcom system is truly a Hyper-micro with a new and innovative concept. It is the first of its kind to have *three computer architectures combined into one system* offering the best advantages of each — namely the performance of *multi-processing, cost effectiveness of time-sharing* and expansibility of *net-working*.

In each Bromcom system up to 16 Slave processors and 16Mbyte of RAM can be accommodated and each Slave can be allocated from one to four users. Fast 8MHz 80186 processors with up to 1Mbyte of RAM on each Slave ensure speed no less than you would expect from a high-performance system.

Each work-station is provided with up to four virtual screens enabling each user to conduct four simultaneous tasks, switching between them by a single key-stroke.

High-capacity and fast Winchesters, tape streamers and floppy disks are all part of the complete and integral system. Furthermore the system can be networked via ArcNet to other Bromcom systems or IBM-PC/AT and compatibles.

SPECIFICATION

16-bit Master processor with 1Mbyte of RAM and:
- Four Serial and one Parallel ports
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102

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Manufacturer/product	Signal type	Topology	Cabling	Access method	Voice/data integration	Transmission speed	Maximum length (m)	Stations	Price	Supplier
Alpha Microsystems Alpha Net	base	bus		token	no	1,000	400	64	£1,800	Alpha Microsystems. Tel: (0753) 821922
Appletalk		bus	TP		no	230	300	32	£50pn	Apple Computer (U.K.). Tel: (0442) 60244
Apricot Network	base	bus	TP	C/CD		1,000	600			Apricot. Tel: 021-501 2284
AST	base	bus	TP	C	no	800	800	160	£440pn	AST Europe. Tel: (0527) 61051
AST PC Net II	base	bus	TP	C/CD	no	800	150	160	£440pn	P&P Micro Distributors. Tel: (0706) 217744
AST Resolve Sharing Network	base	bus	co-ax	C/CD	no	5,000	500	64	£495pn	P&P Micro Distributors. Tel: (0706) 217744
Beale Hilan	base	ring	optic	token	no	10,000	2,000			Beale International Technology Tel: (078481) 3115
BICC Isolan	base	bus	co-ax	C/CD	no	10,000	3,000	1,034	£750	Hitek Solutions. Tel: (0223) 213535
BOS LAN		bus	TP	C	no			64	£1,500	BOS Software. Tel: 01-831 8811
Bridge Ethernet System	base broad	bus	co-ax optic	C/CD	no	10,000	2,500	1,024	£410pn	Bridge Communications. Tel: (06284) 74728
Olivetti 10-Net	base	bus	TP	C	no	1,000	3,000	1,000+	£595pn	British Olivetti. Tel: 01-785 6666
Case Grapevine	base	star	co-ax		yes	20	3,000			Case Communications. Tel: (0923) 58000
CDS Token Net	broad	bus	co-ax	token	no	10,000	no limit			Dacom Systems. Tel: (0908) 675511
Computer Automation Syfanet	broad	bus	co-ax	C	no	3,000	1,000	200	£13,575	Computer Automation. Tel: (0923) 771211
Corvus Omninet	base	bus	TP	C/CD	no	1,000	1,200	64	£295pn	Vistec. Tel: (077382) 6811
Datapoint Arcnet	base	bus	co-ax optic	token	no	2,500	6,500			Datapoint. Tel: 01-459 1222
Digital Microsystems Hinet	base	bus	TP optic		no	500	10,000	64		Digital Microsystems. Tel: (0734) 793131
Equinox Turbonet	base	bus	TP	C	no	800	1,000			Equinox. Tel: 01-739 3450
System Five			TP	C	no	1,000	1,200	64	£450	Five Technology. Tel: (05432) 57701
Fox 10-Net	base	bus	TP	C/CD	no	1,000	600			Techland Systems. Tel: (06285) 26535
Gandalf Pacxnet	broad	star ring bus	TP optic tel		yes	20	7,000			Gandalf Digital Communications. Tel: (0925) 818484
Gateway G-Net	base	bus	co-ax	C/CD	no	1,430	1,200	255	£495pn	Persona U.K. Tel. 01-541 4343
Hewlett-Packard Advancenet	base	bus	co-ax	C/CD	no	10,000	1,500	300	£600pn	Hewlett-Packard. Tel: (0734) 784774
HM Minstrel 4 Network	base	star	co-ax	token	no	2,500	600	255	£495pn	H M Systems. Tel: 01-209 0911
IBM Token Ring	base	star ring	TP optic tel	token	no	4,000		260	£600pn	IBM U.K. Tel: (0705) 694941
IBM PC Network	broad	bus	co-ax	C/CD	yes	2,000		72	£550pn	IBM U.K. Tel: (0705) 694941
IBM Network	broad	bus	co-ax	C	yes	4,000	450	64	£2,893	P&P Micro Distributors. Tel: (0706) 217744
ICL Osnet	base	bus	co-ax optic	C/CD	no	10,000	3,500	2,000	£350pn	ICL. Tel: 01-937 8133
ICL Oslan	base	bus	co-ax	C/CD	no	10,000	1,500			Infopoint ICL. Tel: 01-788 7272
Infa Infaplug		ring			no	10				Infa Communications. Tel: (0984) 24059
Information Technology T-Stream 3000/7000	broad	bus	co-ax	C/CD	no	128	15,000	1,000	£800	Information Technology. Tel: (0442) 42277
Information Technology PC-Stream	broad	bus	co-ax	C/CD	no	2,000	5,000	1,000+	£650	Information Technology. Tel: (0442) 42277
Information Technology T-Stream 4000a	broad	bus	co-ax	C/CD	no	19	15,000		£580	Information Technology. Tel: (0442) 42277
Information Technology Etherstream	broad	bus	co-ax	C/CD	no	10,000	5,500	1,000	£650	Information Technology. Tel: (0442) 42277

KEY

Signal type: base = baseband; broad = broadband
Cabling: TP = twisted pair; co-ax = coaxial; optic = fibre optic; phone = existing phone cable
Access method: token = token ring; C = CSMA; C/CD = CSMA/CD; reg = register; slot = empty slot
Transmission speed: quoted in Kbit/second
Stations: the maximum number of stations or nodes supported by the system
Price: pn denotes the price per node; otherwise prices quoted are for a complete network system

(continued on page 105)

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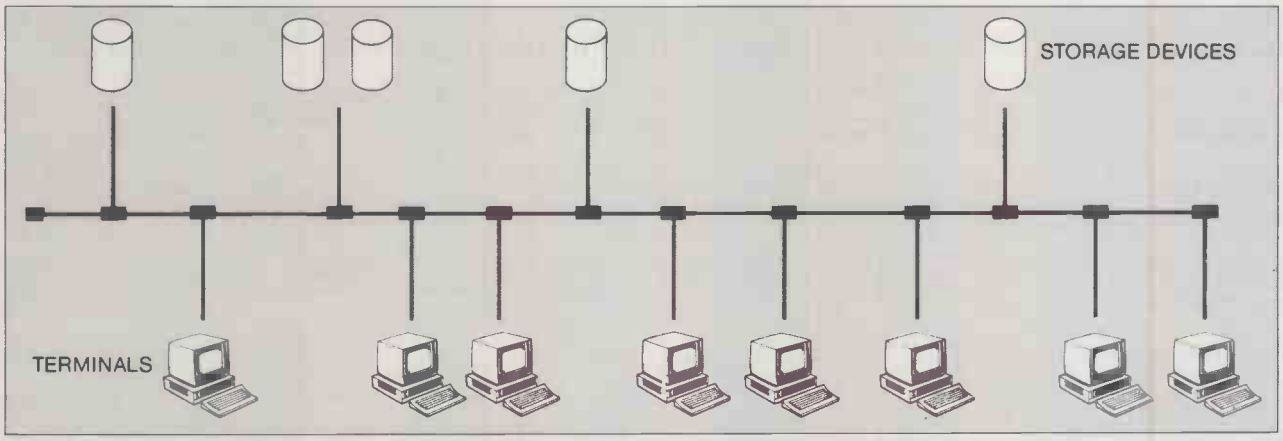

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ISA AMIIS		star	TP	slot	no	10	300			WPS Systems. Tel: 01-930 4884
Logica Polynet	base	ring	TP optic	slot	no	10,000	7,000			Logica VTS. Tel: 01-637 7761
LSI/Perkin Elmer Infonet		star	TP	C	no	40	200			Infospec. Tel: (0532) 441678
Lux Net		ring	TP	reg	no	250	3,000			Lux Computer Services. Tel: (0923) 47367
Master Systems Data Over Voice Ethernet	base	star bus	TP co-ax optic tel	C/CD	yes	10,000	8,000			Master Systems. Tel: (0276) 68385
Nestar Plan	base	star	co-ax fibre	token	no	2,500	6,000			Nestar Systems. Tel: (0895) 59831
Network Systems Hyperbus	base	bus	TP co-ax optic	C	no	10,000	5,000	no limit	£300	Network Systems. Tel: (0990) 23399
Nine Tiles Multilink	base	ring	TP	reg	no	1,500	2,000			Nine Tiles. Tel: (0223) 862125
NMX Datacom	broad base		TP co-ax tel		yes		10,000		£400pn	Tech-Nel Data Products. Tel: (0295) 65781
Nokia Net	base	bus	co-ax	C/CD	no	500	1,000	20		Nokia (U.K.). Tel: 01-907 2299
Northern Telecom Vienna	base	bus	co-ax	C/CD	no	10,000	2,500	200+	£1,000	Northern Telecom. Tel: (05827) 63161
North Star Dimension		star			no	110-19,200	100	12	£9,200	North Star Computers. Tel: (0442) 41266
Novell Netware/Omninet	base	bus	TP		no	1,000	1,200	50	£4,100	Novell Data Systems. Tel: (0892) 47833
Novell Netware Pronet	base		TP optic	token	no	9,960	2,500	50	£6,200	Novell Data Systems. Tel: (0892) 47833
Novell Netware/G	base	bus	co-ax	C	no	1,430	300	50	£4,600	Novell Data Systems. Tel: (0892) 47833
Novell Netware/Arcnet	base	ring	co-ax	token	no	2,500	6,000	50	£4,700	Novell Data Systems. Tel: (0892) 47833
Novell Netware/S	base	star	TP		no	600	1,200	24	£16,250	Novell Data Systems. Tel: (0892) 47833
Philips Sopho-LAN		bus	co-ax	token		2,000	2,500	4		Philips. Tel: (0206) 575115
Primenet/Ringnet	base	star ring	co-ax optic	token		10,000	200	1,024		Prime Computer (U.K.). Tel: 01-572 7400
Proteon Pronet	base	ring	TP optic	token	no	10,000	no limit	255	£800pn	Bonsai. Tel: 01-631 5454
Racal-Milgo Planet	base	ring	co-ax optic	token	yes	10,000	22,000			Racal-Milgo. Tel: (025672) 3911
Rank Xerox Ethernet	base	bus	co-ax	C/CD	no	10,000	2,500	1,024	£900pn	Rank Xerox (U.K.). Tel: (0895) 51133
RM Nimbus Network	base	bus	co-ax		no	800	1,200	64	£1,100pn	Research Machines. Tel: (0865) 249866
Rootnet	base	ring	co-ax optic		no	10,000	1,000	30	£1,000pn	Root Technical Systems. Tel: 01-726 6501
Seel Distributed Network Switch	base		TP optic	token slot	no	10,000	10,000			Seel. Tel: (0506) 411503
Sension S-Net	base	bus	co-ax optic	C C/CD	no	10,000	3,500	no limit		Sension Communications. Tel: (0606) 44321
SMT Goupilnet	base	bus	TP	C/CD	no	1,000	1,600	64	£600pn	SMT International. Tel: 01-785 2411
Sperry Usernet	base	bus	TP	C/CD	no	1,000	1,200			Sperry. Tel: 01-956 0511
Symbiotic Symbnet	base	star bus	TP optic	C/CD	no		9,000			Symbiotic Computer Systems. Tel: 01-683 1137
Transtec Transnet		bus	TP	token	no	1,000	1,000			Transtec. Tel: 01-247 1328
Torus Icon	base	bus	co-ax	C/CD	no	10,000	185	100	£4,200	Torus Systems. Tel: (0223) 862131
Torus Tapestry	broad	star	co-ax	C/CD	no	2,000	250	72	£1,545	Torus Systems. Tel: (0223) 862131
Wang Fastlan	broad	bus	co-ax	token C/CD	no	10,000	200		£2,200	Wang (U.K.). Tel: 01-560 4151
Wang Wangnet	broad	bus	co-ax	token C/CD	no	10,000	12,000			Wang (U.K.). Tel: 01-560 4151
Wang L-10	base	bus	co-ax	token	no	2,500	6,000	255	£500	Wang (U.K.). Tel: 01-560 4151
3-Com Ether	base	bus	co-ax	C/CD	no	10,000	300			Ambar Components. Tel: (0296) 34141
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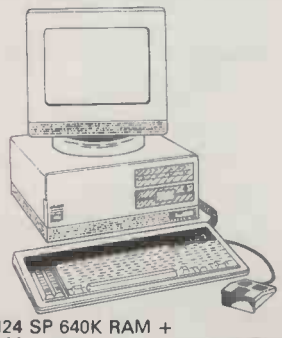

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Submissions should include a brief description which explains what your program does and how it does it. This should be typed with lines double-spaced. The program should be printed with a new ribbon or at double-intensity; the width should be between 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.

LANGUAGES

PASCAL AND BCPL

Following on from last month's article in which he outlined the virtues of Basic, **Ashley Oliver** explains the circumstances under which Pascal or BCPL might be a better choice.

THE KEY feature of Pascal is its handling of data types. Pascal offers a wealth of pre-defined types: Boolean, integer, real, character, user-enumerated, array, set, file, record and pointer. It also allows — within certain limits — the definition of arbitrarily complicated combinations of these. This makes it very easy to establish and handle complex data structures.

Pascal offers a good range of control constructs, generally better than Basic's if not as good as BCPL's. Pascal is also useful for numerical work, and although it has only a limited set of mathematical operators built-in, others can always be defined.

Sadly, Pascal has many disadvantages too. It is generally poor at interactive I/O. Standard Pascal does not allow random-access files, and the simple method of defining a string insists that the string be of known and constant length. Pascal is near useless for real-time applications or for interfacing with peripherals other than filing systems. Pascal has no bit-wise logical operators, making manipulation of data at the bit level not only horrendously slow but also tedious to implement. Access to the operating system is difficult, and linking to machine-code routines is often extremely clumsy unless the operating system can do the job for you. Building object libraries is only possible if the operating system can help, and even source libraries have their problems.

DEBUGGING DIFFICULT

Debugging can be difficult in standard Pascal. There are no standard debugging utilities and the structure of the code produced by a Pascal compiler actually makes them difficult to design.

Translation time can vary wildly between different implementations. If translation time is really a problem you should probably use an interpreted language.

It is also difficult to make an overall statement about the speed at run time because the implementation once again has an enormous effect. Some optimising Pascal compilers on mainframes produce very fast code, but code produced by Pascal compilers tends to be slower than that generated from other compiled languages. Comparing the implementation of the three languages running on the BBC Micro I find that for my typical application Pascal is about twice as fast as Basic but about three to five times slower than BCPL.

Maintenance of a Pascal program has its good and bad points. Well-written and well-structured Pascal programs are generally very lucid but there are also some irritating and unnecessary features. One is that variable declarations and the code that uses them are separated from each other by too great a distance.

Pascal comes into its own when you want to port a program to a new machine. If standard Pascal is used, then the source should recompile and run first time on any machine supporting Pascal. The snag is that it is often difficult to do anything useful in Pascal without using some non-standard extensions.

Pascal is probably no more or less demanding of preparation space than any other language of its type. The same applies to execution space, save that it is very easy to let Pascal suck you into making enormous demands upon data memory.

The Pascal program fragment shown in listing 1 is part of a larger suite of programs to perform functions that require the use of complex algebra. This fragment calculates the square root of a variable j, and includes the routines it uses and essential global declarations. Root j finds the nth root of a complex number. It takes four parameters: the operand, root, order and result. Operand is of type complex and is the qantity whose root is required. Root is of type integer and specifies n: 2 for a square root, 3 for a cube root, and so on. Order is also of type integer and indicates which of the n possible nth roots should be returned. Result is a variable parameter of type complex in which the result is returned.

The method used is straightforward enough. To get the nth root of a complex number in polar co-ordinates you take the nth root of the modulus and divide the argument by n. You then optionally add any integer multiple of 2*pi/n to the argument. The key feature of the program is the definition of a complex number.

Type complex is defined as a variant record. It has a tag field of type Boolean called Po for polar, which may be true or false. If true the variant fields are called Mo for modulus and Ar for argument. If Po is false the fields are called instead Re for real and Im for imaginary. In either case they are of type real. The advantage of this is that by examining Po a routine can tell whether its arguments are in polar or Cartesian form. It is not strictly necessary to use a variant record structure, but it makes the code that much safer, as it becomes obvious whether numbers are being handled in rectangular or Cartesian form by the field identifiers used. Thus the first action performed by Root j is to check whether its operand was given to it in polar form, and if not then convert into polar form.

Of the other routines, Range forces a real value to lie between pi and – pi. Polar converts a variable of type complex from Cartesian form to polar form. Polar's embedded function angle calculates arctan(y/x), making sure that the result is in the correct quadrant; its embedded function sgn performs the same function as that in Basic.

The deciding factors in choosing Pascal for this routine were its type declarations and the ease with which complex numbers can be manipulated once a suitable type definition has been established. Basic would have been much messier and probably too slow for some of the routines in other parts of the program. It could have been done in BCPL and would then probably have run even faster, but a much greater development effort would have been required since standard BCPL does not support floating-point arithmetic.

PORTABLE PROGRAMS

In general Pascal is a good choice for programs using complex data types, programs that have to be portable, and programs that have to be as clear as possible, though in this respect BCPL can be just as good if enough care is taken. Pascal can also be a good choice of language if the combination of execution speed, floating-point arithmetic and short development is of key interest. Pascal is a poor idea if the application is real-time, if machine-code subroutines are going to be a problem, and if debugging is likely to be a problem. Standard Pascal is not suitable if random-access files are needed.

In BCPL, as for Pascal, a key feature affecting the development time of programs is its data types; unlike Pascal, it has not got any. The only object in BCPL is the bit pattern called a word, which on the BBC implementation is 16 bits long. BCPL may treat this as being an instruction, an integer, a bit array, a character, a pair of characters, an address, a pointer or almost anything else, depending entirely upon context. This lack of typing means that you have to provide the procedures to handle complex data structures. This gives

BCPL tremendous flexibility, but means that the programmer has to weed out the sort of errors that a Pascal compiler would detect.

BCPL has an enormously rich range of control constructs. Some of them could be coded in alternative ways, but others have no simple equivalent in either Basic or Pascal. An example of this would be Break, which transfers control to the statement following a repetitive construct such as While, Repeat, For, Until, etc., which encloses the Break.

BCPL is weak for numerical work. Although it may be extended to handle floating-point arithmetic, standard BCPL supports only word-length integers. It is very useful, however, for manipulations at the bit level.

When discussing BCPL it is difficult to separate the language from the system. However, most uses of BCPL would be in its own environment, in which case BCPL offers other features of great interest.

The BCPL system organises all free RAM into an area called the heap. Sections of this heap are allocated as required to programs, data, files, etc. Thus BCPL can maintain a filing system in memory. If a file is small enough to be held in memory then random-access files are supported; if not, the user has to write the procedures. The dynamic allocation of memory also supports such things as co-routines, allowing a sort of multi-tasking.

BCPL is particularly good for the development of large programs. A complete program can be split into sections which can then be compiled separately and linked or overlaid as required. Another consequence of this is that object-code libraries can be developed easily.

STACK ANALYSIS

Debugging in BCPL is aided by several powerful system utilities which offer analysis of stacks, the heap, I/O streams, and tracing, breakpointing, etc., down to the single instruction level. There is also a utility which lets you test individual procedures in a compiled module.

Translation time in BCPL is in principle the same as Pascal. However, it can be effectively shorter, since a change in one section will require only that section to be re-compiled, not the whole program. None of this is true if you are limited to tape storage. Only the intermediate-code interpreter is in ROM; compiler, utilites and everything else must be loaded when required.

Run time is another of BCPL's strong points. Some library procedures are rather slow, but unless a program leans heavily on such things BCPL is clearly faster than Basic and Pascal.

Maintenance of a BCPL program is a rather more difficult area. It has some useful features, such as libraries, separate compilation units and so on. Portability is not as good as that of Pascal: there is a standard for BCPL, but implementations tend to depart from it in places. BCPL also tempts programmers into using machine-specific features where this could be avoided with a little effort.

There is not a a lot to choose between BCPL and Pascal when it comes to preparation and execution space. BCPL's intermediate code may be more compact than Pascal's, but it is difficult to be certain as the code is never strictly comparable. However, BCPL does give the programmer much better control of the space employed for data.

An example of BCPL code is shown in listing 2. This function reads a date from the current input stream and returns a pointer to a three-word heap vector containing the day, month, and year as integers. If this is incorporated into a larger program it would be more efficient for the calling procedure to pass a stack vector to Read.Date as a parameter.

The point of Read.Date is that it will accept a date in almost any reasonable English format. The logic is as follows. If the first field is numeric, then it is the day, otherwise it is the month. In either case the second field is whichever day or month is outstanding. The year is the third field and is numeric. The year should have 1900 added to it if it is only two figures. The separators between fields are any number of non-alphanumeric characters.

The procedure Next.Field reads what, if anything, is left of the present field, then reads until it finds the start of a field, then unreads one character so that the next character read will be the first character of this field.

The Rd.Low procedure reads a character and converts upper to lower case by Oring with hex 20. Month.Conversion is responsible for deciding which month was specified when this is not numeric, and examines no more than the first three characters. The in-built function Read N( ) reads from the current input stream, discarding leading spaces, tabs, etc., and converts decimal characters to an integer, which is returned. It stops on encountering the first non-decimal character. Thus if asked to read something that is not a number, ReadN( ) will return zero.

This function could also have been coded in either Pascal or Basic as well as BCPL. I chose BCPL for a number of reasons. First, BCPL reads are done from the current input stream. So Read.Date could read from a file or the console; in Pascal or Basic changes would have to be made to the code to do this. In neither Pascal nor Basic is there an equivalent to UnrdCh( ), which would make Next.Field more complicated. Indeed, in Pascal or Basic I would start by reading the whole line into a string or array and do the analysis there.

BCPL is at an advantage when speed is required, when large programs are being developed, when proper libraries are required, when flexibility is important or the structure of the code is likely to be very complex, and when it may be necessary to use a lot of machine-code routines. The only major area where BCPL is limited is that of numerical work. However, BCPL is a relatively complex language that requires discipline and experience from the programmer. PC

LISTING 1. PASCAL FRAGMENT

```
PROGRAM COMPLEX_NUMBERS(INPUT,OUTPUT);
CONST pi=3.141592654;
TYPE complex=RECORD CASE po:BOOLEAN OF
                        TRUE: ( re:REAL;
                                im:REAL );
                       FALSE:(  mo:REAL;
                                ar:REAL );
                    END;
PROCEDURE range(VAR t:REAL);
  BEGIN
  WHILE t>pi DO t:=t-2*pi;
  WHILE t<-pi DO t:=t+2*pi;
  END;

PROCEDURE polar(VAR z:complex);
VAR x,y:REAL;

  FUNCTION angle(x,y:REAL):REAL;

    FUNCTION sgn(a:real):INTEGER;
      BEGIN
      IF a>0 THEN sgn:=1
             ELSE IF a<0 THEN sgn:=-1
                         ELSE sgn:=0
    END;

    BEGIN
      CASE sgn(x) OF
        1:  angle:=ARCTAN(y/x);
        0:  angle:=sgn(y)*pi/2;
       -1:  IF sgn(y)=1 THEN angle:=ARCTAN(y/x)+pi
                        ELSE angle:=ARCTAN(y/x)-pi
      END
    END;

  BEGIN
  IF NOT(z.po) THEN WITH z DO BEGIN
                              x:=re;y:=im;
                              po:=TRUE;
                              mo:=SQRT(SQR(x)+SQR(y));
                              ar:=angle(x,y)
                              END
  END;

PROCEDURE rootj(operand:complex;
                root,order:INTEGER;
                VAR result:complex);
  BEGIN
  IF NOT(operand.po) THEN  polar(operand);
  result.po:=TRUE;
  result.mo:=EXP((1/root)*LN(operand.mo));
  result.ar:=(operand.ar+order*2*pi)/root;
  range(result.ar)
  END;
```

LISTING 2. BCPL FRAGMENT

```
LET read.date()=VALOF
$(
    MANIFEST $( day=0;month=1;year=2 $)

    LET next.field() BE
    $(
        LET x=RDCH()
        UNTIL x<'0' DO x:=RDCH()
        UNTIL x>='0' DO x:=RDCH()
        UNRDCH()
    $)

    AND rd.low()=RDCH() | #X20

    AND month.conversion()=VALOF
        SWITCHON rd.low() INTO
    $(
        CASE 'd': RESULTIS 12
        CASE 'n': RESULTIS 11
        CASE 'o': RESULTIS 10
        CASE 's': RESULTIS 9
        CASE 'f': RESULTIS 2
        CASE 'a': RESULTIS rd.low()='p' -> 4,8
        CASE 'm': RDCH()
                  RESULTIS rd.low()='r' -> 3,5
        CASE 'j': RESULTIS rd.low()='a' -> 1,
                                rd.low()='n' -> 6,7
    $)

    AND result,t=GETVEC(2),READN()

    TEST t~=0
         THEN
           $(
             day!result:=t
             next.field()
             t:=READN()
             month!result:= t~=0 -> t,month.conversion()
           $)
         ELSE
           $(
             month!result:=month.conversion()
             next.field()
             day!result:=READN()
           $)
    next.field()
    year!result:=READN()
    UNLESS year!result>99 DO year!result:=year!result+1900
    RESULTIS result
$)
```

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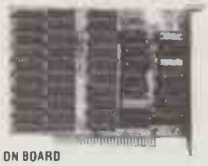

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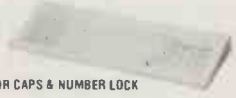

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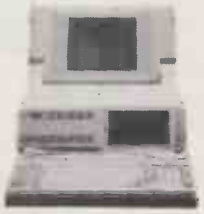

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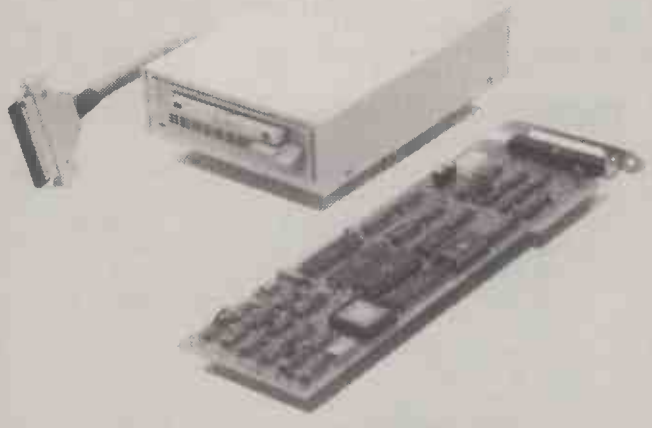

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THE t-TEST

The t-test is used to decide whether there is a significant difference between the means of two sets of data of the same kind. **Owen Bishop** and **Daniel Bishop** explain how it works.

IMAGINE that an agricultural company is enquiring into the profitability of one of its farms. Among many other activities the farm raises pigs. The farm manager is comparing two brands of pig food, brand A and brand B. The two brands are equally convenient to handle, but brand B is slightly more expensive than brand A. The question arises as to their efficacy in raising pigs: does brand B produce a better rate of growth, and if so is it worth the extra cost?

The farm has 19 piglets all of the same breed and of a suitable age for the investigation. The manager divides them at random into two groups, one of 10 pigs and one of nine pigs. The 10-pig group, group A, are on a diet of brand A. The other group, group B, are fed an equal daily amount of brand B. The piglets are weighed every week for several months and their daily rate of increase in growth is calculated.

The results are shown in table 1. The mean increase for group A is 0.63kg/day, while the mean increase for group B is 0.66kg/day. Thus the increase in group B is nearly five percent more than in group A. A five percent improvement in growth makes paying the higher price of brand B worthwhile. The only worry is how much reliance can be placed on the results of the investigation: can the farm always expect to find this improvement?

No two piglets are identical, and therefore no two piglets will have an equal rate of growth. This is plain from the individual increases shown in table 1. It is thus very unlikely that two groups will have exactly the same mean, especially when the groups are rather small as they are here. In this investigation brand B apparently produces the better growth, but this might simply be the result of chance. A greater proportion of intrinsically faster-growing piglets might, by chance, have been allocated to group B.

The idea of populations and samples was introduced in last month's article. One way of trying to assess the effects of the piglets' diet is to begin by assuming that there is in fact no difference between the nutritional effects of the two brands. This assumption is sometimes referred to as a null hypothesis. It implies that the brands produce identical effects and that, as a result, the two groups are merely two samples from one population of piglets. In other words, the sample means differ no more than would the means of any other pair of samples taken from this population.

To show that brand B is better you have to show that the difference between the means is more than you would expect to get from two samples taken from a single population. To establish this you calculate a statistic known as t; for the purposes of this article the details of the arithmetic can be left to the computer.

The probability of obtaining given values of t with pairs of samples of given sizes is obtained by calculations relying on the known properties of t; once again, the computer can handle this. Having found t, the computer works out the probability of obtaining a value as great as or greater than this by chance when there is no real difference between the samples — that is, with samples taken from a single population. In the case of the piglets, the computer reports that the value of t is 2.57, and that the probability of obtaining a value of t as great or greater than 2.57 when there are 10 piglets in one sample and nine in another is 0.019 or 1.9 percent.

The outcome of this investigation can be stated in one of two ways. First, that brand B is better; you are convinced of this because of the small chance of obtaining such a difference between means if there were no real difference. Alternatively you could conclude that there is no difference between the brands, and that the different performances of the two groups of piglets arose by chance.

If you make the first statement there is a 1.9 percent chance that you are wrong. Can you afford to take that chance? Many business decisions are taken in a situation of much greater risk of failure than 1.9 percent, so it could be considered reasonable to abandon the null hypothesis and feed all piglets on brand B in future.

On the other hand, if the manager is of a cautious disposition, he or she may decide that a 1.9 percent chance of being wrong is too big a risk to run. Though brand B appears to be better, the difference of growth rate may not be as much as 0.03kg/day. Remember, the test has only shown that there is probably a difference, but has not given any firm estimate of the size of the difference. A difference of only 0.02kg/day, for example, might not compensate for the added cost of brand B.

At this stage, the company might decide to continue the trials in order to obtain a better estimate of the effects of the foodstuffs. Perhaps further data would show to an even higher level of probability that brand B is superior.

When you are preparing the data file for the t-test using the Data Maker program described in the first article of this series — see *Practical Computing*, February 1986 — enter the two sets of data in two columns of a data table. There need not be the same number of items in the two columns. The program can also work on a table of more than two columns, in which case you have to select which two columns are to be compared.

Load and run the program with file name T-test. Place the data disc in the drive and type the name of the data file. When the means and the standard deviations have been calculated, the data table is displayed with the means and SDs in additional columns and rows, as in last month's program.

To proceed to the t-test key T. If the table has only two columns of data the value of t is displayed immediately. If your table has more than two columns of data you are first asked to select which two columns are to be compared. If t is so small as not to be significant at the 10 percent level, even with a large sample, the message

Difference not significant

is displayed.

With a larger t you are given the option of calculating p, the estimated probability of obtaining a difference between the means of the two columns which is as great as, or greater than, the difference actually found in the data. In other words, if you state that there is a significant difference between the means, p is the probability that you are wrong. The value of p lies somewhere on the scale from 0 for impossible to 1 for certain. In practice a value of 0.05 or less is taken to indicate a statistically significant difference of means.

If there are more than two columns, pressing N takes you back to the table to select two other columns for the next test. Keying R reruns the program from the start, allowing you to load a different data table.

All the programs in this series, along with five others, are available 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

	Brand A	Brand B
	0.62	0.64
	0.61	0.67
	0.65	0.63
	0.66	0.69
	0.60	0.70
	0.62	0.64
	0.64	0.67
	0.63	0.66
	0.67	0.65
	0.64	—
Mean	0.63	0.66

Growth rate of pigs (kg/day)

T-TEST

```
   10 REM- t-TEST
   20 REM- A Statistical Utility Program
   30 REM- ------------------------------
   40 REM- by Owen and Daniel Bishop
   50 REM- ------------------------
   60 REM- Version 1.0 - 13/12/85
   70 REM- For the BBC Micro Model B
   80 REM- ------------------------
   90 *FX4,1
  100 *TV 255,1
  110 L$=STRING$(10,CHR$32)
  120 MODE7:PROCcol:PRINT"t-TEST"
  130 PROCbtm:PROCcol:PRINT "Enter name
of file to be loaded":PROCalpha("(max 7
letters): ",7)
  140 ON ERROR PROCfserror:VDU31,15,0:PR
OCcls:GOTO 130
  150 FILE$=GR$:A=OPENIN FILE$
  160 VDU31,15,0:PRINT FILE$
  170 INPUT#A,DF$:VDU31,24,0:PRINT"DATE:
";DF$
```

T-TEST

```
  180 INPUT#A,NC,NR:PROCcol:PRINT"COLS:
";NC;" ROWS: ";NR
  190 IF NC<2 THEN CLOSE#0:PROCbtm:PROCc
ol:PRINT "AT LEAST 2 COLUMNS OF DATA REQ
UIRED":FORJ=1 TO 9000:NEXT:RUN
  200 DIM SC(NC+4,NR+4),CL$(NC+4),RL$(NR
+4),DP(16),U(103,4),T(4)
  210 INPUT#A,CW,LC:CW=10
  220 IF LC=0 THEN LC=1:GOTO240
  230 FOR J=1 TO NC:INPUT#A,CL$(J):NEXT
  240 INPUT#A,LR
  250 IF LR=0 THEN LR=1:GOTO270
  260 FOR J=1 TO NR:INPUT#A,RL$(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 HI=0:FOR J=1 TO NC:IF DP(J)>HI THE
N HI=DP(J)
  300 NEXT:FOR J=1 TO NC+4:DP(J)=HI:NEXT
  310 CLOSE#0:ON ERROR OFF
  320 NC=NC+4:NR=NR+4
  330 CL$(NC-3)="MEAN":CL$(NC-2)="SDS":C
L$(NC-1)="ESDP":CL$(NC)="ESDM":RL$(NR-3)
="MEAN":RL$(NR-2)="SDS":RL$(NR-1)="ESDP"
:RL$(NR)="ESDM"
  340 DIM NV%(NC-4),SV%(NR-4)
  350 SW=36-7*LR:CC=INT(SW/CW):IF NC<CC
THEN CC=NC
  360 CS=0:RS=0:HB=4+7*LR
  370 IF LR=0 AND NR>=100 THEN HB=5
  380 RB=NR+4:IF NR>16 THEN RB=24
  390 FR=0:FOR J=1 TO NC:IF DP(J)>0 THEN
 FR=1
  400 NEXT
  410 VDU31,0,2:PROCcls
  420 PROCbtm :PROCcol:PRINTSPC(5)"Pleas
e wait while calculating":PROCmean:PROCb
tm
  430 RD=16:IF NR-RS<RD THEN RD=NR-RS
  440 CD=CC:IF NC-CS<CD THEN CD=NC-CS
  450 PROCcolumns:PROCrows:PROCdata
  460 *FX21,0
  470 VDU31,39,22:K$=GET$
  480 IF K$=CHR$139 AND RS>0 THEN RS=RS-
16:GOTO 430
  490 IF K$=CHR$136 AND CS>0 THEN CS=CS-
CC:GOTO 430
  500 IF K$=CHR$137 AND CS+CD<NC THEN CS
=CS+CD:GOTO 430
  510 IF K$=CHR$138 AND RS+RD<NR THEN RS
=RS+RD:GOTO 430
  520 IF K$="T" THEN 540
  530 VDU7:GOTO 460
  540IF NC=6 THEN C1=1:C2=2:GOTO600
  550PROCbtm:PROCcol:PROCnum("Which colu
mn? (1-"+STR$(NC-4)+")",1,1,1,NC-4)
  560 C1=QN
  570PROCbtm:PROCcol:PROCnum("Which othe
r column? (1-"+STR$(NC-4)+")",1,1,1,NC-4
)
  580IF QN=C1 THEN VDU7:GOTO570
  590C2=QN
  600VDU31,0,2:PROCcls
  610 VARDIF=SC(C1,NR-1)^2/NV%(C1)+SC(C2
,NR-1)^2/NV%(C2)
  620 TP=ABS(SC(C1,NR-3)-SC(C2,NR-3))/SQ
R(VARDIF)
  630 VDU31,0,2:PROCcls:VDU31,0,5:PRINT"
t = ";INT((TP+.005)*100)/100
  640 IF TP<1.65 THEN VDU31,0,7:PRINT"Di
fference not significant":PROCbtm:PROCco
l:GOTO670
  650PROCbtm:PROCcol
  660 V=NV%(C1)+NV%(C2)-2
  670*FX21,0
  680VDU31,39,22:K$=GET$
  690 IF K$="P" AND TP>=1.65 AND V>1  TH
EN 730
  700 IF K$="N" AND NC>6 THEN 450
  710 IF K$="R" THEN RUN
  720 VDU7:GOTO670
  730 PROCbtm:PROCcol:PRINT"Calculating
probability of t"
  740@%=&20306
  750 VDU31,0,12:PRINT"Probability is ";
FNp
  760@%=&90A
  770 PRINT'"with ";V;" degrees of freed
om"
  780PROCbtm
  790*FX21,0
  800VDU31,39,22:K$=GET$
  810 IF K$="R" THEN RUN
  820IF NC>6 THEN 450
  830 VDU7:GOTO790
  840 DEF PROCmean
  850 LOCAL J%,K%,C%,SUM,NT%
  860 FOR J%=1 TO NC-4:C%=0:FOR K%=1 TO
NR-4:IF SC(J%,K%)<>1E-29 THEN C%=C%+1
  870 NEXT:NV%(J%)=C%:NEXT:FOR J%=1 TO N
R-4:C%=0:FOR K%=1 TO NC-4:IF SC(K%,J%)<>
1E-29 THEN C%=C%+1
  880 NEXT:SV%(J%)=C%:NEXT
  890 NT%=0:FOR J%=1 TO NC-4:NT%=NT%+NV%
(J%):NEXT
  900 FOR J%=NC-3 TO NC:FOR K%=NR-3 TO N
R:SC(J%,K%)=1E-29:NEXT:NEXT
  910 FOR J%=1 TO NC-4:SUM=0:FOR K%=1 TO
 NR-4:IF SC(J%,K%)<>1E-29 THEN SUM=SUM+S
C(J%,K%)
  920 NEXT:SC(J%,NR-3)=SUM:NEXT
  930 FOR J%=1 TO NR-3:SUM=0:FOR K%=1 TO
 NC-4:IF SC(K%,J%)<>1E-29 THEN SUM=SUM+S
C(K%,J%)
  940 NEXT:SC(NC-3,J%)=SUM:NEXT
  950 FOR J%=1 TO NC-4:SUM=0:FOR K%=1 TO
 NR-4:IF SC(J%,K%)<>1E-29 THEN SUM=SUM+S
C(J%,K%)*SC(J%,K%)
  960 NEXT:SC(J%,NR-2)=SUM:NEXT
  970 FOR J%=1 TO NR-4:SUM=0:FOR K%=1 TO
 NC-4:IF SC(K%,J%)<>1E-29 THEN SUM=SUM+S
C(K%,J%)*SC(K%,J%)
  980 NEXT:SC(NC-2,J%)=SUM:NEXT:SUM=0:FO
R J%=1 TO NC-4:SUM=SUM+SC(J%,NR-2):NEXT:
SC(NC-2,NR-2)=SUM
  990 FOR J%=1 TO NR-4:IF SV%(J%)<>0 THE
N SC(NC-2,J%)=SC(NC-2,J%)-(SC(NC-3,J%)*S
C(NC-3,J%))/SV%(J%)
 1000 NEXT
 1010 FOR J%=1 TO NC-4:IF NV%(J%)<>0 THE
N SC(J%,NR-2)=SC(J%,NR-2)-(SC(J%,NR-3)*S
C(J%,NR-3))/NV%(J%)
 1020 NEXT
 1030 SC(NC-2,NR-2)=SC(NC-2,NR-2)-(SC(NC
-3,NR-3)*SC(NC-3,NR-3))/NT%
 1040 FOR J%=1 TO NR-4:IF SV%(J%)>1 THEN
 SC(NC-1,J%)=SQR(SC(NC-2,J%)/(SV%(J%)-1)
) ELSE SC(NC-1,J%)=1E-29
 1050 NEXT: FOR J%=1 TO NC-4:IF NV%(J%)>
1 THEN SC(J%,NR-1)=SQR(SC(J%,NR-2)/(NV%(
J%)-1)) ELSE SC(J%,NR-1)=1E-29
 1060 NEXT:IF NT%>1 THEN SC(NC-1,NR-1)=S
QR(SC(NC-2,NR-2)/(NT%-1)) ELSE SC(NC-1,N
R-1)=1E-29
```

(continued on next page)

T-TEST

(continued from previous page)

```
 1070 FOR J%=1 TO NR-4:IF SV%(J%)<>0 THE
N SC(NC-2,J%)=SQR(SC(NC-2,J%)/SV%(J%)) E
LSE SC(NC-2,J%)=1E-29
 1080 NEXT:FOR J%=1 TO NC-4:IF NV%(J%)<>
0 THEN SC(J%,NR-2)=SQR(SC(J%,NR-2)/NV%(J
%)) ELSE SC(J%,NR-2)=1E-29
 1090 NEXT:SC(NC-2,NR-2)=SQR(SC(NC-2,NR-
2)/NT%)
 1100 FOR J%=1 TO NR-4:IF SV%(J%)<>0 THE
N SC(NC-3,J%)=SC(NC-3,J%)/SV%(J%) ELSE S
C(NC-3,J%)=1E-29
 1110 NEXT:FOR J%=1 TO NC-4:IF NV%(J%)<>
0 THEN SC(J%,NR-3)=SC(J%,NR-3)/NV%(J%) E
LSE SC(J%,NR-3)=1E-29
 1120 NEXT:SC(NC-3,NR-3)=SC(NC-3,NR-3)/N
T%
 1130 FOR J%=1 TO NR-4:IF SV%(J%)<>0 THE
N SC(NC,J%)=SC(NC-1,J%)/SQR(SV%(J%)) ELS
E SC(NC,J%)=1E-29
 1140 NEXT:FOR J%=1 TO NC-4:IF NV%(J%)<>
0 THEN SC(J%,NR)=SC(J%,NR-1)/SQR(NV%(J%)
) ELSE SC(J%,NR)=1E-29
 1150 NEXT:SC(NC,NR)=SC(NC-1,NR-1)/SQR(N
T%)
 1160 ENDPROC
 1170DEF FNp
 1180DT=.1:F1=1:F2=1
 1190 L1=0:L2=0
 1200FORK=0TO4:T(K)=0:NEXT
 1210IF TP>5 THEN DT=INT(TP)*.04
 1220D=2/DT
 1230VT=(V+1)/2:TQ=INT((TP+.5*DT)/DT)*2
 1240FORJ=1 TO TQ+3
 1250TJ=J/D-DT
 1260U(J,0)=1/((1+TJ*TJ/V)^VT)
 1270NEXT
 1280FORK=1TO4
 1290TU=3-K
 1300 FORJ=1TOTQ+TU:U(J,K)=U(J+1,K-1)-U(
J,K-1):NEXT
 1310NEXT
 1320FORK=0TO4 STEP 2
 1330FORJ=3-K/2 TO TQ+1-K/2 STEP 2:T(K)=
T(K)+U(J,K):NEXT
 1340NEXT
 1350A=DT*(T(0)+T(2)/6+T(4)/180)
 1360IFV/2=INT(V/2) THEN 1510
 1370V1=V/2-.5
 1380FORJ=1 TO V1
 1390F1=F1*J
 1400IF F1>1E20 THEN L1=L1+LN(F1):F1=1
 1410NEXT
 1420IF V=1 THEN F2=1:GOTO 1480
 1430V2=V/2
 1440FORJ=1TOV2-.5
 1450F2=F2*(V2-J)
 1460IF F2>1E20 THEN L2=L2+LN(F2):F2=1
 1470NEXT
 1480L=EXP(L2-L1):F=F2/F1:F=F*L
 1490AA=F*SQR(V)*PI
 1500=1-2*A/AA
 1510V1=V/2+.5
 1520FORJ=1 TO V1-.5
 1530F1=F1*(V1-J)
 1540IF F1>1E20 THEN L1=L1+LN(F1):F1=1
 1550NEXT
 1560V2=V/2-1
 1570FORJ=1 TO V2
 1580F2=F2*J
 1590IF F2>1E20 THEN L2=L2+LN(F2):F2=1
 1600NEXT
 1610L=EXP(L2-L1):F=F2/F1:F=F*L
 1620AA=F*SQR(V)
 1630GOTO1500
 1640 DEF PROCdata:LOCAL J,K:VDU23,1,0;0
;0;0;:FOR J=5 TO 20:VDU31,HB-1,J-1:PROCc
ll:NEXT
 1650 FOR J=1+CS TO CD+CS:HH=HB-1+(J-CS-
1)*CW
 1660 FOR K=1+RS TO RD+RS
 1670 IF SC(J,K)=1E-29 THEN 1690 ELSE @%
=&0102000A+(DP(J)*&100):A$=STR$(SC(J,K))
:IF RIGHT$(A$,1)="."THEN A$=LEFT$(A$,LEN
(A$)-1)
 1680 VDU31,HH-1,3+K-RS:PRINT RIGHT$(L$+
A$,CW):@%=&90A
 1690 NEXT:NEXT
 1700 VDU23,1,1;0;0;0;
 1710 ENDPROC
 1720 DEF PROCcolumns:LOCAL J:VDU23,1,0;
0;0;0;:VDU31,0,2:PROCcll:VDU31,0,3:PROCc
ll
 1730 VDU31,0,2:FOR J=1 TO CD
 1740 VDU31,(HB-1+(J-1)*CW),2:PRINT;J+CS
;
 1750 NEXT
 1760 IF LC=0 THEN VDU23,1,1;0;0;0;:ENDP
ROC
 1770 VDU31,0,3:FOR J=1 TO CD
 1780 VDU31,(HB-1+(J-1)*CW),3:PRINTCL$(J
+CS);
 1790 NEXT:VDU23,1,1;0;0;0;:ENDPROC
 1800 DEF PROCrows:LOCAL K:VDU23,1,0;0;0
;0;:FOR K=5 TO 20:VDU31,0,K-1:PROCcll:NE
XT
 1810 FOR K=1 TO RD:VDU31,0,K+3:PRINT;K+
RS:NEXT
 1820 IF LR=0 THEN VDU23,1,1;0;0;0;:ENDP
ROC
 1830 FOR K=1 TO RD:VDU31,3,3+K:PRINT RL
$(K+RS)
 1840 NEXT:VDU23,1,1;0;0;0;:ENDPROC
 1850 DEF PROCnum(Q$,Q1,Q2,Q3,Q4)
 1860 *FX21,0
 1870 PROCcol:PRINT Q$;:INPUT""QN$
 1880 QN=VAL(QN$)
 1890 IF QN=0 AND QN$<>"0" THEN 1920
 1900 IF QN<>INT(QN) THEN 1920
 1910 IF (Q3=0 OR QN<=Q4) AND (Q1=0 OR Q
N>=Q2) THEN ENDPROC
 1920 PROCline
 1930 GOTO 1860
 1940 ENDPROC
 1950 DEF PROCalpha(Q$,Q1)
 1960 *FX21,0
 1970 PROCcol:PRINT Q$;:INPUT""QR$
 1980 IF LEN(QR$)<=Q1 OR Q1=0 THEN ENDPR
OC
 1990 PROCline:GOTO 1960
 2000 DEF PROCline:VDU11:PROCcll:VDU7:EN
DPROC
 2010 DEF PROCbtm:VDU31,0,20:PROCcls:VDU
31,0,20:ENDPROC
 2020 DEF PROCcol
 2030 PRINT CHR$130;
 2040 ENDPROC
 2050 DEF PROCcls
 2060 LOCAL CRS%,V,H
 2070 V=VPOS:H=POS
 2080 CRS%=999-H-(40*V)
 2090 VDU23,1,0;0;0;0;
 2100 REPEAT:IF CRS%<255 THEN 2120
 2110 CRS%=CRS%-255:PRINTSTRING$(255,CHR
$32);
 2120 UNTIL CRS%<255
 2130 PRINTSTRING$(CRS%,CHR$32);
 2140 VDU31,H,V
 2150 VDU23,1,1;0;0;0;
 2160 ENDPROC
 2170 DEF PROCcll
 2180 LOCAL V,H
 2190 V=VPOS:H=POS
 2200 PRINT STRING$(40-H,CHR$32);
 2210 VDU31,H,V
 2220 ENDPROC
 2230 DEF PROCfserror
 2240 ON ERROR OFF
 2250 CLOSE#0
 2260 VDU7
 2270 IF ERR>44 OR ERR=6 THEN 2310
 2280 CLS:VDU11:REPORT:PRINT " at line "
;ERL
 2290 *FX4,0
 2300 END
 2310 PROCbtm:IF ERR=222 THEN PRINT"No s
uch file";:PROCcol ELSE VDU11:REPORT:PRO
Ccol
 2320 PRINT" error. ":PROCcol:PRINT"Pres
s SPACEBAR, when you are ready "
 2330 *FX21,0
 2340 REPEAT:A=GET:UNTIL A=32
 2350 VDU11,11:PROCcls
 2360 ENDPROC
```

PC

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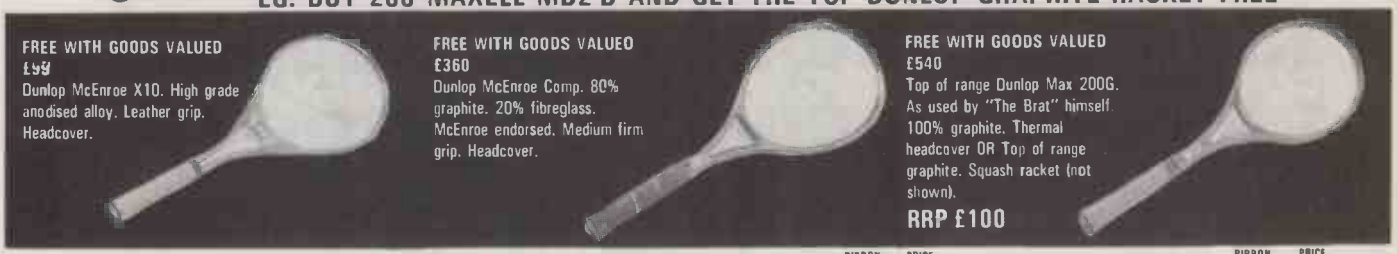

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Apple Imagewriter DMP, ACT Writer	Fab	3.39	6
Apple DWP	M/S	3.19	6
Brother HR15, 25, 35, EM200, CE40 7D	S/C	2.09	6
Brother HR15, 25, 35, EM200, CE40 7D Original	M/S	3.69	6
Brother HR15, 25, 35, EM200, CE40 7D Original	Fab	2.99	6
Brother HR5 Emeral printer Original	Th	2.45	6
Brother EM1/2	S/C	1.19	10
Brother EM1/2	M/S	2.19	6
Brother EP44 Thermal Printer Original	Th	2.70	5
Canon AP11/150, 2/3/4/500	S/C	2.89	6
Canon PW1080A, 1156A	Fab	4.19	6
Centronics 700 Zip pack	Fab	2.19	4
Centronics 150/152	Fab	2.49	5
C. Itoh 8510, NEC PC 8023 A/B/C	Fab	3.39	5
Commodore 1516/21/26 & 4023	M/S	2.64	6
Diablo Hi type II	M/S	1.79	8
Diablo Hi type II	Fab	2.79	6
Digital Decwriter LA34/38 IV/V LA100	Fab	2.69	5
Digital Decwriter LA180	Fab	3.99	6
Epson DX100	M/S	3.69	6
Epson FX/MX/FT RO, IBM PC 5152,	Fab	2.79	4
Epson FX/MX 100	Fab	3.47	4
Epson LQ 1500	Fab	3.55	6
Epson LX80/GX80	Fab	2.99	6
IBM 82C Selectric Ball,	S/C	1.19	6
IBM 82C Selectric Ball,	M/S	2.19	6
Juki 6100	M/S	2.19	6
Juki 6100	S/S	1.29	6
Juki 6300	M/S	1.99	6
Mannesmann Tally MT80 Spirit	M/S	2.64	6

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NEC Pinwriter I & II	Fab	£3.39	10
NEC Pinwriter III	Fab	4.09	10
NEC Spinwriter 2000/3500/7700 Original	M/S	7.90	6
NEC Spinwriter 2000/3500/7700	Fab	3.89	6
NEC Solnwriter 5000/5500	M/S	2.09	6
NEC Spinwriter 5000/5500	Fab	2.89	5
Oki Microline 80/82/83/92/93.	Fab	1.09	12
Oki Microline 84/84A/M84	Fab	2.49	6
Olivetti ET111, 115	S/C	4.69	6
Olivetti ET121 231, TES 4/5/701.	S/C	1.99	6
Olivetti ET121 231, TES 4/5/701.	M/S	2.69	6
Olivetti ET121 231, TES 4/5/701.	Fab	3.41	6
Olympia ES100/B - 105, 110, 150, 180	S/C	1.99	6
Qume Sprint 3, 5	M/S	1.59	6
Qume Sprint, 3, 5	Fab	2.09	6
Qume Sprint 3, 5 Ouickload	M/S	1.99	6
Qume 7/9 MkIV	M/S	2.59	6
Qume 7/9 MkIV	Fab	3.55	6
Ricoh RP 1300, 1500, 1600.	M/S	1.99	6
Seikosha GP100	Fab	2.29	6
Seikosha GP80, 100A/VC, 250	Fab	2.29	6
Shinwa CP80	M/S	2.64	10
Shinwa CP80	Fab	2.79	6
Silver Reed EX42/44 M44	S/C	2.09	12
Silver Reed EX50 77, 2/300, EXP4/5/700	S/C	1.99	6
Silver Reed EX50 77, 2/300, EXP4/5/700	M/S	2.69	6
Star Radix 10	Fab	3.76	6
Star Radix 15	Fab	4.49	6
Toshiba TH21/3100, P1340/50 QL4000	Fab	4.67	6
Triumph/Adler Gabrielle, Nakajima AE330	M/S	3.39	6
Wang 2281W, 6581r2, 5581WD	M/S	1.59	6
Lift Off Tapes	from	0.75	6
Cover Up Tapes	from	0.95	6

S/C = Correctable, S/S = Single Strike, M/S = Multistrike, Fab = Fabric, Th = Thermal.

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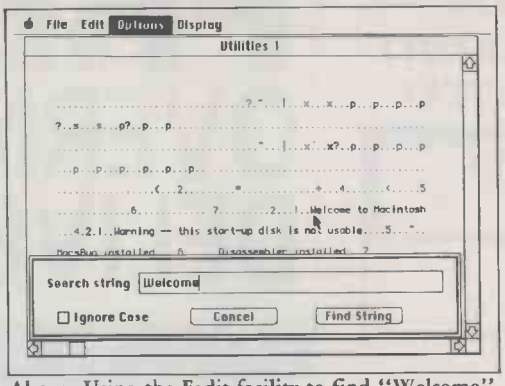
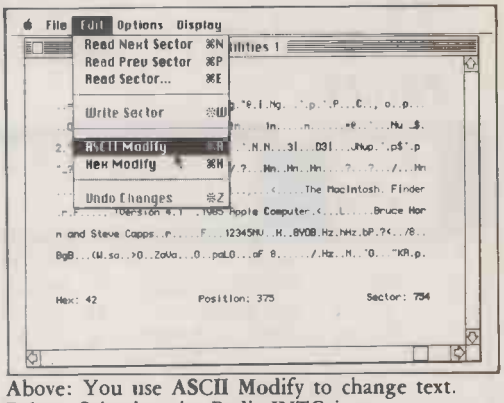
TAILOR-MADE MAC

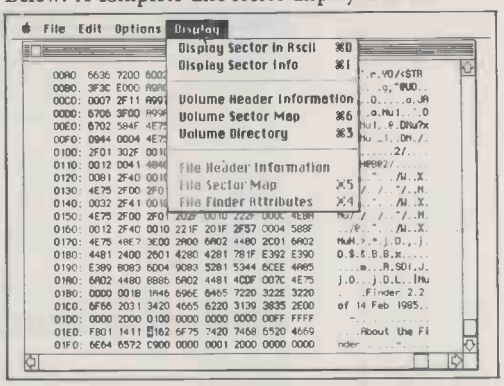
John Lewis explains how you can customise your Mac desk top using public-domain programs.

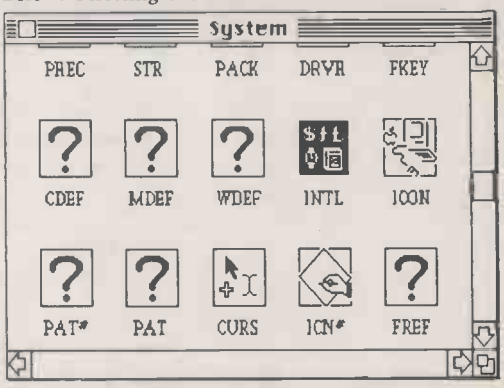


Above: Using the Fedit facility to find "Welcome". Below: A complete disc sector displayed in hex.



Above: You use ASCII Modify to change text. Below: Selecting the Redit INTC icon.





IN THE March issue I looked at ways in which you could personalise the Macintosh by altering the desk-top icons and menu-bar names to suit yourself. However, even more can be done, and you can produce your own start-up screens and tailor the system so that you get rulers in metric instead of decimal, and so on. To do so you need three public-domain programs: Screen Maker, Fedit and either Resedit or Redit. These programs are available from the Mac User Group or your local dealer.

You can design your own screens using Macpaint. First you draw whatever picture you want in the top left-hand corner of the Macpaint page. This will be displayed in the middle of the screen you get when you boot up, and you can use the hand-shaped pointer to move around into the margin areas around it.

Once you have produced your image you should save the Macpaint document, then exit and select Screen Maker. Select Doc to Screen from the file menu and open the Macpaint picture you have just drawn. Screen Maker then converts the image to fill the entire screen. You then select the default file name of Startupscreen. Assuming that you are using Finder 4.1 or later, you can then quit and shut down from the Special menu.

When you boot up again you should see your image appear instead of the usual Welcome to Macintosh message. You may have to go back into Macpaint to centralise the picture in the screen and then go through the Screen Maker/boot-up sequence again, but it is fairly simple once you have started. If you want to see what a start-up screen looks like in Macpaint, select the Screen to Doc option in Screen Maker and then open the resulting file from within Macpaint.

The start-up screens take about 22K on disc so you can only use them if you are not pressed for disc space. If you are, you could alter the Welcome to Macintosh message instead, which is easily done using Fedit. Open Fedit and select Open Volume from the file menu. Now select the Options menu from ASCII Search and enter

WELCOME

for the search string. Click Find String, and away it goes picking up every reference to "welcome". It may pause after a few sectors or find a "welcome" other than the one you want. If so, just hit Command-R to restart.

If it cannot find the string you are looking for make sure that the bottom Scroll button is over to the left-hand side. When the string you wanted is found, select ASCII Modify from the Edit menu and position the cursor over the W in "welcome". Anything you now type will overwrite the text which is already there.

Before starting to type make sure you know what you want to say; whatever you put in can be no longer than the existing text of 20 characters. If you type more than this you will mess up the finder; if you type less than this make up the difference with spaces. When you are satisfied click Write Sector in the Edit menu and your changes will be recorded.

If you feel adventurous, have a look at the sector in its hexadecimal form by using the Display menu. In this Display format the ASCII equivalent of the hexadecimal is displayed down the right-hand side of the screen.

You can use this technique to change any of the text you want. One other screen worth changing is the About the Finder screen from the Apple menu. You search for the string you wish to replace, then type over it making sure you do not exceed the length of the original one. If you decide to do this then to save time select Bruce as your search string rather than Finder.

The Localiser program configures the keyboard and system to national characteristics. For example, in the U.K. dates take the form day/month/year, while in the U.S. the format is month/day/year. Take care which country you decide to emigrate to when using the Localiser for this purpose. Not all of them give the keyboard layout you would expect. On mine if I selected France the A, Q, Z, W and M all change position.

You can use the Localiser to get metric rulers on Macwrite, then use Resedit or Redit. Open the System file and click on

INTL ID = 0

If using Redit click the radio button labelled Metric; if using Resedit you will have to scroll down until you come to a box labelled Metric which should have a 0 in it. Change the 0 to 255, quit and agree to save the changes.

One of the changes I have wanted to implement for some time is to have the paper size default as A4. I recently discovered a way of doing this. The Imagewriter printer stores the different paper sizes it will support as paper dimensions, expressed in hexadecimal as 1/120ths of an inch. The U.S. letter size is 11in. by 8.5in. which gives

0528 03FC

as the hexadecimal equivalent. A4 size is 11.67in. by 8.25in., giving

0578 03DE

hexadecimal, and so on for the other paper sizes. The normal default is U.S. letter size, and to achieve this there are two locations which contain the default letter size as pointers.

If you change the values in these locations then the default paper size will also be changed. Using Fedit, open the Imagewriter file and do a search for hexadecimal

0528 03FC

Change the first two occurrences — or the first occurrence only in the case of Imagewriter version II. The new value should be

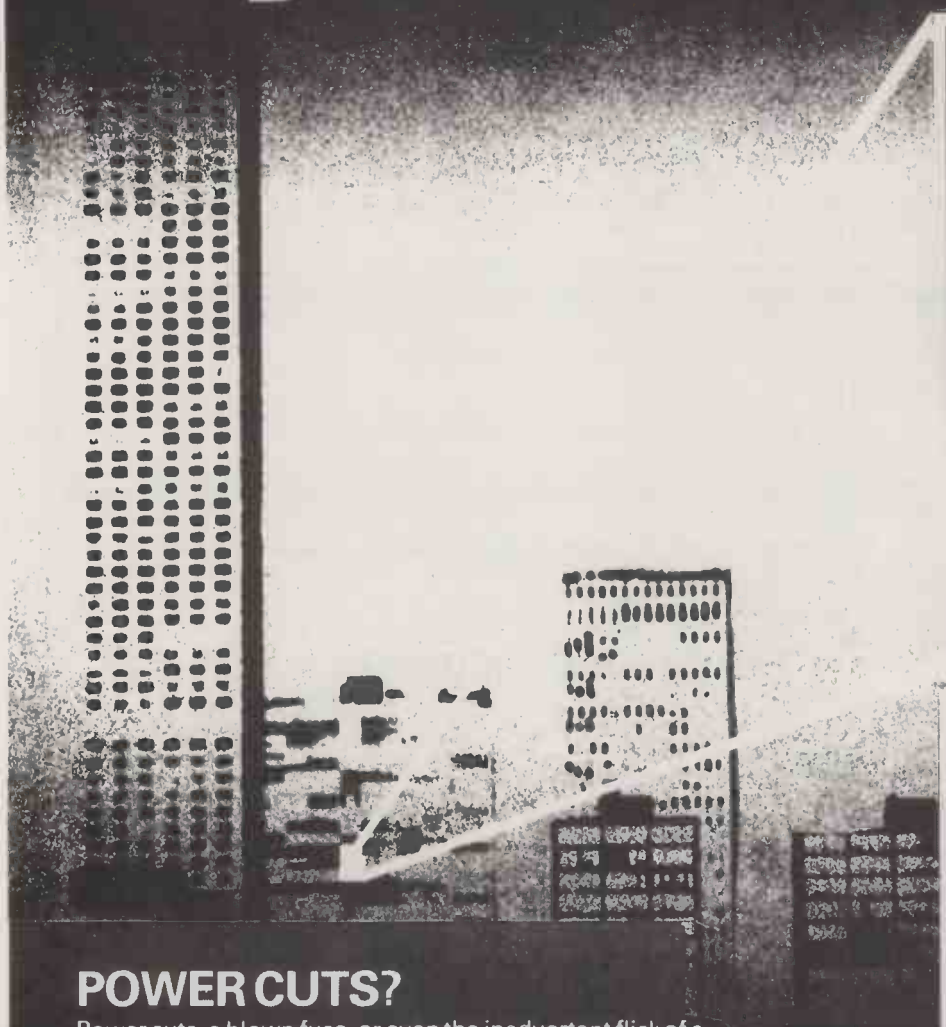
0578 03DE

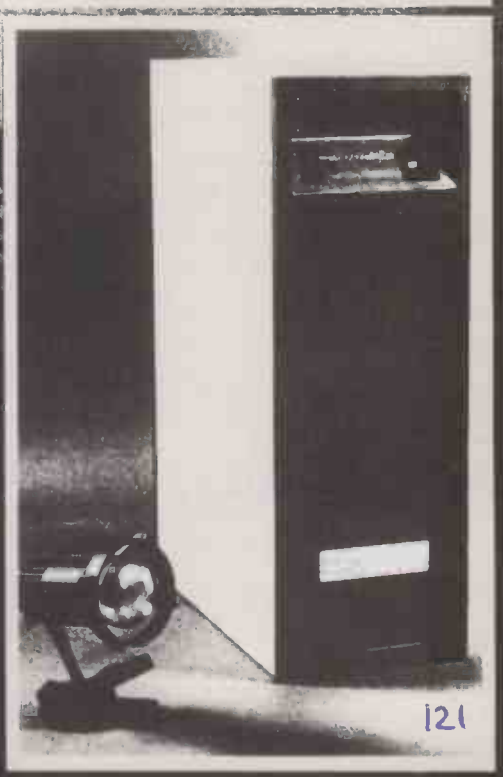
These two locations will be found just after text which reads "Cancel to terminate printing". Changing these pointers will mean that you will boot up in A4 rather than U.S. letter size.

For safety's sake always make changes on a spare disc with copies of the relevant programs on it. When you are satisfied with the changes it is easy to copy the changed files back on to your working disc.

All programs mentioned in this article are available from the Mac User Group U.K., 55 Linkside Avenue, Oxford OX2 8JE. Telephone: (0865) 58027. PC

A light in the darkness





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FILE TRANSFER

USING KERMIT

In their article last month **John Lee** and **Timothy Lee** explained the principles behind this near-universal file-transfer program. Here they describe how to use it on an IBM or a BBC Micro.

LISTING 1

```
rem version for IBM-PC that runs with PC-DOS ver 2.1
rem KERMIT transfer program disk
KEYBUK
rem set serial port to 300 baud on COM1: for modem
MODE COM1:300,,,,P
KERMIT
```

LISTING 2

```
rem serial set to 1200 baud on COM1: for printer
MODE COM1:1200,,,,P
MODE LPR1:=COM1:
rem Auxillary serial set to 300 baud on COM2: for modem
MODE COM2:300,,,,P
```

LISTING 3

```
; Make <- on IBM keyboard be a backspace, space backspace sequence
set key scan 14
\010\040\010
; set B: drive for sending or receiving files
set default-disk B:
; set Kermit to use COM2: the auxillary serial port
set port 2
set baud 300
set eof ctrl-z
set block-check 3-character-crc
```

BEFORE you try and use Kermit you should remember that MS-DOS and PC-DOS versions require quite a lot of space. The file Kermit.Exe which will run Kermit on an IBM PC or other MS-DOS micros is 84,864 bytes long. It is not really practical to use it unless your system has at least 192K of RAM.

By way of example we will describe how to connect an IBM PC to a Honeywell mainframe. You need a suitable cable to connect the 25-pin RS-232C Com 1 serial port of your IBM PC to an acoustic coupler, modem or other serial line into the Honeywell. Power-up your machine, set the keyboard to the U.K. layout by running Keybuk, set the serial port to the appropriate speed with a Mode command, then load Kermit from disc by typing

KERMIT

We use an Autoexec.Bat file to set up the system automatically when we boot up. A suitable Autoexec.Bat file can be created with WordStar, Edlin or whatever editor you use. A simple file to set up Kermit is shown in listing 1.

We prefer to use the serial port Com 1 for a printer at 1,200 baud, and a second auxiliary port at 300 baud on Com 2 for the modem. To do this you replace the Mode command by the short sequence shown on listing 2.

Our Autoexec file loads Kermit automatically. The program has a number of defaults set, but they may be changed permanently by altering the source code for the program and reassembling. Alternatively they may be reset by typing commands to the program. In the MS-DOS version of Kermit you can also reset the faults from a file called MSKermit.Ini. If it is present as start-up time it is read by Kermit, which adjusts the defaults accordingly. This file need not be present for Kermit to work, but it can be very useful as it saves you having to reset the defaults each time you use the program.

Listing 3 shows the code for our MSKermit.Ini file. The Set Key command is there to make the Back Arrow key on the IBM keyboard work properly as a Delete key on the Honeywell. By default, Kermit expects the files you want to transmit to be on drive A, and any file it receives will also go to drive A by default. The command

SET DEFAULT-DISK B:

in our file resets the default to drive B so that we can have the Kermit program on a disc in drive A.

By default Kermit will use serial port Com 1. We use this port for the printer and reset Kermit to use Com 2 with the command

SET PORT 2

Though we have already set Com 2 to 300 baud with the Mode command in the Autoexec.Bat file, we reset it here with the Mode command to 300 baud to be on the safe side, in case Kermit is run without going through the Autoexec sequence.

Kermit defaults to sending whole blocks of information, and pads out the last incomplete block in the file. This is the

NO CTRL-Z

option. We reset it with

SET EOF CTRL-Z

which puts the end-of-file marker literally at the end of the data, not padded out with garbage to the end of a block.

Another default adopted by Kermit is a one-byte check sum to make sure that each block of data has been transmitted correctly. Some versions of Kermit can also implement the more rigorous three-byte CRC check sum. This is invoked by the line

SET BLOCK-CHECK 3-CHARACTER-CRC

When you enter Kermit you will get a prompt

Kermit-MS>

Typing either

HELP

or a ? character will then give you a list of commands on the IBM version. The Stat command will give you the defaults currently in operation.

Typing

CON

after the opening prompt puts the program into terminal mode, ready to connect to another machine. You then make the telephone connection via your acoustic coupler, and press Return to wake up the remote machine — in our case the Honeywell mainframe.

You then type in the log-in sequence and password, and attach to the correct disc area. This logs you in to the Honeywell, and you can use your PC as a terminal to it to list mail, send mail, run programs, send files to the line printer, etc.

Typing the command

KERMIT

loads your Kermit program on to the remote machine, and causes the prompt to change to

KERMIT-MULTICS>

At this stage you can type Help or ? to get a list of commands available on the Multics version of Kermit: Send, Receive, Status, Set, Help and Exec. The command

SEND Filename

sends the single file called Filename from the mainframe to the PC. You can also use the * wildcard to send a set of related files. The mainframe replies

OK

and you then type Ctrl-] followed by C to break out of Multics Kermit and return control to IBM PC Kermit. The prompt then reverts to

Kermit-MS>

you then type either

RECEIVE

in which case the file received by the PC will have the same name as on the mainframe or

RECEIVE Newfilename

to rename the file received by the PC.

A menu is then displayed on the screen, and there is a pause while the Kermit programs on the two machines agree protocols on how to transfer the file. The menu shows the names of the file, the number of packets transmitted and the number of retries, thus indicating progress in transferring the file. When the transfer is finished you type

CON

to get back into Multics Kermit and transfer another file.

When all the transfers are complete, type

EXIT

to get out of Multics Kermit, then type

LOGOUT

to log out from the mainframe. A message on the screen shows

HANGUP

Type Ctrl-] followed by C to get

WHERE TO GET KERMIT

Kermit programs are in the public domain. You may not sell the program for profit, but anyone who has the program is at liberty to copy it and give it away to someone else. This is the ideal method of distribution, as the program comes on the correct disc format for the machine it is to be used on.

The MS-DOS version for the IBM and look-alikes occupies two 360K floppy discs which contain all the source files as well as the working program. The IBM PC Users Group, PO Box 830, London SE1 2BQ has Kermit on four single-sided floppies numbered 207, 208, 243 and 244 in its software library.

If you want the MS-DOS version we can supply it to you. Please send a floppy disc that has been formatted under MS-DOS or PC-DOS to us at 105 Valley Road, Loughborough, Leicestershire LE11 3PY. We will copy our own version, which we have used on an IBM PC and a Ferranti, and send your disc back to you. We will ask you in return to make a small donation to charity. This service will be available only until 31 July 1986.

As a special service to *Practical Computing* readers, Peter Murray Jones has agreed to supply the BBC implementation of Kermit on a PROM. If you wish to take advantage of this offer, which also closes on 31 July 1986, please send a cheque for £15 to cover costs direct to Peter Murray Jones at 94 Oban Street, Leicester LE3 9GA.

The official U.K. distribution centre for all version of Kermit is the University of Lancaster Computing Centre, which should be able to help if you have any difficulty. Kermit should be available from most other university computing centres too.

out of terminal mode and return to IBM Kermit. When you get the

Kermit-MS>

prompt back you type

QUIT

to quit from the IBM Kermit program and return to DOS.

Kermit can also operate in Server mode. To use it you type

SERVER

at the

Kermit-Multics>

prompt. This puts the Multics Kermit into a slave-like mode in which it receives and executes commands that have been sent from the IBM PC Kermit. You then only have to instruct the PC to Send or Get files from the other computer, rather than having to tell one computer to send and the other to receive.

After entering Server you must type Ctrl-] followed by C to ensure that the commands you type are interpreted by the PC Kermit and are not sent to the Multics Kermit. Then to move a file called, say, Test.Txt you need only type

GET Test.txt

Another Get command will transfer another file, and so on. Alternatively you can send a file to the mainframe by typing

SEND file.txt

When you have finished transferring files in Server mode, type

BYE

The PC then tells the Multics Kermit to end. It also logs out of the Multics, breaks the telephone connection and returns you to DOS.

The sequence we have just described is for transferring an ASCII text file, which uses seven data bits. To transfer a machine-code program you need to transfer all eight bits, and for this you must use a slightly different procedure. Under Multics Kermit type

SET TEXT OFF
SET PARITY ON

and under MS-DOS Kermit type

SET PARITY SPACE
SET EOF NO CTRL-Z

then carry out the transfer as for a text file.

To run Kermit on an IBM PC or look-alike you must have a working version of Kermit called Kermit.Exe. The source code for constructing this working version is contained in a number of ASM files. A set of 10 files constitutes the non-machine-specific parts of the current MS-DOS and IBM Kermit program. You will also need the files MSXIBM.ASM and MSYIBM.ASM which contain the source code for the machine-specific parts of this version of Kermit. There are different machine-specific files for other machines; versions for the Hewlett-Packard 150, DEC Rainbow, NEC APC, TI Professional, Wang PC and Zenith 100 are available from the IBM PC Users Group.

To use Kermit from a BBC Micro you should have the Kermit program on ROM. Typing

*KERMIT

then loads the program, and the message

CUCCA KERMIT SYSTEM
Press "?" for help

is displayed, followed by the Kermit prompt

BBC>

Typing the Con command then puts the BBC program into terminal mode, ready to connect to another machine. If this is a mainframe such as the Honeywell you must make the telephone connection via an acoustic coupler in the same way as with the IBM, and press Return to wake up the mainframe. Type the log-in sequence and password, and attach to the correct disc area. Then type

KERMIT

to load Kermit on the mainframe. The prompt changes to

Kermit-Multics>

To send a file from the mainframe to the micro type

SEND Filenome

The mainframe replies

OK

You then press Ctrl-f0 to return control to the BBC Kermit program, and the prompt becomes

BBC>

again.

To receive a file, type

RECEIVE

The file received by the BBC Micro will have the same name as the original file on the mainframe. When transfer is finished, type

CON

This connects the BBC Micro to the mainframe again, and you can transfer another file.

When all the transfers are over, get out of Multics Kermit by typing

EXIT

Then type

LOGOUT

to log out of the mainframe. A message displayed on the screen shows

HANGUP

To return to BBC Kermit press Ctrl-f0; the prompt returns to

BBC>

once again. Finally quit BBC Kermit and return to Acorn DFS by typing

QUIT

Setting up the hardware may cause you some problems, but the arrangement which works for us may at least provide you with a useful starting point for your own setup. Table 1 shows the pin assignments for connecting an IBM PC to an acoustic coupler using 25-pin connectors at either end of the cable. For micro-to-micro communications the wires to pins 2 and 3 must cross over in the lead. The pin connections for the serial port are different on the IBM PC/AT, which uses a nine-pin connector. The equivalent pins are shown in table 2.

The wiring connections for the BBC Micro are shown in table 3. For micro-to-micro connections, the wires going to pins 2 and 3 on the 25-pin connector must be interchanged.

The sophistication of different implementations of the Kermit program can vary considerably. The version for the BBC model B is one of the simpler ones, and it is small enough to fit into a single PROM. The version for the IBM PC is one of the most advanced and is consequently very large: it occupies 84K of RAM. It is also more complex because it supports different disc formats for PC-DOS versions 1 and 2.

Similarly the range of commands supported by different Kermit implementations varies substantially. The standard commands are Send, Receive, Get, Connect, Set Line, Set Speed, Set Parity, Server, Quit and Bye. In addition some versions may have commands for listing the current directory, deleting files and issuing commands to the remote computer. PC

TABLE 1

PC (female)	Acoustic (male)
2	3
3	2
7	7

Connections from an IBM PC to an acoustic coupler, with 25-pin connectors at each end. In addition, pins 4 and 20 at the PC end should be connected together.

TABLE 2

PC	PC/AT
2	3
3	2
4	7
5	8
6	6
7	5
8	1
20	4
22	9

Equivalent pin assignments for IBM PC and PC/AT.

TABLE 3

BBC	Acoustic coupler
2	3
5	2
1	7

Wiring connections for a BBC model B micro, using a male five-pin plug to connect to the machine's RS-423 port, and a male 25-pin plug for the modem. In addition pins 3 and 4 of the plug at the BBC end should be connected together.

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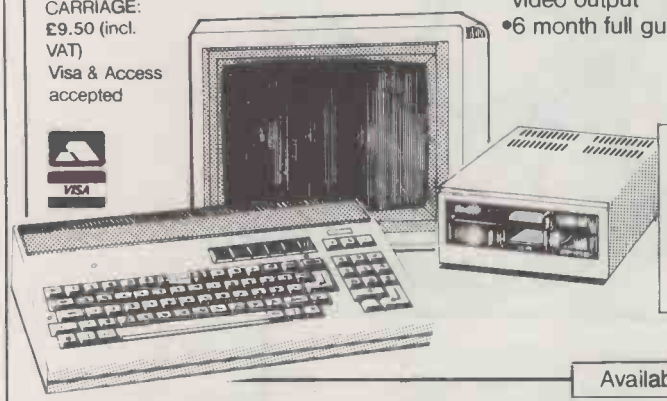

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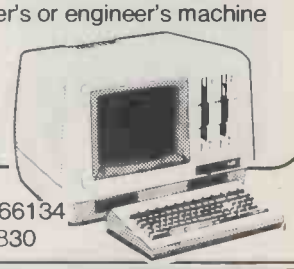

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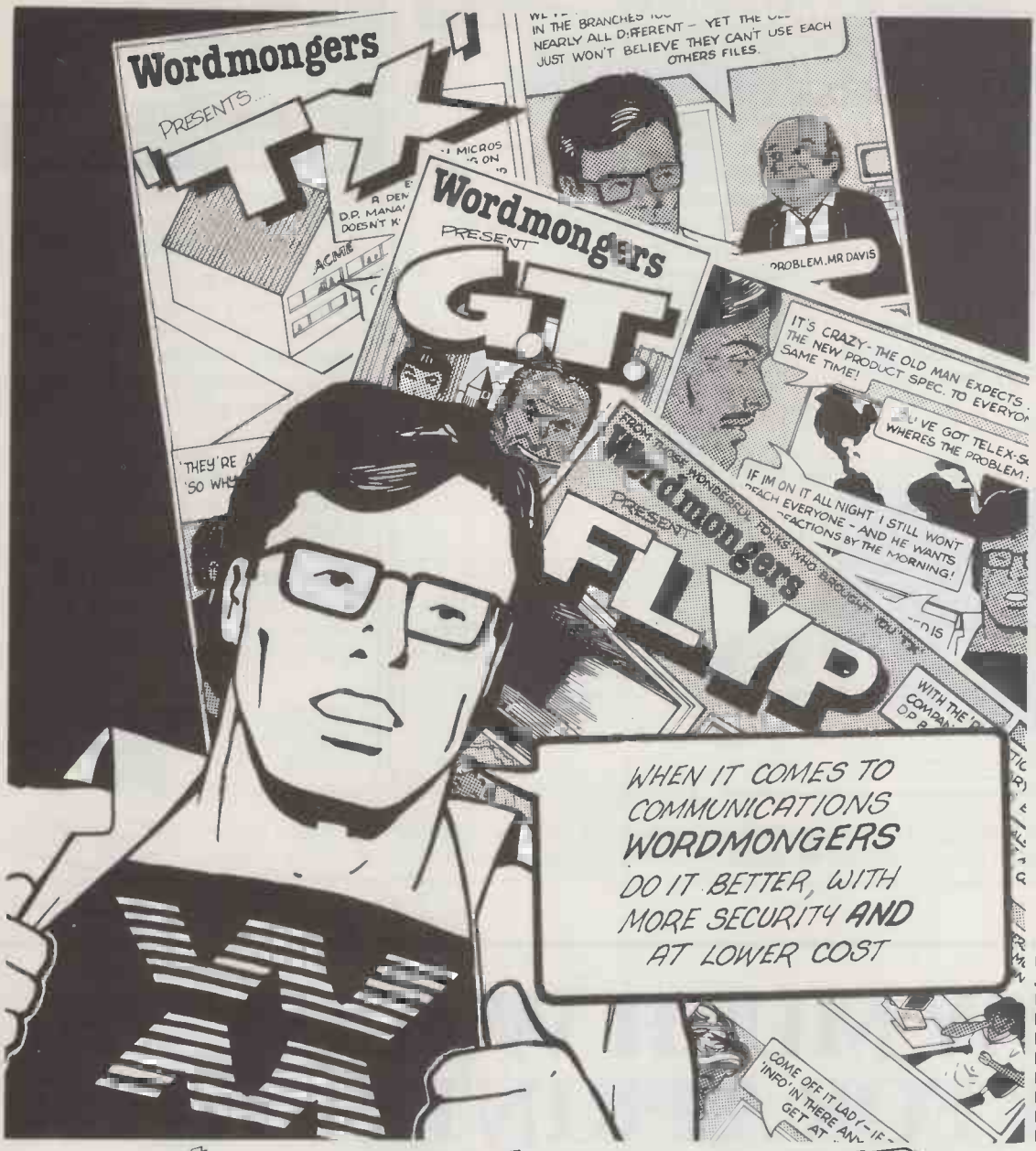

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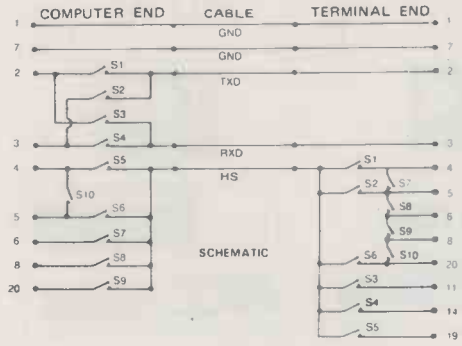

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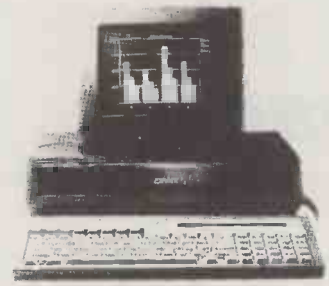

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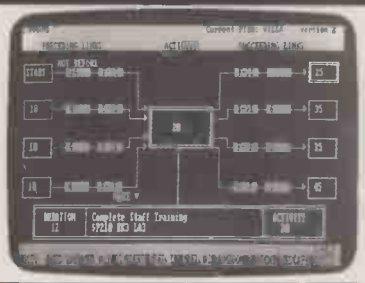

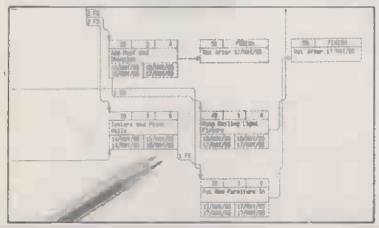

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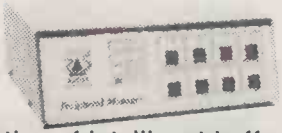

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