

# Personal Computer

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World September 1987 £1.20

Amstrad PC1640:  
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buying?

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# The new JUKI super-printer: major features



A true masterpiece from the Master Printers – that's the new JUKI 7200!

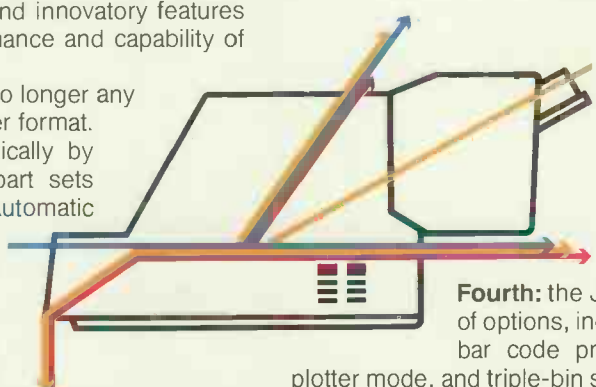
A sophisticated 24-wire flat-bed dot matrix printer, the JUKI 7200 is packed with outstanding and innovative features that take it far beyond the performance and capability of the average dot matrix machine.

**First:** with the JUKI 7200, there's no longer any need to worry about changing paper format. Continuous paper is fed automatically by tractor; single sheets and multi-part sets are fed automatically by the AMF (Automatic Multi-Part Feeder). If you need to interrupt a print run, documents can also be fed manually from the front.

**Second:** the JUKI 7200's flat-bed print system solves many of the problems associated with conventional dot matrix printers. The absence of a roller platen allows you to print perfectly on virtually many sorts of

paper, card or board, including business cards, stiff-backed envelopes, photographs and so on.

**Third:** the JUKI 7200 offers all these features – and more – at a very competitive price. Its Full Letter Quality output is ideal for word processing and graphics, while its fast print speed allows it to double as an operational plotter. All in all, the JUKI 7200 gives you maximum performance at minimum price.



**Fourth:** the JUKI 7200 offers a wide range of options, including interchangeable fonts, bar code printing, OCR printing, colour plotter mode, and triple-bin single-sheet feeder. No matter what your business, expansion and flexibility are no problem with the JUKI 7200!

## JUKI

The Master Printers

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SLRnk-PLUS (Z80)	CP/M-80	£150

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Vol 10 No 9 September 1987



Cover photography by Chris Bell  
Cover story begins on page 98

## BENCHTESTS & REVIEWS

### PC LAPTOPS

It is now possible to buy a PC-compatible laptop for not much more than the cost of a desktop machine. John Donaldson Benchtests three fully-configured laptops which cost less than £1000 and offer true battery power — the Datavue Spark, the Toshiba T1000 and the Sharp PC-4501A.

### AMSTRAD PC1640

Alan Sugar has upgraded the Amstrad PC — it now has enhanced graphics and 640k of RAM. Robert Schifreen looks at the improvements.



### CAMBRIDGE COMPUTER Z88 108

It has taken four months to get here, but now Sir Clive Sinclair really *is* shipping his Z88 laptop. Robert Schifreen takes delivery of one of the first production machines, and finds it to be truly portable and very capable.

### 98 KURZWEIL DISCOVER 114

The new Kurzweil scanner isn't cheap but it is very smart. Using artificial intelligence techniques, it is capable of reading printed text regardless of size, font or format. David Tebbutt investigates this ingenious piece of hardware.

### C COMPILERS 124

Borland's Turbo C is fast, easy to use and conforms to existing C standards, but the market is well-stocked with powerful competitors. Nick Walker compares Turbo C with Zorland C and Mix C.

### OMNIS QUARTZ 136

Five hundred programs are being developed for Microsoft Windows, but there is only one fully relational database among them — Omnis Quartz from Blyth Software. Derek Cohen and Nick Walker take a long, hard look at this friendly but powerful database.

### DESQVIEW 142

Owen Linderholm can now run multiple PC applications with true multi-tasking — and most within windows. No, he hasn't taken delivery of OS/2 or a new 386 machine — all this is possible on a standard PC with the latest version of DESQview.

### XPRESS 146

The Apple Macintosh has always been a popular choice for desktop publishing and now, with Xpress, it offers an even more professional set-up, with unprecedented typographic control over page layout. Graham Jones considers it to be a new standard.

Founder Angelo Zgorelec Editor Derek Cohen Deputy Editor Nick Walker Production Editor Ginny Conran Deputy Production Editor Lauraine Danker Technical Editor Owen Linderholm Staff Writer Robert Schifreen Editorial Assistant Chris Cain Consultant Editors David Tebbutt, Dick Pountain Art Director Martyn J Rowbotham Art Assistant Soo Abram Publishing Director Mike Agate Publisher Mike James Production Controller Judith Middleton Production Manager Rachel Wynne Group Advertisement Manager Jan Pitt Advertisement Manager Moira Thomson Deputy Advertisement Manager Nick Ascough Sales Executives Julie Carter, Janett Harrison, Stephen Babb, Sally McLester Anthony Lavelle, Helen O'Driscoll Advertisement Assistant Val Young

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Optical disk technology is still in its infancy, but two forms of optical media, the CD-ROM and the WORM drive, are fast becoming popular means of high-capacity storage. Nick Hampshire explains.

## GRAPHIC ALGORITHMS

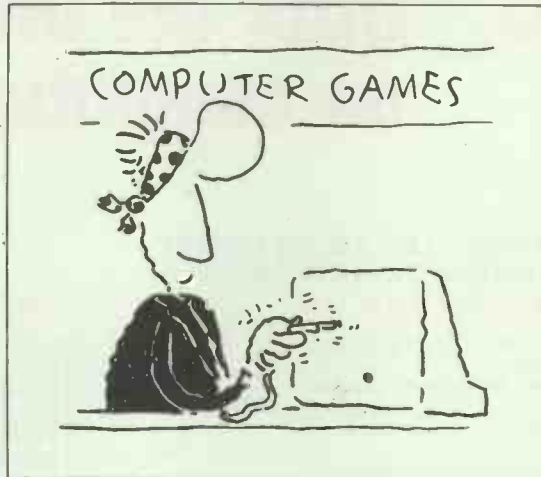
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Amassing a collection of graphics primitives is a time-consuming task, but they can be an invaluable programming tool. Mark Parlour presents a detailed collection of Turbo Pascal algorithms which could lead to some impressive graphic output.

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Dr Andrew Herd charts the progress of computing technology in the doctor's surgery, from the great claims of early mainframe expert systems to the use of personal 'credit card' patient records.



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Guy Kewney sifts through the latest news, and uncovers the truth behind the lack of IBM desktop publishing products and the Amstrad rumours.

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Martin Banks is disturbed by the poor quality of certain printed matter which has dropped through his letter-box, and tracks the problem down to the misguided use of desktop publishing packages.

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A full list of UK user groups can be found among the regulars.

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## CHIP CHAT

More humorous happenings.

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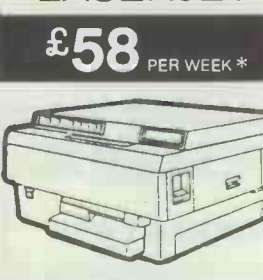
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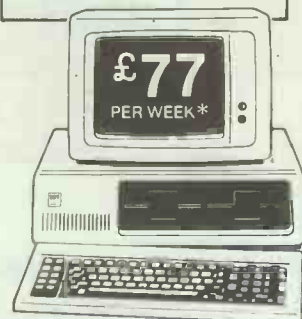
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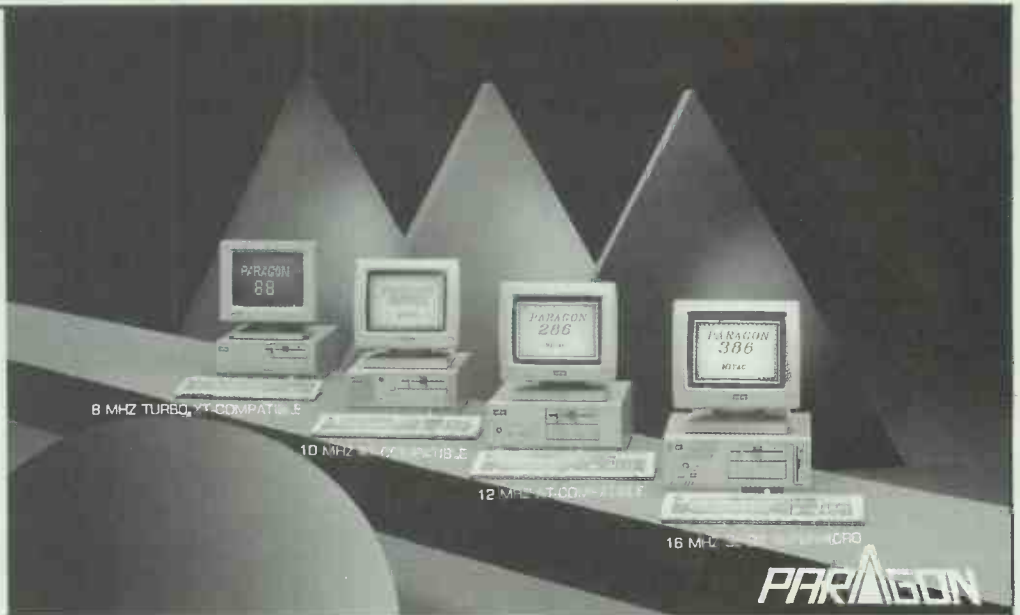
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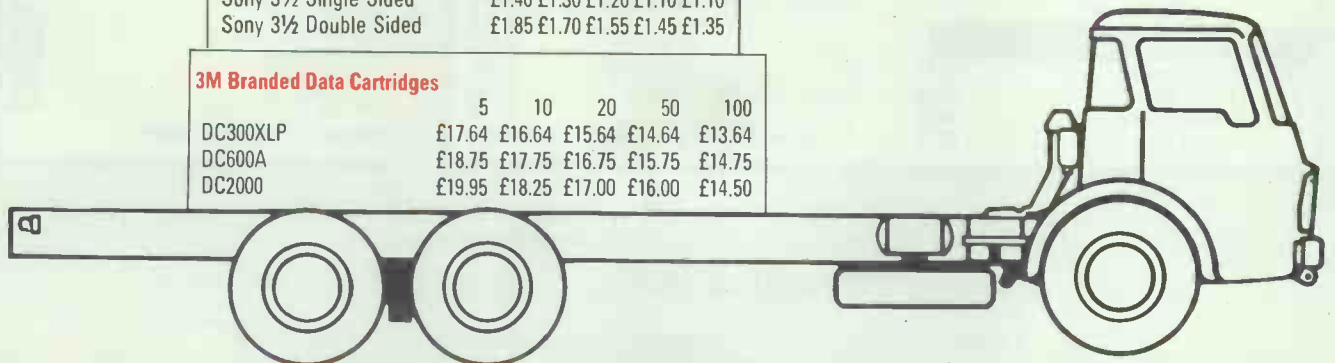
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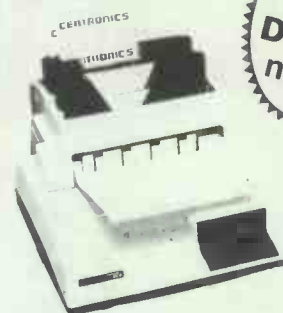


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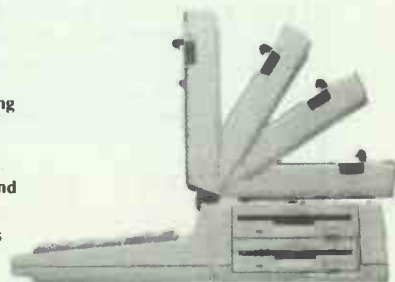
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NEC Pinwriter P7 72/216 24P 136c .....	438
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Olivetti 285/1 Colour 35NLQ/160 JX 80 .....	418
Olivetti DM 250 .....	329
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Panasonic KX-1592 38NLQ/180 136c .....	340
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Star NL10 30NLQ/120 80col + interface .....	210
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Taxan 815 NLQ/180cps IBM set NEW .....	258

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Intel 8087 5Mz .....	100
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NEC Drams 64k 150ns 9 chips .....	18
NEC Drams 256k 150ns 9 chips .....	25
NEC V20 replaces 8088 .....	14
NEC v30 replaces 8086 .....	14

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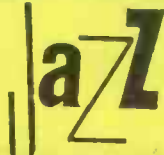


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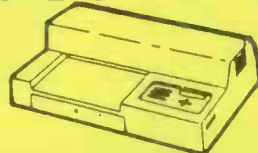
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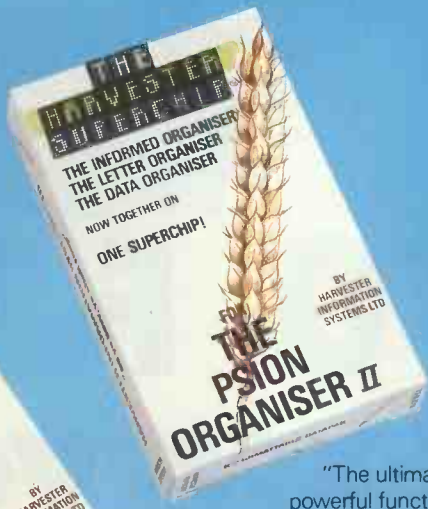
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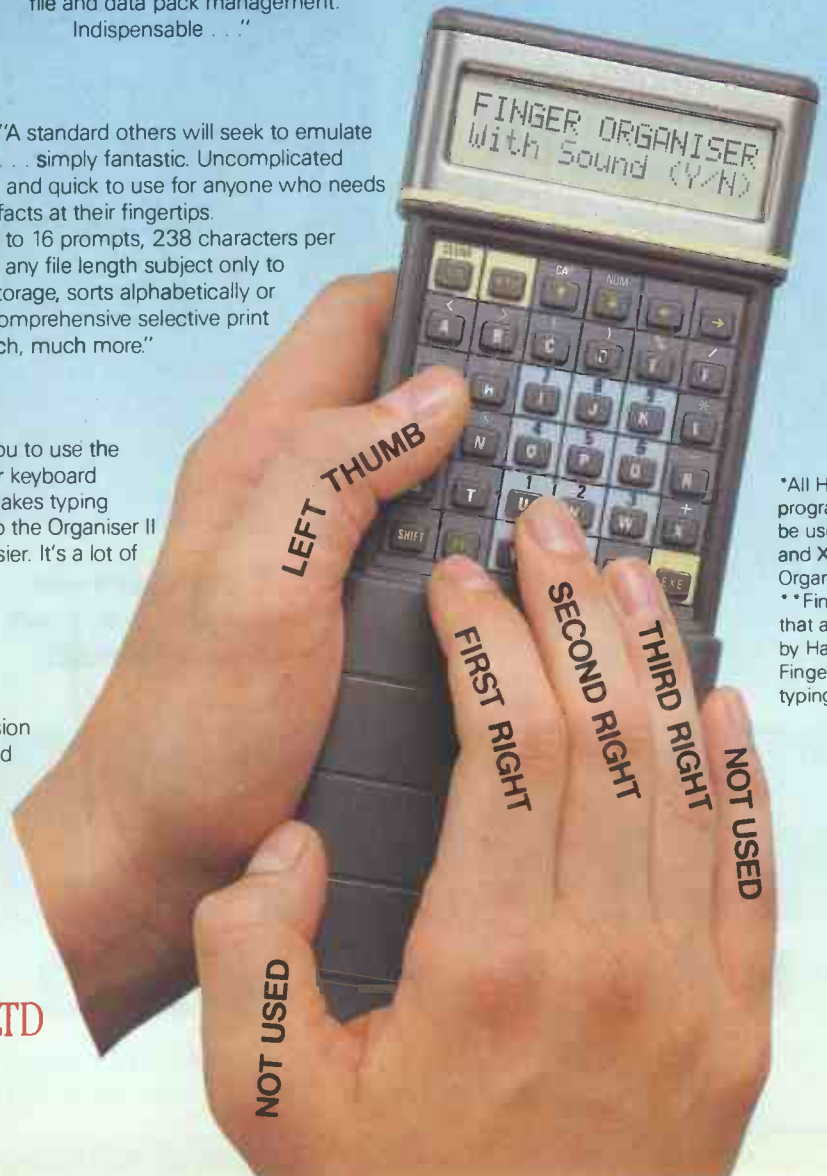


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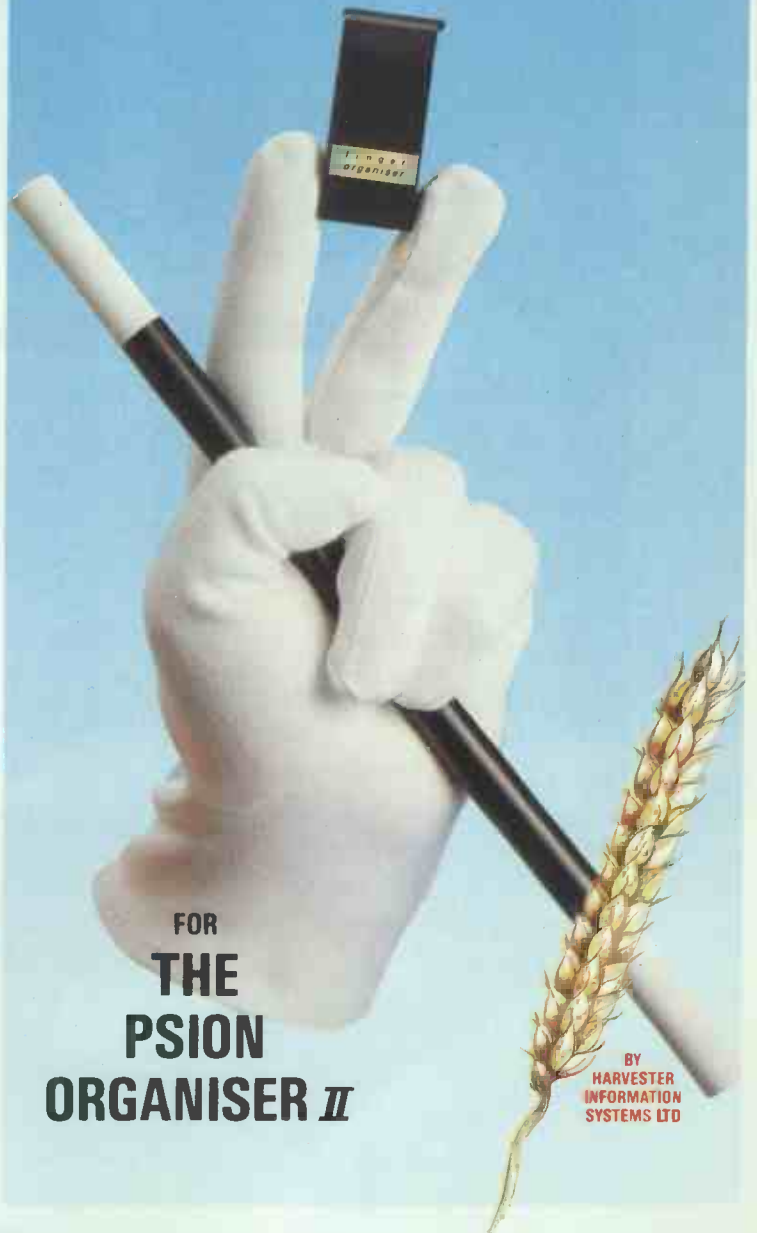
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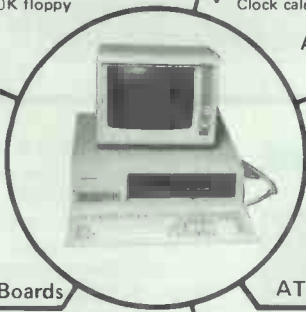
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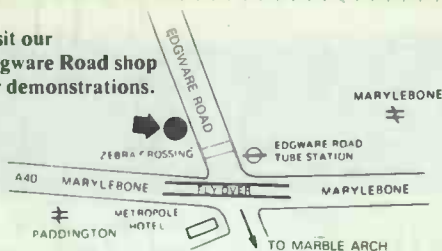
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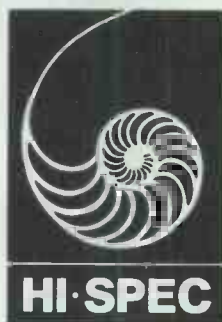
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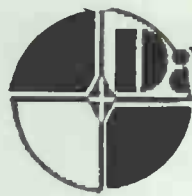
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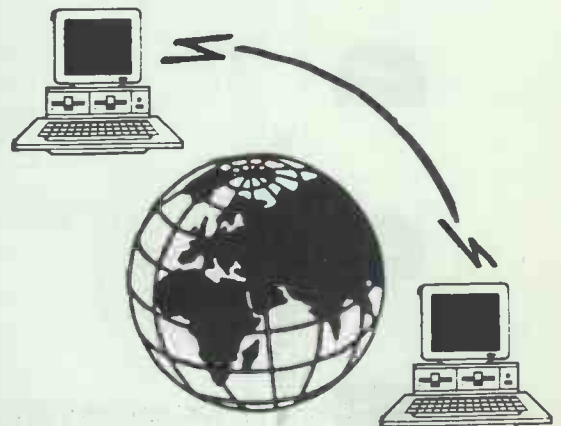
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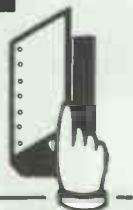
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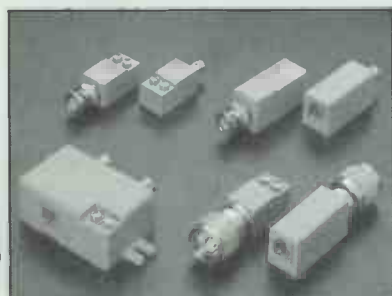
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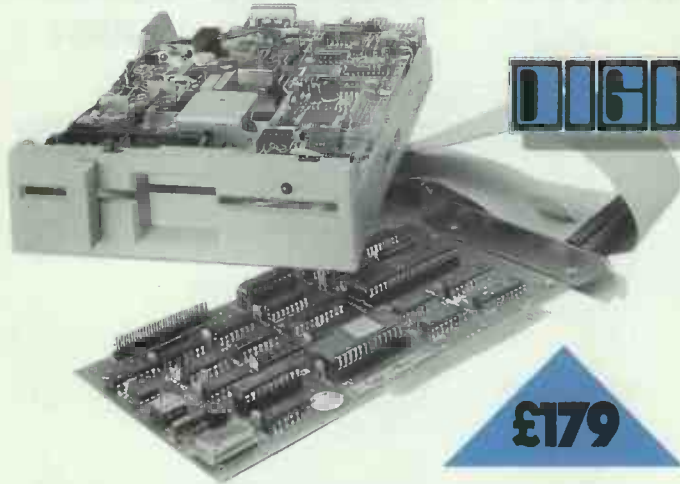
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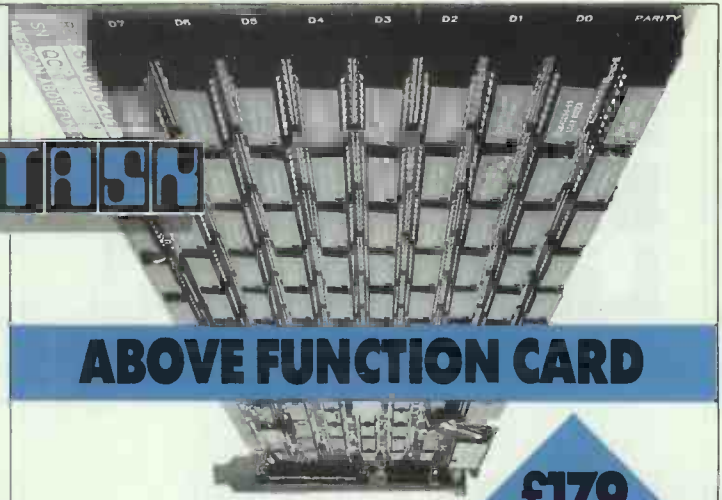
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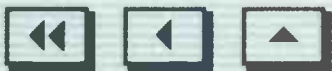
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## VCR style symbols



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Next F/Forward Last

Review records with CURRENT, FIRST, LAST, PREVIOUS, and NEXT. Scan automatically with FAST FORWARD and REWIND. Interrupt or terminate scanning with PAUSE or STOP.

## Key Look-up



Call up a single record from a file instantly by clicking on this button.

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Select and work with any category of records from your file. The Superbase

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Link files together in a free and flexible way. Form new links between files whenever you choose. Split one database into several or create a new database from information in several files. Save your Queries to use again.

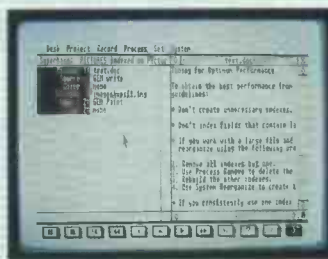
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This review, our first in the UK, concluded that the 286<sup>12</sup> ‘has a higher specification than just about any standard machine’...

- Intel 80286 running at 6 or 12 MHz
- High resolution Monochrome Monitor
- One megabyte of RAM on the system board
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- Combined floppy and hard disk controller
- 192 watt power supply
- Eight expansion slots (five available)
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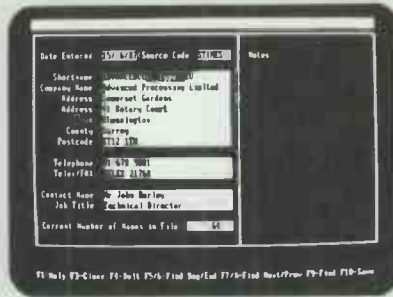
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# How to write your own software without the help of a programmer!



Mailing List Menu



Entry Screen



Print out to Screen

## Develop your first application on day 1.

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"Excellent value for money, especially for novices wanting to learn and developers wanting economic runtime systems." **Personal Computer World Magazine**

"There is no doubt that TAS is a very capable product. It handles serious sized applications and does so with speed." **What Micro Magazine**

"TAS manages to pack plenty of power into its small price." **PC Magazine**

"On a value for money basis this must be one of the most attractive databases on the market."

**Accountancy Age**

"If you cannot find a commercial package to suit your organisation then most certainly this must be one of the first places to start looking in order to produce a system of your own." **Personal Computing with the Amstrad**

## Never run out of steam.

TAS is so fast and powerful that most of the TAS utilities are developed in TAS itself. No other database is remotely capable of doing this. And that is exactly where you benefit. It's simple enough for the first timer but powerful enough for the professional software developer. So you have little to worry about whether TAS is suitable for your particular application or not.

As PCW Magazine said in their review of TAS Plus: "Excellent value for money, especially for novices wanting to learn and developers wanting economic runtime systems."

## Build a reputation for efficiency.

TAS is for people like you. You like using a computer. You know that it is vitally important to have accurate, up-to-date information instantly available. You also know of many applications that can be done easier, better and quicker with a computer. Cut down on shuffling bits of paper. Cut down repetition. Everyone performs better because the job is more interesting and more fun. That's what TAS is all about. With TAS you can make a computer do what you want it to do.

## Nothing else needed.

At £99.00 TAS-Plus is complete. It consists of the Relational Database, Screen Painter, Program Generator, Report Generator, Database Browser, 4th Generation Language, "Idiot Proof" (no disrespect) drop-down menu-driven Command Editor, Runtime Compiler for fast program execution, Tutorial and Manual.

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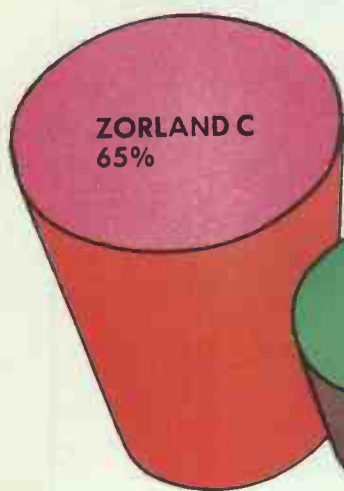
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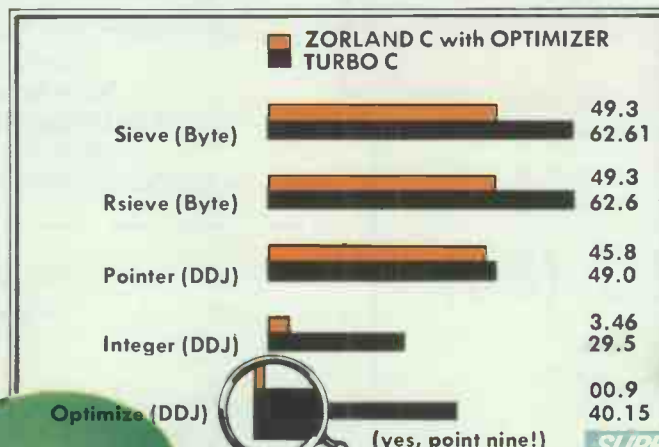
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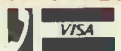
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  - 24-bit address bus
  - 64x32-bit data & address registers
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  - 56 instructions
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  - 5 data types
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### 520ST-M

The affordability of Atari computers is reflected in the price of the 520ST-M keyboard, which is a mere £259 (inc VAT). This version of the ST comes with 512K RAM, as well as a modulator and lead for direct connection to any domestic TV. The price does not include a mouse. In addition, when you buy your 520ST-M from Silica, you will also receive the FREE Silica 'ST Starter Kit'. During 1987, many software houses will be producing games software on ROM cartridges, which will plug directly into the cartridge slot on the 520ST-M keyboard, giving instant loading without the expense of purchasing a disk drive. With the enormous power of the ST, you can expect some excellent titles to be produced, making this the ultimate games machine! If your requirement is for a terminal, then the 520ST-M can fulfil this role too. Leads are available to connect the ST to a variety of monitors, and with the imminent introduction of terminal software on ROM cartridge, the ST provides a low price terminal for business use. If you wish to take advantage of the massive range of disk software available for the ST range, you will need to purchase a disk drive. Atari have two floppy disk drives available, a 1/4 Mbyte model £149 and a 1Mbyte model £199. Full details of these drives, as well as the Atari 20Mbyte hard disk are available on request. If required at a later date, the mouse may be purchased separately.

**£259**

### 520ST-FM

The 520ST-FM with 512K RAM and free mouse, represents a further breakthrough by Atari Corporation in the world of high power, low cost personal computing. This model is the latest addition to the ST family, and is not only powerful, but compact. It is priced at only £399 (inc VAT) a level which brings it within the reach of a whole new generation of computer enthusiasts. When purchased from us, it comes with the FREE Silica 'ST Starter Kit' see paragraph on the left. To make the 520ST-FM ready for use straight away, Atari have built into the keyboard a 1/4 megabyte disk drive for information storage and retrieval, allowing you easy access to the massive range of disk based software which is available for the ST. This new computer comes with all the correct cables and connections you will need to plug it straight into any standard domestic television set. You do not therefore have to purchase an Atari monitor. If you do require a monitor however, these are available with the 520ST in the following money saving packages:

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

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

**£399**

### 1040ST-F

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

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

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

**£599**



To: Silica Shop Ltd, Dept PCW 9, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

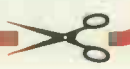
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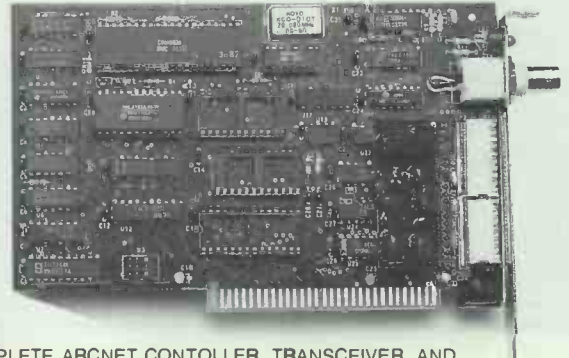
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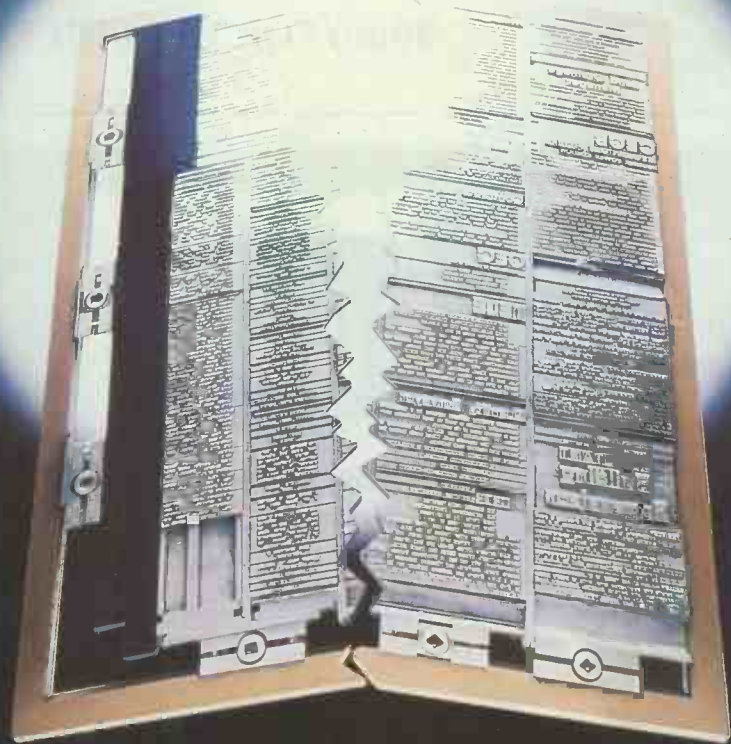
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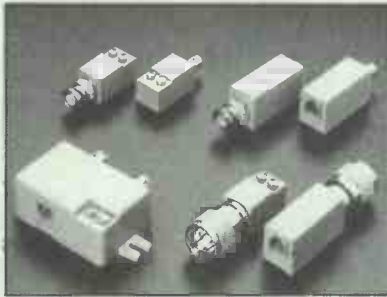
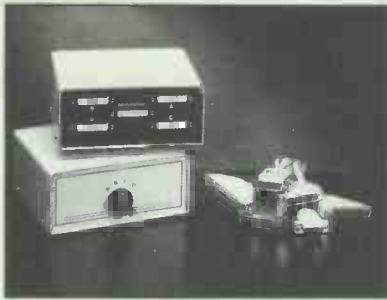
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*The runaway success of Amstrad has impressed many people, but his pricing policy following the launch of the PC1640 has cast a cloud. Guy Kewney searches for a silver lining, as he kicks off this month's news review.*

## What price an Amstrad PC?

The news that the price of an Amstrad 1640 will be only £130 more than the equivalent PC1512, leaves me (for the first time since I met him) doubting some of the marketing wisdom of Alan Sugar.

Alan Sugar is (he says) totally convinced that he has no need to cut prices of his original PC1512, even though his new PC1640 (Benchtest, page 106, this issue) is priced at only £130 more than the equivalent 1512 models.

Sugar believes that the PC1512 will continue to sell strongly, because it will

appeal to a 'less discriminating buyer.' In other words, a schmuck.

He said: 'I am assured by my people — and I know this is right — that the 1512 is now positioned for the consumer electronics market.'

One of Amstrad's distributors put it less tactfully: 'To you or I, who know about computers, the difference is slight. But to the sort of nerds who buy Amstrad, £100 is £100 — it's worth two days in Majorca, and they will go for the low-cost option.'

Actually, this theory has been well-proven, in general, by Tandy's experience with two remarkably similar price/performance machines in the US. Despite the fact that one (the Model 1000) is an awful

piece of work, and costs the earth to upgrade and really needs upgrading, people save a pitiful \$160 by buying it, and not the Model 3000.

Sugar nailed his colours firmly to the price mast. 'I think we will sell far bigger quantities of 1512s than 1640s,' he said. 'I'm not normally wrong, and will be prepared to stand by this in six months' time.'

Well, he *isn't* often wrong. He is sometimes marginally wrong. He was wrong when he predicted large sales of single-floppy or double-floppy monochrome PC1512 machines. Instead, he sold lots of hard-disk machines, many with colour.

Financially, this hardly matters; I expect him to come out of that mistake smelling of roses, since these machines make much more profit for him.

And when he unveils his half-year figures, they will accordingly be good, and he will certainly say that this 'proves' that the press invented stories about flagging PC1512 sales.

I'm afraid the press didn't, and it doesn't.

The price of the 1640 may be another mistake. The trouble with his prediction is that it depends on the buyer staying ignorant.

You can count on that — up to a point. Not everyone will be ignorant. *PCW* readers will be told (here it comes) fair and square: 'Don't touch the 1512, go for the 1640 — it's a *much* better machine.'

But I told *PCW* readers to avoid WordStar 1512 because it was awful and wasn't even WordStar. And there are more than enough people out there who don't read computer magazines (or don't believe what I tell them) and they made WordStar 1512 the best-selling program in the country.

Some readers will even say: 'What the heck, that £130 will buy me a printer,' and will only discover a year later that the printer is not that beautiful, and that they want to plug in a different

screen after all, and can't.

But this time, Sugar doesn't have the shopkeeper on his side.

WordStar 1512 was a great deal for the shopkeepers — an extra £70 on the sale. Naturally, they didn't reveal my rude comments to the potential buyer.

But the 1512 and the 1640 are going to stand side by side in the shops. Side by side, the 1640 is very, very clearly the nicer machine, even before you start counting the internal slots and asking intelligent questions about what you can or can't plug into it.

Of course, the PC1512 starts at £500. People will go into the shop because they see that price in the window. But someone who goes into the shop to buy the Amstrad PC because 'it costs £500' will not buy that single-floppy mono machine. I know that, because they don't: they quickly change their minds and go for the hard-disk, colour machine. That's what's been selling.

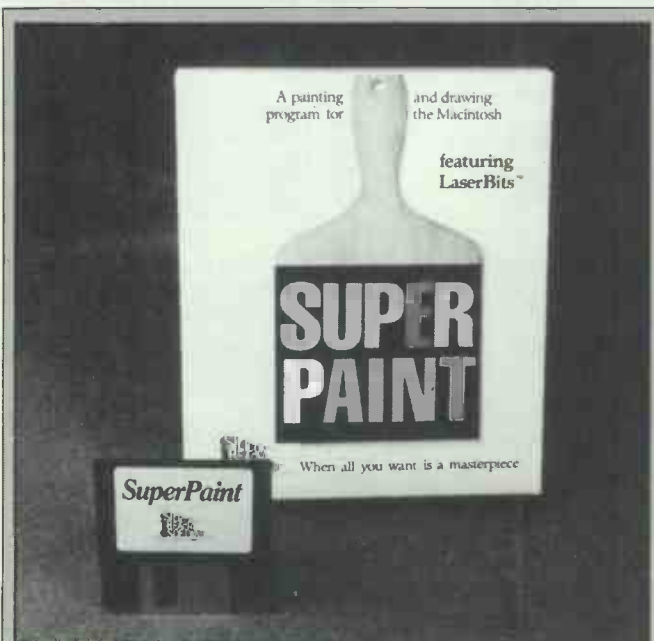
When the shopkeeper has explained to the customer why they are buying the colour machine, the temptation to switch them to the 1640 will be strong. Not only is it an extra £130 on the price, it's an extra £100 profit to the shopkeeper because Amstrad gives an extra six per cent margin on the 1640.

I don't mind watching Alan Sugar putting his trust in the gullibility of fools. But relying on the generosity of shopkeepers?

Frankly, I find it hard to believe. I think that something else is coming — probably, the extinction of the 1512 and the release of an 80286, or 80386, system.

As detailed in the 'Lost in the woods' story on page 78, you can buy an 80386 system in London for £1595, including a floppy disk and a mono screen. And you can buy a Dell 286 system with a hard disk and colour for £1799.

The problem doesn't just face Amstrad. There are lots of people out there planning



**SuperPaint for the Macintosh is quite a lot more than a 'latest version' of Macpaint.**

**Where MacPaint lets you put text into pictures but treats it like graphics, SuperPaint treats it as text which you can actually edit.**

**Where MacPaint sees only pixels, SuperPaint sees 'shapes' and has a 'draw' layer where they can be moved.**

**There are multiple windows, and a whole host of goodies like 300 dots per inch 'laserbits', and dot-by-dot editing of pictures at ultra-high resolution.**

**Full details can be obtained from the importer, P&P Micros, on (0706) 217744, but SuperPaint should be on sale in Mac shops.**

to release super machines based on the 80286, who have been working on them for a year or so, and who were counting on selling them for £2400 each.

A lot of these people are going to stare ruin straight in the face. A lot of *those* people will dodge ruin, by dumping their entire stock on the market for whatever price people will pay.

By Christmas, there's a good chance that prices will be tumbling down. And by then, honestly, I expect Alan Sugar to have no PC1512; for the PC1640 to cost just over £1000 with a hard disk; and for him to have a 386 machine announced — or ready for release as a desktop publishing package — for around £1800.

People who think they know what's going on behind silicon screens in Brentwood, assure me that the 286 machine has been scrapped. But they also suggest that the 80386 system, to be launched soon, will not actually be available until the end of the year — or even later.

And they suggest that this system will include some clever extras — in desktop publishing, facsimile equipment, scanners, laser printers, and so on. I've even been assured that the new Digital Research desktop publisher program will be bundled with it.

We'll find some clues at the PCW Show next month.

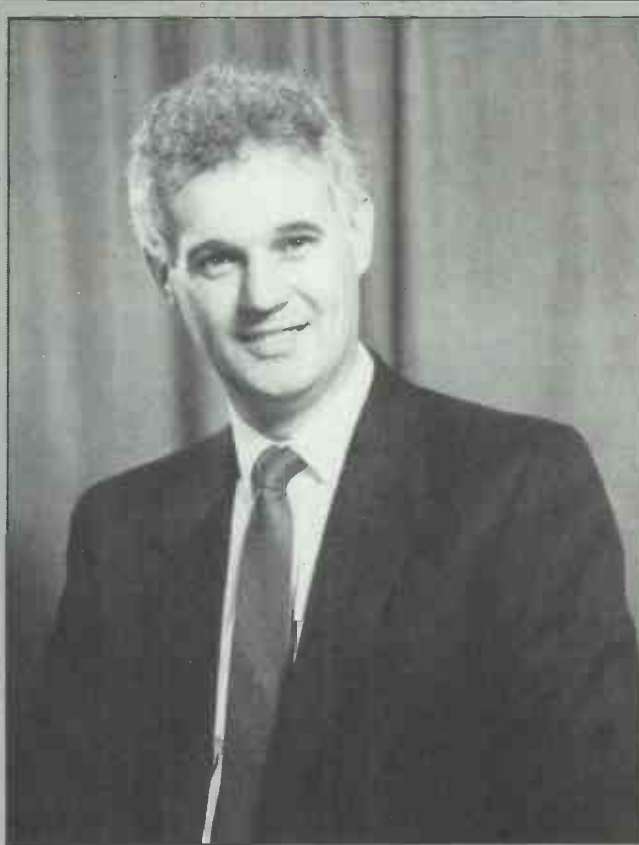
## DosEdit's lurking memory

When playing an Infocom adventure on a PC-compatible, use DosEdit. But beware! If you are playing something like Lurking Horror, DosEdit will give you away to your colleagues.

DosEdit is one of those indispensable programs of unknown origin, which was 'found' inside Microsoft. All it does is repeat the last command given to DOS.

Normally, you can do that with the F3 function key. What makes DosEdit nice is that it remembers the previous 15 commands, too. And it lets you edit them.

So, when you type a complex command such as:  
`pco /r/m = %1/q/l = c:\out\pro.cfg`  
and then find that you should be in a different directory, you can type 'cd\pco', hit the up arrow, and the previous command will reappear.



*I'm not going to make a habit of printing pictures of industry figures, but this striking portrait of the white-headed gent I think of as Sir David Whitehead, charming ex-boss of Adda Computers, was just too nostalgic for me to pass over.*

*Time was, you know, when Commodore was the country's leading supplier of business micros. Then Jack Tramiel fell in love with the Vic-20 and the Commodore 64, and the company abruptly jilted all its business dealers.*

*Each time PCW printed a story about how badly they were being treated, and how they were dropping Commodore and selling alternative micros, Commodore would phone up. 'It's nonsense,' a representative would say. 'Just ring up any of our dealers — try David Whitehead, for instance — and ask him.'*

*And each time, Whitehead would respond that Commodore was a benevolent company, wonderful to dealers, reliable in delivering products when it said it would. And we would wonder what had got into him.*

*I visited Commodore recently and met someone from the old days, and I said: 'Do you remember Sir David Whitehead, who has now taken over as head of SPI?'*

*'Oh, yes,' said this person thoughtfully. 'His company was virtually bankrupt from the day it started until the day it was finally wound up. He would say anything we asked him to ...'*

And if, in an Infocom game, you type:

get red indian headdress  
with cowboy lasso  
and the system says 'You Already Have It', and you realise it was really the Spanish sombrero you wanted, then don't retype — just hit the up arrow.

But don't be too sure you're safe. Most Infocom games are played by 'serious computer users' at their place of work. And it is generally regarded as good policy, when a supervisor

happens by, to be working on something less entertaining — a spreadsheet, perhaps, or copying a list of files onto someone's floppy.

Unfortunately, DosEdit will remember the last 15 commands you typed in Lurking Horror. It can be embarrassing to hit one too many up arrows after typing:  
`copy *.dif c:\lotus\bak\`  
if the last command you gave the game was:  
kill professor with magic stone.

## Love conquers all

As the person who put his reputation on the line by testing Sir Clive Sinclair's Z88 before he built it (Benchtest Preview, PCW March), I have to say I'm very, very relieved by the appearance of the real thing.

If anything, the working Z88 is better than I expected. It has been given the full Benchtest treatment on page 108 of *this* issue so I won't bore you by repeating things here. But, having the thing has changed my life.

Previously, I simply couldn't manage without my Tandy Model 100. I used it for note-taking in press conferences, meetings (I was a whizz at the PTA), and for communications with the office from strange locations.

With the Z88, I have five times the machine in half the weight. And the weight is the single most important thing about a portable computer.

Grouses? I hate the space bar on the keyboard, which only works if you hit it in the right place. The keyboard took a little getting-used to, but then any new keyboard needs adjustment on the part of the user. I can certainly type fast enough on it, but I do miss a positive space bar.

And worse, I find that all my spell-checkers are useless at spotting missing spaces, so editing my notes takes longer than it should, once I've transferred the data from the Z88 to the PC.

One day, I dare say I will accidentally drop my Z88. When I do, I'll report on how robust it is. But at the moment, I love it too much to take the risk.

## Cake eaten, and kept

We have all vastly enjoyed the spectacle of Rod Canion, boss of Compaq, producing in public the cake he ate three months earlier, when IBM launched OS/2.

On the day that IBM announced its PS/2 systems (2 April), Canion went on record deriding OS/2 as useless since there was no software that used it, and the operating system wouldn't be ready for months, if not years.

In June, Canion changed his tune because his biggest customers came to him,

saying (along the lines of):

*Dear Mr Canion, We're sorry to hear that you won't be supporting OS/2 on your machines. We have put a recommendation to the board that we go with OS/2, and this, of course, means we will have to remove your machines from the recommended list...*

He didn't change his tune in private.

He invited several UK journalists to a New York conference with Microsoft, Lotus, Oracle and DCA (the Irma firm), and paid their air fares and hotel bills, too.

There, he spoke reassuringly about how he could demonstrate OS/2 on one of his machines (and there it was, switching tasks, see?) and there was his very good friend, Bill Gates, head of Microsoft, the company which wrote OS/2.

We sent Owen Linderholm over to the Big Apple and, after enjoying the show, he buttonholed Bill Gates, producing the short — but sweet — item that follows.

*Owen Linderholm writes:* Bill Gates of Microsoft has proved that black is white.

After the OS/2 conference in New York, I had the chance to question Bill Gates more closely about the system — specifically, why it could only run one 'real-mode' task.

A real-mode task is one that can be found on any PC; and, under OS/2, if you are running one of these tasks, you can't use its famous ability to run more than one program at once. All other programs 'freeze'.

Programs exist, like DESQview 2.0 (see page 142, this issue), which manage to run more than one real-mode task. They do it by partitioning the tasks off, on an 80286 machine, and monitoring them to ensure that conflicts don't occur.

Bill Gates had an easy answer: 'It's not worth doing.' An easy answer perhaps, but not one I could accept. This didn't impress him: 'I'm the world's greatest expert on this subject' (operating systems) he said, modestly.

Finding this self-praise possibly true but unconstructive, I pointed out that it was possible to run two 320k programs in 640k of memory; and that it was quite possible to run a communications program (like Mirror) in the background, and another

program in the foreground.

Gates responded by muttering something about 'bound to trash the hard disk' and rushed off. I have to admit to feeling rather offended by this arrogant and insulting behaviour — after all, there were plenty of sensible things he *could* have said in reply.

My feelings after the conference and this encounter with Bill Gates are: he tried to hijack the conference as a platform for hyping OS/2, and for persuading all the major manufacturers to endorse the system before it is shipped.

In other words, Bill Gates and Microsoft are trying to force users to buy OS/2, even before they have had a chance to try it.

This is dangerous — it could lead to the current DOS being left behind as a kind of ghetto for unsophisticated users. But, since many users are quite happy with things as they are, they will resent being pushed into spending more money than they need to.

There was one bright note at the conference: Jim Manzi of Lotus, talking about the likely price of OS/2 software, revealed a secret design concept for his company's products.

'We will stick,' he said solemnly, 'with our algorithm of eight cents per byte, for software.'

## Byzantine British Telecom

It is the natural reaction of our country's Authorities, when they find that their employees have been caught doing something naughty, to rush off and do something about it.

Not, as you might expect, to stop the naughty people, no: they stop the people who have caught *them*, from talking about it.

My PCW colleague, Robert Schifreen, together with another colleague, Steve Gold, have mercifully been de-convicted of forgery after they used the password of the Duke of Edinburgh to gain access to Prestel. The Appeal Court judge, Lord Lane, described British Telecom's attempt to pervert the law of forgery into a protection against password misuse as 'Byzantine', and I almost agree.



**With luck, this is the last daft pic of an Amiga that PCW will have to print for some time. I actually feel that the machine will be selling well by the end of the year.**

**Displayed onscreen is an application developed for the Amiga by Bell & Howell, called 'automated inline mailing'. Whoopee! (yawn).**

**But a visit to Commodore's new management team at Maidenhead produced... well, not exactly optimism, but relief, at least.**

**At least there are now people at Bell & Howell who admit that Amiga sales weren't good, that the price was high, and that the Amiga 2000 and the Amiga 500 are both better machines than the original model. They seem to be refreshingly free from mediaphobia, too.**

**You really do want an automated inline mailing system? Details from Bell & Howell, on (0784) 51234.**

Laws about secrecy are becoming crucially important to people in the computer world, and it's time we took them more seriously.

Our governmental system gives self-confessed criminals immunity from prosecution if they will give evidence against other criminals. But, when it comes to investigating its own malpractices, strangely, the same system suddenly becomes a stern upholder of the 'doctrine of confidentiality'.

British Telecom (BT) operates in exactly this double-faced manner. If I print a story about a communications program which can automatically log on to Telecom Gold, I receive tetchy complaints that I'm encouraging poor security practices.

But when Gold and Schifreen contacted BT in order to point out that its own security practices were slack, the company refused

to listen.

Then, when Prince Philip's mailbox was used by the 'offenders' to prove their point, a whole bunch of policemen were sent to their homes to arrest them and their equipment was confiscated.

If you, the reader, are prepared to tolerate the government (I don't mean the current Party of Government specifically) insisting that Secrecy Is Good For You, then you must expect lesser powers like BT to try playing the same game.

Secrecy is *not* good for you. It gives corruption a place to fester, and it keeps truth out of circulation. Of course, we all want to keep prying eyes out of our private lives, but major state bodies and state-serving corporations cannot remain totally free from examination.

Write and tell your MP so. After all, what have these people got to hide?



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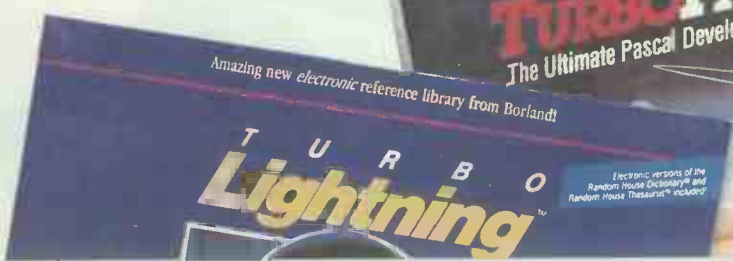
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## A Portable resurrection

You believe that a product launched by IBM will sell because of those three magic letters, don't you?

I received a short, terse illustration of just how false that theory is when I was scrolling through *The Source*, a (costly) American bulletin board recently.

The *Source* quoted the Boston Computer Exchange, which reflects the prices of all micro systems new, second-hand, obsolete or simply available. And it had prices for the IBM Convertible (the laptop machine).

I was highly amused to find that the Convertible had reached a high point, on the open market, of \$650. That was the maximum price you could hope to get, were you a dealer; and (a footnote added) you'd be lucky to find anyone interested, even at that price.

Amusingly, there was another IBM computer there — the Portable. The Portable was launched a couple of years after Compaq launched its machine, in an attempt to take Compaq's market away. Software which would run happily on the ordinary PC and the Compaq, wouldn't run on the Portable; and, after a few unhappy months, IBM began to deny that it was no longer making the Portable. Then it did stop making it.

The Portable, obsolete, unloved and out of date, now sells for \$100 or so more than the Convertible.

I assure you that both machines have the letters 'IBM' emblazoned in large, friendly script all over them.

## Full of UK promise

Michael Dell, the whizz-kid who started his American company, PC's Limited, when still a teenager, tells me that he may launch a laptop 386 machine in the UK within six months, at quite a low price.

He also treated me to a few predictions for the future: among them, that IBM will find the demand for the PS/2 very low.

This American 'wunderkind' has now

officially started shipping machines in the UK, and I was sufficiently impressed by the razzmatazz — and also by the *PCW* review of the Dell 286 (July issue) — to ask the company for the loan of a machine.

Not everything has gone according to plan, naturally. I've found the Dell 286 reluctant to handle its serial port in a totally standard way; its clock gave me a fright for a few hours (see 'Clocking on to real time', page 78, this issue); and, like all machines which arrive in the *PCW* office, it has crashed once or twice, with pretty things all over the screen. And it won't run Digdug, and I can't find out why.

Dell launched his company and three products at the PC User Show in June, and astonished me with the biggest exhibit — an 80386 machine costing nearly £4000, with a colour screen. 'I thought this was meant to be cheap,' said a consultant to Michael Dell.

The point was worth making. With the Euromicro 386 machine selling for £1595 around the corner, including a big slice of profit for dealers (it would cost less than £1300 at trade price), the Dell's absence of a colour screen and a hard disk didn't seem to cover the difference.

In reply I got, not an explanation, but a very interesting dissertation on the micro market from Dell.

Part of his theory includes the fact that his 386 machine is using 'static' memory chips, in a low-power semiconductor technology called CMOS. Not only do these memory chips run far faster than standard 'dynamic' chips, but they use a tiny fraction of the power.

'This will enable us to increase the specification of this machine when Intel gives us faster chips,' he said, 'up to 48MHz.' I didn't know that Intel was planning a 48MHz version of the 80386, but never mind; it certainly is planning 24MHz versions, so this is reassuring.

'And also, because it is static, all we need is a CMOS CPU chip, and we can run the whole thing off batteries.'

Interpreted, I gather that this means: 'We don't have enough 80386 chips at the moment, so there's no point in bringing the price down to encourage buyers.'



*I like to encourage David Philips, boss of the big micro distributor Northamber, when he does something sensible.*

*This picture of Philips (the big man in the white jacket) actually shows him doing something remarkable: opening his new premises and inviting a technology leader, rather than a politician who is far removed from the industry, to cut the ribbon.*

*The technology leader is Masa Sakisaka, who runs Epson in the UK, and who is doing his level best to get us to take his company seriously as a supplier of computers, not just printers.*

*The word is, astonishingly, that he is succeeding. I've spoken to several computer retailers who are suddenly talking quite enthusiastically about the new Epson AT range, when, as little as a year ago, they spoke of Epson as 'not understanding the PC market.'*

*Look for more Epson machines in the shops — and on desks, too, if the company gets its pricing right.*

## People in glass houses . . .

To nobody's great surprise, Research Machines has denounced the BBC's sponsorship of its rival, Acorn's new Archimedes range. Even less surprising — the British Micro Federation, headed by David Fraser, has joined in.

Fraser didn't enjoy my verbal suggestion that he was biased (he's head of Microsoft in the UK) by a desire to see MS-DOS become an education standard. He insisted he was

on the side of the deprived kids who wouldn't have an opportunity to learn MS-DOS — as did Research Machines, naturally.

I heartily agree that the BBC did a pretty daft thing in one way, but I think the mistake was in making the Master an official BBC micro, not in choosing an Archimedes for the role.

Apart from the fact that the Archimedes is going to be overpriced for too long, I really think the range is a step forward of the sort the BBC ought to be associated with.

And over-pricing is something which Research Machines is no stranger to.

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**M5032: SCREEN GENERATOR FOR TURBO PASCAL.** Produces code for input and help screens.

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## EFFICIENCY WITH FILES AND COMMANDS

- U14. **FAKE A KEY** to provide the input expected when batch processing.
- U15. **MULTI-CHOICE MANAGER**. Very cleverly apportions memory so that you can switch between three files.
- U16. **SOUND A TUNE** that lets you know a stage has been completed in batch processing.
- U17. **REQUESTS INFORMATION** in batch file processing. A timed ask utility.
- U18. **MULTIPLE FORMATTING** of disks. Lets you format a lot at same time.
- U19. **SMALL, FAST SUPER DIRECTORY**. Lists directory in 2,4, 6 columns, sorts, etc.
- U20. **SORTED DIRECTORY**. Screen listing that automatically shows hidden files and offers 2 or 4 columns. Various sorts.
- U21. **PERMANENT DIRECTORY SORT**. Resorts your directory and saves it to file. Will work on subdirectories and hard disks, as well as floppies.
- U22. **SUBDIRECTORY LIST**. Shows subdirectories in a given directory.
- U23. **SPACE ALLOCATION**. Combines Dos Tree and Dir commands to show amount of space to be allocated when files transferred to hard disk.
- U24. **FILE MANAGER** with execution facility for running programmes. Will also copy, view, delete, etc.
- U25. **MEMORY-RESIDENT FILE MANAGER** with multiple windows, variable size. Needs CGA card.
- U26. **BATMAKER**. Creates bat files containing all matching files. This is great when using Find in a text search.
- U27. **MENU PROGRAM**. Allows for tailor made menus. Good screen appearance.
- U28. **GO TO DIRECTORY** directly on a hard disk. Reduces amount of keyboard work.
- U29. **SECONDARY DOS**. Lets you suspend currently executing application and invokes a secondary Dos command processor so new commands can be executed.
- U30. **ALLBUT** the programmes you specify can be acted on. Eg, delete, copy, etc.
- U31. **MEASURE** the time your computer takes to execute commands.
- U32. **DISK ERROR MONITOR**. A resident programme that monitors disk errors and gives more information than the abort/retry/ignore message.
- U33. **REMEMBER COMMANDS**. Remembers last 50 commands which may be edited or executed.
- U34. **RENAME A DIRECTORY**.
- U35. **DISPLAY COMMENTS FROM CONFIG.SYS** file when booting up.
- U36. **BUILD DIRECTORY FILE WITH COMMENTS**. Has asm source code so that you can tailor to own needs. Produces list of files with size, crc, file no. and space for comments.

## FILE PRINTING/EDITING

- U130. **PRINT ITALICS**. Set printer for output in italics. Epson compatible.
- U131. **PRINTER RESET**. Resets printer to power-up mode.
- U132. **GRAPHIC SCREEN DUMP** for Epson compatibles.
- U133. **SET 51 LINES PER PAGE** on Epson compatible computer.
- U134. **SET 132 COLUMNS PER PAGE** on Epson compatible computer.
- U135. **SET UNDERLINE MODE** on Epson compatible printer.
- U136. **SET COMPRESSED PRINT** on Epson compatible printer.
- U137. **SET ENLARGED PRINT** on Epson compatible printer.
- U138. **SET WIDE PRINT** on Epson compatible printer.
- U139. **SET EMPHASISED PRINT** on Epson compatible printer.
- U140. **SET EXTENDED CHARACTERS** on Epson compatible printer.
- U141. **PRINT SPOOLER**. Creates a 16k buffer in memory, which allows you to do other work whilst printing.
- U142. **DISK-BASED PRINT SPOOLER**. Uses capacity of disk as buffer for printing, allowing you to continue with other work.
- U143. **SEND ESCAPE (ESC) SEQUENCES** as part of command, such as for printing.
- U144. **WORD FREQUENCY**. Counts number of times each word is used in a text file.
- U145. **FAST WORD COUNT**. Provides count of words, characters, lines, plus a mathematical check sum, which allows you to compare text files for changes.
- U146. **APPOINTMENT REMINDER**. Stores data on disk like a daily appointments diary. Prints details of next 7 days.
- U147. **PRINT WITH NUMBERED LINES**. Great for listing source coding.
- U148. **SIMULTANEOUS EDIT** of multiple text files. Lets you make the same text changes to several files at once.
- U149. **WORD LENGTH ANALYSER**. Checks the length of words in text and compares with readers' level of schooling.
- U150. **TEXT CHECKER**. Examines Wordstar files for typing errors such as missing brackets and quotes.
- U151. **TEXT FILE SORT**. Fast and works with very large files.
- U152. **LIST NON-ASCII BASIC FILE** without loading Basic. Also helpful for listing if you don't have Basica/GWBasic.
- U153. **PAUSE LISTING** so that printer will produce 55 lines on a page.

## EQUIPMENT HANDLING

- U406. **CONTROL BACKGROUND/ FOREGROUND COLOURS** as displayed on your monitor.
- U407. **HARD DISK PERFORMANCE TEST**. Checks the running of hard disks.
- U408. **COMPUTER LOG** to keep track of amount of time of computer usage, how time spent.
- U409. **ELECTRIC TYPEWRITER**. Converts computer into electric typewriter (for notes, envelopes, etc.).
- U410. **KEYBOARD OPTIMISER** that will set cursor size, give type ahead buffer, more. Easy to use command line editing.
- U411. **MAP RESIDENT PROGRAMS**. Shows program addresses, possible conflict.
- U412. **TRACK MEMORY** as programs are running. Has windows and more.
- U413. **MEMORY ORGANISER**. Determine, mark, release, allocate, display memory. Shows how files are loaded in memory.
- U414. **MULTI-SCREEN**. Allows output to be directed to more than one screen. Needs CGA. Multitasking features.
- U415. **NEW ANSI.SYS** that may aid screen presentation and allow faster execution of many functions.

- U416. **BLACK & WHITE MODE** can be switched on colour graphics card.
- U417. **TIMEPARK HEAD** of hard disk after a specified time has elapsed.
- U418. **SET 40 or 80 screen columns** BW mode on colour systems.
- U419. **STATUS REPORT** on system, including information about drives, memory available.
- U420. **SPEED TEST (1)** checks processor speed and compares with IBM-PC. Similar to Norton test.
- U421. **SPEED TEST (2)** checks computer speed in two areas, including Sieve calculation and track to track access time, and compares with IBM-PC.
- U422. **SPEED TEST (3)** comprehensive checks on processing, including block write, register/memory, multiply, divide, stack operations, far jumps, etc, and compares with IBM-PC.
- U423. **RAM TEST**. Tests and tests ram. Identifies faulty memory.
- U424. **DOS ENVIRONMENT VARIABLE EDITOR**. Make changes to edit path, prompt, etc.
- U425. **EXPAND DOS ENVIRONMENT SPACE TO 1K**.
- U426. **FLIP ON/OFF (TOGGLE) DOS PARAMETERS**. Works on several standard Dos parameters.
- U427. **WHAT PROCESSOR?** Examines and identifies the processor/s being used, such as 8088, 8086, etc.
- U428. **WHAT DEVICE DRIVERS?** Examines and reports on devices (eg ports) installed in your computer.
- U429. **WHAT DOS CONFIGURATION?** Examines and reports on memory, vector addresses, and statistical information about version of Dos you are using.
- U430. **WHAT EQUIPMENT?** Examines your equipment and reports on the installed drives, type of cards (eg, printer, colour, mono, RS232) etc.
- U431. **EDIT RAM STORAGE** in your computer.
- U432. **DRIVE STATUS**. Reports on no. of bytes, sectors, clusters-what capacity is and how much is free.
- U433. **DIAGNOSTICS**. Performs large number of computer diagnostics and reports on serial, parallel ports, video, etc.
- U434. **DRIVE TEST**. Floppy disk test drive utility.

## FILE MOVING

- U511. **HARD DISK UNERASE**. Exceptional features. Most unerase utilities don't work on hard disk - this one does!
- U512. **DELETE ALL BUT** those programs you identify.
- U513. **INTELLIGENT COPY PROGRAM** that creates sub-directories as part of the transfer. Also renames rather than over writes.
- U514. **SUPERIOR COPY PROGRAM** that checks and evaluates target before copying. Eg, copies last dated version.
- U515. **UNIQUE COPY PROGRAM** with same function as U514 but does not copy those already on target disk.
- U516. **TREE SURGERY**. Prune files unwanted/ duplicated on hard disk. Has source code and compares files with the same name.
- U517. **KILLDIR**. Delete a branch of a directory. Reduces steps and saves time.
- U518. **MOVE DIRECTORY** around if you prefer it stored in different location.

## FILE ORGANISATION & CHECKING

- U611. **BOMB ALERT**. Examines new files for malicious intent and reports on possible danger to other files.
- U612. **BASIC MENU GENERATOR**. Better access to your Basic files through a menu. For Basica/GWBasic.
- U613. **UNSCREEZE ARC FILES**. Small, efficient utility that occupies less space and is simpler to use than Arc.Exe.

- U614. **HARD DISK OPTIMISER**. Related group of files that optimise hard disk usage and eliminate file fragmentation. Helps pack the disk.
- U615. **FILE RE-ORGANISER**. Regroups a fragmented file into contiguous sectors on a disk for more efficient disk access.
- U616. **RECOVER BAD SECTORS**. Records data on disk. Does 12 retries and thus may recover bad sectors.
- U617. **COLLECT BAD SECTORS**. Marks bad sectors for collection into a separate file that will not be used. Works with floppies and hard disk.
- U618. **ADVANCED COMPARE** facility that can save as edlin script, generate and update deck.

## SPECIAL FEATURES

- U805. **PREPROCESSOR FOR "C" COMPILERS**. Has "C" source and helps organise coding into efficient form for compiling.
- U806. **VOICE EMULATION**. Compiled with Basica source module which allows extensions, revision or use as tutorial.
- U807. **DEMONSTRATION OF COMPUTER GRAPHICS** for those who have CGA.
- U808. **DAYS SINCE JAN 1ST**. Calculate no. of days elapsed since beginning of year. Needs Basica/GWBasic.
- U809. **BINARY FILE CONVERTER**. Converts files from machine language to hex equivalent for examination and modification.
- U810. **CAPTURE BIOS** contents and store in a separate file.
- U811. **EXPLORE FAT (FILE ALLOCATION TABLE)**. Shows the table entries, starting clusters of files, etc.
- U812. **MINICALC**. A small, easy to use spread sheet with 11 x 22 cells for quick every day use.
- U813. **PROGRAMMER'S CALCULATOR** which does special hex and other calculations for those writing programs.

## ORDERS:

The service charge for each program is £2. There is a minimum charge of £12 (six programs) plus £2 for postage and packaging (£3 foreign). UK purchasers add 15% VAT to total.

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## Lost in the woods

An 80386 system for £1600: it was on offer at the PC User Show.

It caused no little annoyance to another company, Mission, whose identical machine was on sale at the same show, at £2000.

The system was imported by Jim Wood, whose Euromicro outfit in North London has been quietly supplying low-cost machines for some time now, but has suddenly hit the jackpot.

Wood buys his machines from Wearnes Brothers in Singapore, and so, after a diversion to ALR (Advanced Logic Research) in California, does Mission. Wood claims (it seems watertight to me) that he therefore pays less for his stock.

It looks very likely that Wearnes will now take over Euromicro and establish that company as its European headquarters, as ALR is its American subsidiary. At that time, you can expect Mission to start buying through Euromicro/Wearnes; but, in the meantime, things will be rather confused.

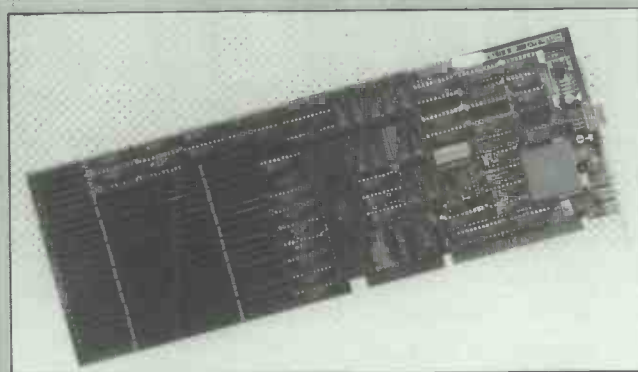
All my information indicates that Wood's machine, lacking a hard disk and colour but including a 1.2Mbyte floppy, 1Mbyte of RAM, MS-DOS 3.2 as well as full expandability, is a sound, reliable piece of hardware. He is entitled to label it as a Euromicro system, an ALR system, or a Wearnes system; and the price is the retail price, so if you see the system in a store, don't let anyone talk you into paying more.

Full details of retail outlets can be obtained from Euromicro on (01) 341 2447.

## Playing the waiting game

Dear old IBM UK is trying to get Britain worked up into a frenzy over the development of a new desktop publishing division, which it plans to announce some time in September.

The company is going to have trouble. It's missing the star performer — a 600 dots per inch laser printer that produces genuine lithography plates. Without



*Real World Graphics' reputation as a leader in graphics technology isn't going to be hurt by this announcement: the company has announced its AT 2500 graphics board at £2600, with a two million pixels per second drawing speed — twice that of the Amiga — but designed to plug into the PC/AT, says Graham Rowan, managing director. Fierce. Details on (0992) 554442.*

that, the show may flop — badly.

The new division has done one thing right, say my sources: it has refused to sell the same stupid Model 30-based PS/2 system that IBM showed in the US when it launched PS/2.

The main product will be running Windows and Aldus' PageMaker, but on a new laser printer (probably Canon-based). And it will be using the Model 50.

Talk to any IBM executive involved in the project, and they will concede: 'Confidentially, we don't think much of the US system, and we think the Model 30 with its 8086 processor isn't fast enough to run Windows and PageMaker. And the method of plugging a card into the computer with its own Motorola 68000 processor on it, is just silly and expensive. We're waiting for something better.'

The 'something better' hasn't appeared because there is a shortage of Model 50 computers, and the software which was going to link them to 'something better' isn't ready, and the 'something better' has turned out to be vastly expensive.

The 600 dots per inch laser printer exists, certainly, but it costs £16000. And there is no evidence of any software to drive it, yet.

IBM UK has, accordingly, begun a new design project in its Hursley laboratory where an upgraded card is being designed. It will fit into the 80286-based PS/2 machines, the Model 50 and the Model 60.

It sounds promising. The only problem is that the shortage of Model 50s and the design cycle delay makes it likely that nothing will be available until December or later.

## Clocking on to real time

One of the little throwaway programs that Amstrad gives to PC1512 users is a utility, RTC, which sets the real-time clock to the same date as the computer thinks it is.

You may consider this to be of trivial interest to users of the Dell 286 machines. You may even think that I'm potty, trying to make a computer have two clocks.

In fact, some MS-DOS computers have three clocks — a DOS clock, a BIOS clock, and a battery-powered chip. Theoretically, when you start up the system, it reads the date and time off the battery clock, or asks you for them if there is no battery clock.

In the case of Amstrad's machine and Dell's 286, you can tell the system it's Tuesday if you like, but it won't believe you until you talk direct to the real-time clock.

The PC1512 has a patch in MS-DOS which does this. The Dell 286 has a system where you punch Control/Alt/Return, and it then lets you decide what day it is. But if you run the Amstrad under PC-DOS, that patch isn't there.

Running RTC (real-time clock) solves the Amstrad's problems. It has another, quite useful, function — you

can leave the machine on overnight.

A normal Amstrad, left on overnight, will just carry on counting seconds. It will fail to reset the time at 24.00 hours, and will go on dividing bigger and bigger numbers of seconds until it has a number too big to handle.

Amusingly, this doesn't bother the machine until you try to save a file to disk. At that point it tries to read the clock, and discovers that the division needed to produce the number of hours is more than it can manage.

The Dell, however, has another irritating aspect: the clock may know the date and time, but it isn't going to tell the rest of the system.

In an attempt to synchronise the clocks, I ran the Amstrad RTC. Result: the wretched machine decided the date was 1 January 1980. The clock knew it was July 1987, but DOS wouldn't believe it.

Dell has promised to fix it.

## Making the customer pay

The only reason I can think of for using Telecom Gold for electronic mail, is that other people do.

This obviously offends the people at Telecom Gold. In an effort to reduce the number of users, they have come up with a new pricing policy, designed to reduce the amount of data you can get into the system or out of it, and also designed to make you use a slower modem.

The new pricing structure coincides with a similar effort on the part of Packet Switch Stream, a company inside British Telecom (BT) which links remote users at local call rates (plus a fee).

I freely forecast a switch to Mercury, despite that company's tiny advertising budget.

The new Gold charges actually reduce the amount spent on connection. You pay (standard rate) 6.5p per minute, where you used to pay 11.5p per minute. But, these days, you also pay 4p per 512 characters.

There's a similar change at cheap rate from 3.5p down to 2p per minute, but 1p per 512 characters.

The effect will be felt most by people using fast modems — both 1200 and 1200/75 bits per second —





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# DIGITASK

## BANISH THE

Like many others you've probably found your head swimming with facts, jargon, prices and names, some you've heard of and some you'll never hear of again! But Digitask is one name you're going to hear a lot more of.

Digitask have been producing PC compatibles and supplying compatible hardware for nearly four years, to end users, corporates and dealers. Our customers include some of the biggest names in the business and nearly every university and technical college in the land.

Why not take a closer look at our range of PC's... there's a package in the range to suit you! If you're not sure which system will meet your needs, then give us a call and talk to someone who not only knows the systems but who actually builds them! Our components are individually sourced throughout the world and imported to the UK. This allows us to choose the best of all the available options and then to build and test the systems in-house. So when you call, our technical staff are fully conversant with all aspects of system design and maintenance.

Our reputation for service is second to none, our clients keep coming back for more.

A 100% British owned company based in the UK, we are going to be around when others have long gone. Maybe that is why over 8000 computer users have chosen Digitask.

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### DIGITASK PC16-X

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because they can read through more text in the same time. And people who did as recommended by BT, and prepared messages offline, will be equally heavily hit.

For the life of me, I can't see the logic of it.

For example, the cost of downloading a weatherlink picture from Microlink (see 'Mailbox', page 178, this issue) would rise from a minimum (cheap rate) of 28p to £1.05, including VAT. Reading through the Infomatics Daily Bulletin would carry a similar penalty. In fact, any of the 'added value' information services in Gold is going to show an average three-times price rise.

When 2400 bits per second becomes the standard modem speed, things will get worse, not better.

If there were no competition, it wouldn't matter, perhaps; but there is, in EasyLink (now MercuryLink) which has only one serious drawback compared to Gold — you can't store files online.

With the new pay-for-data rather than pay-for-time charging system, the temptation to keep files online becomes very small.

The rise in charges for packet-switching is even sillier. Mercury's X.25 network appears to be friendlier, uses digital-only links (less noise) and allows you to use any Mercury network in the country, rather than charging a fee for every number that will accept your password.

Funny, isn't it, how a monopoly mentality just can't adapt to reality, but feels entitled to 'tax' its customers, rather than serving them?

## Enthusiasm wins

The free APL (A Programming Language) interpreter for small machines was due to be demonstrated in Dallas in May, but is still under development.

It has been developed in the UK by enthusiasts and runs on the PC and smaller machines like the BBC B, the Commodore 64, the Spectrum, the Apple and all CP/M systems.

To obtain a copy, write to The Chairman, The I-APL Project, 2 Blenheim Road, St Albans, Herts AL1 4NR.



*People will tell you that Ashton-Tate's Javelin is a spreadsheet — it isn't. It's an analysis tool that looks like a spreadsheet, but it's vastly more flexible and powerful.*

*Because it takes so long to explain to people what Javelin does, the company was faced with a dilemma. Should it increase the price, so that dealers could afford to train customers in using it? Or should it make Javelin so cheap that people could try it out?*

*First Software, the UK distributor, has now decided to follow the example of Ashton-Tate and sell it for £100.*

*Details from retailers, or from First Software on (0256) 463344.*



*The PCW staff have been prepared to barricade the doors to stop this printer from being taken away.*

*Kyocera's 1010 laser printer is fast, quiet, non-smelly, and provides almost perfect IBM graphics printer and HP Laserjet+ emulation. Other emulations supported include Epson FX-80, Qume Sprint and Diablo 630.*

*There are 36 resident fonts including landscape and portrait Times and Helvetica in sizes from 6pt through to 14.4pt, and fonts can be downloaded as well.*

*Kyocera's printers come with their own language — Prescribe, a plain text command language which can be used to change fonts and spacing, or to draw geometric shapes. For example, 'PIE' draws pie charts of a given radius with a number of sector markers; and 'FPAT' defines a fill pattern.*

*It's a pity that more software packages don't support the Kyocera in its native mode, but its HP emulation worked fine with Fantasy and Ventura, producing the latter's Scoop page in about two minutes.*

*Distributor Mekom has just reduced the price of the 1010 to £2495, and can be contacted on (01) 248 1711.*

Derek Cohen

## European suicide

Ventura Publisher is currently the leading UK desktop publishing program, so it was somewhat bewildering to users who ordered the new wonder-upgrade, to discover that Xerox had sneakily made it copy-protected.

This is usually suicide in the corporate market, just for the problems it causes legally, but Xerox outdid itself by using a system which: (a) was easy to break; and (b) caused the program to crash.

In the UK, the copy protection lasted about four weeks, and most buyers will never know it happened. In Europe, however, the less well-educated Xerox subsidiaries have insisted on keeping it. I predict a huge drop in European sales.

## Persecution complex

Alan Sugar told the world (via Channel 4 News, no less) that the Press doesn't like him and makes his life difficult. We must presume it was this hostility which caused the industry's writers to swallow his interesting theory that he 'launched the PC1640 unexpectedly at the PC User Show, after pressure from distributors and dealers.'

He launched the machine at Comdex in Atlanta earlier this year, and told everyone that he wouldn't launch it in the UK until 'much later in the year, maybe even next year.' Three weeks later, he said, he'd 'changed his mind.'

I'm not sure which I find funnier: the idea of Alan Sugar bowing to pressure from dealers; the notion of his buying space at the PC User Show to show his old machine; or the sight of this 'hostile' army of scribblers, all solemnly reporting this nonsense as fact.

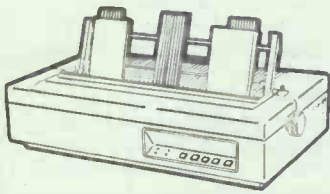
## Beebug challenge

There is a theory that a C language compiler can't be sensibly written for the 6502 chip. Beebug, the club for BBC micro owners, has challenged that by launching a full Kernighan & Richie-specification C on two ROMs, with a disk library, for £59.

Details on (0727) 40303. END

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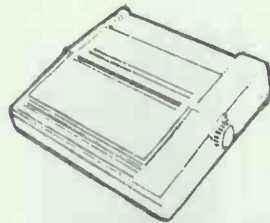
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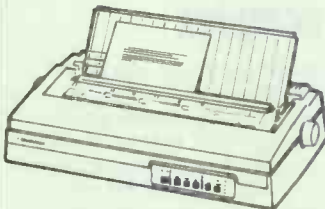
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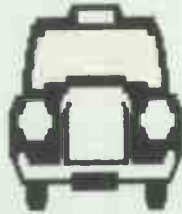
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**LAST FEW**



**EPSON HX20 PORTABLE**

Small batch of brand new and demo Epson HX 20 portable re-chargeable battery powered computers. 16k RAM (Expandable to 32k with optional expansion unit) 20 character by 4 line display. Complete with built in micro cassette and dot matrix printer. Full "QWERTY" keyboard, 10 programmable function keys and numeric keypad. Links to external peripherals such as disk drives, printers & modems. Stocks are some slight demo (at £150) & brand new complete with briefcase style case, A/C charger, **£195**

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 Televideo 1605H ditto inc 10mb ..... **£795**  
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 Compaq Plus inc 256k 10mb ..... **£1100**  
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 \*dBase II Multi user ..... **£350**  
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 \*Easy Junior A/C package ..... **£150**  
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# THE WEST COAST CONNECTION



*Better known as an industry-standard chip manufacturer, Intel has, in fact, many irons in the fire — including the development of a fax card. Tim Bajarin connects up to this month's important US news.*

## When the chips are down, Intel strikes

When you think of Intel, you normally think of a powerful chip manufacturer. But although this is Intel's main line of business, it is not the company's *only* business.

Sources close to Intel claim that this leading-edge company is working diligently on many products, including some similar to those which Chips and Technologies (C&T) has developed in the way of chip integration. Intel plans to give C&T a real run for its money on comparative VLSI products.

However, Intel's PCEO group in Corvallis, Oregon, has been busy, too. This is

the division which produces various Intel-labelled memory expansion boards, maths chips and add-on cards.

Now, this entrepreneurial part of Intel is jumping on the PC/fax card bandwagon and is about to release a card of its own.

Designed for PCEO by SpectraFax, a small company in Naples, Florida, this card will fit into the PC and turn a desktop computer into a fax sending and receiving device.

It will have its own fax modem onboard, and Intel insiders claim that it will offer features which most of the other boards on the market

do not presently have.

This development is Intel's first foray into the complicated field of communications, and could be a sign that the company is looking seriously at modem chips and advanced communication logic devices.

Considering the strong competition that Intel is receiving from Motorola and Texas Instruments, it makes sense for the company to enhance some of its capabilities and examine new areas to broaden its product line.

The Intel fax card should be available by the end of the year.

## Postscript: Apple's slice of the pie is cut

For some time now Apple has enjoyed a long spell as the price-setter for laser printers. The standard LaserWriter retails for \$4295, while the LaserWriter Plus costs around \$5000.

But, now that AST Research has introduced a \$3995 Postscript printer, you can expect to see Apple — as well as Digital, Texas Instruments, Wang and QMS — react quickly to these new pricing pressures.

At the same time, IBM could be forced to lower the target price of its Postscript printer which, at the time of writing, is still under wraps.

In the meantime, Hewlett-Packard (which recently announced support for Postscript) may find it necessary, because of these lower OEM prices, to deal directly with Adobe instead of sub-leasing a printer from QMS, as has been widely speculated.

Adobe has been charging a standard \$200,000 OEM entry fee, plus a hefty royalty tied to each laser printer with Postscript on the system. As a result, the prices of the Postscript printers have stayed high.

But, the new, lower prices reflect the pressure which Adobe is under from the Postscript clones that are being announced almost daily.

Adobe's most formidable opponent seems to be Phoenix Technologies. Rumour has it that this company, known primarily for its PC-clone BIOS software, will produce a Postscript clone superior to Adobe's.

Although this is bad news for Adobe, it is great news for consumers. Within 12 months, we could see Postscript, or Postscript-compatible, printers as low as \$2495.

## Email system offers vastly improved comms service

Electronic mail (email for short) is rapidly becoming a prime area in American business, but it has also created some real frustrations for those who use it. One of the biggest problems with email is that you may subscribe to one service, while the person to whom you want to send a message is on another service.

To allow users of different email services to communicate with each other, DA Systems of

Campbell, California, has introduced DASnet. DASnet allows the exchange of email between the users of most of the major US systems and some foreign systems.

DASnet currently links the following email systems, conference systems and networks: Arpanet, AT&T mail, Bitnet, DCMETA, Dialcom, EIES, EasyLink, MCI Mail, NWI, PeaceNet/Econet, Portal Communications, The Source, Telex, TWICS (Japan), Unison, UUCP and The Well.

For individuals the charges comprise \$4.50 per month, a \$33.50 signing-on fee, and usage fees on both mail systems. (For example, sending 200 words from Bitnet to The Source would cost 59 cents in usage fees.)

This new service is long overdue and could be the catalyst for the serious advancement of email in the US.

Further information can be obtained from DA Systems in California on (408) 559 7434.

## Sony is on the move with portable video system

As a constant traveller who often finds himself stranded in airplanes and hotels, I have fantasised about a combination TV and VCR which I could pack into my briefcase and carry with me wherever I go.

I could watch a colour VCR tape even while hurrying through an airport terminal or while standing in a queue waiting to buy tickets, if I so desired.

Word is just beginning to leak from Japan that Sony is

actually showing a device like this to selected dealers, and could have it on the market by January 1988.

Called the Personal Video, it is about twice the size of a standard Sony Walkman, uses 8mm video tapes that are the size of audio cassettes, and has a built-in 5in TV screen which will have an improved flat-panel, liquid crystal display. It will use conventional NiCad batteries, and can be recharged to give four hours of use.

The Personal Video is expected to cost between \$1000 and \$1500.

Although Sony does not plan to launch this combined unit until next year, it will have, by the end of this year, the first product in its 'Personal Video' line. This will be a plug-in VCR and TV unit which has been designed for busy desks and kitchens. It will use Sony's standard 5in Trinitron tube and is expected to cost less than \$1500.

# THE WEST COAST CONNECTION

## IBM consolidates its lead position with PS/2 range

In early June, two major US publications printed stories which claimed that the IBM PS/2 computers had met with real market resistance and, as a result, were not selling well.

Even though the PS/2 had only been on the market for about two months, the articles cited unnamed sources who claimed that these new PCs were moving slowly through retail channels and that the demand was low. Financial analysts on Wall Street heard this news and became edgy about their position on IBM's stock and earnings.

By mid-June, IBM decided it was time to bring out the big guns and let the world know that the PS/2 was alive and well, and that the company was selling PCs at a greater rate than at any other time in the history of the IBM PC.

This move by IBM came at a time when the market in general is experiencing some confusion over the PS/2.

Industry analysts and observers alike hailed the machine's technology as leading-edge material, but have questioned IBM's drastic change in direction. The company's XT and AT models are still selling well, but, according to Bill Lowe, president of ESD at IBM, both machines will be phased out by the end of the year.

At an emergency securities analyst meeting in June, IBM claimed that it had already shipped over 250,000 PS/2 systems, and that it had back orders of over 500,000 at the time of writing (mid-July).

IBM claims to be making 2000 Model 30s, 1000 Model 50s and 800 Model 60s each day, and is about to add another manufacturing facility to accommodate demand.

Although some dealer channels are still suspect of the PS/2 line, this statement from IBM about early demand signals a very important market direction, and spells more trouble for clone manufacturers than they expected.

One research firm has stated that over 50 per cent of corporate customers which it contacted, claim that they plan to standardise on the PS/2 line within the next 12 months. And, this same firm has shown that even the Model 30 is selling well — although much of this is due



Workstation of the future: the IBM Personal System/2 Model 60 with colour monitor and an IBM 5202

to major price cuts at dealer level.

This means that IBM, even with its drastic move to specifically provide power that only a typical mainframe or minicomputer company could even want or understand, looked into the future and determined that the specification of the PS/2 would eventually be the minimum configuration the market will demand.

By using this proprietary technology as a base, IBM can continue to expand the PS/2's power and functionality; and, even if someone legally clones the machine, the company still

has so many other tricks up its sleeve to add to this base, that it could keep clone companies chasing it for years.

Although Compaq and most of the other clone companies will continue to tout the fact that OS/2 will continue to work on existing ATs — and there are still over 10 million of these machines in use — IBM's PS/2 will evolve into a standard much faster than was originally anticipated.

From discussions with companies such as Chips and Technologies and Phoenix Software, it looks as though the demand for true PS/2

compatibility is the top priority in most clone manufacturers' minds. And, you can bet that if corporations standardise around the PS/2 power quickly, it will become a 'do or die' problem for these clone manufacturers.

How soon can the PS/2 be cloned?

Industry observers expect to see the first versions of these micro-channel clones by November. But, even if the manufacturers succeed, the first boards will have to withstand immediate legal action from IBM: the company will force the courts to move on this before any other clone makers could have their products available.

IBM's legal department has told some clone manufacturers that they can submit their own versions of the micro-channel architecture to see if any patents or copyrights have been violated. The company has hinted that anything which is violated may be subject to IBM consideration to license it.

But, IBM could use this measure to stall anyone from legally having a similar machine until its own machines were well established, and it didn't feel pressure from the competition.

It seems that IBM's all-knowing powers have peered into the future and pulled off an interesting feat by giving the market what it will need — and has caused the rest of the pack to keep on with the chase.

If you, for even a moment, thought that IBM could lose ground with the PS/2, think again!

## Integrated file management software: take two

A new concept in integrated software is currently being developed.

When you hear the term 'integrated software', you expect to see a database, a spreadsheet and a word processor, at the very least. But this term is beginning to apply to the world of utility software as well.

A Washington DC company, US Software (USS), has just launched a new product called TakeTwo Manager.

The original TakeTwo product was rated as one of the best in the area of disk back-up. But, according to

Steve Hicks, president of USS, he was constantly reminded about other needs that transpired as a result of saving and managing the data on a disk. So, he coined the term 'integrated file management', and produced a program which provides a range of features for the same price as one of the better disk back-up programs alone.

TakeTwo Manager gives you automatic back-up. It also has a full, pop-up file manager, with which you can scroll through a list of files and perform functions such as 'Rename', 'Delete', 'Copy',

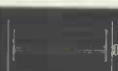
'Find', 'PEEK' and 'OOPs!' (the OOPs! feature is an undelete and has much of the same features as the Norton Utilities).

You can scroll through a tree-structured list of directories, and you can rename, create, remove and even add a memo to each of your files with the 'As Noted' feature.

TakeTwo Manager also includes a report facility, so you can print reports of your system and file configurations, plus your back-up history. It costs \$139. USS can be contacted on (703) 556 0007.

END





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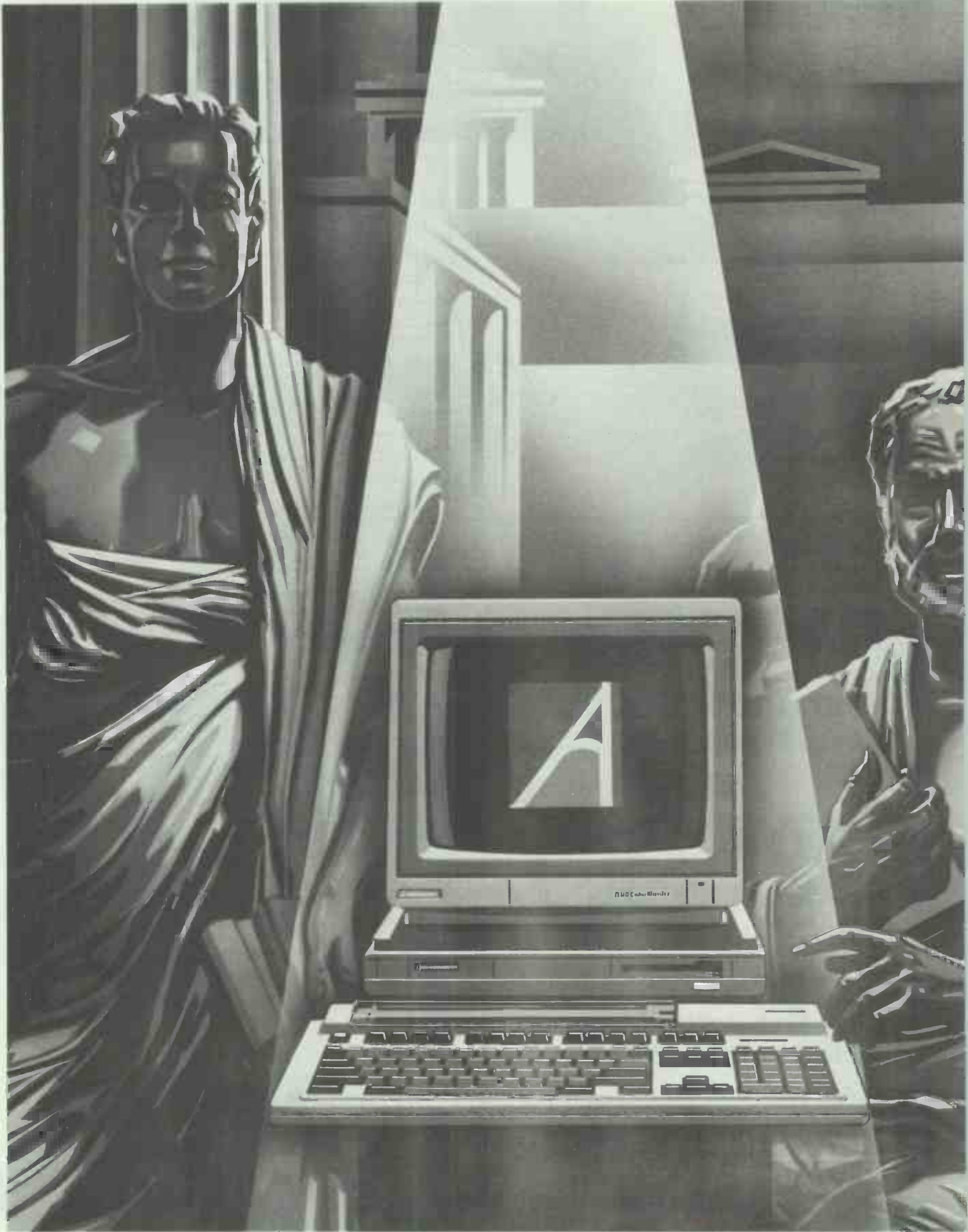


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ARCHIMEDES	BBC BASIC	0.26	0.39	1.03	4.3	4.5	4.5	ALL OTHER FIGURES ARE TAKEN FROM PCW REPORTS (2) ENTRIES WITH AN ASTERISK UNDER STORE WERE NOT AVAILABLE FOR FLOPPY DRIVES
IBM PC	GW BASIC	0.99	1.05	3.09	35.9	48.5	*	
IBM Model 50	BASIC	1.1	2.04	12.5	28.0	7.93	10.7	
IBM Model 50	BASIC	2.6	2.4	15.4	16.3	14.1	17.4	
IBM PC	BASIC A	6.2	6.2	47.0	100.0	49.0	*	
AMIGA 2000	AMIGA BASIC	1.2	2.2	6.7	150.3	25.0	37.7	
OLIVETTI 486	BASIC	2.1	2.0	15.0	38.4	11.8	*	
ATARI ST	ST BASIC	1.5	3.5	7.0	44.8	22.7	36.0	
MASTER 128	BBC BASIC	3.5	4.3	49.0	14.2	22.0	16.8	
COMPAQ 186	GW BASIC	1.0	0.4	3.85	25.5	4.8	*	

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those hard to remember printer control codes, you can store those on whichever keys you want, if you're writing software you can even store mini programs on a button.

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# LETTERS



## Anyone got a spare PC?

I have seen an ad which offers a free IBM PC-compatible to anyone who bought an AT-compatible. If any PCW staff member did buy an AT and hasn't any need for their PC, could I have it?

Seriously, I've noticed an increase in PC-compatibles in the £400-£500 price bracket. As Atari STs and Commodore Amigas — also in this price bracket — are more powerful and have better graphics, will we see PC prices fall even further?  
**Jason Palmer, Huddersfield**

*What do you mean, a member of staff buy a computer?*

## Excellence in reading matter

In his article 'Working to rule' (PCW, June) Jack Weber uses Microsoft's Excel spreadsheet-cum-programming system for the Macintosh to illustrate very pleasingly the art of rule induction, whereby executable decision rules are semi-automatically generated from example decision data. He mentions the original CLS (Concept Learning System) of Earl Hunt; JR Quinlan's development of this algorithm, known as ID3; and also my company's commercial program, Expert-Ease, which embodies the ACLS (Analog Concept Learning System) extension. (The latter was introduced by Andrew Blake of Edinburgh University to cope with numerical attributes in addition to logical ones.)

Since it is clearly Jack

*This is the chance to air your views — send your letters or contact us on Telecom Gold 83: VNU200. The address to write to is: Letters, Personal Computer World, 32-34 Broadwick St, London W1A 2HG. Please be as brief as possible and add 'not for publication' if your letter is to be kept private.*

Weber's intention to encourage readers in a serious approach, it seems a pity that his 'Further reading' section does not include references to these contributions.

The following are some original sources:

**For CLS:**  
*Experiments in Induction* by EB Hunt, J Marin and PT Stone (Academic Press, New York 1966)

**For ID3:**  
*Discovering rules by induction from large collections of examples* by JR Quinlan, in *Expert Systems in the Microelectronic Age* (ed D Michie, Edinburgh University Press)

**For ACLS:**  
*ACLS User Manual* by A Paterson, T Niblett and A Shapiro (Intelligent Terminals Ltd, Glasgow: 1983)

**For Expert-Ease:**  
*Expert-Ease User Manual* by R McLaren (Intelligent Terminals Ltd, Glasgow 1983)

Statistically-minded readers will also find much interesting material, particularly on the treatment of error, in *Classification and Regression Trees* by L Breiman and colleagues (Wadsworth Int Group, Belmont, California 1983)  
**Professor Donald Michie, technical director, Intelligent Terminals Ltd, Glasgow**

*Thanks for the information, and we're pleased to have you among our readers.*

## It pays to advertise

I appreciated your flattering comments in the 'ChipChat' column of the July issue of PCW, in which you focused attention on the great success of Tandem's TV advertising campaign.

However, you made one small error, and that is to assume that the cycle race

featured in the ad was sponsored by Apple Computers.

It is indeed true that Apple's logo was clearly positioned on the cyclist's shirt because a selection of major worldwide customers were exhibited there. Apple uses large Tandem computer systems in its factories to monitor and control its manufacturing program. That a major international supplier of small computer systems should select Tandem for this key activity is, of course, flattering, but from an advertising viewpoint it does help to position our products as large computer systems if we highlight Apple as a major user of Tandem computers.

I hope this clears up any confusion.  
**Mike Lambert, UK marketing manager, Tandem Computers, Northolt, Middlesex**

*You bet it does.*

## Déjà vue for Big Blue?

I was interested in Martin Banks' article, 'Fond farewell' (PCW, July). Twenty-five years ago the British motorcycle industry tried to compete with the newly-introduced Japanese 'scooterettes'. It failed, withdrew, and announced various middle-sized motorcycles of advanced design to replace the ageing designs it was trying to sell to those who wanted more power.

But hardly anyone bought British middle-sized bikes. Instead, they chose the scooterette manufacturers' increasingly powerful offerings. Similarly, why buy IBM's offerings if Amstrad or Atari can develop their models as customers' needs grow?

Brand loyalty among corporate purchasers has served IBM well. But, when the majority of PCs are bought by personal

purchasers, brand loyalty will favour those who stay in the personal computer market.

Perhaps the 'Fond farewell' is not just to IBM's personal computers but, like British motorcycles, to 'Big Blue'. The 'inconceivable' has happened before.

**John R Hudson, Huddersfield**

*As an unashamed Japanese-bike rider, I must say that I barely shed a tear for the British bike industry. The Japanese had a world market view (and world market level of sales as a result) which enabled them to pour vast sums of money into R&D. IBM is in the same position, and its sales worldwide show that it can keep one step ahead of the market.*

*Fortunately, British computer manufacturers such as Apricot and Research Machines have been able to produce high-performance machines that aren't handicapped by the prestige price tags which later British bikes suffered.*

## Verbal overkill promises nothing

I am becoming thoroughly sick and tired of reading in the computer press the recent airings of some software houses, prognosticating their intention, 'at some future date', of releasing software which will do this, that and, more than likely, the other as well.

The industry has coined a choice expression for this indecision — 'vapourware'.

Companies which, a year or two ago, would not have dreamed of dropping a whiff, inkling or hint of their development plans, are now falling over themselves to proclaim to the world what they are going to release *mañana*.

Witness the recent ballyhoo over Lotus' carefully stage-managed leak regarding the LAN version of 1-2-3, and the company's subsequent red-faced

admission that this launch was being pushed back to the Autumn.

Notwithstanding that little episode, we have been entertained recently with more prophetic verbalisations from the software industry's most famous and persistent litigant. Support for VGA and OS/2, 3½in media, a mainframe version of 1-2-3 and a DBMS have all been promised definitely ... sometime in the future ... probably.

Never before has so much vapourware been released into the atmosphere at one sitting. One can only surmise that the PR pundits at Lotus have been feeding on an exclusive diet of curry, sultanas, radishes and lager recently.

What is the reason behind all this huffing and puffing? Could it be the old wile of keeping the opposition at bay while you buy time to grind your own development effort into top gear? We should be told.

I would lay myself open to a charge of false modesty if I failed to mention that SuperCalc 4 has supported all major LANs for the last three months; is supplied on both 5¼in and 3½in media at no extra cost; was demonstrated by IBM at its launch of PS/2, running with IBM's new VGA; and has a big brother — SuperCalc/MF, currently the biggest-selling mainframe spreadsheet in the world.

Needless to say, not one of these developments was pre-announced by Computer Associates.

**Tony Beken, manager, Micro Products Division, Computer Associates, Slough**

## Taking technology too far

My initiation into computers involved bashing out punch cards which I never quite learned to read reliably, and waiting two days for a short (twelve-page) printout which could best be summarised as 'Program crash on line 20'. (Notice the helpful addition of a line number which was probably a facility added by a mad, hacker student.)

The new, cheap PC-compatibles have produced lots of new users who know nothing of computing, and

are able to jump direct to the very high-level interpretative languages of, say, Word-Perfect, Lotus 1-2-3 or GEM Basic.

But while there is a market being served here, the computer user base is becoming complacent and — in some 'yuppie' quarters — arrogant about its understanding of computers.

GEM and Windows may be blatantly annoying both to use and to program within, but I fear they are the punch card of tomorrow's computing. Soon, the user interface programmer will become more important than the researching, register-juggling and generally innovative in-house subroutine/utility programmer.

Sure — the world will end up with lots of slow, unimaginative, beautifully packaged, over-hyped, mindlessly over-graphic, intentionally incompatible total office environments. In response, the manufacturers will have to make faster and faster machines in order to get these programs up to a sensible speed.

I'm not sure who will benefit in the long run. But, when I am woken up with a cup of tea and a digitally-synthesised 'Good Morning!' from my 25GHz, 1024-bit, 804586 Motorintel-based IBM clone, I will still be worried that, if I add just one more background utility, I'll use up my last gigabyte of memory; or I might drop my terabyte holographic optical disc down a crack in the floorboards and never find it again.

**Will Roberts, Guildford, Surrey**

*Floorboards! Luxury.*

*But seriously, do we really want everyone to re-invent the wheel before we let them drive a car? How many people would have persevered with using their Amstrad 1512s if it weren't for their initial handholding under GEM?*

*Surely, as with most things, there is the lazy way of doing something and the creative way. As long as we continue to see windowing as a burden, we'll keep re-inventing the Mac desktop.*

*Once we make windowing our slave rather than our master, we can start adding those little extra touches — just like your hacker student friend with his line numbers.*

## The wrong accent



I find Amstrad's attitude towards its customers very strange indeed.

I bought a PCW8512 with a French manual and software and an 'AZERTY' keyboard. As I am in fact a native English speaker, I thought the English manual and software would be easier for me to learn with, and, therefore, wrote to Amstrad which referred me to its spares and service department in Shoeburyness.

Seven weeks later, I received the manual for the Amstrad CPC464 and a 'Welcome to Amsoft' cassette. Also included was a *pro forma* invoice for the Locoscript disk and manual which I had previously ordered and paid for.

It has taken me six months and many letters to obtain this disk and manual.

Later on I saw an ad for Locospell and, being a forgiving soul, wrote again to Amstrad asking if Locospell would work on an AZERTY keyboard.

The reply stated that Locospell would work on an AZERTY keyboard (Locoscript itself doesn't) but 'it will not recognise any French accents you may wish to use.'

Quite why I would want to use an English spelling-checker on French text is beyond me, and I certainly don't know of many English words with accents.

**Philippe Achener, Pauillac, France**

*Plus ça change ...*

## Don't blink, you'll miss it

If you bought a car, you'd expect parts to be available for some time after the model had been discontinued, wouldn't you? How long, though? Three years? Five? A decade, perhaps? If you buy a computer, it seems the answer to this same question is five minutes.

I bought an IBM PC about 30 months ago, at a time when clones were only just a whisker cheaper than the real thing. It worked fine until a week ago, when the space bar ceased to function.

I rang my friendly dealer/repair man, who told me that a repair 'wasn't economic' and recommended a replacement. I asked him to get me an IBM keyboard, even at the mind-boggling price of £140, because: (a) I like the feel of the keys; (b) I'm familiar with the key positions; (c) I have function key templates that fit the IBM; and (d) I use the machine very heavily — I'm a journalist.

I have now learned that IBM has discontinued the PC/XT keyboard, and that further supplies are unavailable. Since I need to use a computer daily, I have been forced to buy a clone keyboard that is unsatisfactory for the four reasons outlined above.

I don't really subscribe to the 'IBM Conspiracy' theory, but to me, this artificially-generated obsolescence looks like an attempt to force PC users to 'upgrade' to a new product that they don't necessarily need.

**Richard Platt, London N16**

*While currently in short supply, PC keyboards are still available from IBM (the company says). Perhaps it was your dealer who was trying to encourage you to upgrade.*

## Election plea

Now that the General Election is over and done with, I would like to know if anyone supplies, or has written, software to help political parties run their local election campaigns.

**Nicholas Gregory, 3 Triangle Road, Haywards Heath, W Sussex RH16 4HN**

END



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# Which Fish?

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### 3 Stradcom Modem – £159 (ex. VAT)

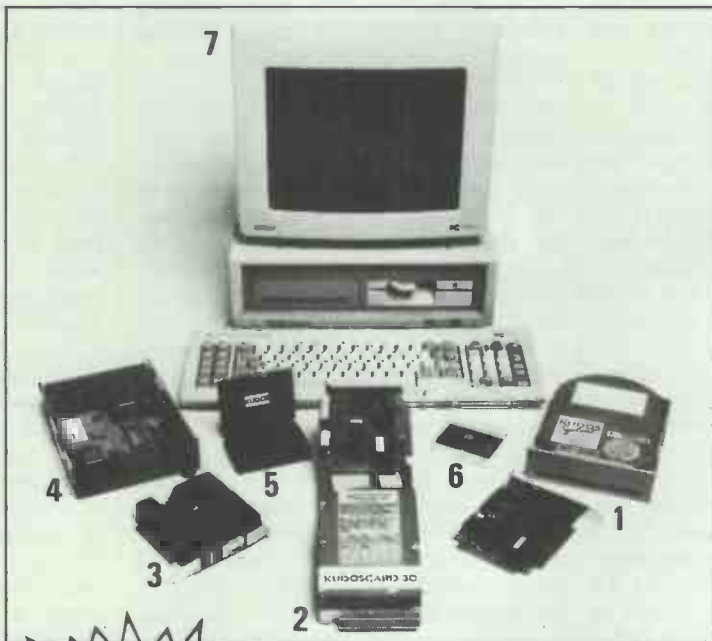
A BT approved 1200/1200 Full Duplex (V21-22) intelligent modem with full Hayes compatibility, auto dial, auto-redial, auto dial directory, auto answer, pulse, tone or auto sense dialing. Free registration to Easylink worth £40.00. Async software is included with Prestel mode. Plug in and talk to the world.

### 6 8087-2 Maths Co-Processor for PC1512 – £149 (ex. VAT)

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### 7 Amstrad PC1512 + HarDisk 30 + Colour Monitor – £949 (ex. VAT)

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### 4 Everex Excel Stream 20 (Internal) – £547 (ex. VAT)

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## BANKS' STATEMENT

# Dressing up

*Martin Banks has been thinking long and 'painfully' hard about the 'flexibility' or not of our computer systems — and finds that it all boils down to 'the same thing'.*

For reasons that are quite beyond me and my acumen with anything numerical, I was recently sent a copy of the *Economic Progress Report* from HM Treasury. That organisation claims to be good with numbers in a way that is diametrically opposed to my own avowed skills with the damned things. And the *Progress Report* is a cunning device to try and prove the point beyond doubt.

As I don't really understand any of it anyway, there was little point in sending me a copy: it was all graphs, statistics and bar charts (funny, I had always thought that a bar chart was a map of the pubs of Central London). Still, I studied the *Report's* contents 'personfully' for ... well ... thirty-five seconds at least, but there was no hope; it was full of gibberish which proved conclusively that the nation was doing absolutely splendidly, or not, as the case may be.

In the end, I found the whole thing fairly depressing reading, but then a thought struck me. (I ducked too late and it caught me right between the eyes. Which was unfortunate, for it took me a second or two to see what the thought had been driving at.) If I didn't understand a word or graph of what was in the *Report*, why did I find it depressing? I have never been one to want to be a smart-ass at things numerical, so it seemed an odd reaction on my part.

The answer appeared at the top of the *Report*, where it was stated that the thing had been reproduced by a well-known combination of snazzy word processor and pretty-pictures graph-producer. That was it; how could I have missed it before? The thing was dull beyond belief; not just in content — that goes without saying — but it was also excruciatingly 'dull' to look at.

It has come to my attention over the last six months or so that there is something happening to the world of the published written word. That something is the combination of the laser printer with a desktop publishing set-up of some description, be it the grandest all-bells-and-

whistles package, or a straight word processor (which some dirty dealer *might* try and pass off as a DTP system). The 'thing' in question can be broadly categorised as 'the same'. It doesn't seem to matter what DTP system is used or what make or type of laser printer. Everything comes out looking 'the same' as everything else that comes out of a desktop publishing system and laser printer.

There are two possible reasons for this, one of which I must admit to finding quite disturbing. The first, and not so disturbing one, is that nobody yet really understands how to use the things. This is quite possible, for the packages are designed to bring all the arts and crafts of publishing and layout to the average individual, and the average individual is not necessarily going to be any good at all at being 'arty' and 'crafty'.

The *more* disturbing possibility, however, fits into a horrid little theory that has been growing in my brain over the last year or so. You can call it paranoia if you like — go on, you know you're dying to — but I am becoming slightly suspicious of some aspects of the application of computers to the real world. Desktop publishing is just one example. The manufacturers in their advertising and literature wax lyrical about the capabilities of their products. Even if they don't use the actual words, one is left with the distinct impression that one can achieve just about anything with these packages — and make information appear in any conceivable form.

Indeed, you can, if you are willing to pay the real price of having all the right gizmos built-in to make such things happen. But even then I suspect that it would not be possible to reproduce the work of a good artist and a real printer on any DTP and laser printer set-up.

Somehow, though, the word 'flexible' is often seen bandied about in computer advertisements; the actual effect of the application of computer technology, however, is to create an 'inflexible' uniformity. Like I say,

most DTP documents have a 'sameness' that is instantly recognisable.

My horrid little theory takes this idea a stage further. Wearing a different one of my many writing hats, I have recently been involved in scribing about factory automation systems. (I even got to see IBM's Personal System/2 Model 50 being made, but that's another story.)

In this work, another thought has struck me. (This time I didn't even bother ducking.) There are companies out there which are spending zillions of greenbacks on investments in automated manufacturing facilities. This makes it possible, or so they say, to be far more flexible in what they manufacture, as the machinery is clever enough to be quickly reprogrammed to make it.

True, but only up to a point. The machines can only manufacture what they are physically capable of handling. A car parts assembly line can only make things that are roughly the same size and shape as car parts, otherwise more massive investment is required to make the changeover. So, as the companies make their investment in 'flexibility', so they become increasingly inflexible. Having spent zillions on one line of automated manufacturing, they are honour and bank manager-bound to make sure it is utilised to the full.

That way leads inevitably to fewer innovations and new product developments, because such efforts might result in something that won't fit the production line; so it had better stick to something safe, and readily saleable.

To some extent, the results can be seen in our High Street shops already. You can buy plastic bomber jackets in 350 different shades of pink, but underneath they are all exactly the same. I fear that, with computers, the word 'flexibility' is doomed to become synonymous with your own 'personal choice' of the colour pink (from a palette of however many it is that graphics systems can now offer). It won't be allowed to mean much else. **END**



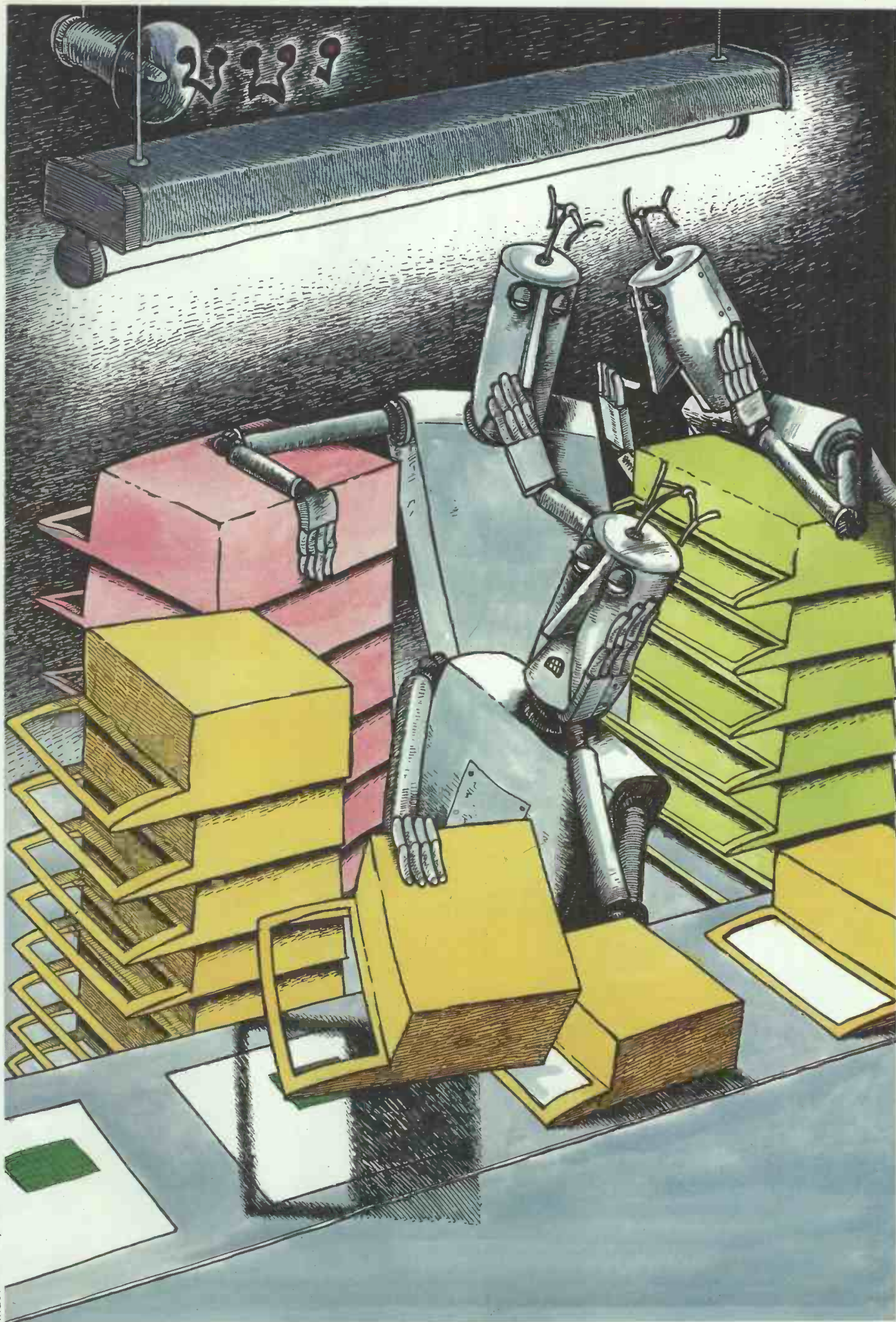


Illustration by Mark Hackett

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This is by no means the only outstanding feature of the LX800, however. In fact, it boasts a far higher spec than any other printer in its price range.

It is certainly very fast. In draft Elite, it can shoot along at 180 characters per second while in letter quality mode (at 10 cpi) it manages a respectable 25 cps.

Furthermore, changing between the different fonts is extremely simple. All you have to do is press a couple of buttons on the "Selectype" panel on the front of the machine.

The LX800 is very flexible in several ways. As well as having two correspondence modes, it can produce an enormous range of typestyles - even italics. It can also draw pies, graphs and charts.

A range of paper feed options is available - though a tractor-feed unit (previously an optional extra) is actually included in the price.

A variety of interface options means that the LX800 is compatible with any make of PC, and the IBM character set is built in as standard.

Also fitted as standard is a 3K buffer. This frees your computer for other tasks more quickly.

Of course, the LX800 is every bit as reliable as you would expect an Epson to be. Each pin in the print head can strike the paper at least 200 million times before it needs replacing.

Yet there's even more to tell about the LX800 than this. If you would like further information, simply print your personal details in the coupon below and return it to us today. (Alternatively, call up Prestel \*280# or ring 0800 289622 free of charge.)

-----  
Please send me information on the LX800 printer at once. (I am very much looking forward to its receipt.)

Name ..... Position .....  
Company ..... Address .....  
..... Tel No ..... BPW1

To: Epson (UK) LTD, Freepost, Birmingham, B37 5BR

# PC laptops

*The innovative supertwist LCD technology means that 'truly' portable computing is here at last. John Donaldson compares three 'cheap and cheerful' PC-compatible laptops which embody the state of the art.*

The micro business is full of good ideas that don't work. For the past three years one of these has been the idea of a battery-powered laptop computer which you can carry around with you and which has all the capability of a desktop micro. Certainly there have been no lack of laptop machines on the market, but unfortunately they have all had their shortcomings — either the LCD screen was too small, or they were mains-operated only which meant that you couldn't use them on the move.

About a year ago things started to change. A new 'supertwist' LCD screen was invented which was truly easy to read and, as a result, 'proper' laptops started to appear. Then the question changed from: 'Do they work?' to 'Are they worth the money?' Now even that criticism has been answered by the introduction of a new breed of useful and cheap laptop micros.

## Datavue Spark

Of the three companies represented here, Datavue is the least well-known. Its machines are distributed in this country by Quadram of PC 'add-on board' fame. The Spark is one of two new portable machines from the company; the other is called the Datavue Snap — and it is a far more upmarket machine.

On paper, at least, the Spark looks like it should offer very good value for money. The entry-level price of £895 buys you a machine with an NEC V20 processor, 384k of RAM, one 3½in 720k disk drive and an 80-column 25-line supertwist LCD display. However, before you get too impressed, life isn't as cheap as it may at first appear, because the price doesn't include the AC mains adaptor or any Ni-Cad batteries.

When it was delivered, my first impressions of the Spark were not good. One of the main things you expect from a portable computer is strength and durability and the casings of the Spark didn't exactly inspire me with confidence. The machine's outer casings are made out of lightweight, dark grey moulded plastic of the kind favoured by Commodore for a time with its Plus 4. This kind of plastic tends to be brittle and my hopes were not raised by a sticker on top of the main casing saying: 'CAUTION. Do not place any heavy objects on the machine. Excessive weight may destroy the floppy disk drives.' Not impressive.

## Hardware

The overall design of the Spark is fairly standard for a laptop of this type. The whole unit weighs about nine pounds and closed up should fit inside a large briefcase. In addition to the main unit, the Spark also needs an external mains adaptor. This provides power for the machine if you are not using batteries and trickle-charges the batteries if you have Ni-Cads installed. It connects to the main unit via four feet of lightweight twin core cable and a jack plug.

The mains unit is very compact and should fit into the briefcase alongside the Spark. One advantage is that the adaptor is auto-mains-sensing and can work on any mains voltage from 90 up to 264 volts. This could come in very handy if you plan to do a lot of international travelling.

The main unit contains all the elements of the computer: the keyboard, display, disk drives and I/O ports, with the display hinging down over the keyboard in normal laptop fashion to create a neat, portable unit. The machine comes complete with a pull-out handle.



PC laptops from left to right:

The disk drives live towards the rear of the machine, one along each side. The back panel houses a surprisingly large number of interface ports. From left to right they are: a reset button; a 9-pin RS232 port; RGB and composite monitor outputs; an IBM-style parallel printer port; and a connector for the optional 5¼in external IBM disk drive. The machine also comes with a blanked-off expansion port for adding yet-to-be-announced external add-ons. The rear left-hand corner of the machine also houses a blanking plate for the optional internal modem.

Usually it is very difficult to get inside a laptop because of the compact nature of the machine and the fact that most laptops house lots of CMOS electronics which could easily be zapped by prying fingers. Datavue, however, includes instructions on how to get inside the Spark. All you do is remove three screws and lever the top panel off. Once inside, you can't see much because everything is crammed so tightly together.



*the Sharp PC-4501A, the Datavue Spark and the Toshiba T1000— the technology finally catches up with the dream*

However, there are two small expansion slots: one for the internal modem, and one for a miniature 256k RAM card which brings the total RAM up to 640k.

The main processor in the Spark is an NEC V20 which is code-compatible with Intel's 8088 and 8086 processors. The Spark can run the processor either at 4.77MHz for true PC-compatibility or at a very creditable 9.54MHz to give the machine truly 'Sparkling' performance (*sic*). The machine also has a socket for an optional 8087 maths co-processor.

The machine is available with either one or two internal 3½in 720k floppy disk drives. However, the entrances to the drives are totally unguarded and there is nothing to stop dirt or old toffee wrappers getting into the drives and gumming them up. The machine is also available with an optional external 5¼in PC-compatible drive. This could be useful for downloading PC software and data; however, as IBM's PS/2 machines gain in popularity, the

need for a 5¼in drive should diminish.

When in use, the display hinges up to reveal the keyboard which actually feels nicer than it looks. As with all laptop keyboards, it is something of a compromise because of lack of space. However, the main qwerty typing section gets most of the space with the ten function keys running along the top of the keyboard. The main problems centre around the editing keys. The Spark starts off well by having a separate section for the four 'Cursor Control' keys and then goes and spoils it by putting the 'Insert' and 'Delete' keys miles away in the top right-hand corner of the unit.

The display is by far the most interesting section of the machine. In common with most modern laptops, it is an 80-column x 25-line supertwist LCD. These new supertwist screens are miles ahead of the older LCDs; they offer much higher contrast and are readable in most lighting conditions. For the ultimate in readability, an electroluminescent

(EL) backlit screen is available as an optional extra.

The Spark screen is mounted on a friction hinge which can be tilted at virtually any angle, although the review machine had quite a lot of play in the hinge which made it difficult to tilt the screen to the optimum viewing angle. Contrast can be altered via a small thumbwheel underneath the keyboard.

The Spark display is fully compatible with IBM CGA graphics and it can display either 320x200 or 640x200 graphics. Also, it is possible to hook up an IBM colour monitor to the RGB port on the rear of the machine and use the monitor as an alternative to the Spark's LCD display.

One of the most interesting aspects of the Spark's LCD display is that it works in colour. Because the LCD crystals are blue and the reflective background of the screen is yellow, the Spark somehow manages to produce four colours on the screen — bright blue, a couple of different shades of purple, and bright yellow.

# BENCHTEST

This can look very odd indeed; however, the Spark is also provided with a software utility which allows you to choose between different foreground and background shades until you find the one which is the most readable.

## Software

### Operating System

The Spark is claimed to be IBM-compatible and I could find little reason to doubt it. As standard, the machine is supplied with good old MS-DOS version 2.11. Because this version was not designed for 720k 3½in disk drives, Datavue has patched it so that it runs happily on the Spark.

Although MS-DOS version 2.11 is supplied with the machine, there could be advantages in going out and buying a copy of the new IBM PC-DOS version 3.3. (This version was released with the PS/2 machines and was designed specifically to work with 3½in disk drives like those used in the Spark.)

Also, as you will see later, there is some evidence that the Spark is more PC-compatible when it is running PC-DOS version 3.3 than when it is using its own MS-DOS version 2.11.

In addition to the usual operating system software, the Spark is supplied with its own disk-based diagnostics software and some ROM-based utility software.

The diagnostics routines are supplied on the master operating system disk and are called up by typing 'Diag' at the A> prompt. Using the diagnostics routines it is possible to check the CPU, the keyboard, the display unit, the floppy disk drives, the speaker, the printer port, the RS232 port and the onboard battery-backed clock.

When you first switch the machine on, the screen displays a list of the current system settings. If you want to change one of them, you have three seconds to hit a key and stop the machine from going into its boot-up procedure.

If you hit a key, the system asks you to press 'R' to reconfigure the system. Once you do this, you can work your way down the menu changing the system defaults. These will then be stored in battery-backed RAM and will remain in force until you change them again. Luckily, if you totally mess up the system, you can opt to return to the factory-set defaults and start again.

It is also possible to play around with most of the system settings while the machine is in the middle of an applications program by using a combination of the left shift, control

and letter keys. The main difference is that any changes you make at power-on are stored in battery-backed RAM while changes made with the keyboard are lost as soon as you switch the machine off.

The main key combination to remember is 'left shift', 'control', 'T'; this displays a list of all the keyboard commands on the screen. What follows will be a brief outline of the functions of the different commands. Instead of saying 'left shift' 'control' all the time I'll just list the appropriate letters. The '+' and '-' keys allow you to change the volume of the keyclick when you use the keyboard. Hitting 'D' allows you to make drive A into B and B into A.

None of this makes any sense until you realise that the Spark can only recognise drives A and B. If you have a twin-disk machine with an external 5¼in drive, you have three disks trying to be two logical drives. Datavue gets around this by allowing you to toggle logical drive B between the second internal drive and the external 5¼in drive.

Hitting 'S' allows you to change the colour palettes on the LCD display and 'I' allows you to invert the screen. If you have a backlight fitted to your display, 'O' allows you to switch it on and off. 'M' allows you to toggle between the internal LCD and an external monitor and 'B' allows you to check the battery level. Finally, 'F' allows you to toggle the processor speed between 4.77 and 9.54MHz.

One of the main compatibility problems for laptops at the moment is that they use 3½in disks and most IBM software is still only available on 5¼in disks. This doesn't have to be a problem because you can always copy the software across; the main problem is with copy-protected software which requires the original disk.

One very good test of compatibility is a public-domain game called Zaxxon which makes heavy demands on the display. When I first tried it on the Spark with MS-DOS 2.11 it nearly worked and then crashed. I then tried it under MS-DOS 3.2 which I happened to have lying around. This time it did worse than the first time. Finally, I tried it with PC-DOS 3.3 and suddenly Zaxxon ran perfectly. It all goes to show what a strange thing PC-compatibility is.

## Documentation

The review machine was supplied with a pre-production copy of the Spark owner's manual and an MS-DOS manual relating to another machine from the same company, the Datavue 25.

The preliminary Spark owner's

manual was laserprinted and ring-bound. The text was complete and I found everything easy to follow and easy to find. The final version should have screenshots and illustrations.

## Toshiba T1000

Of all the companies competing in the laptop market, Toshiba is probably the most successful. It now has a whole range of laptops stretching from the powerful and elegant T3100 down through the T1100 Plus to its newest machine, the T1000.

Each machine in the range addresses a different segment of the market. The T3100 uses a powerful Intel 80286 processor and a gas plasma display to produce an extremely powerful laptop micro. When this is combined with the all-black design of the casings, you have the ideal machine for people who are just as interested in looking flash as they are in raw computing power.

Up until now the T1100 has been the mainstay of the Toshiba laptop line. The original machine featured PC-style performance in a small neat package. The later T1100 Plus added a supertwist LCD screen for improved legibility.

The new T1000 fits in at the bottom of the range. It is competitively priced, but does not compete with the other two machines in terms of either processing power or storage capacity. It does, however, offer full PC-compatibility, a supertwist screen and a single 720k 3½in floppy disk drive.

## Hardware

Unlike the Datavue Spark, my first impressions of the T1000 were very favourable. It is very small, extremely light at only 6.4lbs and, above all, it feels very sturdy and reliable. All the casings are made out of strong, thick, cream-coloured plastic and the overall feel was of a very well-built machine.

The overall design is fairly standard; the front of the machine features a flip-up lid which holds the display and protects the keyboard when the machine is being carried around. The bottom of the casing features a small carrying handle which flips up when it is in use and then folds back flat against the underside of the casing when the machine is not being used.

The right side of the casing features a single 720k 3½in floppy disk drive. However, like the Spark, the drive on the T1000 is open to the elements and therefore susceptible to dust and dirt (and toffee wrappers!). The best idea for disk drives is the method used by the Zenith

Z181 where the disk drives are kept under the lid out of harm's way.

The left side of the casing houses a thumbwheel for adjusting the contrast of the LCD screen, a socket for the optional external numeric keypad, and a switch to select whether the optional external 5¼in floppy disk drive should appear to the operating system as drive A or B.

The rear panel of the T1000 offers exactly the same selection of I/O ports as the Spark. From left to right these are: a nine-way RS232 socket, a parallel printer port, a socket for the optional 5¼in external disk drive, and RGB and composite video outputs for connecting an IBM CGA-compatible monitor to the system.

The final two pieces of hardware on the back panel are the on/off switch and a socket for the 9-volt DC input. The T1000 is supplied with an external mains transformer, but unfortunately it will only accept 240-volt AC input. If you want to use the machine in a country which has a different mains voltage, you will have to buy another transformer.

The review machine was also supplied with the optional internal modem. This comprises a telephone socket and its own on/off switch. The unit on the machine was designed for use in the States and is therefore illegal in the UK.

Getting inside the machine is simply a question of removing six screws and persuading a couple of press catches that they *want* to open. When this has been done the whole top panel and screen lift up to reveal the workings of the machine.

All the circuitry is incorporated onto one PCB, which looks like a miniature work of art. The vast majority of the components are surface-mounted to save space and there are a large number of custom chips all bearing the Toshiba logo.

The main processor is an 80C88 running at a sedate 4.77MHz. There is no high-speed option. As standard, the machine comes with 512k of RAM and 256k of ROM (more of which below).

The RAM can optionally be extended to a total of 1.2Mbytes, of which the first 640k is used as system RAM and the second 640k is available as LIM EMS memory. However, this is only of use for applications programs conforming to the LIM standard.

The T1000 comes with rechargeable batteries as standard and Toshiba claims about five hours use on one charge. As always this is dependent on how much you use the disk drive and the I/O ports, but it turned out to be an accurate figure during the test.

The keyboard consists of 82 keys arranged very sensibly. Considering the small space available, it is very

easy to use. The main qwerty typing section takes up most of the available space and is nicely laid out with the exception of the \ key which has been banished to a far-flung top right-hand corner of the typing section. All the qwerty keys are cream-coloured, while the other keys are grey.

Above the qwerty typing section is a row of fifteen compressed keys. Ten of these are function keys, the left-most is the ESCape key and the other four cover Num Lock, Scroll Lock, Print Screen and Sys Req.

In the top right-hand corner of the keyboard are two LEDs; one glows red when the disk is being accessed and the other glows green in normal use and red if the batteries are getting low.

The bottom right-hand side of the keyboard is taken up by the editing keys. Here we have the cursor control keys surrounded by the page movement and the insert and delete keys. Although this layout isn't ideal, it is much better than the Spark's.

A makeshift numeric keypad is provided by allocating numbers to some of the qwerty keys. If you do a large amount of numeric work, Toshiba can supply a proper external numeric keypad. This should make entering numbers much easier.

The display is a fairly standard 80-column x 25-line supertwist LCD. Unlike the Spark's it uses just two colours, and is all the better for it. There was no evidence of flicker and the characters were well-formed with excellent contrast. The LCD is compatible with software written for IBM's CGA graphics standard and can display graphics at a resolution of 640x200 pixels. The angle can be easily altered, so achieving a good picture is no problem.

The T1000 does not have the option of an EL backlighter, so its performance in very low light conditions suffers. However, in average light, I had no problems reading the screen.

My main criticism of the T1000's display also applies to the other machines in this review and con-



The Toshiba T1000 and the Datavue Spark have identical ports at the rear, consisting of serial port, parallel port, RGB, external floppy disk and composite video. The Sharp PC-4501A has only a serial port, a parallel port and an external floppy disk mounted on its right-hand side

cerns the aspect ratio provided by standard LCDs. All three displays in this review are much wider than they are deep, whereas most CRTs are virtually square. This means that a pie chart which would be circular on a normal IBM display ends up being egg-shaped on these LCDs. The only machine I know of which doesn't have this problem is the Zenith Z181. This has a special LCD with an aspect ratio similar to that of a normal CRT.

## Software

Like the other machines in this review, the T1000 is supplied with MS-DOS version 2.11. However, unlike the other machines, the T1000 has its DOS stored in ROM instead of on disk. This is a *very* good idea.

When you first switch the machine on, it goes through its RAM check and then looks for a DOS disk in the floppy drive. This is done to allow you to use a version of DOS other than version 2.11 which is built into the machine. Some people may want to use version 3.2 or 3.3, for example.

Assuming there is no DOS disk in the drive, the machine goes on to boot from ROM and then goes on to display the usual MS-DOS copyright notices. When it has booted up, the ROM is presented as drive C:. A quick look at the directory reveals that not only is DOS present, but so are all the usual DOS utilities and even some Toshiba utilities. The ROM looks for all the world just like a normal disk drive except that it is write-protected.

### Benchmarks: Datavue Spark

	4.77MHz	9.54MHz
Intmath	5.9	3.6
Realmath	6.9	4.3
Triglog	50.3	30.0
Textscrn	1min 33.9secs	1min 02.1secs
Grafsrn	36.5	21.8
Store	21.4	12.3

### Benchmarks: Toshiba T1000

		9.54MHz
Intmath		5.9
Realmath		7.2
Triglog		54.1
Textscrn	1min 32.3secs	
Grafsrn		37.2
Store		20.9

### Benchmarks: Sharp PC-4501A

	4.77MHz	7.16MHz
Intmath	5.2	4.4
Realmath	6.1	5.2
Triglog	43.5	37.7
Textscrn	2min 49.4secs	2min 17.6secs
Grafsrn	32.3	27.9
Store	22.4	21.6

All timings in seconds unless otherwise specified. For a full explanation of the PCW Benchmarks, see the December 1986 issue, page 164.

The main utility provided with the T1000 is called 'Setup 10'. When it is run it provides a menu which allows you to alter certain system parameters. The first two options are by far the most interesting and cover the placement of the 'Config.sys' file belonging to MS-DOS. One problem with putting MS-DOS on ROM is that it isn't possible to change the entries in Config.sys. As the ROM version of the file only contains the statement 'Country=001', this could be a problem.

Luckily, those clever people at Toshiba have considered this and give you the option of either using the ROM version of Config.sys or copying your own version from disk to a section of battery-backed RAM where it will stay for ever more (or until you change it again). This solution works well and means that you can play with all your files, buffers and devices to your heart's content.

The other options are quite boring by comparison and allow you to play with the RS232 port, display mode and the printer port; this can be set to bi-directional which could be handy for downloading IBM software.

As far as software compatibility is concerned, the T1000 seems to be very compatible with PC software, although perhaps not quite as compatible as the Spark.

## Documentation

No documentation was available with the review machine.

## Sharp PC-4501A

Sharp has been in the laptop market longer than most and has been one of the major innovators. Unfortunately, because of the problems associated with laptops, Sharp's laptops haven't been all that successful. For instance, the company's PC5000 was a real innovator in its day and it had one of the first 80-column screens, a built-in printer and bubble memory storage, but people weren't exactly queuing in the streets to buy one.

Sharp's latest attempts to crack the laptop market centre around its new PC-4500 range. At the moment this consists of two machines: the PC-4501A which is cheap, and the PC-4502 which is a bit more expensive. Both machines are basically the same, but the top model has an extra disk drive, more RAM, a numeric keypad and is painted black.

## Hardware

The review machine was the entry-level PC-4501A which at £850 plus VAT is comparable with the other two machines in this review.

When I was handed the PC-4501A, it was cunningly disguised as a Sainsbury's plastic carrier bag. When I lifted it up, I was convinced that the bag would contain the week's shopping rather than a 'portable' laptop machine. Sharp claims that the machine weighs 10lbs; all I can say is that it feels like a lot more. Unfortunately the PCW regulation bathroom scales were on loan to someone else, so I couldn't check the weight for myself. At just over 12ins wide x 13ins deep x 3ins high, the PC-4501A is quite large by laptop standards. This becomes very obvious when you compare it with the diminutive Toshiba which is a model of compactness and lightness.

The general design and layout of the Sharp is very similar to the other two machines, with a hinged lid holding the display which folds down to protect the keyboard. Sharp has tried to spice things up a bit by putting the hinge to one side instead of in the centre of the lid. Said hinge, by the way, is designed to hold the screen at any angle you like.

The left side of the machine contains all the I/O ports. These consist of one full 25-way RS232 port, one parallel printer port and a connector for an external 5¼in floppy disk drive. Unlike the other two machines in this review, the Sharp doesn't come with monitor ports to allow you to attach CGA screens to the machine. However, a CRT card is available as an optional extra.

The rear of the machine is empty except for a single blanked-off external expansion slot. This is provided to allow you to attach the optional external expansion box which will take up to three Sharp expansion cards.

Underneath the machine are: the carrying handle which flips up for use and then clips neatly out of the way, and a set of DIP switches.

Finally, the right side of the machine contains the disk drive, the on/off button, a 9.8-volt power input socket, and two thumbwheels to adjust the brightness and contrast of the display.

Although the casing has room for two disk drives, the PC-4501A only comes with a single disk. The other slot is blanked off. Unlike the other two machines in this review, Sharp has taken the sensible precaution of fitting a spring-loaded flap to the mouth of the disk drive. This stops any dirt (and toffee papers) accidentally gumming up the works. Sharp has also mounted the disk drive on rubber shock absorbers to aid reliability.

Like the other machines, the PC-4501A is supplied with an external



main power transformer, and, like the Toshiba, it isn't possible to alter the main voltage on the Sharp unit, so using it abroad could be a problem.

The machine comes with internal re-chargeable batteries as standard and Sharp claims five to seven hours use between charges. However, this 'go-anywhere battery-power' did prove to be a headache during the review.

The problems centre around the fact that the Sharp doesn't have a proper on/off switch. Instead of having a normal switch which cuts the power when you flick it, the Sharp has a microprocessor-controlled on/off button. Even when it is switched off, the machine constantly monitors the on/off button and when you press it, the machine switches itself on. When you want to switch off, you press the button again and the machine closes down its files and switches itself off.

This is all well and good, but it is possible to have a software crash which stops the processor from monitoring the on/off switch. On mains-based machines you can always pull the power lead out of the wall, but the Sharp runs on its own internal batteries. If a reset is necessary you have to flick dip switch one. A hardware reset button is promised on the production machine, and I discovered that Ctrl-Alt-Setup will perform the same task.

The main processor inside the machine is the NEC V40 running at 4.77 or 7.16MHz. This is compatible with the 80188 which is best described as the bastard child of the far more popular 8088 processor. If it were a horse, its breeding would be described as 'by DMA out of 8088'.

The PC-4501A comes with 256k of RAM as standard. This seems rather mean when compared with the other two machines in this review, but it can be increased to 640k onboard. The machine also comes with an internal expansion slot which can be used for an optional EPROM card or for an EMS memory board which adds another 1Mbyte of RAM.

The keyboard is nicely laid out with plenty of room between the keys and a nice large 'Return' key. The function keys are strangely laid out in two rows above the qwerty typing section. In addition to the ten function keys, these rows also play host to the 'Num Lock', 'Scroll Lock', 'Ins', 'Del' and 'Esc' keys. There is also a key marked 'Set Up'.

Overall, the Sharp's keyboard had the nicest action of the three machines in this review. The only point I didn't like was the separation of the cursor control keys which were at the bottom of the keyboard and the insert and delete keys which were at the top. In common with the

other two machines in this review, the PC-4501A doesn't have a separate numeric keypad, unlike the more upmarket PC-4502.

One area where you would expect the Sharp to excel is in its display and this was the only machine in this price range to come with an EL backlighter as standard. This means that the Sharp's screen actually glows and there are no worries about having enough light to read the screen.

In use, the Sharp's screen is certainly good; however, it says much for the development of supertwist LCD screens that, even with its backlighter, the Sharp isn't that much better than the Toshiba or the Spark. Sharp claims that the machine also uses a supertwist screen, but when the backlighter is switched off the contrast is very bad.

In most lighting conditions, I wouldn't say there was much to choose between the Sharp with its backlighter and the other two without. However, in low-light situations the Sharp literally shines through

and provides a very impressive display. My only criticisms on the review machine were the high-pitched scream from the EL unit and the slight shortening of battery life which goes with using an EL backlighter.

## Software

Like the other machines in this review, the Sharp is supplied with MS-DOS version 2.11 modified to accept 720k 3½in disk drives. Like other Sharp machines, the PC-4501A uses compatibility ROM software from Vadem Inc in the States. In use, DOS behaves quite normally with no visible changes from Sharp.

The main area of interest is the ROM-based set-up software. This may be called up at any time by pressing the 'Set Up' key on the keyboard. The system then displays a very long and comprehensive menu of system options which may be changed. All options are selected by using the cursor keys and then changed by using the space bar to scroll through the options.



All three machines feature 720k 3½in disk drives, and as this format appears on IBM's entire PS/2 range, there should be no shortage of software. The Spark and the PC-4501A can be fitted with second internal drives, but in the T1000 DOS in ROM means that one drive is adequate

# BENCHTEST

Using the set-up menu it is possible to set the date and time, set an alarm for a certain time, play around with the display, alter serial port baud rates, change the printer interface and change the processor clock speed.

The display options which can be set include cursor type, blinking or not and normal or reverse video. It is also possible to turn the backlighter on or off and alter the time, after which the backlighter automatically switches itself off. As standard, if you don't ask the machine to do anything for two minutes, the backlighter will switch off.

As far as software compatibility with IBM software is concerned, the review machine was indeed far from 'sparkling'.

I should point out, however, that the machine was using pre-production hardware, and compatibility should have been improved by the time the retail version hits the streets. Sharp intends the production machine to be fully IBM-compatible, although much of this is being achieved through the ROM BIOS.

## Documentation

No documentation was available with the review machine.

## Conclusion

When I started this review, I didn't think there would be much to choose between these three laptops as they are all relatively cheap and all offer a similar performance. However, I was surprised that they all have their own unique selling points, and they all have their weaknesses. I was *most surprised* by how good all the machines were: I gave up trying to use laptops about a year ago because I found them too limiting. This is not the case today. Supertwist screens and full PC-compatibility mean that these machines are truly useful.

For me, the clear winner of the contest is the Toshiba T1000. It is small, very light and has a good screen and keyboard. Above all, it is extremely well-built with beautiful attention to detail. Its main failing, however, is its slow processor speed, but if Toshiba doubled the clock speed I wouldn't have anything to criticise.

Second place goes to the Spark. This machine is *technically* more advanced than the Toshiba — it is much faster and offers a wider range of options — but it is let down by its poor build quality and flimsy design. The screen, also, is slightly inferior.

Last comes the Sharp. Its main failings are its relative size and weight

and a question-mark over its PC-compatibility. I'm sure that the retail versions of the machine will be much better than the review machine in this respect, but the use of the V40 processor could still be a problem. If you want to run something ill-behaved on your laptop, you'd be wise to try it on the Sharp before buying. Nonetheless, Sharp is aiming

to run all the major PC packages on the machine. The main advantage of the machine is its backlit screen which is very good in low light conditions.

The Datavue Spark costs £895 (excluding VAT) from Datavue on (0753) 34421.  
The Toshiba T1000 costs £995 (excluding VAT) from Toshiba on (0276) 62222.  
The Sharp PC-4501A costs £845 (excluding VAT) from Sharp on (061) 205 2333.

END

### Technical specifications: Datavue Spark

Processor: NEC V20 switchable to 4.77MHz or 9.54MHz  
RAM: 384k expandable to 640k  
ROM: 32k  
Mass storage: Single 720k 3½in floppy  
Storage options: Extra 3½in drive, external 5¼in drive  
Keyboard: 77 keys  
Monitor: Four-colour supertwist LCD; CGA-compatible  
Standard interfaces: RS232, parallel printer, disk drive  
Expansion: Internal modem  
Size: 13.2insx2.5insx13ins  
Weight: 9lbs  
Bundled software: None

### Technical specifications: Toshiba T1000

Processor: 80C88, 4.77MHz  
RAM: 512k expandable to 640k plus 640k LIM  
ROM: 256k including MS-DOS 2.11  
Mass storage: Single 720k 3½in floppy  
Storage options: External 5¼in IBM-compatible drive  
Keyboard: 82 keys; optional external numeric pad  
Monitor: Supertwist LCD, IBM CGA-compatible  
Standard interfaces: RS232, parallel printer, disk drive, RGB monitor  
Expansion: Internal modem, LIM memory  
Size: 12.2insx2.05insx11.0ins  
Weight: 6.4lbs  
Bundled software: None

### Technical specifications: Sharp PC-4501A

Processor: 80188 switchable to 4.77MHz or 7.16MHz  
RAM: 256k expandable to 640k; optional 1Mbyte LIM  
ROM: 32k  
Mass storage: Single 720k 3½in floppy  
Storage options: Optional second floppy, external 5¼in drive  
Keyboard: 78 keys  
Monitor: Backlit supertwist LCD, CGA-compatible  
Standard interfaces: RS232, parallel printer, disk drive  
Expansion: One slot, optional LIM, EPROM card or RGB interface  
Size: 12.1insx3insx13.75ins  
Weight: 10lbs  
Bundled software: None

### In perspective

There was a time, not so long ago, when laptops were regarded as a niche market. Now even this 'niche' is being further sub-divided into power laptops, mid-range laptops and cheap laptops.

The Datavue Spark, the Toshiba T1000 and the Sharp PC-4501A are all competing at the bottom end of the market in terms of price. However, in terms of features the lines are very blurred between these machines and the next echelon of mid-range laptops.

The Toshiba T1000 suffers most from the need to differentiate itself from its larger and more expensive brother, the T1100 Plus. The lower clock speed imposed by the need for limited performance spoils an otherwise excellent machine.

The Datavue Spark is a much more versatile machine and is available in a wide range of specifications and prices. The main problem is likely to be gaining market support for a relatively unknown brand, but Quadram's distribution deal is likely to help here.

The Sharp's main claim to fame is its backlit screen and the chunky, reliable feel of the machine. The market has been educated to think that backlighters are a good thing, so having one as standard at this price level has to be a big plus. However, in areas such as standard RAM and video output, the Sharp lags behind the other machines, so it could well prove to be a case of swings and roundabouts.

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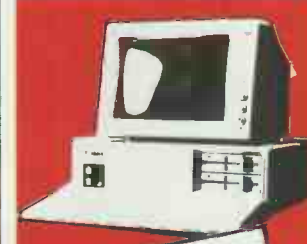
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# Amstrad PC1640

*The Amstrad PC1512's poor reception in the US has led Alan Sugar to redefine the needs of the market at which it is aimed. The PC1640 offers more memory and, above all, EGA compatibility. Robert Schifreen assesses the machine's rejuvenation.*

Arguments still rage over the exact sales figures, but few people dispute that Amstrad's launching of the PC1512 affected the industry to almost the same degree as IBM introducing the real thing in 1981. The PC1512 didn't go down well in the US though, as clones there are ten-a-penny and products that seem good value in the UK aren't always greeted with the same applause over there.

So, the 1640 was developed and launched. With built-in EGA capability and a suitable monitor included, this was more like the type of machine Americans wanted.

At the initial announcement at Comdex Spring, Alan Sugar said that the 1640 would start life only in the US, and that British customers would have to wait until at least the end of the year for the first glimpse of the new model. For a number of reasons — probably because sales of the 1512 suffered in the same way that IBM couldn't sell any PCs immediately before the PS/2 launch — the 1640 has been launched in the UK and is now starting to appear in dealers' showrooms and High Street shops such as Dixons.

The 1640 is essentially the same as the 1512, with a number of additions and a couple of subtractions. Rather than review the machine in detail — most of which has already been covered before — this article concentrates only on the *differences* between the 1640 and the 1512.

## Appearance

Every couple of weeks, Amstrad's PR company phones PCW and asks to borrow our long-term-loan 1512 for a few days. And each time the machine comes back, yet more of the plastic casing has had slits cut in it to provide ventilation, or more of the motherboard has been covered in silver foil to reduce the radio interference. The 1640 system unit is the same shape as the older model, and still more of the plastic casing has



had slits cut in it (the motherboard is now totally oven-ready). There is still no fan in the system unit, although there *is* one in the monitor which still contains the power supply.

For some reason the review machine's DIP switches come factory-set for use with a mono monitor, and a large sticker on the screen tells you to change these before switching on.

The monitor is called the ECD, or enhanced colour display, and is noticeably bigger and heavier than the original colour display. The glass is not coated, and the shiny surface reflects, mirror-like, anything in the room. The screen measures 10.5ins x 7.5ins x 13ins diagonally.

The monitor now connects to the

system unit via an IBM-standard 9-pin socket, so you could use a different monitor — though you'd still need the Amstrad unit to provide power for the machine.

The keyboard is identical to that of the 1512, except for the wording of the logos which now say '1640' and '640K' instead of '1512' and '512K'.

## The changes

When I did my 'interested customer' impression and called Amstrad's technical department, no-one was initially prepared to give me a list of differences between the 1640 and the 1512. Eventually, Amstrad's marketing manager told me what I needed to know. These are the changes that turn a 1512 into a 1640:

### ● The display

The standard monitor supplied with the 1640 is EGA- and CGA- compatible. EGA, the enhanced graphics standard, has a resolution of 640×350 compared with the CGA's 640×200. You can have 16 colours, from a palette of 64, on the screen at a time. The motherboard contains an extra 256k of video RAM to handle the EGA display data.

Hercules compatibility is also built-in on the motherboard and, with a mono monitor, will provide graphics resolution in two colours (black and white) of 720×350. When the system is first switched on, the 'Please Wait...' message appears in CGA mode, but the system then switches by default to give the MS-DOS prompt in EGA mode.

The hardware to handle the switchable display is a custom chip made by Paradise, the EGA card manufacturer which was taken over in the US by Western Digital, maker of hard disk controllers.

The software to change screen modes comes in the form of a short MS-DOS utility called 'DISPLAY' that is used from the MS-DOS command line. Typing DISPLAY CGA, DISPLAY EGA or DISPLAY HERC sets the correct mode, altering the sync rate of the monitor to match and giving a loud click as it does so. Typing DISPLAY HERC with the EGA monitor installed produces a blank screen.

The DISPLAY program allows you to reboot the machine but preserve the current screen mode. There is no documented way of allowing your programs to do what DISPLAY does, but it shouldn't be too difficult to examine the program's code to see which commands are used.

The quality of the display is a huge improvement over the standard IBM CGA, though not as crisp as, say, an IBM EGA card connected to an NEC multisync monitor. Still, considering that the list price of the NEC monitor is over £700, this isn't surprising.

Amstrad's EGA emulation seems fairly sturdy and IBM-compatible. EGAPAINTE, from RIX, worked properly (driven by the Amstrad mouse) and the system had no trouble producing a 43-line display — a standard feature of the EGA, though you need special software to make use of it. Unlike some clones (including the ARC machine which I normally use) DOS used the whole of the 43-line screen and didn't insist on scrolling

after 25 lines. The credit for this belongs to the BIOS on the Paradise card.

The CGA mode seems to work in exactly the same way as on the 1512, as I encountered no problems with the programs I ran. It ran 130COLOR, a Basic program that produces 130 different colours by reprogramming the CGA controller chip, with no problems. Some devious copy-protected games which have to be booted also worked, including BurgerTime and Zaxxon. I did notice a high-pitched whistling noise while the monitor was in CGA mode, but I was impressed with the amount of software it ran.

### Prices

PC1640 with single 360k floppy drive	£799
PC1640 with twin 360k floppy drives	£899
PC1640 with single 360k floppy drive and 20Mbyte hard drive	£1199

*(The specification includes an EGA monitor, DOS, keyboard, GEM and Basic. All prices exclude VAT.)*

With a monochrome monitor attached instead of the EGA one, the system supports Hercules graphics modes too, though I didn't have a chance to try this. The 16-colour graphics mode on the 1512, which was half-way between CGA and EGA, has been dropped.

One of the biggest complaints about the 1512 is that you can't disable the internal graphics adaptor. This means that, although you can put extra graphics cards in the machine, there is a chance that they will clash with the existing Amstrad hardware and neither will work.

A DIP switch setting now allows the IGA (internal graphics adaptor) to be disabled, and standard colour, mono, Hercules or EGA cards to be installed.

### ● Software changes

DOS Plus, Digital Research's MS-DOS lookalike, has been dropped. Although it is shipped free with the 1512, enthusiasm was limited as it offered nothing over and above MS-DOS and was supported by very few companies. Latest rumblings from the rumour mills suggest that the next Amstrad machine will come with Microsoft's Windows.

There are still four coloured disks supplied with the machine, contain-

ing MS-DOS version 3.2, GEM version 2.0 and Locomotive Basic 2. With the extra space on the disks now that DOS Plus has gone, Amstrad has found space for 'LINK', a programmer's utility missing from the 1512 pack. The extra space also accommodates the hard disk format and 'PARK' utilities.

GEM is supplied configured for an EGA and the display is infinitely better — it uses its own typefaces for screen display rather than the CGA's.

### ● Memory

The PC1640 comes with 640k of RAM as standard. If you don't need all of this, there's a RAM disk device driver on the MS-DOS disk.

### ● Expansion slots

As before, there are three expansion slots. However, the 1640 also has a fourth half-length slot buried inside the machine (with no cut-out in the casing) whose official purpose is to take the hard disk controller. This means that hard disk users still have three vacant slots. If you don't have a hard disk, you can use the fourth slot for any short expansion card that doesn't have 'outside' connections.

### ● Clock

The BIOS bug in the 1512's real-time clock appears to have been fixed in the 1640. On previous machines the clock was not reset after midnight, and the system informed you that it was 27 o'clock and promptly crashed. This shouldn't happen now.

### Documentation

The 1640 is supplied with a 500-page manual that looks very similar to the 1512 documentation. It's slightly thinner, though, as references to DOS Plus have been removed. Only two chapters appear to have been rewritten, namely those dealing with display modes and adding extra graphics cards.

### Conclusion

Upgrading any PC from 512k to 640k is not the hardest job in the world, so the 1640's main selling point comes down to the EGA compatibility. It's often risky to launch an EGA machine and to claim that, in CGA mode, it's compatible with existing CGA software, as sometimes the emulation is far from perfect. Amstrad's implementation, which seems to use separate circuitry for each mode, impresses me, though the praise probably belongs to Paradise more than Alan Sugar.

Even so, with the PS/2's capabilities making software developers aware of the importance of good graphics, no-one can deny that the EGA is far from dead and that the 1640 is good value for money.

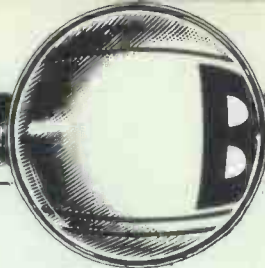
Amstrad is on (0277) 228888.

END

### In perspective

From the start, everyone told Alan Sugar that he had to do it, and he finally has. To launch a PC that can't take an EGA card, when the world of presentation graphics and desktop publishing is just opening up, is ludicrous, and it's hardly surprising that it was the US that forced his hand.

The 1640 is terrific value for money (though you can start to understand why it's so cheap when you look inside the plastic case) and I can't help feeling that this machine could be the basis for a number of future products. If he can get as good a price for any Digital Research product as he's no doubt getting for GEM, we could be looking here at half of the decade's best-value DTP system.



# Cambridge Computer Z88

*The prototype of the Cambridge Computer Z88 previewed in the March issue of PCW has developed into its retail vision — a sub-£300 laptop with admirable facilities. Robert Schifreen tests its mettle.*



Although Toshiba would have you believe otherwise, many people — myself included — don't really need or want all this laptop power. Rather than using a laptop as an extension of the office desktop, they'd be content with a light, thin machine with built-in proprietary software that functioned as a word processor, diary, calendar, spreadsheet, database, and so on. Expensive, heavy disk drives would not be necessary: non-volatile RAM and/or EPROM would suffice, as long as there was a printer socket and a way of easily transferring data into the PC when you were back at work.

This is exactly the philosophy which, hopes Sinclair (the man — the company name now belongs to Amstrad), will make people buy his £250 laptop (excl VAT) rather than a portable PC for ten times the price.

The Z88 is not the first machine like this — as Tandy and Psion would be the first to tell you. But the market has not yet really taken off in a big way. Sir Clive's marketing manager puts this down to the industry not having had Clive Sinclair's name behind it before.

## Hardware

The machine itself looks remarkably like the wood mock-up which was featured in the March issue of *PCW*. Within a millimetre, it's the size of a copy of *PCW* and 2cms thick. The LCD screen doesn't tilt up, but a stand underneath lifts the whole machine up by 4cms. With its four Walkman-size batteries fitted, the machine weighs 21lbs 2ozs, or the same as a well-stuffed Filofax.

The display is a 100-column super-twist LCD made by Epson and not a flat screen TV as was once rumoured.

Going round the edges of the machine, the mains input (via an optional adaptor) and LCD contrast knob are on the left. There is also a reset button, set deep into the case as you shouldn't need to press it. On the right is the RS232 connector, which is a female 9-pin socket. Sir Clive has learned from the Spectrum's mistake — this time it's a full RS232 interface with all lines present, and can handle split baud rates (1200/75 for Prestel).

This connector is the system's only link with the outside world — there is no parallel printer port so you'll need a serial printer or an extra interface for your parallel one.

A flap next to the RS232 socket conceals a 20-way, double-sided edge connector. There is no documented use for this at the moment, though no-one denies that disk drives will, hopefully, be available soon.

The front edge of the machine provides three slots. These hold special

cartridges designed by Cambridge Computer, each slightly larger than a Microdrive cartridge. My review machine had a 128k RAM cartridge in slot one (to extend the basic 32k supplied internally) and a 128k EPROM in slot three. Like the Psion Organiser, the Z88 will blow files onto EPROMs (using just the batteries for power). An eraser costs £39.95. The RAM and EPROM cartridges are also available in a 32k size, and 1Mbyte ones are promised.

There is no battery on the RAM cartridges, so removing one will lose its contents. Although the EPROMs are more permanent, I don't think I'd pass my Z88 through customs' x-ray machine without first removing them and asking for them to be hand-examined.

There is no socket for connecting to a full-screen monitor. The designers say that this is impossible.

The keyboard looks like a QL and feels like a Spectrum. It's rubber — a return to the days of dead flesh. Underneath the one-piece rubber mat, the electronics of the keyboard is the thickness of a piece of cling-film — a revelation to take apart and look at but a pain to put back together afterwards.

The official reason for using a rubber keyboard is that it's quiet enough to use in a meeting without disturbing anyone. Unlike some of Clive's earlier excuses for various disasters, this one stands in my opinion. It takes some getting used to, but you really can work up quite a speed. It's not too fussy which part of a key you hit. If you find it too quiet, an option on the control panel (a popdown application) will turn on a click.

I used the Z88 for a couple of days on the Tube in London and, although the train's movement led to some missed keys, the final result was infinitely more readable than my mobile handwriting.

The rubber gets grubby quickly, as you can't just brush crumbs and things off it. The official cure is a damp cloth and this worked wonders, but don't use tissues as they leave bits of fibre everywhere.

The two most important keys are the square and the diamond. The square is used to launch an application (square B starts Basic, for example), while the diamond selects an option within an application (diamond BC for block copy while in the word processor). If you don't remember the diamond key combination for a particular function, there's a complete Help system that lets you drive everything through menus; these menus also give you the correct diamond key combination so you won't forget next time.

My biggest keyboard gripe is the layout. If your thumb falls short of the left-hand side of the space bar

and hits the square, you'll be back at the applications menu but won't know it unless you look at the screen. A warning beep on pressing this key would be helpful.

Also, the Index key (to return you to the top-level menu) is far too easy to hit with the palm, especially if the train rocks more than it should.

## Inside

The single PCB contains just four chips and a collection of transistors and resistors. There's also a large capacitor that will power the whole system for six minutes while you change the batteries. (The figure of six minutes is for a machine with no cartridges fitted. With all three slots filled, you have only 60 seconds.)

The four chips are a Zilog Z80, a custom ULA manufactured by NEC, a 32k DRAM chip and a 1Mbit EPROM containing all the software. Although the machine is Z80-based, it isn't CP/M in any shape or form.

Surprisingly, the Z80 is not of the less power-hungry CMOS type. Even so, battery life is quoted at 20 hours' use, or up to a year if the machine is never used.

The control panel lets you specify a number of minutes of inactivity, after which the machine switches itself off to preserve power. (Actually, the Z88 is never truly switched off — the display is blanked and memory is still preserved.)

## System software

Assuming that you haven't bought any third-party software on EPROM (Cambridge Computer won't be marketing any), you are tied to the software in the internal 128k of EPROM. System software is divided into 'Popdowns' and 'Applications'. Both types are selected from the same menu — the only difference is that when you exit a popdown, it disappears from memory and is not suspended. The advantage of applications is that you can suspend them, do something else, then return to the program and find your data intact.

It's strange not being able to quit an application — you have to leave it suspended and kill it from outside. I tended to build up a collection of suspended activities and then do a general massacre when memory was getting short.

With my review machine (32k internal memory plus 128k extra), I could easily have six copies of Pipe-dream (the spreadsheet/word processor) suspended, each containing a (different) short document.

When you switch on the machine (by pressing both Shift keys simultaneously) the screen displays the Applications menu and a list of suspended applications. Entries are selected and programs loaded by use

# BENCHTEST



The most impressive component of the Z88 is the 'dead-flesh' keyboard (which is quiet in operation). The electronics are contained in a thin, plastic film, and are activated when your fingers touch them through the rubber mat

of the cursor keys and the Enter key. If you do buy extra software on EPROM, the operating system will find the program's name and add it to the applications menu.

The suspended applications list gives the name of the applications, the file being worked on and the date it was created or last amended. In one of the most user-friendly ways I've ever seen, the date is displayed as 'Today', 'Yesterday', and so on.

To remove an application from the suspended list, you point to it with the cursor and press the diamond key, then type KILL. The screen blanks for a second while the system frees the memory previously being used by that task.

## The Popdowns

### Calculator

On the face of it, the calculator is a four-function calculator with a memory. There are no scientific functions like logs and trig. There is, though, the useful facility of being able to convert to and from Gallons/Litres, Miles/Km, MPG/Litres per Km, Acres/Hectares, Pounds/Kg, Oz/G and Fahrenheit/Centigrade.

### Calendar

The calendar shows one full month

at a time and highlights the current day (the computer has a built-in real-time clock). Cursor keys, in conjunction with Shift, move the highlight forwards and back in steps of a day, week, month or year.

The calendar will calculate dates back to the year 1753 — useful if you want to know that American Independence day (4 July 1776) was a Thursday, or that my hundredth birthday will be a Monday (better keep the party short or I'll miss *Blue Peter*).

### Clock

This popdown opens a small window on the screen containing the current day, date and time. There are two options on the window, selectable with the cursor keys: 'Exit' returns you to the previous task; while 'Set' allows you to adjust the system's clock calendar.

While the clock (or any other application for that matter) is active, other applications on the screen are dimmed. This is pretty clever, since LCD displays work on the On or Off principle — there is nothing in between. Cambridge Computer seems to be achieving the dimming by refreshing some parts of the screen more often than others.

### Alarm

There is no real limit to the number of alarms you can have set, except that each takes up some of the machine's memory and will probably slow down the system by a slight amount while the processor keeps checking to see if any of the alarm times have been reached.

At the duly appointed time, the alarm goes off and the bleeper bleeps. Even if the machine is 'switched off' the alarm will still sound, though unless the machine is actually on your desk you're unlikely to hear the noise it makes. I miss not being able to edit alarms: if you make a mistake, you have to clear the entry and try again.

There's a field in the alarm popdown to enter a message of up to 22 characters. Normally, this message will pop up in a window at the duly selected time to remind you that your meeting is about to start, that your Pot Noodle is almost ready, or whatever. Alternatively, you can set the machine to send the string to the keyboard as a command, which provides a timed execution facility to, say, run a Basic program to download your electronic mail during the night (though you'd have to write such a program yourself).



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# BENCHTEST

## Filer

Documents are saved in files, just like on a PC. Filenames can be up to 12 characters plus a three-character optional extension. You can have separate directories, too.

The filer is the nearest you get on the Z88 to the MS-DOS command line on a PC. Even here, you can't TYPE a file that was created by any of the applications, but you can get a directory listing and rename, copy or delete entries. Surprisingly, the directory doesn't show the total RAM free on a cartridge, though Pipedream's option screen does give you this facility. The size of individual files is shown, though.

You can also copy to and from the EPROM cartridge. You can't run programs or load data files direct from EPROM — you have to copy them into RAM first. This is a serious problem, as having 1Mbyte of EPROM doesn't mean that you can run bigger programs.

## The applications

### Printer Editor

The machine comes configured for an Epson FX printer, and will send out the correct ESCape codes for bold, underline, italics, subscript, and so on. If you have a different printer, the 'Printer Editor' lets you change the codes which the machine sends. You can also specify whether each code is turned off at the end of a line or is to remain in effect until it is explicitly cancelled.

If you have more than one printer, sets of definitions can be saved to files and loaded as required.

### Diary

The diary is a free-form database. For each day, you are presented with a blank eight-line scrolling screen to use as you wish — it is not divided into 30-minute time segments like SideKick, for example.

The designers of this accessory have thought of some novel touches. If you call up the alarm clock from within the diary, the date for the alarm defaults to the date you're currently looking at. Also, if you call up the calendar and select a date, the diary moves to the selected date when you put the calendar away.

The diary is unique in that you can't have multiple suspended copies of it in memory. This means that you can't easily keep the diary of more than one person and switch between them, but you'll have to keep saving and loading different data files.

### Pipedream

Unless you're a Basic programmer, Pipedream is the application you'll use most, as it's the Z88's word

## Prices

Z88 with 32k of RAM (incl VAT):	£287.45
RAM cartridge (32k):	£14.95
(128k):	£49.94
EPROM cartridge (32k):	£12.95
(128k):	£49.95
Mains adaptor:	£9.95
Printer cable:	£9.95
EPROM eraser:	£39.95
300 baud modem:	£99.95
(not yet available)	

(All prices include VAT.)

## Benchmarks

	Z88	BBC Model B
Intmath	11.8	2.6
Realmath	10.2	5.8
Triglog	62.0	80.6
TextScrn	63.0	13.7
GrafScrn	n/a	n/a
Store	n/a	n/a

All timings in seconds. For a full explanation of the PCW Benchmarks, see the December 1986 issue, page 164.

processor, spreadsheet and database rolled into one.

When you first enter Pipedream, the cursor is in cell A1 (the maximum size is cell AS,32768). Although Pipedream looks like a spreadsheet, it's actually a word processor unless you tell the machine otherwise. To enter a document, you just start typing. As you do, a one-pixel-per-character map builds up on the right-hand side of the screen to show you what the current, full 66-line page will look like.

You can split long documents into separate files. You just make a special file containing a list of all the component files, and load this as the document. The system takes care of everything, like loading the next file in the sequence if you keep cursoring down. Beautiful.

To use Pipedream as a spreadsheet, you move the cursor to a cell and press the diamond key followed by X. This tells the system that you want to put an expression in a cell and not just straight text. You can mix text and expressions as you wish (an expression can be a number or a function). Inserting a row or column automatically adjusts references in formulae.

There's no real database package supplied — the manual explains how to set up the spreadsheet to behave as one. The spreadsheet is fairly complex: it will sort blocks of cells, replicate, move things around, search, and so on.

### Basic

The Z88 uses a cut-down version of BBC Basic. There is no editing facility except by retyping lines (there is no

Copy key). Also, all graphics and sound commands are removed, and give a 'Sorry, Not Implemented' error message if you try to use them. Adval is missing, too. Thankfully, Sir Clive has given up the idea of single-keyword entry.

There's a Z80 assembler built-in. When the technical manual is available, which will list all 400-odd operating system calls, Basic programmers should be able to produce sound and graphics through machine code routines.

### Terminal

The VT52 terminal works, but is very basic and can't send or receive files. The business person on the move (at whom the machine is aimed) will want to store their Telecom Gold messages to a file and will be disappointed at not being able to.

The baud rate is set from the control and governs all use of the RS232 port, even the printer (which is a pain, as you don't run serial printers at 300 baud or even 1200).

### Import/export

The PC Link, which Guy Kewney mentioned in March's 'Preview', has not materialised in the final version. As I understand it, this would have allowed you (via special software) to use a PC's disk drive as a Z88 storage device directly. Instead, Cambridge Computer sells a kit called, imaginatively, the Input/Output Software, which consists of a PC disk and RS232 cable that will transfer ready-made files to and from the PC and Z88. The PC end of the software also has a facility for transferring WordStar and Lotus files to and from Pipedream format.

## Documentation

The Z88 comes with a 212-page typeset manual. After a setting-up chapter, the manual starts with task-based chapters. A detailed reference on each application follows.

As for Basic, a list of the commands is available, but nothing else.

## Conclusion

Like every one of Sir Clive's previous inventions, the basic machine is marvellous, good value and will sell in the thousands. Also, like every machine before, there is a major flaw and, in the case of the Z88, it's the flimsy physical construction.

As for the software, I am impressed at what has been crammed into 128k of EPROM (soon to be ROM when the machine goes retail).

If you want a portable micro but don't need a full MS-DOS PC when you're on the move, buy one.

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# Kurzweil Discover

*The Discover 7320 text and graphics scanner from Xerox subsidiary, Kurzweil, 'learns' typefaces as it goes, and incorporates templates and a dictionary to improve its pattern-matching performance. David Tebbutt describes the workings of this impressive, 'intelligent' product.*

A scanner which teaches itself to recognise most text fonts has got to be worth investigating, even if it does cost around £8000. Unlike other text-recognition scanners, Kurzweil's Discover doesn't hold images of a series of fonts in its memory. Instead, it applies rules relating to the general appearance of letters and uses dictionaries, both embedded and user-defined, to try to make sense of what it's reading.

Again, unlike other scanners, this approach gives Discover the ability to read proportionally spaced text. Where it falls down is that it cannot read draft dot-matrix characters, because the lines and curves of the letters are not continuous.

Discover also handles graphics, producing files in PCX, TIFF and RES formats. These graphic images may be captured as straight black and white — fine for line art — or as continuous tones, for photographs and the like. These tones are encoded in 'dithered' form where the sixteen levels of grey are represented by either random or spiral patterns of dots.

Textual information is encoded according to either IBM's Document Content Architecture (DCA) format or in an ASCII-based, user-defined format. This means that the output files can be read by any word processor and, if a user-defined format is used, will contain control character sequences pertinent to that program. These sequences look after such things as the treatment of tabs, indents, line centring, paragraph ends and page breaks.

## System & set-up

The Discover system comprises a scanner, a PC-compatible plug-in board, a connecting cable and the Discover software. The scanner is a badged Ricoh SS30 which feeds sheets (up to ten) from a hopper on top, out through a slot in the bottom



front edge. This gives the machine the advantages of multiple document handling but the disadvantage of not being able to handle books and periodicals unless they are sliced up.

The processor card is driven by a 68020 processor, controlled by a custom logic array, and carries its own 2Mbytes of memory. An optional 2Mbytes, for faster throughput, may be added as a 'piggy-back' at the non-slot end of the card. The slot end is already taken up with its own piggy-back card containing the scanner logic. This suggests that other, more sophisticated scanners might be in the offing.

Kurzweil has covered the outside face of the piggy-back card with a mylar panel, which is just as well since it only just squeezes in between neighbouring cards.

The nice thing about this single-slot approach is that Discover can scan documents in background mode since all its processing is done on the card, independent of the PC and its bus. Within limits (no resident programs) you may run DOS applications or other parts of the Discover software suite while scanning and analysing your document.

Hooking the system up is so easy that it doesn't warrant description,

and installing the 1Mbyte of software is simply a case of copying it to your hard disk.

## Discover software

The Discover software looks crude at first glance but turns out to be a gem to use. Kurzweil has used the Lotus menu bar approach and then added what I'd call 'route maps and signposts'. This way, you always know where you are among its 150-odd options. Because the screen's only job is to control the Discover hardware and software, it can be dedicated to displaying the options available and how to access them, even if they're not part of the current menu bar. Most programs are forced to compromise between putting user information on the screen (words, graphics, numbers, and so on) and giving operating guidance.

Discover lists, in the body of the screen, all the things you might want to access while in a particular section of the program. Thus, if you choose the 'Settings' option within 'Text scanning', the screen will list 'Contrast', 'Units of Measure', 'Page Height', and so on (see the box for a full list). Alongside each entry is the name of the key you have to press to get nearer to that option.

Similarly, alongside Page Height will be the letter 'P' which selects the 'Page' option from the menu bar. Having pressed this, the menu bar changes and the letter alongside the option will change to 'H' for 'Height'. If you find yourself down the wrong branch of the program, an up arrow alongside the option tells you to press <ESC> to go back up. As you move from level to level and branch to branch, a display on the top line shows the path you followed to get to the current option. For example, when you reach Page Height this path will read:

Main—>Scan—>Text—>Settings—  
>Page

This combination of route map and signposts makes Kurzweil's Discover one of the easiest programs I have ever come across.

## Scanning

Whether scanning text or graphics, you have to input the page measurements and, if appropriate, the window within the page you wish to scan. The window facility can be a great time-saver when scanning graphics because Discover won't waste time scanning outside the window. But when you're trying to scan a page of a magazine, it can be a real pain. You have to describe the position of each rectangular area of text or graphics before scanning it — one rectangle per scan. The Newsprint section in PCW, for example, changes from page to page, which

### Text scanning settings

Main—>Scan—>Text—>Settings

Scanner contrast  
Units of measure  
Page height  
Page width  
Next page number  
Page number increment  
Assurance level  
User lexicon  
Language  
Lexical context  
Text type  
Scanning window

### Graphics scanning settings

Main—>Scan—>Graphics—>  
Settings

Graphics file name  
Graphics file extension  
Scanner contrast  
Units of measure  
Page height  
Page width  
Scanning window  
Graphics resolution  
Tones  
Output format

### Conversion settings

Main—>Convert—>KCP—>  
Detailed settings

Vertical space  
Horizontal space  
Horizontal tab  
Decimal tab  
Centre begin  
Centre end  
Block indent begin  
Block indent end  
Questionable characters  
Illegible characters  
End-of-line hyphens  
Underline begin  
Underline end  
Soft page end  
Soft page end  
Hard page end  
End of line  
End of paragraph  
Beginning mark-up  
Ending mark-up  
Prefix file name  
Suffix file name

means a lot of measuring and re-loading the document. Not to put too fine a point on it, this can be very tedious.

Minor gripes apart, though, scanning is a doddle. You simply feed the document into the scanner and press 'Go'.

If you're scanning graphics, a file of the page or window is created in one of the three formats. You may

set the resolution of the scan to 180, 200, 240 or 300 dots per inch. Dithering is a function of the Ricoh scanner and works just fine. I scanned some photos of my children and found that the spiral dither worked best.

Text scanning is similarly straightforward once the windows have been defined. Unlike graphics, a multiple-paged document may be scanned and, assuming single-column text, you may stack double-sided pages and teach Discover to collate pages read into a correctly sequenced file. This is done by making the page increment '+2' on pass one, then turning the stack over and making the increment '-2' on pass two.

You may vary the level of assurance you find acceptable, and also the way in which the system will flag characters it is unsure of. A 'highlight the next character' sequence is ideal, though you have to experiment to find the right balance between Discover being overconfident and unduly nervous.

You may give the name of one of your own dictionaries; so, for example, if you were to scan names and addresses, you might find it helpful to use a town and county name list. If you are reading unintelligible text, it would help to feed a page or two of normal words first so that Discover can get the hang of the typeface before starting real work. Although Discover theoretically treats each document as a brand new challenge, you can fool it into remembering what it has learnt and applying this knowledge to any subsequent documents.

As well as trying to read the words on the page, Discover also attempts to assess page layout and embed the appropriate format codes in the text. It doesn't always work — I ended up with some quite exotic line spacing and tabs at times. It was a great improvement on getting a string of continuous text, though. Tabs, especially, can be a nightmare because Discover hasn't a clue where they will be set on the target word processor.

## Conversion

When Discover has finished reading a document, you have to convert it into DCA or your own defined format by running it through the associated CONVERT program. One of the nice things about Discover is that you can do this while processing the next document on what Kurzweil calls its Lamprey board. (Lamprey, incidentally, was the code name cooked up by the development team. They wanted to use the name of an animal which formed a symbiotic relationship with another. Too late, the team found out that a Lamprey eventually kills the fish on which it is a parasite.)

Once converted, you can access your word processor, a further con-

## How the Kurzweil Discover works

The most intriguing aspect of Discover is its intelligent character recognition (ICR) system. How on earth does it learn to understand text without any help from the operator?

Firstly, it tries to break the scanned text up into lumps that look like lines, or parts of lines, of text. This can be likened to your standing a few feet away from a document — you can easily see which bits are text lines and which are pictures.

When Discover has stripped out the graphics and general noise from the document, it focuses on the text lines and strips away obvious clutter such as underlines and boxes around the text. In the case of the underline, this information is stored with other details of the current text fragment.

Now Discover analyses the fragments to find word breaks and parcels them into word-like objects called clusters. These tend to be the most active structures in Discover. A cluster manager keeps sending them off for analysis until it finally discovers what they are.

The cluster manager has access to a number of recognition experts, each of which is able to return information about the cluster. When the cluster manager has a number of opinions, it calls on a team of resolvers to help choose between the guesses of the various experts.

The main expert is a topological, or geometric, recogniser. This looks for the number, position and size of loops, identifies concavities, convexities, whether a perimeter reaches certain points in the image, and assesses symmetry. Most of this work is organised as trees of experiments.

One of the key tasks is to identify the baseline. When one or two characters in a word have been recognised, the baseline becomes obvious and greatly simplifies the recognition of other characters.

The trickiest things to recognise are broken and touching characters. A fragmentation expert has to figure out what the broken character is closest to in the one case, and decide where to split characters in the other. Some of the results can be quite bizarre. The 'P' in Prolog, for example, came out as 'l' followed by an apostrophe when I scanned a PCW page. Common ligatures, where two letters are always joined in typesetting, are easily handled because Discover is programmed to expect them.

Ambiguities are handled by the resolvers. For example, it is darned difficult for Discover to differentiate between 'e', 'c' and 'o'. Some 'e's, for example don't have closed loops. This is where statistical information about letter frequencies and common sequences come into play.

When the lexical resolver is given a 'word', it looks it up in the dictionary and passes the result up to the main resolver. A successful match will then spread the good news around, reinforcing the shape recognition expertise of the program.

But, if the lexical resolver fails to find a match, the main resolver will try other, less likely, possibilities. If it still draws a blank, it might decide to change decisions made by lower-

level experts. For example, it may decide that word breaks should be altered, either by merging two 'words' into one, or by splitting one into two.

As you can see, the whole process is recursive and, as each new piece of information is discovered, old unresolved clusters are re-examined until, hopefully, the whole page makes sense. Discover does this analysis on a page by page basis, accumulating its findings for the duration of a document.

You can, however, fool Discover into remembering information between documents by 'interrupting' work on a document. This creates three temporary disk files: one contains the page format analysis; another contains the parameters set by the user; and the third contains the important stuff — the character descriptions discovered so far. Judicious deleting and renaming of files enables you to use them on a new document but, since it usually only takes half a page or so to train Discover, you would need a special reason for doing it.

Discover knows the difference between numbers and letters and will arrange numbers into columns if appropriate. It also knows that '1st', for example, is acceptable and doesn't try to turn it into 'lst'. This means that it will also accept '2st' which perhaps isn't so smart. When scanning mixtures of numbers and letters it can sometimes have problems with 'l' and 'i'. January i makes more sense to Discover than January 1, for example, though it should know not to accept the word 'i'.

Recognising words is only part of the Discover story, though. The program also analyses the layout of the page so that it can approximate this layout in the output document. To keep track of the page, Discover maintains a network of paragraph hypotheses. For example, an end of paragraph after the second line leads to an expectation of an end of paragraph after the fourth or fifth line. As the analysis proceeds, it uses earlier discoveries to help it decide the likelihood of its new hypotheses.

The system is far from foolproof. The text in one ordinary letter I scanned had an exceedingly ragged right edge. Discover decided that the first line actually constituted a paragraph and tucked a double-line feed at the end. The program then had a high expectation that each line was a paragraph, so the actual paragraph it was analysing ended up double-spaced.

The system already has the logic necessary to make it interface well with desktop publishing systems. Because it can recognise indents and vertical spacing, it clearly has the potential to help build DTP style sheets. But, since Discover works on general character shapes, it is unlikely to help much when it comes to identifying fonts or distinguishing between bold and normal type.

Don't get the wrong idea: Discover is clever and useful, and, by fiddling with the user parameters, you can get it to produce quite good results. I think we can expect to see regular improvements to the product, though, especially in the areas of text formatting, DTP interfaces and the ability to scan existing graphic image files for textual content.

version program (DCA to something else, perhaps) or a comms program directly from the Discover menus. It will automatically pick up the last file converted for further processing. You may also use a 'back door' to DOS, but don't try to load resident programs because you might not get back again.

I had problems with some resident programs but SideKick seemed to hold up all right provided I loaded it first. Kurzweil seemed doubtful when I mentioned this so I'd suggest you take great care. Again, processing can take place on the Lamprey board while you are performing any of these activities.

Finally, you can run Discover from a command line in DOS by providing a document name and, optionally, the name of the parameter file you wish to use. In the event of a paper

jam or other mechanical problem, jobs can be restarted from the current DOS application by pressing a hot-key combination.

## Conclusion

At more than £8000 and an annual maintenance cost of 12 per cent, based on delivery to Kurzweil, this machine has been priced beyond the reach of most single PC users. It is targeted at those work groups who can't justify the £20,000 needed for big brother, the Kurzweil 4000.

The scanner scores over flat-beds and the DEST because it can read up to ten pages at a time, but it loses points because it can't handle books and magazines. Discover scores over conventional OCR systems because it isn't limited to a rigid set of typefaces but can learn most things you give it in reasonable time, and can

handle proportionally spaced text. On the other hand, it can't read draft dot matrix material.

My guess is that the most likely buyers are going to be those who need to share the device in a work group which requires relatively straightforward data capture from single-column typeset material. Those who can tolerate a high degree of operator intervention might consider using it for more complex work.

My view on the price is that if it's the only machine that can do your job, then you don't have a lot of choice. And if, as I suspect, the sales volume is going to be quite low, then Kurzweil would be mad to pitch it at the kind of price more common in the PC market-place.

Kurzweil is on (0734) 668421.

END



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# Memory media

*Optical disk technology is still in its infancy — and prohibitively expensive for most users — but in a few years' time it could well replace conventional methods of magnetic data storage. Nick Hampshire looks at the application and potential of two forms of optical media: the CD-ROM and the WORM drive.*

The idea of having over 500Mbytes of data storage attached to your personal computer may seem to be a prospect that is both exciting and a little daunting. After all, that is sufficient memory to store over a quarter of a million pages of written text — or enough books to fill over 50 feet of shelf space. However, this is the prospect offered by optical disk technology — an entirely new form of computer data storage media, a media which uses light rather than magnetism.

This media, in the form of the audio compact disc, has become familiar to most of us as a means of reproducing, and economically mass distributing, very high-quality sound recordings. The use of this technology for computer data storage has been a subject of much discussion over the last ten years, but little has been seen apart from a few very complex and expensive products aimed at the mainframe computer market. However, in the last two years this technology has started to become a reality, and promises to bring to personal computer users enormous data storage capacity and economical access to large commercial databases.

The development of optical disk technology for personal computer data storage has resulted in two different forms of optical drive and media. The most widely available and best developed is the CD-ROM. This is a read-only form of optical media which has been directly developed from the audio CD and is being used by an increasingly wide range of information suppliers to commercially disseminate very large databases.

The other form of optical disk tech-

nology is just beginning to come on the market and is called WORM, which stands for Write Once Read Many. As this name implies, it is possible for the user to write data onto such optical disks as well as read data from them.

## Applications

Visually, a CD-ROM is identical to a standard audio CD: it is a 12cm disk of plastic with a metallised layer sandwiched in the middle. The digital data is recorded on this reflective metallic layer on a long spiral track, with over 16,000 turns of the spiral on each inch of the disk surface. The data is stored on this spiral track as a sequence of tiny pits in the reflective metallic layer; these are read by a laser beam which scans along the track. Each pit corresponds approximately to a single 'one bit' and each reflective space to a 'zero bit'.

CD-ROMs are likely to attract a considerable number of users even though they cannot be used for recording user data; one reason being that they offer a serious challenge to online databases and microfilm for the supply of specialist information. It is far more economical to put a 500Mbyte database onto a CD-ROM and distribute it to a range of customers than to perform an update of their databases using telecommunications links. To some extent the widespread application of CD-ROMs will be at the expense of datacom facilities and services. Data communications will only retain the advantage when database updates are very frequent.

The vast storage capacity of CD-ROMs, coupled with the relatively low cost of producing and distributing



them, makes the optical disk the ideal medium for supplying databases which are not subject to rapid change. Databases which are suitable for putting on CD-ROM range from parts catalogues through collections of scientific abstracts, lists of all current books in print, and the financial history of all public companies.

The list of databases which are being placed on CD-ROM is growing daily. So far most are internal applications within large companies, but an increasing number are now being sold to the general public as either one-off publications or information subscription services.

Another area of application for CD-ROMs is as computer-based reference books, which range from encyclopaedias and dictionaries to trade directories. Typical of this type of product is Microsoft's Bookshelf, which provides the user with a range of standard reference books on a single CD which can be transparently accessed from a word processor or other program. The retrieved text can be examined and, if required, pasted into the user's text. The reference books available on this CD include a full dictionary, a thesaurus, a dictionary of quotations, works on writing style, grammar, an almanac of useful up-to-date information, plus a comprehensive guide to the best sources of busi-





ness information. At the moment this is a US-orientated product, but it will not be long before a UK or European version is produced.

The price of material being produced for CD-ROM varies from under £100 to several thousand pounds; again, as the volume of sales increases, so prices should fall.

For the publisher, CD-ROM technology offers a whole new publishing medium which can integrate standard text with static or animated graphics as well as sound or speech. Drive manufacturers are already producing hardware which can output high-quality sound as well as digital data, and a technique was recently demonstrated for storing up to 30 minutes of video film on a single disk, thereby opening up further opportunities for the publication of interactive video products.

The CD-ROM is also a product which is quite cheap to produce, thanks mainly to the enormous investment which has already been made in facilities to mass produce and master audio CDs. Cost savings resulting from the similarity between audio CDs and CD-ROMs have also substantially reduced the cost of CD-ROM drives, where the hardware and much of the electronics are identical for the two applications.

Now let's look at WORM drives. Data

is stored on a WORM disk in much the same manner as on a CD-ROM: as a long spiral of pits in a reflective metallic layer. The disks are, however, slightly larger at 5¼ins and the metallic layer is a special alloy of Selenium-Tellurium which is sandwiched between two sheets of glass mounted in a protective cartridge. The special metallic film has been designed to easily evaporate and produce small pits when exposed to the light from a low-power laser.

Whereas the CD-ROM is essentially a means of cheaply and easily distributing large amounts of information, the WORM disk is a mass data storage device which complements existing magnetic data storage in the form of either floppy or hard disks. WORM disks will probably find their greatest application in creating information and data archives, where they will be used to replace paper and microfilm.

This is potentially a very large market since over 95 per cent of the world's information is still stored on either paper or microfilm. The use of optical disks for such data archiving will have radical effects on the way people utilise and retrieve information since, like CD-ROMs, the WORM disks are also able to store digitised images, sounds and computer programs.

Although the user can write data onto a WORM disk, it is impossible to

change the data once it has been written without writing a new copy of it. This means that systems utilising WORM disks will store a full record of all changes which have been made to a database. This feature will prove very attractive to financial users since it will automatically provide them with data security and a full audit trail.

WORM drives will also find considerable use in applications where it is necessary to have a large file of library data. These include CAD programs which usually require extensive libraries of sub-assemblies and components. Another potential area of application which is likely to develop over the next few years is artificial intelligence, with intelligent databases and systems which incorporate rudimentary common sense. This is another application where the archival recording of all previous consultations could prove valuable.

### Optical disk hardware

CD-ROM disk drives for personal computers have been *commercially* available for nearly three years. The reason why they have not been *widely* available was not that they were initially rather expensive, but that until September 1986 there was no internationally agreed standard for CD-ROMs. This lack of standards held up development of the market, as pub-

# FUTURE TECHNOLOGY

lishers of CD-ROM material were unwilling to invest in the production of disks in a range of different formats. The standards agreed by an association of all the major drive manufacturers and software companies known as the High Sierra Group and published as the *Yellow Book* have now removed this constraint, and sales of both drives and CD-ROM publications are starting to boom. One manufacturer alone, Hitachi, is making over 5000 drives a month and has plans for substantial increases in this volume of production.

As the volume of drive production increases, so the price of drive hardware will fall from the current level of about £1000 to a price similar to that currently charged for audio CD drives. Concurrent with its announcement of increased production, Hitachi has dropped the price of its CDR-2500S drives by five per cent to £895.

The production of WORM drives is, however, still suffering from a lack of international standards, although it is expected that such standards will be agreed in the early autumn of this year. WORM drives are, however, far more complex than CD-ROM drives and do not benefit from being able to share components with audio CDs. It is therefore unlikely that the cost of such drives will fall to the same degree; the current price is between £2000 and £3000 each.

A typical product is the WORM drive just launched by Hitachi, the OD101, a 5¼in 600Mbyte IBM PC-compatible drive which has an OEM price of £2000. Any cost reduction here will depend on how quickly a large PC manufacturer like IBM ships WORM drives as a component in its systems, plus the ready availability of WORM drive support software — both of which will be needed to generate volume sales.

Most CD-ROM and WORM drives are able to interface to IBM PCs and compatibles. Drives are either connected directly to the PC using a plug-in card or by means of the SCSI (small computer systems interface). Both methods work equally satisfactorily, although it is likely that the SCSI interface will eventually become the standard in much the same way that magnetic disk drives are increasingly adopting *this* interface standard. Manufacturers are producing CD-ROM and WORM drives for either full-height mounting within a PC or as separate standalone units.

## Comparison

Besides the greatly increased storage capacity of optical media, in excess of ten times that of a magnetic hard disk of comparable size, the principle difference between optical media and magnetic media is that optical media is currently non-erasable. This non-

volatility imposes limitations on the user which make it particularly important that designers of optical disk-based systems do not think of optical media in terms of conventional magnetic disk usage and programming practices. This primarily means that optical disks cannot be used as virtual memory in the way that most system designers use magnetic disks.

Virtual memory systems are those where disk storage is used to enlarge the system's memory by temporarily storing any data which is not currently required by the program. As soon as this data is required it is loaded back into RAM, a process which is entirely transparent to the user.

The non-volatility of optical disks also means that their file structure has to be carefully designed in order to make the best use of the system. Many CD-ROM systems exhibit poor performance because of the designers' 'magnetic disk think' which has considerably reduced the optical disk's performance. This file structure is further complicated by the large amount of data which can be stored on an optical disk and the fact that the data is stored in what is essentially a serial format.

The differences between optical disks and magnetic media mean that they cannot, given the current state of development, be considered as replacements for conventional magnetic disks. Optical disks must instead be seen as complementary products which have their own unique strengths in certain specific applications, and which overcome some of the weaknesses of magnetic disks.

The non-volatility and relative robustness of optical media has given it considerable appeal in applications involving data archiving. The reliable life of magnetic media is quite short — it is usually recommended that valuable data is re-recorded every four years. Optical media has a much longer life — well over ten years — and is far less vulnerable to environmental hazards such as magnetic fields or X-rays than any other form of data storage.

Initially there were some doubts about the life expectancy of optical disks due to micro-cracking of the plastic substrate and consequent oxidation of the metallic layer, but research and improved production techniques have now virtually eliminated this problem.

However, because of this initial doubt, a very powerful error-correction technique was built into the design of optical data disks. This error-correction procedure is able to reconstruct the data in corrupted blocks as large as 400 bytes, which is well in excess of any data loss which could result from any age-induced micro-cracks.

Relative to conventional magnetic

media, optical media is still quite expensive. WORM disks cost over £100 each, although as volume production increases this is expected to fall to about £25 within the next 18 months. The cost of CD-ROMs is not really comparable since the cost of creating a master has to be added to the cost of each individual disk.

Creation of the CD master from the digital data supplied by the information publisher costs about £3000. This mastering process converts standard digital data into the format in which it is internally stored on a CD-ROM, and adds the error-correction coding as well as creating a glass master from which disk copies will be pressed. For a hundred copies of this disk there is then a unit charge of about £15.

## CLV & CAV recording techniques

In order to understand why it is undesirable to think of optical disks in terms of the more familiar magnetic disks, it is necessary to look at how data is stored on an optical disk. Because of the digital audio parentage of CD-ROMs, the data is stored sequentially as a long spiral (this is identical to the spiral track which can be seen on any conventional record). For music recording this format is essential, but for computer data recording it imposes severe limitations on the disk's performance, particularly when attempting to perform random access of disk data.

The data format of an optical disk is based on constant linear velocity, or CLV, recording, which differs from magnetic disks which use constant angular velocity, or CAV. The difference between these two formats is shown in the box on the opposite page. With a CAV format the disk has a constant rotational speed, which means that the linear velocity of the head relative to the disk surface is greater on the outside tracks than on the inside tracks. With a CLV format the relative speed of the disk head relative to the disk surface remains constant, irrespective of whether the head is on the outside or inside tracks of the disk.

A CD-ROM drive maintains this CLV by changing the disk's rotational speed as the head moves across the disk, a feat achieved by the drive's sophisticated control electronics. Since the speed at which the head moves across the surface of the disk is constant, so the linear length of each sector on the disk is the same. The number of sectors encountered on a single rotation therefore varies from nine on the inside of the disk to about twenty on the outside, thereby achieving the maximum possible data storage density. This is also the

reason why CLV recording has to be on a spiral track rather than in a series of concentric rings, where the gradual increase in track storage would be impossible.

The advantage of CLV recording is its high data storage density, but this is achieved at the expense of a feature naturally inherent in the CAV format where its organisation makes it easy to find the start of any desired sector. With CAV format it is easy to translate a sector number into a track and sector address, a feature which makes the random accessing and indexing of CAV format disk files a relatively simple procedure.

However, with CLV format files there is no simple relationship between a CLV track and the number of sectors on that track, and thus no method of translating a sector number into a track and sector address. This accounts for the relatively slow 'seek' times shown by CD-ROMs, a problem which is compounded by the fact that the mechanical movement of the head must be accompanied by a change in the rotational speed of the disk.

The use of a CLV format by CD-ROMs means that we cannot apply the familiar concepts of track and sector, or cylinder, surface and sector addressing schemes to them. In fact, it is probably best to think of a CD-ROM's data storage in terms of a serial tape device. This concept is reinforced by the digital audio origins of the CD-ROM, which have resulted in the disk having a 60-minute 'playing time', each minute of this recording being divided into 60 'seconds' and each second accessing 75 sectors, with each sector containing 2k of data.

A CD-ROM can hold 270,000 sectors of 552,960,000 bytes of data. The CD-ROM drive electronics allow the user to address any sector on the disk, a 2k sector being the smallest addressable unit. The required sector

is addressed by specifying it in terms of the minute of play in which it is located, the second within that minute and the sector within that second. The first sector on the disk would thus have the address 00:00:00 or zero minutes, zero seconds and sector zero; the 15465th sector would have the address 03:26:15 or three minutes, 26 seconds and sector 15, which is calculated by:

$$(3 \times 60 \times 75) + (26 \times 75) + 15 = 15465.$$

The average user of CD-ROMs does not have to worry about the physical organisation of data on a CD-ROM since this is usually converted to a logical view by an operating system such as Microsoft Extensions, which is a version of the familiar MS-DOS which has been designed for optical disks. This allows the user to view the disk as a collection of named files rather than as a set of numbered sectors. However, an understanding of the physical characteristics and constraints of the CD-ROM's format is essential if the designer of CD-ROM systems is to get the optimum performance from the system.

## Design

Faced with over 500Mbytes of storage and the unavoidably slow search times inherent in optical disk systems, it is vital that the design of the data structure and associated indexing is made as efficient as possible. These problems are particularly acute in WORM disk systems where the user has the further complications of directory management, and file updating with a write-once non-volatile media.

The designer of a CD-ROM database can obtain an off-the-shelf database system into which he or she can simply slot his or her own data and data indexing. Operating system software is also available to handle file access on CD-ROMs. Following

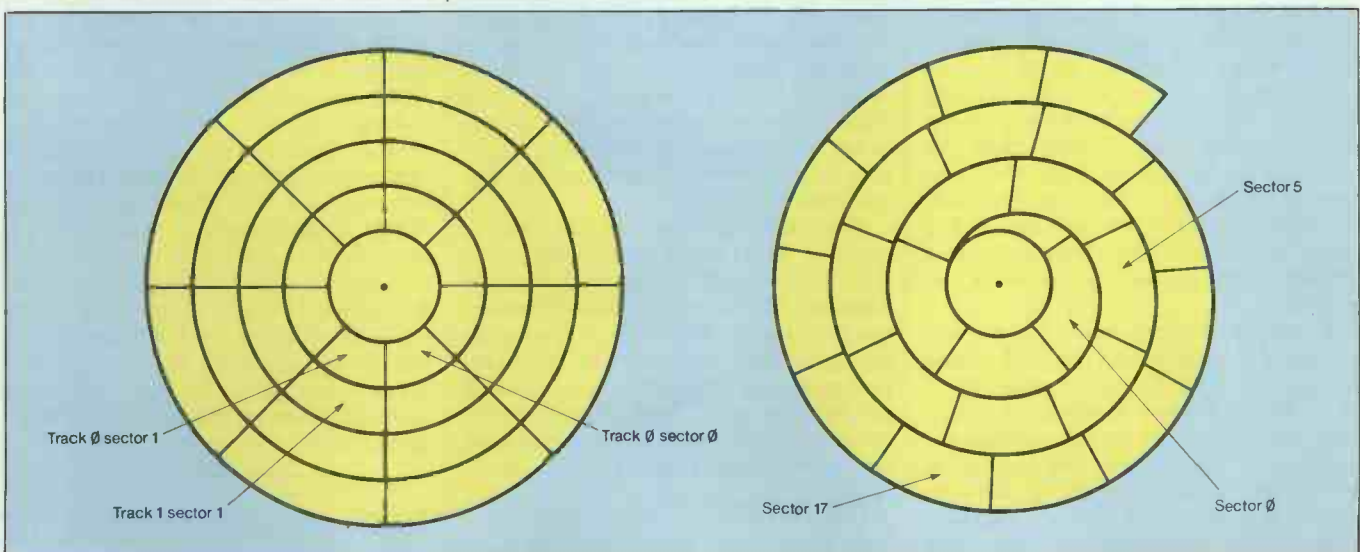
the High Sierra agreement on CD-ROM standards, Microsoft has announced an extension to its MS-DOS 3.2 which allows users to access the entire 550Mbytes on a CD-ROM, thereby overcoming the previous 32Mbyte file size limitation of standard MS-DOS. With this new operating system, the CD-ROM appears to the user exactly like a large magnetic disk drive.

No such assistance exists for users of WORM drives, who are left to sort out the complexities of the system for themselves. The problems associated with handling a media where data once written is not erasable or amendable, require a whole new range of techniques. Until there is agreement on an international standard for 5¼in WORM disks, it is unlikely that any of the software companies will make the investment in producing WORM drive operating systems and support software.

One of the problems encountered in using WORM drives is that the smallest addressable unit on an optical disk is a 2k block, a limitation which is essentially imposed by the error-correction system. Each 2k block is actually 2352 bytes long, the extra bytes being devoted to the error-correction code for that block.

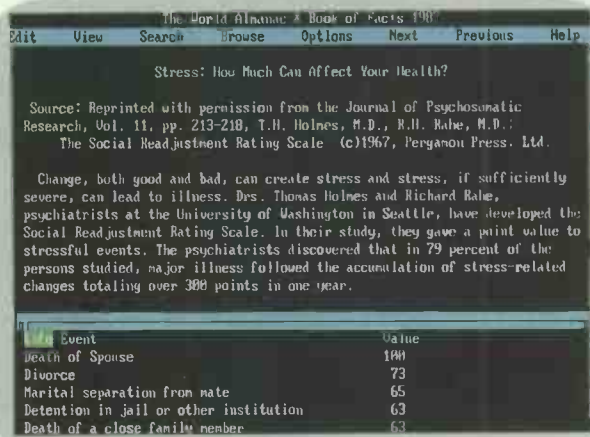
The error-correction technique is a fairly complex and very powerful procedure. It does, however, create the limitation that once a block on a WORM drive has had data written to it, then it is impossible to add further data to that block because the error-correction code is set up for an entire block during the first write to that block. This error-correction code cannot then be changed to allow the addition of further data to the block. This is not such a serious limitation though, since optical disks have such a large data storage capacity.

A far more serious problem is the slow access time of optical disks. The major culprit is the mechanical

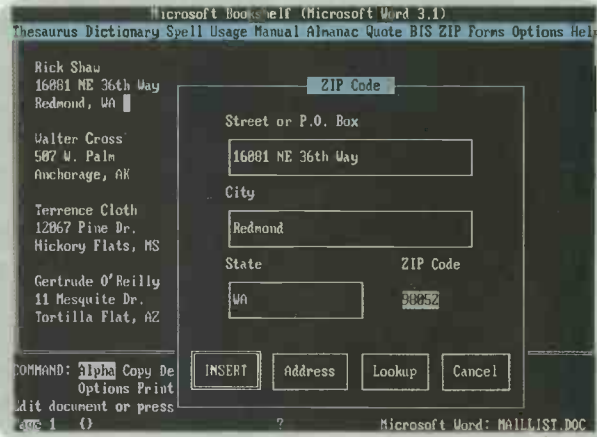


**Left:** Sector organisation of a CAV disk. The sectors on the outer tracks are larger than those on the inner tracks. **Right:** The spiral sector organisation of a CLV disk. All sectors are the same length

# FUTURE TECHNOLOGY



Improve your writing skills and general knowledge with a complete collection of reference sources in the form of the Microsoft Bookshelf CD-ROM Reference Library. This is an example from the World Almanac disk



CD-ROM technology allows a phenomenal amount of information to be stored on each Bookshelf disk. The US ZIP Code Directory is just one of the many comprehensive information tools which comprise the Microsoft library

movement of the read head and the necessity to change rotational speed in order to handle the CLV format. The time taken to perform a seek for a block that lies within a few dozen rotations of the current head position is minimal; the large delays occur when moving the head from one side of the disk to the other. If seek times are to be minimised, then the organisation of data on the disk should be such that the majority of seeks are to blocks which lie close to the existing head position (large head movements should be avoided).

The file management technique which can reduce access times is to interleave blocks of data and their associated directories and indexes. This allows rapid access of data associated with a particular directory and longer access times when moving from one directory to another. By grouping related data items together and organising the directories into a tree structure, access time can be reduced to an acceptable level.

Directories of this kind are usually built up using shallow binary trees: however, the type of tree used depends very much on how the user wishes to access data from the disk. Accessing all occurrences of a key word requires different types of tree structure to access single-block records.

Probably the biggest problem encountered by users of WORM drives is that of updating and appending files. There are two techniques which can be applied to updating files on write-once media, and the technique which is chosen depends on the size of the file. With small files occupying just a few megabytes or less, the easiest method is simply to rewrite

the entire updated file onto disk. This approach is easy to implement but should only be used where files are small and updates are infrequent. In situations where updates are frequent, it is best to use magnetic disk storage as a cache memory and then archive the file to optical disk at regular intervals.

An alternative method of updating files on WORM disks is used when the files are large — for example, it is impractical to rewrite a 100Mbyte file when updating just 2k of that file. This technique involves using indexed addressing, which involves creating an index file that contains the address location and sequence of each block of data within the file.

Updating a file using this method simply means rewriting the block of data which is to be updated, replacing the address of the old block in the index file with that of the new block and then rewriting the updated index file. In some systems the index file is stored on magnetic disk in order to reduce the space taken by repeated index rewrites, but this does pose the potential risk that the index will be lost and should, therefore, be avoided unless absolutely necessary.

This technique can also be used to append files since the position of data on the disk is independent of its position in the index file. However, the one major drawback is that scattering blocks of data in different places across the disk (which is likely to happen after frequent updates), necessitates a lot of head movement and, consequently, slows access time.

## The future

The application of optical disk technology to computer data storage is

in its infancy. Large sums of money are being invested by companies like Sony, Kodak, Hitachi and 3M in the development of new optical media, and in particular media which is capable of true multiple read/write. There have been some major advances in the laboratories of these companies over the last few months, and it looks increasingly likely that these new forms of media will start to come onto the market within the next five years.

With the advent of multiple read/write media, the optical disk will at last take its place as a competitor and replacement for magnetic disks.

The other branch of the optical disk family, the CD-ROM, is now a relatively mature technology and has a considerable number of users and manufacturers. This is a product which we will all probably be using within the next few years, with the number of users accelerating rapidly as prices fall and the number of CD-ROM publications increases. Many people have predicted that the CD-ROM will replace books as a publishing medium: this I doubt, but optical disks will certainly occupy an important position in the supply of information. The importance of CD-ROMs in the supply of information is underlined by a recent report from the market research company, Frost & Sullivan, which showed that by 1990, the market for CD-ROMs in the US alone would be worth over \$2.5 billion per year. All the indicators seem to point to the rumblings of an optical disk revolution.

Technical author Nick Hampshire has edited three magazines and written numerous articles. He recently lost contact with the outside world: an engineer hacked his telephone cable in half! **END**

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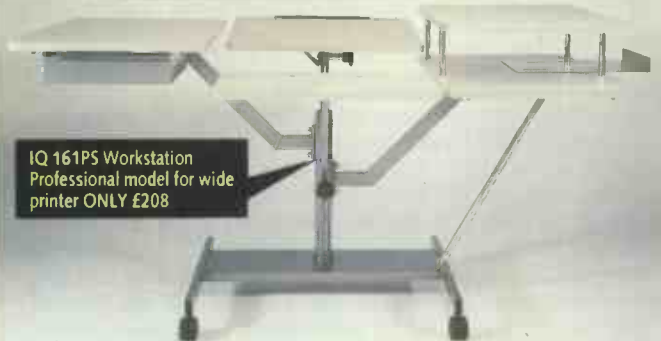
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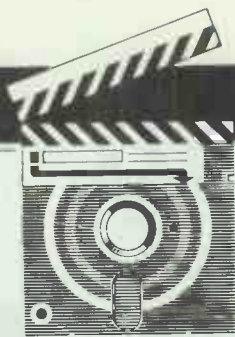
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# C compilers

*Prices of compilers have plummeted ever since Borland set a realistic precedent with its launch of Turbo Pascal. With the increasing number of C compilers now on the market, prices are falling further. Nick Walker looks at two inexpensive versions against Borland's Turbo C.*

Prior to Borland's launch of Turbo Pascal in 1983, compilers for the PC and compatibles cost at least £500 and were about as friendly as a wild boar in a pigsty. Since then the market for budget-priced compilers has rocketed, and an increasing number are now offering a 'Borland-like' integrated environment. Particularly numerous are C compilers, probably because C has rapidly become the favourite language among hackers, and hackers as a rule don't have vast amounts of money to spend.

This proliferation of C compilers has given Borland's own version of C, Turbo C, more direct competition than any other Borland language. In this review, I've taken Turbo C and compared it with two of its better rivals — Mix C and Zorland C.

## Mix C

Mix C from Mix Software was one of the earliest of the budget-priced C's, and has been available in the US for some time. Now, courtesy of Analytical Engines, it is available in the UK.

## Overview

Three components are required to turn C source code into an executable program: an editor to create the source code; a compiler to reduce the code into a machine-understandable form (object code); and a linker to collect all the relevant object code from other sources such as libraries, and from these create an executable program. Mix C includes a compiler and a linker but no editor,

but any editor capable of producing an ASCII file (all editors in use today, in fact) can be used. Mix Software does produce a program editor at extra cost, and it was this which I used for the review.

The Mix 'Editor' is a general-purpose editor tailored with features which aid the creation of programs, and like many editors and word processors is fully configurable: its initial WordStar-like configuration can be mapped onto any key combination you wish to use.

Because of its common features it isn't necessary to go into too much detail about the Mix Editor, but the following is a description of some of its more appealing features.

Unusually, for a micro-based program editor, the Mix Editor provides a macro command language which allows you to combine existing commands into commonly used combinations. For example, one of the pre-defined macros is BOX: typing 'Esc BOX' prompts you for height and width, and you then use the IBM graphics character to draw a box — a feature I frequently use to highlight comments within a program.

Other useful features include: no restriction on file length; the ability to execute DOS commands or run a program from within the editor; and split-screen operation. A macro called 'CC' allows you to run the Mix C compiler over the text in the editor's memory. When CC is used in conjunction with the split-screen facility, you can display the C source code in one window and compile errors in another. This allows you to display and correct multiple errors — unlike some integrated environments which

stop at the first reported error. The linker and the final program can also be run from within the editor but not from menus such as those found in Zorland C or Borland C.

Mix C is a command-line driven compiler. Unless a '/1' switch is given as an argument, the compiler will list the whole C listing — plus error messages — to the screen, which is fairly meaningless unless you have a degree in speed reading. Mix C is also a single-pass compiler, although like most C compilers it has one very fast pre-processing pass which establishes all external references. Further switches control stack size and destination of the object code.

The IBM PC and its compatibles have what is called a 'segmented' architecture: that is, the whole of the memory area is divided into 64k segments. Compilers which produce code for this architecture have a choice of 'memory models' for the final program (code and data in the same 64k segment; code in one segment, data in another; or code in many segments, data in many segments). Mix C produces object code for one, and *only* one, memory model — the large one (code in many segments, data in many segments), so it is rather inefficient for programs with less than 64k of object code.

The Mix C compiler accepts the full C language as specified in *Kernighan & Richie (K&B)* but with one exception — you cannot use an array element address as an initialiser (a silly thing to do, anyway). Also, the following extensions have been added: support for the enumerated data type (an integer that will only take speci-

```

/* char converts to int */
c1 = 'c';
i1 = c1 - 'a' + 'A';
c3 = i1; /* truncate to character */
printf("c1 = %c, i1 = %d, c3 = %c\n", c1, i1, c3);
i1 = 321;
c2 = i1; /* convert integer to char */
c3 = i1 - 1; /* truncates value */
printf("i1 = %d, c2 = %c, c3 = %c\n",
i1, c2, c3);

/* automatic conversion from int to float */
f1 = 299; /* converted to float */
f2 = 358 * i1; /* 358 converted to float */
/* 7 converted to float - result truncated */
i3 = 3.4 * f1;
/* 358 converted to float - result truncated */

Mix C - Version 2.5.0
(C) Copyright 1985, 1986 by Mix Software

main
No errors detected

(Press any key to continue)

```

Used in conjunction with an editor macro, Mix C offers a crude but effective integrated environment. This is one of the many excellent tutorial programs

```

0 main [source]
1 main() /* Example 2.6 */
2 {
3   int xx, jj;
4   int yy, jj;
5
6   ii = ii + 0;
7
8   xx = jj** **jj;
9   printf("xx = %d, jj = %d, ii =
10
11   yy = jj = xx** **ii + 3;

```

MATRIX C 3126 1-01-87 12:02a  
JUMP C 927 1-01-87 12:02a  
20 File(s) 67584 bytes free

A)ctr exan26

Ctrace - Version 1.0.0  
Software Copyright 1987 Dr. Neil Bennet  
Licensed to MIX Software, Inc.  
Loading file = .....

there are no watchpoints set

Ctrace is an excellent debugger for Mix C only. It maintains six windows of debugging information, of which any four can be onscreen simultaneously

fied named values); structures can be assigned, passed by value to functions, and functions may return structures; locally declared arrays and structures can be initialised; and there are compiler options which allow nested comments, the passing of actual char and float values to a function, and automatic initialisation of local variables to zero.

Mix Software divides the library functions of Mix C into four distinct groups — standard, non-standard, DOS and BIOS. Library header files may contain functions from each group — for example, the 'miscellaneous' library includes: a non-standard random number generator, 'drand'; the C-standard 'exit', to exit a program; 'getcseg' from DOS, to return the current code segment; and the BIOS call, 'sound', to drive the IBM's speaker. Although the functions are listed according to which files they are in, there is no mention of the actual file names in the Mix C manual. Consequently, you have to snoop around before '#include'ing a library file.

The usefulness of any compiler is defined by its system-specific functions. Mix C is particularly well-endowed with numerous pre-defined BIOS calls, DOS functions and non-standard functions as well as all the standard C functions. For the 'real' hackers, there is a general-purpose BIOS call which gives full access to the IBM ROM.

The Mix C linker is an unusual beast in that it doesn't link .OBJ files — the standard files of practically every other compiler and assembler on the market. This means that you can't link your existing routines from other languages. Also, the .MIX files which are created by the Mix C compiler are not linkable with any of the standard linkers.

Most professional C programmers use different manufacturers' compil-

ers and linkers in their own customised set-ups, but this is not possible with Mix C.

The linker can be run as a command-line program: a number of switches can define options to the linker, to control stack size, for example. Unless the '/i' option is included, the linker will produce an executable file that requires the file 'RUNTIME.OVY' in order to run; this gives you very small object files but less portability. Alternatively, for those people who like fine control over the linking process, simply typing 'LINKER' with no arguments will take you to a linker menu screen. All stages of the linker (load file, find functions, run, build, and so on) can be controlled manually.

Although Mix C does include some conditionally compiled diagnostics to aid debugging, an independent debugger is really needed to track down the more elusive bugs. Mix Software provided me with Ctrace, a bolt-on extra for Mix C, and specifying '/t' after the 'compile' and 'link' commands will allow it to do its job.

The program 'CTR' will run Ctrace and it requires your executable file as an argument. Ctrace then maintains six windows of information: position in source code; program output; variables and their values; a 'watch' window that allows you to define a particular set of variables, and a course of action should they reach certain values; a 'symbols' window which shows the address of functions and variables; and a 'memory map' window. Programs can be executed single-step, trace speed or at full speed. Whenever a breakpoint occurs or a watch variable meets its value, a pop-up window appears which specifies exactly what has occurred.

Ctrace includes an animated trace feature which shows you the flow of execution; not just line by line, but

statement by statement. Watching the red cursor follow every movement of the program almost made me want to sing along! What a shame that it's limited to Mix C programs.

Ctrace is by far the most delightful debugger I've come across — I actually found myself enjoying debugging!

## Installation

Mix C requires a 128k MS-DOS computer with one disk drive, but I would advise 256k and two disk drives as working with less can be limiting.

Mix C is the only C compiler I know of that is usable on a floppies-only machine. Unusually, it will run on a generic MS-DOS machine although it obviously won't be able to use any of the IBM BIOS calls. Mix Software also produces a CP/M version of the compiler which is functionally very similar to the one featured here and requires a 55k, CP/M-80, two-drive machine. For floppies-only machines the files are organised correctly, so it's just a matter of copying the disk and getting started. Similarly, installation on a hard disk simply involves copying the files to a suitable directory.

Mix C is not copy-protected and has a simple 'treat me like a book' type copyright notice. Programs created under Mix C do not require a run-time licence and can be freely distributed.

## In use

As a test of compilation speed, linker speed, object code size, execution speed and K&R compatibility, I used the source code of a public domain game called Hack. This consists of approximately 60 C source files and header files with a total source code size of around 700k. Hack was originally written for Microsoft C which, with Lattice C, is one of the tradition-

al heavyweight compilers. (Incidentally, the authors of Hack claim that they haven't overstepped the boundaries of *K&R*.) Under Microsoft C, Hack compiles down to an executable file of 255k. The program embraces a wide range of features including real and transcendental arithmetic, file handling, data structures and even graphics via calls to the BIOS.

The idea behind this 'Hack test' was to see which, if any, problems arose when using the compilers reviewed here on a 'real' application. All three compilers were run from the command line and, where possible, used the 'MAKE' system of showing dependencies and grouping multi-source file compilations.

Mix C performed extremely well, with the Hack Test taking approximately three hours to get the application up and running, including: the creation of a suitable batch file, sorting out the few errors that occurred, and linking the whole system. (The test times for all three compilers can be seen in the box on this page).

Mix C found two errors in the Hack source — and, of course, over such a large application, found them many times. These errors were nested comments and a possible unintentional assignment (using 'if (a=b)' rather than 'if (a==b)'). Both these errors can, in theory, be converted to warnings with the setting of a compiler switch. However, with the switch set, Mix C still objected to some of the nested comments. I eventually solved the problem by putting an extra pair of comment delimiters around the offending code.

I also ran the *Personal Computer World* Benchmarks on all three compilers (see *PCW*, December 1986). In many respects Mix C came off worse: its execution times were the slowest in all tests. Despite the use

of the 'shrink' utility, the executable file size was almost always the biggest, although this was due to the large memory model used and would not be so noticeable on large programs.

On the plus side, though, Mix C is a very fast compiler. If you switch off the listing to the screen it's almost a match for Turbo C, because Mix C operates entirely within memory and creates no intermediate files on disk.

## Expansion

The three utilities supplied with Mix C are 'shrink' (mentioned above), 'speedup' and 'convert'. Shrink takes an object file as input and attempts to optimise it for object code size; the typical space saving is 10-25 per cent. Speedup operates in a similar manner but optimises for speed. (The effectiveness of these routines can be gauged from the test results box.) Convert takes a Mix C-format object code file and turns it into ASCII.

No extra libraries are available with Mix C, although it is compatible enough to run most of the commercial C libraries.

## Documentation

Mix C comes with a 434-page manual in the usual 'budget paperback' form pioneered by Borland. Approximately 150 pages are dedicated to one of the most complete C tutorials I've seen bundled with a compiler.

The rest of the manual consists of a fairly standard C reference section and a comprehensive description of the library functions.

## Price

The Mix C and Ctrace package retails for £34.44, while the split-screen editor costs £22.94. Alternatively, £80.44 will purchase all three programs plus a utility to link assembly code, and an examples disk.

## Zorland C

'No — I want a *real* compiler.' I don't know how many times I have heard that remark after advising someone to buy Zorland C. Despite its low £34.44 price tag, Zorland C is a true compiler and in some ways more at home alongside the £200-plus compilers such as those produced by Lattice or Microsoft, than the two it is pitted against here. Zorland C was initially reviewed in the November 1986 issue of *PCW*, but since then it has developed into Version 2 and has sprouted an integrated 'Borland-like' environment.

## Overview

Zorland C, the cheapest C compiler reviewed here, includes an editor and a compiler but no linker. However, any standard linker can be used, such as the one bundled with MS-DOS. Zorland does provide a linker at additional cost, either as part of the company's 'Developer's Upgrade' or separately, and it was this linker which I used during this review.

Zorland C Version 1.0 had a primitive WordStar-like editor. Its successor, Version 2.0, has retained the original dozen or so WordStar commands and has added to them, thereby upgrading it into a full-function text editor. The additional commands are available via two-line horizontal Lotus 1-2-3 style menus rather than the more usual pull-down style menus, and can be accessed by 'Alt' key combinations.

Everything you would expect from a text editor is here in the new Zorland C but, for some reason, it still feels a little crude. Perhaps it's the monochrome screen or the speed of operation — very slow with big files.

The menu options include 'compile': the system is configured so that compile calls the linker being used and runs the program if no errors are detected. If an error is detected, the compiler is stopped and the cursor is placed near the error. If the error is a warning, pressing Enter will continue the compilation; otherwise, the error must be corrected and the compiler invoked again.

One word of warning about using the Zorland integrated environment — it does *not* like the presence of any memory-resident programs. SideKick, PC Outline, DeskSet and even Mode would cause it to crash.

Zorland C is a *K&R* implementation, and also features the complete ANSI and Unix System V extensions. Additional features include: the ability to define constant and volatile types (a constant type never changes under any circumstances, and is typically used for data in ROM, whereas

### Benchmarks

	Mix C	Zorland C	Borland Turbo C
Intmath (File size bytes)	0.075 (22561)	0.058 (9600)	0.045 (5484)
Realmath (File size bytes)	5.7 (22824)	4.1 (9744)	3.7 (19288)
Triglog (File size bytes)	101.9 (22735)	68.7 (20244)	26.1 (19356)
Textscrn (File size bytes)	153.1 (22672)	64.1 (9584)	72.3 (5460)
Grafscrn (File size bytes)	12.8 (23271)	—	—
Store (hard disk)	5.3	4.7	4.6
(floppy disk)	14.1	13.0	12.8
(File size bytes)	(24221)	(19871)	(19323)
Hack compiling	48mins 12secs	78mins 35secs	45mins 49secs
Hack linking	25mins 21secs	32mins 9secs	15mins 33secs
File size	(312823)	(275261)	(249888)
	(295661)	(after running 'Shrink')	

All Benchmarks were run on an Amstrad PC with a MiniScribe 30Mbyte h/disk





*Zorland C offers an integrated environment similar to Mix C and Turbo C, but uses 1-2-3 style 'across the screen' menus without windows*



*When used as an integrated environment, Zorland C stops at the first error it finds. This interruption can be tedious on an initial compilation*

a volatile type can change even if the program doesn't, and is exclusively used for memory-mapped devices such as ports); argument checking, for functions; enumerated data types; and void types, for functions which don't return a value.

Zorland C is a two-pass compiler arranged as two separate programs to perform each pass. The £34.44 version of Zorland C is limited to small systems (up to 64k executable code, 64k data), but an additional £19.95 will buy a Developer's Upgrade which provides a further three memory models to exploit the full addressing space of the IBM PC architecture.

Zorland C implements a full range of file-handling, arithmetic and input/output libraries, both standard C format and MS-DOS specific, and the complete library is 98 per cent compatible with the more expensive Lattice C libraries. The Developer's Upgrade contains the full source code for these libraries and means that you can create your own customised libraries. While the Zorland libraries do include the necessary DOS and BIOS calls, these are limited to low-level calls — for example, there are no graphics mode calls. This can be a little off-putting for beginners, as consequently there is no easy way to access the more interesting 'goodies' of the machine.

As I have already explained, no linker is supplied as standard with Zorland C but the program's object code files conform to the MS-DOS standard. This means that the linker supplied with MS-DOS operates fine; it also means that the object code from other compilers and assemblers can be linked in.

The cut-down MS-DOS shipped with the Amstrad PC1512 does not include a linker. For this reason, Zorland has produced its own much-improved version of the 'LINK' prog-

ramming facility which is roughly twice as fast as Microsoft's and includes a simple 'librarian' to help create your own libraries.

The one component missing from the Zorland collection, even at extra cost, is a debugger. Unfortunately, the recommended conditionally compiled commands are not really adequate for any serious debugging. If only Mix C's Ctrace would work with other compilers, things wouldn't be so bad, but as it is you could end up paying more for a decent debugger than for a complete, upgraded Zorland C.

### *Installation*

Zorland quotes no minimum-system configuration but, as far as I can determine, a twin-floppy 256k IBM PC or compatible is the basic system required in order to use Zorland C successfully. To get the most out of it, you really need a hard-disk system.

There is no copy-protection on any Zorland product, so installing the C compiler is just a matter of copying the file over or, if you're feeling lazy, running the 'Install' program. I recommend separate directories for libraries and source code, but this means changing the path within 'CONFIG.SYS' as Zorland C doesn't really understand directories. Not unsurprisingly for a company called Zorland, the licensing agreement is a clone of Borland's aforementioned 'no-nonsense, treat me like a book' agreement. This allows you to use the program on the machine of your choice, provided it is never in use on two machines at the same time.

Programs created with Zorland C can be freely distributed.

### *In use*

Zorland C made a valiant attempt to compile the Hack system, throwing up warnings about nested comments and then deciding that one of the

nested comments was in fact an error. Zorland C doesn't include an option allowing nested comments, so I had to go through the source, 'un-nesting' wherever they occurred. This tedious process, combined with the slowest compiling time of the three programs, meant that it took me about 5½ hours to get the game up and running.

Interestingly, memory-resident programs wouldn't work with the Zorland version of Hack whereas they would with the Borland and Mix implementations.

The execution times of Zorland C programs are fast: it consistently beat Mix C, and independent sources assure me that Zorland C produces quicker programs than either Lattice C or Microsoft C. However, with the exception of the 'Textscrn' text mode screen-handling routine, Turbo C had the upper edge.

Don't let this put you off, though — Zorland C produces fast, compact, executable programs.

Two utilities which have been borrowed from the Unix C environment, 'MAKE' and 'TOUCH', give Zorland C a very professional feel. MAKE is an automatic program maintenance facility that comes into its own on large systems spread across many source files. Rather than re-compiling the complete system, in just one source file MAKE will determine which files have changed since the last compilation, which files depend on them, and then compile just the requisite files.

TOUCH changes the last modified date to the current date, and so forces compilation.

An optimiser can be purchased at extra cost, and performs a third pass on the compiler code, so improving execution speed. Unfortunately, this wasn't supplied with the review package, so I am unable to comment on its effectiveness.

# SCREENTEST

## Expansion

There are two additional libraries for Zorland C. The BTREE/ISAM Database provides the facilities of a simple database, such as indexing. Zorland Windows gives easy controls for the creation and manipulation of ANSI character windows, and also provides a Lotus 1-2-3 menu control.

## Documentation

Zorland C's accompanying literature is a 350-page manual. A rather feeble tutorial occupies the first 80 pages, but otherwise the rest of the book is adequate. The technical information for the professional C programmer is excellent, and includes a discussion of such problems as producing ROM-able code, memory model difficulties and linking other languages.

## Price

In its cut-down form Zorland C costs £34.44, but I would recommend the power package. This includes the fast Zorland linker, all four memory models and the full source code for the libraries and retails at £68.94. Alternatively, the memory model upgrade on its own costs £22.94.

Zorland also sells a linker/librarian for £22.94, the database and the Windows libraries for £34.44 each, and an optimiser at £34.44.

## Borland Turbo C

It's an interesting reflection of the state of the software market that Borland's Turbo C is the most expensive of the three compilers reviewed here. While everyone else has cut their prices to less than Borland's, Borland hasn't budged from the £80-£100 price bracket that established the

budget PC software market. Still, why reduce the price when the product is selling so well?

## Overview

Turbo C is the most complete of the three programs tested and comprises a compiler (in both integrated environment and command-line versions), an editor, a linker and a number of extra utilities, all as standard. Professional programmers will be pleased that this Borland language incorporates a command-line-driven version. The integrated environment is fine for small applications, but most larger applications are controlled by custom batch files.

The editor supplied with Turbo C is an integral part of the Borland integrated environment and can't be used in any other way. The default editor window occupies the upper two thirds of the screen and is 80 columns wide. This is an improvement over programs such as Turbo-Prolog which default to a quarter-screen editing window. The bottom third of the screen is used for reporting error messages.

As with all recent Borland languages, all windows can be resized as required.

The Turbo C editor has the most complete WordStar command set of the three programs looked at here. It is also the most program-orientated, with such features as auto-indent and very fast handling of large files. There is no facility to customise the control commands, so if your favourite word processor happens to be WordPerfect, you're stuck with having to learn WordStar. Perhaps this lack of configurability has to do with the forthcoming Borland word processor, Sprint, which is very, very configurable.

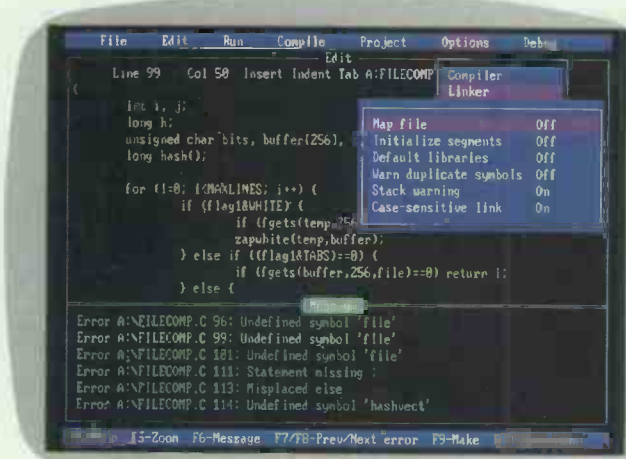
The compiler, linker and practically all other aspects of the Turbo C system can be called into action via the pull-down menus at the top of the screen. These can be called up either by Alt and the first letter of the menu or by hitting F10. In either case, the cursor keys are used to navigate around the menus while the Return key selects the desired entry.

Turbo C is a single-pass compiler which conforms to the K&R standard. It creates standard .OBJ files which can be linked in with other object files. Borland has implemented all the ANSI extensions and, as far as I can tell, all the Unix System V extension are included, although Borland makes no mention of this.

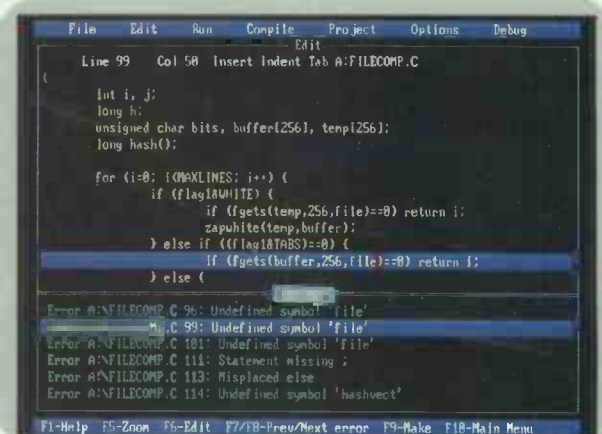
Borland C has the richest choice of memory models, capable of producing six different memory mappings for an executable file. These models are labelled 'Tiny', 'Small', 'Medium', 'Compact', 'Large' and 'Huge'.

Turbo C has too many additional facilities over and above K&R and ANSI standards to mention here, but suffice it to say that they include nested comments and more-relaxed identifier-naming conventions. Also, Turbo C is the only compiler of the three capable of producing 80286 protected mode object code for use with the full 16Mbyte address space of this processor. This will be a great asset for those people interested in upgrading to OS/2 when it becomes available.

When using the integrated environment, the Turbo C compiler reports all its errors in the lower window. It is possible to specify a certain number of errors, after which the compiler gives up and allows you to correct the errors made so far. This is particularly useful in the initial stages of program development because of the



The Turbo C version of Borland's integrated environment is the best yet, with 80-column default windows and the most comprehensive control menus



The Turbo C pull-down menus, plus the reporting of multiple source errors. You can set a maximum limit on the number of errors reported

knock-on effect of certain errors in C.

One wonderful feature of the Turbo C integrated environment is the ease with which you can test individual functions and procedures. With a little effort, you can ask Turbo C to prompt you for a procedures argument and then print the results you wish to see. This feature alone could save hours of development time.

In terms of the quality of functions provided, Turbo C has the most comprehensive library of the three compilers. However, the Turbo C and Zorland C libraries share that same failing — they are both too low-level. I know that C has been likened to a high-level assembler but, nonetheless, it is very frustrating, for example, not to be able to run the PCW graphics Benchmark, Grafscrn, because there is no 'plot' command.

The Turbo C linker, like the compiler, can be run from the integrated environment or as a command-line program. Borland describes the linker as 'lean and mean', which is fairly accurate as it's very fast, although it does lack a lot of the 'bells and whistles' of other linkers.

No debugger is included with Turbo C, although the program does have a decent collection of optional compiler directives to aid debugging.

## Installation

Turbo C requires 384k or more of memory and a single floppy; any serious work requires a hard disk. For a Borland product installation was quite complex, requiring a different kind of file from each of the four disks to be copied into different directories. No installation batch file was provided.

Turbo C is not copy-protected and has a simple licensing schedule that forbids running two copies of the program at the same time. Any programs developed under Turbo C can be freely distributed or sold.

## In use

It took less than an hour to get the Hack program up and running with Turbo C, and the program compiled the Hack C source code first time without so much as a squeak. This was an impressive performance.

Turbo C also lived up to its 'Turbo' label when running the PCW Bench-



## Specifications

Passes (compiler)	1	2	1
Creates .OBJ files	No	Yes	Yes
Memory models	1	4 <sub>1</sub>	6
8087/80287 support	No	Yes	Yes
ROM code generation	No	Yes	No
Integrated development environment	Yes	Yes	Yes
Kernighan & Richie standard	Yes	Yes	Yes
ANSI extensions	Yes	Yes	Yes
MAKE utility	No	Yes	Yes
Command-line operation	Yes	Yes	Yes
Approx number of lines per second being compiled <sub>2</sub>	3500	1800	6500
Library source code	No	Yes <sub>1</sub>	No <sub>3</sub>
Size optimisation	No	Yes	No
Speed optimisation	Yes	No <sub>4</sub>	Yes
Number of library functions	190	210	390
Graphics functions	Yes	No	No
Number of compiler error messages	80	105	130
8087/80287 co-processor support	No	Yes	Yes
80286 protected mode code generation	No	No	Yes

1 Only with the Developer's Upgrade or the professional pack

2 With a meaningless large single file containing no include files

3 Available at an extra cost of £200

4 An optional optimiser is available from Zorland at extra cost

marks. In all tests bar one (Textscrn), the Borland product came out on top.

## Expansion

Included as standard with Turbo C are the TOUCH and MAKE utilities familiar to C programmers in a Unix environment. Between them these utilities take a lot of the effort out of maintaining a large system, as they can be configured to compile only the files which have been affected by any change. I particularly like the inclusion of a 'baby' MAKE facility within the integrated environment, as this allows beginners to become familiar with the concept.

Borland usually releases a set of additional libraries for numeric work, graphics, database design, and so on, some time after the release of a language. In the case of Turbo C, the company hopes to have a collection similar to that of Turbo Pascal released by 1988.

## Documentation

Over 700 pages of documentation is supplied with Turbo C in the form of two manuals, a *User Guide* and a *Reference Guide*. My only criticism is of the tutorial which is good but far too short, and the wealth of advice it contains on using Turbo C with other languages is directed only at Borland products.

Overall, though, the manuals are excellent, and cover most aspects of using Turbo C. In places, they were interesting enough to be read as guides to programming the PC.

## Price

Borland C retails for £89.95, and the source code for the libraries can be purchased at what, for Borland, is the exorbitant price of £199.95. No prices were available for the libraries

at the time of writing, but they should cost around £50.

## Conclusion

It's easy to write a conclusion when there is a clear winner but, unfortunately, in this case there isn't. All three programs are excellent, and any one would make a good choice for PC owners looking for a C compiler.

At first sight Mix C looks the least attractive because it produces large, slow programs and does not include advanced features such as the MAKE utility. However, Mix C has a truly excellent tutorial which probably makes it the best buy for an absolute C novice who has to start from scratch. If, after using Mix C, you want to create a large program, you would be well advised to upgrade to one of the other two compilers.

Zorland C and Turbo C are more than a match for the so-called professional C compilers costing in excess of £250. The best overall performance was given by Turbo C. It is eminently qualified to take a Basic programmer, for example, and lead him or her all the way to the creation of real applications under C; firstly, with the integrated environment, and then onto a true multiple source file with conditional compilation.

Experienced programmers might find Zorland C the easiest to work with as it's the most similar in function to existing heavyweight C compilers. It is also cheap and very compatible with the very successful Lattice C environment — two arguments that certainly weigh heavily in its favour.

Mix C is distributed by Analytical Engines on (0703) 262099. Zorland is on (01) 854 1194. Borland is on (01) 258 3797.

END

# Graphic algorithms

*When you have mastered the basic mathematical principles, creating simple algorithms for computer graphics should result in some sophisticated drawing programs. Mark Parlour guides you step by step through the routines involved.*

This article outlines simple algorithms for plotting lines and circles and for filling areas of the screen. The algorithms can be used in high or low-level languages, and rely on some knowledge of mathematics to explain how the techniques are derived from the equations of lines and circles.

Before considering line plotting, it is necessary to investigate the problem at a lower level: that of plotting individual points (pixels) on the screen.

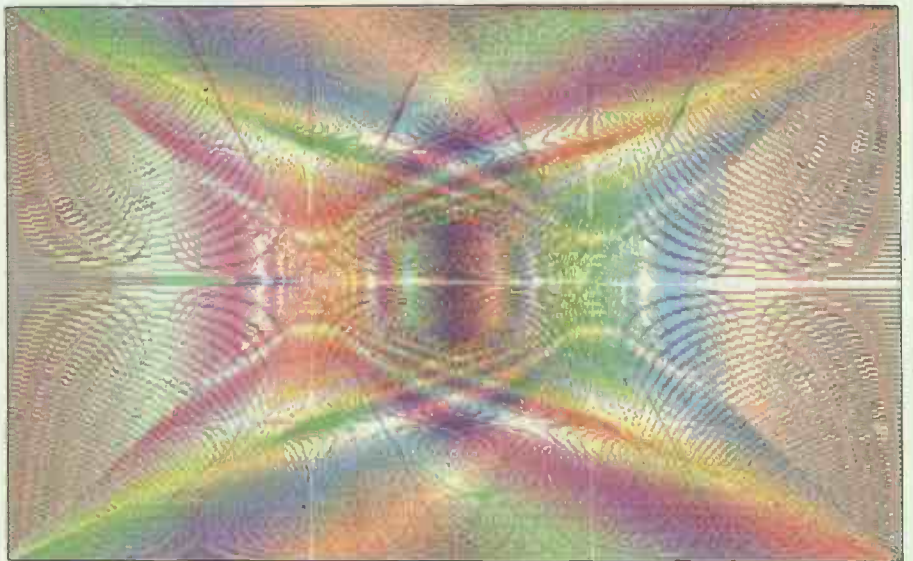
### Plotting points onscreen

Consider a high-resolution screen of 640x200 plottable points: that is, X coordinates of 0-639 and Y coordinates of 0-199. It is essential that we are able to set or test the colour of any pixel of our choice on this screen.

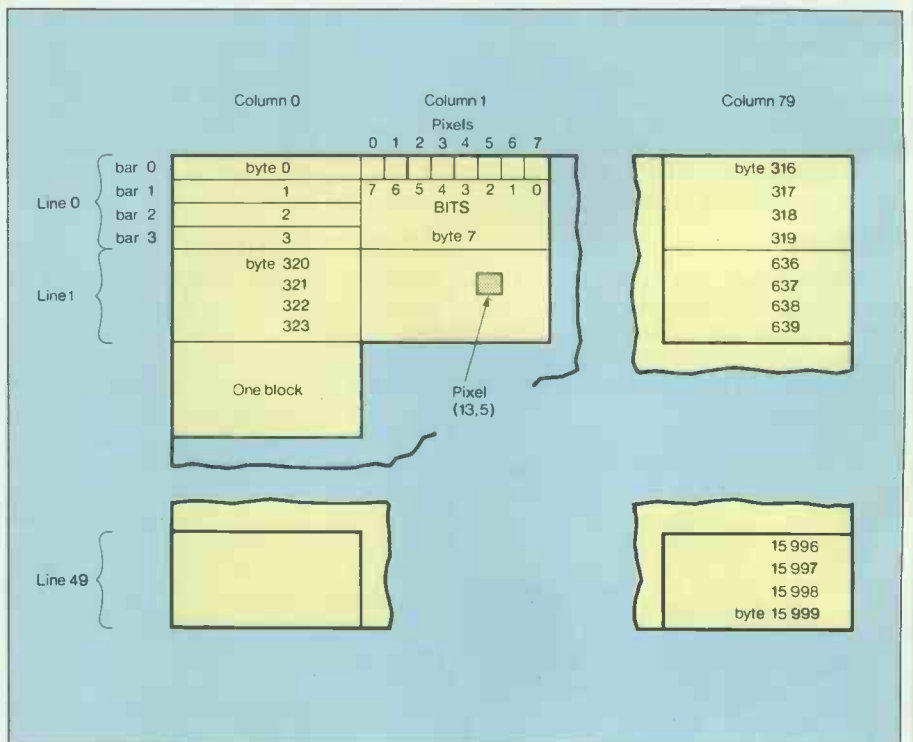
Ideally, we should be able to directly access any point by reference to its coordinates, but there are three principle reasons why this is usually impossible. Firstly, the pixels are not stored in a simple sequence reflecting their position on the screen. Secondly, although each pixel needs only one bit to represent on or off, encoding colour may involve a sequence of bits or multiple images of the same screen encoding different primary colours. Thirdly, we may want to access a single bit but the smallest data item we can read or write directly is a byte, so some extra manipulations (shifts and logical operations) will have to be performed to access individual bits.

Fig 1 shows a fairly typical screen layout for a monochrome display in which we want to access pixel (13,5). The screen is composed of 80 columns by 50 lines of blocks, where each block comprises four bars of eight pixels. To access the pixel we must first access the byte (bar) in which it resides.

Given an X coordinate, we know that if we divided this by eight we would get a result of the block position with a remainder which indi-



*Patience and perseverance with basic mathematics could lead to programming skills which enable you to create elaborate graphical displays*



*Fig 1 This diagram represents a screen which is 80x50 lines and 640x200 pixels. Most screens are organised similarly but with differing sizes*

cated the bit position within that byte. More specifically:

block = X div 8  
 pixel = X mod 8 (equivalent to X AND 7)

which for X=13 gives block 1, pixel 5. Likewise, dividing the Y coordinate by four gives us the line number with a remainder which denotes the bar position on that line. Hence:

line = Y div 4  
 bar = Y mod 4 (equivalent to Y AND 3)

which for Y=5 gives line 1, bar 1. Thus the address of any byte (its offset from the start of the screen) can be calculated as:

total bars = (line \* 80 \* 4) + (block \* 4) + (bar)  
 total bars = ((line \* 80 + block) \* 4) + bar

Thus for pixel (13,5), the address = (1 \* 80 + 1) \* 4 + 1 which is byte 326 of the screen.

In Pascal we may access the byte simply as:

address = (X div 8) \* 4 + Y div 4 \* 320 + Y AND 3

In the calculation, AND is used rather than MOD because it is quicker.

In a low-level language the coordinates have to be split first (as shown in Fig 2 for the Intel 8086/8) by using shift operations on the register specified. The offset can then be calculated by a series of multiplications and additions.

To set any pixel we need some knowledge of the logical operators NOT, AND, OR and XOR shown in the logical truth tables (Fig 3).

A	NOT A
0	1
1	0

A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

A	B	A OR B
0	0	0
0	1	1
1	0	1
1	1	1

A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

Fig 3 Truth tables

Fig 4 shows the situation of a screen bar containing the pattern 10100001 in which we want to set

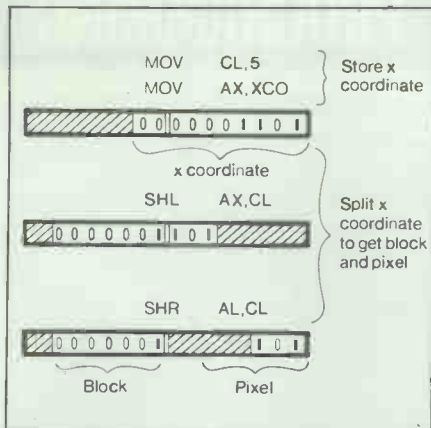


Fig 2 Splitting coordinates in a low-level language (the Intel 8086/8)

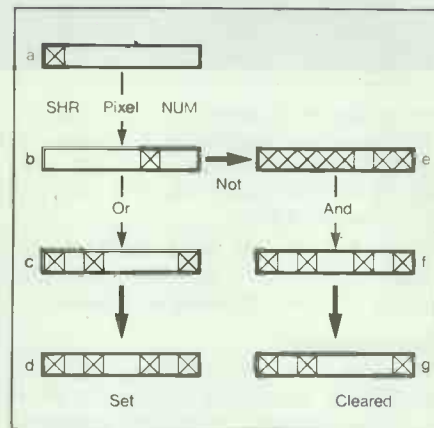


Fig 4 The situation of a screen bar containing the pattern 10100001

```

VAR
  address : integer ; mask : BYTE;
  screen : array [0..8000] of byte absolute $3C00:$0000;
  procedure PSET (X : integer; Y, C : byte);
  begin
    address := (X DIV 8) * 4 + Y DIV 4 * 320 + Y AND 3;
    mask := 128 SHR (x AND 7);
    screen[address] := screen[address] OR mask
  end;
  function pget (X : integer; Y : byte):boolean;
  begin
    address := (X DIV 8) * 4 + Y DIV 4 * 320 + Y AND 3;
    mask := 128 SHR (x AND 7) ;
    if (screen[address] AND mask)>0 then pget:=1 else pget:=0
  end;

```

Fig 5 Constructing the OR mask with mask := 128 SHR (X and 7)

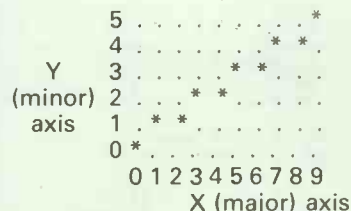
pixel 5 (or bit 2). We must first create an 'OR mask' by loading a bit into an empty byte (a) and shifting it into place (b). If we perform logical OR with this mask on the screen byte (c), you will see that this sets only bit 2 and leaves the others unchanged (d). The mask acts as a stencil: you create the mask to 'expose' the byte to be affected and then 'spray' the operation through it onto the byte. Likewise, to clear that same bit at a later time we must prepare an 'AND mask' (e) by inverting the OR mask using the NOT operator.

In fact, XOR operations are frequently used employing the OR mask because the required bit is set on the first call and cleared when called again using the same mask. Note, however, that if the bit is already set it will be cleared on the first call using this technique. The main use of this technique is in overlaying a simple moving image (for example, a cursor or a sprite) over a complex background image without corrupting it.

In Pascal, the OR mask is constructed by mask := 128 SHR(X AND 7) and the relevant bit is set by ORing or read by ANDing it with the current byte at the calculated address, as shown in Fig 5.

### Drawing a line

Shown below is a representation of a line from position (0,0) to position (9,5). Because the difference in the X axis (dX) is greater than the difference in the Y axis (dY) there is only one point plotted for every X value within the range, whereas there are always one or more points plotted for every positions of the Y axis. The axis which only has one point plotted is called the major axis and the one which has one or more points plotted is called the minor axis.



I'll now consider three methods of drawing the line, each relying on looping through every value on the major axis and plotting the point using the corresponding minor axis coordinate. Because of this, there exist four types of line depending on which is the major axis and whether

# PROGRAMMING

the gradient is positive or negative. The decision algorithm is shown in Fig 6. Given coordinates are X1, Y1, X2, Y2 for the points (X1,Y1), (X2,Y2) at the ends of a line.

For each of the three methods of drawing the line I'll now consider the case of X major positive as above.

## Direct method

We know that a line through the origin (0,0) is described by the equation  $y = mx$  (where  $m$  is the gradient  $dY/dX$ ). So, by adding 1 to the major axis displacement and adding the gradient to the minor axis displacement (rounded down, we may calculate the new coordinates each time: because we are using the minor axis, the gradient will always be less than one, ensuring that no points are omitted during plotting.

```
let Y = Y1
for X = X1 to X2
  pset(X, round(Y))
  let Y = Y + gradient
```

There are problems with precision if we try to store these values accurately (while at the same time making the routine as fast as possible) and there are many elaborate ways of solving this problem — for example, using fixed point arithmetic (see 'Simple arithmetic', PCW, June 1986).

```
let dx = X2-X1
let dy = Y2-Y1
if abs(dx) > abs(dy)
  then (X_MAJOR)
    if X1>X2 then swap
      (X1,Y1) with (X2,Y2)
    let gradient = dy/dx
    if gradient < 0
      then call X_MAJOR
        POSITIVE routine
    else call X_MAJOR
      NEGATIVE routine
else (Y_MAJOR)
  if Y1>Y2 then swap (X1,Y1)
  with (X2,Y2)
  let gradient = dx/dy
  if gradient < 0
    then call Y_MAJOR
      POSITIVE routine
  else call Y_MAJOR
    NEGATIVE routine
```

Fig 6 Decision algorithm

## The integer digital differential analyser method

Rather than calculate the gradient directly, it is possible to set up a guide value or 'dump'. This dump is a constant value and its use simplifies the calculations which the computer has to perform. This in turn means that the calculations will pro-

ceed more quickly, so the line will be drawn more quickly. In this case,  $dX$  is 9 and  $dY$  is 5, so the gradient is  $5/9$ . This is not an integer and its addition to  $Y$  followed by rounding  $Y$  down takes longer than if only integer operations were used. The best way to understand the use of a dump is to try out these values in the algorithm below. We subtract  $dY$  from the dump each time we increment  $X$ , and only increment  $Y$  when the dump drops below zero (at which time  $dX$  is added to it). At the end of the process we will have added 5 steps of 9 and subtracted 9 sets of 5, so the gradient will be preserved. The dump is initialised to half  $dX$  to ensure that the line appears balanced around a central axis.

```
let dump = dX div 2
for loop = X1 to X2
  pset (x,y)
  let x = x + 1
  let dump = dump - dY
  if dump < 0
    then
      let y = y + 1
      let dump = dump + dX
```

Through using integer arithmetic, this is a very simple and fast routine. However, the problem with it is

## Listing 1: 8088 machine code for setting individual pixels on a Sanyo MBC555

```
;PIXEL SETTING ROUTINE FOR SANYO MBC INTEL 8088
;R.M.FARLOUR. FOR TURBO PASCAL defined by
;PROCEDURE PSET(X,Y:integer;C:byte);external 'pset';

CSEG SEGMENT 'CODE'
assume cs:cseg
pset PROC near
;
  X      EQU [BP+0B]
  Y      EQU [BP+06]
  COLOUR EQU [BP+04]
  RED    EQU 0F000H
  GREEN  EQU 03C00H
  BLUE   EQU 0F400H
;
  PUSH  bp      ; save the base pointer
  MOV  BP,SP   ; save SP to access parameters
  PUSH  DS     ; DS must not be corrupted
;
;split the x coordinate into columns + pixels
;-----
;
  MOV  AX,X     ;load the x coordinate
  MOV  CL,05    ;prepare 5 bit shift
  MOV  DX,AX    ;copy x coord into DX
  AND  DL,0000111B ;DL = 3 bit pixel position
  SHL  AX,CL    ;AH = 7 bit column position
  MOV  DH,AH   ;DH = column position
;
;split the y coordinate into lines + bars
;-----
;
  MOV  AX,Y     ;load the y coordinate
  INC  CL      ;prepare 6 bit shift
  MOV  BX,AX   ;copy y coord into BX
  AND  BL,00000111B ;BL = 2 bit bar position
  SHL  AX,CL   ;AH = 5 bit line position
  MOV  BH,AH   ;BH = line position
;
;calculate the pixel's byte offset from screen start
;-----
  XOR  AH,AH   ;clear AH
  MOV  AL,BH   ;AL = lines
  MOV  BH,50h ;BH = 80 (columns per line)
  MUL  BH,AX   ;AX = lines*80 = blocks
  XOR  CH,CH   ;clear CH
  MOV  CL,DH   ;CL = columns within line
  ADD  AX,CX   ;AX = total columns offset
  SHL  AX,1    ;AX = AX*2
  SHL  AX,1    ;AX = AX*2 = offset in bars to block
  MOV  CL,BL   ;CL = bars within block
  ADD  AX,CX   ;AX = total offset in bytes
  MOV  SI,AX   ;load memory pointer with offset
;
;prepare byte and masks for plotting
;-----
  MOV  CL,DL   ;load pixel position for shift
  MOV  AL,10000000B ;set leftmost bit
  SHR  AL,CL   ;and shift into position
  MOV  AH,AL   ;copy OR MASK into AH
  NOT  AH      ;convert to AND MASK
;
;test and plot pixel on each screen in turn
;-----
  MOV  CH,colour ;load CH with pixel colour
  MOV  DH,00000100B ;initialise test bit (red)
  MOV  BX,red    ;operate on red screen
  CALL DISPLAY  ;display pixel
  MOV  BX,green  ;operate on green screen
  CALL DISPLAY  ;display pixel
  MOV  BX,blue   ;operate on blue screen
  CALL DISPLAY  ;display pixel
;
  POP  DS
  MOV  SP,BP
  POP  BP
  RET  6        ;return from pset and discard parameters
;
;display procedure
DISPLAY PROC NEAR
  MOV  DS,BX    ;load screen offset into DS reg
  MOV  CL,CH    ;copy colour test bit into CL
  TEST DH,CL   ;test whether to set or clear pixel
  JZ   CLEARPIX ;if no match clear the pixel
  OR  [SI],AL   ;else set pixel using the OR mask
  JMP NEXTCOL  ;and jump over to the colour rotate
CLEARPIX:
  AND [SI],AH   ;clear the pixel using the AND mask
NEXTCOL:
  SHR  DH,1    ;shift next colour test into position
  RET
DISPLAY ENDP
PSET ENDP
CSEG ENDS
END
```

that a number of calculations are performed each time to find whether the minor axis shift ( $y = y + 1$ ) should occur. Also, in this version, the plotting position is calculated afresh each time whereas only the relative change from the last position need be known.

### Residual gradient dump using relative shift plotting

We know that the gradient is never greater than 1 because of the way we define the major and minor axes. It is possible to use an extension of the first algorithm a 'residual fractional dump' (from 0 to 0.999.) to which the gradient is added each time and a minor axis shift is only performed when the dump becomes greater than one. Only now is the fact that there is a surplus *significant*. All points are now plotted by shifts relative to the last point without reference to its absolute position. Therefore, the necessary accuracy is achieved using a dump of two bytes on which addition alone is performed, and then the decisions are reduced to a simple test of carry so the speed of the routine is maximised (Fig 7).

```
let loop counter = dX + 1
set pixel (X1,Y1)
repeat
  dump = dump + fractional
  gradient
  shift pixel right (increment X)
  if carry signalled then shift
  pixel up (increment Y)
  decrement loop counter
until loop counter = 0
```

Fig 7 Residual gradient dump using relative shift plotting

## Shift logic

The shifting procedure warrants some description as it can be used in a wide variety of graphics algorithms and has the benefit of being very fast (for example, to recalculate the screen address and offset each time on the 8088 takes around 221 clock cycles, whereas to shift takes between 32 and 40).

Fig 8 shows pixel 13,5 marked X. To move up we simply subtract 1 from the address pointer; likewise, to move down we add 1. Similarly, to move right we shift the mask right (or divide it by two) and to move left we shift the mask left (or multiply it by two).

Needless to say, it isn't always this simple, and peculiar conditions exist at the block boundaries as shown in Fig 9. When pixel A moves up we expect to subtract 1 from the address, but, in fact, in crossing the boundary we have to subtract an extra 316. That's simple, but how do we know when it's at the boundary? By simple inspection you will see that the addresses of the top bars within each block are 0,4,8, and so on, which means that the last two bits of the address are clear when in this bar. Therefore, the complete 'shift up' (or decrement Y) routine is as follows:

```
if (address AND 3) = 0
  then let address = address - 316
  let address = address - 1
```

Likewise to shift down (increment Y):

```
if (address AND 3) = 3
  then let address = address + 316
  let address = address + 1
```

When considering horizontal moves we must test the mask to see if we are at the boundary. For pixel B moving left this is:

```
if mask = 128
  then let mask = 1
  let address = address - 4
  else let mask = mask SHL 2
```

and for pixel C moving right (increment X):

```
if mask = 1
  then let mask = 128
  let address = address + 4
  else let mask = mask SHR 2
```

## Drawing circles

It is possible to calculate all the points of a circle by rotating through 360 degrees and calculating the X and Y coordinates using trig functions. However, this is inefficient for three reasons. Firstly, the circle has an 8-point symmetry (Fig 10) which we may utilise by calculating points only in the first 45 degrees and calculating the seven corresponding points by simple algebra. Secondly, plotting by radius may give us more than one point plotted per pixel on a small circle (wasteful in time and some unexpected results using XOR plotting) and gaps in large circles (unsightly and difficult to fill). Thirdly, the processing time is prohibitively long for the functions and various multiplications involved. However, simple integer difference methods using addition and subtraction alone may be used.

The equation for a circle of centre 0,0 is  $X^2 + Y^2 = R^2$ . Thus if we start at

### Listing 2: Turbo Pascal procedure to draw a line on a Sanyo MBC555

```
procedure FGDLINE(x1,v1,x2,y2:integer;rc:byte);
(* uses 14 bit fractional gradient placed in a dump *)
(* with a carry to signal the minor axis update *)
(* written in Turbo Pascal for the SANYO MBC 555 *)
(* by R.M. PARLOUR . DECEMBER 1986 *)
VAR
  address : integer ;
  mask : BYTE ;
  gs : array[0..8000] of byte absolute $3C00:$0000;
  rs : array[0..8000] of byte absolute $F000:$0000;
  bs : array[0..8000] of byte absolute $F400:$0000;
  x,y : integer;
  gradient, dx,dy,absdx,absdy,dump:pointer,loop:integer;
  carry_set:boolean;
procedure plotpoint;
begin
  if C>3 then BS[address]:= mask OR BS[address];
  if (C AND 2)>0 then GS[address]:= mask OR GS[address];
  if (C AND 1)>0 then RS[address]:= mask OR RS[address];
end;
function grad(dy,dx:integer):integer;
begin grad := trunc(32767.0*dy/dx) end;
procedure update_dump;
begin dump:= dump+gradient;carry_set:=false;
  if dump<0 then begin dump:=dump+maxint;carry_set:=true end;end;
procedure calc_offset(x,y:integer);
begin
  address:=x div 8 * 4 + y div 4 * 320 + y and 3;
  mask:=128 shr(x and 7);
end;
procedure increment_x;
begin
  mask:=mask div 2;
  if mask = 0
  then begin masks:= $80 ;address := address + 4 end;
  end;
procedure decrement_x;
begin
  if mask < 128
  then mask:=mask * 2
  else begin mask:=1 ; address := address - 4 end;
  end;
procedure decrement_y;(* update the y coordinate *)
begin
  if ((address and 3)=0 ) then address := address - 316;
  address := address -1;
end;
procedure increment_y;(* update the y coordinate *)
begin
  if ((address and 3)=3 ) then address := address + 316;
  address := address +1;
end;
begin dx:=x2-x1; dy:=y2-y1;
  absdx:=abs(dx); absdy:=abs(dy);
  if absdx > absdy
  THEN (* X MAJOR *) begin
    dump:=absdx div 2; gradient:=grad(dy,dx);loop:=absdx+1;
    if x1>x2 then calc_offset(x2,y2) else calc_offset(x1,y1);
    if gradient < 0
    then begin gradient :=-gradient;
      repeat plotpoint;increment_x;update_dump;loop:=loop-1;
        if carry_set then decrement_Y;
          UNTIL loop = 0; end
    else begin
      repeat plotpoint;increment_x;update_dump;loop:=loop-1;
        if carry_set then increment_Y;
          UNTIL loop = 0; end
    end
  ELSE (* Y MAJOR *) begin
    dump:=absdy div 2;gradient := grad(dx,dy);loop:=absdy+1;
    if Y1>Y2 then calc_offset(x2,y2) else calc_offset(x1,y1);
    if gradient < 0
    then begin gradient :=-gradient;
      repeat plotpoint; increment_y;update_dump;loop:=loop-1;
        if carry_set then decrement_X;
          UNTIL loop = 0; end
    else begin
      repeat plotpoint; increment_y;update_dump;loop:=loop-1;
        if carry_set then increment_X;
          UNTIL loop = 0; end
    end;
  END;
END;
```

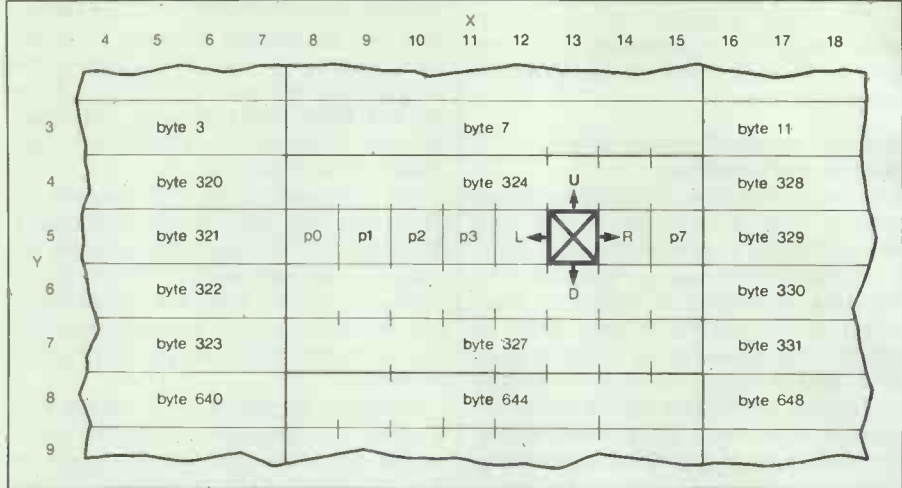
# PROGRAMMING

**Listing 3: IBM program to draw circles**

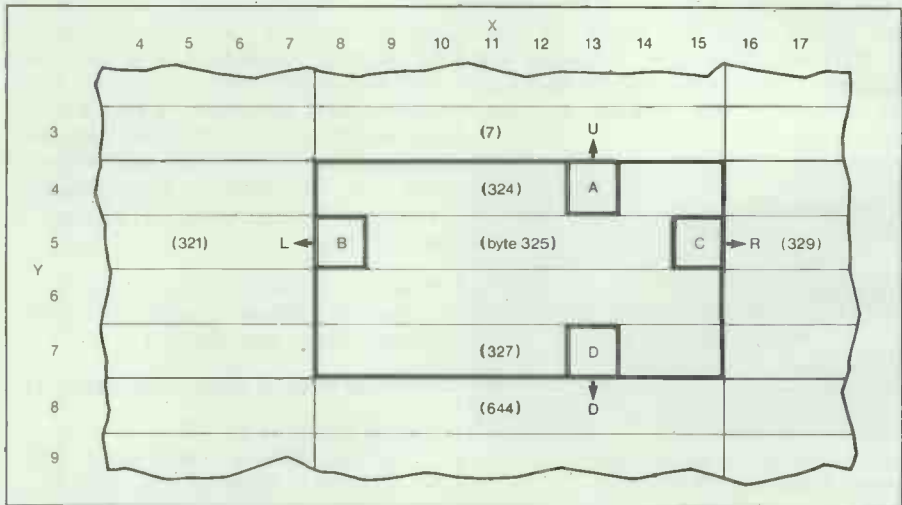
```

program gtest;
var
  xc1,yc1,r,i:integer;
procedure pset(x:integer; y:byte);
var
  address:integer;
  pix:byte;
  sc: array[0..16192] of byte;
begin
  absolute $b800:$0000;
  address:=(x div 8)*(y div 2)*80
    + (y AND 1)*8192;
  pix:=128 SHR (x AND 7);
  sc[address]:= pix OR sc[address];
end;
procedure circle(xc,yc,r:integer);
var
  x,y,ydump,xdump,res:integer;
begin
  x:=0;
  y:=r;
  ydump:=-2*r+1;
  xdump:=1;
  res:=ydump+xdump;
  repeat
    pset(xc+y*2,yc+x);
    pset(xc+y*2-1,yc+x);
    pset(xc+x*2,yc-y);
    pset(xc+x*2-1,yc-y);
    pset(xc-x*2,yc-x);
    pset(xc-x*2-1,yc-x);
    pset(xc-y*2,yc+x);
    pset(xc-y*2-1,yc+x);
    pset(xc-x*2,yc+y);
    pset(xc-x*2-1,yc+y);
    if res<0 then begin
      x:=x+1;
      xdump:=xdump+2;
      res:=res+xdump;
    end;
    if res>=0 then begin
      y:=y-1;
      ydump:=ydump+2;
      res:=res-ydump;
    end;
    pset(xc+x*2,yc+y);
    pset(xc+x*2-1,yc+y);
    pset(xc+y*2,yc-x);
    pset(xc+y*2-1,yc-x);
    pset(xc-x*2,yc-x);
    pset(xc-x*2-1,yc-x);
    pset(xc-y*2,yc+x);
    pset(xc-y*2-1,yc+x);
    pset(xc-x*2,yc-y);
    pset(xc-x*2-1,yc-y);
  until x>y;
end;
begin
  hires;
  hirescolor(15);
  for i:=1 to 40 do begin
    xc1:=random(440)+100;
    yc1:=random(120)+40;
    r:=random(40);
    circle(xc1,yc1,r);
    fill(xc1,yc1);
  end;
end.

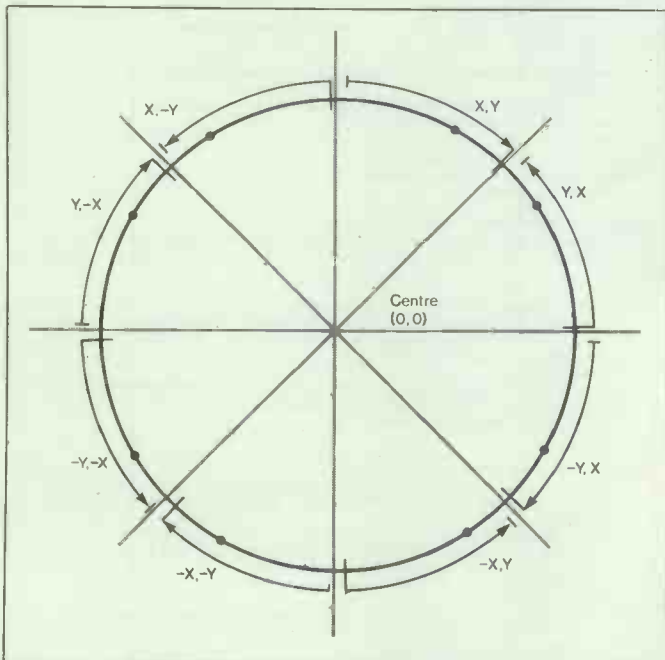
```



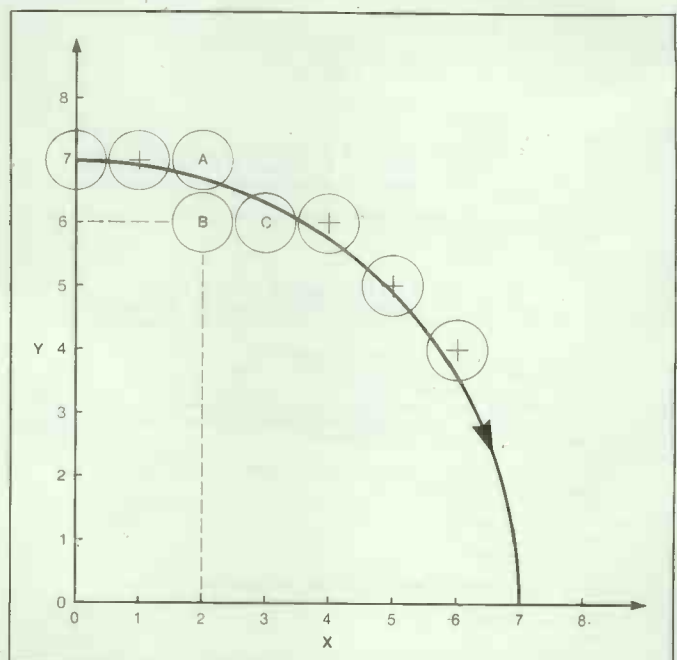
**Fig 8 Travelling up, down, left or right from the central pixel can be done by adding/subtracting 1 from the byte address or by shifting the bits in the byte left or right**



**Fig 9 Problems arise in the shift method when a block boundary is reached (indicated by the darker line)**



**Fig 10 Eight-fold symmetry from algebraic calculations**



**Fig 11 Plotting pixels as near as possible truly on the circle**



X	=	0	1	2	3	4	5	6
X <sup>2</sup>	=	0	1	4	9	16	25	36
diff	=		1	3	5	7	9	11
diff	=			2	2	2	2	2
Y	=	R	R-1	R-2	R-3			
Y <sup>2</sup>	=	R <sup>2</sup>	R <sup>2</sup> -2R+1	R <sup>2</sup> -4R+4	R <sup>2</sup> -6R+6			
Y <sup>2</sup> -R <sup>2</sup>	=	0	-2R+1	-4R+4	-6R+9			
diff	=		2R+1	2R+3	2R+5			
diff	=			2	2			

Fig 12 Differential analyses

X = 0. We know Y = R. We can rearrange the equation to get  $X^2 + (Y^2 - R^2) = 0$  which simply means that this equation holds true when on the line describing the circle. Consider now the point in Fig 11. If we were at point A(2,7) then the equation would yield  $4 + (49-49) = +4$  which means we are off the line. It is clear by inspection that the Y coordinate needs to be decremented, and when this is done the new point B(2,6) yields a value of  $(4+36-49) = -5$  which, being negative, indicates that it is time to increment the X axis. In practice, we can use a dump (as before) as our guideline to the true value.

When the dump is positive we must decrement Y such that the term  $(Y^2 - R^2)$  becomes more negative

and the updated dump is moved towards or through zero. Similarly, when the dump is negative we must increment X and update the dump's X<sup>2</sup> term, and only then plot the point. (Note that this is not an 'either/or' situation and that both updates must be considered before the next point is plotted.)

At the moment we still need to calculate the terms  $(X^2)$  and  $(Y^2 - R^2)$ , but a simple method of solution comes to light when we consider the differential analyses in Fig 12 for the two terms:

These results show that we can generate the main dump's X and Y update terms simply by adding a calculated amount which itself is changed by two each time it is used.

```
let X=0
let y=R
let x_update = 1
let y_update = -2 * R + 1
```

```
let dump = x_update + y_update
repeat
  set_pixel(xc+y, yc+x)
  set_pixel(xc+x, yc-y)
  set_pixel(xc-y, yc-x)
  set_pixel(xc-x, yc+y)
```

```
if dump < 0 then
  let x = x + 1
  let x_update = x_update + 2
  let dump = dump + x_update
  if dump >= 0 then
```

```
  let y = y - 1
  let y_update = y_update + 2
  let dump = dump + y_update
  set_pixel(xc+x, yc+y)
  set_pixel(xc+x, yc-x)
  set_pixel(xc-x, yc-y)
  set_pixel(xc-y, yc+x)
until x = y
```

Fig 13 Completed algorithm for a circle of radius R and centre (xc,yc)

The completed algorithm for a circle of radius R and centre (xc,yc) is shown in Fig 13.

In practice, this method sometimes leaves the edges of the circle too widely spaced. This problem is easily solved by plotting an extra pixel each time with an x coordinate one lower than the points listed above. An example of this is given in Listing 2.

So far I have used techniques involving iterations — that is, performing a simple function a number of times within a loop such that fairly complex solutions may be effected with minimal code. A second technique is that of recursion where a procedure is able to call itself (or disappear up its own stack!) and this is shown in the case of an algorithm for filling a space bounded by an unbroken line of pixels. By now you should be able to see how it works for yourself.

```
procedure fill(x,y)
  if not pixel_set_at(x,y) then
    set_pixel(x,y)
    fill(x+1,y)
    fill(x-1,y)
    fill(x,y+1)
    fill(x,y-1)
  (end if)
```

## Conclusion

This has been a fairly sketchy introduction to drawing lines and circles on a graphics screen, and the techniques used are complicated but very fast. Some of them, such as shifting, are applicable to a wide range of graphics techniques and can be used as a basis for techniques like scrolling areas.

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END

## Converting the graphics routines to other computers

The problem with using these routines on other computers stems from different screen sizes and the different ways in which screens are mapped out in memory. The article assumes that a 640x200 pixel screen is used. It also assumes a monochrome screen and that the organisation in memory is as given in Fig 1 (that is, that blocks of four bytes represent 8x4 blocks of pixels).

To access individual pixels, you need to be able to convert an (x,y) coordinate into an address consisting of a byte and a pixel number. For the screen described in the article (a Sanyo MBC555), the conversion is as follows:

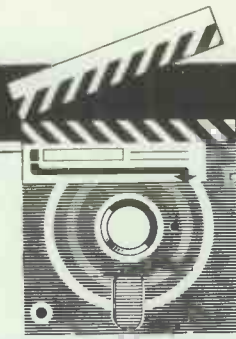
address (byte value) =  $x \text{ div } 8 * 4 + y \text{ div } 4 * 320 + y \text{ and } 3$   
 mask (bit value) =  $128 \text{ shr } (x \text{ and } 7)$

The mask is simply a single bit positioned at the correct place in a byte, and the above formula holds true for any screen with pixels stored as single bits within bytes. If your machine uses several bits per pixel, with the bit pattern representing a colour, then you will need to put the bit pattern in the top part of the byte and shift all the bits to the correct place. For example, if you use a four-colour screen with groups of two bits representing pixels, then you would use colour patterns. The formula would be:  $\text{mask} = \text{colourpattern shr } ((x \text{ and } 3) * 2)$  where colourpattern is a preset value for whatever colour you want to set the pixel to.

The address can be much more complicated. In the above example, the (y and 3) represents the groups of four bytes, the  $y \text{ div } 4 * 320$  represents the lines of blocks and the  $x \text{ div } 8 * 4$  represents the columns. To convert to your screen's organisation, you will have to draw a diagram such as that shown in Fig 1 and work out the conversion. Here is an example for the high-resolution screen on an IBM-compatible CGA:

The IBM CGA monochrome screen is 640x200 pixels. These are organised in memory as a sequence of bytes, with each row across the screen as a block of 80 bytes. This should mean that the screen is represented as 200 rows of 80 bytes in strict sequence. The problem is that the IBM display is interlaced, which means that the even-numbered rows are kept in one place and the odd-numbered rows in another. So, converting an x coordinate is simply a matter of dividing the value by 8 to obtain the byte address. If no interlacing were used, then the y coordinate part would be simply y times 80. However, since the y coordinate part is split into two lumps, the even coordinates can be represented by  $(y \text{ div } 2) * 80$ . The odd coordinates follow immediately after the even coordinates. The even coordinates fit into a block of memory which is  $80 * 200 / 2$  bytes or 8000 bytes long. In fact, it is 8192 bytes long because of the way in which memory is organised, so the odd coordinates all need to have 8192 added to them. This is achieved by  $(y \text{ and } 1) * 8192$ .

The final formulas for a monochrome CGA screen are:  
 address =  $(x \text{ div } 8) + (y \text{ div } 2) * 80 + (y \text{ and } 1) * 8192$   
 mask =  $128 \text{ shr } (x \text{ and } 7)$



## SCREENTEST

# Omnis Quartz

*Omnis Quartz is a powerful relational database for the PC which can be heavily customised, and which runs under Microsoft Windows — the first database to do so — in a multi-tasking environment. Derek Cohen and Nick Walker tackled its comprehensive facilities.*

Back in 1982, a Suffolk Apple dealership, Blyth Software, decided to apply its expertise in building turn-key systems to developing its own product. Thus was born Omnis — a database management system for the Apple II. Later came Omnis 2 and, two years ago, Omnis 3 for the Macintosh. Omnis 3 Plus, the latest Mac version, has for a long time been outselling all the other Mac database products put together, both in Europe and in the difficult to enter US market.

Omnis 3 Plus is available in a multi-user version and is the basis of Blyth's multi-user accounts system, Omnis Accounting, for networked Macs. Omnis 3 for PC-compatibles was launched in 1986, but was a poor text-based shadow of the Mac product, although it shared many of the same capabilities. It has, however, spawned the vertical market Blyth Craftware range of applications.

Now Blyth has produced the first fully programmable relational database to run under Microsoft Windows. Omnis Quartz bears many similarities to its Mac predecessor, but has the added advantage of being able to use the multi-tasking capabilities of Windows including running in the background.

### System requirements

Omnis Quartz is designed to run on an 80286 or 80386-based PC with a minimum of 640k of RAM and a hard disk.

During this review, Quartz was run mainly on a Victor V286 but was also tried on an Amstrad PC with 512k RAM. The reduction in speed was quite noticeable and, while Quartz will run on much less well-endowed machines, it is wise of Blyth to spe-

cify such a minimum-desirable configuration.

Additionally, Quartz needs a full version of Microsoft Windows installed for your particular machine and printer. A mouse is desirable, as using Windows-based applications totally from the keyboard is possible but tiresome. A colour monitor is not essential but colour does improve the organisation of the application.

Windows cannot at present make use of extra memory operating under the Lotus/Intel/Microsoft standard, but when it does Blyth claims that Quartz will use it too.

### General description

Quartz operates totally within the Windows environment, using the pull-down menus, overlapping windows, scaleable fonts, scrollable lists and dialogue boxes common to all Windows applications.

A Quartz application consists of a number of different elements, all of which are under the programmer's control. The end-user will interact with the finished program through pull-down menus, entry layouts, reports, lists (which are in effect onscreen summary reports) and dialogue boxes. In conjunction with a set of file formats which define the fields for the various record types, the user can process the information held in a separate data file. One application library of file formats, layouts, menus, and so on, can be applied to an unlimited number of different data files.

Quartz is also accessed by means of these Windows elements. Entry layouts, pull-down menus and scrollable list windows are used to make selections, build up sequences of commands in the Quartz program-

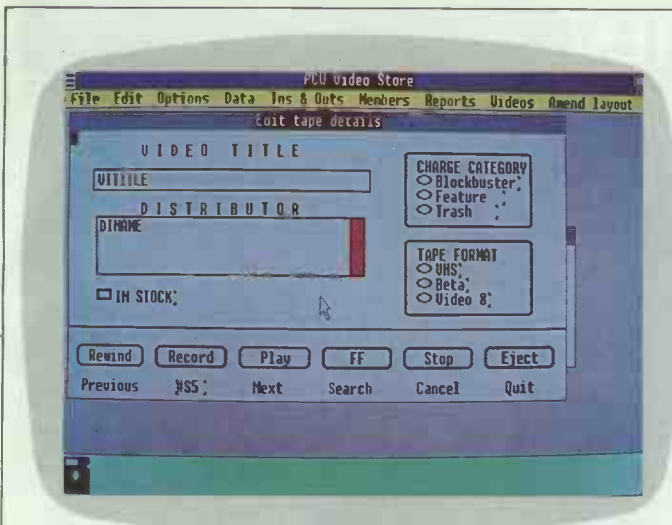
ming language, and define the functions of the finished database application. Because the programming environment and the resulting product share a common interface, Quartz itself becomes a model application from which to learn.

Anyone used to the multiplicity of disk files common to databases like dBasell will find the Quartz organisation slightly alarming at first. Quartz consists of just two files: QUARTZ.EXE, the 420k program; and QUARTZ.INF, a 512-byte file which holds the product registration details, system defaults and the name of the last application used.

Each application will typically produce only two disk files. The first, with an extension 'QAP', holds all the fixed information such as layouts, file and report formats, and menus. All the data is held in another file with the extension QD1; this can hold up to 2560Mbytes of data. And if this is not enough (though it's not clear where at present you'd hold files this big), you can chain on further data files with the extensions QD2, QD3, and so on.

Quartz organises the information within the single data file, and up to 60 separate or related sets of records can be stored with their indexes. Nonetheless, it is useful to be able to describe each set of records as belonging to an imaginary file, even if this is a logical rather than a physical entity. Up to twelve fields can be indexed within each file format, and indexes are automatically selected and maintained whenever the file format is used.

Each pull-down menu can display up to 20 items, with the option of separator bars to group the choices. There can be up to twelve menus



Entry Layout

The two boxes on the right of this entry screen contain radio buttons with each box linked to a particular field. The central box is a list field and, in use, a list of distributor names will be displayed with scroll buttons in the red bar. The programmer can determine the effect of clicking on a line in a list field. When any of the push-buttons at the bottom are clicked, they activate procedures stored in the menus.

In this application, the 'Record' button was designed to perform two functions: to start editing a record; and to indicate that the edit had been completed. A conditional loop in the connected sequence changes the value of the button's label variable — #55 — as the process takes place and tests this variable to determine whether to start editing or save the edited record

installed at once, and commands are available to add or remove menus, to place a check mark against particular choices, and to 'grey out' certain items which are either not applicable or require an access level the current user does not have. All Quartz windows and menus can be password-restricted with up to eight access levels available.

Selecting a menu item can lead to further menus being installed or, more frequently, the opening of windows on the screen carrying entry layouts or the production of printed reports.

Unlike most databases, where the programming instructions are stored in a file of their own, Quartz stores these instructions, known as 'sequences', within the menu structure.

Each menu can contain 100 items, though only the first 20 can be displayed. Associated with each menu line can be a sequence of commands, with each sequence holding up to 5000 bytes, and a total limit of 30,000 bytes of storage available per menu. Each line has a number, and can be given a name which will appear on the menu bar if that line is visible. A window alongside shows the sequence of commands attached to that line; and the lines below 20 — or below those visible if this is less than 20 — are where the prog-

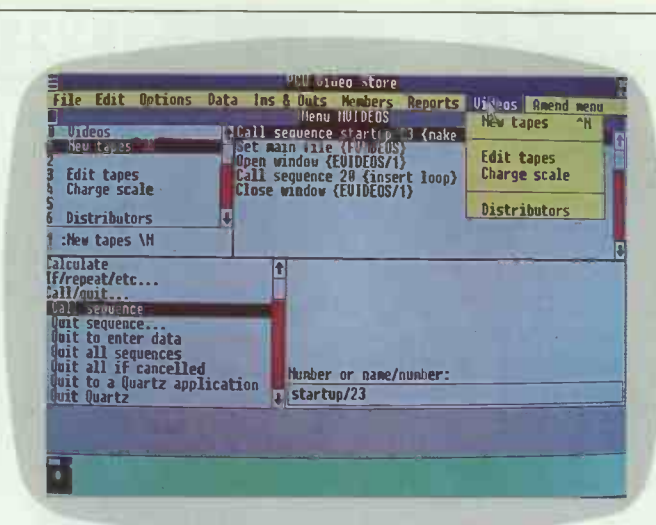
rammer enters and stores the sequences of commands. These sequences may be called by other sequences, or by clicking on menu choices or push buttons on any entry layout.

Entry layouts can each consist of up to twelve separate, sizeable and positional windows. On each layout window the programmer can position fields of the following types: entry or display fields; check boxes for setting the logical value of a field; lists, complete with a vertical scroll bar; radio buttons; and push buttons. In addition, free text and box rules can be used to annotate and organise the layout.

Radio buttons take their name from the channel selectors on car radios — only one button can be selected at any one time, and choosing one (by clicking on it with the mouse) de-selects the current choice.

Push-buttons are a feature common to most WIMP environments — they are the buttons the user clicks to initiate some activity. Standard push buttons are available for moving forwards and backwards through a file, and for finding, adding or deleting records.

However, push-buttons can be linked to the programmer-defined sequences which are stored in the menu formats. Thus a push-button marked



Amend Menu

The sequences of commands or procedures which drive Quartz are stored inside the menus. The menu line names are defined on the left, and the commands which are executed when that line is clicked or called are defined in the right-hand window. Leaving two blank lines in a menu defines the end of the visible part of a menu, and the rest of the lines can be used to store procedures called by number, by pushing buttons or other sequences. 'New tapes' has been associated here with a hot key — control-N.

Creating a sequence of commands involves clicking on a series of available commands from the bottom right-hand list. Any parameters expected (such as the parent menu and number of a sequence called as a subroutine) are prompted for bottom right

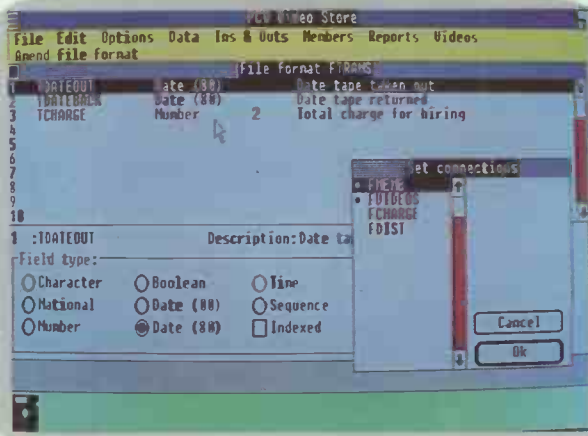
'New Title' could invoke a sequence that opens a fresh window with the cursor in the first field ready to accept data for a new record, checks the data, adds the record, and then returns to the original window.

Lists are one of Quartz's most novel features. Up to eight lists can be current at any one time. Each is defined by a series of commands which specify the list number, the fields which will form one line of the list, and how the list will be made up. Lists can be used as a 'window' onto the records of another file, or as a way of displaying the options available to the user — for example, which reports are available.

Reports can be printed to screen, to printer or to a parallel or serial port. This latter option allows a Quartz application to make use of serial links or modems to send data down the line at the click of a button. Commands are available to set serial port parameters like baud rate, and to send a pre-determined string of characters to the port. This could be an auto-dial sequence to a modem, or a set-up string to initialise a printer.

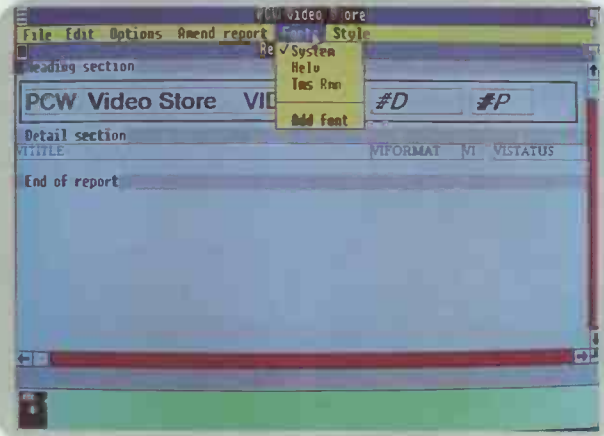
A range of different fonts and font styles can be incorporated in a report, and the report design window shows these onscreen — very WYSIWYG, indeed. Sort and search

# SCREENTEST



## File Formats

Among the field types available in a file format are two date options — one starting at 1900, the other at 1980. National fields are sorted in a different way to character fields to cope with accented characters. To set the connections between records in FTRANS and other files, the file format names in the Set connections box are double-clicked. The maximum length of each field is defined here, though on an entry or report format, the amount of data displayed can be stretched or shrunk using the mouse



## Amend Reports

Reports can consist of a number of different sections including headers and footers, and sub-total headings. Any number of records can be printed across a page, which is useful for printing labels; and the report destination can be changed at print time between the available ports, the screen or a file. Text and fields can be printed in various fonts and font styles and these attributes are shown on the report design screen. As well as fields, system variables such as the date (#D) and page number (#P) can be included

formats can be included either automatically, or by being selected at print time by the user.

## In use

To test Quartz we designed a simple video rental store application. We set up file formats for membership, video tapes and distributors. The tapes file was connected to the distributors' file: we limited each tape to one distributor, and had only one copy of each title.

Throughout Quartz, options are nearly always of the multiple choice type. The most typing we did was in specifying the text for the menus and entering textual descriptions.

Quartz does not support many-to-many linking of files, so we added a transaction file which would connect members with the video tapes they had rented. Having set up the basic file formats, we clicked the menu choice to set the connection between the transaction file and the membership and video tape files. Quartz opened up a window listing the other existing file formats, and creating the links involved merely double-clicking on the required file names. This file list was in fact an ordinary Quartz list that can be created for use on an ordinary layout window.

We next designed the menus. Each menu has a name and a description, the latter being what actually appears on the menu bar. If a menu is given the name 'Startup' it will be automatically installed when an ap-

plication is opened. Additionally, the commands stored as menu line zero will be automatically executed.

Line zero of the start-up menu was as follows:

```
Set Quartz window title (PCW Video Store)
Install menu (MMEMBS)
Install menu (MREPORT)
Install menu (MVIDEOS)
Set 'About ...' sequence 10 (About PCW ...)
Call sequence 23 (make dist list)
```

This command sequence was created with very little use of the keyboard. A window at the bottom left of the screen displays a list of all the available commands or group of commands. Clicking on an item with three dots after it opens up — outline processor fashion — further options. Double-clicking any line copies it into the current sequence. Where a command requires parameters, check boxes or further lists of valid options will appear on the bottom right of the screen. Therefore, selecting the command to set the main data file will open a list of the existing file formats, and clicking the required file name copies the completed command line into the sequence.

To call another sequence, it is necessary to specify it by number, or menu format and number if it is not within the current menu. Names cannot be used, unfortunately. However, the actual name of the sequence is

entered, and if the 'sub-routine' sequence is later edited and re-named, this change will be reflected in the name shown in the calling sequence. In the aforementioned menu, sequence 23 was referred to by number, and the description added automatically by Quartz.

This may all sound quite convoluted, but it is possible to establish a complex sequence of commands quite quickly once you become familiar with where the command you want is in the list. When a menu has been set up, printing the entire set of sequences provides not just a fully commented program listing, but a note of how much space has been used and how many errors have been found.

A 'find' facility will locate where a particular string is in your own sequence of commands or menus, but, unfortunately, it cannot be used on the command list to help you find the particular command you want which somehow isn't in the place you expect it to be. For example, the commands to open and close a window are in the group called 'Select ...' — there is no group called 'Windows' which would have seemed obvious. And the report-printing commands are scattered between the 'Print ...' and 'Select ...' sections.

As there is no way that a command can be typed in — it must be clicked on — there is no way you can make a syntax error (as opposed to a

logical error caused by placing the commands in an incorrect or nonsensical order). But, conversely, there is no way to enter the command line you want directly. The reason is that the command lines don't exist as text, but as pointers to the routines in Quartz. The other consequence is that sequences cannot be created in a text editor and imported as ASCII files. You may work out the structure of an application on your word processor, but you will have to click your way through the lists to enter it up.

Entry layouts consist of one or more windows containing fields, buttons and lists. There are four window types available, from the simple window used for warning messages to the ornate with a title bar containing a combination of fixed information such as a heading, and possibly variable information such as the date, or the user's name or some other locally calculated information. At any one time, a main data file must be specified, and it is only records in this file that can be edited. Data from connected files can only be displayed. However, it is a simple matter to change the main data file upon some user action such as clicking a button.

To place a field on a layout, you double-click where you want its first character. This opens up another window where there are choices for field type, name, calculations and range checks. Fields on one layout can be from any number of different file formats, and fields from connected files can be specified as auto-find. When data is entered into such a field, Quartz will fetch the matching record — assuming the field is an indexed one. Thereafter, any data from that record can be displayed automatically.

The size of the data displayed can be set independently of the actual file format, though this does not affect the file format itself and data is subject to the constraints of the original format. A character field can be up to 2400 characters long, and will automatically word-wrap within a rectangle specified as part of the entry layout. If the rectangle is smaller than the text, the use of the mouse or cursor keys will scroll the text within the rectangle. This is a great improvement over the memo fields of dBaselll.

If a list is chosen as the field type, then you can determine the format of each line in the list, adding text or other variables to the fields that were used to build the list. List boxes can be sized on the layout, and can be as small as just one line. The sequences attached to the entry layout determine the consequences of double-clicking on a list line, but could be used to establish a link with a record in a connected file.

Cut and paste and drag options

allow for the tasteful or ergonomic layout of the entry form, and seven different rectangle types can be used to group together related fields. Any field or box can be coloured, though strangely, text entered onto the layout window itself, such as field descriptions, must be black.

A check box associated with a particular field returns a value of 1 or 0 depending on whether it is checked or not. While there is text associated with the box — for example, 'IN STOCK' — this text is not passed to the current record; only the number is. This seems a pity as a constant translation between number and text has to take place. In practice, you would probably store the data as numbers, but it means that whenever the field is used, the same translation has to be done.

The same is true for radio buttons. In our video store application we used a set of radio buttons for tape format — VHS, Beta or Video 8. Radio buttons are useful when the number of options is fixed for all time, so to speak. If the choices were changing, a list would have been better, with the tape formats stored in a data file of their own and the list created each time the application was run or a format-editing layout used.

The three buttons we used were all linked to the same field. During data entry, Quartz returns a number which specifies the location of the radio button which has been pressed: thus VHS would return a '0', Beta a '1' and Video 8 a '2'. While it might have been better if the associated text had been stored in the record, Blyth argues that this causes difficulty when the record is called from the file for editing. Quartz has to show one of the radio buttons as being selected and would have to evaluate the text on the screen to choose a button. Using numbers, if the field in a record has a value of 1, then Quartz checks the second button in the group.

Push-buttons, as has been mentioned before, can be used to invoke standard record management functions like edit, insert, find, next, and so on, or they can be customised to call any of the sequences contained in the menu formats. The text on the buttons and their size can be changed, though the buttons can only be stretched horizontally and not vertically. Buttons can be designed to disappear during data entry or when there is no current record. Therefore, the 'Edit' button could be hidden while there is no current record, and the buttons to move through the records need not be seen while the user is editing a record. The text which is displayed on a push-button can be variable and can be changed as the user progresses through an application.

Quartz provides a range of system variables, but no user-defined ones except as fields in a file format. There are 60 numeric variables, five string variables, and others representing the system date and time, the state of a logical 'flag', the current workstation number on a multi-user system, attributes of the current list, and the status of various aspects of the data entry process currently taking place.

There is no way that names can be assigned to the variables, which is a pity. A formula #6=(#3-#2)\*#4 makes a lot less sense than RENTAL=(DATEIN-DATEOUT)\* DAY-RATE, and variable names could be assigned dynamically through sequence commands.

All of these variables can be displayed onscreen and manipulated under sequence control. To include them in a calculation or layout, they are selected from the file format list which is always invoked by pressing F10. Again, in keeping with the click approach, calculations can be built up by clicking on the variables and field names in the lists popped up by Quartz. If, on checking, an invalid variable or field name has been entered by hand, it is highlighted and the options presented for clicking into place.

While building a Quartz application, shortcut keys can be used to activate certain functions. Thus Control-M will bring up an editing window for the current menu; Control-W will toggle between editing the current layout and using it; and Control-R will allow you to edit the current report, with the same key being used to start it printing.

Such shortcuts can also be assigned to menu lines, so we assigned Control-N to the 'Add a new member' option, and Control-V to the 'Add a new video' line. For frequently used choices, such shortcuts would speed up a user's operation considerably.

Reports are designed by painting a screen. Each report consists at a minimum of a detail section which is repeated for as many records as satisfy the search criteria, if any, in force at the time. Additionally, headers and footers, sub-totals and sub-total headings are available.

Any item on a report, be it a field or fixed text, can be assigned a font, font size and style such as bold or underlined. Quartz printer handling is determined by Windows and, annoyingly, we had to run Windows' Control program to change printers.

Quartz was run with an Epson LQ800 24-pin dot matrix printer and a Kyocera 1010 laser printer. Using the Epson, Quartz insisted on printing in graphics mode, which would be very time-consuming except for the most elaborate but short report. Long reports containing much data

## Quartz vs dBaselll (the 'biased' views of a dBaselll user)

It took me approximately three months of sporadic working, from knowing nothing to developing the basic structure of a working application using dBaselll. The video shop system we developed under Quartz, although somewhat less complex, took around a week to get into a similar semi-operational state. At first sight this twelve-fold increase in speed seems nothing more than amazing, but then I started to reflect on the process of database creation under Quartz.

Quartz is incredibly easy to use because everything is interactive: creating a procedure under Quartz consists of literally pointing at the statement you want and then pointing at the arguments you want to use with it. This is great fun and a very quick way to create procedures or 'sequences', as Blyth calls them. It's also a very dangerous way of performing any kind of programming — it tempts you into making hasty alterations without considering their repercussions. It is very difficult to sit down and write all the sequences on paper in true top-down fashion.

The majority of programmers spend their time maintaining the source code of existing programs, and my experience suggests that the same is true for database designers. A large Quartz program could be many times more difficult to maintain than its equivalent in dBaselll; not only because of the problems generated by its interactive nature, but also because of other problems. When the sequences are printed, they are printed purely sequentially and so cannot reflect the structure of the overall system; it isn't possible to give meaningful names to variables; and there is no way to build up a library of general-purpose routines (although I am told that an additional Quartz toolkit will make this possible).

Despite these reservations, there is no doubt that Quartz is an immensely powerful package capable of creating applications that are many times more friendly than anything created with dBaselll. All the power of Windows is fully utilised, for example: creation of entry forms, producing reports and utilis-

ing pull-down menus are all exceedingly easy. There were times during the course of this review when I could have cried, as a feature that took me weeks to create under dBaselll took less than five minutes using Quartz.

The most difficult concept for a dBaselll programmer to get used to with Quartz is that of sequences, and the fact that they are hidden away among Windows' pull-down menus. I still find it peculiar to have to examine the depths of a menu in order to find a system's source code. Once you accept that sequences are roughly equivalent to subroutines in dBaselll, things become somewhat easier. But even then the process of converting a dBaselll program would not be a simple line-by-line translation, because so many of the features of Quartz are tied up in interactive set-up screens. Building a Quartz application involves creating all the components of the system (input forms, menus, reports, and so on) and glueing them together with sequences. dBaselll applications are created from the ground up, as in the source code (discounting The Assistant, Ashton-Tate's rather feeble attempt at a friendly application development environment).

I was expecting one of the trade-offs of the Quartz environment to have been speed. Surely, as Quartz has Windows to support, it would be abysmally slow in comparison with dBaselll. When developing applications this is definitely true — running Quartz on anything less than an AT is painful, but when running an application the difference is less noticeable.

My initial (non-scientific) experiments suggest that dBaselll is the quicker of the two programs but not by much. Of course, dBaselll developers have one major advantage in the search for speed — for extra cost they can purchase a dBaselll compiler.

Will I be using Quartz for my own applications? Not right away, no, but I suspect that when the pressure is on and I need a prototype up and running within a week, that I might succumb. Eventually the superior quality of an application generated under Quartz will decide for me, providing of course that the hefty £695 price tag is within my budget.

Nick Walker

need to use a printer's fastest draft mode, but the only way to use this is to change the default Windows printer to a text-only device, in which case we lost the box rules.

When a snazzy, stylish report was required, Quartz turned out some good work with the different fonts and sizes reproducing well. The penalty is speed, but that is a problem for printer manufacturers, not database designers.

On the Kyocera speed was less of a problem, though even there it would have been useful to be able to turn off the fancy fonts and run off a quick draft without relying on Windows' ability to run two programs at once and invoke the Control program.

Additional features available include an import and export facility using industry-standard formats such as DBF, SYLK and WKS.

### Documentation

We worked with a pre-production version of Quartz and the documentation was not finished. However, we did have a fairly complete reference guide and this included a brief description of the function of every command and option, often with brief command listings.

The retail version will include an introductory tutorial manual and an advanced programmer's manual.

This will include sections on database development and design. A quick reference guide will be in loose-leaf format so that updates can be easily inserted.

Quartz will also be supplied with a full sample application of a project management system. This will manage files of people and tasks.

### Price

Omnis Quartz will retail at £695 plus VAT. Blyth has decided not to include Microsoft Windows with the package on the basis that an increasing number of manufacturers are bundling Windows with *their* machines. This decision is questionable, and if you don't have Microsoft Windows it will set you back an extra £75 (plus VAT).

Blyth will be marketing run-time modules for Quartz at around £120 each, and a full multi-user version will be available later this year, although existing applications will need minimal or no modification to run multi-user.

### Conclusion

This review has only provided a taste of what Quartz can do. There is no doubt that it is an extremely powerful programmable database, both in its data-handling capabilities and in the tools it gives the programmer to design applications.

The point and click approach of Quartz to programming, and the use of menu lines rather than separate program files to store sequences, will seem strange to most existing programmers. But when the habit has been acquired, it is possible to set up the bones of a slick-looking application very quickly.

Quartz doesn't lend itself easily to a top-down approach to database design either. Ideally you would start with the visible pull-down menus. But, having designed the file formats, lists and entry layouts, you have to go back to the menus to do the nitty-gritty work of programming. Fortunately it is easy to hot-key between the layouts and the menus, but the process does seem rather circuitous.

Finally, you have to question whether a graphics environment is ideally suited to all data applications. Certainly the screens can be designed well, and push-buttons and scroll bars can prevent users from making mistakes. But in a heavy-duty data entry system, an operator doesn't want to have to keep taking his or her hand off the keyboard to use the mouse, and greater opportunity to design in hot keys would be essential in this situation. Nonetheless, these are small criticisms compared to the power and ease of use of the finished applications.

Blyth Software is on (0728) 3011.

END



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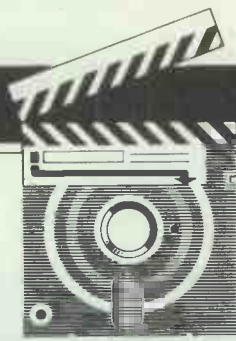
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## SCREENTEST

# DESQview

*Now that multi-tasking is finally becoming a reality, DESQview's innovative form of 'partitioning' will appeal to anyone who wants it now — rather than later, in the shape of OS/2.*

*Owen Linderholm assesses the product's capabilities.*

Quite possibly you are sitting reading this article in front of a PC waiting for a long operation to be performed, like recalculating the accounts spreadsheet or compiling your newest program. Naturally, since you can't use the PC while this is going on, you pick up *PCW* to keep up with the industry and you start to read and dream about OS/2. If that was available, then you could switch to a new task and carry on working on something else.

Here's some exciting news; you could be working *now* even with a humble 8088-based PC. The program that allows this is DESQview 2.0 from Quarterdeck, an American software house.

### *The view from the round window*

DESQview is essentially a resource manager for your PC. It starts from the assumption that you want to use a number of programs on the computer *simultaneously*. Normally this would be completely impossible since both programs would need to use the same bit of memory at once or write to disk at the same time. If you imagine trying to watch two programmes on TV simultaneously, then you will get some idea of the difficulty. The two TV programmes will both be trying to send conflicting information to the screen and speaker at the same time and the result will be a real mess.

Trying to get two computer programs to run on a PC at the same time is even more complicated since there are far more things that the two programs will need access to.

DESQview must manage all of the resources like the screen so that such conflicts do not arise. It does this by

partitioning each program in its own area of memory which it is not allowed to break out of. If programs need to write to the same part of the screen, then DESQview only allows one of them to display at any time and the user has to switch between them. With many programs, this is the only way they can be run under DESQview. In this case, DESQview is simply switching the programs about and the user sees this as something like switching channels on TV; just switch over and you are immediately back in the middle of another program.

However, DESQview *can be* cleverer than this. Let's get back to the TV analogy for a fuller picture. There *is* one way that two TV programmes can be shown at the same time on a TV set. This is to put one (or more) pictures in a box within the full screen. Although this obscures part of the main screen, if carefully placed, the boxes can let you see two things at once without losing any important parts of the picture. Some of the more recent TV pop programmes do this quite a lot and I have seen up to five inset boxes on the screen at once.

DESQview does something similar with computer programs. As long as a program is known to be 'well-behaved' and one that won't try to break the operating system's rules, then DESQview can display it in a window on the screen. This window can be any size, from one character to the whole screen. Information inside the window can be scrolled around and the window can be resized and moved about.

DESQview can also actually have more than one program running and operating at the same time as long

as it can fit them both into memory. It can have lots of programs ready to run, but if they don't fit in ordinary memory then they need to be swapped in and out from disk or extended memory.

To do all this, DESQview needs to be able to manage the processor and memory very carefully. It is a fairly simple matter to shove programs into separate areas of memory and even to prevent them writing data to other areas of memory where other programs have been stored. This is done by having DESQview take over most of the operating system. It intercepts all the calls that a program makes to the processor and data bus and decides whether to let them through, stop them or to modify them to go where DESQview wants them to.

Obviously memory management is an important function of DESQview, but even more important is processor control and multi-tasking. DESQview is essentially a sort of parasitic control program that squats on top of the operating system and controls it so that more than one program can run at once. DESQview also dynamically determines how much of the processor time each program running under it gets. It monitors the passage of time and every now and again — every few hundredths of a second — it switches control from the current program to another on its list. This is known as time-slicing and allows a single processor to run several programs by giving each one a short turn to run.

When DESQview switches between tasks, it needs to save the status of the processor, registers, stacks and other areas of system memory. If there is insufficient memory when it



starts a new task, it also needs to switch one of the old tasks out of main memory and save it somewhere in temporary storage. This can either be expanded memory or a cache on disk that DESQview manages itself. This process is almost instantaneous when swapping to or from expanded memory, and very quick when swapping out to a hard disk.

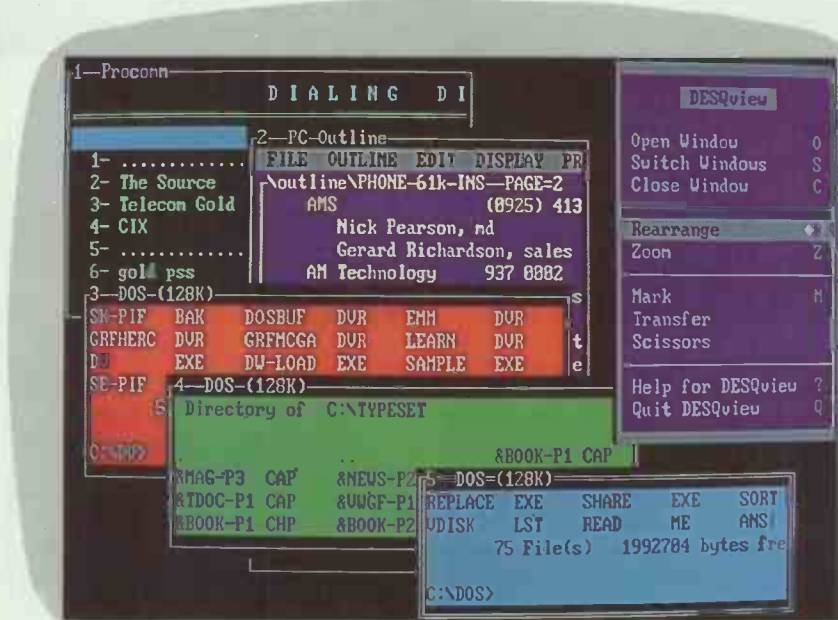
Even allowing for the huge overheads involved in switching whole programs back and forth, managing and saving memory, registers, program stacks, and so on, the processor can manage quite well at performing several tasks. As a simple test, I set my HP Vectra AT compatible to work downloading a large file from The Source using ProComm, then set it printing an equally large file from WordStar and finally opened up another copy of WordStar and bashed away at the keys as fast as I could — no attempt to write properly, just enter letters as fast as possible. Even at about 200wpm typing speed, I could detect no slowdown in the word processor and both the file download and printout performed beautifully.

Since DESQview controls the programs and windows running under it, it is also possible to use it to cut and paste information to and from any window on the screen. As well as simple cut and paste, these operations can be buffered so that different sections from within one application or several applications can be run together. DESQview also provides a wide range of options for pasting information back in so that it will remain aligned in the same way as it was in the original window from which it was taken.

## Features

DESQview 2.0 is considerably changed from the previous version, DESQview 1.3. This allowed multi-tasking and windowing of up to ten programs at a time as long as they were well-behaved and were text mode only. DESQview 2.0 allows multi-tasking and windowing of up to 250 programs at once and these may include graphics programs as well. Support for the 80386 processor has been added and, in addition, DESQview 2.0 works properly with the new IBM PS/2 range. Many programs are now claiming PS/2 compatibility because they are shipped in 3½in disk versions as well as 5¼in. However, DESQview 2.0 and Turbo Basic are the only two programs I know of that support the VGA graphics modes of the PS/2.

In addition, the range of 'badly-behaved' programs that DESQview can work with (such as GEM or Windows) has been enlarged. It does this by providing a special loader for



DESQview 2.0 in action. There are several ordinary DOS windows open in the background, each with 128k available to it. Other open applications are available after a couple of keystrokes and include WordStar and ProComm. The main DESQview menu is at the top

them that lets it control them rather than be controlled by them. Unfortunately, the list of applications supported in this way is still too small. Many of my favourites were not on the list, although a large number of standard business programs such as Lotus 1-2-3, were.

Graphics programs can also be run, but unless you are using an 80386 machine with Quarterdesk Extended Memory Manager 386 (QEMM386), then they will need to be run as full-screen applications. The graphics screen can be put in a window, but the application will be frozen. With QEMM386 and an 80386 processor, however, you can have as many CGA graphics mode screens in windows as you like, all still running. Also, using enhanced expanded memory (EEMS) rather than other forms of extended or expanded memory is an advantage. EEMS is a proper virtual memory system and allows programs residing within the expanded memory to be actually running, so you can have several megabytes of programs all running at once.

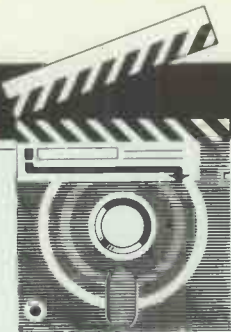
DESQview 2.0 also comes with a built-in DOS 'Services' manager. This lets you get directories and mark, copy, delete and move files around. Besides this, you can also open a DOS window at any time with 128k of memory available. This can be used for simple DOS functions or running short, simple and well-behaved programs.

One other major facility of the program is its ability to learn 'scripts'. These let the user assign any sequence of operations in DESQ-

view or in any set of programs running under DESQview to a single key. For example, you could set DESQview up so that it automatically started your word processor and loaded in (or even typed from scratch) a business letter template, then paused while you entered in a name and, finally, continued by filling in all the greeting part of the letter at the start, leaving you to type in the main paragraphs in the middle to produce a complete business letter with no fuss. Or DESQview could be used to open up your monthly accounts on the spreadsheet, mark the relevant figures for a regular report and paste them into a word processor document ready for you to add some final notes to complete the report.

Many of the ordinary operating parts of DESQview 2.0 have been considerably improved since DESQview 1.3. A particular example is that communications tasks have been optimised. If you are using a communications program under DESQview 2.0 — even as a background task — it runs as smoothly as if it were the only program running on the machine. The only noticeable change is that large chunks of text appear to come in bursts rather than steadily from the communications program.

Another nice touch is that any window on the screen can be scrolled — as if the window were looking through a frame onto a full-sized screen underneath. Also DESQview automatically scrolls the window when anything is printed in it so that the printed information appears in



# SCREENTEST

the visible part of the window.

Finally, DESQview comes set up in such a way that a programmer can easily write their own applications to make full use of DESQview windows, menus, subtasks and message-passing between tasks. Some of these functions are only available to programs specially written for DESQview; hooking your own programs into DESQview in this way can help you to produce extremely powerful and useful multi-tasking programs. For example, DESQview specific applications can perform proper inter-task communication, so that a DESQview communications program could be set to send parts of any received information to a DESQview word processor automatically; or a program could be downloaded from a remote database and automatically installed and run under DESQview.

## In use

DESQview may all sound a bit too good to be true, but it is true except for some details: there are problems with the amount of available memory for extremely large programs, and it may not be possible to run more than one copy of some programs with I/O problems. Also, there are a few programs which when run require the operator's attention continuously and, if paused, might as well be removed from the machine. (Games programs are a good example of this.) Once these limitations are understood, it's easy to tell what will and what won't work well.

Installation of DESQview is critical to its correct operation, so Quarterdeck has made the set-up program simple and easy to use and, more importantly, it can be rapidly re-

installed at any time. To install the program, simply run the set-up program and follow the instructions. You are given the option to perform a simple or advanced set-up. The simple set-up is enough to get you going and get used to the program, after which you will need to run the advanced version.

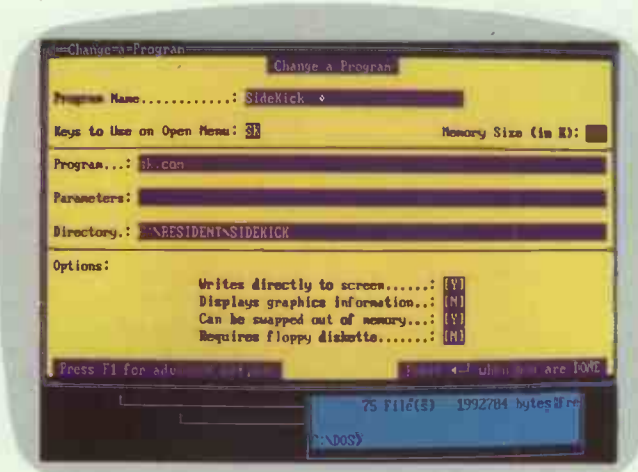
As soon as DESQview has been installed, you will need to install different applications under it; this is a more complicated process. Many applications are listed on the installation menu and, with these, installation is merely a matter of telling DESQview where to look for the applications program. Any programs not on the list must be manually installed and this can be a difficult business. The hardest part is allocating the amount of memory a program will need. Too little and it won't work; too much and you will waste space that could be occupied by another application. For those applications for which I did not know the amount of memory needed, I found it best to start with too little and kept testing and allocating more memory until the program worked properly. (It is very important to experiment properly since if an application does run out of memory under DESQview, it will try to grab more and it is sometimes not possible for

DESQview to prevent this. The result is that the whole machine freezes or crashes spectacularly.)

DESQview can be installed for use with either a mouse or the keyboard. The keyboard tends to be quicker, but the mouse feels better in use since it can be used, Mac-like, to size, scroll and move windows on the screen. It is probably a good idea to try both and see which you find more useful. It is important to realise that if DESQview is installed for the mouse, it may well not work properly in your application program. If you set DESQview to use the keyboard, however, then the mouse will work properly in the application.

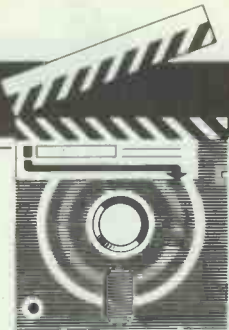
Using DESQview is a little odd. It is exactly the opposite of using a memory-resident pop-up program. Memory-resident programs pop up over any current application and disappear when no longer needed. DESQview pops the applications up and is always there lurking in the background, monitoring. All your ordinary applications become pop-up and memory-resident; available at the touch of a key and shoved away in windows. Only the one you are currently working on seems to be active, even though other tasks may be running quietly in another window. It is a very strange environment to work in and I am still accustoming myself to it.

In DESQview it is also very easy to zoom an application up to full window size and forget about other open applications. If you then quit DESQview, you will have lost work in other windows. Fortunately, DESQview can be set up so that it won't close unless all the windows have been shut down separately.



Setting up a program to run under DESQview is a critical operation. Although there are only a few choices to make, the answers must be right for the program to work properly with DESQview

DESQview has a few applications available immediately before any new ones are installed. Shown here are the memory display (being resized), a DOS window and the rearranged sub-menu of DESQview



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One thing that is hard to do is to 'get lost'. The whole program is controlled by menus accessed either entirely with the mouse or using the 'CTRL', 'ALT', 'SHIFT' and 'cursor' keys. Short-cuts using initial letters from the pop-up menus are available but you don't have to use them. I found this side of the program extremely easy to use, and a sheer delight.

DESQview makes use of EGA and even VGA modes properly and I was able to get displays of up to 43 lines using EGA. This meant that I could have one 80x25 application and one 80x14 application at once, which could be very useful. However, graphics didn't seem to work so well. Although the program worked with graphics, it would only do them full-screen. If the application is frozen, then the graphics screen could be put in a window, but not while it was working. The manual says that CGA screens can be freely put in windows on 386 machines while continuing to work, but I was unable to try this.

The application I found DESQview most useful for was transferring information and files via various online services in the background while continuing to work on editing a document in the word processor or outline processor in the foreground. This operation worked perfectly the first time I tried it; it was also useful for continuing to work while sorting my phone list in the database. The only thing to watch out for is clearly indicated in the manual: communications programs must be run only when held in the computer's normal memory.

The other main use I found for DESQview, and the one that would make me seriously consider buying it, was keeping several applications open at once and ready to use. This may sound a little unnecessary, but I

found it very convenient to have my communications program, word processor, phone list, disk manager and a programming language all available at the touch of a key.

## Problems

There were, however, a few problems, but most of them were of my own making when I tried to do ridiculous things in order to push DESQview to its limit. The worst problem was with printer conflict. I tried to get three different versions of WordStar to print different files at the same time on the one printer. I set DESQview up to manage printer conflicts and let the three programs start. DESQview seemed to manage okay, but when I came to look at the output it had only partly succeeded. All three printouts were printed in large contiguous chunks, but DESQview had decided to switch between the applications halfway down a page. This meant that I got five and a half pages of one document, then five and a half of another, and so on. Unfortunately, half-pages aren't very useful. Printing one document while doing other non-printer tasks worked fine, so I recommend not doing anything silly like trying to do lots of printing with DESQview all at once.

Subsequently I discovered that installing DESQview to manage printer conflict caused problems even when printing a single WordStar file. This is to do with WordStar's inability to properly manage sending all the in-

formation to the printer. WordStar pauses once the printer buffer has been filled and has to manually be told to restart. When WordStar pauses, DESQview does something to manage task-switching that messes up the printer.

By resolving printer conflicts, DESQview ensures that only one application can print on any one page, but because of the PC's hardware idiosyncrasies it is unable to tell when an application has reached the bottom of a page. This means that if an application such as WordStar pauses halfway down a page, DESQview detects the pause and switches to a new application — which starts on a new page. Of course, everything will work fine if the application that is printing only pauses at the end of pages.

Another problem I deliberately created with WordStar was to have four different versions of WordStar editing the same file. Not surprisingly, WordStar got very confused (but not DESQview). It occurred to me that programs which can do file-locking for network access would probably not mind this, but I hadn't set my WordStar to do this and every single one of them refused to save the file. On quitting I discovered I had lost it — fortunately, I used a test file rather than something I needed.

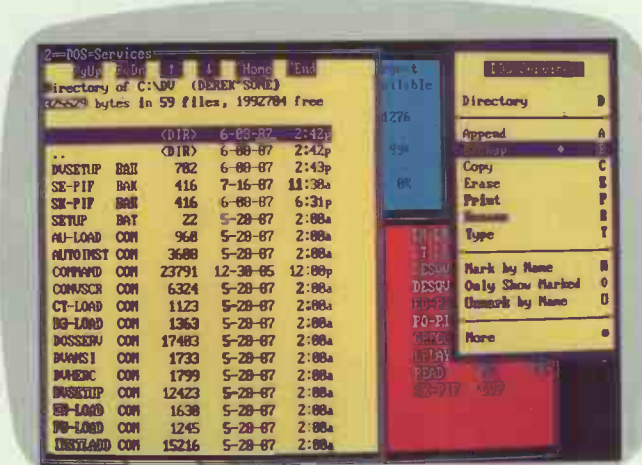
One area in which I expected to encounter problems was in using large numbers of applications; I didn't have any. I got up to forty programs open at once before I got bored, but none of them had any problem running. However, swapping applications in and out of memory took a while. Expanded memory in the form of a Quadram Quadboard-AT helped, but forty applications easily fills up expanded memory too.

Although DESQview works fine on floppy-based systems, problems can arise if you use too many applications since swapping memory out to disk takes much longer. However, using only two applications at the same time worked well.

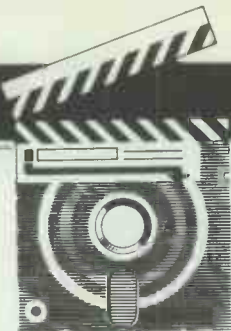
## Conclusion

If all you want is to run several of your current MS-DOS applications at once, then DESQview is a convenient and cheap solution. Remember, though, that DESQview works better on hard-disk systems and even better with extended or expanded memory. Also, watch out for those problems with allocating memory and printer clashes!

DESQview 2.0 costs £125 and is available from Xionics, 4 Dollis Park, Finchley, London N4  
Tel: (01) 346 0247. **END**



*This screenshot shows the disk manager program, DOS Services, that comes with DESQview. It is a fully-fledged disk manager similar in function to products like X-Tree and Directree. It can call up DESQview menus or run its own multi-tasking sub-programs*



SCREENTEST

# XPress

*Described as a truly professional, if pricey, page make-up system for the Mac, XPress from US company Quark Incorporated offers unprecedented typographic control over page layout, and has set a new standard for desktop publishing software. Graham Jones gives his verdict.*

When the vogue for desktop publishing really began to take off last year, one program stood head and shoulders above the rest as the 'Rolls-Royce'. That program was PageMaker, from Aldus, and it was used as a yardstick by developers hoping to gain a slice of the rapidly expanding desktop publishing market.

However, PageMaker has some limitations, especially for professional users who have become increasingly frustrated by them, and by the slowness of Aldus in introducing upgrades. Enter Quark, a US company, with a new desktop publishing package called XPress.

## New standards

Quite simply, XPress is the best desktop publishing package available for the Macintosh. It outshines the old

yardstick of PageMaker — even the new version — and sets new standards of its own.

There are two main advantages to XPress. Firstly, it has a degree of typographical control which is so fine that it will allow you to alter the spacing of type to within 0.00014 of an inch, or 1/100th of a point — that is, one fifth of a dot even on a 1270 dots-per-inch typesetting machine! Secondly, XPress allows you to wrap text around complicated graphics simply, efficiently, and quickly. To date this has only been possible on the Macintosh with extreme difficulty using PageMaker, or by programming in PostScript.

XPress has a number of advantages over PageMaker and another page make-up program, Ready, Set, Go! 3; it combines the best of both of these and provides a truly profes-

sional page make-up package.

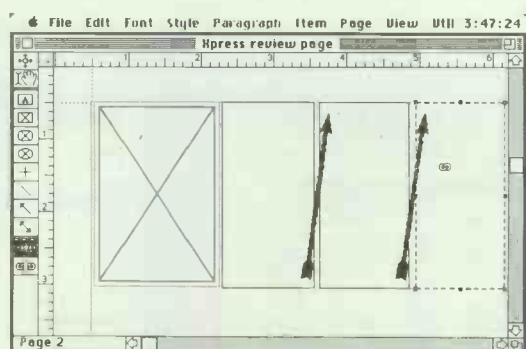
The program comes on three disks. One contains the application itself, a second has the system folder and a few examples of XPress documents on it, while the third disk contains two utilities to allow the program to be copied to floppies or to a hard disk. (To run the program efficiently a hard disk is necessary.) The program is copy-protected, but you are allowed to make up to three copies for personal use. Also included with the program is a utility called 'Frame Editor' which allows users to construct borders to surround pages, text, or illustrations.

## In use

Once the program has been loaded you have the usual option to open up an existing document, or start a new publication. When choosing a



Pages in XPress can be viewed in a variety of sizes. The toolbox always appears on the left of the work area, and is not movable. Rulers can be in a variety of units and can be removed if not required



The three text boxes are linked (shown by the onscreen arrows) by using the chaining tool, highlighted bottom left in the tool palette. Other tools allow picture boxes to be drawn, and lines and arrows to be positioned

new document from the 'File' menu a dialogue box asks you to decide on the size of the page, the number of columns, the margins, and so on. The page can be any size from three inches square to a poster-sized 36 inches by 36 inches.

Once you have decided on your basic page size you can open up the first page. However, you do need to enter the paper size in the 'Page Set Up' dialogue box before printing anything you work on. This is an annoying little problem with some Mac programs. Why the paper size cannot be included in the new document dialogue box is a mystery!

Nevertheless, the Page Set Up dialogue box does contain quite a bit of information, and even allows users to determine the grey level, in lines per inch, of PostScript laser printers such as the Apple LaserWriter. By adjusting this value you can get improved grey tones. The default is 60 lines per inch, which in my view is too low. A value of 80 or greater achieves much better grey resolution on the LaserWriter and avoids the coarse-looking tints of other desktop publishing programs.

Once the page has been set up as you want it, you can set to work. The document always opens at the top left of the first page — no matter where you stopped working. This is not too much of a problem since travelling around the pages is fast and efficient.

### Page design

XPress, unlike PageMaker, asks you to define areas of text or graphics prior to entering any copy onto the page. This is similar to Ready, Set, Go! 3 and, at first sight, has always seemed to me to be an unnecessary additional step which PageMaker cleverly avoids. However, it does provide a much greater degree of design flexibility, allowing you to simply move items around the page to redesign any aspects you don't like.

You can define text boxes, or three types of picture boxes in XPress. Each text box can be altered by using the 'modify' command from the 'Item' menu. This allows precision control over the position of the text box, allowing you to move it around the page if you have not drawn it exactly where required. You can change text box positions to within an accuracy of 1/1000th of a point! The modify dialogue box also allows you to specify the number of columns in a text box, alter the gutter (space) between them, and to request the 'text offset' — the space between the outer edges of the columns and the start of the text. This is very useful if the text has a rule around it, thus ensuring that there is a space between.

You can also make text boxes

## XPress — the best page make-up package for the Mac?

Xpress enables you to perform a number of tricks which are not easily possible with the most popular Macintosh page layout program, PageMaker.

It is very easy to make text run around irregularly shaped objects such as the picture on the right, something which PageMaker has not been able to do without a lot of effort.

The next version of PageMaker should be able to do this, but the US version I have seen does not cope with such sophistication, and by the end of June the British update had still not been made available, despite months of speculation.

Running text around complicated

graphics is not the only advantage of XPress when compared to PageMaker. XPress also possesses a unique feature in its ability to be able to control the grey levels of PostScript printers such as the LaserWriter. This means that it is

possible to achieve much less coarse tints than are available with many other programs. XPress also

includes a printer driver to run a Linotype machine or a Data Products laser printer. It is highly likely that XPress will find widespread use as a front end typesetting solution in many graphics orientated publishing houses.

XPress provides a much greater degree of typographic control which is necessary in such situations.



### Frame editor allows design flexibility

The XPress package also includes a program called 'Frame Editor'. This is a utility which allows you to design and modify borders for text, pages, and pictures, just like the one around this page.

Most of the examples included with the XPress package are pretty horrible, including this one!

But the Frame Editor utility does allow you the flexibility to produce

your own borders from any kind of graphics you care to import.

Such a system is not available with other leading page make-up programs for the Mac, such as Ready, Set, Go! 3 or PageMaker 2.0.

Fancy frames are not widely used in publishing, but there will always be a day when producing something and a frame editor will be required.

Another simple utility provided within the

XPress package is the ability to truly change the horizontal scaling of fonts.

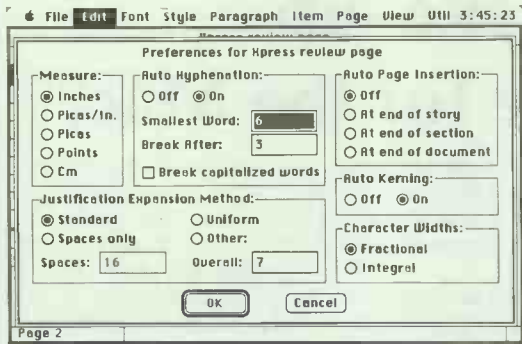
So it is possible to stretch type to achieve some pretty unusual effects, some of which will, nevertheless, have a use, especially in magazine work.

Graham Jones

transparent by using the modify command. This means that you can place other text or illustrations behind these boxes and they will be seen through the text. The default is for opaque text boxes. Should any other material, such as a picture box, be included inside, then the text runs around this. Text boxes can also be chained together so the text will flow automatically from one to another. This is a very useful facility, especial-

ly in magazine work where text may be split between pages which are a long way apart.

The three types of picture boxes available are those which are rectangular, oval, or rectangular with rounded corners. Pictures can be included within these boxes from MacPaint, PICT, or Encapsulated PostScript files, such as those created in Illustrator. Like text boxes, picture boxes can be modified for accurate



*Setting up a page in XPress allows you to decide the system of measurements you use; whether hyphenation will happen, and if so, how; the method of justifying lines of type; whether kerning will occur; how character widths are calculated; and so on*

positioning. You can also change the radius of corners for rectangular boxes with rounded corners, and you can decide how far text outside boxes will be offset when it is to run around them. Like text boxes, picture boxes can be transparent. You can also make picture boxes transparent but make the text run around the picture itself.

All boxes, whether for text or graphics, can have background shades, and you can specify the colour of such shades. This is very useful in professional publishing since XPress will print off each colour item separately, thus allowing you to produce colour separations for litho printing. Incidentally, XPress also provides other useful printing luxuries, such as the ability to produce wrong-reading negative film, thus saving additional costs and time at the printers. The colour option, which also allows you to specify colours for text, will work with colour ImageWriters — though anyone who has bothered to buy XPress will almost certainly never use an ImageWriter. The colour flagging will also be useful when colour laser printers start to appear sometime within the next year.

When you have placed your boxes precisely, flagged them for shades and colour, and so on, you can then place a 'frame' around them if necessary. Basically, an XPress frame is a rule around the box which can be one of a wide variety available, or one you have constructed using the Frame Editor utility. Like everything else, frames can be flagged for colour, and size can be precisely controlled.

## Entering text and graphics

With a page designed with boxes for text and pictures, and shades, frames, colours, and so on, having been decided upon, you can begin

entering text and graphics. Naturally, you can alter all of the specifications set for the items on the page at any stage in the production of the publication, but it is often useful to set them all initially since this is more professional and it does save time in the long run.

Text can be entered directly in XPress, much faster than in PageMaker, though it is still slower than standalone word processors. Text can also be imported from the standard Macintosh word processors, MacWrite and Microsoft Word, as well as text only or ASCII files. Before entering text it is a good idea to alter the default settings under the 'Preferences' option of the 'Edit' menu. The default is for no hyphenation, and for no kerning. Considering that XPress allows such a degree of typographic control, to leave these two options switched off seems daft!

Hyphenation and kerning can also be manually controlled, even overriding the automatic feature if required. Kerning can be controlled to 1/100th of an em, thus providing control suitable even for high-resolution typesetting machines.

Leading (the spacing between lines of type) can be controlled very finely, and the parameters of each paragraph, such as indenting the first line, and so on, can also be fine tuned. Text can be in any size from the smallest you can read up to 500 points. Cleverly, XPress also allows you to precisely alter the horizontal scale of text. You can compress the text to 25 per cent of its original width, or expand it fourfold.

Pictures in XPress can also be precisely altered in either width or height to within one per cent of their original size. This is a much more accurate method of changing the size of illustrations than allowed for by the manual resizing in PageMaker.

Using XPress is a delight. Features like the horizontal text scale adjust-

ments, the accuracy of positioning items, and the ability to run text around complicated graphics, mean that it places design much more in the hands of the operator who is less at the mercy of the program.

## User image

The program is fairly easy to learn, but its range of features means that it demands a few weeks of fairly regular use before you become truly proficient, rather than the few days of less ambitious programs.

Without a doubt, XPress will have given the PageMaker developers at Aldus a few sleepless nights. It is considerably more sophisticated than PageMaker 1.2, and even gives version 2.0 a run for its money. XPress allows precision control over typography which would please even the fussiest typesetter. Consequently, XPress is likely to be the program of choice for professional publishers, and for many people entering desktop publishing for the first time.

## Documentation

The manual is well put together, though it does not cover everything the program is capable of doing, such as the ability to produce well-fitting 'drop caps' (large capital letters) at the beginning of articles.

## Price

At £695 XPress is a very pricey program; but despite the high price, it is exceptional value. Two years ago such precision control would only have been available in some front-end typesetting solutions, at a cost of around £4000.

## Conclusion

For anyone involved in desktop publishing on the Macintosh, XPress is well worth investigating, especially if you need to produce material with a great deal of typographical control, or if you want to have the output typeset. It is particularly valuable in magazine design, as well as, say, for advertisement production.

XPress has set new, very high, standards for desktop publishing software, and this time next year commentators will doubtless be saying that anyone without XPress is not really a desktop publisher.

XPress from Quark Incorporated is available in the UK from Heyden and Sons Ltd, Spectrum House, Hillview Gardens, London NW4 2JQ. Tel: (01) 203 5171.

Graham Jones is a freelance journalist and author of *The Desktop Publishing Companion* (Sigma Press, £14.95). He offers a consultancy service and uses his Mac and LaserWriter Plus to produce a variety of desktop publications for commercial clients.

END

# 'DOUBLE YOUR MEMORY AND TAKE IT AWAY'

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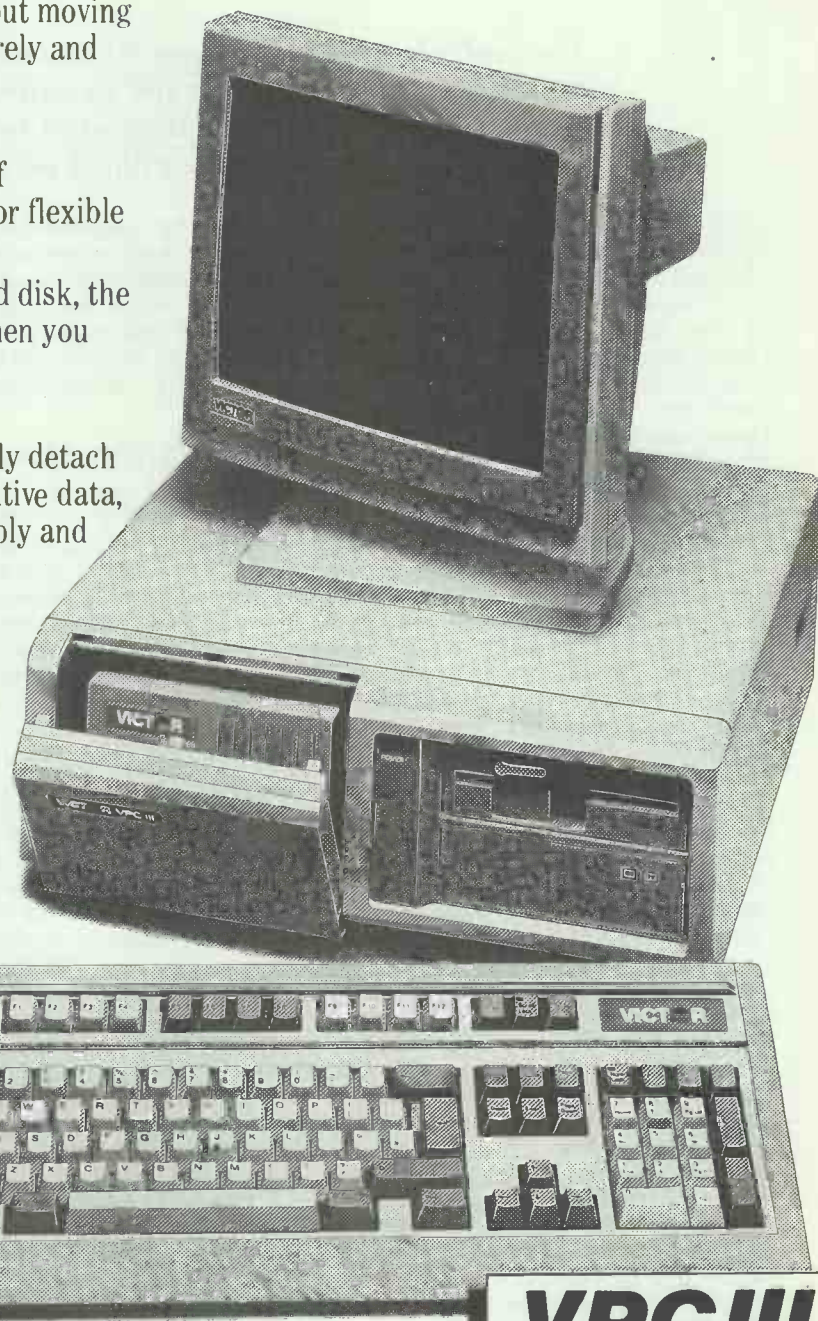
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## VPCIII

# Silicon surgery

*The inefficiencies and delays of the NHS make it a prime target for computerisation. But despite the excellent 'Micros for GPs' scheme and the proven record of medical diagnosis systems, progress has been slow.*

*Dr Andrew Herd examines what has been achieved.*

The involvement of general practitioners in computers dates from the 'Micros for GPs' scheme announced on 7 June 1982. At that time, beyond a few Apple IIs, the most sophisticated computer in general use was the Sinclair Spectrum. One hundred and fifty practices around the UK were equipped with computers, with the Department of Trade (as it then was) meeting half the capital cost and providing some support costs. The machines were relatively slow 8-bit systems, the software poorly conceived and support patchy. Many practices underestimated the data conversion task, some finding the strain on clerical procedures intolerable. Hardware proved unreliable with stories of several hard disk failures being not unknown. One of the software companies withdrew almost all support at the end of the scheme. Nonetheless, many practices forged ahead, soon outstripping the boundaries of their software — to find that what they possessed was an end-user system and slow developments.

A period of retrenchment has followed. Less than five per cent of the 27,000 GPs have access to a practice computer at present. Money is hardly a restriction, as a four-man practice might have a gross income of nearly £200,000. A number of new companies have now moved in on the software scene, and more sophisticated 16-bit hardware is in use. The reason for the lack of enthusiasm within the profession is more likely to be due to the restricted ambitions of the software developers, whose systems are often merely faster interpretations of existing manual systems. At present the benefits of computerised recall are almost exactly cancelled out by the extra time taken to load the data on in the first place, and you have to keep written notes anyway, so why bother?

The other spectre on the horizon is the major difficulty of data conversion from one software format to another, which a few practices have faced when their suppliers folded — a number of GPs are sitting back and

waiting for dependable firms to establish themselves before getting their feet wet. It can take months or years to enter even the meanest amount of information about the patients on the practice list and GPs are not usually overwhelmed by DP staff!

## Information storage

The smallest unit of information in general practice is the patient's notes. These belong to the Secretary of State for health and constitute a legal document. At present, the great weakness of conventional data storage systems is their reliance on easily altered magnetic media. Written documents are much less liable to unintentional or intentional alteration and this has remained one of their supporters' greatest arguments.

Information is recorded onto your medical record each time you attend, but not necessarily in a form which enables easy deductions about patterns of attendance, or which helps diagnosis. There is no clear view of what is going on. Written notes do not aid data structure and interpretation, but are relatively inexpensive, relatively hard to destroy, and even harder to alter. Magnetic media are easy to alter and it's important that one remembers this, as the National Security Council has recently found to its cost.

You have doubtless observed your own doctor attempting to work out what he wrote in your notes last time you visited the surgery, and this is one of the most cogent arguments for some kind of change. The other is that there is no insurance against loss of your folder, something that occurs more often than one would imagine. Present day magnetic media are limited in storage capacity, and have the disadvantage of allowing undetectable alterations to be made to the information stored upon them. This is undesirable in the case of a medical record, which the doctor may one day have to use to defend his actions.

One way ahead may well be the

'WORM' drive. When information has been committed to the disk, it is burnt in, and this would prove a great strength of the system. Coupled with the ability to store up to a gigabyte per side, the days of your Lloyd George folder may well be numbered, as this kind of capacity would allow text storage as well. The technology already exists, but as usual, no-one wants to be the first to use it.

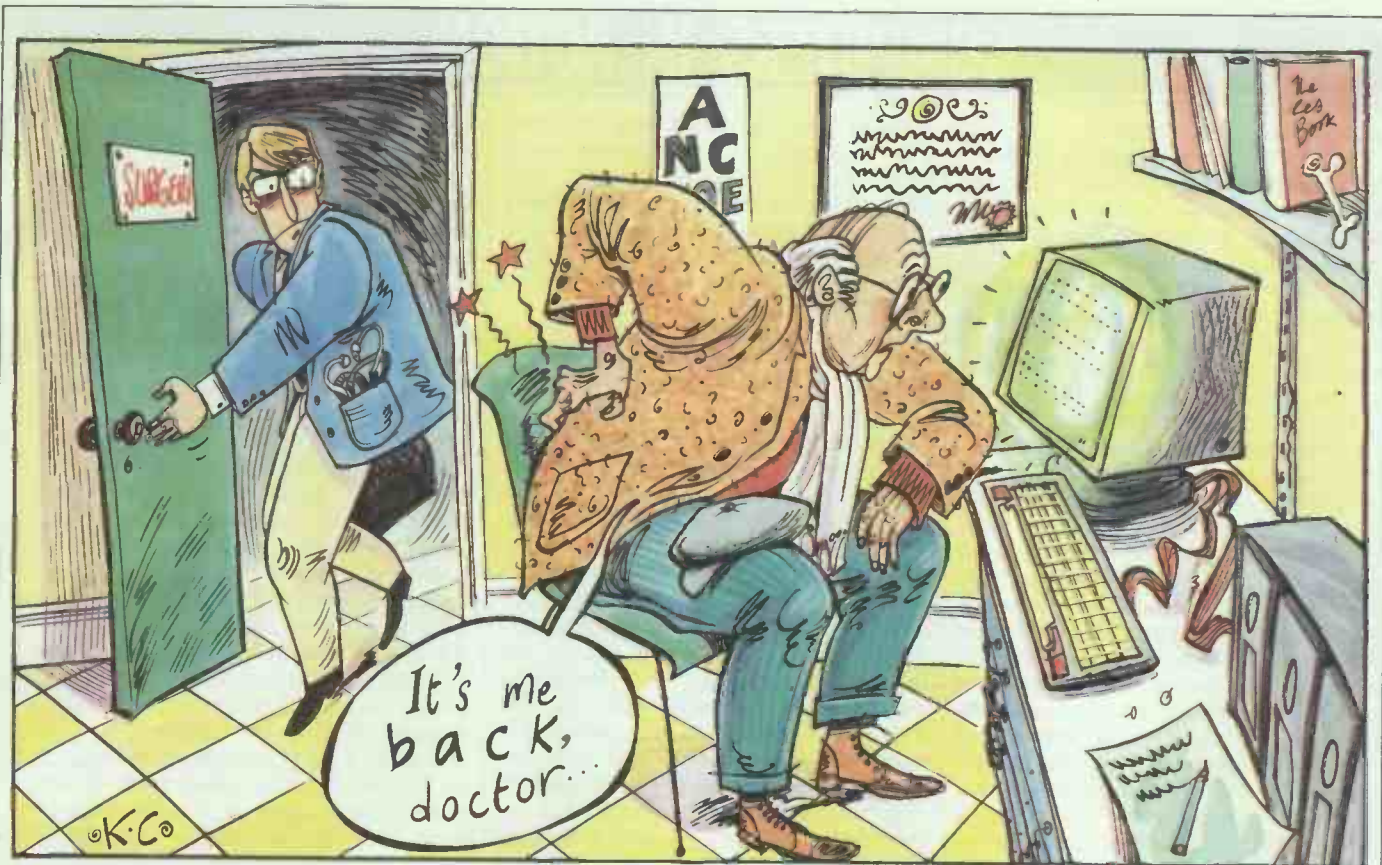
## Play your cards right!

Have you ever been to the hospital outpatients and been unable to remember when you had your frontal lobotomy? A system currently under trial may have the answer for this. 'Smartcards' the size of credit cards have been around for some time now, begging for applications (see 'West Coast Connection', June 1987). The Honeywell Bull smartcard presently stores 16k — enough to store vital details, previous medical history, current active diagnoses, drug history, allergies, next of kin and significant pets. By 1988 it should hold 64k of data — enough to store most of a medical record used in general practice.

Smartcards are already being used in national and regional schemes in France, as a method of short circuiting the incredible amount of paperwork threatening to engulf their health system. Savings have been estimated at £600m so far! Depending on the parent scheme, cards are issued by GPs, pharmacists or hospitals and a total of 250,000 cards have gone into circulation over the last 4-5 years. One advantage of the smartcard is that the consent of the patient who possesses the card is required before the card can be used to upload information, which limits confidentiality problems.

As yet their medical use in the UK has been confined to one experimental scheme in Cardiff. The aim is not to replace surgery-held computer records, but to facilitate information transfer while leaving control of confidential information in the





hands of the GP. At present, the system, which has been live since August 1986, relies on the GP separating patient information into two files on his surgery hard disk. One of the files, containing non-confidential information, can be downloaded onto the patient's smartcard with the other remaining on the surgery disk. Access to the hard disk record is limited by matching of a keyboard-entered password with that held on a 'password' smartcard held by the GP and entered in the surgery card reader. (I should point out that this represents at least one more security level than your existing computerised surgery record is likely to have at present; most systems relying entirely on single-level password protection alone.) Card readers are held at surgeries within the area and also at pharmacies participating in the scheme. A portable reader has been developed, which interfaces with a battery-operated printer, the entire machine fitting in an *attaché* case and hopefully being robust enough for the doctor to take on his calls. Uploading of 16k from card to surgery terminal takes about three seconds, and in addition to diagnostic use, the information held on the card can be used for the automatic production of repeat prescriptions in the surgery and of labels in the pharmacy.

If all GPs and hospital doctors had access to card readers, then the patients could effectively carry their medical history around with them. Not only would this prevent mistakes occurring but details could be up-

dated as required, bypassing the often crucial paperwork delays during which treatment progresses on a 'best-guess' basis as to what the little white tablets actually were. This venture could be regarded as a very sophisticated form of the 'medic alert' bracelets worn by epileptics, for example.

Honeywell says that the technology is already available to store features such as retina patterns, voice and fingerprints. If this is so, then it might also be possible to store digitised images such as X-rays, for instance; more RAM, and it might even be possible to squeeze on the entire text of the notes. The Honeywell smartcard at least, will use standard software, and card readers will cost about £250 with cards at present costing between £3-7 depending on the quantity ordered. Existing Honeywell cards can only be written to once, but an EEPROM (electrically-erasable programmable read-only memory) card is promised by 1988, and this will allow rewriting of data.

The question of alteration of card data arises at this point. In theory any patient with a little bit of know-how, and minimal hardware, could read and write to his own card. Lost cards would be vulnerable to the same manipulation. The latter case could be covered by protected areas on the card, only accessible by code entry; existing cards have this feature already. In the same way that your cashcard is useless without the PIN, the smartcard would lock the data without the code.

Future developments, discussed

earlier, will allow fingerprint, retinal pattern or voice-recognition identification keys. The Honeywell chips, at least, also contain encryption keys to the Telepass algorithm, allowing for protection and decoding of transmitted data. Obviously, a patient who was minded to change the data on his card himself could do so, but the information could not be protected from him in any case, since it is available under the Data Protection Act. Such manipulation would not go unnoticed for long, however, because of mismatches with the data held on the GPs files.

### Enter the experts!

In recent years, the limits of medical knowledge have accelerated away from the origin at meteoric speed. In consequence, areas of specialisation have shrunk, and the art of diagnosis has grown more complex — there are simply too many *known* diseases. Once a diagnosis has been made, treatment has also become more complex. The NHS has probably only survived this far as a result of the 'general practitioner' concept, a screening system which catches 95 per cent of all illness and keeps it out of the hospitals' itchy (and expensive) fingers.

However, the very nature of the GP means that by definition he is not an expert, and is bound to miss some subtle clues that the more narrowly-sighted specialist will pick up. However, as the specialists race over the horizon after new knowledge, even identifying the correct consultant to refer to can be a problem.

# COMPUTERS IN ACTION

## Enter the expert system?

There are curiously few AI applications targetted at general practice, but one stands out for its breathtaking vision — something few medical software houses can be accused of suffering from. The 'Oxford System of Medicine' (OSM) is possibly one of the most ambitious AI projects ever attempted. It is being financed by the Oxford University Press, and is being developed by John Fox at the Imperial Cancer Research Fund. The prototype alone has a domain knowledge of 3000 facts, and the definitive system will rely on at least one million. The OSM will aim to cover all aspects of medicine, from diagnosis to treatment. It will be an evolving product, updated as medical know-how advances. A great deal of attention has been paid to ease of use; for example, the prototype's diagnostic process can be interrupted to review patient history or an explanation of current conclusions. OSM will use a 'WIMP' interface, a radical departure from the menu-based software most GPs are used to. There are mouth-watering mutterings about graphics capabilities and laserdisc pictures. All this innovation means it won't be available overnight and, to a certain extent, the developers are also waiting for an appropriately powerful desktop micro on which to run it. The OUP has a release date in the late 1990s in mind, and I wish them luck.

The current leading-edge AI models are all hospital-based, and some promise a great deal. One computer-aided diagnostic system was used in eight centres to treat 17,000 patients with abdominal pain. Diagnostic accuracy rose from 45.6 per cent to 65.3 per cent. The number of operations which were carried out and at which no operable cause for the pain was found fell by half (a frightening

statistic for those of us who still have our appendix!). The savings were assessed as 278 operations and £748,000 over two years. Nationally the *direct* saving would be £5m and indirect resource savings about £20m. And this is just for abdominal pain admissions!

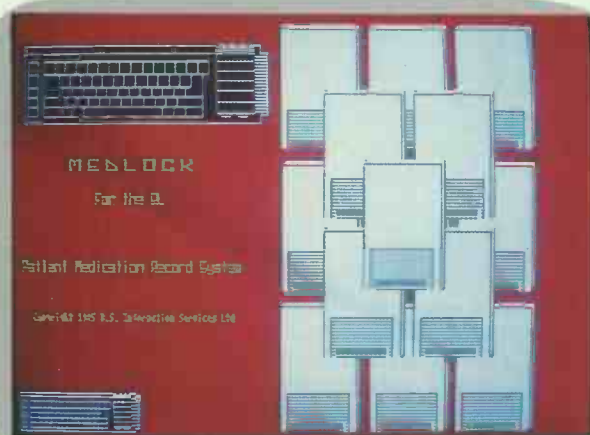
The software was designed for use by the non-computer literate and the down-time was less than one per cent, mostly due to disk corruptions. However, the system was only personally used by the doctor 45 per cent of the time and 30 per cent of doctors said the system was time-consuming if they were busy, despite the fact that most users were familiar with the system in 2-3 days. Four users disagreed with the computer on principle, a factor which is unfortunately a real pitfall in medicine. Some of the problems with the trial may have related to the computers used (the Commodore PET and Apple IIe). A good deal of the diagnostic improvement was probably due to the systematic way doctors had to consider the information, but the trial has a clear message: computers improve diagnosis, even when not all the users are willing! This system is in fact now being used by paramedics on US nuclear submarines, traditionally a bad place to have your appendicitis misdiagnosed!

Limited expert systems already exist for the diagnosis and treatment of bacterial infection, diabetic management (developed at St Thomas') and diagnosis of cardiac arrhythmias. The most extensive system in operation is probably 'Internist', predictably an American model, which has 600 stored diagnoses, with the most frequently used languages being Lisp and Prolog. More recently, expert system shells have been developed, and languages such as OPS5, Heresay-II and ROL have come to the

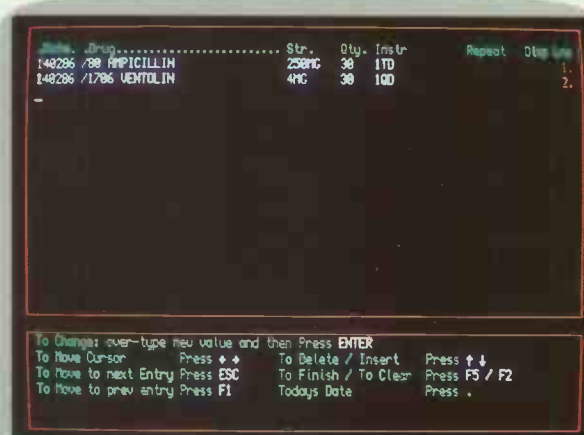
fore. In the future, self-learning inference strategies are likely to become more common, and interfaces which can cope with the rather archaic terminology medicine demands, will be necessary.

The imprecision of data collection and patient and disease variability, has caused modern systems to move away from rule-based systems towards frame-based systems, where data with common features are grouped together in order to describe a subset of knowledge. The effects of social background and psychological variables, for instance, cloud even simple diagnoses. Causal networks are now being developed, with the *deep* knowledge that rule-based systems lack, allowing the additional interaction of physiology, pathology, and anatomy. One such model is being defined in the University of Sussex, under the guidance of a Brighton-based cardiologist. Some of these newer systems are even able to give an explanation of how they arrived at the diagnosis, something most doctors can't do!

Standing in isolation as they do, medical expert systems can contribute little at present to general practice, but as part of integrated software suites, or as pop-up applications, they may one day prove indispensable. New patients could be assessed and problems identified, then management tested. In particular, they may prove invaluable for GPs on home visits, when decisions have to be taken on the move, using the minimum amount of information. The expert system is likely to prove particularly useful for the recognition of the clusters of apparently unrelated symptoms which point towards the rarer diagnoses, and for the provision of help with their investigation and management. On this basis, real savings in terms of hospital referrals



The Medlock system, developed by Dr RG Stevens, is the only UK-developed medical record system



Processing the issue and dispensing prescriptions in the National Health Service, using the Medlock system

are likely to be shown.

An obvious future problem will be responsibility for errors in diagnosis. Who will be liable when a medical expert system makes a mistake? The clinician using it, the programmers, the experts or the manufacturers? The recent Lotus suit may give some pointers in this area, as Lotus was not held responsible for the financial loss one company attempted to pin on its use of 1-2-3, but more clarification will be needed in this area.

## Communications

Armed with an expert system, and drug database, who could ask for more? Well, modem links with the surgery, for one thing! This is a development that probably lies a long way off at present. Of the five per cent of GPs who currently possess a computer, only about 5-10 per cent have a modem, on my estimation, and few of these are linked to software which would allow any kind of remote access to the system. I have not yet discovered any GP who can access patient records remotely, and given the current state of security development, this is probably a good thing.

Can you imagine a hacker gaining access to your medical records? This is not just a remote possibility, as many individuals and corporations, such as insurance companies, would give their eye-teeth for a confirmatory check through your record, particularly in view of the rise of diseases such as AIDS. (I am not suggesting for a moment that big business would indulge deliberately in such criminal activities, but certain parties might find the temptation too hard to resist.) Secure phone lines will therefore have to be found and probably also some form of data encryption used. Modem access to central notes might well ease the pace of the somewhat 'on the hoof' quality of home consultation management decisions, but the time involved in getting online would probably render it a dubious advantage.

More likely, from the comms viewpoint, will be access to hospital databases. Some hospital information is already available on Prestel, on an ICL-based system. I bet you all wondered where the One Per Desk — the machine that refused to die — had gone to? Look no further; GPs in one health authority are using it to access regularly updated pages of information about laboratory reference levels and sample transfer requirements. Another online database carries information about social and community services available within its particular area — an outstanding development, as these agencies are springing up so fast that available printed lists are always way out of date. 'Clinical Notes Online' is a data-

base of case reports, which can be keyword-searched, as well as allowing the entry of new cases remotely.

## Life or death

I feel that the above are peripheral to a more important area that is almost unexplored as yet, but promises great improvements in efficiency — hospital mail. Unless you live in a particularly efficient area, it can take up to two weeks for any hospital communication, however vital, to reach the GP and vice versa — such are the vagaries of the system. Vast quantities of literally life-saving data, such as recommended adjustments to medication, or referral letters, are stuck in the hospital mail at this very moment. The only way around this that I know is to ring up and bother the specialist concerned personally, assuming he can remember the patient and is not on holiday or at another hospital! Electronic mail has been with us for several years and would solve this particular problem entirely, leaving only the dictation and secretarial delays, which usually only amount to a few days.

Another comms area that could be developed now is the downloading of blood test results, at present held on laboratory minis into which they are read direct from the analysers. Incredibly, the results are then dumped as hard copy and proceed to get delayed in the post — like everything else. Results could be available within hours, if these computers were online. I could go on and on — if waiting lists were available, GPs could check outpatient waiting times and refer to the shortest list and the same could be applied, with benefit, to operating lists.

## Choices

With hardware prices falling so dramatically, it is easy enough to visualise the 80x86 supermicro network in the surgery, linked to optical record storage and a terminal on every desk. Such a system could completely replace every aspect of manual data recording, from the receptionist booking appointments to clinical note-taking. Voice recognition could have a crucial role to play here, obviating the need for doctors to develop the typing skills they have so far successfully resisted acquiring — such systems are said to be under development by IBM. Improved record display techniques, allowing the graphical reproduction of trends in information such as weight and blood pressure, would allow easier recognition of trends and facilitate better preventative medicine. Artificial intelligence systems will aid and confirm diagnosis and drug databases will take the chore out of thumbing through endless books. Disk-based drug databases already

exist and, if they were more widely available, could be used routinely to ensure that correct treatment is prescribed and to limit drug interactions.

Much of a GP's work is done on the move, and portables will assume crucial importance here. Currently available hardware is simply too large, and when you are dealing with a sick child, you won't want to lug in your bag and 20lbs of computer. A system that fitted in half a briefcase would be the largest practical, maybe with a 10-line supertwist screen and a smartcard reader. Modem links remain a tricky problem, for reasons already discussed, and given present technology, the surgery database will only remain comparatively secure as long as the file-server stays offline.

Compatibility with hospital systems will be a significant problem. There is no country-wide policy on hardware purchasing and until recently the result has been chaos; only two years ago was any attempt made by the health authority for whom I worked to find out even what the spread of machines was that it owned. The situation is slightly better in hospitals than general practice, where there has been a free-for-all over the last five years which will take at least another five years to sort out. Steering groups with real authority are desperately needed.

## Conclusion

Will your GP ever have a computer on his desk? Much depends on professional insecurity. Statements such as 'What if someone presses the wrong key?'; 'It would upset the patients'; and, 'I can make my own decisions, thank you!' are common. Many GPs are still in either shell or culture shock after their first experience of computers under the 'Micros for GPs' scheme. Money is not infrequently mentioned; there is no obvious link between having a computer and increased earnings. And here we begin to run into a difficult problem.

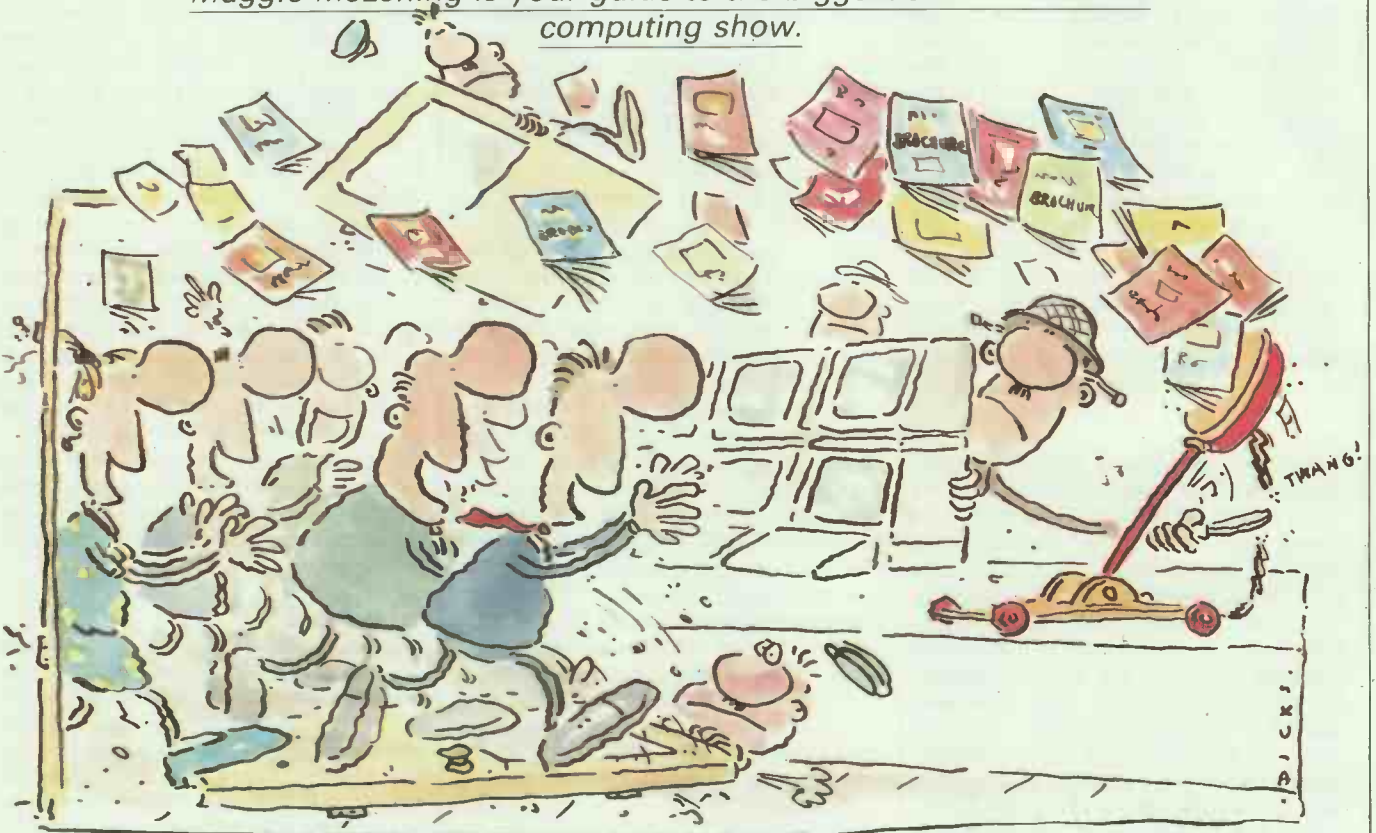
The market for computers in general practice will have to expand a good deal before it is likely that profit margins are high enough for the development of the specialist software I have outlined above to be a commercial proposition. On present showing, GPs will not buy computers until they are shown to be cost-effective, and some systems are only marginally so at present. Catch 22. Medical conservatism will not vanish overnight, and we will probably be watching some doctors trying to extract crumpled pieces of paper from bulging folders for a long time yet.

Dr Andrew Herd's medical career has included experience in ear, nose and throat surgery, orthopaedics and plastic surgery.

END

# Showing off!

*The PCW Show celebrates its tenth anniversary this year at Olympia, and once again an impressive line-up of companies will be there. Maggie McLening is your guide to the biggest and best annual computing show.*



Summer may be almost over but the hotspot of the personal computing year is yet to come, with the PCW Show at Olympia from 23-27 September 1987. Celebrating its 10th birthday this year, the PCW Show has grown with the industry to be the definitive source of information, whatever your interests. This year's Show is crammed with every conceivable micro product from the latest 386 business micros and RISC machines to a new generation of video arcade games. Many of the exhibits have been nominated for prestigious British Microcomputing Awards, and the winners will be announced at a gala dinner at The Gloucester Hotel in Kensington, on the first day of the Show.

As in past years, the first two days are restricted to trade, business and professional visitors, who will find registration very much easier this year, with the introduction of a new bar-coded system. Each visitor will receive a badge bar-coded with their name, title and company, so that ex-

hibitors can transfer the details to index cards using a light pen, for follow-up information or contacts.

## Business . . .

The main Business Hall is again in Olympia Two, and the general exhibition is in the National Hall, although some companies, like Atari, have feet in both camps. Whatever the type of product you're looking for, the PCW Show is the place to see it in action, and get impartial — and free — advice from the experts. The Federation of Microsystem Centres, for example, will have up to ten consultants on hand to offer advice on hardware and software, and visitors will be able to try its popular database, spreadsheet and word-processing packages for themselves in booths with standalone PCs. The Data Protection Registrar, too, will be on hand to explain the full implications of individuals being able to find out computerised information about themselves from November.

Last year, the PCW Show attracted

47,528 business visitors, out of a total attendance of 66,030. Many expressed interest in specific growth areas of the industry, each of which has become the focus of a special 1987 feature.

PC Productivity, on Level Two of the Business Hall, is sponsored by PC magazine and covers the four most requested topics: desktop publishing (DTP); networks; expert systems; and, last but not least, online information services.

DTP proved an enormous attraction last year — so much so that it hindered our first attempt to produce the exhibitors' PCW Show News *in situ!* Nevertheless, we shall try again this year, with the benefit of a much larger stand and the staff of *Desktop Publisher* magazine, who will also be bringing out an issue at the Show, standing by. In addition to the live production unit running a variety of equipment, there will be an information centre manned by DTP systems in other parts of the exhibition.

Vitalmatch, a newly-formed com-

pany in Holland Park, London, plans to show some of the customised DTP systems developed for customers, and others available for lease to produce one-off newsletters or brochures. PCW Show regular Mirrorsoft has moved into the Business Hall to show the Fleet St Editor DTP system on the Amstrad PCW and the full-blown Fleet St Publisher system on the Atari ST. Aussedat Rey Burotic is travelling from France to show its range of DTP consumables, including papers and transparencies for electronic printing and publishing, by laser, impact printers, plotters or fax machines.

Over 17,000 of last year's visitors expressed an interest in networking, so this year PC Productivity is geared up to tell them where to go — for anything from modems to LANs! Low-cost networking of different manufacturers' machines is a priority and Nine Tiles, for example, will be demonstrating Multilink interfaces to its Superlink LAN, for Amstrad CPCs, PCWs, BBCs, and PC-compatibles.

Also building on last year's success is the Open University, which plans to repeat its programme of daily showings of the Alvey Directorate-sponsored videos. Three tapes will be shown: 'Expert Systems in British Industry', 'Image Processing' and a review of the 'Alvey Report' itself. Remember to get there early if you want a seat!

ASLIB, the Association for Information Management, is running the fourth PC Productivity feature covering online information services. This year, the emphasis is on individual help and practical advice; because the number of databases and the choice of equipment to access them have both grown so dramatically that it is difficult for ASLIB's consultants to generalise.

Outside the PC Productivity area, visitors can expect a patter of tiny footprints amid the bumper crop of 386 machines. Olivetti will be showing its new range of PCs including the M20, M240 PC, and M380 Compact with bundled TopJob 386 operating environment. Holland's largest PC manufacturer, Tulip Computers, commences UK operations at the PCW Show. In addition to the AT 386 announced in Hanover earlier this year, Tulip plans to unveil a 286-based AT Compact and a new PC which is still under wraps. Sources at Tulip say that the latest PC will offer a 'tiny footprint and revolutionary design, at a tiny price'.

### ... and pleasure

PCW Show's wealth of business systems in Olympia Two is matched by an equally exciting entertainment and leisure section in the National Hall. This year sees more launches than ever — companies as well as

products, many from abroad.

US entertainment software publisher, Electronic Arts, has timed its European launch for the Show and will be announcing several new 68000 titles, as well as showing the Deluxe range, Marble Madness, and Bard's Tale games for which it is already well-known in the UK. Microprose is sharing space with Origin Systems and Suncom, and will be bringing 'a real flight simulator' over from the US, it says, in a bid to steal the Show.

Some of the newcomers reflect a Far Eastern influence in both presence and presents. The Taiwanese World Trade Promotion Corporation is arranging personal appearances for a group of Taiwanese companies, one of which is Datex. Amazingly, Taiwan imported \$578 million-worth of computers and related products in 1986 — it exported \$2.1 billion!

Two British companies are launching Japanese products likely to end up in Christmas stockings. Toy manufacturer Mattel will be demonstrating the Nintendo Entertainment system, while Mastertronic plans to introduce the Sega arcade games console, as well as its own Arcade machine. Back on Level Two of the Business Hall, two lucky visitors will win the chance to sample some oriental delights for themselves, by winning a draw for a fortnight's holiday in Thailand, worth about £2500.

### Atari vs Commodore

There are likely to be some surprises from Atari, too, according to Jack Tramiel, who plans to put in an appearance. Atari has the same space as last year, between the Business and National Halls, and will be sharing it with about 35 Atari software houses and suppliers. Renamed Atari World, this year's stand has special Atari pavilions, with themes such as 68000, PC-compatibles, DTP and software. They are clustered around the central company stand featuring the full range of products, including the Mega ST and the 520ST, whose price was cut to £299 in August.

Tramiel is forecasting that Christmas will see a massive resurgence of the games market for sub-teenagers, so there will also be a chance to try out the new 2600, XE and 130XE games machines, and preview Atari's Christmas TV campaign on video.

Commodore has taken the entire ground floor of the Addison Suite to set up its own 'Village' for the Amiga this year. One of the villagers, software house Taurus, is introducing a powerful CAD system for the Amiga, capable of producing over 3000 lines per second, as well as showing the Acquisition and Acom database packages. Busbyte will be demonstrating networking for the Amiga, Scicom its

touch-sensitive screens, and other companies will be offering business and DTP applications, digitising graphics and sound-sampling systems. Commodore itself plans to feature the Amiga 500, A2000 and PC 40/40 AT-compatible models.

Regular exhibitor Acorn has gone for a high-RISC profile, with the Archimedes on its stand, and Minerva Systems in Devon plans to present some of the first RISC software for it, including the System Delta Database Management System, and 18 other programs converted from BBC format.

Once again, graphics and music will be much in evidence in the National Hall. Llamasoft will be revealing the ColourSpace 'light synthesiser' currently under development for the Atari ST. Demonstrations combining the output of several STs via a video mixer will be shown on an eight-foot video screen.

On the music front, Electromusic Research (EMR) plans to give live computer-controlled keyboard demos, while Syndromics will have a full recording studio on hand.

From pianos to piranhas, of which there will be a live tankful waiting to celebrate software publisher Piranha's first birthday with anybody who feels so inclined. They could be waiting a long time!

In the meantime — see you there!  
**And a final word from PCW's editor, Derek Cohen ...**

### PCW steals the show

Don't miss PCW's own stands. In the National Hall we will be letting you get a close-up look at the machines which have graced our covers over the past year, all of them running demos which show off their abilities. In the Business Hall you'll find our back numbers service and a rolling panel of experts to answer your queries. Finally, watch out for the goodies stand where T-shirts and other mementoes can be bought.

Tickets are available either from the PCW Show's organisers, Montbuild Ltd, or from Keith Prowse ticket agencies, or at the door. The Show is open from 1000-1900hrs daily, except on Sunday 27 September, when it will close at 1700hrs. (Also see Chip-Chat on the back page for a special ticket offer.)

### Guide to stand numbers FLOOR NUMBERS BEGINNING WITH

<b>GENERAL</b>	
National Hall (Ground)	1
National Hall (Level 2)	3
<b>BUSINESS</b>	
Olympia 2 (Ground)	2
Olympia 2 (Level 1)	4
Olympia 2 (Level 2)	5

# PCW SHOW PREVIEW

Here we present an alphabetical index to the exhibitors who will be displaying their wares at the PCW Show.

(Where available, the PCW Show stand number and telephone number are given at the end of each entry.)

## A1 PRIMARY DISTRIBUTION

Combining success as a distributor with support of the latest state of the art comms, A1 Primary Distribution promises dynamic and efficient distribution and warehousing to computer software houses. Services offered include: an on-line computer link, with monitored security for management information; credit administration and control; telesales; and statistical information.

Stand 3033 (0977) 797777

## ACORN COMPUTERS

The 'extremely user-friendly' *Archimedes* micros recently launched by Acorn will be on view. Based on 32-bit Risc technology, they provide low-cost workstation applications for school, business and home use. Also on view will be the PC card, *Springboard*.

Stand 1303 (0223 245200)

## ACTIVISION

Visitors can gain hands-on experience of 10 new titles, including the cream of the Christmas arcade releases. A game based on the Schwarzenegger movie, *Predator*, will be previewed, and there will be a host of other releases.

Stand 1417 (01) 431 1101

## ADVANCE ELECTRONICS

Advance offers a wide range of power conditioners: fitted between a computer system and the mains supply, these units eliminate the 'spikes' and voltage variation which can corrupt or even wipe out precious data.

Stand 4019 (0978) 821000

## ADVANCED SYSTEMS & TECHNIQUES

Essex-based AS&T is a major Atari dealer, offering over 50 complete ST systems from £420. Choices available include five different sizes of RAM, four floppy disk drives, Atari hi-res mono and colour monitors, and hard disks. An extensive range of ST add-ons is stocked. The ST service centre is open Mon-Sat.

Stand 4136 (0702) 510151

## ALTERNATIVE SOFTWARE

'The fastest growing budget software house in Europe', claims Alternative, now in the top four of budget software houses. A wide range of software is available at £1.99, its packaging commended by the Design Council; all well supported. Its new line is double and triple games packs.

Stand 3037 (0977) 797777

## AMSTRAD

The Amstrad products at the PCW Show will be split into four ranges: games/home machines; word processors; PC compatibles; and printers. There will also be a selection of other peripherals and software packages.

Stand 1403 (0277) 228888

## ANCO SOFTWARE

This company's new emphasis is on budget (£9.95) games for the Amiga and Atari ST, though it will continue producing quality software for the C16/Plus 4 as long as there is a demand.

Stand 3053/3059 (0322) 92513

## ANGLO COMPUTERS

The Show will see the launch of 'a totally new concept in computer peripherals' from Anglo, producer of the *Enterprise* range of modems, and a range of interfaces, leads and cables. Anglo's *Enterprise Turbo* range has full Hayes compatibility, V21 and V23 modes, and automatic entry to the Mercury Network.

Stand 0316 (0970) 4321

### Guide to stand numbers FLOOR NUMBERS BEGINNING WITH

#### GENERAL

National Hall (Ground) 1

National Hall (Level 2) 3

#### BUSINESS

Olympia 2 (Ground) 2

Olympia 2 (Level 1) 4

Olympia 2 (Level 2) 5

## APPLICATIONS ADVISORY SERVICE

*Micro Decision* magazine will be offering a free consultancy enabling visitors to get expert advice about any computer queries.

In conjunction with VNU, *Directories* will also be providing a free facts and figures service. Issues and subscription details for both titles will be available on the stand.

Stand 4011 (01) 439 4242

## ARNOR

First-time exhibitor Arnor is using the occasion to launch its *PC Protex* word processor. Originally designed for the Amstrad, *Protex* has been completely re-written for the PC and compatibles. It costs £60 and includes a spelling checker and mail-merge facilities.

Stand 1915 (0733) 239011

## ASPEN/SPRINT

The company specialises in interactive video production, but also produces computer-based information and training systems. A range of Amiga-based programs will be on display.

*Commodore Village*

## ATARI

Atari will be showing its entire product range on a massive feature exhibit. Atari president Jack Tramiel will fly in for the Show — and surprises are promised. Products shown will include the *Mega ST* range and video consoles. There will be a large collection of business and entertainment software.

*Atari World* (01) 388 9871

## AUSSEDAT REY BUROTIC

Under the *Alrey* brand name, Ausseadat Rey Burotic provides papers and transparencies for electronic printing and publishing, in A4 sheets, continuous paper, fanfold, rolls and coils.

Stand 4217 (01) 263 6241

## BATH COMPUTER SHACK

One of the first Atari dealerships in the UK, BCS now has a wide customer base. It is a specialist in the education market and takes pride in its back-up and after-sales service. In-house programmers write for vertical markets in the business sector. Two programs, *Cars* — a GEM-based program for the motor trade — and *Take Stock* — a stock control program — will be demonstrated at the PCW Show.

Stand 4129 (0225) 310300

## BERNARD BABANI (Publishing)

Babani will be showing 'the finest and most comprehensive range of computer books available' at the Show. Recent publications include *Getting Started With Basic and Logo on the Amstrad PCWs* and *A Concise Introduction to MS-DOS*. Free 1988 catalogue available on stand.

Stand 1001 (01) 603 2581

## BUBBLE BUS SOFTWARE

A selection of good quality games and utilities for 8-bit computers will be on the Bubble Bus stand. The company is launching its first 16-bit games and expanding its *Mini Bus* range. Business programs for the PC include the *Supernews* news delivery system and the *Supervideo* video hire system.

Stand 1008 (0732) 355962

## CAMBRIDGE COMPUTER

Sir Clive's *Z88* laptop, with peripherals and software, will be the focus of the Cambridge stand.

Stand 1607 (0223) 312216

## CAROUSEL TAPES

Gloucestershire-based Carousel, already established as a distributor of blank video and audio tape, is expanding to take on the *Nashua* disk range and *Trackmaster* storage cases.

Stand 3096 (045382) 2151

## CASCADE GAMES

Within crawling distance of the balcony bar, Cascade is ready to shower visitors with five new titles and its biggest ever presence at PCW. On the stand will be *Ace2*, follow up to *Ace*, and the amazing *PD System* of software development.

Stand 3015 (0423) 504526

## CDS SOFTWARE

Among the games being launched by CDS at the Show are *Casino Roulette* — the ancient strategy game; and *Colossus 4 Bridge* — with raw recruits being taken through the rubbers to club level. Also on the stand: four youngsters compete in the final of the *Brian Clough's Football Fortunes* challenge.

Stand 1010 (0302) 21134

#### CENTRAL TECHNOLOGIES

Now one of the largest UK computer media stockists, Central supplies over 700 companies with computer diskettes, ribbons, cartridges, stationery, and so on.  
**Stand 1809** (021) 233 4041

#### CHEETAH

Peripheral maker Cheetah exhibits its range of computer and music products. Launches include: the *PC Powerplay* joystick for the IBM, Amstrad and compatibles; and the *Midi Interface for the Commodore 64*.  
**Stand 3061** (0222) 555525

#### CHERRY

Keyboard manufacturer Cherry will be highlighting its *A3 Graphics Tablet Mark II* digitiser and the *VoiceScribe 1000* speech-recognition system. Cherry is launching its state-of-the-art IBM-compatible *G80-2000* keyboard at the show.  
**Stand 2003** (05827) 631100

#### COLUMBIA COMPUTER PRODUCTS

*Cleanprint*, a brand new concept in printer maintenance, is being launched at the PCW Show by Columbia. *Cleanprint* is a complete print-head cleaning kit (cleaning material cassette; aerosol; pre-saturated wipes) which is claimed to improve print quality and reduce wear on the print head. A selection of Columbia's other products will also be on show.  
**Stand 3051** (01) 656 8233

#### COMMODORE BUSINESS MACHINES (UK)

Commodore has taken over the Addison Suite on the ground floor and transformed it into the 'Commodore Village' to demonstrate its home computer, the *Amiga 500*; the *A2000* business computer; and its PC range, including the *PC40/40* AT compatible. A variety of companies will be in the 'village' to demonstrate the range of applications available.  
**Commodore Village**

#### COMPUPRINT

Compuprint offers high-quality computer forms, labels and cheques, with delivery suited to customer requirements, and many other related products — such as payroll slips, continuous envelopes, and clean edge microperfed letterheads.  
**Stand 4002/5** (0264) 59222

#### COMPUTER ASSOCIATES

Important announcements regarding a major new line of software programs are to be made at the PCW Show by Computer Associates, which claims to be the world's largest independent software company. CA's spreadsheet *SuperCalc 4* and project management software *Super-Project* will be on show.  
**Stand 4047** (0753) 77733

#### COMPUTER BOOKSHOPS

This company is a wholesaler of computer books whose service to the retail trade includes full merchandising, initial stock recommendations and stock balancing.  
**Stand 2212** (021) 706 4518

#### COMPUTER CONCEPTS

*Calligrapher*, a new word processor/DTP program for the Atari STs, will be launched. Among other products on show will be: *ST Doctor* desk accessory and the *Fast ASM 68000* assembler.  
**Stand 4108** (0442) 63933

#### COMPUTER FRONTIER (UK)

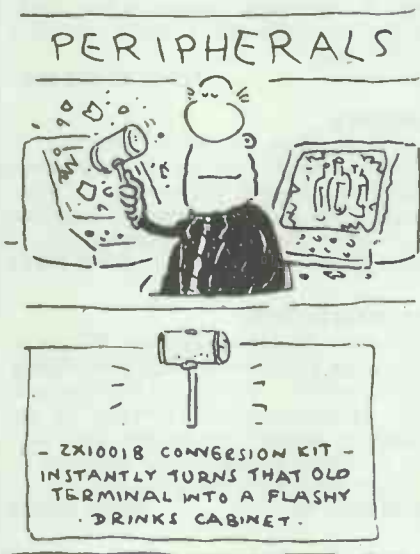
The recently-launched *Flyer A286* will be among the range of *Flyer* PCs on the Computer Frontier stand. The *A286*, based on the Intel 80286, has a standard memory of 1Mbyte, expandable to 8.5Mbytes. The *A286* is claimed to be the first portable to offer a 1.2Mbyte/360kbyte dual speed floppy disk drive and also includes a 20Mbyte ruggedised hard disk.  
**Stand 2102** (0462) 673939

#### COMPUTER TRADE WEEKLY

CTW is an established magazine covering the whole home and small computer industry. It has expanded its editorial to cover both business and leisure product retailers. CTW invites its readers to drop by its stand for a frank exchange of views.  
**Stand 3000** (0438) 310106

#### CONNEXIONS

Connexions will be showing its complete range of computer cables, data switches, connectors, testers and protectors. New at the Show will be a range of networking accessories, and the latest additions to its peripherals range.  
**Stand 2002** (07072) 69444



#### CROWN DUST COVERS

A full range of dust covers and padded luggage for computers is on offer, and a design service for cases not covered by the existing range.  
**Stand 2201** (0984) 33377

#### CYBERSOFT

The full range of its *Cybercom* IBM-compatible PCs will be on display. Scheduled for release are a gas plasma *Cybercom-Portable* and the *Cybercom-386*. Visitors will also be able to buy a large collection of low-cost software.  
**Stand 4041** (0734) 591873

#### D&H GAMES

A new software house interested in producing high-quality strategy games, D&H will be focusing at the Show on its latest game, *Football Director*.  
**Stand 3096/1** (0438) 728042

#### DATA PROTECTION REGISTRAR

The Office of the Data Protection Registrar will be providing guidance to data

users in preparation for the full implementation of the *Data Protection Act* on 11 November 1987, when failure to register will be punishable by fines. Eight new guideline booklets have been published and these will be available free on the stand.  
**Stand 3148** (0932) 225526

#### DATABASE PUBLICATIONS

A special show offer of free registration and instant documentation for the *Micro-link* electronic messaging system is available from the Database stand.

*Microlink* offers many extras, including free telesoftware which can be downloaded over the phone. Database is the publisher of *Atari User* and *Atari ST User*.  
**Stand 4107** (061) 456 8383

#### DATAPHONE

Dataphone will be displaying a complete range of comms equipment, including its recently-launched modems, *Demon II* and *Designer Modem*. A new easy-to-use comms package for the PC, *Kiwichat PC*, is being launched.  
**Stand 3110** (0378) 78137

#### DATATRADE

*Systemizer*, 'a unique printer-sharing concept', will be exhibited at the PCW Show by Datatrade. *Systemizer* allows up to 15 VDUs and/or PCs to share one or more printers. With its 64k buffer and priority-access function, *Systemizer* will, it is claimed, make disputes over printer access a thing of the past.  
**Stand 5126** (0604) 250541

#### DIGITAL INTEGRATION

Reinforcing its position in the field of simulations, Digital Integration launches: *F-16 Combat Pilot* — seek promotion and fame in the war machine of the 1990s; *ATF* — test your mind and dexterity in a hostile world; and, *Bobsleigh* — race on simulated slopes at terrifying speed.  
**Stand 1201** (0276) 684959

#### DIRECT DISK SUPPLIES

DDS claims to offer the highest quality and lowest prices on disks at the Show. Special '25 Packs' and 3M disks on offer. Flippies (reversible disks) will also be on sale.  
**Stand 3096/18** (01) 979 7811

#### DIRECT TECHNOLOGY

*Automator mi* is a 'software robot': a program which can be taught how to drive other programs. Applications include automatic log on/off, automatic data retrieval and integration of several packages into one. *Automator mi* from Direct Technology will drive the majority of 3278, 5250 and VT100 emulations.  
**Stand 2204** (01) 847 1666

#### DISCOPY LABS

New facilities added by this long-established disk duplicator include: duplicating flexibility; on-disk printing; programmable ink-jet printing; and turnkey software protections.  
**Stand 1200** (01) 871 2629

#### DOMARK

The publishers of *Trivial Pursuit* are launching a major new software label at the PCW Show: *TV Games*. It will consist only of popular TV quiz shows, such as *Treasure Hunt* and *Blockbusters*.  
**Stand 3035** (01) 947 5622

# PCW SHOW PREVIEW

## DURELL

Durell Software on Stand 3146 will be releasing two new compilations for the Spectrum, Commodore 64 and Amstrad CPC. Durell Computers on Stand 4200 will be exhibiting a range of its business software for the IBM; for example, *Insurance Master V2*, *Investment Manager* and *Store Manager*.

**Stands 3146/4200 (0823) 254029**

## DYNAMICS MARKETING

Designer of the original *Competition Pro 5000* joysticks, Dynamic Marketing is to launch at the PCW Show the *Pro Extra* joystick. The *Pro Extra* has been designed to enable users to win even more points per game by allowing the user to select an auto-fire option or slow-motion movement for finer control.

**Stand 1823 (061) 626 7222**

## EASI-BIND INTERNATIONAL

Attractive and competitively priced systems for maintaining and presenting computer paperwork, like *Store-It* binders, plus the convenient handling of floppy disks, are displayed on the Easi-bind stand.

**Stand 4213 (0773) 761341**

## ELECTRIC DISTRIBUTION

Leading software distributor Electric Distribution will have over 40 products for the Atari ST at the PCW Show, including a CAD 3D package from Antic, which will be demonstrated with *Stereotek 3D* glasses. *1st Word Plus ST* will also be on display. Visiting dealers will get a full range of POS material free from Stand 4131. On Stand 3079, Electric will be showing the complete range of *Timeworks* products for the Commodore 64 & 128k, the Atari ST and IBM/Amstrad PCs, including a full feature low-cost package.

**Stands 3079/4131 (0954) 61258**

## ELECTROMUSIC RESEARCH (EMR)

New recording, editing and score-writing products will be on sale at the PCW Show at special offer prices on the EMR stand. Virtuoso performer Mike Beecher will give live computer-controlled music demonstrations of EMR's range of computer midi software and hardware.

**Stand 3036 (0702) 335747**

## ELECTRONIC ARTS

US home software publisher Electronic Arts is announcing over 20 new titles. It aims to show at the PCW Show its commitment to long-term growth, new standards of technology, product quality and entertainment.

**Stand 1517 (01) 938 2222**

## ELITE SYSTEMS

Developments in both the coin-op licence and compilation fields will be demonstrated by Elite. From the creators of *Frank Bruno's Boxing* and *Paperboy* come *Ikari Warriors* and *Buggy Boy*; compilations ready for Autumn and Christmas will be released through the *Hit Pak* brand label.

**Stand 1209 (0922) 55852**

## ELR INTERNATIONAL

The low prices on its *Isis* brand of XT's and AT's do not mean poor quality, according to ELR: 'no 'grotty drives, flimsy keyboards and fuzzy monitors', it claims.

At the Show, ELR is displaying the *Isis-200 XT-compatible*.

**Stand 4222 (04830) 505605**

## EMAP BUSINESS & COMPUTER PUBLICATIONS

The publishers of *Computer & Video Games*, *Commodore User* and *Sinclair User* are creating an arcade games centre where punters can play against US champions, or even the *Commodore User* team. Stickers, t-shirts, bags, mags galore — and journals to chat with.

**Stand 1717/1721 (01) 430 1200**

## ENCYCLOPAEDIA BRITANNICA INTERNATIONAL

The latest tomes of the new edition of Britannica will be at the PCW Show. Its reference power is claimed to be doubled by a two-volume index.

**Stand 1911 (01) 482 5238**

## EPSILON

Now available on the Atari ST is *MProlog* from Berlin-based Epsilon. Features include over 140 built-in predicates, a dedicated Prolog editor, interactive help facility, garbage collection and tail recursion optimisation.

**Atari World (01049) 30 882 6991**

## EUROMAX

The *Free Style VI* from Euromax is claimed to be the first truly multi-propose customised joystick because of its additional hand grip and handles. Euromax also markets *Kao* and *Wiz* brand disks.

**Stand 3094 (0262) 60251**

## EVESHAM MICROS

Mail order supplier Evesham Micros is making its PCW Show debut, exhibiting its *Excelsator+* disk drive (Commodore 1541 replacement); the *Slimline 64* replacement case for the 64; the latest version of *Freeze Frame*; and a range of its own and other PC-based products.

**Stand 3096/12 (0386) 765500**

## EXECON

Execon will be showing its powerful set of modular/integrated business software, *Accounts, Invoicing & Stock-Control*.

**Stand n/a (01) 567 6285**

## EXECUTIVE CLUB INTERNATIONAL

A comprehensive business, travel and leisure service, Executive Club International offers reductions on air fares and hotel accommodation, and membership to private clubs around the world.

**Stand n/a (01) 739 2861**

## FIREBIRD/RAINBIRD/SILVER

A trinity of leading software labels on one stand. New releases from Firebird include *Flying Shark*, *Bubble Bobble* and *Star Trek*. Rainbird invites people to feast their eyes on the latest Sandy White blockbuster, *EPT*. Among Silver goodies are *Decathlon*, *Pitfall II* and *Hero*.

**Stand n/a (01) 240 8377**

## FORMSCAN

The *Codem Disk Reader* from FormScan takes seconds to translate 8in diskettes to all the leading 5¼in word-processing packages. Old documents come up 'IBM new' with virtually no editing.

FormScan subsidiary Lexisystems distributes DEST products in the UK, including *PC Scan*, *PC Scan Plus* and *Publish Pac*.

**Stand 5040 (0373) 61446**

## FRONTIER SOFTWARE

Frontier is the sole UK distributor of the Supra range of Atari peripherals. The Supra range of hard disk drives will be on show, including a 20Mbyte unit smaller and faster than the Atari SH204. The 60Mbyte drive is the fastest hard disk currently available for the ST, claims Frontier. Also being shown is the £500 64k *MicroStuffer* printer buffer.

**Stand 4141 (0423) 67140**

## FUTURE PUBLISHING

Binders, back issues and chat, and the latest copies press-hot are promised by the publishers of *Amstrad Action*, *8000 Plus*, *PC Plus* and *Advanced Computer Entertainment*.

**Stand n/a**

## GARWOOD GROUP

Garwood Distribution is a low-cost software distributor, specialising in the Amstrad, IBM PC and compatibles market, and with a nationwide dealer base. Garwood Software supplies software, computer consumables and stationery wholesale to dealers and retail to large corporates, government agencies and the education sector in Essex and North London.

**Stand 1907 (0245) 460788**

## GLENTOP PRESS

Glentop's substantial presence covers both its full range of technical and computer books and (in Atari World) its range of GFA products as well as its ST books.

**Stand 0311 (01) 441 4130**

## GOLLNER PUBLISHING

*ST World* (formerly *ST User*) was the first UK magazine exclusively dedicated to the Atari ST. It offers in-depth reviews, scoops, interviews, and reader help and advice.

**Stand 4126 (0243) 783932**

## GREMLIN GRAPHICS SOFTWARE

Christmas comes early this year as Gremlin launches its festive offerings. One can choose between Dolph Lundgren in *Masters of the Universe* or the rodent hero of *Basil the Great Mouse Detective*. Compete against Ivan 'Chernobyl Breeze' Karamazov in *Tour de Force*, or inoculate yourself against the Olympics with *Alternative World Games*.

**Stand 1211 (0742) 753423**

### Guide to stand numbers

#### FLOOR NUMBERS BEGINNING WITH

GENERAL	
National Hall (Ground)	1
National Hall (Level 2)	3
BUSINESS	
Olympia 2 (Ground)	2
Olympia 2 (Level 1)	4
Olympia 2 (Level 2)	5



## GULTRONICS

This leading London computer centre will be making special Show offers on its full range of computers, printers, disk drives, monitors and peripherals. It will be demonstrating the 'mind-blowing' features of the Toshiba range of portables.

Stand 1807 and 2009 (01) 323 4612

## HARVESTER

An independent producer for the *Psion Organiser II*, Harvester offers *The Letter Organiser* and *The Finger Organiser*, enabling users to turn the *Organiser II* into a very creditable, very small word processor. Harvester's range also covers the commercial, institutional and construction sectors.

Stand n/a

## HEWSON

Hewson is launching several games at the Show. *Morpheus* won't let you sleep as *Dreadnought* bites back; and *Evening Star* will keep you steaming along the Somerset and Dorset (aka *Slow and Dirty!*) Railway. Aficionados can get a glimpse of the new Steve Turner game, *Mag-natron*, sequel to *Quazatron*.

Stand 1622 (0235) 832939

## HILTON COMPUTER SERVICES

The main attraction of its *Personal Banking System*, according to Hilton, is its ease of use in managing finances in an ordinary way. A PC version has just been launched, bringing to eight the number of computers *PBS* runs on.

Stand 3096/14 (0689) 70911

## IANSYST

A surprise new mind-boggling program to test IQ and improve mental alertness is promised by Iansyst for the PCW Show. It will join stable-mates: the *lankey Crash Course in Typing for Beginners*; the *lankey 'Two Fingers to Touch Typing' Conversion Course*; and the powerful programming tool, *VICAR*.

Stand 4002/4 (01) 607 5844

## INTERCEPTOR

*Satar*, a space odyssey arcade adventure game, is to be launched at the Show. Interceptor's new 'Players' image and its born-again budget label, *Autumata UK*, will also be on view.

Stand 3072 (07356) 71500

## JOSTY UK

The *Josty RS232-Kit* — 'everything you need to accomplish an RS232 connection' — will be launched. As sole UK distributor, Josty will also be showing the *Posso* media storage system. A wide range of cables and other accessories will also be available.

Stand 4032 (0642) 76900

## KEMPSTON

The *Kempston PCW Mouse* uses a WIMP system, and includes a hi-res mouse, interface, and GSX and RSX drives that allow it to be used in conjunction with CP/M software like *DR Draw*, *DR Graph*, and so on.

There will also be system launches for the Sinclair Plus 3.

Stand 3077 (0908) 690018

## KONAMI

Computer conversions of arcade favourites *Jackal* and *Iron Horse* are due for release at the PCW Show, as are



Old rivals Sinclair and Amstrad at last year's show.

several MSX cartridge games. The *WEC LeMans* sit-in arcade simulator will be available to test drive. The Konami Software Club will be making its debut at the Show.

Stand 3083/3090

## KUMA COMPUTERS

The Kuma range of GEM-based business applications products for PC compatibles, Atari ST and Amiga will be demonstrated, including: *K-Spread 2* spreadsheet; *K-Data* database; and *K-Graph 2* business graphics.

The *K-Max* transputer development system for the Atari ST and the IBM PC compatibles, with associated software, will be on show.

Stand 3154 (07357) 4335

## LEISURESOF

Leisuresoft is a national distributor of computer software and peripherals, servicing the independent retailer with over 5000 product lines in: full-price and budget games; business software; joysticks, blank disks and accessories.

Stand 1709 (0604) 768711

## LIGHTWAVE LEISURE

Lightwave supplies a large range of quality-tested computer cable assemblies, components and dustcovers for most home and business computers. All products have a one year guarantee.

Stand 1018 (051) 639 5050

## LITTEX

Litex will be organising a display of sales literature mainly from companies not otherwise represented at the PCW Show. It will also pass on enquiries and generally act on behalf of companies, with literature on display.

Stand 2202 (04515) 799

## LLAMASOFT

Ask the Sphinx how to help you deal with *The Return of the Mutant Camels* on the Llamasoft stand. It also hopes to be able to demonstrate the *Colourspace II* light synthesiser, which is able to combine, via a video mixer, the output of several STs onto one screen.

Stand 3093 (07356) 4478

## MAGNAM PRODUCTS INTERNATIONAL

As one of the leading suppliers of computer software packaging in Europe, Mag-nam offers a wide range of prestigious packaging and is also able to undertake bespoke design and production projects. Staff will be on hand to discuss all aspects of packaging.

Stand 1020 (0635) 65509

## MARTECH

All Martech's recent titles, like *Nemesis the Warlock* and *Catch 23*, will be on offer at reduced prices. The PCW Show will see the launch of *Slaine*, licensed from 2000AD comic, and first previews of *Nigel Mansell's Grand Prix*.

Stand 3009 (0323) 768456

## MASTERTRONIC/MELBOURNE HOUSE

Mastertronic promises to show off its large selection of budget software games, including its most recent, *Americana* and *Ricochet*. It will also be demonstrating its arcade machines — *Arcadia* — and the *Sega* games console. Lucky entrants have the chance of winning a *Sega* system.

Stand 1109 (01) 377 6880

## MATTEL TOYS

Nintendo, claims Mattel, represents the new generation of video games: true arcade quality on a dedicated machine. Nintendo is initially targetted at boys aged 8-14 and their fathers. Mattel will be operating a Nintendo Hotline to provide a specialist service to trade and consumers.

Stand 3023 (0533) 826666

## MICRODEALER INTERNATIONAL

Microdealer is a large distributor of full price and budget software, and has over 4000 lines in stock. It has become a distributor for Ashton-Tate and Borland.

Stand 1222 (0908) 74000

## MICRONET

User-friendly access to Telecom Gold at local call rate is promised to Micronet members via Interlink. It claims this is the first stage in the generation of complete message interchange being developed by Telecom. Micronet's new online PC magazine is *PC Support*, with news, reviews, tips, help desk and software.

Stand 3133 (01278) 3143

## MICROPROSE SOFTWARE

MicroProse's first appearance at the PCW Show will be in tandem with Origin Systems and Suncom. MicroProse is bringing from the US a real flight simulator and a selection of simulations. Origin will be there exhibiting its *Ultima* series, including the latest, *Warriors of Destiny*. Suncom *Tac* and *Starfighter* joysticks will be there too.

Stand 1511 (0666) 54326

## MICROSOFT PRESS

New releases from the books division of Microsoft include: *Music Through MIDI: The New Writer*; and *Command Performance: dBase III Plus*.

Stand 3045 (01) 938 2200

# "It's a great machine".



**From only  
£499**

**A PC which can beat the likes of Amstrad, Tandy and Zenith in a press comparison of IBM-compatibles, deserves your attention. So does a company whose computer sales in Britain now exceed the entire production of some of its rivals.**

The Company in question is Opus and its class-beating compatible is the PC II Turbo, now being built in Britain in monochrome, colour and EGA versions. 'PC User' Magazine which conducted the comparison test said of the PC II Turbo:

*"Even in its basic £499 form, it is a superior beast.  
This is a great machine."*

# • their words not ours

But what really makes the PC II Turbo stand out from the compatible crowd? The answer it seems depends on which computer magazine you read.

"Performance is above average, thanks to the NEC V20 chip. The PC II exhibits excellent compatibility, no doubt due to its US-registered legal ROM Bios."

'What Micro?'



"The Opus PC II looks and feels like a solid beast. Expansion cards fit firmly inside, the keyboard doesn't feel like it might break if you hit it too hard and the monochrome display offers a clean and rock-steady picture."

'Which PC?'



"It is extremely solid and well built. It lacks the thrown together feel of many cheaper clones from small companies."

'Which Computer?'



## NEED WE SAY MORE? ... YES NOW THE PC II TURBO IS EVEN BETTER

Even our £499 entry level PC is now equipped with a new dual-mode graphics card supporting both the Hercules monochrome and IBM colour graphics standards and featuring a mouse port. It keeps the PC II Turbo's standard specification out in front:

- Software switchable NEC V20 super processor 4.77/8 MHz
- Dual-mode mono/colour graphics card
- High resolution monochrome monitor, tilt and swivel base and anti-glare screen
- Quality AT-style keyboard
- 256K of RAM expandable to 1MB on motherboard creating 384K RAM disk
- 360K floppy disc drive
- 8 expansion slots
- Highly compatible BIOS
- Parallel printer, mouse and joystick interfaces
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- 12-month guarantee
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Options include dual drives, 20 Megabyte Winchester and 1 Megabyte RAM expansion, maths co-processor and on-site maintenance cover.

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**Opus.**

Opus Supplies Ltd, 53 Ormside Way, Holmethorpe Industrial Estate, Redhill, SURREY RH1 2LW.

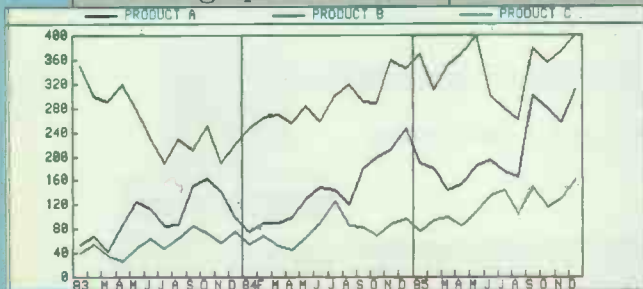
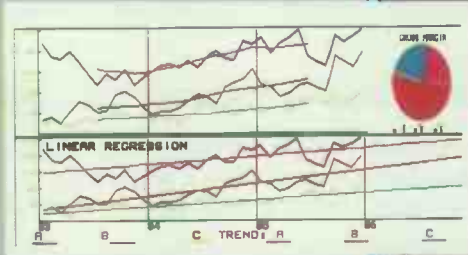
# “Most graphics help you present. These graphics help me decide.”

want other people to go along with my decisions. So my recommendations had better be better.

Give me Lotus, the sales figures, and an hour or two, and I can make those figures dance. But no matter how clever the number-crunching, it shows me nothing.

So give me Decision Graphics. It takes the Lotus file, and puts it all in a line graph.

I want more. Just a few seconds to type in directly the cost of sales data. And then show the gross margin as a pie chart,

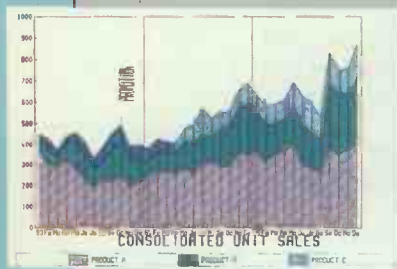
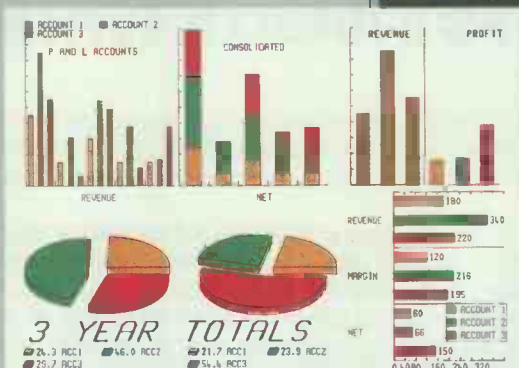


A few keystrokes later, using split windows, and the pattern gets clearer.

Now for the trends

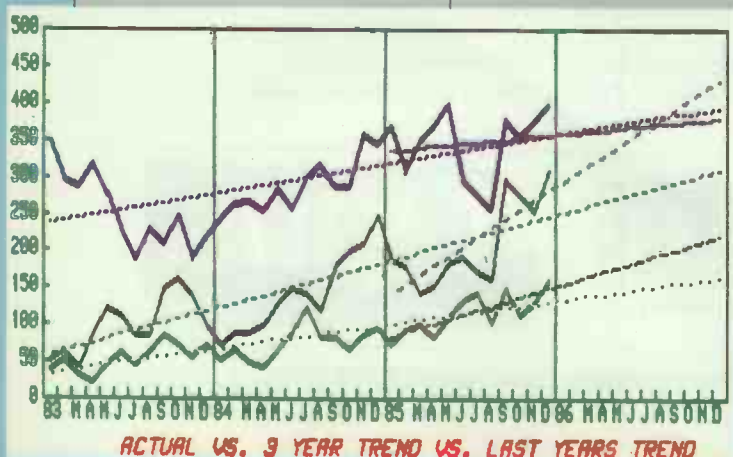
Immediately. With no scales to set. I push two keys and it's now a bar graph. We're getting somewhere towards a decision.

here – the growth rates – and the profitability picture.



I like to see the trends. The last 36 months, and the next 12 months forecast. Done. And seen to be done.

Decision Graphics gives me the true picture. Now you can make the right decision.

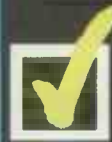


Decision Graphics imports Lotus, Multiplan, dBase III, SuperCalc, ASCII, and even mainframe-held data, fast and simply.

Decision Graphics displays 375 different graph variations, types and options, calculates with 30 built-in functions, records your macro-commands for re-processing, and outputs to printers, plotters, slides and as a PC slide show.

Decision Graphics displays data, calculated data and hypotheses for your analysis, exploration and interpretation – all before you present. And Decision Graphics helps to show the thinking behind your proposals when you present.

Picture Decision Graphics working for you.

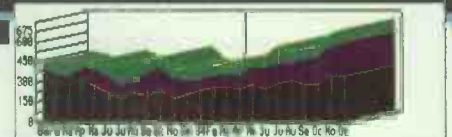


## Decision Graphics

Worth more than a thousand words.

Mercator Ventures Ltd., Southbank House, Black Prince Road, London SE1 7SJ. Telephone: 01-587 1121

Decision Graphics is sold and supported by Mercator Ventures Ltd. Lotus is a trade mark of Lotus Development Corporation. Multiplan is a trade mark of Microsoft. dBase III is a trade mark of Ashton-Tate. SuperCalc is a trade mark of Sorcim.



Decision Graphics could show me the way. Send me samples, specifications, and ordering details.

Name \_\_\_\_\_

Position \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

Phone \_\_\_\_\_ PCW \_\_\_\_\_

Mercator Ventures Ltd., Southbank House, Black Prince Road, London SE1 7SJ Telephone: 01-587 1121

**NEW DG3 AVAILABLE NOW!**

# PCW SHOW PREVIEW

## MICROWARE

The theme of Microware's participation in this year's Show is the link between the technology of the future from IBM and the services and support for its goods from Microware. A wide range of products, including the PS/2s, will be on display.

**Stand 4043** (01) 940 8635

## MINERVA

Data-handling specialist Minerva's product ranges include Risc products for the Archimedes; the System Delta Database management System on BBC Micros, and other BBC products; and an inexpensive learner-friendly range for Amstrad PCWs.

**Stand 4002/3** (0392) 37756

## MIRACLE TECHNOLOGY

Miracle will be previewing its new generation of modems at the Show; they are said to incorporate sophisticated features as standard. Its *Keycard 3000* and *WS3000* and *WS4000* modems will be demonstrated. The stand will also have a number of guest exhibitors from software houses and service providers.

**Stand 4042** (0473) 216141

## MIRRORSOFT

On Stand 1601, Mirrorsoft will be sharing with four other companies to present a display of games software, including its 'autumn biggie', *Mean Streak* (makes the Wild Bunch look tame). Mirrorsoft is also showing in the Business Hall for the first time (stand 5053). Its range of DTP and presentation software includes *Fleet Street Editor 1.1* for the IBM and *Graphic-Works 1.1* for the Mac.

**Stands 1601 & 5053** (01) 377 4837

## MONDEC

Mondec designs, manufactures and distributes comms products, in particular for printer/plotter applications. It will show its range of automatic peripheral sharers, and introduce its latest products, *M-Box*, *A-Box*, and *C-Box*, and all its data buffer units.

**Stand 4209** (0272) 230383

## NEUTRAL

Neutral is exhibiting the *Essex* point-of-sale terminal, a low-cost standalone unit that stores all product information and a day's transactions in its solid state memory. It's available in 256k or 1Mbyte versions. Also on show: an easily-installable low-cost network, *NeuNet*.

**Stand 4049** (01) 474 6010

## NEWSFIELD PUBLICATIONS

The publishers of *Crash* and *Zzap! 64* are launching a new magazine at the PCW Show — *The Games Machine*. In Newsfield's first floor mini village, visitors can meet the staff, buy the magazines — and add-ons such as hats, sweat shirts and carrier bags.

**Stand 3047**

## NINE TILES

*Superlink*, exhibited by Nine Tiles, is an inexpensive 1.5Mbaud LAN, allowing networking via direct interface cards or standalone units. Two new products will be demonstrated: *SimpleNetBIOS*, which allows NetBIOS software to be used across Superlink; and *CatenaNet*, running

on Triplos/Superlink computers like the Amiga 2000. The range of *Multilink* interfaces will be available.

**Stand 4051** (0223) 862125

## NOAH SYSTEMS

Texas company Noah is a first-time exhibitor at the PCW Show. It will be showing a number of MS-DOS products for the first time in the UK, including *Friendly Finder*, a pop-up search utility for dBase-III; and the powerful programming languages *Snobol4+* and *Icon*. A £2 shareware diskette will be on sale.

**Stand 0096**

## NOVAGEN

Novelties from Novagen include the *Mercenary* sequel *Mercenary II*, and a fast-action solid 3D combat simulation.

**Stand 3062/3** (021) 449 9516

## OCEAN

The Ocean Stand is promised to be bigger and better this year, displaying Ocean's latest releases in every category of leisure software, from arcade game conversions to original strategy projects on the *Ocean* and *Imagine* labels.

**Stand 1411** (061) 832 6633

## OLIVETTI

Olivetti will be showing its new range of PCs, including the *M240* and *M380*, and the *386-Top Job*, an operating environment that makes full use of the powerful 386-based *M380*.

**Stand 2018** (01) 785 6666

## THE OPEN UNIVERSITY

OU video tapes on applications for artificial intelligence in industry and other AI topics will be shown and on sale at its stand, as well as other videos and materials from the Open University.

**Stand n/a** (0906) 653779

## PACE MICRO TECHNOLOGY

A full range of Pace modems will be on display. Its *Series Four* (three models) is easily upgradable, powerful but simple in operation, claims Pace. Its latest model, the *Linnet*, offers features not normally available on modems in its price range.

**Stand 4026** (0274) 488211

## PAGE 6 PUBLISHING

*Page 6*, the longest-established Atari users' magazine in the UK, will have an Accessory Shop at the Show; a wide selection of public domain software for Atari 8-bit micros and STs; and, of course, copies of *Page 6* itself.

**Stand 4137** (0785) 213928

## PALACE SOFTWARE

Palace will be launching its new label *Outlaw* and giving a first outing to its Autumn and Winter releases at the PCW Show. It will also be exhibiting new versions of its existing games; for instance, the 16-bit version of *Barbarian*.

**Stand 3041** (01) 278 0754

## PALAN ELECTRONICS

As a leading Commodore supplier, Palan will be exhibiting a complete range with full product support. Launches at the Show: the *NCE Hyper-Mouse*, to run with the IBM and compatibles; *Magic Key* diskettes, to enable PC/XT/AT CGA software

to run on Hercules; and the *EVA/480 Enhanced Video Adaptor Board*, fully compatible with IBM's EGA.

**Stand 3001/3003** (01) 368 1276

## PATH GROUP

Path's Allsop product range will be on display — accessories that include media storage, printer stands and drive head cleaners — all elegantly engineered, according to Path.

**Stand 4017**

## PC MAGAZINE

The largest circulation magazine for IBM compatibles will be illustrating aspects of PC productivity. One of the new IBM PS/2s will be on display. Professional PC users will be invited to register for complimentary copies of *PC* magazine.

**Stand 5000** (01) 439 4242



*Personal Computer World* will have three stands at the PCW Show: one in Olympia 2, and a further two in the National Hall.

## OLYMPIA 2

**Stand 2014**

The *Personal Computer World* stand will give visitors the chance to meet face to face the key *PCW* editorial staff and get advice about any computer queries or problems they may have. The October issue of *PCW* and the *Show Catalogue* will be on sale, together with a Back Issues service. *Personal Computer World* will also have a very special subscription offer available throughout the Show.

The stand will feature a great free competition with the prize being a 'holiday for two' in Thailand. To enter this prize draw, just come along to the stand, fill in an entry form and deliver it to stand 5000 on Olympia 2, Level 2.

## NATIONAL HALL

**Stand 1009**

Take a closer look at ten of the computers featured on the front covers of *PCW* in the last year, with reprints of the reviews to take away. Come and talk to the *PCW* editorial team who will be offering advice on problems visitors may have with their own machines. The *Show Catalogue* as well as the October issue will be on sale.

## NATIONAL HALL

**Stand 1400**

*Personal Computer World* will have bags, balloons, badges, T-shirts and hats available on this stand, together with the October issue and the *Show Catalogue*.

# PCW SHOW PREVIEW

## COMPUTER GAMES



HAVE HOURS OF FUN  
WITH  
'PLUG THE LEAD INTO  
THE TERMINAL'  
INCORPORATING  
LATEST BLINDFOLD  
TECHNOLOGY!

### PHILIPS CONSUMER ELECTRONICS

Philips will be showing its latest range of personal monitors, a wide choice of mono or colour, in standard high resolution with a choice of phosphors and built-in compatibility with most PC makes.

Stand 2006 (01) 689 2166

### PIRANHA

Beside a tankful of its namesakes, Piranha will be featuring its latest games: *Yogi Bear* and *Roy of the Rovers* are popular tie-ins, and for those desiring a brain-straining game set in Buck House with bizarre Royals, there is *Flunky*.

Stand 1617 (01) 836 6633

### PITMAN PUBLISHING

Pitman will be displaying and selling the latest in quality books from a range of publishers, including new releases and previews. Software for the Mac, Commodore and Amstrad machines and repair data sheets for all major brands will be on show.

Stand 4027 (01) 379 7383

### PRAYBOURNE

Praybourne offers dust covers and padded luggage to specification, and manufactures sports/promotion bags, T-shirts, and so on. It is launching *Stat Mats* at the PCW Show, a range of economically-priced anti-static mats.

Stand 4005 (0527) 61221

### PRECISION SOFTWARE

'A radical new concept in databases' is how Precision describes *Superbase Professional* to be launched at the PCW Show. Precision is promising to have a major presence, demonstrating its own-badged hardware, PC and Amiga software, and the *Abacus* range of specialist books and software it imports from the US for the ST.

Stands 4208 & 4132 (01) 330 7166

### PRESTON

Preston is the sole importer of the *Enhancer 2000* Commodore 64-compatible disk drive. It will be exhibiting the drive, and a range of Dragon software, peripherals and books.

Stand 3040 (0656) 880965

### PRISM LEISURE CORPORATION

Prism promises something for everyone (distributors, retailers and programmers anyway) at its stand. The computer adaptation of what Prism says will be the board game of 1987 will be released at the Show.

Stand 1423 (01) 804 8100

### PROSPERO SOFTWARE

Two new products are to be launched at the Show by Prospero: *Prospero Gem Pascal* and *Prospero Gem Fortran-77*. They can run on any PC which uses MS-DOS and GEM.

Stand 4000 (01) 741 8531

### PSION

The *Psion Organiser II* and associated software and peripherals will be on view; also *PC-Four*, a suite of four popular business programs for the IBM PC and compatibles, and the *XChange* fully integrated pack of business applications using Xen.

Stand 4022 (01) 723 9408

### PSL MARKETING

Export distributor PSL is only interested in trade customers and so will only be present for the first two days of the Show. Argus Press shares the stand, and will be present for the whole Show, previewing its Autumn releases such as *Red October*.

Stand 1621 (0462) 675544

### PST (TRADING)

PST (Trading) specialises in the export of computer hardware, and welcomes trade customers interested in bulk buying. It will be offering 'PCW Show, Specials' — computers, printers and monitors at low prices.

Stand 1217 (06284) 6911

### R&R DISTRIBUTION (Entertainment)

A private family company big enough to cope and small enough to care, is how R&R describes itself. This distributor of computer software promises following-day courier delivery of the many thousand title range always in stock.

Stand 3039 (0977) 795544

### RAM ELECTRONICS

The *Ram Turbo* joystick interface for the Spectrum and its latest product, *Music Machine*, are among Ram's successes. It is now expanding into OEM projects, confident that the UK is now regarded as an excellent manufacturing base.

Stand 4015 (0252) 850031

### ROBTEK/DIAMOND GAMES

Robtek will be introducing its products for all popular and expanding fields of personal computing. Among them, its DTP package, *Lazer Set*; the *Artpak* drawing, music and animation package; and a video digitiser/scanner.

Diamond games will have a range of games predominantly for 16-bit machines.

Stand 1117 (01) 847 4457

### ROCKFORT PRODUCTS

The *Disciple* disk upgrade system for the Spectrum and relevant software developed by the *Disciple's* User Group will be demonstrated on the Rockfort stand.

Stand 1501 (01) 203 0191

### SAHARA SOFTWARE

Sahara will be showing the *Mirage* operating system for the Atari ST, with a range of software. *Mirage* is a powerful and sophisticated operating system for larger 68000-based computers like the Stride 400 Series and the H-P 300 Series.

Stand n/a

### SAMSUNG ELECTRONICS (UK)

The major launch will be of the Samsung PC/XT and AT compatibles, the *SPC 3000* and the *MFC-6000*. It will also be demonstrating its new range of data monitors, including 12in mono and 14in CGA and EGA screens.

Stand 2010 (01) 391 0168

### SATELLITE COMPUTING

PCW Show regular Satellite will be featuring *Dataplus*, its fourth generation database and application generator. The package can be used by anyone wishing to design their own software applications. Satellite will also be demonstrating presentation systems, including its own *Presenter* product.

Stand 2208 (01) 940 1810

### SENTINEL SOFTWARE

Sentinel, exclusive UK distributor for *WordPerfect*, will be launching an Atari ST version of *WordPerfect*, the word processor, which now runs across 12 mini/micro environments. Among other products demonstrated will be *WordPerfect Executive*, an integrated software suite for managers.

Stand 2116 (0932) 231164

### THE SMALL COMPUTER COMPANY

The company's training centre is the first independent computer education unit in the UK to be totally Atari ST-based. A number of courses are offered in the company's ten-desk classroom located at Bognor Regis.

Stand (0243) 860717

### SOFTSHOP/ADAMS WORLD

Two computer retailers from the South East join forces to offer a broad range of software and peripherals for most popular makes. They promise unbeatable bargains on printer purchases.

Stand 3138 (0753) 889010

### SOFTWARE EXPRESS

Specialist Atari software distributor Software Express will be displaying its *Flagship* range of offerings for the educational, personal productivity and business markets. Guesting on the stand will be Voglar Software of Austria, launching its multi-warehouse stock-control and merchandising program.

Stand 4128 (021) 328 3585

Guide to stand numbers	
FLOOR	NUMBERS BEGINNING WITH
GENERAL	
National Hall (Ground)	1
National Hall (Level 2)	3
BUSINESS	
Olympia 2 (Ground)	2
Olympia 2 (Level 1)	4
Olympia 2 (Level 2)	5

INTRODUCING

# The **TWIN** Classic

**A program so similar to 1-2-3™, that if you know how to use 1-2-3™, then you know how to use the **TWIN****

**SPECIAL  
INTRODUCTORY  
OFFER**

**£49.95**

- A spreadsheet amazingly similar to 1-2-3
- Fantastic presentation level graphics
- 1-2-3 Macro compatible
- Reads and writes 1-2-3 files directly
- Site licensing plans available
- No copy protection.

## PC MANAGEMENT

*"Clones Challenge LOTUS"*

The first clone for LOTUS 1-2-3 is out, and is being sold under the claims of "amazingly similar to 1-2-3" which it is. Software clones of this kind could have a major effect on the market for all PC software. The **TWIN** was developed by MOSAIC SOFTWARE."

## PC MAGAZINE

"Companies currently using 1-2-3 could safely introduce **TWIN** into the same environment. In spreadsheet and database functions it is a true 1-2-3 clone. Represents excellent value for the money. A powerful spreadsheet with very good graphics."

## WHAT'S NEW IN COMPUTING

"The **TWIN** offers the chance to buy a program which has a spreadsheet compatible with 1-2-3 and a number of improvements as well."

## 30-DAY MONEY BACK GUARANTEE

YES, you may try the **TWIN** on your IBM PC/XT, Amstrad PC1512 or compatible (min 512k RAM is needed) for 30 days. If you find that **TWIN** does not perform in accordance with our claims and provided that all goods returned to us (in a good condition) within 30 days of purchase, we will refund your purchase price.

**The **TWIN** offers so much more for so much less!**

**The **TWIN** advantages . . . above and beyond 1-2-3's features, the **TWIN** has the following additional capabilities.**

1. No copy protection for full backup
2. Supports the 8087 coprocessor chip
3. Spreadsheet can import its own and 1-2-3 print files
4. Displays available memory on status line
5. User selectable 16 color display for spreadsheet and graphics
6. Financial functions IRR, NPER, and RATE
7. Bi-level analysis and presentation level analysis
8. Up to 15 different types of graphs
9. 11 text fonts displayable on screen
10. 2 and 3 dimensional graphs
11. Horizontal bar charts
12. Pie-bar combination graphs
13. Logarithmic scales
14. 2 vertical Y axes
15. Optional "Fill in the blanks" for complete user control
16. On-screen slide presentation. Single or sequence of graphs
17. Simple configuration of hardware
18. Point at range names
19. Meaning of function keys is displayed in ready mode
20. Space/backspace operate cursor movement in flip menus
21. Reads and writes DIF files without leaving program

**ORDER YOUR COPY TODAY** New UK version \*\*Time limited promotional offer



SOFTWARE INC.  
0604 830496

**YES I'M IMPRESSED! PLEASE SEND ME A **TWIN** CLASSIC** at the Special Offer price of **£49.95**. I enclose a cheque/money order for £59.40 (includes VAT & Postage) Cheques made payable to MOSAIC SOFTWARE INC.

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TELEPHONE \_\_\_\_\_

Post to: MOSAIC SOFTWARE INC.  
P.O. BOX 97 NORTHAMPTON NN4 0YY

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# PCW SHOW PREVIEW

## NEW INNOVATIONS



STOP INDUSTRIAL  
ESPIONAGE WITH OUR  
USER UNFRIENDLY  
PROGRAM!

### THE SOFTWARE SELECTION

The Software Selection will be selling a wide variety of games for all computers.

Stand 1100 (021) 378 1371

### SOUTHDATA

The latest release of its advanced *Superfile* database manager will be on show, now running on WORM disks.

Stand 4053 (01) 995 7587

### START SYSTEMS

Start Systems, a dealer in advanced graphical equipment, will be demonstrating the *SAM* realtime video digitiser and the *GEN* professional genlock.

Atari World (0304) 363566

### SUN MICROSYSTEMS

The latest of the *Sun-3* family of colour and mono workstations based on the MC68020 will be exhibited, along with a number of DTP third party software.

Stand 5051 (0276) 62111

### SUPERIOR SOFTWARE

'Fast becoming legendary' Superior brings its latest releases and previews for the BBC and Electron markets. *Codename Driod* and *Craze Rider* follow the *Repton* series and the *Superior Collections*.

Stand 3096 (0532) 459453

### SUPERTEC

Atari, Amstrad and Acorn dealer Supertec also offers printers, plotters and modems, as well as 16-bit software.

Stand 4100 (0268) 282308

### SYBEX COMPUTER BOOKS

For the most up-to-date information on computers and how to use them, there is a Sybex book for every level of business and professional user.

Stand 4029 (0279) 26721

### HUGH SYMONS DISTRIBUTION SERVICES

High-profile marketing techniques, professional sales teams, efficient warehouseing and strong back-up services are promised by distributor Hugh Symons, which is planning its biggest stand this year.

Stand 1701 (0202) 745744

### SYNDROMIC MUSIC

MIDI applications on the Atari ST will be exploited by Syndromic Music, showing a range of applications dedicated to the control of MIDI instruments. These include visual editors, librarians, stereo samplers and software. It will be launching the *MIDI MAZE* interactive game at the Show.

Stand 4133 (01) 444 9126

### SYSTEMS ARCHITECTS

Some of the most visually stunning point-of-sale graphics currently available are promised for the Systems Architect stand.

Commodore Village

### TAURUS

Amiga specialist Taurus will be showing its *Acquisition*, a user-friendly, fully-fledged relational programmable database system. It will also show its new fully-professional CAD package, *XCAD*.

Commodore Village (0483) 579399

### TROJAN PRODUCTS

Trojan is launching a Graphics/Lightpen pack for the Amstrad PCW, consisting of the Trojan lightpen and *Cadmaster+* software specially written for the Amstrad.

Stand 3096/17 (0792) 205491

### TULIP COMPUTERS

Tulip (from Amsterdam) is opening its UK subsidiary in September and launching its IBM PC-compatible range at the PCW Show. Three machines will be released:

PC Compact, AT Compact and AT 386 Compact.

Stand 2112

### TYNESOFT

Tynesoft and its budget label Microvalue will be demonstrating its new top line titles, autumn and winter compilations and previews.

Stand 1722 (091) 414 4611

### US GOLD

An arcade coin-op extravaganza is promised by US Gold. It has new titles, new games under a new label, and US classics from Epyx will make the stand resound.

Stand 1311 (021) 356 3388

### VITALMATCH

This is a new company founded by Peter Reich to market DTP systems, customised to clients' specifications and budget, and incorporating an advisory bureau for those needing guidance in their choice of system.

Atari World (01) 243 1062

### WHAT MICRO?

*What Micro?* is a monthly buyers' guide for business users. Editorial focuses on hardware tests, software surveys and vertical market features and peripheral tests. Each issue incorporates a classified buyers' guide. Complementary copies of the October issue (with a 36-page software supplement) will be available.

Stand 4227 (01) 439 4242

## How to get there

### BY RAIL

Olympia has its own BR station. Direct rail services from the Midlands, North West and South coast.

### BY TUBE

From Earls Court (District and Piccadilly lines) take the special PCW Show service to Olympia.

### BY ROAD

Olympia is just off the main M4 route into London and well signposted from the city centre.

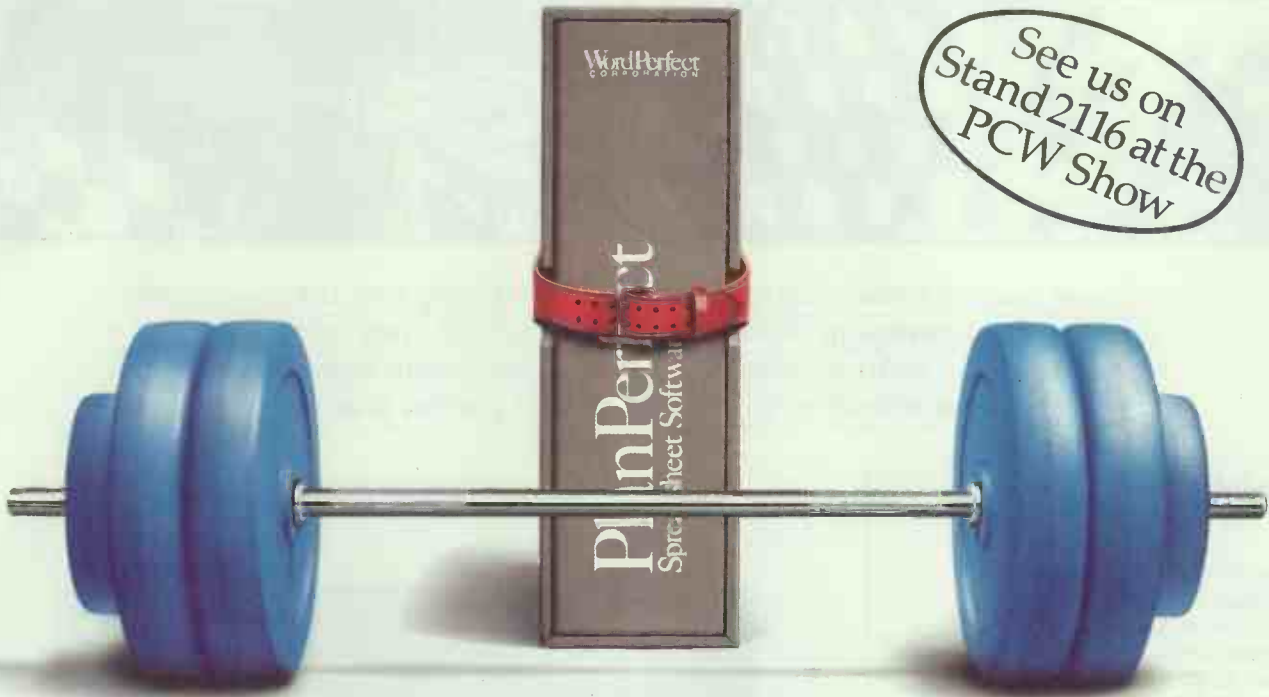
### BY AIR

From Heathrow take the Piccadilly line to Earls Court and change for Olympia. From Gatwick take the direct rail link OR the fast service to Victoria and then travel by tube.





See us on  
Stand 2116 at the  
PCW Show



# PlanPerfect spreadsheet. Easier to work out by our calculations.

PlanPerfect is the heavy weight spreadsheet that's easy to work out but with the muscle to handle your financial planning.

For example, memory isn't wasted storing empty spreadsheet cells. And if you should run out of RAM (after all, PlanPerfect can take advantage of 8 Mb, creating spreadsheets of up to 256 columns by 8192 rows), then elegant handling of virtual memory allows your work to spill over onto disk.

PlanPerfect can increase your output, without the downside of a long learning curve. It's simple yet sophisticated, offering a text processor, dual document editing, and over 80 built-in functions – arithmetic, financial, logical, calendar and text. Don't worry if

you use some esoteric calculations; simply define your own special functions.

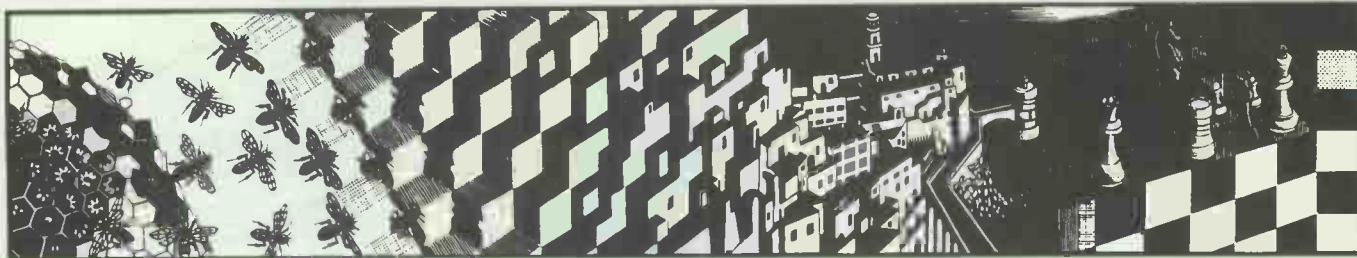
Another definite plus is that text graphics are provided in addition to bit mapped, so you don't necessarily need a graphics adaptor. PlanPerfect integrates perfectly with WordPerfect, the world's leading word processor, for the simple transfer of graphs and spreadsheets into letters and reports. PlanPerfect also adopts a similar easy-to-learn, easy-to-use function key and template approach, with many features in common, and offers you time-saving single keystroke macros in just the same way.

Now call for our brochure and weigh up the advantages of PlanPerfect for yourself.



SENTINEL  
SOFTWARE

Wellington House, New Zealand Avenue,  
Walton on Thames, Surrey KT12 1PY.  
Telephone: (0932) 231164  
Telex: 916005. FERGUS G.



*Some people never learn. If they're not chasing evil uncles around volcanoes or ravaging cities in search of petrol, they're studying at a very gruesome school indeed. Stephen Applebaum tests his nerves in this month's review of the best games around.*

## A night to remember

**Title:** The Lurking Horror  
**Computer:** Many formats  
**Supplier:** Activision  
**Format:** Disk  
**Price:** £24.99 (8-bit version);  
 £29.99 (all others)

It is almost impossible to pick up a computer magazine at the moment and not read the name Infocom; a situation largely due to the company's recent collaboration with Douglas Adams, creator of *A Hitchhiker's Guide To The Galaxy*, and author of the frustratingly difficult and highly overrated adventure, *Bureaucracy*.

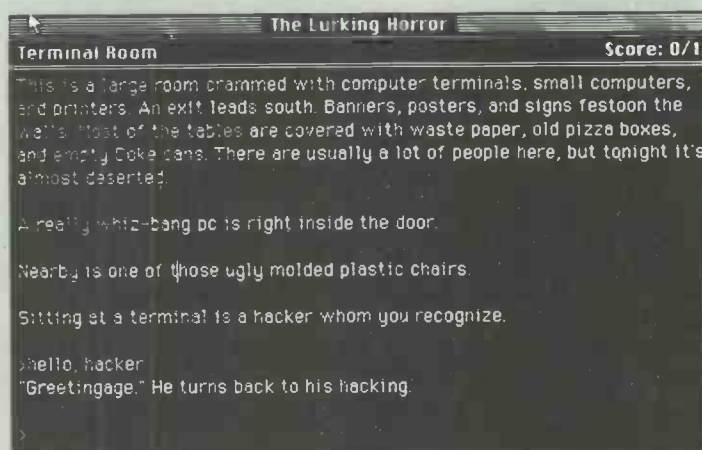
Adams' involvement with Infocom generated so much interest that other, better adventures, launched around the same time or just after *Bureaucracy*, have gone relatively unnoticed. One such game, *The Lurking Horror*, is a powerful exercise in interactive terror that should not be missed by anyone interested in the genre.

Using every trick in the horror writer's repertoire, Dave Lebling has created a claustrophobic atmosphere of all-consuming dread similar to that pervading stories by Poe and two of his greatest peers, Lovecraft and King.

Although *The Lurking Horror's* setting is contemporary, its tone is gothic. Lebling's characters inhabit a superficially mundane world where things look familiar and yet nothing is quite what it seems. Everyday objects gush malevolence, and give *The Lurking Horror* a nightmare quality guaranteed to set your spine tingling.

In keeping with other Infocom adventures, *The Lurking Horror* is entirely text-based; which doesn't matter, because Lebling's descriptions are stomach-turning enough without graphic support.

The story begins in the ominously titled 'terminal room' of the George



Underwood Edwards Institute of Technology (GUE), on the eve of the final day of term. You are there to finish a 20-page paper for presentation the following morning.

Outside a blizzard is blowing hard and the roads are buried beneath impassable snow drifts. Even the elements conspire to make this night one that you will never forget — should you survive long enough to remember it, that is.

Nothing much happens in the game unless you switch on a spare terminal and try to access the file containing your assignment. Instead of your term paper you find some worthless verses and a fuzzy picture showing an unidentifiable animal. Examining the picture propels you into a dreamworld peopled by strange and inhuman creatures. This is your first encounter with the dark forces at work below GUE.

With you in the room is a 'hacker' (a dedicated computer enthusiast), whose only notable feature is a large keyring hanging from his belt. One of

the keys — I won't reveal which — is of vital importance and must be borrowed before you can search several locations. How to persuade the hacker to give you the correct key is your first major problem.

*The Lurking Horror*, like most of its predecessors, is full of minute detail; detail which extends beyond location descriptions to include the tasks you are required to perform at various junctures. For example, in a kitchen adjacent to the terminal room, there is a refrigerator containing food and a microwave oven. It is possible to take food from the fridge and place it in the microwave, wherein it can be cooked. However, to complete this part of the game successfully, you must set the correct cooking time and temperature, or the food will be ruined.

Much of the action in *The Lurking Horror* occurs in basements and interconnecting tunnels located underneath the numerous buildings of GUE. Wandering around is like being one of those characters in a horror

movie who, against all logic, goes for a midnight stroll through a wood, despite his family, best friend and pet budgie having been massacred there the previous night by a rabid, axe-wielding psychopath.

Hidden in these benighted locations are artefacts totally incongruous to the modern surroundings described earlier. A blood-spattered altar bearing cryptic symbols and a sacrificial knife indicate cabalistical practices; while a metal panel hides something unspeakably bad. This could have some connection with the black creature which follows you at various points in the adventure, though I have not yet discovered its true significance.

Not everything evil in *The Lurking Horror* is as obvious or anachronistic as an ancient altar. Even someone as unassuming as a maintenance man can turn out to be one of the undead.

The only way to find out whether people are actually on this side of the veil or not is to stick an axe or other such instrument into them. You have to be careful, though, as this invariably makes them angry.

Notwithstanding my previous allusion to Poe, Lebling's style is much closer to Lovecraft and King in that he revels in lurid descriptions of carnage. I mentioned the maintenance man just now. When he finally lays down and dies he does not croak in the normal way, but 'shortens and dissolves ... undergoes a convulsion, and then explodes into a crowd of small, squealing creatures.'

No Infocom game is packaged without a number of superfluous goodies. Some of which come with *The Lurking Horror* are a laminated student ID card; an amusing guide to help freshmen settle into the college environment; and a synthetic cen-

tipede. Both the ID card and the guide contain information giving access to your files on the PC at the start of the game, but they are all just another Infocom give-away.

So that's *The Lurking Horror*. It is creepy, tasteless in places, as gory as any shock-horror movie and just as fun. Since Infocom has dispensed with its rating system, which indicated the difficulty of each adventure, you cannot tell how you might fare without actually playing the game. I would say, however, that *The Lurking Horror* is ideal for anyone who has some adventuring experience. Complete novices might find it a little too heavy.

If Adams' super-hyped *Bureaucracy* was a slight disappointment, *The Lurking Horror* is a triumph in the traditional Infocom mould. Buy it and lose a few nights' sleep — it will be well worth it.

## Under the volcano

**Title:** Barbarian  
**Computer:** Atari ST; Commodore Amiga  
**Supplier:** Psygnosis  
**Format:** Disk  
**Price:** £24.95

Psygnosis has been around for some time, but the company has never really made its mark on the games market because its products, which are always visually stunning, have lacked gameplay. This is not the result of insufficient programming talent, but the company's apparent belief that if a game looks good it will sell, regardless of whether it is fun to play.

*Arena*, a sports simulation, suffered badly from this philosophy. Not even its excellent graphics could hide the fact that it was just an overblown Track and Field rip-off — and an expensive one at that. What a surprise it was, therefore, to discover that *Barbarian* not only offers the best graphics that ever graced an ST monitor, but also a degree of gameplay far in excess of any previous Psygnosis product.

*Barbarian* is an arcade (graphical) adventure set in a world where good and evil battle for supremacy. As Hegor, a dragon-slaying, beer-swilling, womanising barbarian, you must descend into the Tartarean depths of Durgan, a volcano, in pursuit of Necron, your evil uncle. When found, he has to be destroyed; only then can the people of Thelston, the village in which you grew up, escape from the dark shadow Necron has cast over them.

The only problem with this plan is that Necron lives in the deepest region of an underground kingdom. To reach him, you have to battle your



way past the many creatures that guard the tunnels leading to his lair; the most terrible of which is a giant dragon, Vulcuran, who guards the final entrance to Necron's *sanctum sanctorum*.

Vulcuran is a lumbering mass of scales, made fat on the flesh of countless human victims. His sheer size makes it impossible for Hegor to kill him with a sword — only a bow is potent enough to despatch him.

On his way through Durgan, Hegor must find a bow and collect as many arrows as he can; one is not enough to kill Vulcuran. When the dragon and his master have been destroyed, Hegor can then return to the surface before Durgan finally erupts. The amount of time Hegor has to get back depends on how long it takes to reach Necron and destroy him.

*Barbarian*, like previous Psygnosis titles, relies heavily on visual impact. As soon as the title screen depicting a Tarzan-like figure swinging a broadsword appears, you just *know* you are in for something special.

When the game has loaded, the display divides horizontally to form two windows. The larger of these takes up about two thirds of the screen and features a view onto the current scene; the bottom one contains numerous options for controlling Hegor's movements and posture.

David Lawson and Garvan Corbett,

*Barbarian's* programmers, have done their best to make sure players feel at home with the game's controls. Rather than dictating the type of control device that must be used, they have configured the program to accept input from a joystick and the Atari's mouse and keyboard, none of which need be specified at the beginning of a game since all three can be used at any time.

Unless the keyboard is being used, all actions are initiated by icons chosen from a range of twelve. These make Hegor run, jump, flee, fight, defend himself, pick up and use a weapon, and climb up and down ladders.

Hegor and Necron's wicked minions are all depicted as large and extremely finely detailed animated characters, and how Hegor attacks and defends is dependent on the foe encountered at any one time. If things get too hot, he can be made to run away using the aforementioned 'flee' option. Selecting flee causes Hegor to let out a fearful scream, drop everything he is carrying and bolt towards safety. Running from danger does not always pay off, however, as Hegor sometimes simply runs from one creature into the clutches of another.

Fearsome as his appearance is, Hegor does not cut quite as awesome a figure as his assailants, who

# SCREENPLAY

range from dog-like men in chain-mail to blue rhinos and zombies. Although these look dangerous, most can be killed with one swing of Hegor's sword. Once hit they change into a cloud of vapour, in which can just be seen some skeletal debris, composed of a skull and rib cage.

On top of its amazing graphics, Barbarian also boasts the best digitised sound in an ST game. Here you

have screams, grunts, groans, growls and the clanking of metal. It just goes to show that anything the Amiga can do, the ST can do.

Although Psygnosis would appear to have changed its approach to game design, it has made little headway toward improving its quality check. My copy of Barbarian, like other Psygnosis products I have used, failed to load unless the disk

was held down inside the drive, and even then the game did not always load correctly.

Loading problems aside, Barbarian is an impressive game of outstanding graphic and audio quality. Psygnosis has taken a turn for the better with this one, and has at last overcome the memory of albatrosses like Arena and Bratticas. I look forward to the company's other new titles.

## On the road

**Title:** Roadwar 2000  
**Computer:** Atari ST; IBM; Amiga; Macintosh  
**Supplier:** US Gold  
**Format:** Disk  
**Price:** £24.99

Roadwar 2000 is set in an America torn apart by bacteriological warfare at the dawn of the twenty-first century. Law and order has crumbled, and small pockets of survivors have formed themselves into road gangs who battle for petrol.

Your role in the game is that of a gang leader still loyal to the last remaining fragment of the Federal Government. You are on a mission to find eight scientists who collectively hold the formula for a vaccine to destroy the virulent microbes which continue to poison the land, long after the war has ended. When you have located the scientists, they have to be transported to an underground lab where they can develop the vaccine. Finding the scientists depends on your ability to survive the hostile gangs who control whole regions of America.

Roadwar 2000 is a kind of futuristic dungeons and dragons, in as much as it plays like games of that ilk. Instead of adventurers, however, you have cars. A gang can comprise as many as 15 vehicles, each with its own individual ratings in 24 categories. To acquire the maximum number of cars can take a long time, so, as in most other adventures, it is possible to save a game at any point. I am not sure how long it would take to complete Roadwar 2000, but the packaging cites 50-plus hours as the average playing time.

Roadwar 2000 is played on a map of America. In the Atari ST version tested here, a small icon, representing your gang's position, is moved around the map using the numeric keyboard. At certain instances, messages appear warning of an encounter with another gang. Generally, you have to fight your way out of such a meeting.

The majority of people in a gang



come from one of the categories known as armsmaster, bodyguard, commando, dragoon and escort; the list being in order of decreasing effectiveness. Other members, known as 'cronies', can be doctors, drill sergeants or politicians, and are usually recruited as a result of forays into towns and cities.

Recruiting in cities is dangerous because they swarm with mercenaries, street gangsters, armed rabble and cannibals, among a host of other undesirables. And, as if these were not bad enough, the residents include survivalists, renegade national guardsmen and satanists. Sometimes it is possible to negotiate with the locals, especially if you have a politician in your gang, but, more often than not, force is the only way to get what you want.

Road combat is different to foot combat and is considerably more complex. In all there are three modes available: abstract, tactical and quick. When an encounter occurs, you begin your attack by allocating gang members to whatever vehicles are at your disposal. Depending on how quickly you want to complete this phase, you can either deploy the men manually or get the computer to do it.

After you have deployed all your men, the display changes to show a tactical map whereupon small icons indicate the positions of your vehicles. These can be moved — within certain limitations — to positions where they will be most effective during combat.

Also shown on the map are the positions of the opposing gang's vehicles. Moving one of your cars into an occupied position causes a



'ram' to occur; the amount of damage caused by this move depends on the speeds and masses of the vehicles involved. Before ramming another car it is possible to accelerate, thus increasing the damage potential of the manoeuvre.

Cars need not only be rammed: they can be shot at using a variety of weapons, and even boarded and their crews killed (which is how you increase the number of vehicles under your control). You start a game with six vehicles and increase your total by one each time you win a battle with a rival road gang.

Quick combat is much faster than tactical combat but does not allow enemy vehicles to be captured. Using this method, you are required to set the ram ratio and aiming priorities for each of your groups.

The ram ratio determines the size of enemy vehicles which your vehicles ram. Aiming priorities, on the other hand, refer to the targets you want your men to shoot.

If the pressures of life on the road get you down, you can enter a town or city under the control of another gang, defeat it in combat and take the location for yourself.

Having to worry about rival gangs and mutant bikers means that it's quite easy to forget about the scientists you are supposed to find. Your search can be shortened considerably by a piece of kit called a Radio Direction Finder (RDF). This picks up signals being sent out from a homing device worn by the scientists.

Roadwar 2000 is an imaginative twist on the dungeons and dragons-type scenario. It is intelligent, challenging and, above all, entertaining. What more could you ask for? **END**

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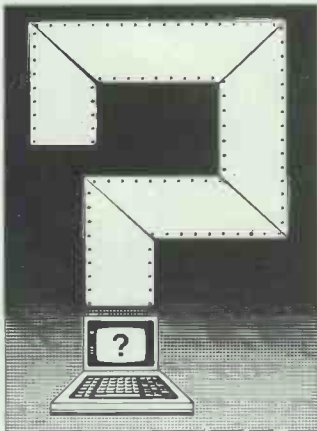
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# COMPUTER ANSWERS

Steve Gold takes his toolkit to your problems.  
The address to write to is: *Computer Answers, PCW,*  
32-34 Broadwick Street, London W1A 2HG



Computer Answers is PCW's help column. We offer advice about all kinds of specific hardware and software problems through the pages of the magazine. We also welcome further information in response to published queries.

## DOS format for hard disk

Having bought a 30Mbyte hard card from my dealer, who formatted the disk for me, I find that I can't get my machine to boot up to DOS properly. Even when I reformat the hard disk using the DOS FORMAT command, it still comes up with a 'Wrong Command.Com File'. Is the hard disk faulty? Should I take it back?  
*Alan Crane, Plymouth*

The problem lies in the DOS you're using. You'll probably find that your version of DOS differs from the one your dealer used to format the hard disk. Unfortunately, it's not simply a matter of re-formatting the hard disk with your version of DOS, as there are fundamental differences between the way that some DOSs format hard disks; right down to the underlying interleave format (how the consecutively numbered sectors are laid down on the disk).

If you are familiar with hard disk formatting, follow the procedure given here precisely; otherwise, return the unit to your dealer and ask him to reformat the disk for your new DOS.

- 1) Place your DOS disk in the drive and type DEBUG, followed by a <Return> or <Enter> at the > prompt.
- 2) At the resultant Debug prompt, start the format program by typing in the following after the '-' appears:  
g=c800:5 followed by a <Return> or <Enter>
- 3) Your screen should say something like this:  
WX2 Format Revision 1.5  
(C) Western Digital Corp  
1986. Current Drive is C:,  
select new drive or (Return)  
for current drive
- 4) Your screen will then tell you:  
Interleave is 3; Select new interleave or hit (return) for current interleave.  
Enter 4 (return) to select interleave 4
- 5) After selecting the interleave factor specified in your hard-disk manual (usually 4), the computer will then ask:

Are you dynamically configuring the drive? Y/N  
6) Select N and press (return) and the drive will commence formatting. This can take up to five minutes or more, depending on the speed of your machine and the size of the hard disk being used.

You may hear the drive making rattling noises, followed by a 'ping'. This is quite normal and merely indicates that the format program has found some bad hard-disk sectors. It may take a few minutes for the program to map these sectors out, so don't panic if the screen display seems to have frozen on a particular sector number.  
7) At the end of the interleave format, the screen should show:

Format Successful

>

You may then proceed with the FDISK and FORMAT :C commands as usual, since your hard disk has now been interleave-formatted for your respective DOS.

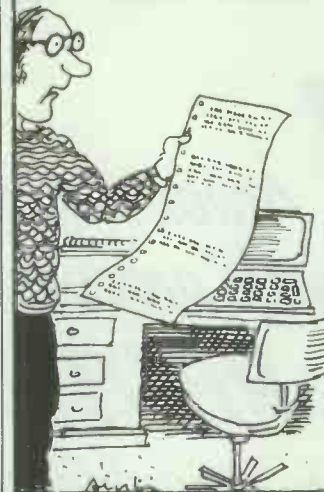
## Apple upgrades

I recently bought a second-hand Apple IIe as a partner to my Macintosh and Imagewriter II printer. Can I use the IIe to drive the Imagewriter?  
*R Reidford, Sheffield*

Yes. You'll need to connect the IIe to the Imagewriter with a special cable and a serial interface card such as Apple's Super Serial Card. Almost any serial card will do — keep an eye on the second-hand columns for bargains. The cable which Apple recommends for the Imagewriter II to a IIe is part number A9C0314.

## Printing gaps

I THINK IT'S A  
READ-BETWEEN-  
THE-LINES FACILITY!



My word processor seems to be incompatible with my printer. It prints out two pages as normal, neatly formatted and numbered. Then, for no apparent reason, it prints a line and proceeds to the next page, leaving great gaps in my printout. What's wrong?  
*P Reid, Barrow-in-Furness*

This is a common problem, particularly with the wide variety of word-processing packages and printers around today.

The problem may be caused if either your software or printer is set up to leave a top and/or bottom margin on each sheet, but is set for the wrong-size paper. First, check the settings on your software — is the package installed for your printer? If in doubt, select 'Epson-compatible' as a reference point.

If this fails, carefully check that the DIP switches on your

printer are set for Epson or IBM-compatibility. Again, when in doubt, select Epson-compatibility as a reference point.

The problem may be caused if you have installed your software for one of the latest generation of 24-pin printers now available, instead of the more common 9-pin printer. The problem lies in the fact that some software uses an <ESCAPE J> to perform a line feed. If this is the case, you will also notice that the gap between the lines on your problem printouts is slightly too wide, owing to the fact that the <ESCAPE J> command instructs the printer to step 1/180in on 24-pin printers and 1/216in on 9-pin printers.

If all else fails, check your computer/printer combination with other software which has been correctly configured. Close examination of the parameter or installation program for your respective programs may reveal the source of your problems.

Another common problem is telling your printer how long your pages are, particularly if you are using A4 paper which is 11 2/3in or 70 lines long. DIP switches or configuration programs invariably only specify 11ins or 12ins.

To set the page length correctly, your software has to send the printer an initialisation string to tell it how long the page is. Otherwise, your software will think there are 70 lines per page, and your printer will think there are only 66 lines and wind the paper on after that number.

If you want to check that your printer is set up correctly, the following method will work on MS-DOS machines and may be adapted for others.

Align the perforations of your continuous paper with the top of the print head. From the keyboard at the DOS prompt type <Ctrl-P>; this echoes anything that appears on the screen to the printer. (The same command turns the echo off.) Type <Ctrl-L>, which is a form feed character, and the paper in the printer should move up. If the perforations no longer align with the print head, then your printer is set to a different form length from the paper.

## Disk failures

**My disks keep failing in my second drive, yet they format OK in both drives. Does my drive need replacing or realigning?**

**Paul Webster, Solihull, Birmingham**

It sounds like you have either bought cheap disks or may have a misaligned disk drive. Try using better-quality disks (yes, I know they cost more, but you do get what you pay for in the disk market).

It could be that your drive heads need cleaning more frequently. Which head cleaner do you use? If you *don't* use a drive head cleaner, then that may be the answer to your problem!

## Lost characters using a modem

**While accessing online services such as Telecom Gold and Prestel, the service didn't appear to accept instructions. This meant that I had to rekey the commands several times before they had any effect. Is there a problem with my modem?**

**Tim Paxton, Ealing, London**

You don't say which software, modem and computer combination you're using, but the chances are it's your modem cable that's at fault. Many modems these days are speed-buffered: that is, they buffer data received until the online service is ready to accept it. In the case of Prestel, for example, data comes in at 1200 baud, while outgoing data goes at 75 baud.

Some computers, notably the IBM PC, Tandy Model III/IV and some Apple II machines, cannot handle such split baud rates, and so communicate with the modem at 1200 baud full duplex or higher, relying on the modem to buffer data as required.

Many modems will work with the ground, signal earth, RX and TX connectors linked correctly. In the case of speed-buffered modems, the DSR (Data Set Ready) and CTS (Clear To Send) connections must be connected through to your computer's serial port. If this is not done, then the X-on/X-off flow control signals that your modem generates may not be received correctly, allowing your outgoing data to be lost, and requiring rekeying before it has been successfully transmitted to the online system.

The exceptions to this rule are the QL and Sinclair Spectrum computers. Since these machines have only a very simple serial port, true duplex (both-way) serial communication is not possible. Instead, outgoing data must wait for the incoming data to finish (and vice versa) if it is not to be 'lost' to the system. In such circumstances, you should wait until all incoming data has been received before issuing commands to the database you are on.

In extreme circumstances, it might be worth investing in a more flexible modem to cope with the inadequacies of your computer's serial port.

## Cheaper hard disks

**I've noticed that 30Mbyte hard disks have become more prevalent in dealer adverts. On enquiry I find that these units are selling for about the same price as 20Mbyte units were earlier this year. As I intend to buy a hard disk for my Amstrad PC in the next few months, should I hold on and wait for the price to fall still further, or buy now? Steve Hemmens, Belper, Derbyshire**

Your question raises a number of points regarding hard disks and Far Eastern equipment generally.

If you've ever examined the video recorder market, you'll have noticed that some machines can squeeze twice as much material onto a single four-hour tape to give up to eight hours of recordings. Such machines are called twin-speed machines, and work by cramming twice as much information onto a tape as normal. While manufacturer claims for such machines are good, often there is a noticeable drop in picture quality when such double-density tapes are viewed.

In the hard-disk world, things have moved similarly. A new type of hard-disk controller is now available that uses a special data format (RLL) which squeezes one and a half times the amount of data into the same amount of space on a hard disk. In theory, therefore, a 20Mbyte hard disk could accommodate up to 30Mbytes of data, with similar performance increases *pro rata* for other hard disk sizes.

The problem is that, like videotapes, the signal quality on such hard disks is not quite

as high as that seen on the old non-RLL controlled hard disks. And, while on video the only bother is slightly more fuzzy picture and sound, there is a greater possibility that such high-density hard disks will produce errors.

As a result, the ST225, which is the most popular hard disk unit around at the moment, is not usually recommended to be used with an RLL controller. That's not to say that RLL-controlled hard disks won't work. On the contrary, many of them do work and work well. The slightly higher-rated ST238 is the best hard disk unit to use with an RLL controller.

If you do find yourself a bargain RLL-controlled hard disk with an ST225 hard disk unit, don't despair. My sources say that, provided the hard disk formats okay, you have only a 20 per cent chance of your hard disk having an error at some stage in its life.

Whatever kind of hard disk you use, it's always wise to use some sort of back-up program to make a copy of your valuable files — 20Mbytes is a lot of information to have to recreate.

On your other point regarding 'buy now or wait for prices to fall further', I say buy now. The Japanese Yen — and several Far Eastern currencies — are doing rather well at the moment, and there's every indication that Far Eastern computer kit prices are set to rise, as importers end up having to pay more for their imported equipment, so don't delay too long.

## SideKick problems

**I use an Amstrad PC1512 with a hard disk and SideKick. Sometimes, for no apparent reason, when I attempt to call up SideKick, the speaker just chirps at me and nothing happens. Is this a problem peculiar to the Amstrad PC? Paul Thompson, Bridgewater, Somerset**

This problem is invariably encountered by SideKick users. Just as you can type ahead of the prompt on the PC, allowing the machine to 'catch up' with you in due course, so PC-DOS or MS-DOS will return control of the machine to you (via the > prompt) when, in fact, it's still carrying out certain housekeeping tasks.

If the DOS task involves certain portions of memory

or reading/writing to disk, SideKick senses the situation and will not page in until it thinks it is safe to do so. At your own risk, it is possible to force SideKick to page in by pressing the ENTER key. This will interrupt the DOS task and bring up SideKick as usual.

## Shareware dollars break the bank

**I regularly download shareware programs for use on my computers, which include a Tandy Model IV and an Amiga A500, from bulletin boards. I also obtain shareware software from my local computer club. I like some of the packages and intend to use them a lot.**

**When I try to register as a user of the software, however, my bank says that it costs at least £10 to send a dollar cheque to the American companies concerned. Since the registration for the software only costs ten to twenty dollars, I think this is an incentive for people not to register.**

**Is there a solution? G Rhodes, Newcastle-upon-Tyne**

Since the 'shareware' idea originated in the US, most registrations have to be made in US currency. Some companies accept credit cards (Access, Visa, and so on) to register, but for individuals and small firms, it is a major disincentive against 'going legal' and registering your software.

Lloyds Bank now has a solution for such situations which is available to both customers and non-customers alike. Thanks to an agreement with American Express, Lloyds now offers dollar money orders for a flat rate of £3 (rather less than many other banks).

The American Express dollar money orders are available 'while you wait' at most Lloyds branches, so it's a relatively easy matter to pop in and get one from your local branch. This is the cheapest way to send dollars to the US at the moment, and the money order is treated as a normal cheque by the US banks.

Steve Gold is a freelance journalist who specialises in computers and computer communications. He writes regularly for several computer publications, both in the UK and abroad.

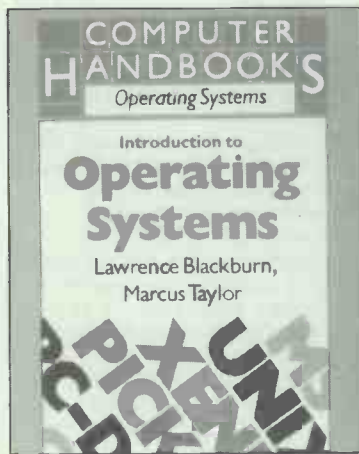
END



# BIBLIOFILE

*Under the spotlight this month come books on operating systems. Our reviewers help you sort out the good buys from the bad.*

## Introduction to Operating Systems



**Authors:** Lawrence Blackburn and Marcus Taylor  
**Publisher:** Pitman  
**Price:** £3.95

I have rather a penchant for handbooks, and I do mean *handbooks*, not those massive volumes that masquerade under that description and yet would have Popeye reaching for his extra can of spinach.

It's probably because I do equate the idea of something being explained simply with the reality of short and unambiguous statements. Why say in 100 words what could be said in 20? You may have guessed by now that I wholly approve of the *Pitman Handbook: Introduction to Operating Systems*. Any book that I can't read as comfortably as a novel and yet pick up and dip into at any point really counts a lot with me: two books for the price of one, really.

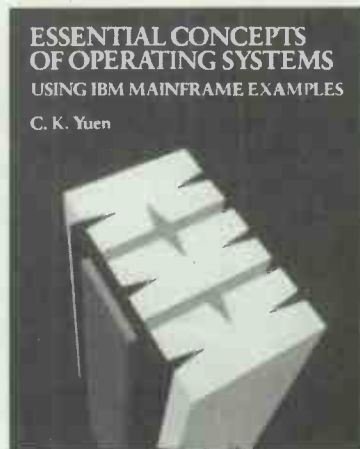
This book can be used as a general introduction, summary, top-up or leader volume for other 'handbooks' in the series on 'Operating Systems'. (Unix and CP/M are also available as separate books by the same authors.) *This short text attempts to touch upon the general design principles used to build operating systems*

*which will efficiently manage the resources of the system.* No space is wasted: a general introductory chapter encompasses all the most important principles, followed by specific chapters on 'Storage Management' through to 'File Management'. 'Chapter 8: Systems Management' ties up all these ideas by considering the management of the system as a whole rather than as separate parts and 'Chapter 9' is invaluable as a brief guide to contemporary popular operating systems for microcomputers, with pages devoted to Unix, Pick, CP/M and MS-DOS among others.

It's not going to answer every question that you may have on operating systems, but then that really wouldn't give any incentive to future authors, would it?

Lorna Kyle

## Essential Concepts of Operating Systems



**Author:** CK Yuen  
**Publisher:** Addison-Wesley  
**Price:** £13.95

Professor CK Yuen states that this book is mainly *'concerned with the concepts of operating systems, rather than the systems themselves.'* If he can make 'concepts' last nearly

200 pages, it makes you wonder what he could do with a fully-blown detailed analysis. It is pretty serious stuff and not a book for light reading or to be dipped into occasionally, especially as mainframe examples are quoted. You are either the type of user who needs and wants to know more about mainframe operating systems or one who wouldn't touch a book like this with a barge-pole.

Topics discussed have been organised by operating system functions but the reader is advised to leave 'Chapter 3: Memory Management' and 'Chapter 6: Data Management' until after 'Chapter 2: I/O Operations', 'Chapter 4: The Management of Concurrent Processes' and 'Chapter 5: Device Management and Resource Sharing' have been covered. If you can try and keep the basic definition in mind, namely *'an operating system is a set of interconnected programs that control the hardware and data resources of a computer and perform system-related functions on behalf of users and user programs'*, then all will not appear lost when diving into the realms of channel programs: that is,

CP CCW X'11', DATA, X'40', 80 monoprogramming, multiprogramming, dynamic partitions of memory management, paging registers, address buffers, task control tables, context switching and PSW registers.

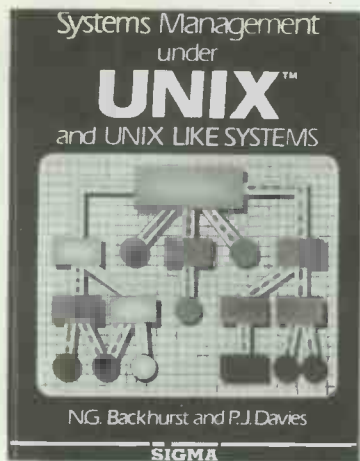
The benefits of an 'industry-standard' operating system, such as Unix, versus machine-incompatible system programs are discussed and the author feels that the concurrent task call facilities of ADA makes it one of the forerunners for a general system programming language.

Each, rather long, chapter ends with a very short summary. Odd exercises are dispersed throughout the text. These are mainly of a discussion type, with twenty additional exercises provided at the end of the book. The diagrams consist mainly of memory maps, block figures and tables. *Essential Concepts of Operating Systems* is a tool for the enthusiast rather than the vaguely interested.

Lorna Kyle



# Systems Management under Unix



**Authors:** NG Backhurst and PJ Davies  
**Publisher:** Sigma Press  
**Price:** £12.95

*Unix — the book*, also from Sigma Press, is accepted by most as the best introduction to Unix for new users. *Systems Management under Unix* is a companion volume for those privileged few who consider themselves system managers. It is intended to be an understandable reference book to sit alongside those cryptic system manuals and steer you in the right direction when problems occur; reading it from cover to cover is a tedious and fruitless task.

The book leads off with a brief description of the history of Unix from its origins in the failure of Multics, through its years with the academics, to its acceptance as a small multi-user business system. It was reassuring to hear the authors express some doubts as to the suitability of Unix for a business environment, and by the end of the first chapter it's made clear that:

- there are better business operating systems but they may not have the applications you need;
- the authors are not blinkered academic Unix gurus; and
- the job of a Unix system manager is not an easy one.

I felt particular empathy with the quote from a toilet wall in a large Unix installation: *'We were promised a pearl, but it turned out to be cultured and there are signs that it might be artificial.'*

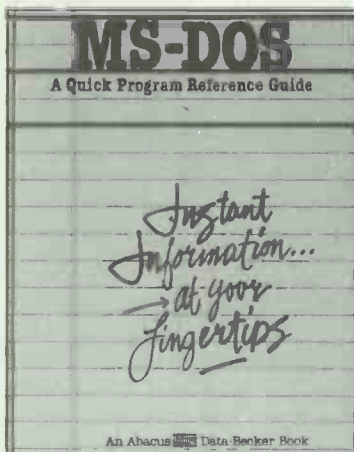
The book then continues with 18 chapters that address the majority of situations a Unix system manager might encounter. The emphasis throughout is on the 'management'

of 'business' installations, which is exactly what it should be. In general, the non-technical explanations of the vagaries of Unix were excellent, particularly the chapter on the cryptic, but immensely powerful, Unix filing system. The discussion of the human factors involved, however, was less satisfactory — an area better described in many general management books.

Overall, I found this book a worthy companion to *Unix — the book*; although I feel it would be of more use in the home of a system manager to be read the night before performing any major task.

Graham Wood

## MS-DOS — A Quick Program Reference Guide



**Author:** J Schieb  
**Publisher:** Abacus Data-Becker  
**Price:** UK price not yet available

The *MS-DOS Program Reference Guide* is intended to be a quick reference tool for knowledgeable MS-DOS users. It is *not* an introductory text and *does* assume some experience of an IBM PC or compatible. As one who has spent considerable time studying the original PC-DOS manual I wondered how much I might discover that I didn't already know; to which the answer proved to be: *nothing*.

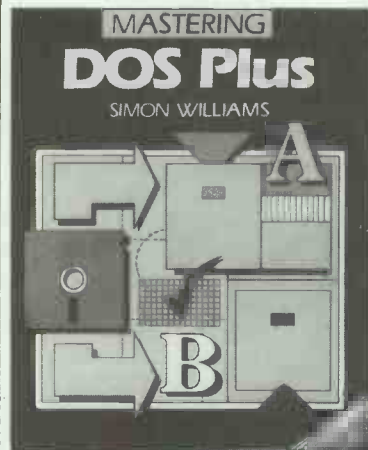
*MS-DOS — A Quick Program Reference Guide* provides a list of all the MS-DOS commands in an alphabetical order with instructions that are remarkably similar to the official Microsoft documentation. Other than this there are two chapters on configuring DOS using CONFIG.SYS and batch processing.

I personally find the manuals that come with MS-DOS just as quick and easy to use as this book, and far

more comprehensive. The only justification I can see for buying this very slim volume is to save desk space. Users of portable and laptop computers might also find it handy, but otherwise save your money for something more worthwhile.

Graham Wood

## Mastering DOS Plus



**Author:** Simon Williams  
**Publisher:** Sigma Press  
**Price:** £12.95

DOS Plus is an operating system that will run both MS-DOS and CP/M-86 programs. It was produced by Digital Research (DR) in an attempt to regain a little ground on the most successful 16-bit operating system, MS-DOS. Unlike other DR products, DOS Plus has the advantage of being bundled with the Amstrad PC1512s. *Mastering DOS Plus* is one of the many books that aim to be an alternative to, and more understandable form of, the official manual.

The back cover claims that the book is relevant to the users of a variety of different machines including the IBM PC, the Amstrad PC1512, the BBC Master and the Philips: Yes. Suggesting that the book will be of interest to BBC Master owners is very misleading, as the Master needs an expensive hardware upgrade in order to run DOS Plus. Including the Philips: Yes in the list is also a bit dubious considering that Philips did not actually sell any in the UK.

Simon Williams divides the book into three main sections: a description of the facilities of DOS Plus; an introduction to GEM and Basic2; and a 'quick reference guide to all those tricky problems you're bound to encounter.' I'm sorry to say that all three sections failed to inspire me. The description of DOS Plus offers little that can't be found in the standard documentation and in places I actually found it less comprehensi-

ble. The guide to GEM proved to be yet another DR advertisement hiding under the guise of editorial (if I see that GEM Paint tiger once more . . .). Possibly the most useful section is the trouble-shooting guide which is good but fails to address a lot of important questions such as 'Why do memory resident MS-DOS programs not work under DOS Plus?'

Despite its general title and the claims of the back cover, the real market for this book is given away in an example 'Expert System' written in the DOS Plus batch language. Using the age old example of choosing a micro, this program recommends Amstrad machines for nine of its ten possibilities. *Mastering DOS Plus* is yet another disappointing book attempting to gain a few bucks at the expense of the naive Amstrad PC owner.

Graham Wood

## Liberating Technology

### LIBERATING TECHNOLOGY

*Steps towards a benevolent society*

John Graves

Author: John Graves  
 Publisher: Peter Owen  
 Price: £12.50

There are two prevailing attitudes towards technological innovation: that of the optimists who claim that it will replace dull, repetitive jobs with exciting, new ones; and that of the pessimists who fear for their very livelihoods as jobs are forfeited in the name of 'progress'. Both stances have their adherents, but the fact of the matter is that there is no simple solution to the 'inevitable reality' of increasing unemployment.

John Graves, a lecturer in Economics and Political Thought and author of *Liberating Technology*, does not claim to have any easy answer to this ongoing dilemma. What he does have, though, is his

personal vision of the future: a vision of a world where work is no longer the be-all and end-all of life (and one where only a few people have to do it, anyway), and where man has discovered his lost humanity and lives in harmony with his neighbours (in every sense of the word) in an all-providing society. He urges us to believe in the liberating potential of this radically new technology, and to use it in a positive way: 'the primary purpose of technology is the enhancement of human life, and the production of tools and time necessary for creative, life-affirming activities . . .'. Mr Graves envisages a post-industrial society which is based on a totally new socio-economic framework, within which technology works for us, rather than against us. To date, he argues, this has not been possible as our 'market' economy forces technology to be linked to purely commercial criteria.

But don't get me wrong; *Liberating Technology* is not an attack on the existing Government (although it's clear that Mr Graves did not vote Tory at the Election), but a *cri de coeur* for facing up to a new world. This new world will involve turning current values and practices on their head, and evaluating our 'real' needs for the future.

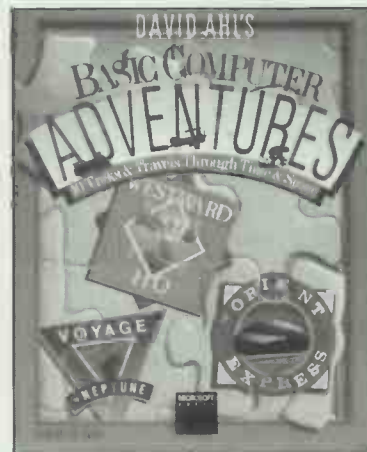
The book lucidly espouses Mr Graves' doctrines for ridding society of its present day *malaise* (I can almost see his students, fresh with their idealism, meticulously scribbling down all his utterances) as he paints a pretty picture of the automated factory and office, and moves on to present his 'ideal' society by redefining the concept of work, and showing how it will become inextricably linked with 'life-affirming activities' (such as voluntary work, and — feminists will love this bit — getting men back into the household) in the 21st century.

Despite what many will no doubt rebuff as 'pure idealism' and 'Utopia' he *has* done his sums and presents a monetary breakdown of how everyone (irrespective of whether they work or not) will have sufficient for their needs under his 'egalitarian social dividend scheme'.

Perhaps I've been watching too many party political broadcasts of late or I've already been brainwashed by eight years of Thatcherism, but in a world without incentive it seems to me that many jobs would never get done at all. *Liberating Technology* is a thought-provoking book which elucidates many universally felt sentiments, but just like a clever politician Mr Graves seems to evade many of the real issues.

Joanna Murchison

## Basic Computer Adventures



Author: David Ahl  
 Publisher: Microsoft Press  
 Price: £6.95

Ex-PCW West Coast columnist David Ahl is well-qualified to write computer adventure games, having worked with Digital Equipment Corporation and AT&T, as well as having founded the first (now folded) consumer magazine devoted to personal computers, *Creative Computing*. In this book he presents us with ten Basic simulations, ranging from the foot-destroying trek of Marco Polo in 1271, through the pedal-pushing power of the Tour de France and ending with a futuristic journey to the planet Neptune in 2100. Each simulation has five unique parts: an introduction to the game; some historical background; program notes; program variables; and the program listing itself.

The games are primarily of a similar theme — that is: how much fuel/food can you carry/consume in order to reach the destination/pick up the jewels in time. A couple of the games even use similar frameworks, but, in all fairness, the proof of the book is in the pudding, or in the playing so to speak, and not in the reading of program listings. If you enjoy simulation games then I'm sure you'll love it, although I personally would have preferred slightly more variety. A disk containing all the programs is available from the author for those with lazy fingers.

Lorna Kyle

Graham Wood runs a computer consultancy in Cheshunt, Hertfordshire. Lorna Kyle is a systems analyst/programmer for a leading UK retail group. Joanna Murchison is a freelance computer journalist.

Next month: artificial intelligence and expert systems.

END

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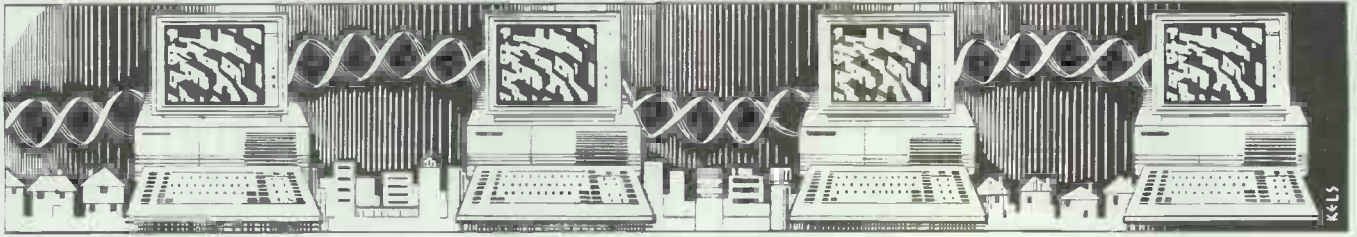
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# Microlink live!

*Microlink is a two-year-old online service which boasts European access points and a flexible email system. Peter Tootill logs on to its facilities.*

Microlink was launched in 1985, and rather than working from scratch, it used the messaging services of Telecom Gold as a base and added a number of other features in an attempt to produce a comprehensive online service. The nature and quantity of those extra features are fairly dynamic, so it's time to find out how Microlink stands after two years' trading.

There are now 7500 Microlink subscribers, and the addition of access points in Europe on the Comshare network (Ian McNaught Davis's company) has attracted a number of European subscribers (for comparison, Micronet has around 20,000 members).

## Electronic mail

Before looking at the 'extras' that Microlink provides, I'll outline the basic services available to any Telecom Gold subscriber. The main one is, of course, electronic mail (known as email for short).

Microlink's electronic mail is a flexible system with all the usual features including advice of receipt, multiple addresses, personal directories and automatic addressing of replies. A batch of messages can be prepared offline and uploaded in one file, even if they are going to different people.

Telecom Gold is just one point on a global email network called Dialcom. The two-digit number that precedes your mailbox number identifies which computer on the network holds your mailbox's contents. UK systems use numbers 72,81,82 and 83, among others.

It is as easy to send a message to a Dialcom subscriber in, say, Canada, as it is to send one to a Gold subscriber in the UK, and costs are economical. Just make sure that you specify the correct computer number on the front of the mailbox; if you don't, or you get the number wrong, the message is returned, undelivered, to your mailbox.

This method, it is generally agreed, is insane. According to the way in which Dialcom is arranged, it is impossible for two systems on the network to have a mailbox with the same name and number, so there's no reason why the user should have

to know which system the message is to go to — Dialcom should work this out for itself.

It is even more aggravating when Gold moves a batch of mailboxes from one computer system to another (which *does* happen). You have to inform your correspondents, or their messages to you will be returned.

Gold users can also send and receive telexes, which is a big incentive for many small businesses who would not otherwise be able to justify the cost of a dedicated telex terminal.

An interesting recent development is the Gold 400 service, which is an implementation of a new international X.400 standard that allows messages to be transferred between electronic mail systems. The impact of this service will depend on how quickly it is implemented by other email systems.

## Services

A number of other services are also provided by Gold to all subscribers and, in some cases, these are run on the system by other organisations. For example, there is a 'World of Lotus' for users of Lotus 1-2-3; general and company news with sys-

### Main menu

BB .... Bulletin Board  
 BR .... British Rail  
 EE .... Electronic Mail  
 EG .... Exhibition Guide  
 FL .... FloraLink  
 GG .... Telecom Gold  
 GT .... Golden Tips  
 GU .... Gold Users Entry  
 GW .... Gateways from MicroLink  
 LL .... List of Bulletin Boards  
 MM .... Microlink Menu  
 NB .... NewsBytes  
 NL .... Microlink Newsletter  
 PP .... MemoPad  
 RR .... Press Reviews  
 SW .... Shop Window  
 TM .... Telemessages  
 TT .... Telex  
 UU .... User Guide  
 WL .... WeatherLink  
 WW .... Who's Who in Microcomputing  
 XX .... TeleSoftware

### Some systems available on Telecom Gold

<b>AIMS</b>	Info on Government and EEC grants for UK businesses
<b>BACS</b>	Bankers Automated Clearing Services pilot scheme
<b>BBC</b>	BBC <i>Micro Live</i> Fact Sheets
<b>DS</b>	DATASOLVE news and information database
<b>FINTECH</b>	FinTech on Gold — Financial Times service on technology
<b>GAMES</b>	Computer games: Lunar Lander, adventures, and so on
<b>IDB</b>	Infomatics Daily Bulletin (info on the computer industry)
<b>INFOCHECK</b>	Companies House info and interpretation
<b>JORDANS</b>	Companies House info with extensive detail on large companies
<b>LOTUS</b>	World of Lotus
<b>OAG</b>	Official Airline Guide
<b>PEM</b>	Petroleum Monitor — daily info on North Sea oil and gas
<b>TEXTNET</b>	Translation, typesetting and other text-related services

tems such as Datasolve (including World Reporter) and Fintech; and, of course, PCW publisher VNU's own IDB — the Infomatics Daily Bulletin — that is a daily news digest of computer and information technology news. It occupies about 20k and can be read, scanned and searched using keywords.

Unfortunately, you have to pay extra charges to use these services, and some are quite steep: Infocheck costs £2.50/min and World of Lotus a mere 5p/min. All these costs are on top of normal Gold charges (and exclude VAT).

### **Microlink extras**

What do you get if you join Microlink? Apart from all the aforementioned facilities, there are a number of services aimed primarily at the domestic user. There are no online multi-user games or conferencing facilities, but there is a bulletin board-type message area; it isn't as flexible as the average Fido or TBBS system, but neither is it engaged as often.

Floralink allows you to send flowers via Interflora; and Press Reviews is a summary of the contents of some of the current micro magazines. The British Rail area only covers services to and from London (although Microlink plans to introduce a comprehensive weekend break feature) and the Exhibition Guide gives details of forthcoming exhibitions. NewsBytes is a weekly computer news magazine; and Shop Window is an area for advertisers which features price lists of computer-related items.

The Telesoftware section currently only covers home micros such as the BBC, the Amstrad CPC and Apple machines. The software has to be in ASCII format which severely restricts the type and length of program that can be provided. Microlink informs me that it now has Kermit file transfer protocols available and is busy adding software for IBM and Atari ST systems. Xmodem protocols should also be available later this year.

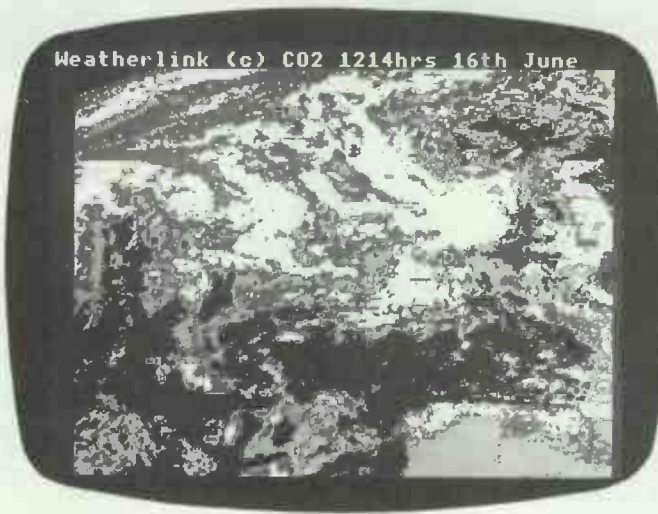
Also of interest on Microlink are 'gateways', which are routes to other systems that can be used via Microlink.

There's also a one-way gateway which allows Micronet users to send messages to Telecom Gold subscribers. Contact Micronet for details.

### **Costs**

Joining Telecom Gold direct costs £40 (excluding VAT), but it's cheaper to join through a user group or other system. Joining through Microlink costs £5 and Micronet subscribers who want to use the gateway can register free of charge.

Time charges for Gold are 11p/min during the day and 3.5p/min between



*Microlink's comprehensive services include the facility to download satellite information about the weather*

7pm and 8am weekdays, plus all day Saturday, Sunday and Bank Holidays. If you don't live in the London local call area, there is an extra charge for using PSS to access the system. This is 2.5p/min at 300 bits/sec and 3p/min at 1200 (including 1200/75).

Using Gold from Micronet is cheaper as there is only a 1p/min gateway surcharge on top of normal Telecom Gold charges — there is no PSS access charge.

On top of the time charges there are storage charges at 20p per 2k unit per month. You need three or four files to run your mailbox effectively, so that can add another £1 a month to the bill. There are no additional charges for sending messages in the UK. Overseas messages cost 20–30p for each 2k block, and telex charges are on a sliding scale and rates depend on destinations. For example, for each 100 characters, a telex sent within the UK costs 5.5p and to the US, 18p. Telexes can even be sent to ships via Inmarsat, at a cost of £2.75 per 400 characters. Incoming telexes are free. If you have a radio pager, you can arrange to be 'bleeped' when a message arrives in your mailbox (this is free).

Microlink charges a flat-rate subscription of £3 a month on top of the normal Gold charges — there are no additional charges, except for the special gateways. If you are a bulletin board addict, used to calling long-distance to your favourite systems, then Microlink via PSS costs about the same.

The documentation provided when you join the system is somewhat superficial, but there are online help files (although you do have to pay to read them).

### **Conclusion**

If you want to send messages to other people who use Telecom Gold, then Microlink is a very useful service. Currently it is the biggest by far of the UK electronic mail companies, with around 76,000 subscribers — the worldwide Dialcom network has

a quarter of a million subscribers. However, the costs can be rather expensive. Gold has recently dropped the £10 minimum monthly charge, but I suspect that few regular users will see any real benefit. For business users £10 is not a lot of money, but for home users Prestel offers many more facilities at considerably less cost, especially as Micronet users can also access Telecom Gold. (Gold's messaging system is streets ahead of Prestel's and much more appropriate for the serious user.) If you have a viewdata terminal you cannot use Telecom Gold directly: you have to use it via a Prestel gateway such as Micronet's Interlink.

On the minus side the Microlink system tends to be slow, with pauses of several seconds not uncommon. Microlink informs me that it is currently rewriting all the software, and this should result in a dramatic improvement in speed.

### **Telecom Gold charges shock**

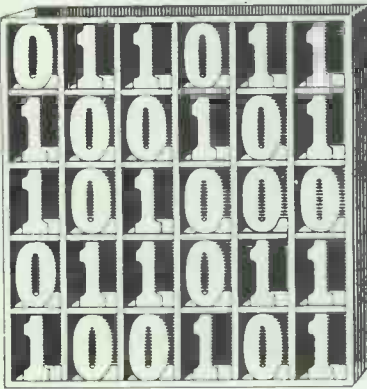
Just as this column went to press, Telecom Gold announced a change to its price structure. The net effect will be a significant increase in charges for those calling with V23 and V22 modems. The effect will be especially felt by those who use the system efficiently — that is, they log on to briefly collect messages and then prepare replies offline.

See this month's Newsprint for more details.

### **How to join**

Microlink is on (061) 456 8383. You can join Telecom Gold direct by calling (01) 403 6777 and asking for an information pack. You can also join Gold through a number of other organisations and user groups, but you will probably already be aware of Microlink if you are in contact with one of these. Micronet subscribers can obtain online information by typing \*INTERLINK#.

You can contact Peter Tootill electronically on: Fidonet node 511/71, Telecom Gold 83:VNU202, Prestel 219991119, or CompuServe 72746.3202.



*David Barrow presents more machine code routines and information for assembly language programmers. All helpful programming hints and short, useful new routines are welcome, as are improvements to or conversions of those already printed. Submissions must be printed or typed clearly and be documented to the SubSet standard, although documentation may be amended for publication. Send your contributions to SubSet, PCW, 32-34 Broadwick Street, London W1A 2HG.*

## 8080 or Z80?

Dave Nicholls of Dartford suggests that although most 8080 programs will run without error on a Z80 system, some will not.

One minor problem is that there are slight timing differences between some instructions that are otherwise identical. For example, the 8080 instruction 'OUT port' (code D3 nn)

takes 10 T-states; but the same instruction in Z80, 'OUT (port), A' (code D3 nn) takes 11 T-states.

A more serious difficulty is that bit 2 of the flags register, F, is always a parity flag in the 8080 but has the double use of parity for logic operations and overflow for arithmetic operations in the Z80. Thus 8080 programs which rely on parity checking after an arithmetic operation cannot be run on a Z80 system.

```

;=====
PCHECK SUB  A          ;A - A = 0. This resets the      97
;overflow (=parity) flag on
;the Z80 but sets the parity
;flag on the 8080.
;skip if P(/V) flag reset.      E2 XX XX
;
; JPO  Z80
;
; 8080          ;put "processor is 8080" message here.
; Z80          ;put "processor is Z80" message here.
;=====
    
```

Fig 1

The parity/overflow discrepancy can be used to check which processor is running a program and abort

if necessary. Include the code in Fig 1 at the start of any sensitive program and you should have no trouble.

## CP/M links

Dave Nicholls has also submitted details of the CP/M linkage editor he uses. This is a Microsoft-compatible linker called ProLink by NightOwl Software and is apparently free, being licensed for non-commercial use and distribution. Dave found the linker on the MBBS Leconfield bulletin board.

ProLink supports batch execution, module placement, symbol file control, patching and automatic library search as well as normal linkage.

Dave also recommends

using a very powerful public domain macro assembler of unknown origin called ZASM. This supports conditional assembly nesting to eight levels, macro nesting to eight levels and file nesting to four levels.

If you don't have a modem for accessing the free software to be found on bulletin boards but wish to try these utilities, Dave has offered to supply both of them along with a useful public domain screen editor free of charge. Send any formatted 3in or 5¼in disk or IBM 8in single-sided disk, full format details and an *sae* to Dave Nicholls, 18 Morgan Drive, Stone, Dartford, Kent DA9 9DT.

## Batcher's short

BATCHZ, from John Kerr of Glasgow, is the only datasheet sent in response to January's request for a sequential implementation of Batcher's parallel sort method.

The algorithm, given in volume three of Knuth's *The Art of Computer Programming*, works on record numbers and requires seven variables. John's routine manipulates record or record key addresses and has no less than eleven

variables — far more than the Z80's available registers. This has made it necessary to store variables on stack and access them by (SP) exchanges and stack indexing. John has also changed the inner section of the algorithm since that given in Knuth cannot deal with addresses.

The two sample comparison routines submitted by John will be published next month, along with a discussion of the differences between the parallel method described by Knuth and John's sequential algorithm.

## DATASHEET 1

```

;=====
;BATCHZ Merge exchange sort based on Batcher's algorithm.
;ASORTZ Ascending order entry into BATCHZ.
;DSORTZ Descending order entry into BATCHZ.
;=====
    
```

### STRUCTURAL CONCEPTS

```

;DATA
;KEYFILE: Simple in-RAM list of same type record keys to be
;sorted into ascending or descending order of
;record. Sort comparison may be on key or record
;value depending on data type & compare routine.
;KEY: Fixed length number or descriptor corresponding
;to a single record. May be same as record.
;RECORD: Unknown, possibly variable length value.
    
```

```

;PROGRAM
n = no. of keys. f = 1st key addr. x = data type.
s <- key length (x).
CMP??? <- comparison operation (x).
g <- f + s * (n - 1).
m <- s * 2 ^ INT (LOG2 (n - 1)).
p <- m.
WHILE p >= s
{
  r <- 0; d <- p; q <- m.
  REPEAT UNTIL q < p
  {
    
```

```

      r <- r + f; d <- d + r.
      WHILE d <= g
      {
        t <- LEAST (g, (d - s + p)).
        WHILE d <= t
        {
          CMP??? record (r), record (d).
          IF compareflag = SET THEN
          {
            SWAP key (r), key (d).
          }
          r <- r + s; d <- d + s.
        }
        r <- r + p; d <- d + p.
      }
    
```

```

      }
      r <- p; d <- q - p; q <- q \ 2.
    }
  }
  p <- p \ 2.
}
    
```

### SYSTEM REQUIREMENTS

```

;PROCESSOR Z80
;HARDWARE RAM containing keyfile.
;SOFTWARE "CMP???" - comparison routines for all data types
Input: B = 0, C = key length,
DK & HL address 1st bytes of two keys.
Output: Entry at CMP??? (descending order):
Cy = 1 if record (HL) > record (DE);
Entry at CMP??? + 1 (ascending order):
Cy = 1 if record (DE) > record (HL).
    
```

### PROGRAM DETAILS

```

;INPUT Cy=1 (or entry at ASORTZ): ascending order sort.
Cy=0 (or entry at DSORTZ): descending order sort.
A = x (data type index (0 - 255), not greater
    
```

```

; than maximum index at (VECTBL)).
; DE = n (number of keys in keyfile).
; HL = f (1st byte of first key).
; OUTPUT
; Cy=0: keyfile sorted into required order.
; Cy=1: sort not performed because of non
; implemented data type, file > 64K, file
; less than 2 keys or memory wraparound.
; STATE CHANGES AF BC DE HL changed.
; I/O ERRORS None.
; OPTIMISATION Use of known Cy status & 0's left in registers.
; INTERRUPTS May be interrupted and re-entered only if
; "CMP???" can be interrupted and re-entered.
; LOCATION NEED Contains absolute address references. PROMable.
; PROGRAM BYTES 227 + VECTBL size (3 bytes per data type + 1).
; STACK BYTES 22 + "CMP???" stack use.
; TIMING To sort randomly generated file into ascending
; order (clock frequency 4 MHz, no interrupts) -
; 1,000 strings of length 0-30: 5 secs.
; 10,000 2-byte signed integers: 1 min 4 secs.
;=====  

; APPLICATION NOTES  

; KEY SORTING The program section which swaps keys can be
; bypassed to allow sorting of complete records or
; other subfields. In this case CMP??? must perform
; the exchange when necessary and return Cy=0.
; LARGE FILES Large random access files may also be sorted by
; assigning a data type index with key size 1.
; Call BATCHZ with DE = n, HL = 1. BATCHZ will work
; on record numbers. CMP??? must read from disk and
; compare records numbered DE & HL, write the
; records back in reverse order if necessary and
; return Cy=0 to bypass BATCHZ's swap code.
;=====  

ASORTZ SCF ;Set Cy for ascending order. 37
JR BATCHZ ; 18 01
DSORTZ CP A ;Clear Cy for descending order BF
;=====  

BATCHZ PUSH HL ;Get start-of-file (f) in IX, E5
EX (SP),IX ;saving original IX on stack. DD E3
PUSH DE ;Save number of keys in file (n). D5
LD D,0 ;DE <-- data type index, x. 16 00
LD E,A ; 5F
LD HL,VECTBL;HL <-- table base 21 XX XX
LD A,(HL) ;A <-- max type index 7E
INC HL ;HL = 1st type length 23
PUSH AF ;Save sort order flag (Cy) F5
ADD HL,DE ;Add data type index * entry 19
ADD HL,DE ;length to base, getting 19
ADD HL,DE ;(HL) = data type length. 19
POP AF ;Restore sort order flag. F1
LD C,(HL) ;C <-- length byte (s) 4E
INC HL ;address CMP??? vector 23
LD B,(HL) ;"LD HL,(HL)" to get 46
INC HL ;CMP??? vector (descending) 23
LD H,(HL) ;order comparison entry address) 66
LD L,B ;in HL. 68
JR NC,NOBUMP;Skip if descending, else bump 30 01
INC HL ;vector for ascending entry. 23
;=====  

NOBUMP EX (SP),HL ;HL <-- number of keys (n). E3
EX (SP),IY ;(SP) <-- IY, IY <-- vector. FD E3
LD B,D ;Clear B, BC = data length (s) 42
PUSH BC ;save as initial value of m. C5
CP E ;If input data type index > max BB
JR C,GIVEUP ;then exit, Cy set. 38 28
;=====  

LD A,16 ;Compute g: count 16 bits 3E 10
LD E,D ;Clear DE as initial product (g) 5A
DEC HL ;Hl = n - 1. 2B
;=====  

JUSTFY ADD HL,HL ;Find ms-bit of n. If ms-bit 29
JR C,MSTART ;appears, skip out to multiply 38 0E
DEC A ;else loop until ms-bit or 3D
JR NZ,JUSTFY;count out with no ms-bit. 20 FA
SCF ;no ms-bit, n was = 1, so 37
JR GIVEUP ;exit, Cy set. 18 1B
;=====  

MLTPLY ADD HL,HL ;mul loop: shift left product 29
JR C,GIVEUP ;exit, Cy set if overflow. 38 18
EX (SP),HL ;access m and shift it left too E3
ADD HL,HL ;to compute m = s*2*int(lg(n-1)) 29
EX (SP),HL ;restack m, restore g E3
EX DE,HL ;access multiplier (n-1) to get EB
ADD HL,HL ;next multiplier bit to Cy 29
;=====  

MSTART EX DE,HL ;(mul entry) HL = product (g) EB
JR NC,MCOUNT;skip if no add in this bit place 30 03
ADD HL,BC ;else add in s 09
JR C,GIVEUP ;exit, Cy set if overflow. 38 0D
;=====  

MCOUNT DEC A ;Repeat for 16-bit product 3D
JR NZ,MLTPLY;HL = g = s * n-1. 20 EF
;=====  

PUSH IX ;copy start-of-file (f) DD E5
POP DE ;to DE and add to HL to complete D1
ADD HL,DE ;HL = g = f + (s * n-1). D9
JR C,GIVEUP ;Exit, Cy set if overflow. 38 04
PUSH HL ;Save g while checking if E5
DEC HL ;the last key straddles 2B
ADD HL,BC ;the 0FFFFH to 0000H memory 09
POP HL ;boundary. E1
;=====  

GIVEUP JP C,NOSORT ;Exit, no sort if Cy = 1. DA IX XX
LD A,C ;A = s 79
POP BC ;BC = initial p from stacked m C1
PUSH BC ; C5
;=====  

FULSCN POP DE ;get m to reset q D1
PUSH DE ;re-save m D5
PUSH DE ;(SP) = q <-- m D5
LD DE,0 ;DE = r <-- 0 11 00 00
PUSH BC ;(SP) = d <-- p C5
EX (SP),HL ;Hl = d, (SP) = g E3
;=====  

SUBSCN PUSH IX ;Copy f to HL while DD E5
EX (SP),HL ;saving d on stack to compute E3
ADD HL,DE ;r <-- r + f 19
EX DE,HL ;in DE EB
POP HL ;HL = d again E1
ADD HL,DE ;HL = d <-- d + r. 19
;=====  

JOBLOT PUSH BC ;Stack p, d, r. C5
PUSH HL ; E5

```

```

PUSH DE ; D5
LD D,0 ;Compute address limit for this 16 00
LD E,A ;set of comparisons; this is 5F
SBC HL,DE ;either the address of the last ED 52
EX DE,HL ;key, g, or else d-s+p, EB
LD L,6 ;whichever is the lesser. g is 2E 06
ADD HL,SP ;buried on stack so point 39
EX DE,HL ;HL to it. EB
ADD HL,BC ;t <-- (d-s) + p 09
EX DE,HL ;in DE. EB
LD C,(HL) ;"LD HL,(HL)" to get g. 4E
INC HL ; 23
LD H,(HL) ; 66
LD L,C ;HL = g. 69
JR C,BEYOND ;computed t wraps, HL = t <-- g. 38 06
SBC HL,DE ; If t < g ED 52
ADD HL,DE ; then use t = g. 19
JR C,BEYOND ; else use t = d - s + p. 38 01
EX DE,HL ; D5
;=====  

BEYOND POP DE ;DE = r D1
EX (SP),HL ;HL = d, (SP) = t E3
LD B,0 ;BC = s (key size) 06 00
LD C,A ; 4F
;=====  

ONEJOB PUSH BC ;Save s, r, d (key size, lower C5
PUSH DE ;and higher pointers). D5
PUSH HL ; E5
CALL JUMPIY ;Call CMP???, compare records r,d CD XX XX
POP DE ;Restore d, r, s, with pointers D1
POP HL ;reversed (HL = lower pointer r). E1
POP BC ; C1
JR NC,NOSWAP;CMP??? said don't swap. 30 10
;=====  

EI DE,HL ;Swap: set higher pointer at EB
ADD HL,BC ;key length + 1. 09
EX DE,HL ; 2B
ADD HL,BC ;Set lower at key length + 1. 09
PUSH BC ;Save s. C5
LD B,C ;B = s for swap count. 41
DEC DE ;Swap loop: Index next bytes 1B
DEC HL ; 2B
LD A,(DE) ;exchange key bytes 1A
LD C,(HL) ; 7E
LD (HL),A ; 44
LD A,C ; 79
LD (DE),A ; 12
DJNZ EXDR ;repeat for s bytes, leaving r, d 10 F7
POP BC ;as before swap. Restore BC = s. C1
;=====  

NOSWAP ADD HL,BC ;Bump r <-- r + s, and save 09
EX (SP),HL ;while getting limit t E3
SBC HL,DE ;to check if pre-bump d = t ED 52
ADD HL,DE ;(SBC sets Z, unchanged by ADD) 19
EX (SP),HL ;re-save t, restore r E3
EX DE,HL ;to DE, HL = d EB
ADD HL,BC ;bump d <-- d + s. 09
JR NZ,ONEJOB;Repeat compares until d > t. 20 DB
;=====  

LD A,C ;Restore A = s. 79
POP BC ;Discard t and restore BC = p. C1
POP BC ;If last bump d <-- d + s wrapped C1
JR C,MEMRAP ;past 0FFFFH, subscan complete. 38 0F
EX DE,HL ;bump r <-- r + p. EB
ADD HL,BC ; 09
EX DE,HL ; EB
ADD HL,BC ;bump d <-- d + p. Again, subscan 09
JR C,MEMRAP ;finished if d wraps. 38 09
EX DE,HL ;Final check; DE = d EB
EX (SP),HL ;HL = g (last key) E3
SBC HL,DE ;check if d > g ED 52
ADD HL,DE ; 19
EX (SP),HL ;restore (SP) = g, E3
EX DE,HL ;DE = r & HL = d EB
JR NC,JOBLOT;continue subscan if d <= g. 30 A7
;=====  

MEMRAP POP DE ;End of subscan; DE = g D1
POP HL ;HL = q E1
CP A ;clear Cy and BF
SBC HL,BC ;compare q, p ED 42
ADD HL,BC ; 09
JR Z,SCNEND ;If q = p, scan ends 28 0D
PUSH HL ;else save value of q E5
SRL H ;q <-- q \ 2 CB 3C
RR L ; CB 1D
EX (SP),HL ;(SP) = new q, HL = old q E3
SBC HL,BC ;HL = d <-- q - p ED 42
PUSH DE ;(SP) = g again D5
LD D,B ;DE = r <-- p 50
LD E,C ; 59
JR SUBSCN ;Go do another subscan. 18 8B
SCNEND EX DE,HL ;HL = g. EB
LD E,C ;E = old p. 59
SRL B ;BC = p <-- p \ 2. CB 38
RR C ; CB 19
CP E ;If old p > s then go do another BB
JF NZ,FULSCN;scan else exit with Cy=0. C2 XX XX
;=====  

NOSORT POP HL ;Discard m, E1
POP IY ;restore saved index registers FD E1
POP IX ; DD E1
RET ;Exit BATCHZ with Cy=0 if sorted. C9
;=====  

JUMPIY JP (IY) ;Transfer control to CMP???. FD E9
;=====  

; CMP??? vector table for particular applications of BATCHZ.
; 1st byte gives maximum data type (one less than number of
; entries in VECTBL).
; Remainder of table consists of 3-byte entries, one for each
; data type:
; 1st byte: key length in bytes.
; 2nd, 3rd bytes: address of associated comparison routine.
; CMPSTR & CMPINT are sample comparison routines.
;=====  

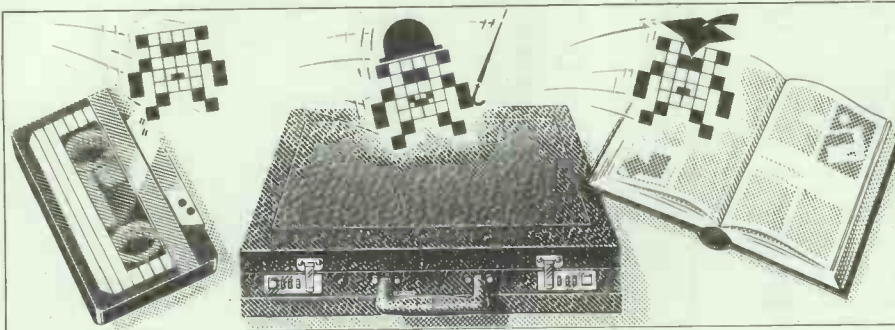
VECTBL DEFB 1 ;Maximum data type index. 01
;=====  






DEFB 3 ;Data type 0: keys sorted are 03
DEFW CMPSTR ;3-byte descriptors of strings. XX XX
;=====  

DEFB 2 ;Data type 1: keys sorted are 02
DEFW CMPINT ;2-byte signed integers. XX XX
;=====  


```

# PROGRAM FILE



-  Games
-  Scientific/mathematic
-  Business
-  Toolkit/utilities
-  Educational/Computer Aided Learning

## All change!

*Perceptive readers have spotted some inconsistencies in the algorithms which have been featured recently. Owen Linderholm presents the changes, along with this month's program selection.*

Despite my recent requests, I haven't received any good-quality algorithm submissions from PCW readers for inclusion in my introductory feature each month. Why not get writing and earn a bit of money? Any algorithms featured in Program File will be paid for at our usual rates (see box on this page). Remember that the algorithm itself will require plenty of explanation, so include up to 1000 words as documentation — plus diagrams, if possible.

I have had some correspondence regarding algorithms, however. Many people have been a little confused about some of the programs that include subroutines which are not used by the main program. These subroutines are included as

examples: although they are not used by the program to demonstrate the algorithm, they are working and useful routines.

### Eagle eyes

A sharp-eyed reader has spotted the errors I made in the addition and subtraction routines in the July issue; so sharp, in fact, that he spotted the 'deliberate' mistake I had left in *after* the corrections. However, he missed one of the little gremlins! Full marks to Keith Holmes for his detective work and for having the courage to try out the program in the first place.

Here is the one other change to make to the program besides those given in the August issue. Line 4090

should be changed to read:

```
4090 IF C<>1 THEN RETURN.
```

Other readers have been just as eagle-eyed about some of the reader programs published recently. Two people wrote in about Mads Dam-Larsen's tip on converting Roman numbers to decimal and vice versa (PCW, June). John Paton and Andrew Simpson sent in a few corrections — amazingly, they sent in almost exactly the *same* corrections. Andrew's observations were very slightly better, so here they are:

● Line 103: Add :IF A=0 THEN 105 at the end of the line.

● Change line 106 to:

```
106 DATA DCCCC, CM, CCCC, CD, LXXXX, XC, XXXX, XL, VIII, IX, III, IV)
```

● Change line 107 to:

```
107 FOR N=1 TO 6: READ A$,B$:Q = INSTR (R$,A$)
```

● Change line 108 to:

```
108 IF Q THEN R$=LEFT$(R$,Q-1) + B$+MID$(R$,Q+LEN(A$))
```

Finally, Dave Swinburn found the output of the BBC/QL Solitaire program (Program of the Month, PCW June) rather confusing in that the board was only displayed when traversing *down* the tree of possible moves; no intermediate states are displayed. Although this does not affect the way in which the program finds solutions, it could be confusing.

The following changes will cause the program to display all the moves and states checked. Note that this will take longer.

```
765 olddep%=dep%
```

```
840 IF sol%=0 AND olddep%-1=dep% THEN VDU 7:
```

PCW is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation, and a listing on plain white paper — typed if you have no printer. Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number.

Check through the previous Program Files to see the kind of programs we prefer. As a rough guide, original ideas are always welcome, as are good implementations of utilities and applications. Obviously the programs should be well-written, easy to understand, and preferably not too long (remember that other readers have to type them in). All programs should be fully debugged and your own original, unpublished work. We prefer to receive programs with a maximum 80-column width printed in emphasised typeface. If possible, please include printed sample output.

We will try to return submissions if they are accompanied by a stamped, addressed envelope of the appropriate size, but please keep a copy of everything. Programs are paid for at the rate of £50 per page of published listing, plus a £50 bonus for the Program of the Month.

Send your contributions to Owen Linderholm, Program File, PCW, 32-34 Broadwick Street, London W1A 2HG.



PROCboardplot (lx%,by%,  
rx%,ty%)

841 IF dirc%<4 GOTO 760

## This month's programs

The Program of the Month is a very useful utility for hard-disk MS-DOS computers. The program is written in standard Microsoft Basic (GW-Basic or BasicA) and can be compiled by a compiler such as Microsoft's Quick-Basic.

The program is a menu and manager system for file access, which allows you to run all and any of your programs on a hard disk from a menu. Some file utilities are also provided and you can drop out to DOS and return to the menus again. Also provided is password protection so that you can keep unauthorised users out of your computer when you aren't at your desk.

Unidraw has been written in Amiga Basic for any Amiga with at least 512k of memory.

There's also a tip for the Apricot which enables you to attach a colour monitor to it; and a suite of programs for the Psion Organiser.

## Program of the Month MS-DOS Basic XT Manager by Richard Jones

XT Manager is a hard-disk menu program that was developed in order to make the loading of programs from hard disk an easier task, and which contains some useful facilities. There is a password protection 'lock': when you are at a menu page and want to leave the computer, no-one can use XT Manager unless they know the password. When the correct password has been input, the current menu page is re-displayed.

There is a floppy disk file where an up-to-date record of all your floppy disks can be kept. An extra use for this file is if the user wants to copy a certain disk to hard disk: the search option can be specified and, if found, the disk(s) matching the specified criteria can be shown. Then, another option can be chosen to copy a disk in drive A: to a specified directory of drive C:.

Another useful feature is the DOS utility menu where the user can specify DOS routines and save them for use in the future — such as running a CHKDSK of A: or B:, for example.

There is also a command by which the user can SHELL to DOS. This means 'pop' back to DOS to do a short task, such as send the directory to the printer; and, on typing EXIT and <Return> at the DOS prompt, the XT Manager program reappears.

There are 10 menu pages within the program, each holding 60 entries. Up to 600 programs can be held in a file, which should be sufficient for most applications.

### Hardware required

- IBM PC/XT or compatible (XT Manager was written on a Ferranti PC/XT)
  - One floppy disk drive (A:)
  - One Winchester hard disk (C:)
  - One colour or mono monitor (if a mono monitor is used it is advisable to alter some of the colours, otherwise the highlighting of menu options may not be apparent)
  - At least 64k RAM
- (Note: This program runs well after compilation with MS QuickBasic, but more memory is needed for this.)

### Loading up

After booting up on drive C, change to the directory containing all the XT Manager files by typing CD\XTMAN. To load XT Manager, a batch file is used; type X.BAT.

The first menu now appears. From here, you can configure XT Manager (a good idea once you have got the hang of using it), exit back to DOS, or load the menu.

### The main menu

On loading, menu page one will appear (as indicated at the top right of the screen). To select a program to run from this page, move the arrow around the screen with the cursor keys until it points to the program you want to run. If, on pressing the cursor keys, nothing happens, press [NumLock] and try again. If nothing happens *still*, check that you have typed in the program correctly. With the arrow pointing at the program you wish to run, press Enter/Return and it will load. Note that if you press Enter at a vacant space on the menu nothing will happen, as the program will have detected that there is no specified program at this position.

To change to another menu page, press '+' and a window will appear. Here, another page can be selected by highlighting the required page number and pressing Enter.

To lock the program while you leave the computer, press L. To return to the menu page, type in the password. As you type, a marker character will be shown on the screen rather than the letters being typed. This prevents casual users seeing your password.

To select the floppy disk file, press 'F' and a window will appear at the top left of the screen. To select an option, press its first letter. To return to the menu page operations, press [Esc] and the floppy disk window will disappear.

The colour of the programs on-screen can be altered, and is done by pressing 'C'. A window pops up

showing the colours available. Move the cursor up or down and select a colour; that colour will be used every time XT Manager is run until you change it once again.

Pressing 'A' shows a different screen. This is used when you want to copy the contents of a disk in drive A: to the root or a sub-directory on C:.

Pressing [TAB] accesses the editor screen.

### The Edit option

**Edit** Invokes the menu page editor.

**Quit-NO SAVE** Returns to the current page menu with no changes made.

**Quit-SAVE** Saves changes and returns to the current page menu.

**Help** Shows a general Help screen.

**Delete an entry** Delete an entry from the current page menu.

**Configure** Allows configuration of menu titles, pages and password (can also be accessed from the initial load-up screen).

Whereas the other options are straightforward enough, 'Edit' has to be explained. When this option is chosen, a coloured block of 10 lines appears and it is here that you type any loading specifications needed for the program. These loading operations should be entered in order, one per line, as this information is directly written to a batch file if the program is selected. This batch file, XTEEXEC.BAT, is then executed. Move the cursor arrow up and down using the up-& down cursor keys (remember [NumLock] if nothing happens). To choose a place to type in a loading command, press Return/Enter. Type in the command. Press Return/Enter. Continue until all the loading details have been entered. When satisfied, press [TAB] and the Editor menu will reappear. In order to save this addition to the current page menu, select the 'Quit-SAVE' option.

### Basic version used

When I wrote this program, I wrote it in MS GW-Basic 3.10 running under MS-DOS 3.1. To shorten typing, I've renamed GW-Basic as GW.EXE. So, in the batch file X.BAT, at the point where GW MAN2.BAS appears, replace 'GW' with whatever your Basic name is: for example, BASIC MAN2.BAS, BASICA MAN2.BAS or GWBASIC MAN2.

Remember that it is vital to load XT Manager from DOS by typing X and *not* by jumping straight in and typing GW MAN2 yourself. The program should be regularly saved while being typed in and it should always be saved before trial running. Unless the program is completely finished and saved before you try to run it, you will be returned to DOS and any new XT Manager program instructions will be lost.

The main program listing contains box-drawing characters for single-

# PROGRAM FILE

line boxes; these can be changed to double-line boxes if preferred. To enter the special characters, you may have to check the necessary ASCII values for your machine.

One other point to remember: your

copy of Basic should be in the same directory as the XT Manager batch files. You should create a directory XTMAN for all the XT Manager files and copy Basic into this.

You will also have to type in and

run the following Basic programs to create the data and batch files that XT Manager needs.

The programs themselves need not be saved (apart from the main program, of course).

## MS-DOS XT Manager file creation

The following details regard the creation of the other files that XT MANAGER needs in order to run correctly.

### COLOUR.DAT

Create this with the following:

```
10 OPEN "O", #1, "COLOUR.DAT"
20 PRINT #1, C
30 CLOSE
```

### DOS.DAT

This contains information used in the DOS CUSTOM command. To create a dummy file, type the following:

```
10 FS="DIR A:"
15 OP1="ECHO INSERT DISK INTO A:" OP2="PAUSE"
20 OP3="DIR A:/P:" OP4="ECHO OK." OP5="ECHO RETURNING TO XT-MAN"
30 OPEN "O", #1, "DOS.DAT"
40 WRITE #1, FS, OP1, OP2, OP3, OP4, OP5
50 CLOSE
```

### FLOPPY.DAT

This file contains information regarding the filing of floppy disks. A dummy file must first be created, for example:

```
10 T="WORDSTAR":D="DISK NO.1":N=1
20 OPEN "O", #1, "FLOPPY.DAT"
30 WRITE #1, T, D, N
40 CLOSE
```

For each disk in the file, there is the TITLE, DISK NAME and its NUMBER.

### XTXEC.BAT

This is the batch file used when a program has been selected to run. This file must be created before XT-MAN can run. This example assumes that PARK.COM resides in the root directory. Change this if need be as where XT-MANAGER is exited, the hard disk is automatically PARKED.

```
10 OPEN "O", #1, "XTXEC.BAT"
20 PRINT #1, "C:\PARK"
30 CLOSE
```

### TYPEIT.BAT

Despite its name, this batch file is used for executing a selected CUSTOM command from the DOS UTILITIES CUSTOM menu. This file is automatically created in the program so a dummy is therefore not needed.

### COPY.BAT

### INSTALLC.BAT

This batch file, run from DOS, installs XT MANAGER onto hard disk C: in sub-directory XTMAN. Type the following:

```
COPY CON:INSTALLC.BAT
echo off
cls
echo
echo This batch file installs all of the
echo files needed for XT-MANAGER to load
echo in directory C:\XTMAN. Many other
echo disk menu's reside in the root part
echo of the directory, but I feel it is
echo neater & more organised to have it
echo tucked away within a sub-directory.
echo
echo To exit this installation, press
echo (Ctrl)(C) (Break) otherwise just
pause
cls
cd \
cd xtman
cd xtman
a:
copy *.* C:\v
cls
echo
echo All files are now loaded over to C:
echo To load XT-MANAGER, just type :
echo C:
echo CD\XTMAN
```

```
ECHO
ECHO
ECHO
ECHO
ECHO
ECHO
ECHO
ECHO
ECHO
ECHO
ECHO
ECHO
```

However, it is far more convenient to include this procedure within the AUTOEXEC.BAT file so that XT-MAN will load automatically on booting up your computer. If this is the first time you have loaded XT-MAN, run the configuration section.

[ Remember ! keep this backup disk safely hidden away. ]

### X.BAT

This batch file MUST be used to load XT MANAGER. If XT MANAGER is loaded directly from BASIC (v.3.10) the program selected WILL NOT LOAD. Type the following to create X.BAT

```
COPY CON:X.BAT
ECHO OFF
@W MAN2.BAS
XTXEC.BAT
```

After typing the above, press F6 and X.BAT will now be saved to disk.

### XT-MNU

This data file contains the screen positions for the 3 columns on the screen. This must also be created before XT MANAGER can be run.

```
5 OPEN "A", #1, "XT-MNU"
10 F(1)=1:F(2)=29:F(3)=59
20 FOR L=1 TO 3
30 FOR T=1 TO 25
40 WRITE #1, T, F(L)
45 NEXT T
50 NEXT L
55 CLOSE
```

This program creates XT-MNU.

```
XT1, XT2, XT3, XT4, XT5, XT6, XT7, XT8, XT9, XT10, XT11, XT12
```

At present, XT MANAGER is designed to run using 10 menu pages. The above files contain all program loading data for the 10 pages. These 10 files must first be created using the program below:

```
5 BS=" "
10 INPUT FS
30 OPEN "A", #1, FS
40 FOR R=1 TO 60
50 WRITE #1, BS, BS, BS, BS, BS, BS, BS, BS, BS, BS, BS
60 NEXT R:CLOSE
```

The above program can be used to create the underlined files above. Run the program repeatedly, entering the file names underlined above, one at a time until each file, underlined above, has been created. The file to be created is input at line 10 of the above program.

### XT6

This file contains all the menu page titles wanted. At present the main program, MAN2.BAS, is set up to only read the first 5 menu titles as I only use the first 5 pages. To change this, alter the loop at line 220 to input the number of menu page titles you want to use.

```
To create this file:
10 T="Demo title"
20 OPEN "O", #1, "XT6"
30 FOR R=1 TO 10
35 PRINT #1, T
40 NEXT R
```

### XT7

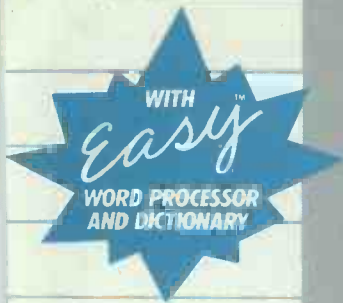
Contains the password in encrypted form. Type the following program. This creates XT7 and writes data to it for the password. The password, on loading XT MANAGER, is IBM (in capitals) until you change it (from configuration option).

```
10 OPEN "O", #1, "XT7"
20 PRINT #1, 237.25
25 PRINT #1, 214.5
30 PRINT #1, 250.25
40 CLOSE
```

## MS-DOS Basic XT Manager main listing

```
1 WIDTH 80:SCREEN 0,1:KEY OFF:COLOR 2,1,1:CLS
2 COLOR 4,6:LOCATE 0
3 LOCATE 2,2:PRINT " "
4 LOCATE 3,2:PRINT " "
5 LOCATE 4,2:PRINT " "
6 LOCATE 5,2:PRINT " "
7 LOCATE 6,2:PRINT " "
8 LOCATE 7,2:PRINT " "
9 COLOR 5,6
10 LOCATE 3,4:PRINT "XT-MANAGER J.S. 1987."
11 COLOR 3
12 LOCATE 4,4:PRINT "-----"
13 COLOR 17
14 LOCATE 5,4:PRINT " Loading .... " :COLOR 2,1
15 FOR P=1 TO 2500:NEXT P
17 CLS
20 COLOR 2,1:LOCATE 2,2:PRINT " "
25 LOCATE 3,2:PRINT " "
30 LOCATE 4,2:PRINT " "
35 LOCATE 5,2:PRINT " "
40 MS(1)="Run XT-MAN" :MS(2)="Configure"
MS(3)="Quit program" :M(1)=3:M(2)=4:M(3)=5
41 OPEN "O", #1, "xtxec.bat":PRINT #1, "C:\park":CLOSE
42 CHECK=1:DIM R(200)
43 LOCATE M(1),4:PRINT MS(1):LOCATE M(2),4:PRINT MS(2):LOCATE M(3),4:PRINT MS(3)
45 Q=3:GOTO 70
```

```
50 Z$=INKEY$
52 IF Z$="8" THEN 80
53 IF Z$="2" THEN 70
54 IF Z$=CHR$(13) THEN 80
55 GOTO 50
60 LOCATE M(Q),4:COLOR 2,1:PRINT MS(Q):COLOR 6,4:IF Q=J THEN Q=3:GOTO 75
65 Q=Q-1:GOTO 75
70 LOCATE M(Q),4:COLOR 2,1:PRINT MS(Q):COLOR 6,4:IF Q=3 THEN Q=1 ELSE Q=Q+1:GOTO 75
75 LOCATE M(Q),4:PRINT MS(Q):GOTO 50
79 STOP
80 IF Q=1 THEN 100
85 IF Q=2 THEN 90
87 IF Q=3 THEN SYSTEM
90 GOTO 3060
100 CH=1:PAGE=CH:COLOUR=1
105 DIM S(200)
106 DIM F(200)
110 DIM FILES(70),OP1$(70),OP2$(70),OP3$(70),OP4$(70),OP5$(70),FED$(60),S$(500),SN$(500),DN$(500)
120 DIM OP6$(70),OP7$(70),OP8$(70),OP9$(70),OP10$(70),X(70),Y(70)
125 COLOR 2,1:LOCATE 12,30:PRINT " "
128 LOCATE 13,30:PRINT " "
128 LOCATE 14,30:PRINT " "
128 LOCATE 15,30:PRINT " "
130 COLOR 3:LOCATE 13,34:PRINT "Loading"
135 LOCATE 14,34:PRINT " XT-MAN ... "
140 REM
```



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# PROGRAM FILE

```

150 Fs(1)="xt1":Fs(2)="xt2":Fs(3)="xt3":Fs(4)="xt4":Fs(5)="xt5"
155 Fs(6)="xt6":Fs(7)="xt7":Fs(8)="xt8":Fs(9)="xt9":Fs(10)="xt10":Fs(11)="xt11":Fs(12)="xt12"
160 Ps="xt6":Ts="xt7"
170 OPEN "I",E1,Fs(CH)
180 FOR I=1 TO 60:INPUT E1,FILES(I),OP1$(I),OP2$(I),OP3$(I),
    OP4$(I),OP5$(I),OP6$(I),OP7$(I),OP8$(I),OP9$(I),OP10$(I):NEXT I:CLOSE

185 T=1
190 OPEN "I",E1,"xt7"
191 WHILE NOT EOF(1)
192 INPUT E1,R(T)
193 T=T+1
194 WEND
195 CLOSE:T=T-1:GOSUB 3000
200 CLOSE
203 OPEN "I",E1,"COLOUR.DAT":INPUT E1,COLOUR:CLOSE
210 OPEN "I",E1,"xt6"
220 FOR R=1 TO 5:INPUT E1,T$(R):NEXT R:CLOSE
230 OPEN "I",E1,"XT-MNU"
240 FOR R=1 TO 60:INPUT E1,X(R),Y(R):NEXT R:CLOSE
245 IF CHECK=2 THEN 425 ELSE 250
250 LOCATE 16,1:COLOR 2:PRINT
252 LOCATE 17,1:PRINT
253 LOCATE 18,1:PRINT
255 COLOR 3:LOCATE 17,3:PRINT "Password :":COLOR 2
257 LOCATE 19,1:PRINT

:REM full screen width
258 LOCATE 20,1:PRINT
:REM full screen width
260 LOCATE 21,1:PRINT

:REM full screen width
262 TRYS="":LOCATE 20,3
263 FOR R=1 TO LEN(Ps)
264 Z$=INKEYS
265 IF Z$="" THEN 264
266 PRINT "E ";TRYS=TRYS+Z$:NEXT R
270 IF TRYS=Ps THEN 425
275 LOCATE 20,2:PRINT "Incorrect Password ....."
:FOR P=1 TO 2000:NEXT P:GOTO 257

425 WIDTH 80:CLS
430 REM RETURN HERE
440 COLOR 3,0,0:CLS
450 LOCATE 1,1:PRINT"XT-MAN - ":COLOR 6:PRINT "R. Jones 1987 FERRANTI PC860XT Disk Menu."
460 COLOR 4
470 LOCATE 2,1:PRINT

:REM full screen width
480 COLOR 3,1:LOCATE 1,68:PRINT "Page ";:COLOR 2,1:PRINT PAGE:
490 COLOR 2,4:LOCATE 2,40-LEN(T$(PAGE))/2:PRINT " ";Ts(PAGE);
500 COLOR COLOUR,0
510 L(1)=1:L(2)=27:L(3)=53
520 C=1
530 FOR O=1 TO 3
540 FOR I=4 TO 23
550 LOCATE I,L(O)
560 IF C<10 THEN PRINT " ";
570 COLOR 1:PRINT C:;COLOR 6:PRINT " ";:COLOR COLOUR,0:PRINT FILES(C)
580 C=C+1
590 NEXT I,0
600 LOCATE 3,3:COLOR 6,0:PRINT " L ":;COLOR 3:PRINT "ock ":;COLOR 6:PRINT "TAB ":;COLOR 3:PRINT "Edit ":;COLOR 6:PRINT "Q ":;COLOR 3:PRINT "uit ":;COLOR 6:PRINT "+- ":;COLOR 3:PRINT "Page ":;COLOR 6:PRINT "C ":;COLOR 3
605 PRINT "olour ":;COLOR 6:PRINT "A ":;COLOR 3:PRINT "dd to C ":;COLOR 6:PRINT "D ":;COLOR 3:PRINT "OS Utilities ":;COLOR 6:PRINT "F ":;COLOR 3:PRINT "lopples
610 Y=4
620 XP=1:YP=1
630 FILE=XP
640 YC(1)=1:YC(2)=30:YC(3)=60
650 LOCATE X(XP),Y(YC(YP)):COLOR 3,0,0:PRINT CHR$(16):COLOR 2
660 LOCATE 1,53:PRINT " Selection:":;COLOR 3:PRINT FILE
670 Z$=INKEYS
680 IF Z$="2" THEN 780 '***** DOWN
690 IF Z$="8" THEN 820 '***** UP
700 IF Z$="4" THEN 860 '***** LEFT A COLUMN
710 IF Z$="6" THEN 900 '***** RIGHT A COLUMN
720 IF Z$=CHR$(13) THEN 940 '***** SELECT
730 IF Z$=CHR$(9) THEN 1200 '***** EDITOR
740 IF Z$="Q" OR Z$="q" THEN 2510 '*** QUIT
750 IF Z$="+" THEN 2290 '***** PAGE ON
760 IF Z$="-" THEN 2300 '***** PAGE BACK
762 IF Z$="C" OR Z$="c" THEN 5000
763 IF Z$="A" OR Z$="a" THEN 6000 '***** ADD NEW DISK TO c: & INSTALL
764 IF Z$="D" OR Z$="d" THEN 7000 '***** DOS UTILS
765 IF Z$="L" OR Z$="l" THEN 9000 '*** LOCK
767 IF Z$="f" OR Z$="F" THEN 9200 '*** floppy search
770 GOTO 670
780 '***** DOWN
790 LOCATE X(XP),Y(YC(YP)):PRINT "
800 IF XP=20 THEN XP=1:FILE=FILE-19:GOTO 650
810 XP=XP+1:FILE=FILE+1:GOTO 650
820 '***** UP
830 LOCATE X(XP),Y(YC(YP)):PRINT "
840 IF XP<2 THEN XP=20:FILE=FILE+19:GOTO 650
850 XP=XP-1:FILE=FILE-1:GOTO 650
860 '***** LEFT
870 LOCATE X(XP),Y(YC(YP)):PRINT "
880 IF YP=1 THEN YP=3:FILE=FILE+40:GOTO 650
890 YP=YP-1:FILE=FILE-20:GOTO 650
900 '***** RIGHT
910 LOCATE X(XP),Y(YC(YP)):PRINT "
920 IF YP=3 THEN YP=1:FILE=FILE-40:GOTO 650
930 YP=YP+1:FILE=FILE+20:GOTO 650
940 '***** SELECTION *****
945 IF FILES(FILE)=" " THEN 650
950 COLOR 2,0,0:CLS
960 LOCATE 2,1:LENGTH=8+LEN(FILES(FILE)):LOCATE 3,3:PRINT "R":
FOR R=1 TO LENGTH:PRINT "=";NEXT R:PRINT "
965 LOCATE 4,3:PRINT " ";:FOR R=1 TO LENGTH:PRINT " ";:NEXT R:PRINT "
968 LOCATE 5,3:PRINT "L":;FOR R=1 TO LENGTH:PRINT " ";:NEXT R:PRINT "
970 COLOR 19,1:LOCATE 4,4:PRINT "Loading ":;PRINT FILES(FILE)
1015 KILL "xtexec.bat"
1020 OPEN "A",E1,"XTEXEC.BAT"
1030 PRINT E1,"ECHO OFF"
1040 PRINT E1,"CLS"
    
```

# PROGRAM FILE

# MICROMART



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```

1050 IF OP1$(FILE)=" " THEN 1060 ELSE PRINT £1,OP1$(FILE)
1060 IF OP2$(FILE)=" " THEN 1070 ELSE PRINT £1,OP2$(FILE)
1070 IF OP3$(FILE)=" " THEN 1080 ELSE PRINT £1,OP3$(FILE)
1080 IF OP4$(FILE)=" " THEN 1090 ELSE PRINT £1,OP4$(FILE)
1090 IF OP5$(FILE)=" " THEN 1100 ELSE PRINT £1,OP5$(FILE)
1100 IF OP6$(FILE)=" " THEN 1110 ELSE PRINT £1,OP6$(FILE)
1110 IF OP7$(FILE)=" " THEN 1120 ELSE PRINT £1,OP7$(FILE)
1120 IF OP8$(FILE)=" " THEN 1130 ELSE PRINT £1,OP8$(FILE)
1130 IF OP9$(FILE)=" " THEN 1140 ELSE PRINT £1,OP9$(FILE)
1140 IF OP10$(FILE)=" " THEN 1145 ELSE PRINT £1,OP10$(FILE)

1143 PRINT £1,"C:"
1145 PRINT £1,"CD\XTMAN
1146 PRINT £1,"X"
1160 FOR P=1 TO 200:NEXT P:CLOSE:CLOSE
1165 COLOR 0
1170 SYSTEM
1190 CHECK=2:GOTO 100
1200 CLS
1205 FOR R=1 TO 10:OP$(R)=" " :NEXT R
1210 CLS
1220 LOCATE 1,1:COLOR 6:PRINT"XT-MAN Menu Editor 1987.":COLOR 2:
PRINT" Jonahsoft (C).":COLOR 3:PRINT" Richard Jones."
1230 LOCATE 2,1:COLOR 4:
PRINT"
:REM full screen width
1240 COLOR 6,4:LOCATE 2,40-LEN(T$(PAGE))/2:PRINT T$(PAGE)
1250 M$(1)=" Edit ":"M$(2)=" Quit-NO SAVE ":"M$(3)=" Quit-SAVE ":"M$(4)=" Help ":"
M$(5)=" Delete an entry ":"M$(6)=" Configure "
1255 N$(1)="Edit a position in the current page menu":
N$(2)="Return to current page menu & don't save changes":
N$(3)="Return to current page menu with latest changes included"
1257 N$(4)="Display general guidance in operation of XT-MAN":
N$(5)="Remove (blank) position on the current page menu":
N$(6)="Configure page menus, password, page titles"
1260 COLOR 6,0
1270 M(1)=1:M(2)=7:M(3)=21:M(4)=32:M(5)=38:M(6)=55
1280 FOR R=1 TO 6:LOCATE 4,M(R):PRINT M$(R):NEXT R
1290 LOCATE 4,67:COLOR 6,1:PRINT " ":"CHR$(27); " :CHR$(26);+" Cursors "
1300 S=2:GOTO 1360
1310 COLOR 8,0:LOCATE 5,1:
PRINT"
COLOR 7,0:LOCATE 5,1:PRINT "Use:":COLOR 3:PRINT N$(6)
1318 Z$=INKEY$
1320 IF Z$="4" THEN 1360 ***** LEFT
1330 IF Z$="6" THEN 1390 ***** RIGHT
1340 IF Z$=CHR$(13) THEN 1420
1350 GOTO 1318
1360 COLOR 6,0:LOCATE 4,M(S):PRINT M$(S)
1370 IF S=1 THEN S=6:COLOR 6,4:LOCATE 4,M(S):PRINT M$(S):GOTO 1310
1380 S=S-1:COLOR 6,4:LOCATE 4,M(S):PRINT M$(S):GOTO 1310
1390 COLOR 6,0:LOCATE 4,M(S):PRINT M$(S)
1400 IF S=6 THEN S=1:COLOR 6,4:LOCATE 4,M(S):PRINT M$(S):GOTO 1310
1410 S=S+1:COLOR 6,4:LOCATE 4,M(S):PRINT M$(S):GOTO 1310
1420 ***** SELECT ONE OF EDITOR OPTIONS
1430 ON S GOTO 1440,1790,1810,1950,2020,90
1440 COLOR 0,0:LOCATE 5,1:
PRINT"
COLOR 4,0:LOCATE 5,1:PRINT"
1445 FOR Q=1 TO 10:OP$(Q)=" " :NEXT Q:NO=0:FED$(NO)
1450 COLOR 2,0:LOCATE 6,1:INPUT "No to edit (1-60).....":NO
1460 LOCATE 6,1:INPUT "Enter name of file (>19 chars).....":FED$(NO)
1465 IF FED$(NO)=" " THEN FILES$(NO)=FILES$(NO) ELSE FILES$(NO)=FED$(NO)
1470 IF LEN(FILES$(NO))>19 THEN 1460
1480 COLOR 3:BLOCK$="
1485 OP$(1)=OP1$(NO):OP$(2)=OP2$(NO):OP$(3)=OP3$(NO):OP$(4)=OP4$(NO):O
P$(5)=OP5$(NO):OP$(6)=OP6$(NO):OP$(7)=OP7$(NO):OP$(8)=OP8$(NO):
OP$(9)=OP9$(NO):OP$(10)=OP10$(NO)
1490 FOR L=8 TO 17:LOCATE L,40-LEN(BLOCK$)/2:PRINT BLOCK$:
IF OP$(L-7)=" " THEN 1495 ELSE COLOR 4,3:LOCATE L,40-LEN(BLOCK$)/2+1:
PRINT OP$(L-7):COLOR 3
1495 NEXT L
1500 LOCATE 20,1:COLOR 6,1:
PRINT"
:REM full screen width
1510 COLOR 6,1:LOCATE 21,1:
PRINT"[To enter data to a field : press Enter : type in loading command :
press Enter]":LOCATE 22,1:
PRINT"[Press up & down cursors : check [NumLock] : when done : press <TAB
> for menu: "
1520 LOCATE 23,1:COLOR 6,1:
PRINT"
:REM full screen width
1530 COLOR 2,4:LOCATE 7,29:PRINT"Commands:"
1540 COLOR 2,1
1550 FOR L=1 TO 10:LOCATE L+7,(40-LEN(BLOCK$)/2)-4:PRINT L:
IF L<10 THEN COLOR 1:PRINT" :COLOR 2,1
1560 NEXT L
1565 LOCATE 18,2:PRINT" Editing no.":NO
1570 P=8
1580 COLOR 6,0:LOCATE P,(40-LEN(BLOCK$)/2)-5:PRINT CHR$(16):COLOR 1,3:
LOCATE P,(40-LEN(BLOCK$)/2)+1
1590 LOCATE 18,59:PRINT " Command ":"P-7;"/10 "
1600 Z$=INKEY$
1610 IF Z$=CHR$(13) THEN 1650
1620 IF Z$="8" THEN 1670
1630 IF Z$="2" THEN 1690
1640 IF Z$=CHR$(9) THEN 1710 ELSE 1600
1650 COLOR 4,3:LOCATE P,(40-LEN(BLOCK$)/2)+1:LINE INPUT OP$(P-7)
1660 GOTO 1580
1670 COLOR 8,8:PRINT " :IF P=8 THEN 1580 ELSE 1680
1680 LOCATE P,(40-LEN(BLOCK$)/2)-5:PRINT " :P=P-1:GOTO 1580
1690 COLOR 8,8:PRINT " :IF P=17 THEN 1580 ELSE 1700
1700 LOCATE P,(40-LEN(BLOCK$)/2)-5:PRINT " :P=P+1:GOTO 1580
1710 ***** END
1720 FILES$(NO)=FED$(NO)
1730 OP1$(NO)=OP$(1):OP2$(NO)=OP$(2)
1740 OP3$(NO)=OP$(3):OP4$(NO)=OP$(4)
1750 OP5$(NO)=OP$(5):OP6$(NO)=OP$(6)
1760 OP7$(NO)=OP$(7):OP8$(NO)=OP$(8)
1770 OP9$(NO)=OP$(9):OP10$(NO)=OP$(10)
1780 COLOR ,0:GOTO 1200
1790 ***** NO SAVE
1800 CLOSE:COLOR ,0:CHECK=2:GOTO 125
1810 ***** SAVE
1820 CLOSE
1830 IF PAGE=1 THEN F$="XT1"
1840 IF PAGE=2 THEN F$="XT2"
1850 IF PAGE=3 THEN F$="XT3"
1860 IF PAGE=4 THEN F$="XT4"
1870 IF PAGE=5 THEN F$="XT5"

```



# PROGRAM FILE

# MICROMART

```

2305 COLOR 0:FOR R=8 TO 13:LOCATE R,4:PRINT "          ":NEXT R
2307 COLOR 4:LOCATE 8,3:
PRINT "
2309 LOCATE 9,3:
PRINT "
2311 LOCATE 10,3:PRINT "
2312 LOCATE 11,3:PRINT "
2313 LOCATE 12,3:PRINT "
2317 COLOR 0:FOR R=14 TO 19:LOCATE R,1:
PRINT "
NEXT R
2319 COLOR 2,1:LOCATE 14,1:
PRINT "
2320 LOCATE 15,1:
PRINT "
2322 LOCATE 16,1:
PRINT "
2323 LOCATE 17,1:
PRINT "
2324 LOCATE 18,1:
PRINT "
2325 LOCATE 19,1:
PRINT "
2340 M$(1)=" I ":M$(2)=" II ":M$(3)=" III ":M$(4)=" IV ":M$(5)=" V "
2345 M$(6)=" VI ":M$(7)=" VII ":M$(8)=" VIII ":M$(9)=" IX ":M$(10)=" X "
2350 M(1)=6:M(2)=9:M(3)=13:M(4)=18:M(5)=22:M(6)=27:M(7)=33:M(8)=39:M(9)=45:
M(10)=51
2360 COLOR 1,0,0:FOR R=1 TO 10:LOCATE 10,M(R):PRINT M$(R):NEXT R
2370 LOCATE 12,9:COLOR 6,1,0:PRINT " ":CHR$(27):" ":CHR$(26):" ESC exit "
2380 S=2:GOTO 2440
2390 LOCATE 16,3:COLOR 2,1:PRINT "Menu : ":COLOR 3:PRINT T$(S)::
R=80-LEN(T$(S)):R=R-11:FOR L=1 TO R:PRINT " ":NEXT L
2395 Z$=INKEY$
2400 IF Z$="4" THEN 2440 "***** LEFT
2410 IF Z$="6" THEN 2470 "***** RIGHT
2420 IF Z$=CHR$(13) THEN 2500
2425 IF Z$=CHR$(27) THEN 430
2430 GOTO 2395
2440 COLOR 1,0:LOCATE 10,M(S):PRINT M$(S)
2450 IF S=1 THEN S=10:COLOR 6,4:LOCATE 10,M(S):PRINT M$(S):V=1:GOTO 2390
2460 S=S-1:COLOR 6,4:LOCATE 10,M(S):PRINT M$(S):V=S+1:GOTO 2390
2470 COLOR 1,0:LOCATE 10,M(S):PRINT M$(S)
2480 IF S=10 THEN S=1:COLOR 6,4:LOCATE 10,M(S):PRINT M$(S):V=5:GOTO 2390
2490 S=S+1:COLOR 6,4:LOCATE 10,M(S):PRINT M$(S):V=S-1:GOTO 2390
2500 IF S=CUR THEN 430 ELSE PAGE=S:CH=PAGE:CHECK=2:CLS:GOTO 125
2510 SYSTEM
3000 '
3005 G$=""
3010 FOR LOOP=1 TO T
3020 A=R(LOOP)/3.25
3030 C$=C$+CHR$(A)
3040 NEXT LOOP
3050 P$=C$:CLOSE:RETURN
3060 KEY OFF:T=1:Y=0
3080 CLOSE:OPEN "I",E1,"XT7"
3090 WHILE NOT EOF(1)
3100 INPUT E1,Y(T)
3110 T=T+1
3120 WEND:T=T-1:CLOSE:GOSUB 3890
3130 COLOR 6,1
3140 CLS:LOCATE 1,1:
PRINT "XT-MAN Configuration Program R.Jones 1987. JS Corp.
3150 COLOR 2:LOCATE 2,1:
PRINT "Please enter the current system password below to gain acc
ess
3160 COLOR 3:LOCATE 4,1:
PRINT "
3170 COLOR 2:LOCATE 6,1:PRINT "PASSWORD:=>";
3180 TRY$=""
3190 FOR R=1 TO LEN(P$)
3200 Z$=INKEY$:IF Z$="" THEN 3200
3210 PRINT "E ":TRY$=TRY$+Z$:NEXT R
3220 IF TRY$=P$ THEN 3240
3230 LOCATE 8,1:PRINT "Invalid password => Access Denied (<=":FOR P=1 TO 3000:
NEXT P:SYSTEM
3240 LOCATE 8,1:PRINT "Password => Accepted
3250 LOCATE 10,1:COLOR 6:
PRINT "
3260 PRINT
3270 COLOR 3
3280 PRINT "In this program you may install XT-MAN for your own needs; you are
asked for a system Master password, 5 file menu titles which can contain
labels for the types of application used."
3290 PRINT "or perhaps have them display your company title & phone number for
example. You may also install new menus, simply by answering question
s. Be warned !! if you choose to install new menus."
3300 PRINT "all previous data held in the menus will be cleared out in preparat
ion for you adding new programs to the menus. It is important for you to
choose an obscure password, otherwise unauthorised"
3310 PRINT "users may be able to access your system & corrupt data even! If you
wish to discontinue this program now, press Q otherwise press C to co
ntinue
3320 PRINT:COLOR 6:
PRINT "
3330 Z$=INKEY$
3340 IF Z$="C" OR Z$="c" THEN 3370
3350 IF Z$="Q" OR Z$="q" THEN CLOSE:SYSTEM
3360 GOTO 3330
3370 FOR R=1 TO 9:PRINT:NEXT R
3380 VIEW PRINT 16 TO 20
3390 COLOR 3
3400 P$="" : CLEAR OLD PASSWORD
3410 PRINT "Qn 1. Please enter a system password => ";
3420 Z$=INKEY$:IF Z$="" THEN 3420
3430 IF Z$=CHR$(13) THEN 3450
3440 P$=P$+Z$:PRINT " ":GOTO 3420
3450 PRINT:PRINT:GOSUB 3960
3460 INPUT "Qn 2. Menu title E1 => ":M$(1)
3470 INPUT "Qn 3. E2 => ":M$(2)
3480 INPUT "Qn 4. E3 => ":M$(3)
3490 INPUT "Qn 5. E4 => ":M$(4)
3500 INPUT "Qn 6. E5 => ":M$(5)

```

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# PROGRAM FILE

```

3502 INPUT "Qn 7.          £6 ==> :Ms(6)
3503 INPUT "Qn 8.          £7 ==> :Ms(7)
3504 INPUT "Qn 9.          £8 ==> :Ms(8)
3505 INPUT "Qn 10.         £9 ==> :Ms(9)
3506 INPUT "Qn 11.        £10 ==> :Ms(10)
3510 FOR P=1 TO 8:PRINT:NEXT P
3520 PRINT "Qn 12. Clear all menus Y/N ==> ";
3530 Qs=INKEY$
3540 IF Qs="Y" OR Qs="y" THEN 3570
3550 IF Qs="N" OR Qs="n" THEN 3740
3560 GOTO 3530
3570 '***** CLEAR ALL MENUS
3580 PRINT Qs;
3590 KILL"XT1"
3600 KILL"XT2"
3610 KILL"XT3"
3620 KILL"XT4"
3630 KILL"XT5"
3631 KILL"xt8"
3632 KILL"xt9"
3633 KILL"xt10"
3634 KILL"xt11"
3635 KILL"xt12"
3640 Fs(1)="XT1":Fs(2)="XT2":Fs(3)="XT3":Fs(4)="XT4":Fs(5)="XT5"
3645 Fs(6)="xt8":Fs(7)="xt9":Fs(8)="xt10":Fs(9)="xt10":Fs(10)="xt11"
3650 Bs=""
3660 FOR O=1 TO 10
3670 OPEN "A",#1,Fs(O)
3680 FOR I=1 TO 60
3690 WRITE #1,B$,Bs$,Bs$,Bs$,Bs$,Bs$,Bs$,Bs$,Bs$,Bs
3700 NEXT I
3710 CLOSE
3720 NEXT O
3730 CLOSE:PRINT "-cleared"
3740 PRINT:PRINT
3750 PRINT "Processing password + titles ....";
3760 KILL"xt7"
3770 KILL"xt6"
3780 OPEN "a",#1,"xt7":FOR R=1 TO LEN(Ps):PRINT #1,B(R):NEXT R
3790 CLOSE:OPEN "a",#1,"xt6"
3800 PRINT #1,Ms(1)
3810 PRINT #1,Ms(2)
3820 PRINT #1,Ms(3)
3830 PRINT #1,Ms(4)
3840 PRINT #1,Ms(5)
3850 CLOSE
3860 PRINT:PRINT "Loading XT-MAN ...."
3870 VIEW PRINT
3880 CLEAR:GOTO 1
3890 ' DSKFILE-> PROGRAM READABLE
3900 Cs=""
3910 FOR LOOP=1 TO T
3920 A=Y(L)/3.25
3930 Cs=Cs+CHR$(A)
3940 NEXT LOOP
3950 Ps=Cs:CLOSE:RETURN
3960 'program readable -> disk file
3970 FOR L=1 TO LEN(Ps)
3980 A=ASC(MID$(Ps,L,1))
3990 B(L)=A*3.25
4000 NEXT
4010 CLOSE:RETURN
5000 'IF COLOUR=9 THEN COLOUR=1 ELSE COLOUR=COLOUR+1
5010 'GOTO 500
5020 COLOR 6,0
5030 LOCATE 3,50:PRINT "
5040 FOR R=4 TO 15
5050 LOCATE R,50:PRINT "
5060 NEXT R
5070 LOCATE 16,50:PRINT "
5075 LOCATE 4,51:COLOR 2:PRINT " Selection :
5080 FOR R=1 TO 9:LOCATE R+5,52:COLOR R,0:PRINT "
5085 P=COLOUR:GOTO 5125
5090 Zs=INKEY$
5100 IF Zs="2" THEN 5120
5110 IF Zs="8" THEN 5130
5115 IF Zs=CHR$(13) THEN 5150
5117 GOTO 5090
5120 LOCATE P+5,62:PRINT "
5123 IF P=9 THEN P=1 ELSE P=P+1
5125 COLOR 7:LOCATE P+5,62:PRINT CHR$(17):GOTO 5090
5130 LOCATE P+5,62:PRINT "
5135 IF P=1 THEN P=9 ELSE P=P-1
5140 GOTO 5125
5150 COLOUR=P:CLOSE:OPEN "O",#1,"COLOUR.DAT":PRINT #1,COLOUR:CLOSE:GOTO 430
6000 CLS
6005 COLOR 2,0,0:LOCATE 1,1:
PRINT "
6010 LOCATE 2,1:
PRINT "
6015 LOCATE 3,1:
PRINT "
6030 COLOR 6:LOCATE 2,3:PRINT " Add floppy programs to winchester C:"
6035 LOCATE 5,2:PRINT " To continue & copy a floppy over to C: and then install
it in XT-MAN, press Y otherwise press N to return to page menu :":
COLOR 6:PRINT PAGE
6040 Zs=INKEY$
6045 IF Zs="Y" OR Zs="y" THEN 6100
6050 IF Zs="N" OR Zs="n" THEN 430
6060 GOTO 6040
6100 LOCATE 8,1:COLOR 3:PRINT "
6103 LOCATE 9,1:COLOR 3:PRINT "
6105 LOCATE 10,1:COLOR 3:PRINT "
6110 LOCATE 9,3:COLOR 2:PRINT "Insert disk in A:
6115 LOCATE 11,3:PRINT " and press ENTER when ready.
6120 Zs=INKEY$:IF Zs=CHR$(13) THEN 6125 ELSE 6120
6125 LOCATE 13,3:COLOR 3:PRINT "Directory to copy disk to (C:) .....":
INPUT DIR$
6130 IF LEN(DIR$)>8 THEN 6125 ELSE 6135
6135 LOCATE 15,3:COLOR 2:
PRINT "Ensure disk is in A: with the latch down & press ENTER
to begin copy of disk. ";
6140 Zs=INKEY$:IF Zs=CHR$(13) THEN 6150 ELSE 6140
6150 COLOR 6:PRINT " <ENTER>"
6160 KILL"XTEXC.BAT":CLOSE
6170 OPEN"a",#1,"XTEXC.BAT"
6171 PRINT #1,"ECHO OFF"
6172 PRINT #1,"CD\"
6173 PRINT #1,"IF EXIST C:\DIR$ GOTO PC"
6177 PRINT #1,"MD C:\DIR$"
6179 PRINT #1,"":PC"
    
```



# PROGRAM FILE

```

6181 PRINT £1,"CD\XTMAN
6185 PRINT £1,"a:"
6190 PRINT £1,"copy *.* c:\DIR$
6195 PRINT £1,"C:"
6200 PRINT £1,"chdir C:\xtman"
6205 PRINT £1,"cls"
6210 PRINT £1,"dir C:\DIR$"
6215 PRINT £1,"pause"
6220 PRINT £1,"x"
6225 CLOSE
6230 PRINT:COLOR 2:PRINT"Processing now ....."
6235 CLEAR
6240 CHDIR"C:\XTMAN
6245 VIEW PRINT 20 TO 23
6250 SYSTEM
7000 '***** dos utils
7003 CLEAR
7005 COLOR 2,1:LOCATE 7,20:PRINT"
7006 COLOR 2,1:LOCATE 8,20:PRINT"
7010 FOR R=9 TO 14:COLOR 2,1:LOCATE R,20:PRINT"
7020 LOCATE 15,20:COLOR 2,1:PRINT"
7040 COLOR 2,4:LOCATE 8,22:PRINT"Dos Utilities"
7045 COLOR 18,1:LOCATE 9,22:PRINT"
7050 LOCATE 10,22:PRINT"Directory A:"
7055 LOCATE 11,22:PRINT"Directory B:"
7060 LOCATE 12,22:PRINT"Directory C:"
7065 LOCATE 13,22:PRINT"TYPE file"
7070 LOCATE 14,22:PRINT"Custom"
7075 M(1)=10:M(2)=11:M(3)=12:M(4)=13:M(5)=14
7078 C=5:GOTO 7100
7080 Z$=INKEY$
7085 IF Z$="2" THEN 7100
7090 IF Z$="8" THEN 7150
7095 IF Z$=CHR$(27) THEN CHECK=2:GOTO 100
7095 IF Z$=CHR$(13) THEN 7200 ELSE 7080
7100 LOCATE M(C),21:COLOR 6:PRINT"
7105 IF C=5 THEN C=1 ELSE C=C+1
7110 COLOR 2:LOCATE M(C),21:PRINT CHR$(16):LOCATE M(C),35:PRINT CHR$(17)
7115 GOTO 7080
7150 LOCATE M(C),21:COLOR 6:PRINT"
7160 IF C=1 THEN C=5 ELSE C=C-1
7170 GOTO 7110
7200 ON C GOTO 7220,7290,7350,7450,7550
7220 CLS:LOCATE 2,3:PRINT"
7223 LOCATE 3,3:PRINT"
7225 LOCATE 4,3:PRINT"
7230 LOCATE 3,5:COLOR 3
7232 PRINT"Directory of A:"
7235 PRINT:PRINT
7237 COLOR 2:LOCATE 5,5:PRINT"Insert disk in A: and press ENTER. "
7239 Z$=INKEY$:IF Z$=CHR$(13) THEN 7245 ELSE 7239
7245 CLEAR:COLOR 6:PRINT" DIR A:/P "
7247 PRINT:COLOR 2:SHELL"dir A:/p"
7250 GOTO 7000
7254 Z$=INKEY$:IF Z$="R" OR Z$="r" THEN 7000 ELSE 7254
7290 CLS:LOCATE 2,3:PRINT"
7293 LOCATE 3,3:PRINT"
7295 LOCATE 4,3:PRINT"
7297 LOCATE 3,4:PRINT"Directory of B:"
7300 PRINT:PRINT
7305 COLOR 2:LOCATE 5,5:PRINT"Insert disk in B: and press ENTER. "
7307 Z$=INKEY$:IF Z$=CHR$(13) THEN 7310 ELSE 7307
7310 CLEAR:COLOR 6:PRINT" DIR B:/P "
7315 PRINT:COLOR 2:SHELL"DIR B:/P"
7320 GOTO 7250
7350 CLS:LOCATE 2,3:PRINT"
7352 LOCATE 3,3:PRINT"
7355 LOCATE 4,3:PRINT"
7357 LOCATE 3,4:PRINT"Directory of C:"
7360 PRINT:PRINT
7365 COLOR 2:LOCATE 5,5:PRINT"C: Directory to view :":INPUT D$
7367 IF D$="" THEN D$="" ELSE D$=D$
7370 PRINT:COLOR 6:PRINT" DIR C:\D$"/P":PRINT:DR$=CHR$(34)+""+D$+CHR$(34)
7375 OPEN "O",£1,"D.BAT":PRINT £1,"ECHO OFF"
7377 PRINT £1,"CLS"
7378 PRINT £1,"DIR C:\D$"/P"
7379 PRINT £1,"PAUSE"
7380 CLOSE:CLEAR:CLS:COLOR 2,0,0:CLS
7385 SHELL"D.BAT"
7390 KILL"D.BAT"
7395 GOTO 7000
7450 CLEAR
7455 CLS:LOCATE 2,3:PRINT"
7456 LOCATE 3,3:PRINT"
7457 LOCATE 4,3:PRINT"
7460 COLOR 3:LOCATE 3,4:PRINT"Type a file."
7465 COLOR 6:LOCATE 5,4:PRINT"Type file (*extn) to view .... "
7470 COLOR 1,3:LINE INPUT V$:DR$="TYPE "+V$
7473 PRINT:PRINT:COLOR 2,3,4:LOCATE 6,4:PRINT"Viewing ";V$
7475 PRINT
7480 SHELL DR$
7485 FOR P=1 TO 2000:NEXT P:GOTO 7000
7550 CLS
7560 COLOR 2:LOCATE 1,1:PRINT"
7565 LOCATE 2,1:PRINT"
7570 LOCATE 3,1:PRINT"
7575 COLOR 7
7580 LOCATE 2,3:PRINT"DOS Custom Procedure."
7585 CLOSE
7590 M(1)=" Create a new command file "
7595 M(2)=" Utilise a command file "
7600 M(1)=5:M(2)=7
7605 COLOR 3,1:LOCATE 10,20:PRINT"Use up & down cursors & select an option"
7606 LOCATE 11,20:PRINT"by pressing ENTER. <ESC> for DOS menu."
7610 LOCATE M(1),23:PRINT M(1)
7615 LOCATE M(2),23:PRINT M(2)
7617 C=2:GOTO 7650
7620 Z$=INKEY$:IF Z$="" THEN 7620
7625 IF Z$="2" THEN 7650 'down
7630 IF Z$="8" THEN 7670 'up
7640 IF Z$=CHR$(13) THEN 7700
7645 IF Z$=CHR$(27) THEN 7000
7650 COLOR 7,1:LOCATE M(C),23:PRINT M(C):IF C=2 THEN C=1 ELSE C=C+1
7655 COLOR 6,4:LOCATE M(C),23:PRINT M(C):GOTO 7620
7670 COLOR 7,1:LOCATE M(C),23:PRINT M(C):IF C=1 THEN C=2 ELSE C=C-1
7675 GOTO 7655
7700 ON C GOTO 7710,8000
7710 CLOSE:OPEN "I",£1,"dos.dat"
7715 C=1
7720 WHILE NOT EOF(1)
7725 INPUT £1,F$(C),OP1$(C),OP2$(C),OP3$(C),OP4$(C),OP5$(C)

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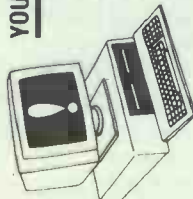
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# PROGRAM FILE

```

7730 C=C+1
7733 WEND
7735 C=C-1
7740 COLOR 3,1:LOCATE 12,20:PRINT"So far there ";;
IF C=1 THEN PRINT "is"; ELSE PRINT"are";
7743 IF C=1 THEN PRINT C"entry so far."
7744 IF C<>1 THEN PRINT C"entries so far"
7745 FOR P=1 TO 1000:NEXT P:CLS:VIEW PRINT 1 TO 23:COLOR 6:FOR R=1 TO C
7755 COLOR 6,1:PRINT R";:COLOR 1,3:PRINT F$(R)
7758 NEXT R:C=C+1:VIEW PRINT:COLOR 2,1
7760 LOCATE 25,3:PRINT"Enter title of NEW operation to ADD to file .... ";
7765 INPUT F$(C)
7770 CLS:LOCATE 2,2:COLOR 3:
PRINT"Enter commands in DOS, pressing ENTER after each. To finish this st
age, <ESC>.";COLOR 2:PRINT
7780 COLOR 7,4:LOCATE 4,2:PRINT"
7785 FOR R=5 TO 10:LOCATE R,2:PRINT"
NEXT R
7790 LOCATE 11,2: PRINT"
7795 COLOR 2,4
7800 LOCATE 5,4:LINE INPUT OP1$(C)
7805 LOCATE 6,4:LINE INPUT OP2$(C)
7810 LOCATE 7,4:LINE INPUT OP3$(C)
7815 LOCATE 8,4:LINE INPUT OP4$(C)
7820 LOCATE 9,4:LINE INPUT OP5$(C)
7830 COLOR 3,1:LOCATE 13,4:PRINT"Are you happy with this routine Y/N ? ";
7835 Z$=INKEY$:IF Z$="" THEN 7835
7840 IF Z$="Y" OR Z$="y" THEN 7890
7845 IF Z$="n" OR Z$="N" THEN 7770
7890 CLOSE:OPEN "O",F1,"dos.dat"
7895 FOR R=1 TO C:WRITE F1,F$(R),OP1$(R),OP2$(R),OP3$(R),OP4$(R),OP5$(R):
NEXT R
7900 CLOSE:GOTO 7000
8000 DIM F$(300),OP1$(300),OP2$(300),OP3$(300),OP4$(300),OP5$(300):
CLOSE:OPEN "I",F1,"DOS.DAT"
8015 C=1
8020 WHILE NOT EOF(1)
8025 INPUT F1,F$(C),OP1$(C),OP2$(C),OP3$(C),OP4$(C),OP5$(C)
8030 C=C+1
8033 WEND
8035 C=C-1
8040 COLOR 3,1:LOCATE 12,20:PRINT"So far there ";;
IF C=1 THEN PRINT "is"; ELSE PRINT"are";
8043 IF C=1 THEN PRINT C"entry."
8044 IF C<>1 THEN PRINT C"entries."
8045 FOR R=1 TO 1000:NEXT R:COLOR 6:CLS:VIEW PRINT 1 TO 23:FOR R=1 TO C
8055 COLOR 6,1:PRINT R";:COLOR 1,3:PRINT F$(R)
8058 NEXT R:C=C+1:COLOR 2,1:VIEW PRINT
8060 LOCATE 25,3:PRINT"Enter routine number to execute (0 to exit) .... ";
8065 INPUT NUM:IF NUM=0 THEN 7550
8070 IF NUM>C OR NUM<1 THEN 8060
8075 C=NUM
8080 CLOSE:OPEN "O",F1,"TYPEIT.BAT"
8085 PRINT F1,"echo off"
8086 PRINT F1,"CLS"
8090 IF OP1$(C)="" THEN 8100 ELSE PRINT F1,OP1$(C)
8100 IF OP2$(C)="" THEN 8110 ELSE PRINT F1,OP2$(C)
8110 IF OP3$(C)="" THEN 8120 ELSE PRINT F1,OP3$(C)
8120 IF OP4$(C)="" THEN 8130 ELSE PRINT F1,OP4$(C)
8130 IF OP5$(C)="" THEN 8150 ELSE PRINT F1,OP5$(C)
8131 PRINT F1,"C:"
8132 PRINT F1,"CD\XTMAN"
8135 CLEAR:CLOSE:CLS:SHELL"TYPEIT.BAT"
8150 GOTO 7550
9000 COLOR 0,0,0:CLS
9005 C$=""
9010 COLOR 2
9020 LOCATE 3,3:PRINT"System Locked : Type password to UNlock":LOCATE 5,3
9030 FOR R=1 TO LEN(P$)
9040 Z$=INKEY$:IF Z$="" THEN 9040
9050 COLOR 6:C$=C$+Z$:PRINT CHR$(4);
9060 NEXT R
9070 IF C$=P$ THEN 9100 ELSE 9000
9100 GOTO 430
9200 COLOR 2,1:S$="" :SNS="" :DNO$="" :CLOSE
9205 LOCATE 1,1:PRINT
9210 LOCATE 2,1:PRINT
9213 LOCATE 3,1:PRINT
9215 LOCATE 4,1:PRINT
9217 LOCATE 5,1:PRINT
9220 LOCATE 6,1:PRINT
9223 LOCATE 7,1:PRINT
9225 LOCATE 8,1:PRINT
9230 COLOR 3,4
9235 LOCATE 2,2:PRINT " Search floppy diskette file "
9240 COLOR 2
9245 LOCATE 3,2:PRINT " Add Change Del Search [ESC]"
9250 LOCATE 7,2,1,0,7:COLOR 2,1
9255 Z$=INKEY$:IF Z$="" THEN 9255
9260 IF Z$="a" OR Z$="A" THEN 9300 'add
9265 IF Z$="c" OR Z$="C" THEN 9400 'change
9267 IF Z$="d" OR Z$="D" THEN 9500 'delete
9270 IF Z$="s" OR Z$="S" THEN 9600 'search
9272 IF Z$=CHR$(27) THEN LOCATE ,,0:GOTO 430
9275 GOTO 9255
9300 C=1:LOCATE 7,2:PRINT" Enter software name "
9305 LOCATE 4,3:FOR R=1 TO 27
9310 Z$=INKEY$:IF Z$="" THEN 9310
9313 IF Z$=CHR$(13) THEN 9320
9315 S$=S$+Z$:PRINT Z$;
9317 NEXT R
9320 R=27
9330 LOCATE 7,2: PRINT" Enter diskette name "
9335 LOCATE 5,3:FOR R=1 TO 27
9340 Z$=INKEY$:IF Z$="" THEN 9340
9345 IF Z$=CHR$(13) THEN 9355
9350 SNS=SNS+Z$:PRINT Z$;
9353 NEXT R
9355 R=27
9360 LOCATE 7,2: PRINT" Enter diskette number "
9365 LOCATE 6,3:FOR R=1 TO 27
9370 Z$=INKEY$:IF Z$="" THEN 9370
9375 IF Z$=CHR$(13) THEN 9385
9380 DNO$=DNO$+Z$:PRINT Z$;
9383 NEXT R
9385 R=27
9390 LOCATE 7,2: PRINT" Save information Y/N ";
9392 Z$=INKEY$:IF Z$="" THEN 9392
9393 IF Z$="y" OR Z$="Y" THEN 9396
9394 IF Z$="n" OR Z$="N" THEN 9200
9395 GOTO 9392
    
```

# PROGRAM FILE

```

9396 OPEN "a",#1,"floppy.dat":WRITE #1,S#,SNS,DNO$
9397 GOTO 9200
9400 REM
9402 OPEN "I",#1,"FLOPPY.DAT"
9404 C=1:WHILE NOT EOF(1)
9405 INPUT #1,S$(C),SNS$(C),DNO$(C)
9407 C=C+1:WEND:C=C-1
9410 MAX=C:C=1
9415 LOCATE 4,3:PRINT"          ":LOCATE 4,3:PRINT S$(C)
9417 LOCATE 5,3:PRINT"          ":LOCATE 5,3:PRINT SNS$(C)
9420 LOCATE 6,3:PRINT"          ":LOCATE 6,3:PRINT DNO$(C)
9425 COLOR 3:LOCATE 7,2:PRINT" Edit Y/N [ESC] ":COLOR 2
9427 Z$=INKEY$:IF Z$="" THEN 9427
9430 IF Z$="Y" OR Z$="y" THEN 9440
9432 IF Z$="N" OR Z$="n" THEN 9435
9433 IF Z$=CHR$(27) THEN CLOSE:GOTO 9200
9434 GOTO 9427
9435 IF C=MAX THEN 9425
9436 C=C+1:GOTO 9415
9440 LOCATE 4,3:PRINT"          "
9443 LOCATE 5,3:PRINT"          "
9445 LOCATE 6,3:PRINT"          "
9450 LOCATE 7,2:PRINT" Enter NEW software name ":S$(C)="" :SNS$(C)="" :DNO$(C)=""
9455 LOCATE 4,3:FOR R=1 TO 27
9457 Z$=INKEY$:IF Z$="" THEN 9457
9459 IF Z$=CHR$(13) THEN 9463
9460 S$(C)=S$(C)+Z$:PRINT Z$:NEXT R
9463 R=27:LOCATE 7,2:PRINT" Enter NEW diskette name "
9465 LOCATE 5,3:FOR R=1 TO 27
9467 Z$=INKEY$:IF Z$="" THEN 9467
9470 IF Z$=CHR$(13) THEN 9477
9472 SNS$(C)=SNS$(C)+Z$:PRINT Z$:NEXT R
9477 R=27:LOCATE 7,2:PRINT" Enter NEW diskette number "
9480 LOCATE 6,3:FOR R=1 TO 27
9482 Z$=INKEY$:IF Z$="" THEN 9482
9484 IF Z$=CHR$(13) THEN 9490
9485 DNO$(C)=DNO$(C)+Z$:PRINT Z$:NEXT R
9490 R=27
9491 LOCATE 7,2:PRINT" Save NEW information Y/N "
9492 Z$=INKEY$:IF Z$="" THEN 9492
9493 IF Z$="Y" OR Z$="y" THEN 9496
9494 IF Z$="N" OR Z$="n" THEN 9200
9495 GOTO 9492
9496 CLOSE:OPEN "o",#1,"floppy.dat":FOR R=1 TO MAX:WRITE #1,S$(R),SNS$(R),
DNO$(R):NEXT R:CLOSE:GOTO 9200
9500 OPEN "I",#1,"FLOPPY.DAT"
9504 C=1:WHILE NOT EOF(1)
9507 INPUT #1,S$(C),SNS$(C),DNO$(C)
9509 C=C+1
9510 WEND:C=C-1
9513 MAX=C:C=1
9515 LOCATE 4,3:PRINT"          ":LOCATE 4,3:PRINT S$(C)
9517 LOCATE 5,3:PRINT"          ":LOCATE 5,3:PRINT SNS$(C)
9519 LOCATE 6,3:PRINT"          ":LOCATE 6,3:PRINT DNO$(C)
9520 LOCATE 7,2:PRINT" Delete Y/N [ESC] ":
9523 Z$=INKEY$:IF Z$="" THEN 9523
9525 IF Z$="Y" OR Z$="y" THEN 9535
9526 IF Z$="N" OR Z$="n" THEN 9530
9527 IF Z$=CHR$(27) THEN CLOSE:GOTO 9200
9528 GOTO 9523
9530 IF C=MAX THEN 9520
9533 C=C+1:GOTO 9515
9535 CLOSE:OPEN "o",#1,"floppy.dat"
9540 FOR R=1 TO C-1:WRITE #1,S$(R),SNS$(R),DNO$(R):NEXT R
9545 FOR R=C+1 TO MAX:WRITE #1,S$(R),SNS$(R),DNO$(R):NEXT R:CLOSE
9550 LOCATE 7,2:PRINT" Deletion complete ":FOR R=1 TO 1000:NEXT R:GOTO 9200
9600 REM
9610 LOCATE 7,2:PRINT" Enter search string ":SER$=""
9615 LOCATE 4,3:FOR R=1 TO 27
9620 Z$=INKEY$:IF Z$="" THEN 9620
9623 IF Z$=CHR$(13) THEN 9630
9624 IF Z$=CHR$(27) THEN CLOSE:GOTO 9200
9625 SER$=SER$+Z$:PRINT Z$:
9627 NEXT R
9630 R=27
9635 LOCATE 7,2:COLOR 18:PRINT" Searching ...          ":COLOR 2
9640 CLOSE:OPEN "i",#1,"floppy.dat":C=1
9645 WHILE NOT EOF(1)
9650 INPUT #1,S$(C),SNS$(C),DNO$(C)
9655 C=C+1:WEND:C=C-1
9660 MAX=C:C=1
9665 FOR C=1 TO MAX
9670 L=LEN(SER$)
9675 IF LEFT$(S$(C),L)=SER$ THEN 9700
9677 NEXT C
9680 LOCATE 7,2:COLOR 2:PRINT" End of file ...          "
FOR R=1 TO 1000:NEXT R:CLOSE:GOTO 9200
9700 LOCATE 7,2:COLOR 3:PRINT" -----Found----- "
9710 LOCATE 4,3:PRINT"          ":LOCATE 4,3:PRINT S$(C)
9715 LOCATE 5,3:PRINT"          ":LOCATE 5,3:PRINT SNS$(C)
9720 LOCATE 6,3:PRINT"          ":LOCATE 6,3:PRINT DNO$(C)
9730 LOCATE 7,2:FOR P=1 TO 3000:NEXT P
9735 LOCATE 7,2:COLOR 2:PRINT" C to continue or [ESC] "
9740 Z$=INKEY$:IF Z$="" THEN 9740
9745 IF Z$="C" OR Z$="c" THEN 9677
9747 IF Z$=CHR$(27) THEN 9200
9750 GOTO 9740

```



## Apricot Portable Monitor Tip

by Paul Hardy

Now that the Apricot Portable has come down in price, many people may want to attach a colour monitor to it. The Apricot puts out an RGBI signal, but the pins are not in a stan-

dard order. Making a cable is not too difficult, however, for those with a little skill with a soldering iron. You will need two female 9-pin D connectors and some 9-strand cable. The

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# PROGRAM FILE

cable should be made up as shown in Fig 1.

On the Apricot side, pin 1 is unused; and on the monitor side, pins 2 and 7 are unused.

This procedure will, of course, only work with colour monitors taking a 9-pin D connector input such as colour monitors intended for use with IBM CGA displays.

Apricot end	Signal pin number	Monitor end	Pin number
+12v	1	no connection	
R	2	-----	3
I	3	-----	6
Hsync	4	-----	8
Vsync	5	-----	9
+0v	6	-----	1
G	7	-----	4
Ground	8	-----	1
B	9	-----	5

Fig 1



## Psion Organiser Program Suite

by Sean Overend

This suite of programs occupies just under 16k. Not all the programs need be used, but be careful when entering programs since they share several common routines. There are two sets of programs: one to calculate interest rates in various ways; and the other to provide a local train timetable and information about the departure time of the next train.

The program CRSTIAC is used by the timetable program for data entry as well as by the interest rate prog-

ram. Data can be stored in A, B or C. In the programs, it is assumed that interest information is stored in C:STIAC and C:JDR, while timetable information is in A:Tdown and A:Up.

Each new procedure is preceded by asterisks, and the top-level programs that can be called from the Organiser menu (press the Mode key when you switch on) are SKO and TTBLE.

### \*\*\*\*\*GENERAL INPUT ROUTINES\*\*\*\*\*

QZ: (a#)

This (Psion) routine returns an integer through the procedure identifier.

```
LOCAL zX
ONERR I1::
I1::CLS :PRINT a#,CHR$(16);
INPUT zX
CLS
RETURN (zX)
```

Q: (a#)

This returns a non-integer number.

```
LOCAL z
ONERR I1::
I1::CLS :PRINT a#,CHR$(16);
INPUT z
CLS
RETURN (z)
```

### \*\*\*\*\*THE INTEREST PROGRAMS\*\*\*\*\*

(a) The driver program SKO

SKO

The program name "SKO" should be inserted in the main menu display of the computer. When run the user is given three alternatives, namely:

- (i) to subtract two dates, the answer being given in days (inclusive of both dates),
- (ii) to calculate simple interest accruing daily on a given capital sum between two dates (inclusive), the interest rates being those set out in a specified interest rate file - the calculation allowing for the interest rates to vary on any number of occasions between the

# PROGRAM FILE

start and end of the period.  
(iii) to create the interest rate file, containing eg the Short Term Investment Account, or movements in the Bank Rate of one of the clearing house banks etc

```
GLOBAL NZ,MZ,IZ,JZ,IZ,HZ
LOCAL iZ
iZ=MENU("DATES,CALCINT,RATES")
IF iZ=0:RETURN
ELSEIF iZ=3:CRSTIAC:RETURN
ELSEIF iZ=1
NZ=qZ:("Lo day")
MZ=qZ:("Lo month")
LZ=qZ:("Lo year")
JZ=qZ:("Hi day")
IZ=qZ:("Hi mnth")
HZ=qZ:("Hi year")
IF CMPDTZ:(NZ,MZ,LZ,JZ,IZ,HZ)=0
MO=SUBZ:(NZ,MZ,LZ,JZ,IZ,HZ)
PRINT "(MO) ";MO:GET
ELSE PRINT CHR$(16):ENDIF
ELSEIF iZ=2
M1=INT:
PRINT "(M1) interest"
PRINT FIX$(M1,2,-13)
GET
ENDIF
```

(b) The Date subtraction routines

```
*****
CMPDTZ:(SDZ,SMZ,SYZ,ODZ,OMZ,OYZ)
LOCAL Z
IF SYZ>OYZ:RETURN(-1)
ELSEIF SYZ=OYZ:RETURN(0)
ELSEIF SMZ>OMZ:RETURN(-1)
ELSEIF SMZ=OMZ:RETURN(0)
ELSEIF SDZ>ODZ:RETURN(-1)
ELSE RETURN(0)
ENDIF
```

```
*****
SUBZ:(NZ,MZ,IZ,JZ,IZ,HZ)
LOCAL DZ,YZ,ES(2),YS(24),Z
DZ=0
IF HZ=1Z
IF MZ=IZ:RETURN(JZ-NZ+1):ENDIF
YS=MDY$(HZ)
ES=MID$(YS,2*HZ-1,2)
DZ=VAL(ES)-NZ+1
Z=MZ
WHILE Z<(IZ-1)
Z=Z+1
ES=MID$(YS,2*Z-1,2)
DZ=DZ+VAL(ES)
ENDWH
RETURN(DZ+JZ)
ENDIF
YS=MDY$(IZ)
ES=MID$(YS,2*IZ-1,2)
DZ=VAL(ES)-NZ+1
Z=MZ
WHILE Z<12
Z=Z+1
ES=MID$(YS,2*Z-1,2)
DZ=DZ+VAL(ES)
ENDWH
Z=1Z
WHILE Z<(HZ-1)
Z=Z+1:DZ=DZ+365
YS=MDY$(Z)
IF MID$(YS,4,1)="9"
DZ=DZ+1:ENDIF
ENDWH
YS=MDY$(HZ)
IF IZ>1
Z=0
WHILE Z<(IZ-1)
Z=Z+1
ES=MID$(YS,2*Z-1,2)
DZ=DZ+VAL(ES)
ENDWH
ENDIF
RETURN(DZ+JZ)
```

```
*****
MDY$(YZ)
LOCAL KZ
KZ=YZ-4*(INT(YZ/4))
IF KZ=0
RETURN("312931303130313130313031")
ELSE RETURN("312831303130313130313031")
ENDIF
```

(c) To create the interest rate file  
The CRSTIAC program

CRSTIAC

As for the Tax file creation program, this program will either allow a new file to be started, or an existing one to be displayed and/or added to, or the whole deleted. The format is given below.

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This program is also used to create a file for the Timetable program'

```
LOCAL y%,Stiac*(8)
PRINT "Create file:"
INPUT Stiac
```

I have used files named C:STIAC and C:JDR to store the Short Term Investment Account rates and the Judgment Debt rates

```
IF NOT EXIST(Stiac*)
CREATE Stiac*,A,d%,m%,yr%,r
ELSE OPEN Stiac*,A,d%,m%,yr%,r
PRINT "Display Y/N" :KSTAT 1
IF GET*(">")="Y"
LAST :ENDIF
DO
PRINT A,d%:"-":A,m%:"-":A,yr%:" " :A,r%:"%" :GET
NEXT
UNTIL EOF
ENDIF
```

The format for data entry is to enter in strict chronological order each change in the interest rate in the sequence: Day Month Year %Rate eg the following, taken from the Judgment Debt Rates:

20	4	1971	7.5(%)
1	3	1977	10
3	12	1979	12.5
9	6	1980	15
8	6	1982	14
10	11	1982	12
16	4	1985	15

The data format for creation of a timetable is shown in the Timetable section below.

```
KSTAT 3
DO
A,d%=Q%("Day or 99")
IF A,d%>31 :BREAK :ENDIF
A,m%=Q%("Month")
A,yr%=Q%("Year")
A,r%=Q%("% Rate")
y%=A,d%
APPEND
UNTIL y>31
CLOSE
PRINT "Done"
PRINT "DELETE Y/N":CHR*(16) :KSTAT 1
IF GET*="Y" :DELETE Stiac*
PRINT "Deleted"
ELSE PRINT "OK"
ENDIF
GET
```

(d) The substantive interest calculation program - INT (using files "C:STIAC" and "C:JDR" as examples)

```
INT
LOCAL dys%,tot%,z%,Stiac*(8),n%,m%,l%,j%,i%,h%,
cap,curr,a%,b%,c%,in,a*(1),pr%
z%=MENU("C:STIAC,C:JDR,another")
IF z%=1 :Stiac*="C:STIAC"
ELSEIF z%=2 :Stiac*="C:JDR"
```

Use your own file names in the preceding three lines if you prefer instead of C:STIAC and C:JDR

```
ELSE PRINT "Which rate file"
INPUT Stiac*
ENDIF
IF NOT EXIST(Stiac*)
PRINT "No such file":CHR*(16) :GET :RETURN
ELSE OPEN Stiac*,A,d%,m%,yr%,r
ENDIF
cap=q%("Capital sum")
n%=q%("Start day")
m%=q%("Start mnth")
l%=q%("Start year")
curr=A,r
DO
z%=CMPD%:(n%,m%,l%,A,d%,A,m%,A,yr%)
IF z%=0 :BREAK :ENDIF
curr=A,r
NEXT
UNTIL EOF
j%=q%("Last day")
i%=q%("Last mnth")
h%=q%("Last year")
PRINT "Details Y/N" :a%=GET%
IF UPPER(a%)="Y"
pr%=-1
ELSE pr%=0 :ENDIF
a%=A,d% :h%=A,m% :c%=A,yr%
PRINT "Calculating"
DO
z%=CMPD%:(j%,i%,h%,a%,b%,c%)
IF z%=0 OR EOF
a%=j% :b%=i% :c%=h% :ENDIF
dys%=sub%:(n%,m%,l%,a%,b%,c%)
IF EOF :z%=0 :ENDIF
in=COMP%:(cap,curr,dys%+z%,pr%)
tot=tot+in
n%=a% :m%=b% :l%=c%
IF EOF :BREAK :ENDIF
curr=A,r
NEXT
a%=A,d% :b%=A,m% :c%=A,yr%
UNTIL z%=0
CLOSE
RETURN(tot)
```

\*\*\*\*\*

# PROGRAM FILE

COMP: (cap,curr,dys%,pr%)  
Calculation of daily interest, with option of display.

```
LOCAL ans
ans=cap*curr/36500*dys%
IF pr%<>0
PRINT dys%;"d:";curr:"% "=";ans :GET
ENDIF
RETURN(ans)
```

\*\*\*\*\* THE TIMETABLE PROGRAMS  
\*\*\*\*\* (a) The driver program TTBLE

TTBLE  
Busy commuters put TTBLE in the computer's main menu as the first entry to reduce the number of key presses to a minimum

```
LOCAL i%,f%(8),ch%,cm%,ct%,cz%
i%=MENU("exAmer,exLondon")
```

Any number of departure stations (airports etc) can be entered here, provided a separate data timetable is created for each. In the example, the times of trains exAmer (sham) are stored in the "A:Tdown" data file, while the times of trains exLondon are stored in "A:Tup" (I know they should be the other way round!). The user selects which timetable he needs by menu selection.

```
IF i%=1
f%="A:Tdown"
ELSE
f%="A:Tup"
ENDIF
OPEN f%,A,h%,m%,t%,z%
ch%=HOOR :cm%=MINUTE
PRINT HOUR,MINUTE
GET
```

Find out the time from the system clock and display it. Then work out the time of the next train by comparing the current time with the chronological list of departures.

```
DO
IF ch%<A.h% OR (ch%=A.h% AND cm%<=A.m%) :BREAK :ENDIF
NEXT
i%=i%+1
UNTIL EOF OR i%>50
```

Hitting the space key repeatedly will give the following entries in the timetable after the next train. Any other key terminates.

```
DO
PRINT A.h%,A.m%:" ";
```

The destinations are printed out in accordance with the code you have chosen. In this case the destination codes are:

```
0 Aldgate
1 Baker St
2 Marylebone
3 Amersham
4 Chesham
```

```
IF A.t%=0
PRINT "Aldgate"
ELSEIF A.t%=1
PRINT "Baker St"
ELSEIF A.t%=2
PRINT "M'bone"
ELSEIF A.t%=3
PRINT "Am "
ELSEIF A.t%=4
PRINT "Ch "
ENDIF
```

The comment codes that follow can be alternative departure points eg

```
1 ex Farringdon
2 ex Baker Street
3 ex Marylebone
```

```
IF A.z%=1
PRINT "exFAR"
ELSEIF A.z%=2
PRINT "exB.St"
ELSEIF A.z%=3
PRINT "exM'B"
ENDIF
```

If you want to insert an ARRIVAL TIME in the Data file instead of a comment code then insert the following 3 program lines here:

```
IF A.z%>3
PRINT A.z%
ENDIF
```

```
NEXT
UNTIL GET%<>" " OR EOF
CLOSE
```

\*\*\*\*\* The Timetable data creation program

Use the CRSTIAC program, by selecting SKO, then RATES on the menu, and then enter A:Tdown or A:Tup (or whatever) when asked for a file name. You then enter the departure times in strict chronological order, each entry

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# PROGRAM FILE

consisting of four items of  
information, namely: give the  
departure time (in hours and  
minutes) followed by destination  
code and comment code (or arrival  
time):

The computer will ask questions as  
though you were entering interest  
rate information. You should  
answer them as follows:-

Question	Answer
=====	=====
Day	Hour
Month	Minute
Year	Destination
Rate	Comment

EXAMPLE answers from the author's  
ex London timetable

Hour	Min	Dest	Com
.	.	.	.
15	49	3	1
16	9	3	1
16	30	3	3
.	.	.	.
.	.	.	.
.	.	.	.

The first two trains are the 1549  
and 1609 to Amersham ex Farringdon.  
The third train is the 1630 to  
Amersham ex Marylebone. (See codes  
in program commentary)



## Commodore 64 Multiple Conversions

by Chris Swift

This is a short and simple but useful  
program, and it shouldn't be difficult  
to convert to other machines.

For those people who are unfamiliar  
with the C64, the graphics symbols  
in the listing represent display  
formatting commands and can be replaced  
by trial and error.

The program has 38 different conversions  
available, such as centimetres to inches  
or kilometres to miles. You can also  
print any times table of any length to  
screen or printer.

When run, the program presents a  
menu of choices accessed by function  
keys. F1 brings up the conversions  
menu, F3 the 'Times Table' option,  
and F5 exits the program.

Pressing F1 once brings up the first  
half of the conversions menu; pressing  
it again gets the second half. To

choose any of the conversions displayed,  
press the letter corresponding to it.  
To leave the conversions menu, press F3.

When you have chosen a conversion,  
the screen clears and asks you to enter  
a number. At this point, 0 will take you  
back to the main menu and any other  
number will result in the corresponding  
conversion. Another menu will appear  
which allows you to print out the result,  
calculate another conversion or return  
to the main menu.

Choosing the Times Table option leads  
to a screen where you are asked to enter  
the table to be displayed, the start  
position in the table and the end position.  
When the table has been printed to  
screen or printer, you are given the  
option to print another or return to the  
main menu.

```

10 REM *****
20 REM ** MULTI-CONVERTER **
30 REM * PLUS TIMES TABLES *
40 REM * BY CHRIS SWIFT *
50 REM * JANUARY '87 *
60 REM * VERSION 2 *
70 REM **
80 REM * ALL REM'S CAN BE LEFT OUT *
90 REM * THIS LINE 120 IF NO PRINTER*
100 REM *****
110 P=0:Q=SUB1530:REM-CHECK SUM OF DATA
120 Q=EN4,4:P=1:REM-MISS IF NO PRINTER
130 POKE53280,0:POKE53281,0:PRINT"OK"
140 REM
150 REM-----MAIN MENU-----
160 REM
170 PRINT:PRINT" MULTI-CONVERTER PLUS TIMES TABLES."
180 PRINT
190 PRINT:PRINTSPC(14)"MAIN MENU." :PRINTSPC(14)"
200 PRINTSPC(10)" F1= CONVERSION MENU."
210 PRINT:PRINTSPC(12)" F3= TIMES TABLES."
220 PRINT:PRINTSPC(12)" F5= EXIT PROGRAM."
230 PRINT"***** PLEASE ENTER YOUR CHOICE.*****"
240 GETCH$:IFCH$=" " THENGOTO240
250 IFCH$=" " THENGOTO320:REM-CONVERTER
260 IFCH$=" " THENGOTO470:REM-TABLES
270 IFCH$=" " THENGOTO660:REM-EXIT PROG.
280 GOTO240
290 REM-----

```



# PROGRAM FILE

```

300 REM-----CONVERTER BIT-----
310 REM-----
320 GOSUB900:REM-GET CONVERSION
330 PRINT"*****C1$ TO C2$
340 FORT=1:OLEN(C1$)+LEN(C2$)+4:PRINT"::NEXT:PRINT
350 PRINT:PRINT"HOW MANY C1$::INPUTNU
360 PRINT:PRINTNU,C1$="NU*CM;C2$
370 PRINT:PRINT"PRESS: F1= SAME CHOISE F3= MAIN MENU"
380 IFP=1THENPRINT" F5=PRINT OUT"
390 GETCH$
400 IFCH$=" "THENGOTO330:REM-SAME AGAIN
410 IFCH$=" "THENGOTO130:REM-MAIN MENU
420 IFCH$=" "ANDP=1THENGOSUB1270:GOTO370:REM-PRINT OUT CONVERSION
430 GOTO390
440 REM-----
450 REM-----TIMES TABLES-----
460 REM-----
470 PRINT"::PRINTSPC(13)"TIMES TABLES."
480 PRINTSPC(13)"
490 PRINT:PRINT"WHICH TABLE WOULD YOU LIKE":INPUTCH:IFCH=0THENGOTO130:REM-MENU
500 PRINT"OKAY."
510 PRINT"START FROM WHERE":INPUTSC
520 PRINT"OKAY."
530 PRINT"WHERE TO END(MORE THAN"SC")":INPUTEC
540 IFEC<SCTHENPRINT"TOO LOW.":GOTO530
550 PRINT"OKAY.":IFP<1THENGOTO680:REM IFP<1THEN NO PRINTER,DISPLAY ON SCREEN
560 PRINT:PRINT"PRESS: F1= SCREEN OUTPUT F3=PRINTER OUTPUT"
570 GETCH$:IFCH$=" "THENGOTO630:REM-PRINTER
580 IFCH$=" "THENGOTO680:REM-SCREEN OUT-FUT
590 GOTO570
600 REM-----PRINT TABLE TO PRINTER-----
610 REM-----
620 REM-----
630 PRINT"*****PRINTING"CH"TABLE (<"SC"TO"EC")"
640 PRINT#4,CH"TABLE(<"SC"-"EC")":FORT=SC:TOEC:PRINT#4,T*"CH"=T*CH:NEXT:GOTO790
650 REM-----
660 REM-----DISPLAY TABLE ON SCREEN-----
670 REM-----
680 PRINT" "THE"CH"TIMES TABLE("<"SC"TO"EC")":PRINT
690 TT=0:FORT=SC:TOEC:PRINTT*"CH"=T*CH:TT=TT+1
700 IFTT=20THENGOTO720:REM-REACHED BOTTOM OF SCREEN
710 NEXTT:GOTO790:REM-ANOTHER TABLE
720 PRINT:PRINT"PRESS: F1=CONTINUE F3=MAIN MENU F5=TABLES"
730 GETCH$
740 IFHK$=" "THENGOTO760
750 IFHK$=" "THEN T=EC:NEXTT:GOTO130
760 IFHK$=" "THEN T=SC:NEXTT:GOTO470
770 GOTO730
780 PRINT:PRINT" "THE"CH"TIMES TABLE("<"SC"TO"EC")":TT=0:NEXTT
790 PRINT:PRINT"PRESS: F1=ANOTHER TABLE F3=MAIN MENU"
800 GETCH$:IFCH$=" "THENGOTO470:REM-TABLES
810 IFCH$=" "THENGOTO130:REM-MAIN MENU
820 GOTO800
830 REM-----
840 REM-----EXIT PROGRAM BIT-----
850 REM-----
860 POKES3280,14:POKE53281,6:PRINT"X":CLOSE4,4:END
870 REM-----
880 REM-----CONVERSION MENU 1-----
890 REM-----
900 PRINT" "CONVERSION MENU 1"
910 RESTORE
920 FORT=1:TO19:READCM$,CM:PRINT" "CHR$(T+64)" "CM$:NEXTT:REM-DISPLAY MENU
930 PRINT:PRINT" PLEASE ENTER CHOISE,OR PRESS:"
940 PRINT" F1= MENU 2 OR F3=MAIN MENU"
950 GETCH$:IFCH$=" "THENGOTO950
960 IFCH$=" "THENGOTO1930:REM-MENU 2
970 IFCH$=" "THENGOTO130:REM-MAIN MENU
980 C=ASC(CH$):IFC>64ANDC<84THENCD=1:GOSUB1160:RETURN:REM-CONVERSION CHOSEN
990 GOTO950
1000 REM-----
1010 REM-----CONVERSION MENU 2-----
1020 REM-----
1030 PRINT" "CONVERSION MENU 2"
1040 PRINT"
1050 FORT=1:TO19:READCM$,CM:PRINT" "CHR$(T+64)" "CM$:NEXTT:REM-DISPLAY MENU
1060 PRINT:PRINT" PLEASE ENTER CHOISE,OR PRESS:"
1070 PRINT" F1= MENU 1 OR F3=MAIN MENU"
1080 GETCH$:IFCH$=" "THENGOTO1080
1090 IFCH$=" "THENGOTO900:REM-MENU 1
1100 IFCH$=" "THENGOTO130:REM-MAIN MENU
1110 C=ASC(CH$):IFC>64ANDC<84THENCD=18:GOSUB1160:RETURN:REM-CONVERSION CHOSEN
1120 GOTO1080
1130 REM-----
1140 REM--GET TITLE+DATA FOR CONVERSION--
1150 REM-----
1160 RESTORE:C=C-64
1170 FORT=0:TO(C+CD):READCM$,CM:NEXTT
1180 T=1
1190 LC=LEN(CM$)
1200 C1$=LEFT$(CM$,T)
1210 T=T+1:IFMID$(CM$,T,1)=""THENGOTO1230
1220 GOTO1200
1230 C2$=RIGHT$(CM$,LC-T):RETURN:REM-GOT IT
1240 REM-----
1250 REM--PRINT CONVERSION TO PRINTER--
1260 REM-----
1270 IFP<1THENRETURN
1280 CHD4:PRINT#4,CHR$(18)"I"C1$ TO "C2$CHR$(146)
1290 CHD4:PRINT#4,NU,C1$=" "NU*CM;C2$
1300 PRINT"::":RETURN:REM-PRINTED.
1310 REM-----
1320 REM-----CONVERSION DATA-----
1330 REM-----
1340 DATA"CMS-INCHES",0.3937,"INCHES-CMS",2.540,"METERS-FEET",3.281,"FEET-METERS
1350 DATA0.3048,"METERS-YARDS",1.094,"YARDS-METERS",0.9144,"KILOMETERS-MILES"
1360 DATA0.6214,"MILES-KILOMETERS",1.609,"SQ.CMS-SQ.INCHES",0.155
1370 DATA"SQ.INCHES-SQ.CMS",6.452,"SQ.METERS-SQ.FEET",10.76,"SQ.FEET-SQ.METERS"
1380 DATA0.0929,"SQ.METERS-SQ.YARDS",1.196,"SQ.YARDS-SQ.METERS",0.8361
1390 DATA"SQ.KILOMETERS-SQ.MILES",0.3861,"SQ.MILES-SQ.KILOMETERS",2.59
1400 DATA"HECTARES-ACRES",2.471,"ACRES-HECTARES",0.4047,"CUB.CMS-CUB.INCHES"
1410 DATA0.06102,"CUB.INCHES-CUB.CMS",16.39,"CUB.METERS-CUB.FEET",35.31
1420 DATA"CUB.FEET-CUB.METERS",0.02832,"CUB.METERS-CUB.YARDS",1.308
1430 DATA"CUB.YARDS-CUB.METERS",0.7646,"LITERS-CUB.INCHES",61.03
1440 DATA"CUB.INCHES-LITERS",0.01639,"GALLONS-LITERS",4.546,"LITERS-GALLONS",0.22
1450 DATA"GRAMS-GRAMS",0.0648,"GRAMS-GRAMS",15.43,"OUNCES-GRAMS",28.35
1460 DATA"GRAMS-OUNCES",0.03527,"POUNDS-GRAMS",453.6,"GRAMS-POUNDS",0.002205
1470 DATA"POUNDS-KILOGRAMS",0.4536,"KILOGRAMS-POUNDS",2.205,"TONS-KILOGRAMS"
1480 DATA1016,"KILOGRAMS-TONS",0.0009842
1490 DATA"NO MORE",0
1500 REM-----
1510 REM-----DATA CHECK-----
1520 REM-----
1530 T=0

```

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43C3:0000	-----	-----
43C4:0000	-----	-----

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4120:2BB0	-----	-----

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# PROGRAM FILE

```
1540 READDC$,DC:IFDC$="NO MORE"THENGOTO1560
1550 T=T+DC:GOTO1540
1560 T$=STR$(T):IFT$=" 1671.91829"THENRETURN:REM-DATA OK CONTINUE PROGRAM
1570 FORA=1TO50:PRINT"XXXXXXXXXXXX A T A E R R O R ! ! XXXXXXXX":NEXTA:END
```

READY.



## BBC Multi-Windows

by John Green

The following four procedures in BBC Basic allow you to have eight windows numbered 0 to 7. Each of these can be written to separately and will scroll separately. The cursor position and colours used within a window are retained, even when you switch to a new window.

The four procedures are:  
**PROC\_SET\_WINDOW**  
(N,X1,Y1,X2,Y2):

this is used to create a window; N is the window number and the others are coordinates of the corners.

**PROC\_WINDOW(N)**: changes to window N.

**PROC\_CLW(N)**: clears window N; CLS only clears the current window.

**PROC\_COLW(N)**: use this instead of COLOUR N.

You can leave out all the remarks when typing in the program, to save memory.

```
10 DIMW%64
Place your program or the demo-program here.
900 END
1000 REM-----
1010 DEFPROC_SET_WINDOW(N,X1,Y1,X2,Y2):IFN<0ORN>7ENDPROC
1020 WZ?(N#8)=X1:WZ?(N#8+1)=Y1 :REM Store window bottom left corner
position.
1030 WZ?(N#8+2)=X2:WZ?(N#8+3)=Y2 :REM Store window top right corner
position.
1040 WZ:(N#8+4)=0:WZ?(N#8+4)=7 :REM Set colours of the window as white or
black and move cursor to home.
1050 IFWZ?64=N VDU28,X1,Y1,X2,Y2,20
1060 ENDPROC
2000 REM-----
2010 DEFPROC_WINDOW(N):IFN<0ORN>7ENDPROC
2020 WZ?((WZ?64)#8+6)=POS:WZ?((WZ?64)#8+7)=VPOS :REM Store the current.
cursor position.
2030 VDU28:LDCAL:A:FDR=0TO3:VDUWZ?(N#8+A):NEXT :REM Create new window.
2040 PRINTTAB(WZ?(N#8+6),WZ?(N#8+7)): :REM Move cursor.
2050 COLOURWZ?(N#8+4):COLOURWZ?(N#8+5)+128 :REM Change colour.
2060 WZ?64=N :REM WZ?64 contains the
current window number.
2070 ENDPROC
3000 REM-----
3010 DEFPROC_CLW(N):IFN<0ORN>7ENDPROC
3020 LDCAL:A=WZ?64 :REM Remembers current window.
3030 PROC_WINDOW(N):CLS:PROC_WINDOW(A) :REM Changes to new window, clears
it and returns to old window.
3040 ENDPROC
4000 REM-----
4010 DEFPROC_COLW(N):COLOURN
4020 WZ?((WZ?64)#8+4)+((N AND 128)/128)=N AND 127 :REM Checks to see if
colour is foreground
or background by bit 8
and then stores the
colour number for the
current window.
4030 ENDPROC
5000 REM-----
The demo-program is:-
20 ONERRORDU26,20,12,10:GOTO900
30 MODE1:PRINTTAB(0,9):REPEATREADA$
40 PRINTA$:CHR$(-(40-LENA$)*11)
50 UNTILA$=""!REPEATUNTILCET
60 CLS
70 DATA"-----" :REM Forty dashes.
80 DATA" MultiWindows by John C. Green."
90 DATA"-----"
100.DATA" On the screen you will now see the"
110 DATA"computer print the words: zero, one,"
120 DATA"two, and so on."
130 DATA" But after every word it will change to"
140 DATA"a new window."
150 DATA" "
160 DATA"-----"
170 DATA"Press the spacebar."
180 DATA"-----"
190 DATA""
200 PRINTTAB(32,17)"By"TAB(31,19)"John"TAB(31,21)"Green"TAB(12,5)"Multi"TAB(11,
6)"Windows"
210 FORA=0TO7:READX1,Y1,X2,Y2:
220 PROC_SET_WINDOW(A,X1,Y1,X2,Y2):PROC_WINDOW(A)
230 PROC_COLW(A AND 3):PROC_COLW(131-(A AND 3))
240 CLS:NEXT
250 DATA0,7,9,0
260 DATA0,31,19,16
270 DATA0,15,19,8
280 DATA20,31,29,16
290 DATA30,31,39,24
300 DATA20,15,39,0
310 DATA10,3,19,0
320 DATA36,23,39,16
330 DIMA$(7):FORA=0TO7:READA$(A):NEXT
340 DATAZero,One,Two,Three,Four,Five,Six,Seven
350 REPEATFORA=0TO7
360 PROC_WINDOW(A):PRINTA$(A) " "
370 NEXT:UNTILFALSE
```

# PROGRAM FILE



## Amiga Unidraw by Ronald In't Velt

This program has been written in Amiga Basic for any Amiga with at least 512k of memory. The program can be rather slow, so if something doesn't work, wait a few seconds and try again. The program works with Workbench versions 1.1 and 1.2, and optional fonts are from version 1.1. If you want to add your own fonts, change the FOR..NEXT loop which reads data into t\$( ) to read exactly the right number of fonts, and then add the name and size of your font to the data statements.

To create Unidraw, make a blank formatted disk called Drawings, and a blank formatted disk called Unidraw holding Workbench, Basic and

the diskfonts. Create an empty drawer called BMAPS. Copy the file Graphics.bmap to the BMAPS drawer from the Extras disk. Type in and run Listing 2; this creates a file named Diskfont.bmap which will be put in the BMAPS drawer. Type in and save Listing 1; this can then be run (under Basic). The program will not request that the Drawings disk should be present when it needs it, so you will have to swap that one into the disk drive when it is required.

The program itself operates in the standard Amiga manner, with menus available at the top of the screen using the right-hand button. Its operation is fairly self-explanatory.

```

CLEAR.50000&

DECLARE FUNCTION openfont&() LIBRARY
DECLARE FUNCTION opendiskfont&() LIBRARY

CHDIR "unidraw:BMAPS"
LIBRARY "graphics.library"
LIBRARY "diskfont.library"
GOSUB setup
SOUND 440.4

main:
  oldtool=Tool
  WHILE MOUSE(0)<>0:WEND
  ON Tool GOSUB tdraw1,tline,tpaint,tcircle,tframe,tbox,tpoly,tairbrush
  SOUND 1000,1
  ON ≤0 GOSUB setbrush,type,colors,misc:SOUND 1000,1
  MENU ON
  GOTD main

END

setup:
mo&=1:GOSUB mode
MENU 1,0,1,"Tools"
MENU 1,1,1,"Draw"
MENU 1,2,1,"Line"
MENU 1,3,1,"Paint"
MENU 1,4,1,"Circle"
MENU 1,5,1,"Frame"
MENU 1,6,1,"Box"
MENU 1,7,1,"Poly"
MENU 1,8,1,"Airbrush"

MENU 2,0,1,"Set Brush"
MENU 2,1,1,"Line brush"
MENU 2,2,1,"Paint brush"
MENU 2,3,1,"Airbrush"

MENU 3,0,1,"Text"
MENU 3,1,1,"Type"
MENU 3,2,1,"Get new font"

MENU 4,0,1,"Colors"
MENU 4,1,1,"Use"
MENU 4,2,1,"Set"

MENU 5,0,1,"Project"
MENU 5,1,1,"Load picture"
MENU 5,2,1,"Save picture"
MENU 5,3,1,"Clear screen"

SCREEN 1,640,400,4,2
WINDOW 1,"Unidraw", (0,0)-(631,186),0,1

DIM g%(15000),pa%(7),c%(7),o(3),t*(20),cc(15,2)
i=&HFFFF:FOR a=0 TO 7:pa%(a)=&HFFFF:c%(a)=&HFFFF:NEXT
Tool=1:abr=10
FOR t=1 TO 13:READ t*(t):NEXT
FOR a=0 TO 15:FOR b=0 TO 2:READ cc(a,b)
NEXT:PALETTE a,cc(a,0),cc(a,1),cc(a,2):NEXT
AREA (10,10):AREAFILL:CLS
ON MENU GOSUB choice
ON ERROR GOTD errors
MENU ON
mo&=0:GOSUB mode
RETURN

choice:
MENU OFF
    
```

# MICROMART

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# PROGRAM FILE

```
s0=0:m0=MENU(0)
IF m0=1 THEN Tool=MENU(1)
IF m0>1 THEN s0=m0-1:s1=MENU(1):Tool=0
MENU ON:RETURN
```

```
tdraw:
q=MOUSE(0):PSET(MOUSE(1),MOUSE(2))
WHILE MOUSE(0)<>0
LINE -(MOUSE(1),MOUSE(2))
WEND
tdraw1:
IF Tool<>1 THEN RETURN
IF MOUSE(0)=0 THEN tdraw1
GOTO tdraw
```

```
tline:
m0=2:GOSUB mode
WHILE MOUSE(0)<1:IF Tool<>2 THEN tlineend
WEND:x1=MOUSE(1):y1=MOUSE(2)
WHILE MOUSE(0)--1:WEND
WHILE MOUSE(0)<1
x2=MOUSE(1):y2=MOUSE(2)
LINE (x1,y1)-(x2,y2):LINE (x1,y1)-(x2,y2)
IF Tool<>2 THEN tlineend
WEND
m0=0:GOSUB mode
LINE (x1,y1)-(x2,y2)
WHILE MOUSE(0)<0:WEND
GOTO tline
```

```
tlineend:
m0=0:GOSUB mode
RETURN
```

```
toaint:
WHILE MOUSE(0)<1:IF Tool<>3 THEN RETURN
WEND:x=MOUSE(1):y=MOUSE(2)
rp=WINDOW(B):m0=1
flood& rp&,m0&,x&,y&
GOTO toaint
RETURN
```

```
tcircle:
m0=2:GOSUB mode
WHILE MOUSE(0)<1:IF Tool<>4 THEN tlineend
WEND:x=MOUSE(1):y=MOUSE(2)
WHILE MOUSE(0)--1:WEND
WHILE MOUSE(0)<1
r=ABS(MOUSE(1)-x):a=ABS(MOUSE(2)-y)/(r+1)
CIRCLE(x,y),r,,,a:CIRCLE(x,y),r,,,a
IF Tool<>4 THEN tlineend
WEND
m0=0:GOSUB mode
CIRCLE(x,y),r,,,a:GOTO tcircle
```

```
tframe:
m0=2:GOSUB mode
WHILE MOUSE(0)<1:IF Tool<>5 THEN tlineend
WEND:x1=MOUSE(1):y1=MOUSE(2)
WHILE MOUSE(0)--1:WEND
WHILE MOUSE(0)<1
x2=MOUSE(1):y2=MOUSE(2)
LINE (x1,y1)-(x2,y2),,b:LINE (x1,y1)-(x2,y2),,b
IF Tool<>5 THEN tlineend
WEND
m0=0:GOSUB mode
LINE (x1,y1)-(x2,y2),,b
GOTO tframe
```

```
tbox:
m0=2:GOSUB mode
WHILE MOUSE(0)<1:IF Tool<>6 THEN tlineend
WEND:x1=MOUSE(1):y1=MOUSE(2)
WHILE MOUSE(0)--1:WEND
WHILE MOUSE(0)<1
x2=MOUSE(1):y2=MOUSE(2)
LINE (x1,y1)-(x2,y2),,bf:LINE (x1,y1)-(x2,y2),,bf
IF Tool<>6 THEN tlineend
WEND
m0=0:GOSUB mode
LINE (x1,y1)-(x2,y2),,bf
GOTO tbox
```

```
tpoly:
m0=2:GOSUB mode
WHILE MOUSE(0)--1:WEND
WHILE MOUSE(0)<1
x2=MOUSE(1):y2=MOUSE(2)
IF fpoly=1 THEN LINE (x1,y1)-(x2,y2):LINE (x1,y1)-(x2,y2)
IF Tool<>7 THEN tpolyend
WEND
IF fpoly=1 THEN LINE (x1,y1)-(x2,y2)
AREA(x2,y2)
x1=x2:y1=y2:fpoly=1:GOTO tpoly
tpolyend:
m0=0:GOSUB mode
AREAFILL
fpoly=0
RETURN
```

```
tairbrush:
m0=2:GOSUB mode
tab1:
x1=MOUSE(1):y1=MOUSE(2):IF Tool<>8 THEN tlineend
CIRCLE(x1,y1),abr:CIRCLE(x1,y1),abr
IF MOUSE(0)=0 THEN tab1
m0=0:GOSUB mode
WHILE MOUSE(0)<>0
x%=MOUSE(1):y%=MOUSE(2)
```

# PROGRAM FILE

```

an=RND#7:r*x%=x%+COS(an)*abr#RND
ry=y%+SIN(an)*abr#RND/2
PSET (rx%,ry%):WEND
GOTO tairbrush

setbrush:
GOSUB windowo
ON s1 GOSUB bline,bpaint,bair
GOSUB windowc
RETURN

bline:
FOR a=0 TO 15
  x=300-a#18
  LINE (x,10)-(x-20,25),((11 AND 2^a)/2^a)*3,bf
  LINE (x,10)-(x-20,25),1,b
NEXT a
b11:
b=MOUSE(0):x=MOUSE(1):y=MOUSE(2)
IF b<>0 AND x=0 AND y=0 THEN WINDOW OUTPUT 1:PATTERN 11:RETURN
IF b<1 OR y<10 OR y>25 OR x<10 OR x>300 THEN b11
a=2^(INT((300-x)/18))
IF (11 AND a)=0 THEN 11=(11 OR a) ELSE 11=(11 AND (&HFFF-a))
x=INT(x/18)*18-6:LINE (x+1,11)-(x+17,24),((11 AND a)/a)*3,bf
GOTO b11

bpaint:
FOR a=0 TO 8:LINE (0,a#7)-(175,a#7),1:NEXT
FOR a=0 TO 16:LINE (a#11,0)-(a#11,56),1:NEXT
FOR a=0 TO 15
  FOR b=0 TO 7
    p=2^(15-a)
    LINE (a#11+1,b#7+1)-(a#11+10,b#7+6),((p%(b)AND p)/p)*3,bf
  NEXT
NEXT
bp1:
b=MOUSE(0):x=MOUSE(1):y=MOUSE(2):IF b=0 THEN bp1
IF b<>0 AND x=0 AND y=0 THEN WINDOW OUTPUT 1:PATTERN,pa%:RETURN
IF x>175 OR y>56 THEN bp1
x=INT(x/11):y=INT(y/7):p=2^(15-x)-(x=0)*65536&
v=(p%(y)AND p)/p
IF v=0 THEN p%(y)=(p%(y) OR p) ELSE p%(y)=(p%(y) AND (&HFFF-p))
LINE (x#11+1,y#7+1)-(x#11+10,y#7+6),-(v=0)*3,bf
WHILE MOUSE(0)<>0 :WEND
GOTO bp1

bair:
LINE (0,10)-(160,20),1,b
LINE (abr#10+1,11)-(abr#10+9,19),1,bf
CIRCLE (35,35),abr,1:abo=abr
WHILE MOUSE(0)=0 OR MOUSE(1)>150:WEND
x=MOUSE(1):y=MOUSE(2)
IF x=0 AND y=0 THEN RETURN
LINE (abo#10+1,11)-(abo#10+9,19),0,bf
CIRCLE (35,35),abo,0
abr=INT(x/10)
GOTO bair

colors:
GOSUB windowo
ON s1 GOSUB cuse,cset
GOSUB windowc
IF s1=1 THEN COLOR colsel
RETURN

cuse:
FOR a=0 TO 7
  FOR b=0 TO 1
    LINE (a#30,b#15)-(a#30+20,b#15+10),a+b#8,bf
  NEXT b
NEXT a
WHILE MOUSE(0)<1 OR x>230 OR y>25
  x=MOUSE(1):y=MOUSE(2)
WEND
colsel=INT(x/30)+INT(y/15)*8
RETURN

cset:
GOSUB cuse
CLS
LINE (0,0)-(320,10),colsel,bf
LINE (0,15)-(210,20),1,b
LINE (0,25)-(210,30),1,b
LINE (0,35)-(210,40),1,b
FOR s=0 TO 2
  o(s)=cc(colsel,s)
  LINE (cc(colsel,s)*200+1,(s+1)*10+6)-(cc(colsel,s)*200+9,(s+1)*10+9),1,bf
NEXT

cset1:
WHILE MOUSE(0)=0 OR MOUSE(1)>200:WEND
x=MOUSE(1):y=MOUSE(2)
IF x=0 AND y=0 THEN RETURN
s=0:IF y>13 AND y<22 THEN s=1
IF y>23 AND y<30 THEN s=2
IF y>33 AND y<42 THEN s=3
IF s=0 THEN cset1 ELSE s=s-1
cc(colsel,s)=x/200
cset2:
LINE (o(s)*200+1,(s+1)*10+6)-(o(s)*200+9,(s+1)*10+9),0,bf
LINE (cc(colsel,s)*200+1,(s+1)*10+6)-(cc(colsel,s)*200+9,(s+1)*10+9),1,bf
PALETTE colsel,cc(colsel,0),cc(colsel,1),cc(colsel,2)
o(s)=cc(colsel,s):GOTO cset1

type:
ON s1 GOSUB ttype,ftont
Tool=oldtool

```

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```

RETURN
ttype:
WHILE MOUSE(0)=0:WEND
x%=MOUSE(1):y%=MOUSE(2):ro%=WINDOW(8)
move% rp%,x%,y%
mo%=2:GOSUB mode
t$="":g$="":WHILE g%<>CHR$(13)
g%=INKEY$:IF g$="" THEN ttype1
IF ASC(g%)=8 AND LEN(t%)>0 THEN t%=LEFT$(t%,LEN(t%)-1)
IF ASC(g%)<>13 AND ASC(g%)<>8 THEN t%=t%+g$
ttype1:
move% rp%,x%,y%:PRINT t%:
move% rp%,x%,y%:PRINT t%:
WEND
mo%=0:GOSUB mode
move% rp%,x%,y%:PRINT t%:
RETURN

tfont:
fs=1
GOSUB window
AREA (10,0):AREA (0,5):AREA (20,5):AREAFILL
AREA (10,50):AREA (0,45):AREA (20,45):AREAFILL
rp%=WINDOW(8):x%=30:y%=30
LINE (25,22)-(170,33),1,b
tfont1:
LINE (26,23)-(169,32),0,bf
move% rp%,x%,y%
PRINT t$(fs):
WHILE MOUSE(0)=0:WEND
x=MOUSE(1):y=MOUSE(2)
IF x=0 AND y=0 THEN tfont2
IF x<21 AND y<6 AND fs>1 THEN fs=fs-1
IF x<21 AND y>44 AND y<51 AND fs<15 THEN fs=fs+1
WHILE MOUSE(0)<>0:WEND
GOTO tfont1

tfont2:
t%=LEFT$(t$(fs),LEN(t$(fs))-3)+".font"
h=VAL(RIGHT$(t$(fs),3))
WINDOW OUTPUT 1
textattr%(0)=SADD(t%+CHR$(0))
textattr%(1)=h*65536&
IF LEFT$(t%,5)="topaz" THEN fontptr%=openfont%(VARPTR(textattr%(0)))
IF LEFT$(t%,5)<>"topaz" THEN fontptr%=opendiskfont%(VARPTR(textattr%(0)))
rp%=WINDOW(8)
IF fontptr%>0 THEN CALL setfont%(rp%,fontptr%)
GOSUB window
RETURN

DATA "topaz 08","topaz 09"
DATA "ruby 08","ruby 12"
DATA "opal 11"
DATA "sapphire 14","sapphire 15","sapphire 18","sapphire 19"
DATA "diamond 12"
DATA "garnet 09","garnet 16"
DATA "emerald 20"

misc:
ON s1 GOSUB pload,psave,pcls
Tool=oldtool
RETURN

pcls:
PATTERN,c%
LINE (0,0)-(640,200),0,bf
PATTERN,pa%
RETURN

psave:
GOSUB filename
CHDIR "drawings:"
OPEN f% FOR OUTPUT AS #1
FOR a%=0 TO 2:
GET (0,a%*62)-(631,a%*62+61),g%
FOR b%=0 TO 9950:PRINT #1,g%(b%);:NEXT
SOUND 3000,2
NEXT
FOR a%=0 TO 15:FOR b%=0 TO 2
PRINT#1,cc(a%,b%)::NEXT:NEXT
CLOSE #1
RETURN

pload:
GOSUB filename
CHDIR "drawings:"
OPEN f% FOR INPUT AS #1
mo%=1:GOSUB mode
FOR a%=0 TO 2:
FOR b%=0 TO 9950:INPUT #1,g%(b%):NEXT
SOUND 3000,2
PUT (0,a%*62),g%,PSET
NEXT
mo%=0:GOSUB mode
FOR a%=0 TO 15:FOR b%=0 TO 2
INPUT#1,cc(a%,b%):NEXT
PALLET IF a%,cc(a%,0),cc(a%,1),cc(a%,2)
NEXT
CLOSE #1

plx:
RETURN

filename:
GOSUB window
INPUT "Enter filename":f%
GOSUB window
    
```

# PROGRAM FILE

# MICROMART

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RETURN

errors:

SOUND 440,2:SOUND 880,2:SOUND 1760,2  
RESUME pix:

mode:

rp&=WINDOW(8)  
setdrmd&.rp&,mo&  
RETURN

window:

GET (0,0)-(330,60),g%  
WINDOW 2,,(0,0)-(311,50),0,1:WINDOW OUTPUT 2  
RETURN

window:

GET (0,0)-(330,60),g%  
WINDOW 2,,(0,0)-(311,50),0,1:WINDOW OUTPUT 2  
RETURN

windowc:

WINDOW CLOSE 2:WINDOW OUTPUT 1  
Tool=oldtool  
PUT (0,0),g%,PSET  
RETURN

DATA 0,0,0,1,1,1,1,0,0,0,1,0

DATA 0,0,1,1,1,0,0,1,1,0,1,0

DATA .5,.5,.5,.7,.7,.7,.5,0,0

DATA 0,.5,0,0,0,.5,.5,.5,0,0,.5,.5

DATA .5,0,.5

END

rems:

REM ----- Instructions -----

REM - Starting up:  
REM Select Unidraw's icon and double-click the left mouse button  
REM Wait for the program to load  
REM When the program is ready, the screen will turn black and you'll  
REM hear a low tone

REM - Selecting options:  
REM Press the right mouse button and select an option (the program  
REM will beep)  
REM The five options are:  
REM - Tools These are the drawing tool such as paint,line  
REM - Set Brush This is for changing the line,paint and air-  
REM brush shape  
REM - Text This section is for entering text in your  
REM drawing,and for loading other fonts  
REM - Colors This section is for changing and selecting  
REM colors  
REM - Project Contains the Load,Save and Clear functions

REM - Tools  
REM - Draw Plots a point whenever you hold the left mouse  
REM button down  
REM - Line Press once to mark the start of the line;press  
REM again to draw the line  
REM (from the start of the line to the position of  
REM the pointer)  
REM - Paint Flood-fills an area with the current color  
REM Press once to mark the center of the circle.and  
REM move the mouse to change the circle's shape.  
REM Press again to draw the circle  
REM - Circle Press once to mark the start of the frame,and  
REM move to the end of the frame. Press again to  
REM draw the frame  
REM - Frame Same as Frame,but draws a filled frame (a box)  
REM This is for drawing complex filled shapes.  
REM Press the button to mark a corner of the shape.  
REM You can mark up to twenty corners. Selecting  
REM any other tool will draw the shape  
REM - Airbrush Works just as draw,but plots random points  
REM withing a certain radius,thus simulating an  
REM airbrush

REM - Set brush  
REM - Line brush Lets you change the line brush,for drawing  
REM dotted lines etc.  
REM - Paint brush Lets you change the Paint brush,so you can fill  
REM shapes with custom patterns  
REM - Airbrush For changing the Airbrush radius

REM - Text  
REM - Type First,select a position with the mouse and  
REM press the button,then you can enter text.  
REM Press (RETURN) to draw the text  
REM - Get new font shows a box with a font and its height,and two  
REM arrows. Use the arrows to step through the  
REM available fonts,and close the small window to  
REM load the font

REM - Colors  
REM - Use A small window is opened,showing the available  
REM colors. Move the pointer to the color you want

REM and press the button.  
REM Select the color you want to change as is Use,  
REM then you can change the color with  
REM the three 'slidebars' (as in PREFERENCES)

REM - Project  
REM - Load picture Loads a picture from the PICTURE disk  
REM - Save picture saves a picture  
REM - Clear screen clear the screen

REM Notes

REM The functions Line brush,Paint brush,Airbrush,Get new font,Use.

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```
REM Set,Load and Save open a small window. to close the window (and
REM thus exiting the function),move the pointer to the upper-left
REM corner of the screen and press the button. (Except for Use,Load
REM and Save. These funtions close the window themselves when you
REM select the color or enter the filename)
```

```
REM Loading and Saving takes a lot of time (+- 3 minutes)
```

```
REM When you select a function for the first time,the program will
REM not react at once,because it has to organize a lot of variables.
REM If nothing happens,try again. Once a function has been selected
REM before,you won't have to wait again.
```

```
REM When you are working with the Setbrush,Text.Color or Project
REM functions,don't select another function until you are finished
REM with the current one. When you are finished,the program will
REM return to the Tool you last used.
```

```
REM Playing with the various functions and Tools is the best way to
REM learn!
```

```
Program 2:use this program to create the diskfont.bmap file
```

```
CHDIR "Unidraw:BMAPS/"
```

```
FOR i=1 TO 35
  READ c$
  c=c+VAL("%h"+c$)
NEXT
IF c<>319B THEN PRINT "Error in data statements":END
RESTORE
OPEN "0".1."Diskfont.bmap"
FOR i=1 TO 35
  READ c$
  c=VAL("%h"+c$)
  PRINT #1,CHR$(c):
NEXT
CLOSE #1
PRINT "Diskfont.bmap has been created"
```

```
DATA 4f,70,65,6e,44,69,73,6b
DATA 46,6f,6e,74,00,ff,e2,09
DATA 00,41,76,61,69,6c,46,6f
DATA 6e,74,73,00,ff,dc,09,01
DATA 02,00,02
```

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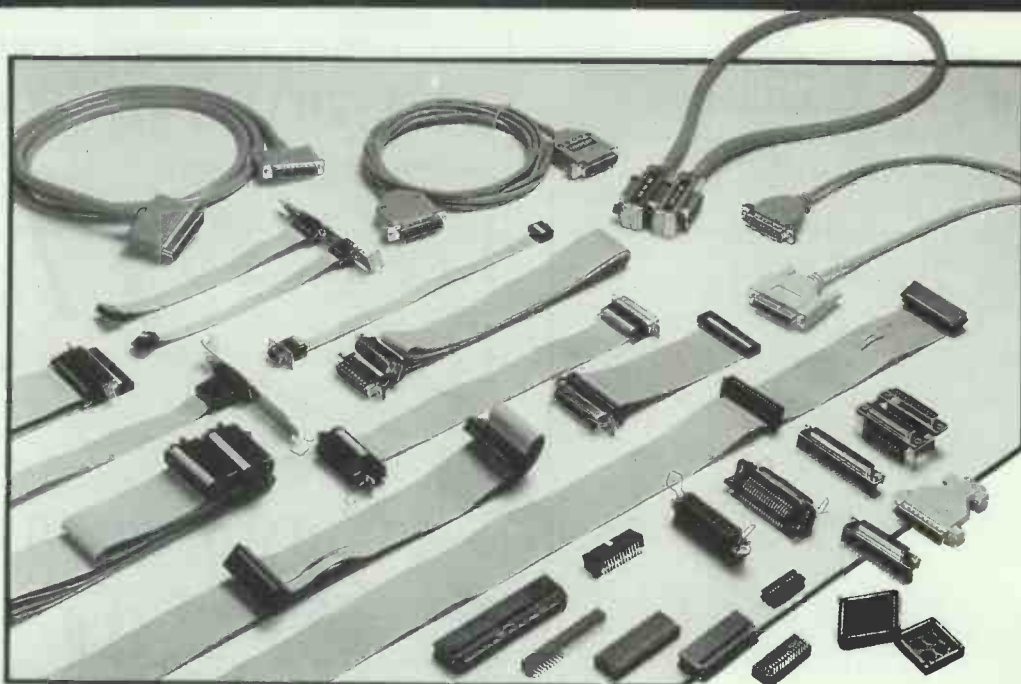
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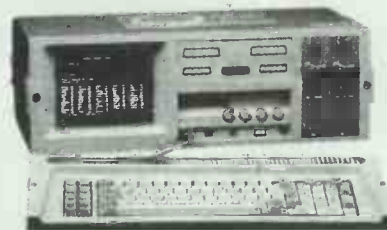
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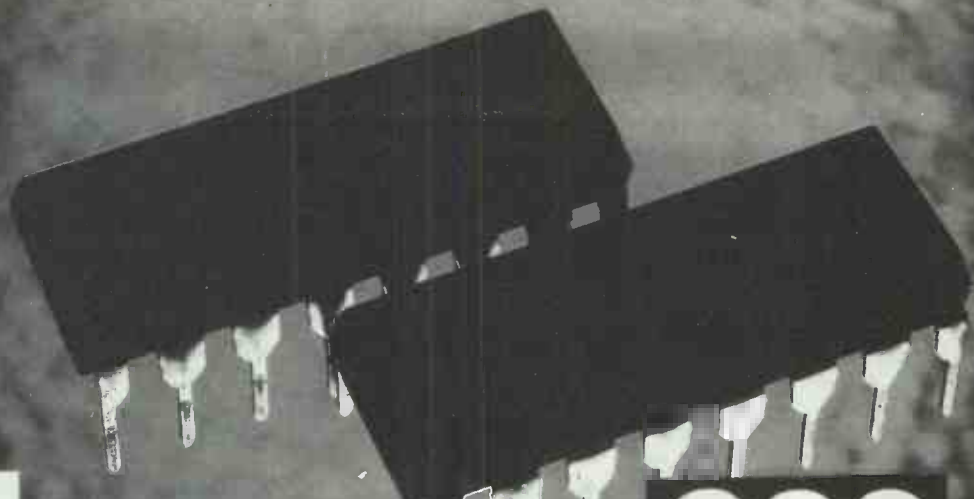
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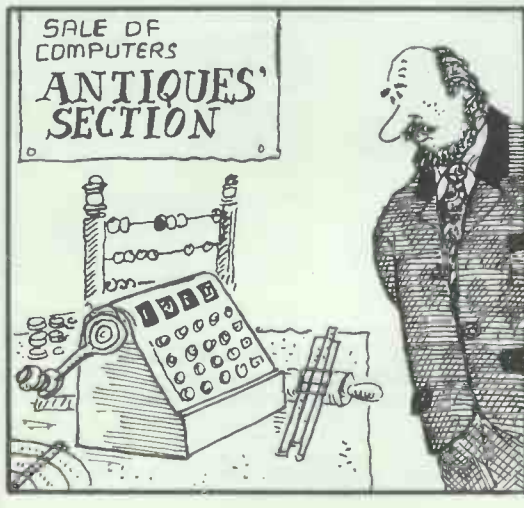
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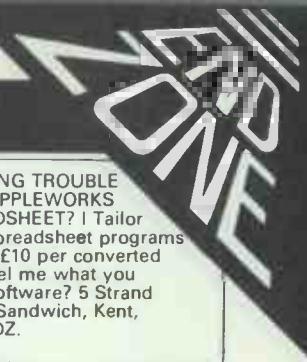
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 ● AMSTRAD PC1512 HD20 COLOUR. 9 months guarantee. Perfect condition. £950 o.n.o. Tel: (01) 341 3994.  
 ● FRAMEWORK II VERSION 1.0. Complete with all manuals. £100. Tel: Buckingham 817094. Ask for Paul Ferguson.  
 ● FOR SALE: IBM PC 256k Motherboard, £175. Monochrome display adaptor, £70. Floppy disk adaptor. £50. 5 1/4 inch full height floppy drive, £50. Write to Mr Turner, 19 Grosvenor Square, Sheffield, S2 4NF.  
 ● E.G.A GRAPHICS CARD. £150. Samsung 12" mono monitor, £60. Mono graphics card, £60. Upstart icon driven menu system, £50. Presentation graphics on the IBM by Lambert, £15. Bedford 60792.  
 ● HERCULES COMPATIBLE GRAPHICS CARD. With parallel printer adaptor. Plus high resolution monochrome monitor (amber) (0201) o.n.o. John Chapman (061) 434 6251 Eves.  
 ● TOSHIBA T3100 PC-AT COMPATIBLE. 640k Ram. 10Mb internal hard disk. Internal 720k, 3.5 micro floppy drive. With MS-DOS 3.2. £1800 o.n.o. Tel: 373 3191 after 5pm.

SALE OF COMPUTERS

## ANTIQUES' SECTION





## MISCELLANEOUS

● **RS232 BREAK-OUT BOX.** Imac clear signal interface tester with Tri-state L.E.D.'s on all lines. Also patching facilities. Cost over £200 new. Bargain at £75. Tel: (1734) 478274 Eves.

● **MICROWRITER.** Complete with BBC link £150 o.n.o. Fawdry Milton Keynes (0908) 665806 Eves.

● **OLIVETTI M.19 H.D.** EXPAN KIT. New, boxed, never used, £500. Torch £80 2nd processor card, £100. Other BBC hardware. Tel: Kilmarnock 0563 31068 any evening. Raymond Crane.

● **ACT SIRIUS.** 10Mb hard disk, 1.2 Mb floppy. Software: Wordstar, Multiplan, Crosstalk, Pegasus stock control. Preference manuals included. Good working order, £995. (0606) 556439 Simon.

● **SIRIUS TWIN FLOPPY.** 2 x 600k 256k RAM, MS basic, Assembler, progs, toolkit, Pulsar accounts, MS Fortran + MS basic compilers, manuals etc. In perfect condition. Virtually unused, fair price, £750. Tel: eves Bath (0225) 26329.

● **DATELMODEM 4242**

● **BRITISH TELECOM MERLIN SYSTEM.** Cost £1040 March 1986. Used twice, will accept £500. Tel: (0602) 501196.

● **ACT SIRIUS.** 128k twin floppy, s/sided, £450. 256k twin floppy, d/sided, £650. 256k 10 MEG £875. All with manuals and software. White fronted if preferred. No V.A.T. (0532) 860795.

● **6809 CASED RACK SYSTEM.** PSU, keyboard, flex, SK DOS, Utilities, Forth-83, ED3. £250. Consider exchange QL system. Dynastar RMS McCosh 'C' £100. Tel Tim Bangor (0248) 601049.

## MONITORS

● **TAXAN KAGA COLOUR MONITOR.** Excellent

condition, ideal for IBM, Apple, Oric etc. £150. Tel (0753) 853553 x257 (Mark) work (0628) 74687 after 6.00pm.

● **PHILIPS Green screen monitor.** As new, boxed, £50. Dragon disk drive and interface boxed with manuals and software, £100. Also second hand Demon or WS4000 wanted Maidenhead (0628) 825444.

## PORTABLES

● **EPSON PX-8 PORTABLE.** 120k RAM, PF10 disk drive, P80 Primer, usual software & manuals. £525. Tel: (01) 385 6561.

● **EPSON PX-8.** Including Wordstar, Calc, Card box, Basic software. Plus Philips monitor and UD-80 controller and acoustic modem CX-21. Excellent condition, £650. Tel: Hans on (01) 594 7272 Extension 242.

● **ZENITH Z-181 PORTABLE.** With PCXFER. £1150. Inc MS-DOS and manuals. Excellent machine. No longer required. Tel: (01) 668 3792.

## PRINTERS & PLOTTERS

● **PLOTTER COLORWRITER 6320.** Ex-demo, 10 pen, A3, static, flat, bed HP compatible. £795. Also plotter A3 6 pen flat bed type. Watanaba compatible. £250 new. In box. Tel: (0322) 331984.

● **DAISYSTEP 2000 DAISYWHEEL PRINTER.** As new, in full working condition. Owner selling due to no longer wanting computer. £180. Tel (0272) 638481 after 6pm.

● **BROTHER TWINRITER 5 PRINTER.** Daisywheel and dot matrix combined. Plus electric sheet feeder. Little used, £975 (+ VAT). Foster. Day Brighton (0273) 693622, Eves 504385.

● **JUKI 6100 DAISY WHEEL PRINTER.** Boxed with

manual. Home use only. Excellent machine. Reason for sale, upgrading. Tel: Wantage 02357 69309. Could deliver. £230.

● **HP 7470A PLOTTER.** Virtually unused. Apple II serial card, cable and connector. £950 o.n.o. Tel: (01) 458 5415.

● **HP THINKJET PRINTER.** As new. Parallel interface, with cable. £175 o.n.o. Tel: (06284) 6888.

● **DIABLO 630 DAISYWHEEL.** Tractor feed. Ribbons and print wheels. £350, (01) 435 9169.

● **DIABLO 630 (HPR05) DAISYWHEEL PRINTER** £550. Olivetti PR430 daisywheel printer. £295. Brother HR15 daisywheel printer, £175. Microline 83A matrix printer, £140. Epson FX80 matrix printer, £120. No VAT. (0532) 860795.

## SHARP

● **PC1500 (18k).** RS232 I/F, plotter, software, manuals, magazines (US), pens, paper, etc. £250 the lot. (0635) Newbury 42809.

## SINCLAIR

● **SINCLAIR QL.** With Philips green monitor, ICE Flight Simulator, TALENT workbench, Centronics interface, joystick books, magazines, manuals. £180 Tel: Brighthouse (0484) 721 205 Eves.

● **640k SINCLAIR QL AND PHILIPS MONITOR.** Lots of software. Languages, games, utilities, JM, ROM, Psion 2.3. All v.g.c. £175. Tel: Greg Salt (0603) 614062 anytime.

● **QL CASH TRADER.** (£35), Supercharge and other software for sale, due to computer breaking down, all brand new. Tel: (0223) 322625.

● **SINCLAIR QL SYSTEM.** Microvitec monitor, twin book floppies, printer, modem, interfaces, Psion packages, ICE ROM, Choice, Mailmerge, Multitask,

utilities, McGraw assembler, Chess, many books, will split. £375. Tel 054555 292.

● **QL 640k, 2 x 720k disk drives, parallel printer interface.** Assembler, ICE. Choice, books, magazines. All in good condition. £449 o.n.o. Tel: Bristol (0272) 423860 Eves only.

## SOFTWARE

● **IBM S-WARE for sale.** Flight simulator, DBASE III+, Fortran, Turbo Pascal, SuperCalc, Autocad, and many more. Send s.a.e. for details. Tom Dragic, 2A Sutton Court Mansions, London W4 3JH or Tel: (01) 994 7507.

● **APPLE S/WARE for sale.** Flight simulator, DBASE II Fortran, Pascal, Beagle Graphics and many more. Send s.a.e. For details. Tom Dragic, 2A Sutton Court Mansions, London W43JH or Tel: (01) 994 7507.

● **USED COPIES OF PC1512 SOFTWARE.** Wordstar 1512, £39. Supercalc 3, £39. TAS+, £39. GEM: Draw+, £49. Graph, £49, Business library, £19. Excellent condition. Fully boxed and manuals. Tel: (01) 902 2081. David.

● **SOFTWARE SALE:** Word 3.1, £180. Symphony 1.2, £150, DOS 3.1, £20. Reflex, £40. Lightning, £30. Norton 3, £20. Spotlight, £20. All unused original disk and manuals, in 'mint' condition. Please call Fred at (01) 785 9880.

● **CHESS EXPERT.** BBC micro series disk-based system. Saves games, openings, comments, analysis. Optional 300k openings database. Demo disk £1. Bernard Hill, Hawthorn Bank, Scott's Place, Selkirk, TD7 4DP.

● **IBM COMPATIBLES SOFTWARE:** Microsoft Multiplan, JR spreadsheet (still unopened), £42. Autodesk's Autosketch drawing program, £60. Tel: (061) 256 3257.

● **HAVING TROUBLE WITH APPLEWORKS SPREADSHEET?** I Tailor make spreadsheet programs for just £10 per converted page. Tel me what you want, software? 5 Strand Street, Sandwich, Kent, CT13 9DZ.

## TANDY

● **TANDY MODEL.** 48k plus single disk drive, manuals, Visicalc, printer cable, editor assembler. Tel: Stephen (042) 783202 Lincs.

● **T.R.S. 80** With expansion interface, green screen monitor, Tandy line printer, two disk drives, software including Visicalc books and spare disks. £75 the lot! Milton Keynes 663864.

## WANTED

● **DBASE II OR DBASE II CP/ M2.2** for Memotech MTX512 (64k) computer with 500K twin FSX 5.25 inch floppy disk system. Any offer considered up to £200. Tel (0423) 526267 after 5.30pm.

● **WANTED:** RS232C serial interface for Sanyo MBC 555-2 computer. New or used. Write to John Robinson, 53, Ferrier Road, Stevenage, Herts SG2 0NZ or Tel (0438) 354177 anytime. State price.

● **WANTED.** A1, A2 or A3 flatbed plotter. i.e. Hewlett Packard, Roland, Graphtek or similar: Also, suitable I.B.M compatible digitizer and C.A.D. software etc. Tel Joe Scott 584 3624 office. 352 8806 Eves.

● **WANTED.** Deja Vu Decision analysis system software for IBM. £45. Tel: Edinburgh (031) 228 1142.

● **WANTED.** Date arithmetic formula for use with Datastar, Reportstar, programs. Will swap hard disk utilies for information. Tel: (0959) 76075 office hours, (0959) 74165 Eves. K. Lyward.

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*Mike Mudge delves into the factorisation and other properties of Fermat Numbers, with mathematical requirements being kept to the minimum.*

**Definition** 'Fermat Numbers' are defined by  $F_n = 2^{2^n} + 1$ . Thus,  $F_1 = 5$ ,  $F_2 = 17$ ,  $F_3 = 257$ ,  $F_4 = 65537$ .

It can be readily verified that these first four Fermat Numbers are prime; indeed, Pierre De Fermat (1601-1665) conjectured that *all*  $F_n$  were prime. However, such are the dangers of generalisation based upon empirical evidence, and in 1732 Leonhard Euler found that:

$$F_5 = 2^{2^5} + 1 = 2^{32} + 1 = 4294967297 = 641 \times 6700417$$

In 1880 F Landry proved that:

$$F_6 = 2^{2^6} = 2^{64} + 1 = 274177 \times 67280421310721$$

No prime Fermat Number has been found beyond  $F_4$ , so that Fermat's conjecture has not proved to be a very happy one. It is perhaps more probable that although the number of prime  $F_n$  is finite, there are others waiting to be discovered (reference the probabilistic argument given as a footnote in *An Introduction to the Theory of Numbers* by GH Hardy and EM Wright).

The existence of prime  $F_n$  has an interesting geometrical connection, since Karl Friedrich Gauss proved that a regular polygon having  $F_n$ -sides could be inscribed in a circle by Euclidean methods if  $F_n$  is prime. (A 65537-sided regular polygon inscribed in a given circle could provide an interesting challenge in computer graphics, particularly if an attempt was made to simulate the Euclidean methods mentioned above!)

**Theorem 1** No two Fermat Numbers have a common divisor other than 1.

**Theorem 2** If  $F_n$  is prime, then the number:

$$Z_n = 3^{2^{2^n-1}+1}$$

is divisible by  $F_n$ .

For example,  $F_2 = 17$  is prime, hence we know that  $3^{2^3} + 1 = 3^8 = 6561 + 1$  is divisible by 17. In fact,  $6562 = 17 \times 386$ .

**Note** The converse of theorem 2 is also true: that is, if  $F_n$  is *not* prime, then  $Z_n$  is *not* divisible by  $F_n$ .

**Theorem 3** Any factor of  $F_n$  has the form  $k \times 2^m + 1$  where  $m \geq n + 2$  and  $k$  is an odd integer.

For example, the factor 274177 of  $F_6$  cited above is given by  $256 \times 1071 + 1$ , while the factor 6700417 of  $F_5$  is given by  $52347 \times 128 + 1$ .

This month's project is to search for factors of Fermat Numbers; it is suggested that Theorem 3 be used, hence two different ways of organising the search are possible.

The description which follows is due to Professor Wilfrid Keller of the University of Hamburg, who has conducted extensive research in this area using both a Telefunken TR 440 computer in TAS assembly language and a Siemens 7.755 with built-in extended precision floating point arithmetic.

How far can PCW readers get with this work?

**Approach 1 — Trial division** For fixed  $n$ , look for all  $k$  less than some search limit  $L_n$  to see if  $k \times 2^n + 1$  divides some  $F_r$ ,  $r \leq n$ .

**Approach 2 — Tabulation of primes** For fixed  $k$ , list all primes of the form  $k \times 2^m + 1$  for  $m$  up to some limit  $M_k$ . Then, for each prime, look to see if it divides some  $F_n$  where  $n \leq m - 2$ .

Readers are invited to send their thoughts, together with attempts at this project, to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Staffordshire WV4 5NF, tel: (0902) 892141, to arrive by 1 December 1987.

It would be appreciated if such submissions contained a brief summary of results obtained, in a form suitable for publication in PCW. These submissions will be judged using subjective criteria, and a prize will be awarded by PCW to the 'best' contribution received by the closing date.

Please note that submissions can only be returned if a stamped addressed envelope is provided.

## *Belated review: September 1986*

Regular readers of Numbers Count will be aware that the prize award associated with this problem was deferred (PCW, March) due to a lack of response. Interesting correspondence has since been generated, resulting in a very worthy prizewinner: Fred Hartley of 46 Hughes Road, Hayes, Middlesex UB3 3AP. Fred used a BBC Model B and relied very much upon a set of long integer arithmetic routines written in assembler which cope with integers up to 256 bytes in length.

The computing went hand in hand

with a careful theoretical analysis, and Fred's third communication concludes: 'I suspect that  $s(k)/k$  increases without limit as the number of factors increases, but I have not proved this.' Can any mathematicians help?

I am certain that Fred would welcome enquiries from interested readers regarding the details of his work.

## *Review: March 1987*

This problem was, as expected, extremely popular. It was prompted by the following results quoted in LE Dickson, *History of the Theory of Numbers, Volume 2*.

'Fermat noted that if in (205769, 190281, 78320) we add the area to the square of the sum of the legs, we get a square.

'Frenicle stated that in (17, 144, 145) the sum of the area and the hypotenuse is a square, while the first three right triangles in which the sum of the area and smaller leg is a square, are (3, 4, 5); (16, 30, 34) & (105, 208, 233).

"Calculator" found three right triangles of equal perimeter and areas in arithmetical progression (18601944, 13951458, 23252430); (18559223, 13999464, 23247145) & (18515584, 14048388, 23241860)'. While AH Beiler, *Recreations in the Theory of Numbers*, reports:

'Four primitive Pythagorean triangles having a common perimeter have also been found. Only seven such quadruples exist for a perimeter less than 1000000 so they are quite rare. The smallest of these perimeters is 317460 and the triangles are (153868, 9435, 154157); (99660, 86099, 131701); (43660, 133419, 140381) and (13260, 151811, 152389). Can the reader find the other six?'

Unfortunately, the italics in part (v) of the problem together with the lack of the adjective 'primitive' generated a great deal of computer output — at least one complete answer to that part!

After much consideration, this month's prizewinner is Peter Hicks of 9 Carramar Street, Rye, Victoria, 3941, Australia.

Mike Mudge welcomes correspondence on any subject within the areas of number theory and other computational mathematics. Particularly welcome are suggestions, either general or particular, for future Numbers Count articles; all letters will be answered in due course.

Isolated readers can be put into contact with others sharing the same interests. However, greater efficiency regarding published problems should result from contacting the prizewinner directly.



# USER GROUPS

*News from around the user groups and clubs with Rupert Steele, with a special emphasis this month on our old friend, the ACC.*

One of the most pleasing aspects of the micro 'revolution' in this country is the quite extraordinary efforts made by the various user groups to help people understand and use their micros. Many of the groups are run on a hobby basis, while others may help contribute to the income of the person running them. However, I don't think that there are many examples (industry-sponsored 'captive' user groups being a possible exception) of anyone getting rich through running a user group.

But despite the low-cost approach that is usually taken in user groups, the quality of their output — and its general usefulness — continues to impress me. Several groups now produce their newsletters on laser printers and the results are often very worthwhile.

Perhaps the best user group newsletter I have seen in a long time is the *Apricot File* distributed by TP Group. This is a goldmine of useful technical information about the Apricot. Among the nuggets in 'Release 2.9' of the newsletter are a five-page manual on the screen-driving characteristics of the Apricot, complete with comprehensive details of undocumented features in certain BIOS releases; a program to split large files for use with SuperWriter; an explanation of the MS-DOS 'environment' facilities; IBM emulation (now becoming increasingly important); and advice on how to use SuperWriter with boilerplate text. Yes, I know a lot of this should have been in Apricot's release kit — but it wasn't, and I for one will be keen to see what other issues of *Apricot File* contain. *Apricot File* also has a library of public domain software, plus a collection of utilities and discounted proprietary packages.

I think I have made my point. *Apricot File* is a must for the serious Apricot User — even if you already have undelete and copy-protection breaking utilities. Contact *Apricot File*, TP Group, PO Box 509, London N1 1YL or tel: (01) 833 3501.

*Apricot File* was one of many newsletters to come through my door in response to the new format of the User Groups column. My mailbox has grown considerably over the past few months, so if some groups have to wait a while before being mentioned here, it is simply due to the size of the queue. But I can't write about a club at all if I don't have any information to go on, so it

is most important that you keep writing in.

It will also help if members of user groups write to me relating their good or bad experiences. I obviously have to take a lot on trust from the material I am sent, and the Directory of User Groups published on the next two pages doesn't imply any kind of warranty from me as to the quality of the groups. But if I hear widespread reports that a group is not up to scratch, I will obviously want to avoid pointing people at it. So good or bad, let me know!

I have to report a change from some information I published last month about the Sharp User Group, run by Larry Galliford. I have been told that there is a new secretary for the club, namely Andrew Fergusson, 11 Harcourt Close, Henley on Thames, Oxon RG9 1UZ. The group now publishes its newsletter, of 50-60 pages, three times a year for a total subscription of £6. More information is available from Andrew on (0491) 574850.

I have received a lot of comments about the Directory of User Groups and am pleased to say that most of you seem to like it, and find it useful. This month, as space permits, it appears in its entirety (see over the page).

## ACC news

I have had a newsletter from the Association of Computer Clubs. Although this went out to its member clubs a while ago, it does contain some information of general interest. The Association acts as the umbrella group for all local and national user groups that are organised on a non-profit basis. It has a comprehensive database of all local clubs around the country, with several hundred entries. The newsletter announces that the ACC will be present at the 10th PCW Show this month (see the Preview in this issue on page 154), organising the clubs area and arranging for many other clubs to take part — though some may simply give publicity information to the ACC and avoid having to man a stand for the five days. The ACC will also have two computers running the ACC database so that visitors at the show will be able to get an online pointer to their nearest clubs.

The ACC has also published its timetable for the Annual Council meeting on 14/15 November in Milton Keynes. Any motions must reach

the secretary by 5 October, and clubs should receive a Notice of Meeting by 17 October. The newsletter also mentions a 'magazine' project — the ACC will supply enough copies for every member of every affiliated club to have one. I hope it goes well — back in 1981, I started a similar project in the Amateur Computer Club, but it didn't quite take off.

The ACC's newsletter also lists the ACC services. All affiliated clubs are automatically included in the ACC's insurance scheme for Public Liability, and inexpensive insurance is available to cover club members' computers at, or in transit to, club meetings. And, of course, it mentions the highly successful ClubSpot 810 database on Prestel, run by the ACC's autonomous Electronic Publishing Committee. Finally, the newsletter gives details of a new range of fact-sheets published by the Association on such diverse subjects as Compiling a Press Release and the Data Protection Act. Membership of the Association is a remarkably good deal for almost any local computer club, and I would thoroughly recommend it. For details, see the Association's entry (and ClubSpot's) in the Special Interest' section of the 'Directory'.

## Club news

There is just space to mention a couple of local groups in the West Country. The South West Atari ST User Club has been running about six months. The membership is around 26 and interests cover every aspect of the ST. Meetings start at 7:30pm on the second Tuesday of each month in the General Teaching Block of Plymouth Polytechnic. Details from Karl Fuller, 289 Fort Austin Avenue, Crownhill, Plymouth, Devon PL6 5ST.

The other club is based at the Allendale Community Centre, Hanham Road, Wimbourne, Dorset. Dennis Horn, the activities' organiser for the Community Association, has written to say he is starting a club there. More information is available from Dennis at 6 Richmond Lodge, Victoria Avenue, Swanage, Dorset BH19 1AN.

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If you would like your user group or club to have a mention in this column, or you wish to be considered for the Directory of User and Support Groups, please write to Rupert Steele, 12 Philbeach Gardens, London SW5 9DY.

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Turn the page for the Directory of User and Support Groups.

# DIRECTORY OF USER GROUPS



## GROUP

## CONTACT

## NOTES

### ● SPECIAL INTEREST

AMRAC-Amateur Radio & Computer Club	Trevor Tugwell, G6TJT, 6 Kestrel Drive, Mudeford, Christchurch, Dorset BH23 4DE. Or phone Phil Bridges on (0703) 847754 (G6DLJ)	300/300 Bulletin Board on 0736 518818
Church Computer Users Group	Rev Nigel Hardcastle, 112 Rotherfield Rd, Garretts Green, Birmingham, B26 2SH (021) 743 2971	Support group for those using computers in the running of churches
Local Authority Micro-Computer User Group	John New, Borough Engineers Dept, Municipal Offices, North Quay, Weymouth, Dorset DT4 8TA (0305) 785101 (ext 272)	
Seafarers	Mr C E Watson, 29 Doods Place, Doods Road, Reigate, Surrey RH2 0NS	
SNUG — Special Needs User Group	Jeff Hughes, 39 Eccleston Gardens, St Helens WA10 3BJ. (0744) 24608	Computing for the disabled handicapped, and so on
Society of Genealogists	Society of Genealogists, 14 Charterhouse Buildings, London EC1M 7BA (01) 251 8799	Use of computers in tracing ancestors. Monthly meetings
Comms file	TP Group, FreePost, London, N1 1BR (01) 833 3501	Comms users newsletter. Subscription: £75
Amateur Computer Club	Andy Leeder, Church Farm, Stratton St Michael, Norwich, NR15 2QB	Hardware Club. Large SAE for sample newsletter
Association of Computer Clubs	John Dale, 12 Poplar Road, Newtown, Powys SY16 2QG	Umbrella group for all hobby clubs. National database of local groups (SAE)
ClubSpot 810	Andy Leeder, Church Farm, Stratton St Michael, Norwich, NR12 2QB *810#	Hobby Information Provider on Prestel. Clubs may be able to edit own free pages
Find-It	Orkney Computing, 60 Albert Street, Kirkwall Orkney, KW15 1HQ. (085 686) 268	Disk-based index to PCW and five other UK business micro mags. Runs on PC
Christian Micro Users Association	Philip Clark, 138 Bramwell Gardens, Sheffield S3 7PW	
● AMSTRAD		
1512 Independent User Group	PO Box 55, Sevenoaks, Kent TN13 1AQ (0959 2) 2585	£20 subs; PC clone only
Amstrad Professional User Club	John Ainsworth, Amstrad Prof User Club, Victoria House, 1-6 Low Row, PO Box 10 Sunderland SR1 3PY (0783) 673395	Business users only; £49.95 subscription
Amstrad User Software Database	AUSD, PO Box 11, Gosforth, Newcastle-upon-Tyne NE3 1RP (091) 285 6107	Fido bulletin board available
PCW Users Group	Robert Moberley, 37 Clifford Bridge Road, Binley, Coventry CV3 2DW (0203) 441417	Monthly newsletter. SAE with postal enquiries
The PCW Computer Club	Ron Morland, 12 Deneve Avenue, Poole, Dorset BH17 7LR	SAE please for details
Advantage	Jeffrey M Green, 33 Malyns Close, Chinnor, Oxon, OX9 4EW (0844) 52075	All Amstrad machines. SAE please
Amstrad CPC Computing Newsletter	Chris Bryant, 11 Havenview Road, Seaton, Devon EX12 2PF	Home users. Large SAE for sample newsletter
PCW File	Chris Bryant (as above)	Subscription £2 including free PD software. Large SAE for sample newsletter
WACCI (Europewide Amstrad User Club)	Jeff Walker, WACCI, 75 Greatfields Drive, Hillingdon, Uxbridge UB8 3QN (0895) 52430	Newsletter; £12 sub; special offers
Amstrad Groups Federation	4 Sutton Road, Gorton, Manchester M18 7PN	Umbrella organisation for Amstrad User Groups
● HARDWARE		
68 Microgroup	J Turner, 63 Millais Road, London E11 4HB	Hardware/software for 68000/6800
Apricot File	Apricot File, TP Group, PO Box 509 London N1 1YL (01) 833 3501	Detailed technical Apricot newsletter
Atari National User Group	N Lewis, 13 Weavers Walk, Courthouse Green, Coventry CV6 7LG	Newsletter; SAE please
Atari ST-Club	Paul Glover, ST-Club, PO Box 20, Hertford	PD software available
Basug	Sheila Hurst, PO Box 177, St Albans, Herts AL2 2EG (0727) 73990	Apple systems
BOOG	Victor Nollen, 38 Rocks Lane, Barnes London SW13 0DA (01) 833 2526	Osborne support group
Commodore Plus 4	Steve Kent, 203 Wolverhampton Road, Pelsall Walsall, West Midlands WS3 4AW	SAE please
Compucorp University Users Group	c/o Compucorp, Cunningham House, Westfield Lane, Kenton, Middx HA3 9ED	
HICUPS	Bruce Ainge, Foxberry House, 16 Foxberry Road, London SE4 2SP (01) 691 5202	Hitachi MBE 16002 PC group
ICPUG	Jack D Cohen, ICPUG, 30 Brancaster Road, Newbury Park, Ilford IG2 7EP (01) 346 0050 (home); (01) 579 1229 (day)	Commodore machines from PET to Amiga. £10 subs + £1 entry fee

# DIRECTORY OF USER GROUPS

AND ONE

## GROUP

## CONTACT

## NOTES

Independent Psion Organiser User Group (IPSO)	Mike O'Regan, 130 Stapleford Lane, Beeston, Nottingham NG9 6GB	SAE please. Monthly newsletter IPSO FACTO
IQLUB (renamed QUANTA)	Brian Pain, 24 Oxford Street, Stoney Stratford, Milton Keynes MK11 1JU	Sinclair QL and compatibles
IOUG	Gary Ramsay, 1 Kingsway Crescent, Burnage, Manchester M19 1GA	Oric users; newsletter IOU
Jupiter Ace User Domain Resource Centre	Ian Jones, 21 Dene Street, Pallion, Sunderland SR4 6JB (091) 565 2833	Software/hardware ideas exchanged. SAE please
Macintosh User Group UK	John Lewis, 55 Linkside Avenue, Oxford OX2 8JE. (0865) 58027	£25 subscription: professional group
MacTel	David Nicholson-Cole, 15 Elm Tree Avenue, West Bridgeford, Nottingham NG2 7JU Board (0602) 817696 or (0742) 350319	Bulletin board for Mac users 300/300; 1200/75; 1200/1200
Memotech Owners Club	Phil Eyres, 23 Denmead Road, Harefield, Southampton SO2 5GS	SAE please
NATGUG (National Amstrad, Tandy and General Users Group)	Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes MK11 1JU (0908) 564271	Tandy, Genie, MS-DOS, Amstrad
NBUG	Gerald McMullon, 36 Armitage Way, Cambridge CB4 2UE	NewBrain SAE please
OPEN#STREAM	1 Ranelagh Road, Deal, Kent CT14 7BG	NewBrain group
Research Machines National User Group	Steve Burrows, Wirral CAE Services Ltd, Gorse Lane, Wallasey, Wirral L44 4HE (051) 639 8237	RML 380Z, 480Z, Nimbus and 80286/80386 machines
Sanyo MBC-550	Mr M H Syed, Wistaria, 53 Acacia Grove New Malden, Surrey KT3 3BP (01) 942 9009	Informal group
Sharp User Group	Andrew Fergusson, 11 Harcourt Close, Henley on Thames, Oxon RG9 1UZ (0491) 574 850	£6 Subscription. Newsletter (60 pages) & software library
SORD/PIPS	Mr B Nicholson, 5 Brunton Place, Edinburgh EH7 5EG (031) 556 2340	Informal group for UK users of SORD M-23
Tangerine	David Cawthorne, 40 Westbourne Road, West Kirby, Wirral L48 4DH (051) 625 7311	Informal info sheet and newsletter; £2/copy
The One And Only	Neil Smith, 42 Hayes Road, Bromley BR2 9AA	ZX Spectrum software exchange. SAE please
T199/4a EXCHANGE	Clive Scally, 40 Barrhill, Patcham, Brighton BN1 8UF (0273) 503968	Subscription £6; quarterly newsletter
UKAS (UK Adam Subscribers)	Keith Marner, 33 Homer Road, Croydon CR0 7SB (01) 654 2184	Coleco Adams. Journal every 2 months; SAE please
UK Einstein User Group	Graham Bettany, UKEUG, 80 Dales Road, Ipswich IP1 4JR	£15 subscription. Monthly newsletter. SAE please
West Midlands & Oxon TI User Group (International)	Gordon Pitt/Peter Brooks, 259 Sneyd Lane Bloxwich, Walsall WS3 2LS Bloxwich 476373	National T199/4 group Subscription £12.50; monthly newsletter
● SOFTWARE SYSTEMS		
Compulink	Frank Thornley, 67 Woodbridge Road, Guildford GU1 4RD (0483) 573 337	FIDO Bulletin Board offering public domain software
CUG (C Users Group UK)	Martin Houston, 36 Whetstone Close, Farquhar Road, Edgbaston, Birmingham	£10 subscription; the group supports the C language
Econet User Group (Scotland)	Michael Ryan, Balkeerie Cottage, Eassie, by Forfar, Angus DD8 1SR	English & Welsh also welcome
Lotus User Group	The Lotus User Group, 78-80 Peascod Street, Windsor, Berks SL4 1DH (0753) 841686	Subscription £95. Magazine, Helpline, consultancy, and so on
Memory Alpha	Memory Alpha, 16 Mayfield, North End, Portsmouth, Hants	MSX Group. SAE please
MSX User Group	Lee Simpson, 3 Mayfair Place, Tuxford, Newark, Notts NG22 0JD	
PC-SIG	ISD International Software Distributors Ltd, PO Box 872, Sutton Coldfield, West Midlands B75 6UP	Public domain software for PCs. £6/disk donation to author. 700+ disks available
PD-SIG	PD Software Library, Winscombe House, Beacon Road, Crowborough, Sussex TN6 1UL (08926 63298)	Public domain software for PCs, CP/M, Apricot. Disk conversions
PIP	PIP, 28 Gordon Mansions, Torrington Place, London WC1E 7HF	Group for CP/M compatibles: Amstrads; Einsteins; Osbornes, and so on. BBS
Serviceline	Clare Winter, Ashton-Tate UK Limited, Oaklands, 1 Bath Road, Maidenhead, Berks (0628) 33123	Telecom Gold Ashton Tate information/supply service
World of Lotus	World of Lotus, Telecom Gold Ltd, 60-68 St Thomas St, London SE1 3QU	Commercial Telecom Gold Lotus support. £9.60/hour to use. Free macros, drivers

An up-to-date list of UK bulletin boards, compiled by Peter Tootill.

## London

Airtel - TBBS (01) 200 3439  
 24 hrs; 3/1275; Pilots' area  
 Brixton iTec (01) 735 6153  
 24 hrs; 1275  
 Communitel (01) 968 7402  
 24 hrs; 1275v  
 Crystal Tower (01) 886 2813  
 24 hrs; 3-24  
 Gen interest; Apple & IBM  
 CyberZone (01) 638 2034  
 24 hrs; 3  
 Dark Crystal Fido (01) 207 2989  
 24 Hrs; 3-12  
 Distel (01) 679 1868  
 24 hrs; 300  
 Display electronics - Commercial  
 3/1275 on 01 679 6183  
 Gnome at home (01) 888 8894  
 24 hrs; 1275v  
 Hackney BBS (01) 985 3322  
 24 hrs; 1275v  
 Health data (01) 986 4360  
 24 hrs; 1275v  
 Hendon Fido £\*(01) 200 7577;  
 (01) 220 8281 24 Hrs; 3/1275  
 Opus system  
 ITCU Training (01) 960 4742  
 24 hrs; 1275v  
 Lots of iTec training materials  
 Link Fido (01) 659 6992  
 24 hrs; 3-12  
 London U'gnd (01) 863 0198  
 24 hrs; 3-24 wildcat BBS  
 Marctel (01) 346 7150  
 24 hrs; 3/1275 FBBS system  
 MBBS Mitcham (01) 648 0018  
 24 hrs; 3/1275  
 Metrotel (01) 941 4285  
 24 hrs; 1275v  
 NBBS London (01) 883 5290  
 24 hrs; 3/1275  
 NNBS London (01) 455 6607  
 24 hrs; 3/1275  
 OSI Lives (01) 429 3047  
 24 Ring back; 300  
 Owlitel (01) 927 5820  
 24 hrs; 1275v  
 PC Access (01) 853 3965  
 24 hrs; 3-24 For IBM PC users  
 Poly Fido (01) 580 1690  
 24 hrs; 3-12  
 Prestel 24 hrs (01) 248 5747  
 24 hrs; 300 baud  
 No graphics on this number  
 Taecom (01) 573 8822  
 MF: 7pm-8am; WE:all day Sun; 300  
 Interak micro section

TBBS Rovoreed (01) 542 4977  
 24 hrs; 3-24  
 TBBS London (01) 348 9400  
 24 hrs; 3-12  
 Techno Line (01) 450 9764  
 24 hrs; 1275v; Commercial  
 Techno-line 2 (01) 452 1500  
 MF: evenings; WE:24 hrs  
 1275v Commercial  
 The Star BBS (01) 586 6882  
 24 hrs; 3/1275; Atari ST area  
 The Village (01) 464 2516  
 24 hrs; 3-24; Atari 520ST based  
 Twigh't Phone Fido (01) 624 5338  
 24 hrs; 3  
 Typnet (01) 676 0283  
 24 hrs; 300; Budget Typsetting  
 WBBS Wimbledon (01) 542 3772  
 Sat 7pm - Mon 8am; 3/1275

## The Midlands

CBABBS; Birmingham (021) 430 3761  
 24 hrs; (not Thurs); 300  
 Atari based. Can send mail to Canada  
 Digital Matrix Fido; Birmingham  
 (021) 705 5187  
 24 hrs; 3/1275 Compu-store on-line  
 Infocom BBS; Birmingham  
 24 hrs; 3/1275

On-Line games;adult stories;BBC  
 The City; Birmingham (021) 353 5486  
 24 hrs; 300  
 Atari 8 bit & ST; Lonely Hearts  
 TUG II; Birmingham (021) 444 1484  
 24 hrs; 3/1275  
 Amstrad;Tandy;online Adventure  
 Wolverhampton BBS (0902) 745 337  
 24 hrs; 3/1275  
 MS-DOS; CP/M; Commodore areas

## The North East

49'ers; Cleveland (0237) 43 920  
 MF:10pm-4am; WE:10pm-4am; 3/1275  
 FBBS colour for BBC users  
 Avon Fido; Weston Supe Mare  
 (0934) 29 570 24 hrs; 3/1275  
 Forum-80; Hull (0482) 859 169  
 MF:7pm-11pm; WE:1pm-11pm; 3/1275  
 Midnight-8am on Bell 103 lines  
 L E M S Fido; Leeds (0532) 670 749  
 Daily 10pm-8am; 3/1275  
 Hamnet; Hull (0482) 465 150  
 MF:6pm-8am; WE:24 hrs; 3/1275  
 Radio Hams  
 Key Board; Milton Keynes  
 (0908) 668 398  
 8pm-8am exc Tues and Thurs; 12h

Runs on a Spectrum.  
 Log On Tyne Fido; Tyneside  
 (091) 477 3339 24 hrs; 3/1275  
 MacTel Sheffield (0742) 350 319  
 24 hrs; 3-24; For Macintosh Users  
 MacTel HQ; Nottingham (0602) 817 696  
 24 hrs; 3-12; Macintosh Users  
 MacTel Green Box; Nottingham  
 (0602) 811 950 24 hrs; 3-24  
 For Macintosh users  
 MBBS Leonfield (0401) 50 745  
 24 hrs; 3/1275  
 N.Yorks Fido; Knaresborough  
 (0423) 862 268  
 MF:10pm-4am; WE:10pm-4am; 3-12  
 Norview; Northants (0604) 20 441  
 24 hrs; 1275v  
 OBBS Bradford (0274) 480 452  
 24 hrs; 3/1275  
 Colour for BBC users  
 On-Line Systems; Cleveland  
 (0429) 234 346; 24 hrs; 3-24  
 Viewdata/scrolling  
 PD-Sig Fido 1; Warwicks (08926) 61 149  
 24 hrs; 3/1275  
 PD software interest group  
 Stockton Fido; Teeside (0642) 605 838  
 Daily 6pm-6am; 300; MSX  
 The Sharrow BBS; Ripon (0765) 707 887  
 24 hrs; 3/1275  
 Viewdata & scrolling BBC based

## The North West

Bolton BBS (0204) 43082  
 MF:8pm-6am; WE:24 hrs; 3-24  
 8am-8pm on ring back  
 CNOL; Lancaster (0524) 60 399  
 24 hrs; 300  
 Clinical-BBS for medics  
 Fido Compulink North; Liverpool  
 (051) 220 3761 24 24 hrs; 3/1275  
 Fido Manchester (061) 773 7739  
 24 hrs; 3/1275  
 Mektronic Electronic design cons  
 Intel-Ace; Oundle (0832) 73 003  
 MF:6pm-8am; WE:24 hrs; 1275v  
 Liverpool Mailbox (051) 428 8924  
 24 hrs; 3-24; UK TBBS HQ system  
 Matrix; Liverpool (051) 737 1882  
 24 hrs; 3/1275  
 Multi-user games; 4 lines  
 NBBS Cheshire (0936) 77 025  
 24 hrs; 3/1275  
 OBBS Manchester (061) 427 1596  
 24 hrs; 3/1275  
 Portal; Wirral (051) 355 0911  
 MF:8pm-6am; WE:24 hrs; 3/1275  
 Pyramid; Leigh; Lancs (0942) 609 611  
 24 hrs; 3  
 Stoke iTec (0782) 265 078  
 24 hrs; 1275v  
 TeePee Link; Manchester (061) 494 6938  
 24 hrs; 3-24  
 Telemac 15; Macclesfield (0625) 33 703  
 24 hrs; 3/1275

## The South East

Acorn BBS; Cambridge (0223) 243 642  
 24 hrs; 1275v  
 ARONET; Colchester (0376) 518 818  
 24 hrs; 300  
 BABBS; Felixstow (0394) 276 306  
 24 hrs; 3-24  
 Banat Board; Oxford (0865) 882 872  
 24 hrs; 3-24; FidoNet UK coordinator  
 BBS09; Portsmouth (0705) 736 025  
 MF:7pm-7am; WE:24 hrs; 300  
 OS9; Sci-Fi; Dragon; CoCo sections  
 BITEC; Basildon (0268) 22 177  
 24 hrs; 1275v  
 BITEC; Basildon (0268) 25 122  
 24 hrs; 300  
 Bloxam; Banbury (0295) 720 812  
 Daily 10pm-1am; 300  
 C A T S Fido; Maidenhead  
 (0628) 824 852 24 hrs; 3/1275  
 V22/bis coming  
 C View Rochford; Kent (0702) 54 6373  
 24 hrs; 1275v  
 CIX; Guildford (0483) 573 337 or 338  
 24 hrs; 3-24; multi-user  
 CP/M User Group; Windsor (0753) 868 196  
 24 hrs; 3-24; CP/M and MS-DOS software  
 Datasoft Opus; Ilminster (04605) 4615  
 24 hrs; 3-24; Inc Datatalk Support area  
 Dr Solomon's Fido; Amersham (02403) 4946  
 24 hrs; 3-24; mostly for IBM programmers  
 Fido PD Software; E Grinstead  
 (0342) 315 636 24 hrs; 3-24  
 PD software database  
 Gosport Apricot BBS  
 (705) 524 805; 24 hrs; 300  
 LABBS; Surrey (0863) 844 164  
 24 hrs; 3/1275; The Prisoner - 2 lines  
 Lasermail Fido; Worthing (0903) 212 552  
 24 hrs; 3/12  
 Maptel; Southend (0702) 552 941  
 24 hrs; 300; commercial system  
 NBBS Essex; Brentwood (0277) 228 867  
 24 hrs; 3/1275; subscribers only  
 Patnet; Colchester (0206) 844 813  
 Daily 8pm-8am; 12h; runs on a Spectrum  
 PBBS-'Adult' BBS; Woking  
 24 hrs; 3/1275  
 PD-SIG System; Uxbridge (0895)  
 24 hrs; 3-24; also on 0895 52685

# UK BULLETIN BOARDS



Pete's Place; Colchester (0206) 862 354

24 hrs; 3-24; good IBM SIG

RICBBS; Basildon (0268) 710 637

MF:5pm-10pm; WE:24 hrs

RSGB; London (0707) 52 242

24 hrs; 1275v

SBBS - Watford (0923) 676 644

9pm-11am plus 11pm-6am daily; 3/1275

TBBS Gamlingay; Sandy; Beds (0767) 50 511

24 hrs; 3-24

Trinity 3; Reading (0734) 484 847

24 hrs; 3/1275 TBBS system

## The South West

BOOG BB; Fleet; Hants (0252) 626 233

24 hrs; 3/1275

Osborne; MS-DOS; CP/M areas

CBBS South West; Exeter (0392) 53 116

24 hrs; 3/1275

Jersey Fido (0534) 39 389

24 hrs; 3/1275

QMC Viewdata; Basingstoke (0256) 471 757

24 hrs; 1275v; Queen Mary's College

TBBS Blandford; Dorset (0258) 54 494

24 hrs; 300; Blandford Computers

Trinity 1; Exmouth (0395) 272 611

24 hrs; 3-12

Trinity 2; Faringdon (0367) 81 507

24 hrs; 3/1275

Sponsored by Courier Consultancy

Vampire's Coffin; Weybridge

(0832) 245 593 24 hrs; 1275v

Viewdata & scrolling

## The West

Access Fido; Worcester (0905) 52 536

24 hrs; 3-24; midi section

Octopus; Bristol (0272) 421 196

MF:6pm-6.30am; WE:24 hrs; 3/1275

## Scotland

Aberdeen ITEC (0224) 641 585

24 hrs; 1275v

Aberdeen Commodore (0224) 781 919

24 hrs; 300; Commodore 64 based

Betelgeuse 5; Inverness (0463) 231 339

24 hrs; 3/1275

Kirklees ITeC; Batley (0924) 442598

24 hrs; 1275v

Information Technology Centre

Livingstone BBS; Livingstone

(0506) 38 526 24 hrs; 300

People's Palace; Glasgow (041) 956 6537

Daily 6pm-6am; 3/1275 Colour

## Wales

Bulletin AT Fido; Swansea (0792) 297 845

MF:6pm-9pm; WE:24 hrs; 3-12

Capital Data Line; Cardiff (0222) 461 824

24 hrs; 300; computer repair company

Cardiff ITeC (0222) 464 725

24 hrs; 1275v

Communitree; Powys (0874) 711 147

24 hrs; 300

Cymrutel; Colwyn Bay (0492) 49 194

24 hrs; 1275

FBBS Swansea (0792) 203 953

24 hrs; 3

MGBBS Mid Glamorgan; Ferndale

(0443) 733 343 6pm-1am daily; 300

Proteus Opus; Porthmadog (0766) 4154

24 hrs; 3-24; ANSI colour graphics

## Northern Ireland

Deep Thought Fido; Bangor NI

(0247) 467 863 24 24 hrs; 3-24

PC-DOS; CP/M; BBC; Tech help Sigs

PBBS 1 Portadown (0762) 333 872

Daily 10pm-1am; ring back; 300

## Eire

DUBBS; Dublin (0001) 885 634

MF:8pm-8am; WE:24; 3-24

Amiga based; astronomy SIG

Dublin Fido; Dublin (0001) 854 522

24 hrs; 3-24

IACCBBS; Eire (0001) 903 341 24

24 hrs; 300

Irish ACC Runs on Commodore 64

# LEISURE LINES

*Brainteasers courtesy of JJ Clessa.*

### Quickie

Can you find a 4-digit number whose digits reverse when it is multiplied by 9?

### Prize puzzle

A simple (!) problem in logic this month. Two families are involved in this. 'Whodunnit': the Smiths; comprising of teachers Alan and Betty and hairdresser Cynthia; and The Jones, where Donald is a teacher and Eric and Fiona are hairdressers.

One evening, two of the above were at the cinema, two were shopping at the supermarket, and two were playing golf. One of the two playing golf murdered the other. The facts are as follows:

- A teacher and a hairdresser were

shopping.

- The two people at the cinema had the same occupation.

- The victim and the murderer were twins.

- The dead person was married to one of the two people at the supermarket, and the murderer was married to the other.

- The victim and the victim's spouse had different occupations.

- Of the two people at the cinema, one was the ex-spouse of one of the two people shopping, and the other was the same sex as the teacher at the supermarket.

*Who was the killer?*

Answers on postcards, please, or backs of envelopes only, to reach

PCW, Leisure Lines September 1987, 32-34 Broadwick Street, London W1A 2HG, no later than 30 September.

### June prize puzzle

Two hundred and two correct solutions were received, plus 21 incorrect ones. Frankly, I didn't think that the optimum grid-crossing problem would be so popular. For some entrants it was nostalgic, as one wrote: 'I never thought I would find a use for dynamic programming...'

The maximum grid total possible was 455 obtainable in several ways, one of which is 38-40-40-40-36-39-40-28-40-37-37-40.

The winning card came from Mr AN Brooks of Cambridge.

# DIARY DATA

### IBM SYSTEM USER SHOW

Olympia 2, London — EMAP International Exhibitions (01) 608 1161

2-4 September 1987

### PERSONAL COMPUTER WORLD SHOW

Olympia, London — Montbuild (01) 486 1951

*(Obviously the UK's No 1 computer show. Make sure you don't miss it!)*

23-27 September 1987

### DEC USER SHOW

Barbican, London — EMAP International Exhibitions (01) 608 1161

6-8 October 1987

### COMPUTER GRAPHICS '87

Wembley Conference Centre, London — Online Conferences Ltd (01) 868 4466

*(Includes a number of conferences)*

13-15 October 1987

END



# MIGHTY MICRO

Mighty Micro Manchester Ltd, Sherwood Centre  
268 Wilmslow Road, Fallowfield, Manchester M14 6WL  
Telephone 061-224 8117 (3 lines)



## BUSINESS COMPUTERS

AMSTRAD\* AMIGA  
ATARI  
FERRANTI\* KAYPRO  
SHARP\* AKHTER  
TANDON  
COMMODORE PC\* OPUS  
OLIVETTI  
EPSON\* SANYO

## HOME COMPUTERS

AMSTRAD\* AMIGA 500  
BBC

## IBM COMPATIBLES

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Seagate 10MG + Card ..... £260  
Seagate 20MG + Card ..... £299  
Seagate 30MG + Card ..... £320  
20MG Winchester on Card ..... £325  
30MG Winchester on Card ..... £340  
20MG Tape Streamer INT ..... £357  
60MG Tape Streamer INT ..... £747  
External Tape Streamers ..... CALL

ADDONS  
\*\*\* FREE FITTING \*\*\*  
PC Mouse from £55  
PC Joysticks from £18  
Cards ..... various  
Memory Upgrades ..... FREE FITTINGS

## PRINTERS

Amstrad DMP2000 ..... £136.00  
Amstrad DMP3000 ..... £160.00  
BROTHER ..... Full Range  
EPSON LX86 + Tractor ..... £199.00  
EPSON LQ800 ..... £475.00  
EPSON LQ1000 ..... £635.00  
EPSON LQ2500 ..... £836.00  
STAR NB25-1S ..... £635.00  
STAR ..... Full Range  
CITIZEN MSP20 ..... £286  
CITIZEN MSP25 ..... £339  
PANASONIC 1081 ..... £173

## LASER PRINTERS

EPSON GQ3500 ..... £1499  
CITIZEN Overture ..... £1550  
CENTRONIC PPB ..... CALL  
QMS K8 ..... £1775  
HP LASERJET 2 ..... £2199  
HP LASERJET ..... £1559

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## SOFTWARE

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AMSTRAD PCW Compilers, accounts  
packages, databases  
AMSTRAD 612B ..... games, compilers,  
languages etc.

## BARGAIN SOFTWARE

(LIMITED QUANTITY)  
PERFECT WRITER 2 ..... £30  
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PERFECT FILER 2 ..... £30  
QED ..... £50  
COMMUNICATION EDGE ..... £45  
SALES EDGE ..... £45  
MANAGEMENT EDGE ..... £45  
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SAMNA WORD 1 ..... £45  
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DDM software Any modem with 300/300 1200/75 and TTY  
software Online from 7pm to 8am Mon-Sat/All day Sunday

## BUFFERED SMART SWITCHES

- BOTH PRINTERS PRINTING DIFFERENT DOCUMENTS SIMULTANEOUSLY •
- SOFTWARE CONTROL • OVERRIDE SWITCH • RESET & MULTIPLE COPY FUNCTION •
- EXPANDABLE • SIMULTANEOUS DATA INPUT • AUTO SELECT •

ACS - AUTO COMPUTER SELECT • SI - SIMULTANEOUS INPUT • C - COPY • SPS - SOFTWARE PRINTER SELECT

### CENTRONICS

PB-DP (64K) • 1 Centronics input and 2 output soft  
select with 64K buffer expandable to  
£249 256K. • C/SPS  
PB-4-2 (256K) • 4 Centronics input and 2 output  
with 256K buffer. ACS/C/SPS  
£345  
PB-6-2 (256K) • 6 Centronics input and 2 output  
with 256K buffer. ACS/SI  
£495  
PB-7-1 (256K) • 7 Centronics input and 1 output  
with 256K buffer. ACS/SI  
£445

### SERIAL

SB-4-2 (256K) • 4 Serial input and 2 serial  
output with 16K buffer at each  
£415 input & a total of 256K memory.  
ACS/SI/C/SPS  
SB-7-1 (256K) • 7 Serial input and 1 serial  
output with buffer at each input  
£595 and a total of 256K memory  
expandable to 1MB. ACS/SI

## UNIVERSAL BUFFER

- SERIAL & PARALLEL INPUT AND OUTPUT • X ON AND X OFF SOFT AND DTR HARD,  
HANDSHAKE • CENTRONICS • 2 FRONT PANEL SWITCH INPUT AND OUTPUT • COPY •
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- UB (64K) £220

## SMART AUTOMATIC SWITCHES

- AUTO COMPUTER SELECT • SERVICE • REQUEST LED INDICATION • MANUAL OVERRIDE  
SWITCH • UNSERVICED COMPUTER RECEIVES BUSY •

### CENTRONICS

MP-401 • 4 Centronics input and 1  
£150 Centronics output  
MP-801 • 8 Centronics input and 1  
£200 Centronics output

### SERIAL

MS-401 • 4 Serial Input and 1 serial output  
£180  
MS-801 • 8 Serial input and 1 serial output  
£230

## INTELLIGENT PRINTER BUFFERS

- SELF-TEST FUNCTION • BUFFER/PRINTER READY INDICATOR • BUFFER RAM STATUS  
INDICATOR • RESET AND MULTIPLE COPY FUNCTION • BUFFER BYPASS SWITCH •

PB (64) • 1 Centronics input and 1 PB (256) • 1 Centronics input and 1  
£140 Centronics output with 64K buffer  
PB-2 (64) • Above with 2 way manual switch to PB-2 (256)  
£185 connect 2 micros to 1 printer or vice versa  
£235 connect 2 micros to 1 printer or vice versa

## ACCESSORIES

KSM 101 • Serial RS232 to parallel converter  
£65 with PSU  
KSM 104 • Parallel to serial RS232 converter  
£70 with PSU  
KSM 110 • Multi-link serial RS232 switch  
£24 selectable cable

## CABLES (6ft long)

KPC 104R • Ribbon Cable 36pin-36pin £12.00  
KPC 104 F6 • Flex Cable 36pin-36pin £16.00  
KPC 105-6 • Flex IBM Parallel printer  
cable £15.00  
KPC-105-10 • Flex IBM Parallel printer  
cable £17.00  
KPC-106 • Flex (25 lines) 25pin-25pin £14.00  
KSC-101 • Flex (10 lines) 25pin-25pin £12.00

## CUSTOM CABLE-MAKING SERVICE AVAILABLE

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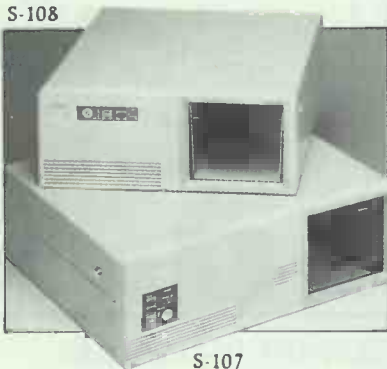
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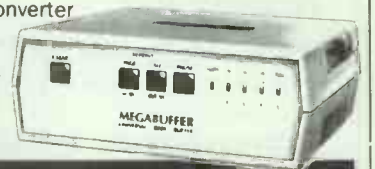
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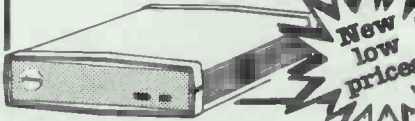
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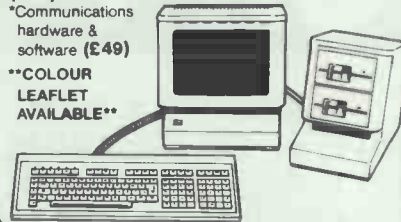
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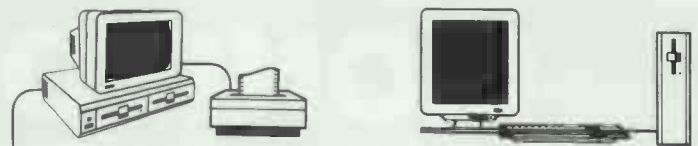
The RPTI-NET was designed with one person in mind: the user. In real terms that means you can install it yourself in a matter of minutes. And then get straight down to taking advantage of the advanced features of the RPTI-NET networking software. Providing a full range of features to match networks of twice the price, the RPTI-NET can be operated by all your staff after just a few minutes practice. That means everybody in your office has access to the information and equipment they need, when they need it.

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- \* Addressable Users: 255 Maximum
- \* Cabling System: RS-422 Twisted Pair Wire (AWG 20)
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1,200 Meters (4,000 Ft) with Repeater
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- \* IBM PC Network (LAN) Program (with RPTI-NET's NETBIOS Emulator)
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For further information contact:

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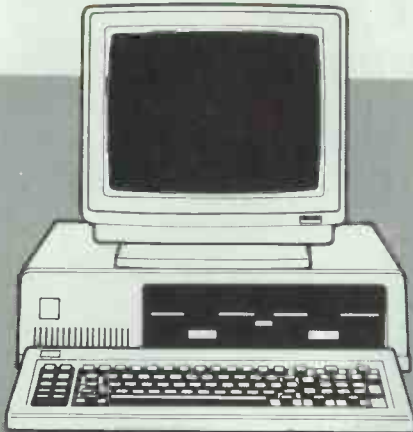
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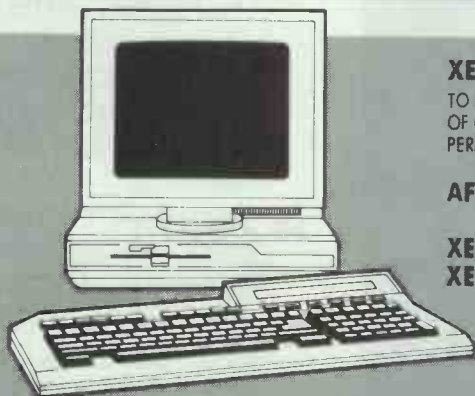
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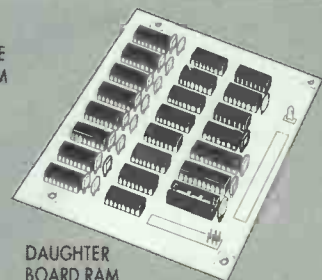
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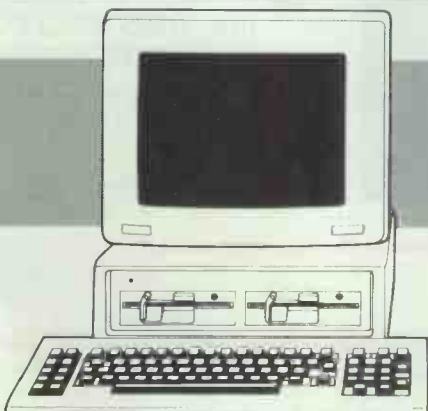
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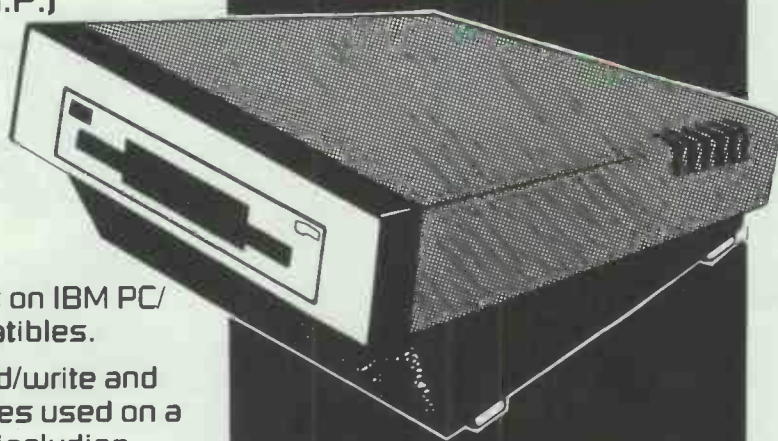
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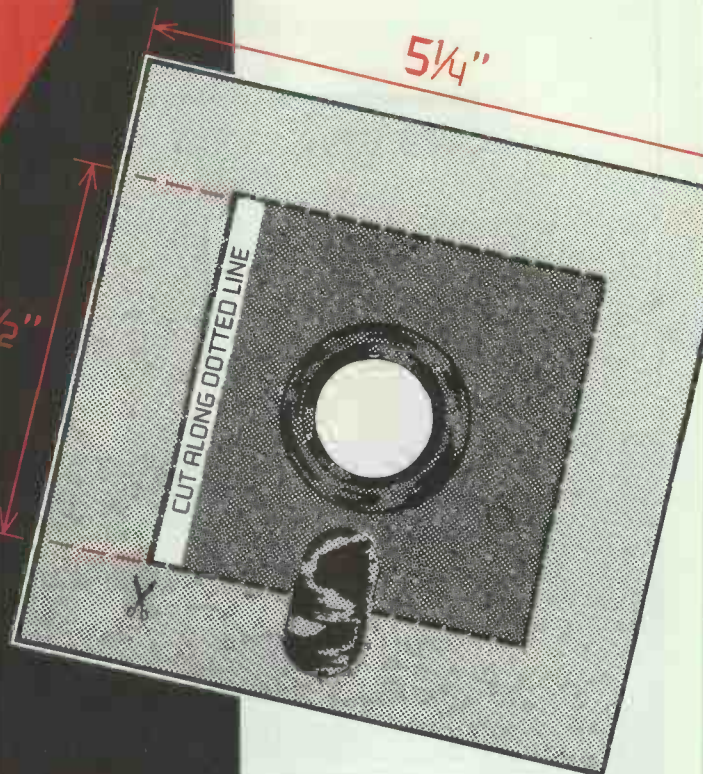
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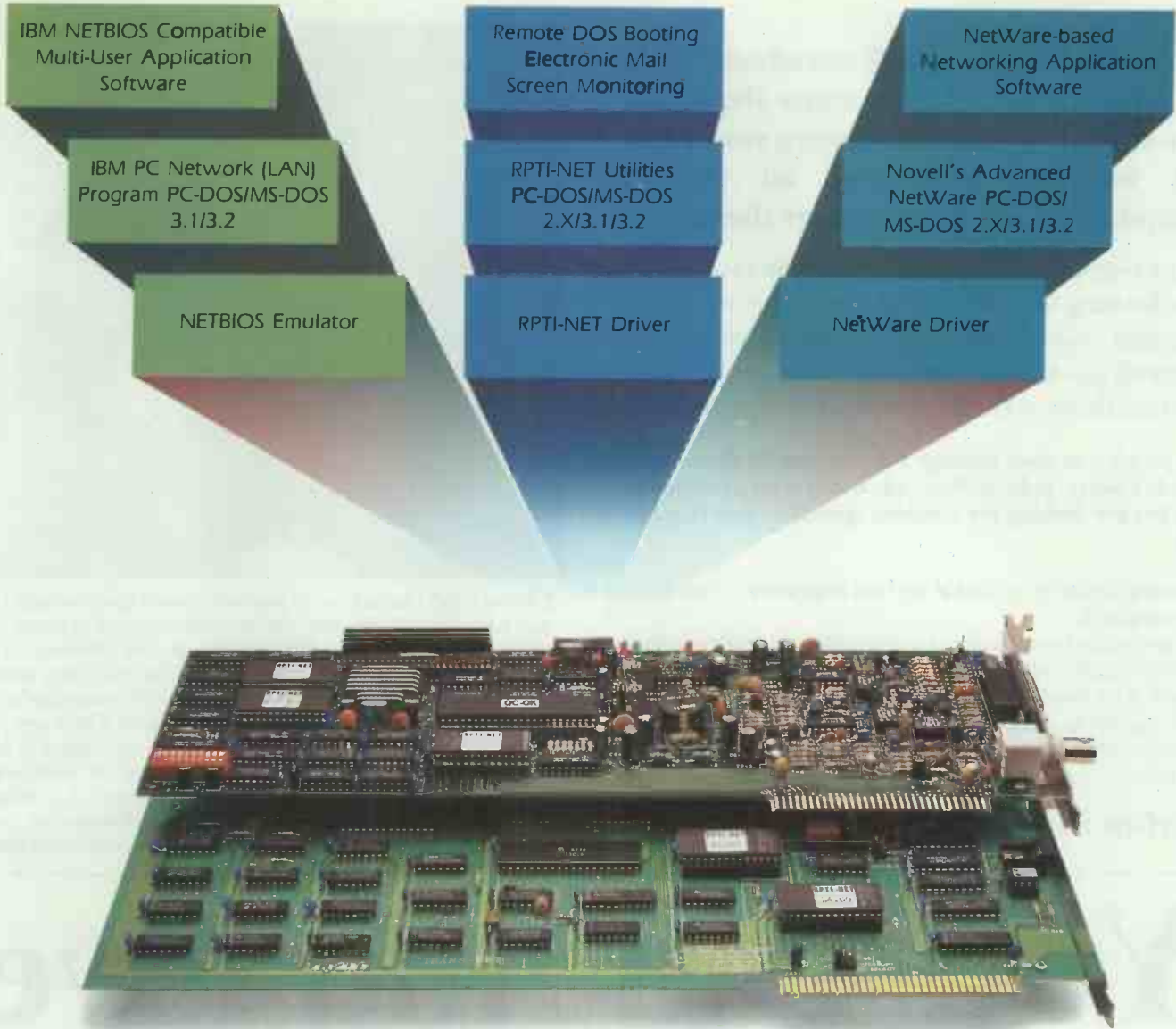
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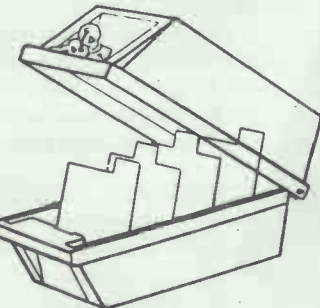
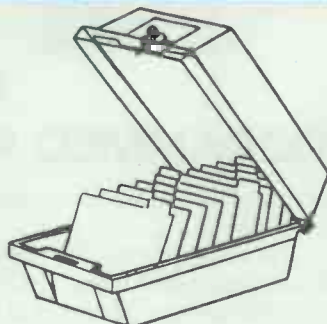
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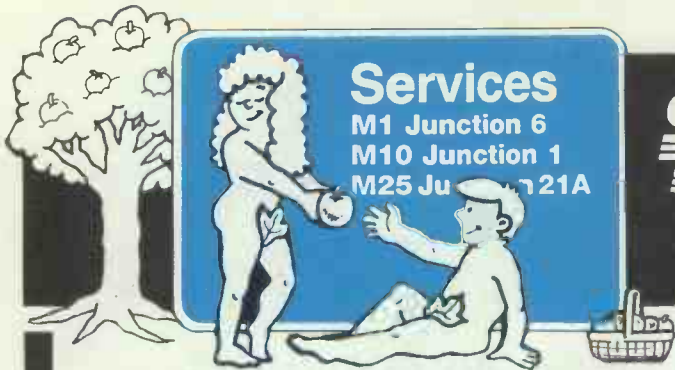
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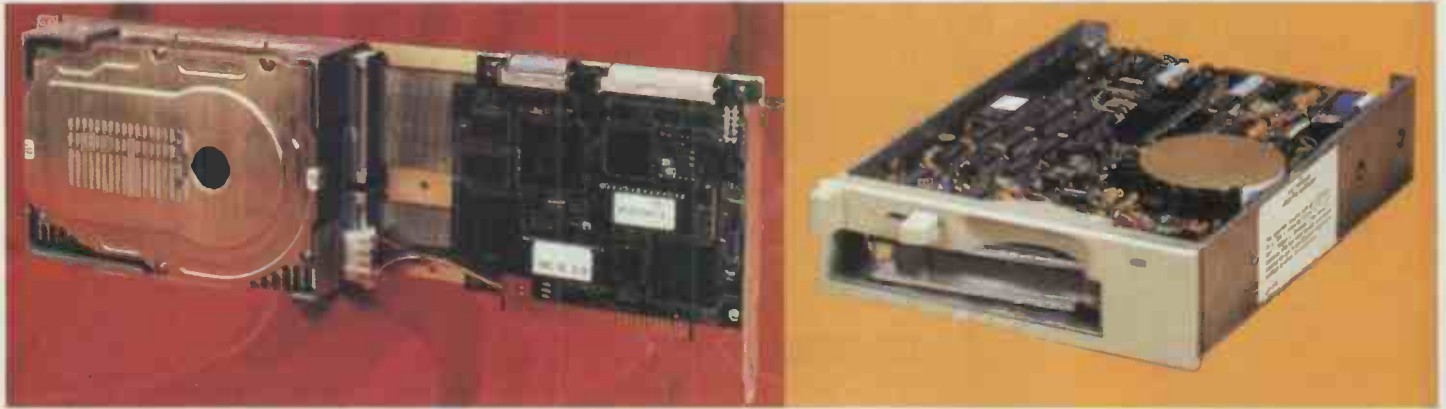
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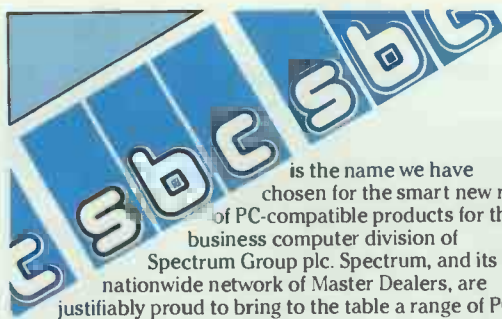
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Microprocessor	8086-2	NECV-40	Basic language supplied	Locomotive Basic-2	Industry Std. CW Basic-3.2
8087-2 co-processor socket	✓	✓	Expansion slots	3	4
Parallel electronics port	✓	✓	CGA graphics option	No	✓
RS232 serial port	✓	✓	CGA graphics output	No	✓
Power supply rating	70W (approx)	135W	Mono colour changer switch	No	✓
Power supply location	In-rack	In Main Case	Dual speed processor	No	✓
Twin 360K floppy drives	✓	✓	640K RAM as standard	No	✓
Mouse and controller	✓	No	Full 12 months on-site warranty included in purchase price	No	✓
Gen and gem paint	✓	No			
MS-DOS 3.2	✓	✓			

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501	Mini Asd	7.99 (Now compiled)
503	Pascal Compilers	7.99 One a subset of Turbo (everything but disk I/O); One Tiny Pascal; One Visible Pascal - built in editor/debugger.
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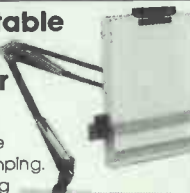
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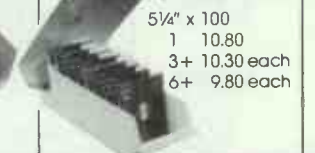
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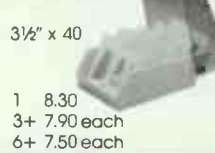
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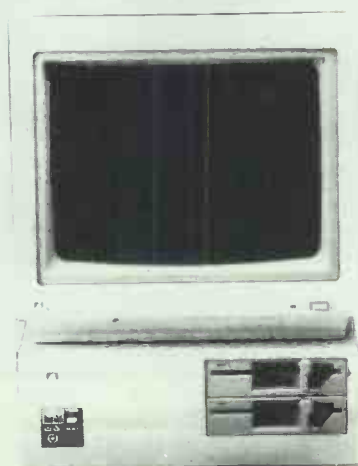
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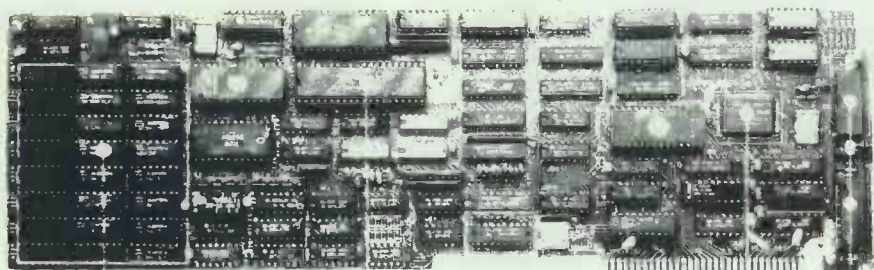
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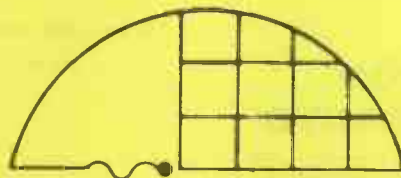
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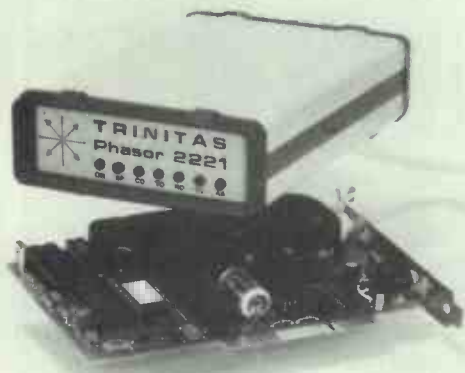
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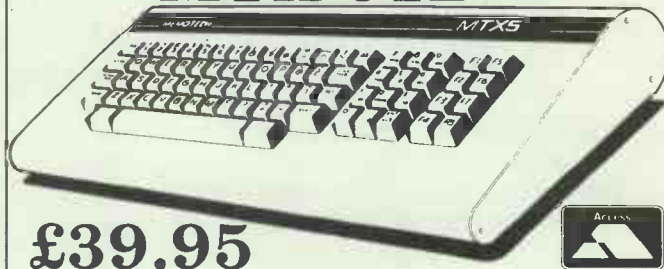
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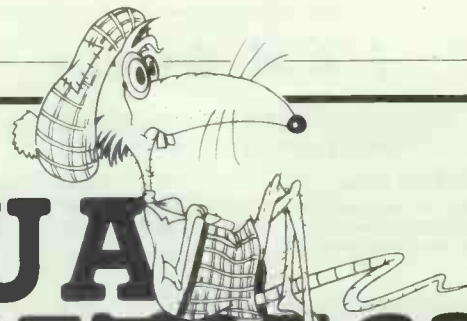
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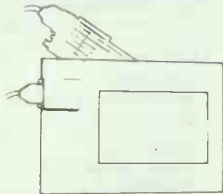
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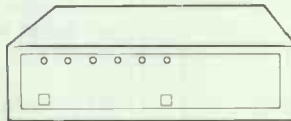
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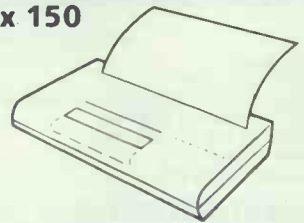
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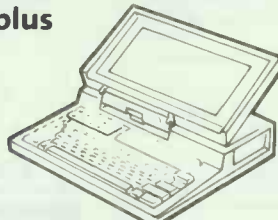
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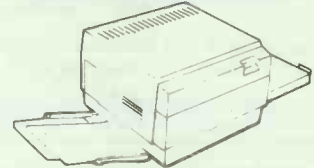
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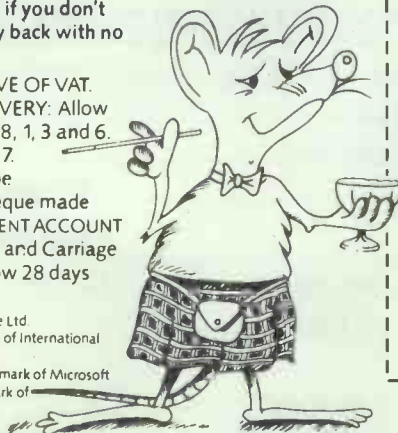
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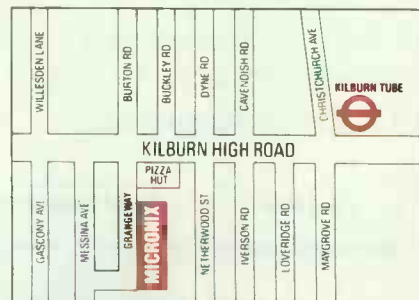
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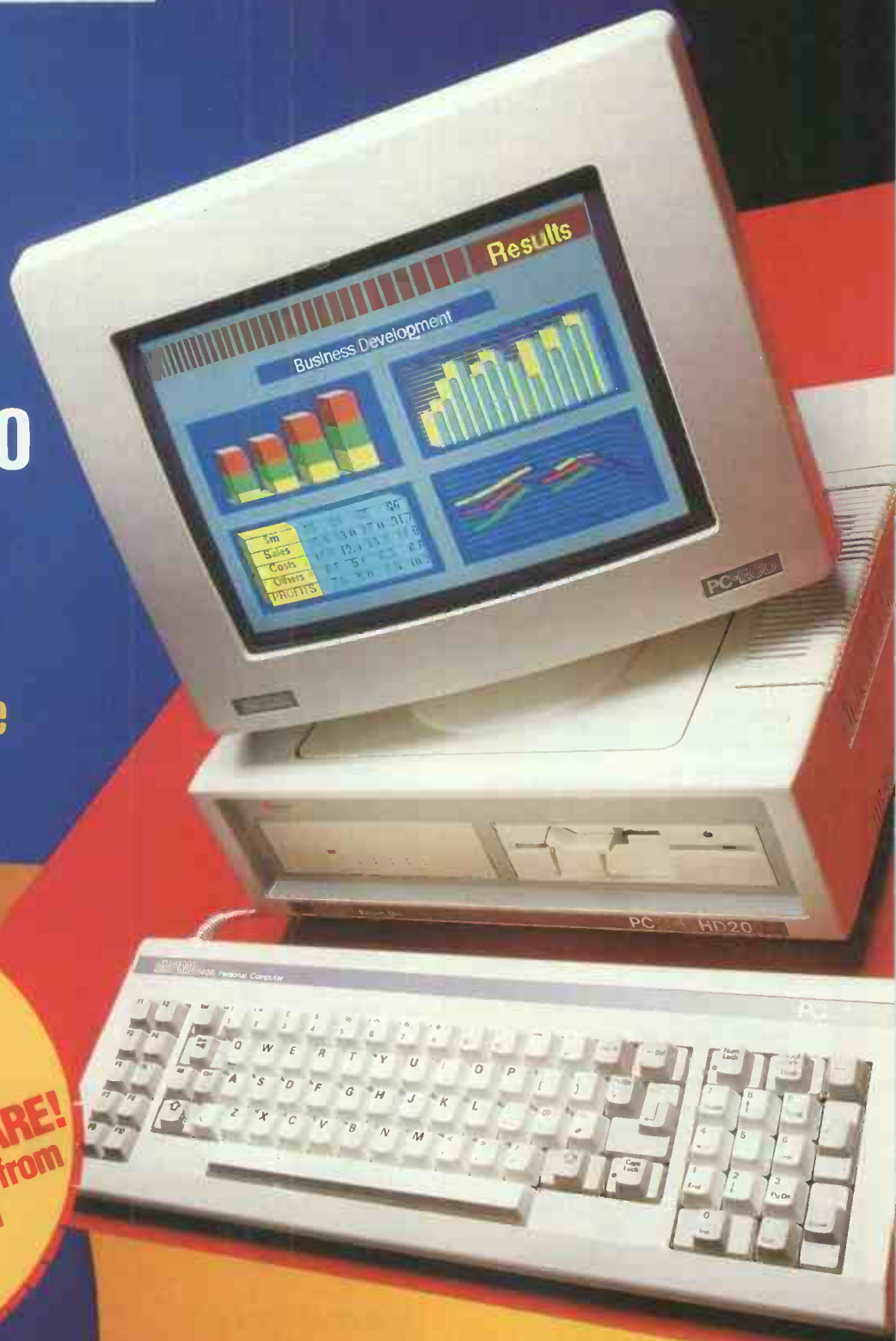
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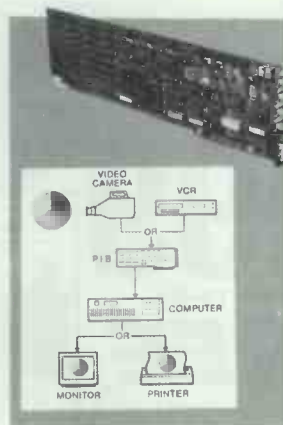
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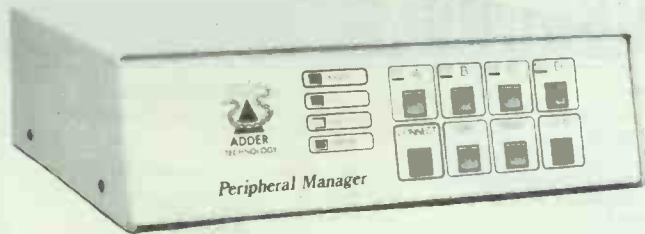
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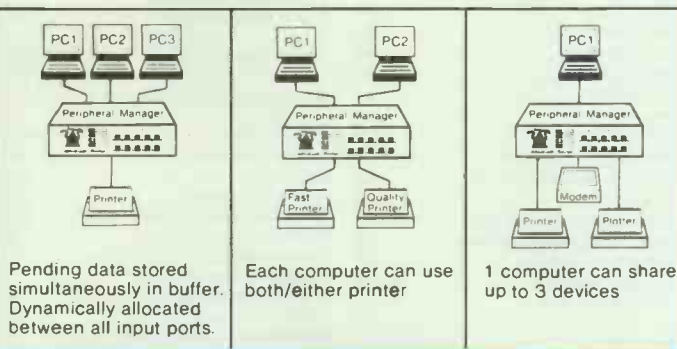
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T-Debug Plus	PC-DOS	£ 35
Turbo Database	CP/M & MS-DOS	£ 49
Turbo Editor Toolbox	PC-DOS	£ 49
Turbo Extender	PC-DOS	£ 55
Turbo Gameworks	PC-DOS	£ 35
Turbo Graphix Toolbox	PC-DOS	£ 49
Turbo Advantage (Lader)	MS-DOS	£ 60
Turbo Link Plus	PC-DOS	£ 65
Turbopower Utilities	PC-DOS	£ 60
Turbo Optimiser	PC-DOS	£ 45
Turbo Professional	PC-DOS	£ 45
Turbo Screen	CP/M,MS,PC-DOS	£ 65
Turbo Tutor	CP/M & MS-DOS	£ 29
TurboWINDOWS	PC-DOS	£ 50

### GENERAL PASCAL LIBRARIES

Blaise Tools (s'ce) (MS)	PC-DOS	£ 95
Blaise Tools 2 (s'ce)	PC-DOS	£ 80
Blaise Asynch (s'ce) (MS)	PC-DOS	£125
Btrieve (MS)	PC-DOS	£190
MetaWINDOWS (MS)	PC-DOS	£100
Multi-Halo (MS)	PC-DOS	£175
Blaise View Mngr. (MS)	PC-DOS	£205
Shark database (Propas)	MS-DOS	£250
Prospect Graphics (Pro)	MS-DOS	£ 70
Panel (Screen) (MS)	MS-DOS	£205
Shark database (Propas)	CP/M-86	£250
Prospect Graphics (Pro)	CP/M-86	£ 70
Shark database (Propas)	CP/M-80	£150

## PROGRAM EDITORS

Kedit and Norton are new to us.  
So many good editors, spoilt for choice.

BRIEF v2	PC-DOS	£150
EC Editor v2.1	PC-DOS	£ 40
Epsilon v3.1	PC-DOS	£140
Lattice CVUE	PC-DOS	£ 95
FirstTime for Pascal	PC-DOS	£190
FirstTime for Turbo-P	PC-DOS	£ 60
Kedit v3.52	PC-DOS	£ 95
Norton Editor V1.3	PC-DOS	£ 80
Pmate PC v4	PC-DOS	£115
RED v6.6 (with C S'ce)	PC-DOS	£ 65
XTC (with Pascal source)	PC-DOS	£ 65
Vedit-Plus	PC-DOS	£120
CSE (with C source)	MS-DOS	£ 75
MIX Editor	MS-DOS	£ 35
Pmate 86 v4.00	MS-DOS	£115
Vedit-Plus	MS-DOS	£120
Vedit-Plus	CP/M-86	£120
CSE (with C source)	CP/M-80	£ 75
MIX Editor	Z80 + CP/M-80	£ 35
Nevada Edit	CP/M-80	£ 35
Vedit-Plus v2.33	CP/M-80	£120

For more information please call us.

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We can copy files to and from 400 disk formats including CP/M, CP/M-86, MS-DOS, PC-DOS, ISIS, APPLE, SIRIUS, BBC, TORCH, APRICOT, HP150, TRSDOS, DEC RT-11, IBM BEF, ATARI520, AMSTRAD.  
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The view from Amstrad Towers must be interrupted by a mass of rose-tinted lenses. The press release announcing the launch of the PCW9512 in the US last month concludes: 'In Great Britain, it is difficult to find a journalist who has not bought and paid for an Amstrad word processor ...' From where I sit, I can count at least 20 ...

Still at Amstrad, another view of the company's self-perceived omnipotence comes from the apology which followed the above release: the company 'mistakenly stated that Locoscript and Locomail were registered trademarks of Amstrad plc.' Amstrad liked the names so much, it thought it had bought the company ...

Mind you, it's not just car aerial salesmen who want to succeed in the business (but not many will succeed as well as Alan Sugar). A reader from Skegness wrote in, saying that he was setting up as a dealer of hardware and software, including Commodore Amigas.

However, his knowledge of the computer business contained some gaps and could we help him with the phone numbers for Commodore's distributors. He also thinks that perhaps he will set up a bulletin board and could we tell him how to set one up. Perhaps he expects us to teach him how to sell as well ...

Another offer we've protected you from this month is a description of how to re-ink your own printer ribbons. It involves drilling holes into the top of the ribbon case and pouring in a mixture of stamp pad ink and glycerine. One month later you have a sticky mess ... No, sorry — it's supposed to be a nice, black ribbon. Try it at your

peril. We haven't ...

A rather distraught American Apple dealer phoned Apple, complaining that he could no longer 'wind back' the copy counter inside the new-model Apple Laserwriter like he used to be able to do on the old models. 'Why do you want to reset it?' Apple asked.

'Well, this is a demo model, and it's done 1400 copies so it's impossible to sell. But the warranty is about to run out so I have to reset the printer, and to do that I have to set the counter back to zero.'

The dealer in question was rather astounded that Apple wouldn't help him with this sleight of hand, according to the *Newsbytes* reporter who questioned him.

Can you imagine a car dealer phoning Ford and asking how to turn the clock back on his personal-use Sierra so he can sell it as brand new ...

Livingston Hire has the new IBM Model 30s available for hire, but the company has obviously had them upgraded as it has heard that these machines are a bit sluggish at times. How else can Livingston explain its announcement which describes the Model 30s as being based on the 80386 microprocessor ...

Another rental company, Microrent, has a new Microsprint service which offers two-hour replacement of faulty equipment, including laser printers. Microrent itself was clearly left in the lurch, as its announcement was printed on the faintest dot-matrix printer we've ever seen. Perhaps the cartridge was blocked up with glycerine ...

If you're still using Telecom Gold you might have received a message at some time, as succinct as this one from our Mailbox

columnist, Peter Tootill:

}i}\_{\_Xd}/ra{\_d li{e will call back ...

### Action Required

Cobonic has offered us a free digital clock/timer/alarm unit which normally sells for around £17.50. Handily, for the computer user, it comes with a magnetic clip for attaching to metallic surfaces — like disk drives and floppy disks ...

A combination of five lasers and realistic sound effects is being used inside a 'microdome' to train soldiers in ground-to-air combat. Four of these lasers draw the aircraft shapes onto the surface of the dome, superimposed on photographs of real settings; the fifth reproduces the flare of the laser. Scenarios such as Port Stanley in the Falklands are available.

It makes Starglider seem rather tame ...



*A new-technology showcase is being planned for Berkshire, including a permanent technology exhibition, countryside park and hotel. The 'Information Age' will be situated near Reading, on a site that looks like a refugee from MacPaint ...*

## This month

PC-compatible laptops are getting cheaper and smaller — those on our cover this month are certainly compact. But it does seem that screen design has some way to go before all machines have screens as legible as CRTs. How well current technology stands up can be seen on page 98.

The multi-tasking DOS utility, DESQview, was at the centre of a row between *PCW*'s technical editor, Owen Linderholm, and Microsoft founder, Bill Gates. On page 142 you can see why Owen became so heated in challenging Gates' belief that you couldn't multi-task properly without OS/2.

We all gave a sigh of relief when a full, working Cambridge Computer Z88 arrived in the *PCW* office. The warm, soapy cloth was kept busy cleaning up afterwards, as we all crowded round to get our eager paws on the rubbery keyboard and see whether



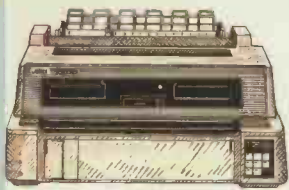
the internal software lived up to expectations. Page 108 gives our findings.

Finally, this issue sees a new member of staff joining our team. Chris Cain is our new editorial assistant, replacing Debbie Wallace who has moved on to the art studio. Chris is an Amiga owner and, as well as handling your general queries, will be looking after the Transaction File and Diary Data sections of End Zone. Our telephone is now answered with the mellow tones of Marble Madness in the background.

## Cheap PCW Show tickets!

As promised, here's how you can get £1 off the entry price to the PCW Show at Olympia, 23-27 September (see 'Showing off!', page 154). You should by now have in your possession two vouchers — marked '1' and '2' — cut from this and last month's subscriptions cards. (If you don't have our last wonderful issue, our Back Issues department will be happy to oblige.)

Send those two vouchers (photocopies are obviously not acceptable) along with a cheque or postal order for £2, to: Keith Prowse, PCW Show Ticket Office, PO Box 2, London W6 0LQ. Don't forget to enclose a stamped, self-addressed envelope, too, or Keith Prowse will be snowed in by unclaimed tickets.



#### 7200 NLQ MATRIX

The world's first multi-function, multi-wire, flat-bed printer. It allows you to print virtually any kind of business form. It gives quality print as well as colour and plotting facilities.

**Speed:** 324cps (Draft). 108cps (LQ).  
**Columns:** 136. **Compatibility:** IBM, Epson, or Diablo 630.  
**Price:** £1625.



#### 5510/5520 NLQ MATRIX

High speed, NLQ with full graphics mode and 3K memory. 5520 is the colour version.

**Speed:** 180cps (Draft). 30cps (NLQ).  
**Columns:** 80. **Compatibility:** IBM & Epson.  
**Price:** 5510 £329. 5520 £449.



#### 6500 DAISYWHEEL

This new daisywheel is designed for heavy duty office use. It's very fast and includes parallel and serial interfaces.

**Speed:** 60cps. **Columns:** 132.  
**Compatibility:** IBM & Diablo 630.  
**Price:** £1299.



#### 6300 DAISYWHEEL

Our best selling general purpose daisywheel printer. It's fast speed and low noise level make it ideal for the office.

**Speed:** 40cps. **Columns:** 132.  
**Compatibility:** IBM & Diablo 630.  
**Price:** £899.



#### 6200 DAISYWHEEL

A popular wide bodied letter quality printer, perfect for the smaller office. Parallel or serial interface.

**Speed:** 30cps. **Columns:** 132.  
**Compatibility:** IBM & Diablo 630.  
**Price:** £579.



#### 6100 DAISYWHEEL

The U.K.'s best selling daisywheel printer. 30 character wheel. 2K memory expandable to 8K.

**Speed:** 20cps. **Columns:** 110.  
**Compatibility:** IBM & Diablo 630.  
**Price:** £399.



#### 6000 DAISYWHEEL

Letter quality printer designed for home use. 100 character wheel and either parallel or serial interface.

**Speed:** 10cps. **Columns:** 90.  
**Compatibility:** IBM graphics printer.  
**Price:** £199.



## The Juki 7200. The first printer in the world that can print anything.

Well, when we say anything we mean virtually any kind of business document. Everything from the usual cut sheets, labels and continuous paper to multi-part sets, envelopes, business cards, airline tickets, freight bills, cheques, statements and ledger leaves.

This is due to its revolutionary flat bed design and three way feed system. Combine this with print quality to rival a laser and the option of colour, you have something no other machine can match.

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\*Does not include printheads, ribbons and daisywheels.

All prices are RRP Ex VAT.

All trade marks are recognised.

# Why are PC users from New Zealand to Norway changing over to PCL?

**PCL** (Personal Computer Language) is the ideal language for beginners and experts alike. It is easy to learn and offers much greater practical programming power than either BASIC, Pascal or C.

**PCL** has a logical syntax and a clear structure which encourages the writing of very readable programs. Extensive debugging features and sensible error messages help you to track down errors quickly.

**PCL** is a major new high level language, implemented as the fastest interpreter on earth. **PCL** is not a scaled down adaptation of a mainframe language like Basic, Pascal or C – it was designed for the PC.

Calend\* developed **PCL** for the practical PC user. You will find that **PCL** is more powerful and easier to learn than any language you have come across.

**PCL** makes you more productive and it gets more performance out of your micro. It gives you the flexibility of an interpreter with an execution speed that puts most compilers to shame.

Join the fast growing number of **PCL** programmers. Get your applications running in record time. Why waste time wrestling with the quirks of the traditional languages. **PCL** has more useful built-in functions than the others:

- Sophisticated windowing, boxes frames and menus. Save and restore window settings and contents.
- Extremely fast screen displays.
- Array arithmetic.
- Sorting.
- Extended text manipulation and scientific functions. 16 digits precision. Date arithmetic. Automatic 8087/80287 support.
- Powerful file handling, directory and disk management.
- Dynamic record structures.
- DOS command interface.
- RS232 communications up to 19200 Baud handled by built-in background tasks.
- Supports the IBM graphics characters, but not pixel graphics which are incompatible with fast text display.
- Any **PCL** application can be made RAM-resident

...and much more.

**PCL** has over 330 built-in functions.

\*Calend is an independent UK software house.

Any **PCL** program can call on the interpreter itself at run time and pass source code for immediate execution. Useful for self-modifying, intelligent programs, spread-sheets, data dictionaries, AI applications etc.

Description	BASICA	MS-BASIC	C	PASCAL	PCL
Empty loop x 10000	4.6	23	.09	25	.04
BYTE Magazine decimal arithmetic benchmark:	252.5	17.32	39.4	31.88	14.82
With 8087:				6.29	6.09
Display 24 lines of 80 characters on standard colour display:	3.62	4.00	4.6	2.70	15
Mono or EGA display:	3.40	3.40	3.6	2.45	.04
Format & display 100 decimal numbers:	6.95	2.02	2.6	1.51	.42
With 8087:				1.35	.25
Convert 1000 decimals to character strings:	22.0	3.56	6.5	3.89	3.17
With 8087:				2.87	1.04
Convert 1000 character strings to decimals:	50.7	3.92	13.1	8.18	2.43
With 8087:				3.48	1.12
Catenate two 10 byte strings x 1000:	3.2	.65	.32	.58	.32
Sequential write, 1000 x 90 byte records	18.3	9.0	11.2	7.5	2.9
Sequential read, 1000 x 90 byte records	18.2	8.6	9.2	7.4	2.5

All timings are in seconds. They were taken on a standard IBM PC with PC DOS 3.1, a real-time clock and a 10MB hard disk. BASICA is the PC-DOS interpreter, MS-BASIC is Microsoft's compiler (version 2.0), C is the Digital Research version 1.1, PASCAL is Borland's Turbo Pascal 3.0

Minimum system requirements: IBM PC/XT/AT or compatible, 256k RAM, mono or colour monitor, PC DOS or MS DOS version 2.1 or later. **PCL** comes on a 5¼ diskette (not copy protected) with 16 sample programs. It is accompanied by a 255 page manual. The manual covers all aspects of **PCL** programming, is well structured and has a sensible index. 30 days money back guarantee for single copy prepaid UK orders.

Become more productive – order **PCL 2.0** from Calend for £100 (includes VAT and UK postage).

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