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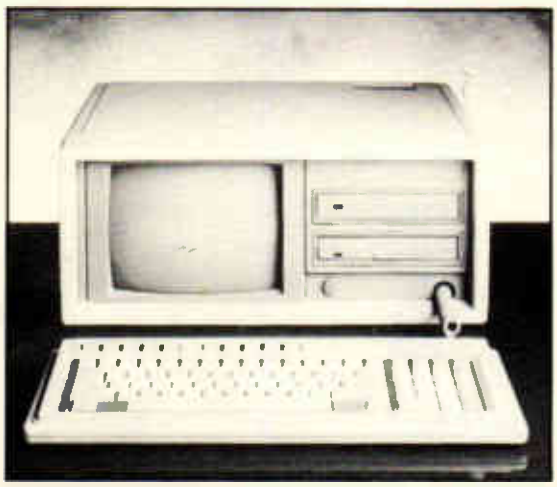

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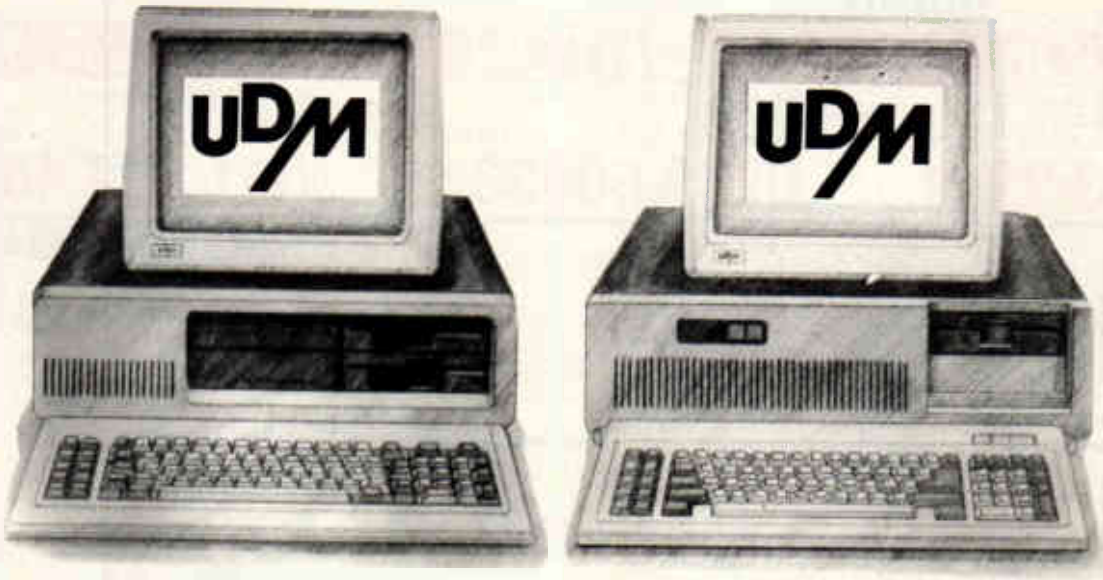

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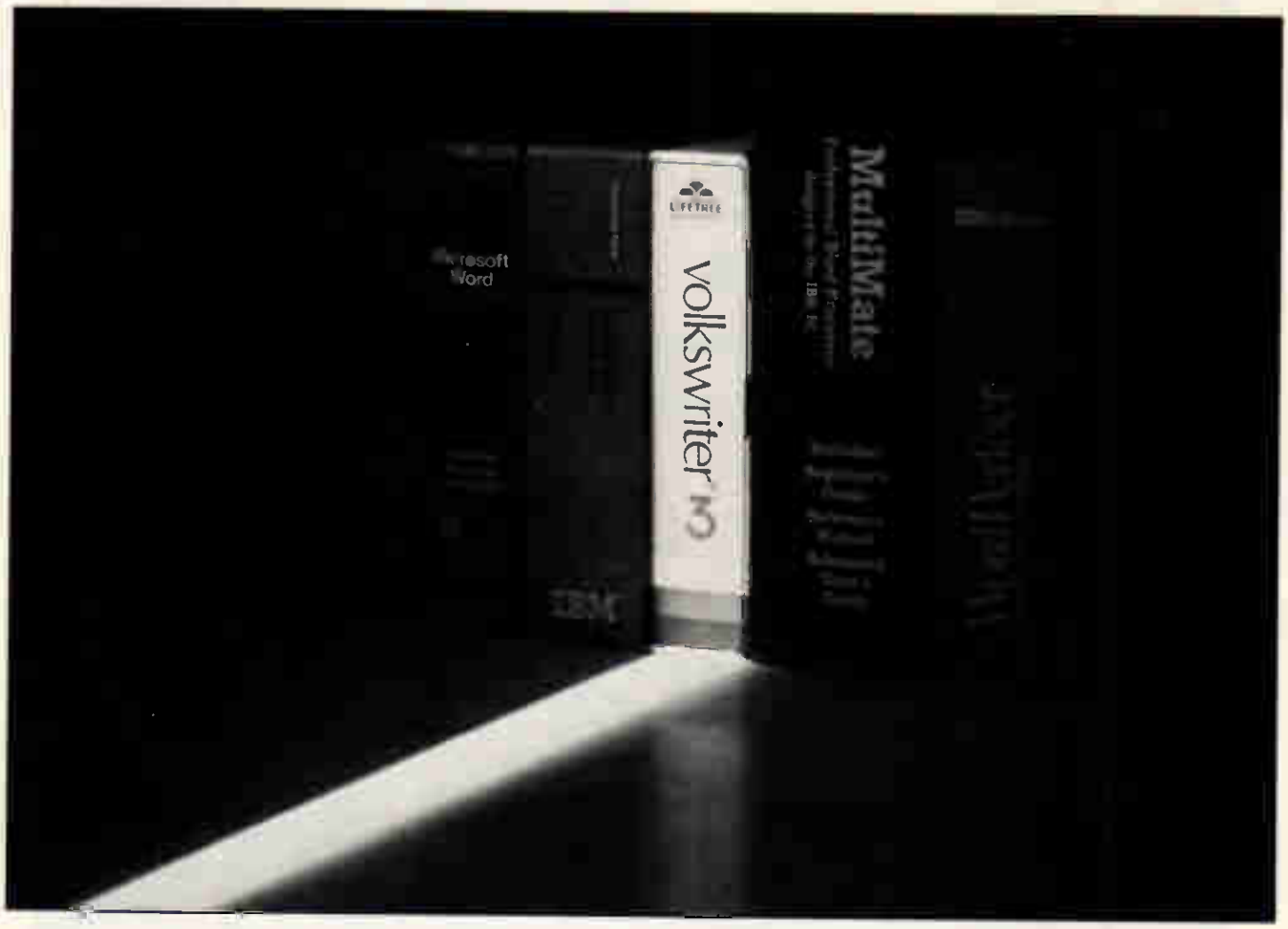

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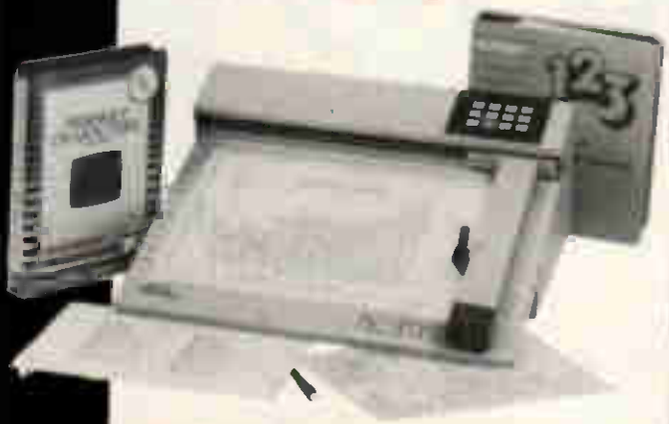

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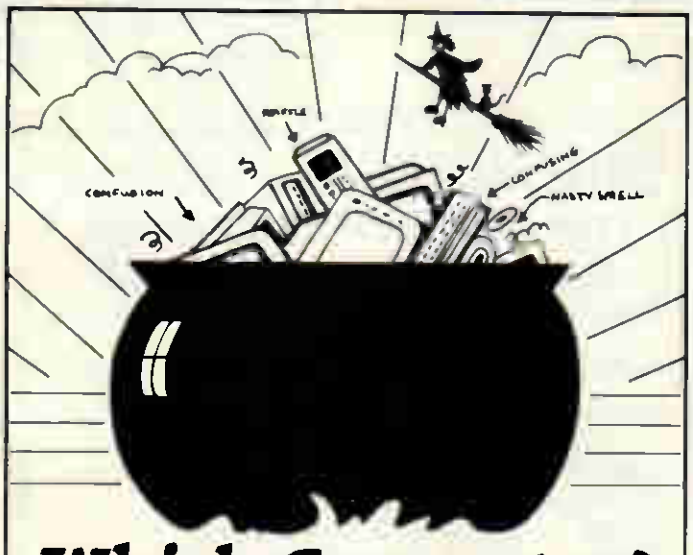

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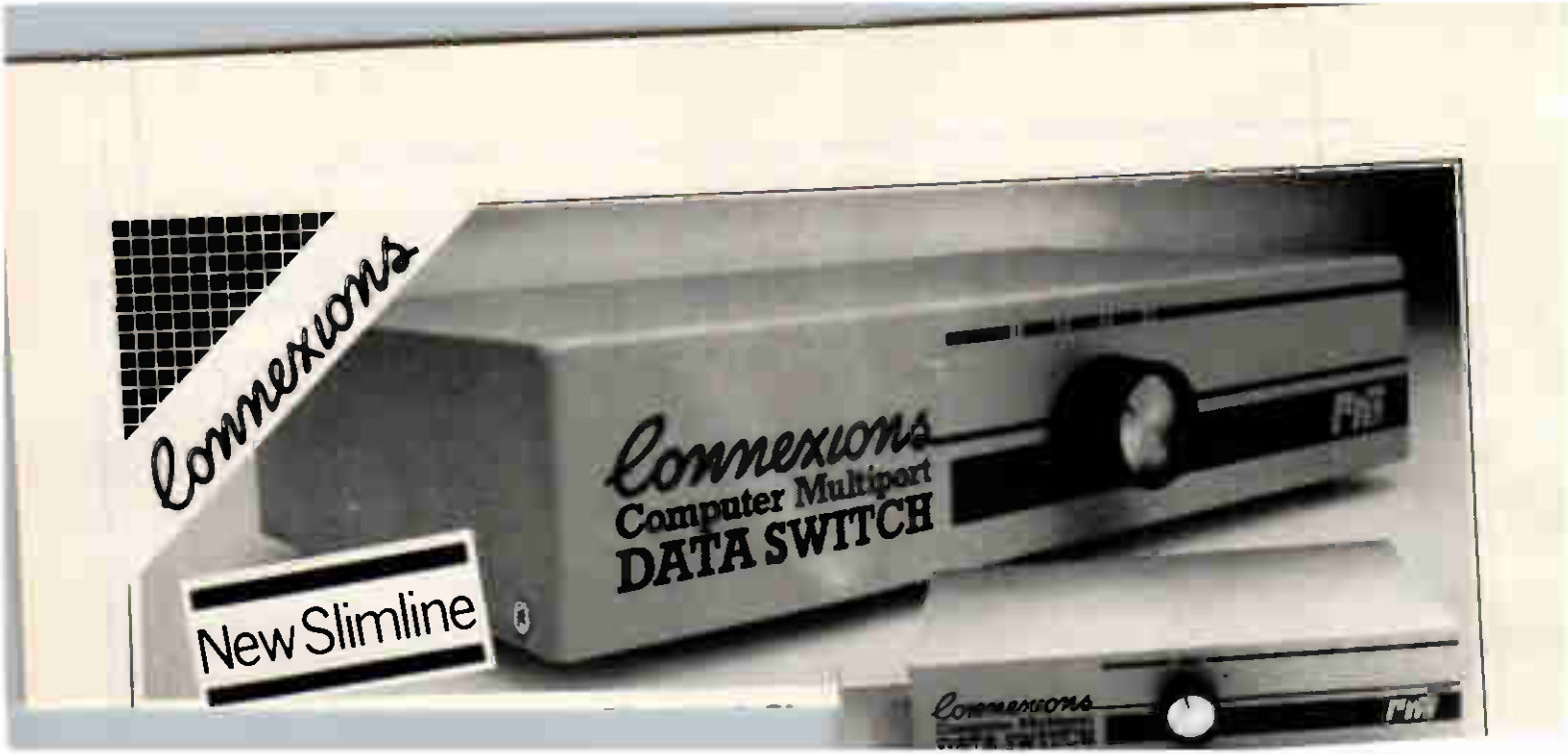
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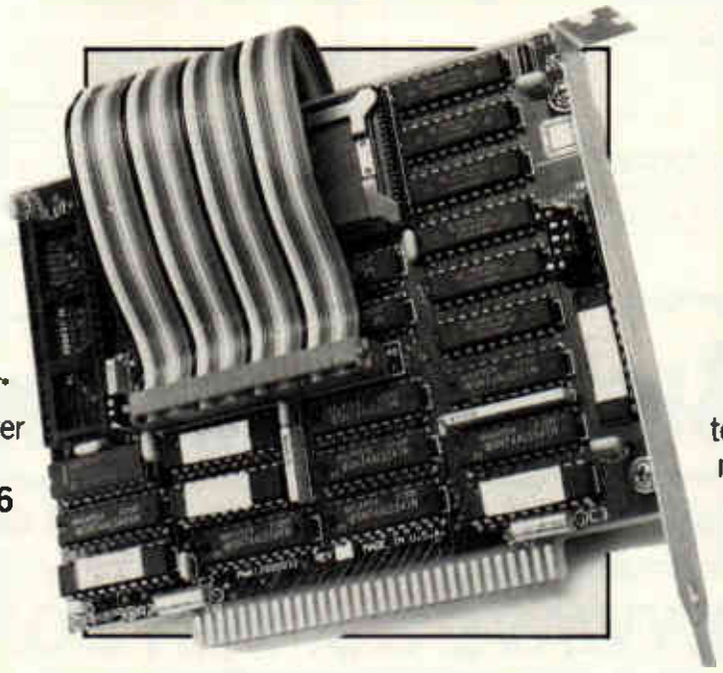

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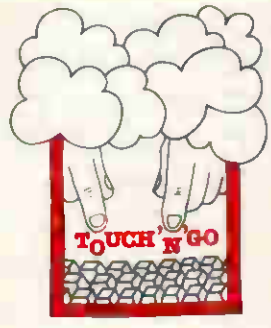

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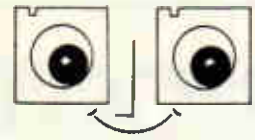

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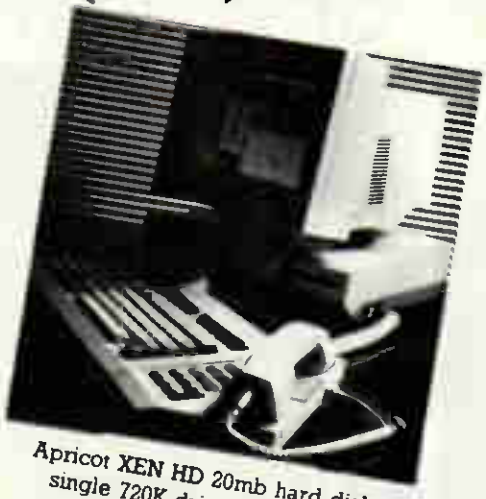

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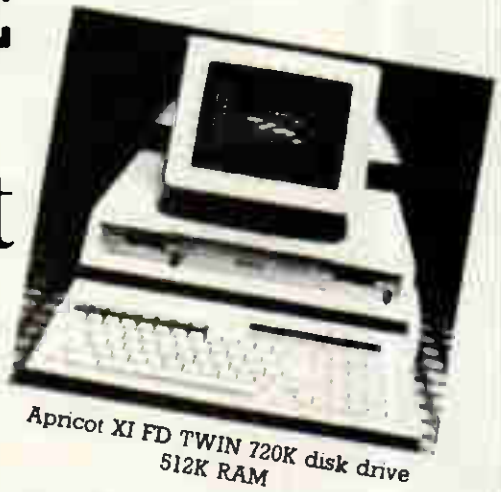

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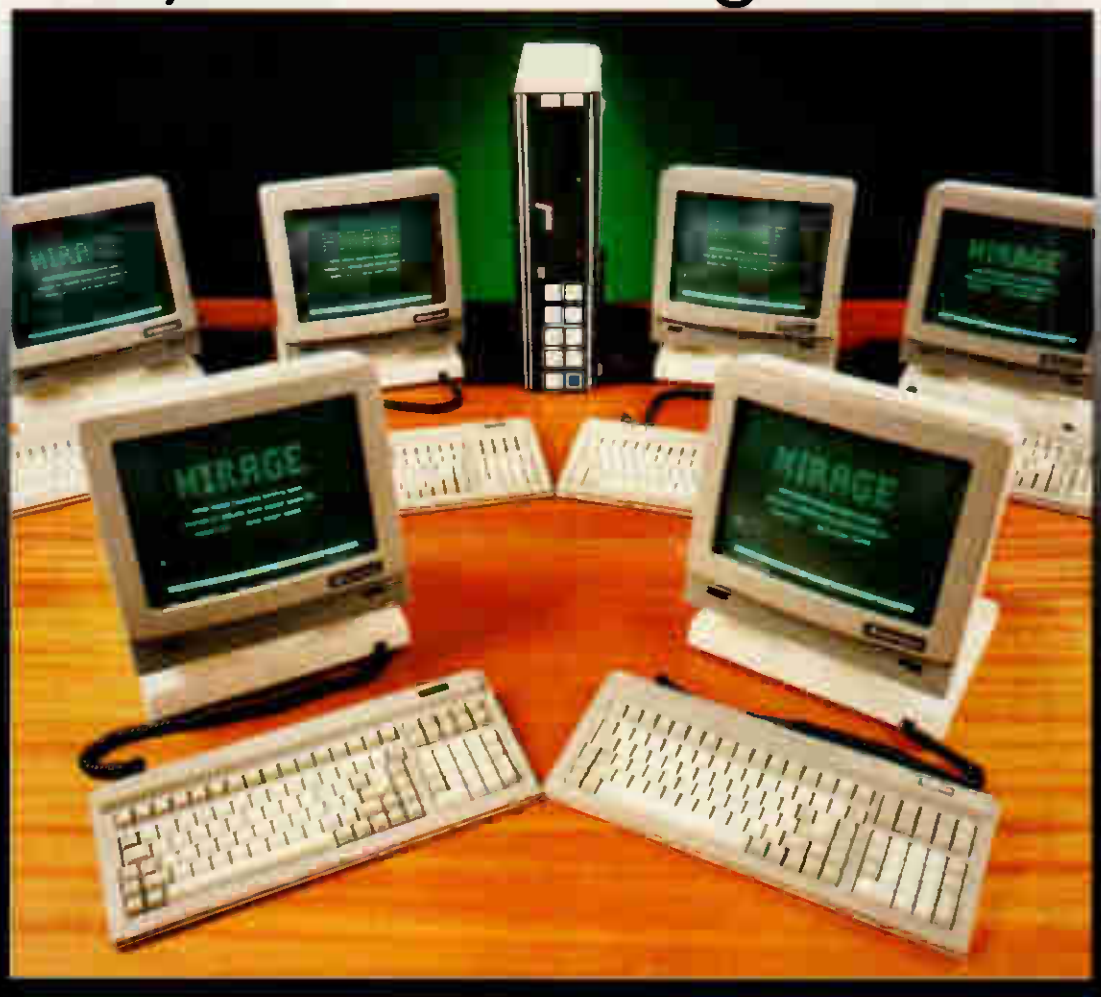

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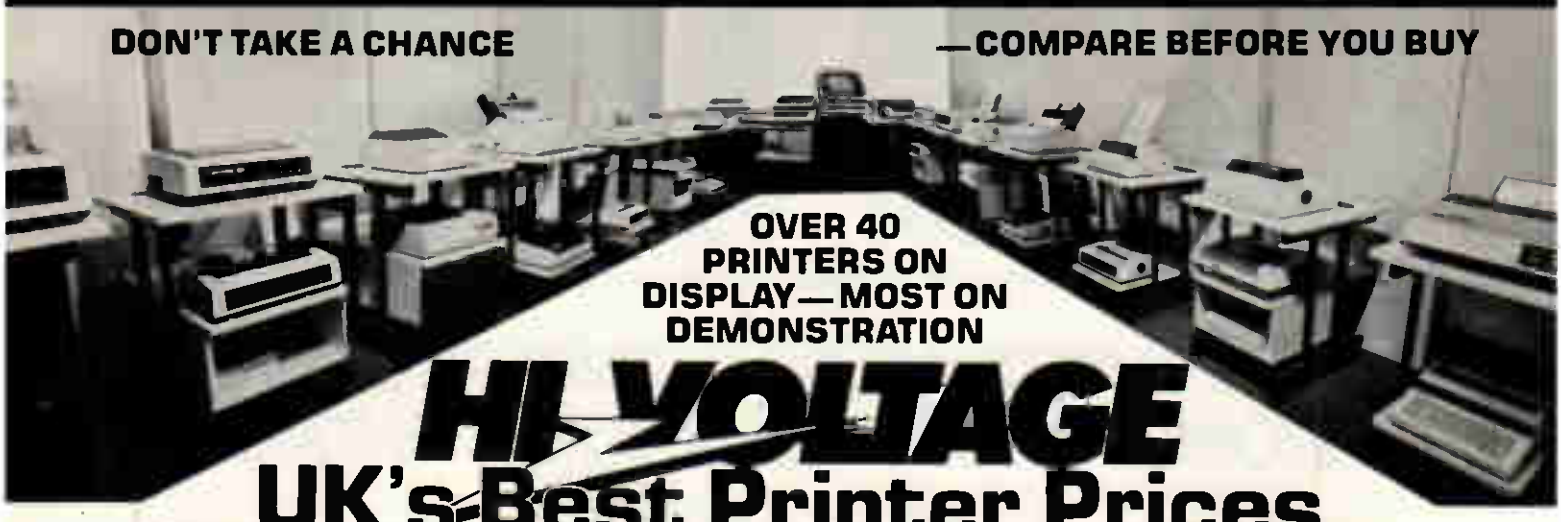

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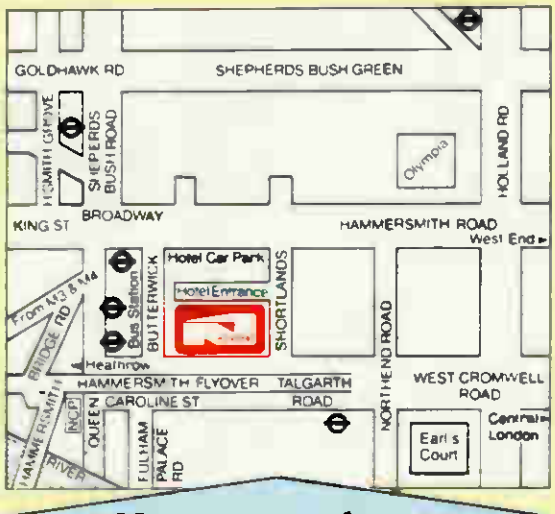

How to get there:

Novotel London is right by the A4/M4 and is only two minutes from Hammersmith underground station (for the West End, City and airport). For those bringing their own car, there is a large underground car park at the hotel.

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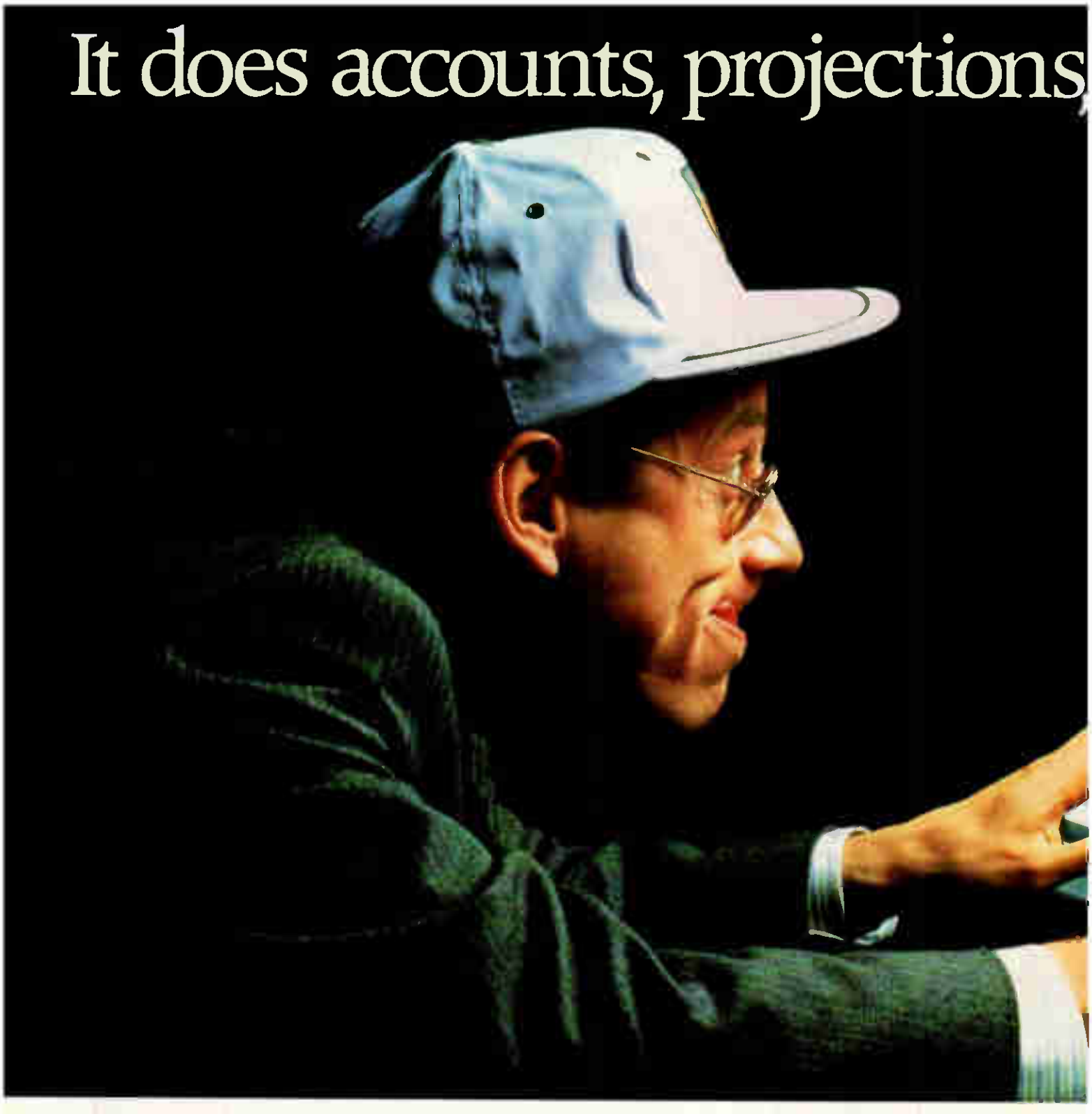


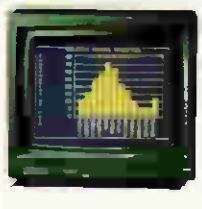
No wonder people are racing out to buy Amstrad's new CPC 6128 computer.

Not only does it answer all your business needs, it's also compatible with nearly 200 arcade and adventure games. So it can either speed you through your income tax returns or whizz you round a simulated Silverstone.

On the business side we start you off with a free disc which introduces you to the Amstrad CPC 6128's impressive range of capabilities, and the best ways to exploit them.

You'll discover how its massive 128k memory can open the door to over 8,000 CP/M* applications.

Programs like 'Wordprocessing' and 'Database' will file and index records, produce standard letters, mailing lists and even compile reports.



There's a series of business control programs which form a complete invoice, stock control and statement system.

In other words it's easy to choose the software you need to take the big problems out of your small business.

But even if you don't own a business there are plenty of good reasons for owning an Amstrad CPC 6128.

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That's why the Amstrad comes complete with a built-in disc drive as well as a monitor (green screen or full colour). So it's ready to go to work as soon as you get it home.

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Finally there's one feature of the Amstrad CPC 6128 that's both good business and a pleasure: the price.

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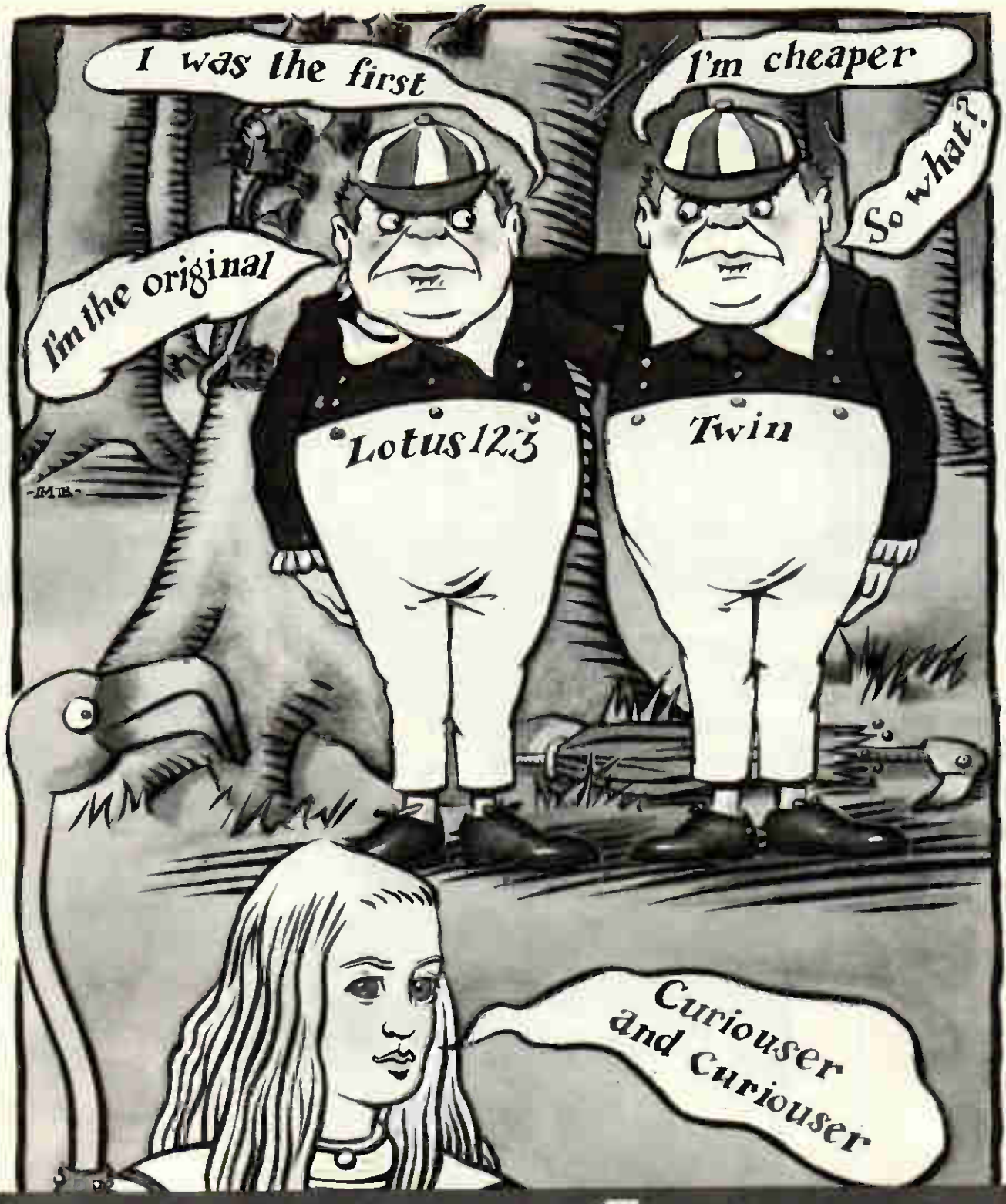

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The two pictures below represent two different types of potential computer purchasers – the gentleman on the left is a typical owner/director of his own business, and the gentleman on the right is a typical corporate buyer.

Both these gentlemen probably know what they want a computer to do, but one may know how to achieve it while the other doesn't. They both have a list of the pertinent criteria – see if you can spot the difference!

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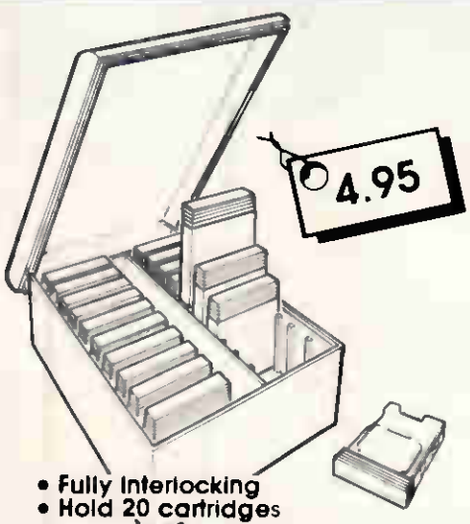

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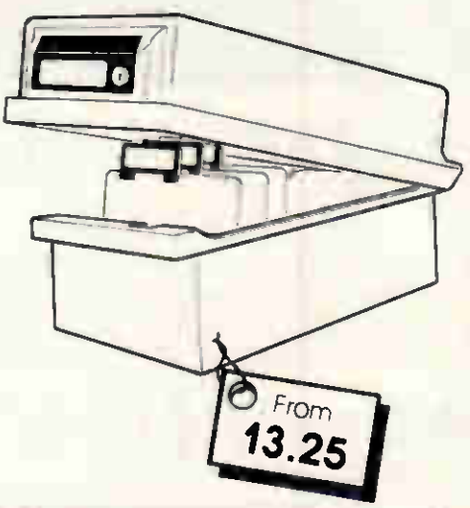

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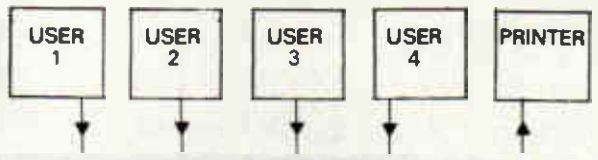

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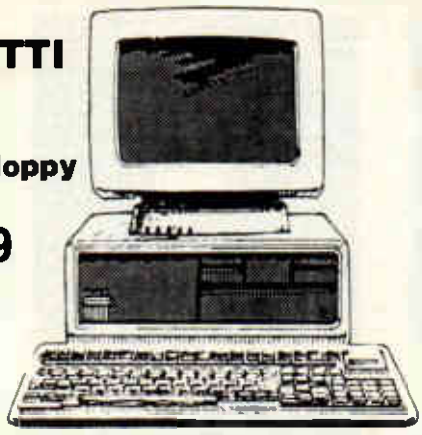

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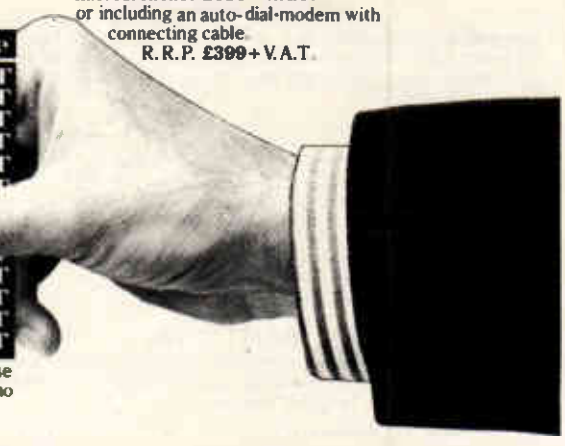

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NEWSPRINT

Don't knock Alan Sugar's marketing strategy until you've read Guy Kewney's account of the motive behind the method. The industry's prime news this months starts here.

Sugar of the Year

How nice that Alan Sugar became Personality of the Year at the *Which Computer?* Show! His 'professed aim to make the benefits of information technology available to everyone' apparently impressed the judges of the Rita awards. And his 'watchword is simplicity, both in presentation and operation'.

This sort of sanctimonious claptrap must have had Alan splitting his honest sides.

Actually, I use the word 'honest' without any attempt at satire — despite what some buyers of the CPC464 thought last year.

There were many who wrote to us, here at *PCW*, complaining that he didn't warn them he was going to release the CPC664, nor the 6128. Frankly, I have no sympathy: I told anyone who wanted to know, here in this column, that the machines were coming. And you wouldn't expect him to announce that his machines were about to be made obsolete, any more than you'd expect turkeys to vote for Christmas.

Alan Sugar's 'watchword' is not 'simplicity', but 'make it look expensive'.

His professed aim is not some pious altruism, but an intent to sell equipment (and what else is a manufacturer supposed to aim at?) in large volumes, at a good profit.

Myself, I'd have given him an award for honesty, following his financial results. They were, by the way, splendid, and it's a shame that some idiots in the City press misread his performance so far as to claim he had 40 per cent of the UK computer market. What can they have been thinking of? Sugar's results are exciting enough without misprints.

No, honesty in the City is rather rare. Ever since it became illegal (rather than just 'frowned on') for companies to leak details of their annual financial results on the Stock Exchange, it has been thunderingly obvious that everyone does it. No-one gets prosecuted, of course.

A company announces a 20 per cent drop in profits. Strange: for the previous two weeks, everyone had been selling the shares. Another company announces a 100 per cent increase. Funny, but the share price hardly moves (though it is twice what it was three weeks ago).

Alan Sugar's Amstrad announced profits are substantially above what the City expected, and all the City Editors commented on this.

What they meant was: Alan Sugar didn't let a few friends in stockbrokers' offices see his results before they were officially announced.

Wake up! — the industry lives

In the 100 issues of *PCW* since my original *Computing* magazine column was advertised in the first one, next to an article on 'the history of computers' which I wrote, the only thing that has changed is the sheer volume of information.

It isn't true, honestly it isn't, that the industry has become dull and unexciting. It's just harder to find the exciting stuff among all the dross, which used to be rare.

But the actual information is still interesting.

For example, last month, as was the case 100 issues ago, there were announcements of innovative, shoe-string budget micros with no hope of big-time success.

A 100 issues ago, it was the late John Miller-Kirkpatrick connecting his Scrumpi to Clive Sinclair's original pocket TV — the one 'for people with deep pockets,' as a colleague said at the time. It weighed a ton, and was almost as portable as the typical three-cell electric torch. Not to worry: Miller-Kirkpatrick, bless his enthusiastic socks, devised a way of generating print large enough to read on the tiny screen, and also found a way to save money by using only 16 keys and about five different shift combinations. Something like the Spectrum, only more so.

This time, it's Micro Concepts with the Micro Box III, a Motorola 68000-based machine, rivalling the Amiga. It uses Motorola graphics chips to give the animation, it has Tripos (from which Metacomco's AmigaDOS was developed) and also has CP/M 68k, plus Tony Tebby's operating system with a name like SMS2.

What does SMS2 mean? 'I'm not altogether sure,' said the computer's designer when I asked, 'but I think it stands for Silly Micro System, and it's the second, because his first was the QL's QDOS;' the point being that it will run Sinclair QL software. 'And we also have CP/M 68k, and we're hoping to have GemDOS, too.'

Actually, the Box stands a much better chance of success than Scrumpi, and is every bit as exciting. So why pretend things are getting dull?

Take software. A 100 issues ago, we stood in the lunch room of the first Build Your Own Computer Show, and listened to Computer Workshop dazzle us with the unbelievable: 'We're going to give you Basic!' Many people there didn't believe you could get a Motorola 6800 to run a Basic interpreter; only mainframes could do that.

This issue, Metacomco (again) has stood up and announced that IBM's new super-micro, the Reduced Instruction Set RT, uses Metacomco Basic.

Soon after *PCW* started, I had a whale of a time reporting the absurdities of Apple's appointment of two 'exclusive' importers, followed by the appointment of a third to replace them. And there was the background humour: the new distributor, Data Efficiency's Microsense subsidiary which eventually turned into Apple UK (actually, Microsense was Data Efficiency's way of buying out John Miller-Kirkpatrick just before his death), had been distributing a lunatic Apple II imitation made by ITT. It wouldn't run Apple II software, but it was painted silver . . .

Well, this issue, I can report on the anger of Novel Data, which has discovered that Novel Inc has appointed two other 'exclusive' distributors for its networking systems.

And with tape back-up maker Sysgen, the situation is even sweeter. Bonsai, a London shop, has taken over distribution of this range of products from a large distributor, P&P Micros. P&P is accordingly arranging to buy its distribution stocks from a shop. Sysgen likes the idea because Bonsai will advertise the product, because it doesn't have rivals . . . oh, it all makes perfect sense: it always did.

The games business is unrecognisably more fun. I admit, a 100 issues (or so) ago, it was incredibly exciting to play Star Trek on a glass teletype. Star Trek assumed you had a printing terminal, so it could print out a map of the sector scan and you'd be able to scan it later. The glass teletype just forgot about anything that went off the top of the screen, and you'd have terrible trouble shooting Klingons. But it can't compare with the joy of Sir-Tech's Wizardry, which this month loaded a non-existent back-up roster of heroes onto my Level 5 Samurai and my 81 hit-point Fighters . . .

What has faded is the dream. The dream is still cherished by some fading politicians and one or two fervent journalists. They dream that we, the Brits, will dominate the world of computers because we're so much Cleverer than Those Foreigners.

Some of them, really and truly, only build computers to prove that Brits are Cleverer than Others. I can introduce you to several.

Obviously, the UK can't dominate the micro world any more than British

companies can sell more cars than Americans or Japanese. We British used to run an Empire, and had the resources of half the planet to play with. With that sort of clout, of course, we were richer than people in other parts; and with that sort of Empire, of course we came to believe that we were, somehow, just Cleverer than Others.

It doesn't work like that, and anyone who tells you that a machine is British — with pride in that fact alone — is living the dream, and is about to wake up.

If a micro is the best, it's the best. If a product is marketed properly, it sells as well as it deserves. A company which tries to control world-wide marketing of a new product from one small island in the Gulf Stream, is going to lose control. People who just get on with making and selling products, beating the competition when they can, will make money.

And anyone who tells you that this is a dull business, is someone who has never realised what is going on it.

What makes this over-£4000 printer a bargain is not just the excellent laser-generated print it will give your micro, but the fact that it is a photocopier, too.

The other interesting thing about this printer, made by Xerox, is that it actually can manage to print 5000 copies per month. Most laser printers burn out if you push them over 2000.

Sensibly, given the price (the photocopier option costs extra) Xerox recommends that four people share it and pretend that it's a daisywheel printer. Sounds excellent to me — pity I work on my own.

Full details on (0895) 51133, from Rank Xerox.

The easy way to crash

My colleague Menno Aartsen says that he found it almost impossible to crash the Tandy 100 lap-held by using the new £170 portable disk (Checkout, *PCW* March). Menno obviously doesn't have what it takes to *really* crash a system.

His report on the 100k storage system bragged about lightning storms, humidity, and other illustrations of how hard Florida (where he lives) can be on hardware.

I don't need Florida; all I have to do is plug in the thing.

Tandy lent me a drive at the *Which Computer?* Show. I'd used my Tandy 100 for an interview with one of my heroes, Chuck Peddle. He invented the 6502 chip (Apple, Acorn, Commodore) and the Sirius, and he's now running Tandon Computer. The very next day, I had to fly off to the US with the machine, and I thought it would be nice to test the beast by saving my Peddle interview to disk, and get on with other work during the 11-hour flight.

To understand the problem, you have to count bytes. The Tandy 100, without expansion, can hold a measly 32k of memory. My Peddle interview took up about 11k, and my own Tandy 100 only has 24k anyway.

The software Tandy supplies is on the disk. There is a snag: if the disk software that reads the disk is on the disk, how do you read it off?

Answer: to use the thing you have to do something Menno didn't mention — you have to type in a Basic program of only four lines, but of nonetheless unbelievable inpenetrability. It's a string of commands to the disk, telling it to send data from track x and load it into memory starting at point y, but it looks just like gibberish. You have to type it exactly right.

I'm fairly sure I got it right, because the message saying 'loading, please wait' came up on the screen. And the red light on the disk turned on and off, just like the manual said. Then it turned on, then off, and this time, it stayed off. I waited, and chatted to my neighbour in the plane.

After a few minutes of chat, I began to have a sinking feeling about my interview. All the 'stop' buttons were pressed, and eventually, I found a way of getting the computer to watch me again. The interview, every byte of it, was still there, but the 8k worth of disk filing system was not. Instead, there was a missing 4k of memory. Add all the files together, and it comes to 4k less than the 24k in the machine. Why?

There was still room for that 8k of filing system software, so, foolishly, I suppose, I tried again. Any rational human would have let well alone, but I did want the interview to be turned into an article, and (let's face it, I had good reason) I was anxious that the machine was going to swallow it if I didn't get it onto disk.

Again, I typed in the Basic. My colleague Peter Bright, who happened to be sharing the journey to San Francisco, checked it. We agreed that it was right.

We were wrong. This time, after two false starts, the system became serious. It stopped — totally and unrecoverably. Nothing could make anything happen — except an emergency full reset. That clears out everything from the memory.

At that point, there was one bright spot: at least we didn't have to worry about what else might be in memory. We had 24k free. We tried again, and the sequence repeated itself pretty well — apart from the fact that this time, we didn't wipe out an interview with Check Peddle, because there wasn't one there.

So now you know why I don't have an interview with Chuck Peddle of Tandon, and can't give you a report on the Tandy filing system.

This will change, I'm certain. Tandy folk seemed (when I borrowed the disk) so anxious to please, I'm sure that soon, one of them will return at least one of the rather red-hot phone calls I've made to them, and I'll have another chance to make it work.

Or at least, I'll find out how many articles can be stored on a 100k disk and how long it takes to read them in and out.

What I *hope* happens, is that someone clever puts this wretched filing system software in a plug-in ROM chip, and we don't have to rely on writing Basic PEEK-and-POKE programs which load filing system software off a faulty disk. It is 1986, after all, and I've heard tell of 64k ROMs which really don't cost all that much, compared with what they cost when the Tandy was launched.

In the meantime, I think I'll contact Zeotek, a firm which makes a filing system for the same disk, and see if it can supply a start-up program that works.

Zeotek is on (01) 205 9068 and you ask for John Starr.

Apricot network

The arrival of Microsoft's MS-DOS version 4.0 turns out to be a bit of a damp squib. Instead of being offered to you and me to speed up our IBM PCs and lookalikes, it is buried in networks.

The network was first announced by Apricot — or is due to be at press time — as MS-Net II.

It uses the Xen, stripped of disks, as a terminal, while another Xen, with a tape back-up unit stuck inside, functions as the network host. And it runs, say my sources, very much faster than the old Point 32 from Apricot.

My sources had to admit, however, that it still doesn't actually work very well. But, they say, it will soon.

The nice thing about the Apricot version (IBM should announce one very soon) of this network is the package — it includes a laser printer.

Laser printers are the only really convincing reason I know of for buying a network, so if the company gets the software right, it could make Apricot a bit of much-needed money.

Xen sales, by the way, appear not be affected by rumours of a new Xen in June. They are strong, with 1000 more ordered than delivered (2500 delivered) in early February.

So much has been written about Clive Sinclair's 'secret' portable, called the Pandora, that it's worth comparing it with what the rest of the world is doing — waiting for IBM's lap-held.

Sinclair's project is under rather less effective secrecy than IBM's. It uses the Z80, and should be both Spectrum and CP/M-compatible, but may not have disks. It will use existing flat-screen TV technology, with a magnifying glass, and it will cost under £500. And it will use plug-in Astron credit cards.

If it were up to me, I think I'd scrap it, but then I haven't spent years of my life dreaming about flat CRTs. Clive has.

At press time, everyone is waiting for IBM to announce the 'Clamshell' lap-held portable. I'm expecting it on 11 March.

It had been due before 1 February, because that was the date it had to be announced if it was to get the American Inland Revenue Service contract. American law says that no unannounced product can be considered for public contracts. The contract was due to expire on 1 February. As you probably noticed, there was no Clamshell.

Meanwhile, Toshiba made a lot of headlines with this portable as illustrated. It was supposed, said whispering experts, to be very similar to the 'Clamshell'.

What seems to have happened in the States with IBM is that the Government made a mess of its budget, and the Inland Revenue had to abandon (postpone) its decision on new hardware.

It was not entirely certain that IBM would get the contract, even then.

There is a small micro company on the West Coast, run by George Morrow, called Morrow Computer. It produced the Pivot, which it sold through Zenith. Zenith, a large Government supplier, offered the Zenith lap-held to the Government for the IRS.

But that, say my sources, is not the most likely winner: more likely to get the IRS contract would be Sperry.

Sperry builds the mainframes on which the States' taxes are calculated. It has the rights to the Pivot in the Morrow form, rather than the Zenith form. And it was looking pretty encouraging inside the Sperry camp, until news of the Congressional budget cuts came through.

There is also another contender — a lap-held from the Far East.

The one thing that is certain about all these imaginary machines, is that the Morrow/Zenith is the least compatible on keyboard terms; the Toshiba is the least portable; and the IBM is the largest.

People who have played with the IBM version say that the keyboard is wonderful. But, they add, it's a big box.

People who have been near the Toshiba say that the plasma display is great in cold weather. Don't use batteries when trying to run plasma displays (Toshiba agrees) — plug in the machine instead.

The Zenith 170/Pivot has a flip-down keyboard. It is too narrow to have IBM's combined numerical keypad and cursor keys over on the right, so some of the more usual keyboard keys double as numeric/cursor keys; or perhaps, one should say, they treble, because obviously they aren't numbers and cursors together.

This makes the operation of programs which read the keyboard direct almost murderously difficult to drive. And some keyboard functions just don't work, because the Home, End, Page-up and Page-down keys are missing.

Meanwhile, Quadram has updated its Datavue portable. This has always had a detachable keyboard; it now has an intelligent keyboard, with a mini-display, so you can take the keyboard away and pretend it's some kind of Tandy 100 lap-held.

Behind all this, with Amstrad selling CP/M machines for £300, and Husky selling CP/M-compatible portables for £800-plus, Clive Sinclair is trying to use his old flat-screen TVs in a souped-up Spectrum, due for launch by November (apparently).

I was marched out to Cambridge for an 'exclusive' look at the Pandora in prototype form. Some things about it had already been widely rumoured, but in particular, two things were, it was emphasised darkly, ultra-secret. I swore not to breathe a word.

Within a week of my return to London, fellow journalists were telling me all the details that I'd seen. In particular, they were also telling me the deadly secrets, saying that the new machine would use plug-in credit cards — the Astron design.

This looks like a credit card, but is actually a few RAM and ROM chips, and software pretends it's a floppy disk. You plug in WordStar, and CP/M pretends it's reading a disk — but it goes much faster. And it's a deadly secret which everyone knows and has printed stories about.

The other thing which was particularly secret was the price. I've seen pretty accurate printed estimates about that, too, but since I (foolishly) promised to keep it secret, I'll have to refrain from saying whether Clive plans it to be around £300, or around £500. One of those is about right, as Clive himself said, in public, when launching the Spectrum 128.

IBM in it for profit

Existing technology 'is not being properly made available by manufacturers, and most users are totally blind to what is really possible.'

The opinions are those, trenchantly expressed, of Martin Healy, a professor at Cardiff University. He was speaking at a conference run by Database Consultants Europe, and it was a welcome reminder of the fact that IBM's main aim in business is *not* the supply of the best possible machine, but the management of a profitable range of stock.

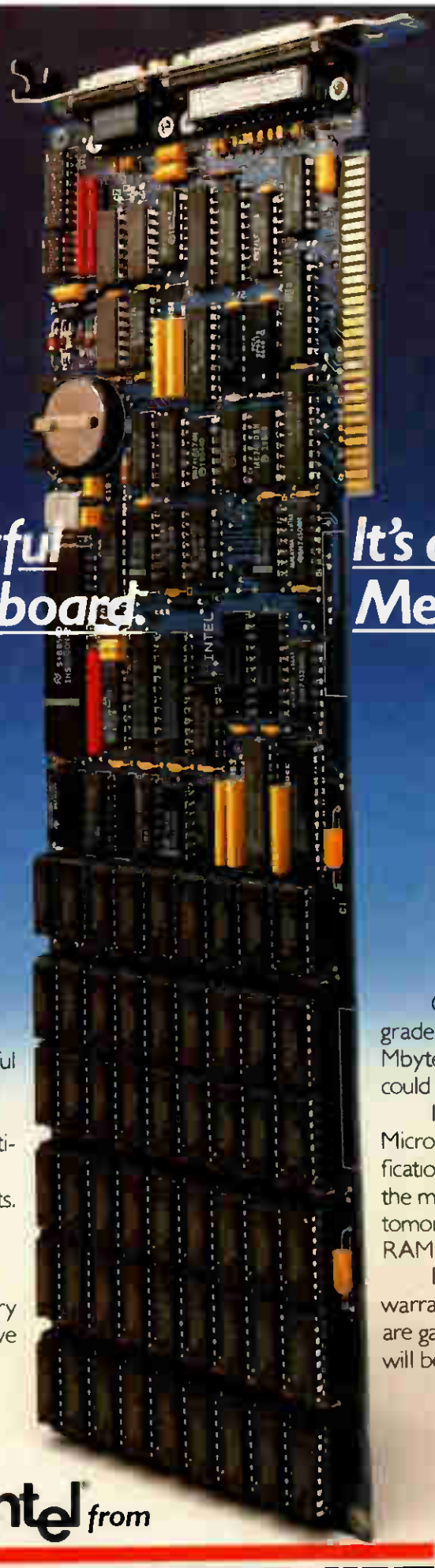
'As an example of a manufacturer's concealed self-interest,' says a report sent to me by Database Consultants (DCe), 'Healey cited IBM's latest local area networking announcement.'

'In his opinion, it was announced solely to protect IBM's own interests, and was actually against users' interests,' the report added. It quoted Healey again:

'If the IBM network had been a good one, instead of this effort that is already out of date, network users would have realised how much more they could do than if they bought a System 36.' System 36 is an office mini which sells well, only because IBM chose not to make the PC/AT more powerful.

'Users would also have discovered,' Healey went on, 'how easy it is to put only one or two IBM PCs on a network, and use cheaper and more powerful compatibles for the other nodes. Neither of those two possibilities was in IBM's interest: therefore they announced a LAN that was not of sufficient quality to allow users that freedom.'

Healey's opinions are expert: he designed the FTS micro and helped implement that group's networking policies.



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It's an Expanded Memory board.

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And the Six-Pak, with all its faithful clones, has been overtaken.

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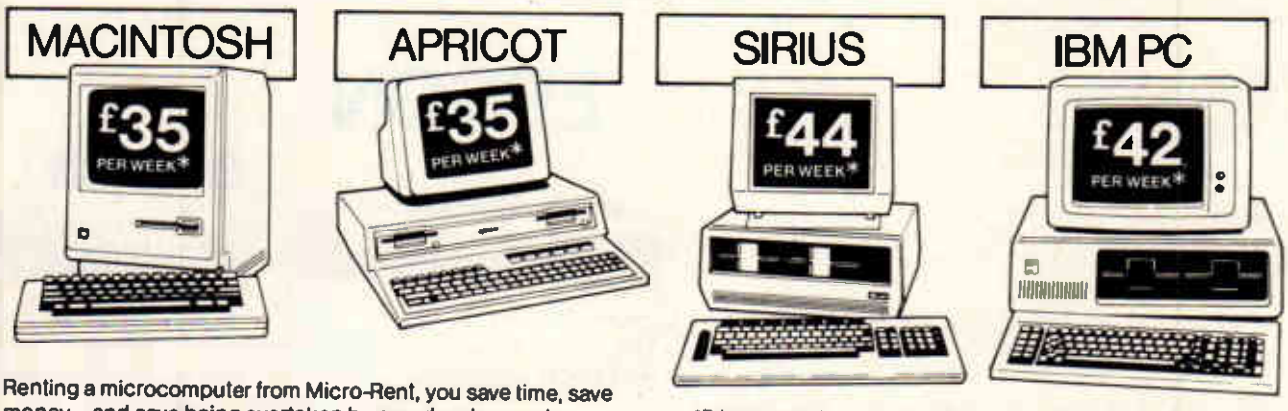

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Close to God

Had Ron Young of Systematics said, when he launched MacTime, that it was a religion and not a scheduling package, I'd probably have mentioned it before.

The program sounds dull enough: 'A software package to better help you manage and control your business and personal life.'

Ha! That's like describing Hitler as 'unpopular with later generations' or the Pacific as 'hard to cross in a small boat'.

MacTime is derived from something called Time Manager, which takes over your whole life.

It requires you to decide what you do with your world. You decide what are 'key areas' in your life, and schedule them according to rules learned on religious retreats — sorry, tutorials — run by Chris Lane, who runs Time Manager International.

If something comes up, your Time Manager can tell you not only whether you have time for it, but whether you ought to bother doing it. 'Is this one of your key areas in your life? No? Then don't do it.'

For some people, the idea of only doing what they planned would be unthinkable, and the system breaks down.

For others, where planning is essential if difficult schedules are to be sorted out, Time Manager is irreplaceable. An example recently quoted to me was of a just-separated couple, who had very strict child-care sharing arrangements, where they just had to make sure that appointments ended before it was too late to pick up the kids from the other partner. Time Manager can cope with that, wh re diaries just can't.

As to how MacTime works, you'll just have to ask Systematics, on (0787) 210252.

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BROADWAY
BROADWAY ENGRAVED

The pretty fonts shown above were produced on an ordinary BBC Micro with an ordinary Epson printer. They are an advertisement, really, for a memory upgrade for the standard Beeb; this comes from Permanent Memory Systems.

Using a PMS memory module, you can now add a £12.95 software package which produces these fonts with Wordwise. There's a special offer on the RAM modules, at £114.95 plus VAT. Details on (03552) 32796.

Also using expanded memory is Ibbotson's Design Software, which has taken the concept one step further and produced a publishing package, Imagin.A. As the sample below shows, this includes pictures, 'paint'-type abilities, and page layout. Cost depends on whether you have to buy mice, disks, and so on. Details on (077 389) 658.

The problem with wizards . . .

I have a sad story to relate about a Macintosh Hyperdrive — a 10Mbyte internal hard disk that has (I think) just been rendered obsolete by the announcement of the Mac Plus.

To explain the sadness, I have to talk about Wizardry (see review, 'Screenplay', page 168).

Imagine that you had spent five days locked in a dark, dangerous dungeon, trying to teach a bunch of raw enthusiasts the rudiments of survival.

Imagine that at the end of those five days, after numerous terrifying encounters with pickpockets, footpads, and other criminals, not to mention inexplicable appearances by some very strange people who showed all the signs of being . . . well, dead, but were still walking around attacking passing strangers . . .

Anyway, at the end of these days of training, you might imagine, these raw recruits were starting to show promise.

One of them was not just a superb fighter, but a specially talented swordsman, a Samurai. Another had proved herself to be a tireless warrior, virtually impossible to wear down and kill — and, more important, very quick to heal. Still another had developed a talent for psychologically daunting enemies. He believed, himself, that he used magic; and sometimes, the effects he produced really were hard to explain away. And there was that weird character who believed himself to be in touch with God, and used to go into a strange trance whenever danger threatened. He claimed he'd been praying for our survival, and since we didn't actually die, there wasn't any way of arguing with him.

Anyway, I was rather proud of this team, and I though I'd take them round to the editorial offices of *PCW*, and show them to my colleagues. Naturally, I decided to put them on a separate diskette.

The team, as you obviously realise quite soon in this fantasy, is a group of Dungeons and Dragons-type characters, which you develop in the Proving Grounds of the Mad Warlord.

The game was terribly popular a couple of years ago on the Apple II, but I never quite got into that version, possibly because of a disk fault. On the Macintosh, however, it is amazingly convincing, and an awful lot of fun.

Anyway, to save a particular character, there is a way of making a copy of the whole group, and then transferring one of them out.

You use the 'back-up characters' routine, and then the 'transfer characters' routine. I'm not stupid enough to try the experiment of 'transfer' without first making a back-up! In fact, I made three separate back-ups.

Transfer turned out (as I had suspected) to have a problem. The Mac asked for a particular disk to be inserted. That particular disk was already there. Until you inserted that disk, it wouldn't do anything.

On the Mac, taking a disk out is *not* voluntary unless you cheat and use a paper clip. Desperate, I used the paper clip, got the disk out, and put it back in again.

As far as the Mac was concerned, my tender caresses hadn't had any effect — nothing had happened. I had to turn off the power. And when I turned it on again, my special transferred characters had disappeared.

Fortunately, there were the back-ups. I told the machine to 'restore characters from back-up'. At once, all the remaining characters disappeared as well.

I examined the disk, and discovered several files called back-ups, all containing OK bytes. I

phoned Sir-Tech in the States.

'Do you know,' I asked in polite tones, 'of any problems with the Hyperdrive on the Mac?'

'Oh,' someone said, 'you mean the back-ups?'

I can think of several simple improvements to this game. For example, it should be easier to do stupid things without the system (otherwise known as the Dungeon Master) protecting you. If you cast an immense conflagration spell and there are no monsters about, the system shouldn't say (solemnly): 'You can only cast that spell in combat,' but should instead insist on blasting one of your own party — who would then need to be dragged back to the Temple for an expensive cure.

And the three-dimensional maze you wander through is a real mapping puzzle, but it would be better if it used the QuickDraw routines (you see them on the Mac when it opens up a window, with little blurry lines to simulate speed of movement) to show which way you are turning.

And although the manual insists that 'this is an Equal Opportunities Universe', I'm afraid it is painfully obvious that it isn't. For example, should you create a character called Hilda, and subsequently get her cursed to the point where there's nothing to do except retire her, you will be told: 'Hilda will spend the rest of his days in Flayhhrda!' And should Hilda get clobbered by an ogre who chops off his head, you will be told: 'An ogre hits Hilda for 18 damage, and kills him!'

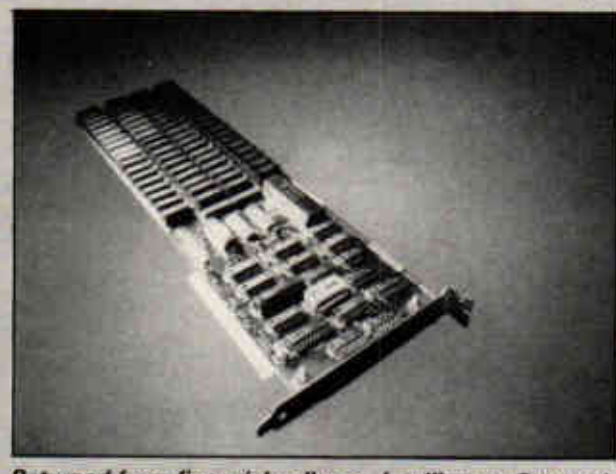
All the warriors you meet in the dungeon (with the exception of Stately Ladies) are male. There are Ninja fighters, who are described as 'Men in Kimonos'; there are armed fighters, called 'Men in Armour'; and there are magic users, described as 'Men in Robes'. It would be very simple for the computer to swap the words Men and Women on an equal opportunity basis. It would be very simple to say: 'Hilda can look forward to long years of content in sunny Flayhhrda,' or 'Hilda is hit by an ogre, for 18 points of damage, and is dead.'

Of course you could argue that a dungeon is *not* an Equal Opportunity Universe. Why not? It would more accurately reflect the real world, after all. But to pretend that it is, when it isn't, is pure hypocrisy.

However, I have had a whale of a time in this dungeon, and I look forward to new dungeons in which to take my incredibly tough characters.

But should you take my enthusiasm as a recommendation, then do take the warning with it: the back-up routine has a bug in it. Sir-Tech's executives say that they 'just don't know when the programmers will get it sorted: they haven't found out what's causing it yet.'

If you have a Hyperdrive, don't run Wizardry on it. Boot up on floppy disk.



Returned from financial collapse, Intelligence Research is now owned by ex-MP Tom Benyon, whose company Intelligence Technology Holdings bought it out of receivership. Intelligence has just launched a memory board which meets the Lotus/Intel Above Board specification. This is it; it can hold 2Mbytes, and four of the boards in one PC can give 8Mbytes. Details on (01) 740 5758.

Against expectation

A lot of people were expecting Olivetti's PC/AT lookalike to be a lot bigger and faster than the new M28, to be released during April.

Mostly, people expected this because Olivetti has a reputation for making super-fast imitations of IBM machines, and has already announced the 'special performance' SP version of the M24, which it said was a rival to the AT.

In fact, the M28 is faster than the IBM AT, but only by about 30 per cent (very much in line with the speed of Apricot's Xen), and even runs at the same 8MHz clock speed, rather than the 10-MHz which people guessed would be the case.

The real surprise will be the portable, the M22, which has already surfaced in the US. We hope to test this in a forthcoming issue of *PCW*, but the word so far suggests that it is very light, very expandable, and has a nice display. All these features are where most portables fall short. Perhaps this is the one?

The way in which the big M28 will be sold will be a surprise only to people who didn't read Newsprint on the subject of Xenix V, Microsoft's version of Unix on the 80286 chip (inside the M28 and the Xen) last year.

Word had reached me, back then, that despite Olivetti's close relationship with American phone giant AT&T, the AT&T 6300 Plus with Unix V was not regarded as the way to go.

The AT&T 6300, confusingly, is the Olivetti M24 in a slightly different box. The Plus doesn't have an equivalent.

Olivetti, however, wants a more powerful multi-user box than the 6300 Plus, and wants the Xenix, rather than Unix, version of the operating software, probably because it is more like MS-DOS.

The other new box is the ultra-small M19. This could be used as an 'affordable' (rather than cheap) PC-DOS machine with good graphics. However, Olivetti sees it as the way to give network users a compatible workstation.

The similarities with Apricot's announcement of NET II are obvious — the super-powered server box, and the low-cost terminals. Apricot, of course, has gone for much faster (and much cheaper) terminals, with the diskless Xen. Olivetti seems to be more interested in multi-user Xenix systems.

Both decisions are gambles with the future, and it will be fascinating for the rest of us to watch and see which works better.

The M28, by the way, has been subjected to internal Olivetti tests, still secret at press time, but which excited executives couldn't keep to themselves. Apparently, they show the M28 running faster than DEC's VAX 780 supermini.

On the Rampage

There are two ways of extending memory on the IBM family: Intel/Lotus's Above Board, and AST Research's Rampage.

Why should you consider Rampage rather than the original? To help you make up your mind, AST has started giving away a multi-tasking operating system, Desqview, with the boards.

Desqview is reported to be better than IBM's TopView in that it handles graphics rather better. It isn't Microsoft Windows, but it does take advantage of the extra features of the Rampage, rather than the (comparatively) limited features of the Above Board, says AST.

Details on (0274) 309930.

Where there's life . . .

The hopes for a bright future at Commodore which one or two people still cherished last month, dissipated somewhat with an announcement by the company boss, Marshall Smith, that in effect said: 'We are not going bankrupt — we have another month.'

I spoke at length with senior Commodore executives after that announcement, and morale was low, even among the incurable optimists and positive thinkers. We can expect, I'm told, an announcement by Commodore's bankers on 12 March.

With losses of around $180m for three quarters and $53m in the last quarter of 1985, the share price is understandably low, and there must be a real chance that someone will buy Commodore.

But no-one inside seriously believes that the Amiga will be sold off separately, because the Amiga part is no longer separate and has made no money.

Commodore didn't have a display booth at the Consumer Electronics Show in Las Vegas. The company's excuse for not attending Comdex (among others) was that CES was more important. I think it was right.

Still: where there's life . . .

Tall Trees' Preview

The IBM PC cannot read floppy disks used by its big brother, the PC/AT, because the big machine stores 1.2Mbytes where the old model stores 360k (a quarter of the capacity).

Pull out one of your old 360k floppies, however, and you have space for two Tall Trees Systems' drives. One is half-height 360k, the other is half-height 1.2Mbytes. They will read IBM PC/AT disks.

No, it isn't cheap. Details, for those who would like bigger floppy capacity, from the UK agent for Tall Trees — RCS Computer Services in North Feltham. Tel: (01) 844 2044.

Tall Trees is also giving away Flight Simulator with its high-resolution (monochrome) graphics board, Preview. You should buy this version of Flight Simulator: it lets you land just about anywhere, including the open sea, and has no objection to letting you belt off across Central America on the ground, driving straight through Seattle at 200 knots. And the mountains are made of a thin piece of cardboard! (It's awful!) But you can pretend you're flying . . .

Advance problems

Hard disk problems reported in a recent issue of *PCW* involving the Ferranti Advance 86b have prompted an offer by Microbe Computer Systems of special fixes for the Advance.

On a portable Epson PX-8, all you have for saving programs and data is this little minitape drive. It works, but tapes are tiny, so Olympus has evolved a 90-minute tape. It costs £7 plus vat from dealers.

The problem involves incompatibility between the Advance's internal software and IBM-standard hard disks. According to the Microbe people, the usual symptom is that the machine won't recognise the drive.

That may sound rough, but apparently it gets worse if the machine *does* recognise it: in that case, there can be serious read/write errors, and data on the disk can be lost.

Microbe reckons to have disks of 10, 20 and 40Mbyte capacity, specially for the Advance, and designed to work with Ferranti ROMs, BIOS versions FX 4, 5 and 6. You fit the upgrade yourself, and don't have to lose either floppy disk.

Details on (0468) 62333.

What's in a name?

'One computer system being given away free, does not,' as Nigel Grant says, 'make much of a dent in the figure of 75 pupils per computer.'

That's the statistic in UK schools, the 'most computer literate in the world,' as our politicians keep saying.

Grant's way of handing over the machine is a competition, generating publicity for his cheap PC clone and software business. I don't care: if everyone could think up a cute company name like his, I'd use any excuse to write about it.

The competition, simply enough, is to dream up a name for his £499 PC clone. With the machine as first prize, the winning school will get a hard disk, memory, a tape streamer, colour and a serial card, plus software, bringing the whole package up to a retail value of £10,000.

Grant's company, for those who just can't bear the suspense any longer, is Ctrl.Alt. Deli. He's contactable on (0908) 662759.

If you've got it, advertise it!

I hope Olivetti is charging advertising rates for the stuff it's giving away with its 'blank diskettes' these days.

The company has hit upon the idea of selling its own diskettes, with commercial advertising for software. On the box of 10 disks you buy with the Olivetti label, you get a non-functional WordStar 2000, Datease, Multimate, SuperCalc 3, Multiplan, Easy, Gem, Superproject, PPS, and Word.

Of course, the diskettes are formatted, too. And apparently they cost 'no more than ordinary blank disks'.

Euphemisms I have loved

Victor, I read in my press handout, is 'poised to storm the Micro Market'. And Microsoft Windows, I note in another release, is 'set to become a standard'. In other words, in case I wasn't aware of it before I read this handout, they've got a long way to go before they succeed.

Similarly, I have received several press releases in the past few weeks from companies with a 'strong inventory position'. In other words, they can't sell a thing, and stocks are building up.

You might particularly like Apricot's descriptions of some of its micros as 'award-winning'; a nice way of admitting that they've won more awards than sales.

Again, one has to acknowledge the artistry of Commodore's reference to its 'strong credit line' — meaning that it owes the banks one hell of a lot.

Systematics, publisher of one of my favourite brands of accounting software, recently reported that it had outsold 'most' brands of accounting software; which, interpreted, means that it hasn't outsold Pegasus.

Apple has told the world of its failure to get Northern Telecom as an OEM customer, by describing the relationship as a 'strategic alliance'. This means something like: we didn't get it right, but they're telling us what we did wrong, and perhaps one day there will be a deal after all.

And how many hopefuls before Micro Box have attempted (but failed) to conceal their awareness of how little hope they had, by announcing that their new product 'is not targetted at the mass market.' So much more artistic than 'we'll only sell a few of these to loony enthusiasts.'

Compaq, of course, is just the most recent of many to announce 'a reduction of £1500' in the price of a £9500 system now costing £8000 — something which would still be available for under £5000 from anyone else.

Recently, I had the pleasure of hearing something quite different. I was speaking to an advertising agency, which had not been paid for six months, and which rung me to warn me that its computer-builder client was obviously going bust.

After talking to someone at the computer-builder company, I spoke to the ad man again. 'I spoke to X,' I told him, 'and he says the cheque is already made out.'

'Ha! You spoke to X, did you? That rat!' said my ad man. 'Did you ask him if it was signed?'

As it turned out, when I phoned back, X told me that it wasn't. But what I liked was not the subtle misdirection (euphemism?) of X, but the candour of the ad man. 'That rat!' — if only more people were so clear, so accurate, so direct!

On second thoughts, though, as a journalist, I think I'll continue to collect misdirections. At least I can print those. END

YANKEE DOODLES

There are changes afoot at Atari, plus exciting news of build-it-yourself robots. David Ahl has the gossip.

Atari back in gear

Atari recently announced that it will sell its 520ST personal computer through mass market outlets. Specialty computer shops, which had been the company's channel for the product, will get a new model, the 1040ST with 1Mbyte of memory. Concurrent with this move, Atari has added an RF modulator to the 520ST and dropped the price by $100 to $399 for an unbundled CPU. A system with a 3.5in disk drive, a mouse, and a black and white monitor will sell for $699 while a system with a colour monitor is priced at $899. All systems include Basic, Logo, a graphics package, and a word processing package.

The new 1040ST will be the same price as the original 520ST — that is, $1200 for a complete system with a high-resolution colour monitor. Meanwhile, the 130ST has been quietly dropped along with the 800XL series.

On the other hand, the 65XE and 130XE are available in new, bundled packages. Complete with mouse, printer, disk drive, and five software titles, the 65XE sells for $300 and the 130XE for $400.

Surprisingly, Atari announced that the company had sold over one million video game systems in 1985 and that it would dust off its year-old plans to introduce the 7800 high-end game system (an 800 computer in a different box); price $80. Also, a new compact version of the 2600 video game system has been introduced. Atari reasons that with a retail price of $39 to $49 for the new unit, the 2600 still has several good years of life.

Meanwhile INTV Corp, which purchased the manufacturing and distribution rights to Mattel Electronics' Intellivision in 1984, is continuing to invest in the video games market. At CES the firm showed its System III unit, which features enhanced graphics and an LED on/off indicator, as well as three new games: Baseball, Karate Chap and Thunder Castle (a survival game).

Robot link-up

Multibotics has announced an interface which connects a Commodore 64 computer to Capsela, a popular line of build-it-yourself motorised toys. The Capsela toy kits consist of 2in transparent spheres, each one containing a different working part such as a motor, differential gear, transmission, right angle drive, and so on. While the models built with Capsela sets are interesting, there is no way to control them except by simply turning them off and on.

The Multibotics interface adds a new dimension of fun and challenge to a Capsela set by providing an input sensor (infra-red photo cell, audio responder, and so on) and output control signals to vary the speed and reverse the direction of up to three motors.

I built a robot crawler that executes a random walk on a large piece of white paper but will not go off the edge (sensed by the infra-red scanner). Joystick control lets me vary its speed, direction, and the 'randomness' of its walk. Multibotics kits are priced from $60 to $200 depending upon the number and type of sensors.

Meanwhile Computer Magic, which had announced an interface to three Tomy robots last June, is finally delivering the product. The interface works with the Verbot, Omnibot, and Omnibot 2000 robots and a Commodore 64. The software lets you control all the motions and sounds of the robot. It also saves batteries since it provides power from the computer to the robot.

Japan's Kahomusen Company has developed prototype computer interfaces for three of its Movit robot kits — Circular, Mr Bootsman, and Memocon Crawler. No decision has been made at the time of writing as to whether these will be marketed.

Lights! Camera! Activision!

One of the most fascinating new software products I've seen lately is the not-quite-finished Director program from Activision. An extensive set of pull-down menus (similar to those in Garry Kitchen's GameMaker package) lets you take various figures (people, vehicles, animals) and combine them in animated sequences against varied scenic backgrounds, thus making your own movie. The beauty of the package is that you don't have to design your own figures — they're already built-in and they know how to walk, run, jump, dance, and even fly.

Director will be the fifth package in Activision's line of creativity software. Another dynamite package in this series is The Music Studio (for the C64, the Atari 800 and ST, the Amiga, and the PCjr). This package, complete with a MIDI interface, will appeal to both amateur and professional musicians. Pull-down windows for composition and editing coupled with complete music notation make it easy to use and understand; also, its colourful 'Paintbox Mode' is an ideal short-cut for fast, easy composition.

The other packages in the creativity series include GameMaker (an integrated set of five design tools for making your own games), The Designer's Pencil (a graphics and animation design tool) and The Complete Computer Fireworks Celebration Kit (which makes electronic greeting cards).

Along a similar line as Director is PSI–5 Trading Company from Accolade. This package, designed by Mike Lorenzen, features detailed graphic depictions of 30 different characters who interact with the player through conversational text to produce a science-fiction 'mini-drama' whose plot and outcome is contingent on the player's relationship with the crew. PSI–5 Trading Company is available for the C64 and the Apple.

Random bits

Sharp has introduced the PC–7000, a transportable IBM PC clone with dual 5¼in drives, 320k of RAM, a 25 × 80 back-lit LCD screen, plus serial and parallel ports for $1795 . . . Another new transportable is the Colby PC–5, an advanced machine compatible with the IBM XT. It has an electroluminescent display, a 20Mbyte hard disk, a 1200 baud modem, a 3½in disk drive and 256k of memory for a mere $2995 . . . Meanwhile IBM is going off in a different direction with a reduced instruction set computer (RISC) which uses a 32-bit proprietary MPU called the 801. The machine has three ports, 1Mbyte of RAM, a 5¼in floppy disk drive, and a 30Mbyte hard disk. An entry level configuration will cost around $6000 . . . Berkeley Softworks has created a rather interesting graphic environment operating system, GEOS, for the C64 which has a menu/icon/windowing interface similar to the Mac, multi-tasking capabilities and a disk transfer speed-up routine. It comes with a word processing and painting/charting program for only $59 complete . . . Another nifty package for the C64 (and IBM PC or CP/M computer) is PrintMaster, a package similar to Broderbund's Print Shop, but with a few more goodies built-in. It lets you make signs, stationery, calendars, greetings cards and banners. From Unison World . . . If you own The Print Shop, a nice add-on is Graphics Expander for $39 from Springboard Software. END

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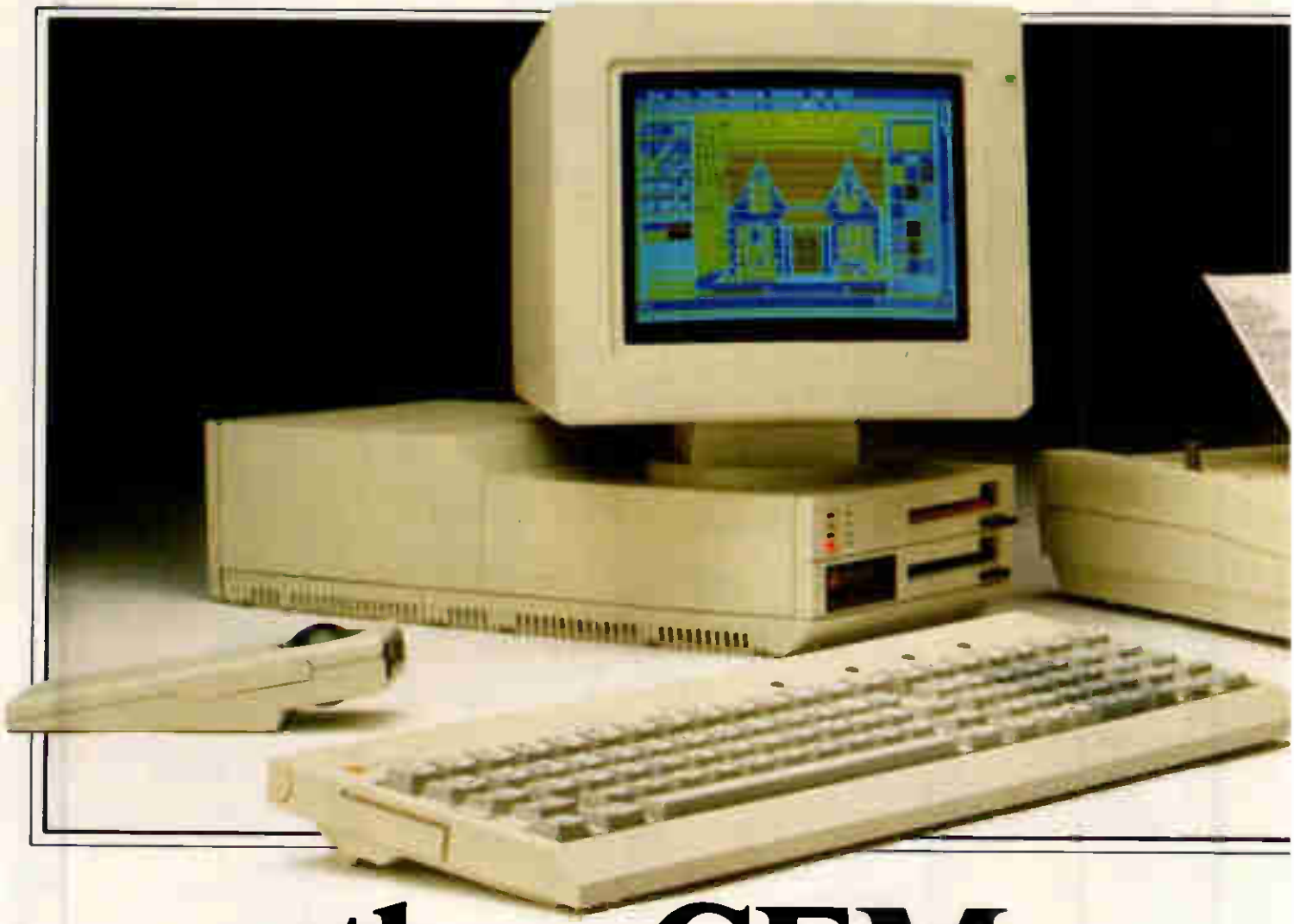

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LETTERS

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Starting something

I see that *PCW* has published two pages of one person's political outlook on the world under the thin guise of a treatise on the responsibilities of the computer industry ('The computer strikes back', February). The problem with this approach is that there are going to be replies from people who disagree with the facts as stated because: (a) they see the facts as erroneous in some respects and in need of correction; or (b) they disagree with the political standpoint of the author and are about to use precisely the same facts to disprove the argument.

I hope that I belong to the first category.

Communications are *already* a vitally important part of the defence environment. The Joint Tactical Information and Distribution System (JTIDS) is already in existence. It allows ships, aircraft and troops to share and contribute to the information gathered by various sensors. For example, an aircraft usually has only the information, gathered by its radar, available to it regarding the disposition of targets. As a rough rule, it only knows what is going on ahead of it, as that is the area being swept by the radar. JTIDS means that this radar information is available on the displays of other aircraft in the vicinity, and that their information is available on the subject's display. Typically, a pilot/navigator on a suitably-equipped fighter will be aware of targets in front and behind, which targets are at present unchallenged by defence forces and which targets are being actively engaged. Naturally, specially-built aircraft like AWACS are likely to be the biggest information providers to the network. The displays are not 'raw' data directly from the radar, but 'synthetic', having been processed by the radar's built-in computer to provide a symbolic representation of the threats.

There are many examples of computer-controlled communications networks which are not open to the likes of Mike Scialom and myself (even with 1200-baud modems) because we are irrelevant to their operation. Just because the names are not published each month in 'Networks' does not mean that the world at large is backward in the communications field. Arpanet has been up and running for a long time in the US, and has been held up as a good example of a communications net between US universities and other institutions, but the name is derived from the US Defense Advanced Research Projects Agency. There are Arpanet access points in the UK. There is also 'Wimex' (properly WWMCCS, the Worldwide Military Command and Control System). These and others are all communications networks which are up and running and in everyday use. The whole field of data collection, analysis and dissemination is known as Command, Control, Communications and Intelligence, or C^3I. The airborne control and command centres are C–135s (Boeing 707s with lots of bolt-on goodies) known rather aptly as 'Silk Purse'. As they come into their own when the missiles are flying and the ground is no longer a safe place to be, no doubt they are indeed trying to make silk purses out of a lot of pigs' ears.

Paul Hardy, Bingley, West Yorkshire

Mounting horror

I read with mounting horror Mike Scialom's piece on the Strategic Defence Initiative in the February issue of *PCW* ('The computer strikes back'). Beginning with the pointed observation that Star Wars has 'stimulated little public debate within the scientific or computing fraternities', and the even more pointed thesis that 'Star Wars is showing the West to be bankrupt — of morality and true vision', the article manages to conclude that SDI represents a 'chance in a million' that 'the scientific — and especially the computing — establishment' will ignore at its peril.

Two assumptions seem to guide his argument. On the one hand, that the objective of the Star Wars programme is exhausted by Reagan's vision of a nuclear-free and totally defensive security strategy. On the other, that speaking (I presume) as a member of the computing fraternity, Mike Scialom thinks that the whole issue can be approached solely from the point of view of the benefits that will occur to it — at least, that is, to its American division.

It is patently *not* the case that Star Wars will be developed at the expense of the offensive American nuclear arsenal — let alone that of the West; the UK and France in particular have shown no signs of winding down their offensive nuclear weapons programmes.

The basic problem with Star Wars is that it will not be a perfectly functioning system, a hypothesis that Mike himself considers possible. The '100 per cent accuracy' which will be required if the thing is to work, is truly a 'pipedream'. If the (relatively speaking) simplistic systems and software which we work with today can never be fully debugged, how many more unwitting errors will, for example, the hypothesised 10 million lines of code required for Star Wars contain?

Clearly, some of the bugs will cause no more than hiccoughs; but what about the others? My own imagination boggles.

More importantly, the politicians and military personnel who now constitute the moving force behind Star Wars are well aware of the fact, and a less ambitious defence is envisioned which will not do away with offensive weaponry.

And what about the Soviets? There is no indication in the article that Mike is aware of their antagonism to Star Wars, let alone informed as to the reasons why. Simply put, the Soviets see Star Wars as yet the most ambitious attempt yet by the Americans to re-establish global strategic superiority and, ultimately, economic and political hegemony.

Herein lies the cause of the chorus of 'No!'s which Mike finds so astonishing. Once the mind goes beyond the particular jobs which the high-tech industry will reap from the financial bonanza of Star Wars, it simultaneously revolts at the concept.

Let me thank Mike for opening the debate in *PCW*. I am sorry that I cannot agree more with his prospectus. Assuredly, let us make research money available to the scientific and computing establishments; definitely, let the politicians provide challenges for all involved so that 'scientists of real stature and merit — perhaps genius' *can* come forward; finally, let us make sure that our educational institutions are up to the challenges. But rather than centring all this on the development of military technology in the hope that civilian spin-offs will result, why not focus on the problems that are of direct concern to society worldwide. Lord knows, we have enough of them.

Randy Banks, Senior Research Officer, ESPC Data Archive, University of Essex

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LETTERS

The author strikes back

In his article 'The computer strikes back' (*PCW*, February), Mike Scialom raises the very important subject of the Stars Wars programme, but he seems to be unaware of the dangers inherent in this programme.

The two main arguments raised in the article in support of Star Wars are that it will lead to important advances in computer technology which will benefit mankind in general while offering, however small, a chance to eliminate the nuclear threat that hangs over the world. I would agree that the project will lead to many technological advances, but these will be more costly in relation to their benefits to the civilian economy than direct investment in civilian technology (including computers).

Most important, though, is the fact that Star Wars will be a destabilising programme: that is, it will increase, not decrease, the threat of nuclear war. This is because it is an attempt to create a large-scale anti-ballistic missile (ABM) system, banned under the 1972 ABM treaty. The creation of a large-scale ABM system would give the nation that possessed it the ability to use, or threaten to use, nuclear weapons without itself being threatened by a retaliatory strike. Therefore, the only possible Soviet response to the programme, if it is implemented, is to develop weapons to penetrate the Star Wars shield and quite possibly develop a similar ABM system as well, so as to ensure its own (and its allies') security. It should be noted that the Star Wars programme is not non-nuclear, as often claimed, but in fact includes the development of nuclear-powered laser, the X-ray laser. Nor is it entirely defensive: weapons to be developed in the programme heve capabilities to hit orbiting satellites, and possibly ground-based targets as well.

The way to eliminate the nuclear threat and also help accelerate technical progress to the benefit of mankind is by political measures. The recent Soviet offer made by Mr Gorbachev, to eliminate all nuclear weapons by the year 2000, offers an excellent framework for a future without nuclear weapons. This will also allow the funds at present wasted on weapons to be better spent on peaceful developments to the benefit of all humanity.

DL Clarke, North Shields, Tyne & Wear

Printer hint

The popular Mini-Office package will not support NLQ on many printers because it re-sets the printer to the initial state obtained at switching on. It does this at the start of a print routine by sending an 'Initialise' command, which cancels all margin and NLQ settings obtained from the control panel of printers such as the Seikosha SP–1000.

By quickly switching the printer off and on again, immediately after beginning printing, the NLQ mode can be set. Starting a letter with a line of spaces allows ample time for this operation before the letter heading is reached.

MJ Banks, Northampton

Time warps

As George Sutherland revealed in 'Letters', *PCW* February, the Japanese unit of time is different to that commonly used in Purley. The reason for this is quite straightforward — continental drift (or plate centronics, as it is called by printer manual writers).

Japan's position on the west side of the Pacific means that it suffers from an extreme rate of drift of a somewhat unpredictable nature. To keep pace with this, the East Perceived Second of Nippon was devised. This is the same as the internationally recognised Purley unit except in November, when a correction term is added to compensate for the year's westward drift through the world's time zones. November was chosen so as to boost the Christmas watch sales, which explains the Japanese domination of the market.

The wily Japanese have, of course, taken full advantage of their nation's peculiar motions. In war, a fatal error of navigation led the Russian fleet to disaster in the Russo-Japanese war at the turn of the century, and the fall of Singapore has been attributed to the speed of the Japanese advance. In peace, all measures of speed and productivity are made in November, so giving a totally false picture (witness the 45mph 'bullet train').

The Japanese 'miracle', however, is coming to an end. Western leaders increasingly talk of Japan 'catching up with' the US (although few realise they are talking of time zones). Trade agreements usually require the unit of time to be prominently displayed on the product; worst of all, Japan is expected to collide with its communist neighbours in the year 2001. It is doubtful if China and the Soviet Union would survive the impact.

Matt Webster, Preston

A company that cares

I have just read the February issue of *PCW* and saw a number of letters complaining about lack of dealer support. This letter is different in that it is a letter of praise.

I am the proud owner of a Tatung Einstein, and I am very pleased with it and would not swap it for any other computer that I have had the 'pleasure' to use. I have added an 80-column card and a Canon PW 1080A printer, and both are happy and doing well.

My only problem has been lack of detailed information on the delights of ROM routines such as Circle, Draw, Fill, Poly, and so on. All these functions are built into the ROM and are available to the user in assembly language programming. I wrote to Tatung asking for information, and within a week received a list of ROM calls for almost everything I could think of. I say 'almost', because last week I wrote to Tatung again for more information and again received it within a week.

Tatung helped to set up a user magazine for Einstein users, and now I receive regular updates on what hardware and software is available.

There are some manufacturers which care about their users. I would like to say thank you to Tatung for its help and support.

S Price, Cambridge

Blank disks

Like Mr Sharland ('Letters', *PCW* February), I too bought a PCW 8256 based upon your Benchtest of October 1985. However, unlike Mr Sharland, I have had no problem in acquiring blank disks, except when trying to get them from Dixons. My experience of Dixons is that it tends to give out 'duff gen', and also fails to stock consumable items in sufficient quantities. My advice would be to go to Comet, John Menzies, WH Smith or Boots for disks.

I do agree with Mr Sharland on one point – that Amstrad should include at least two blank disks with the package, but I disagree that the machine should be referred to as an 'electronic typewriter'. My job is to repair 'professional' word processors (among other things) and I can honestly say that the features of the PCW 8256 are either on a par with or out-class these machines (costing several times the price) and also certain software packages (at least the 8256 shows the end of the page).

Mr Sharland should also note that if his LocoScript is version 1.0, this contains some bugs which have been ironed out in version 1.2. He should, once he's copied his master, return the master to Amsoft for a replacement; the company will also provide him with an updated version of CP/M (version 1.4).

My only complaints about the PCW 8256 are that the Basic does not contain any graphics commands (can someone please help me on this by providing a routine for Draw, Plot, and so on?) and there is no mention within the manuals of the way in which the memory is mapped, or the outputs of the expansion connector.

How right Mr Sutherland's friend is about printer speeds ('Letters', *PCW* February). I'm sure the quoted speeds of most printers are calculated *when not actually printing!* That is to say, the quoted speed does not include such things as the time taken to line feed, and so on, and as such assumes an infinitely wide paper.

D Oxley, Penicuik, Midlothian

END

Illustration by Eddie Gornall

BANKS' STATEMENT

Happy birthday

Martin Banks is in a contemplative mood as he looks back over the past 100 issues, and predicts what the future holds . . .

One hundred issues; it doesn't sound many, does it? – yet it is something over eight years since this august organ began charting the course of the micro industry. And during that time, what has it seen?

Well, sad to say, one thing *PCW* has observed is the demise of fun. It had to happen, of course. There was no way that the personal computer business could ever keep up its lunatic excesses of the early days of people such as Spangles Cary, Kerr Borland, Kit Spencer, Martin Underwood and Robin Woods.

They were fun people in fun times; the whole PC business was built on the lunacy of its complete improbability. It was such an unlikely thing to happen, even for those who could predict its occurrence from technology trends. But the happening created a major industry and a major force in business, commerce, science, technology and, by no means least, the home.

In so doing, of course, things had to change. The fun has slowly gone out of the personal computer business, to be replaced by the smart suits and elegant accents of the professionals. They have come from industries such as canned drinks — but, somehow, a canned drink doesn't have any soul. As some have found, a personal computer can't be sold in the same way.

All this has been observed, reported and commented upon within *PCW*'s pages during its 100 issues. But what of the future? What breakthroughs will occur to fill these pages during the next 100 appearances?

One thing that seems certain, there will be no fun. PC users seem to be dividing into two distinct camps: serious business; and the rest. Unfortunately for the fun lovers, it's going to be the serious business users that hold sway for some time to come.

The reason? Well, the market which manufacturers have been chasing for so long, the big corporate users, is now taking off. That in itself would be interesting enough for the average computer maker but there is more, for this development is occurring when the 'traditional' PC business market is declining. The industry has used up the individuals who have wanted to buy a personal computer.

What is more, unlike a canned drink, a personal computer isn't consumed that quickly. There are still people happily achieving what they want to achieve on Commodore Pets, North Star Horizons and, most of all, Apple IIs.

Users may like the idea of a new machine but they are unlikely to buy one, especially just when they've got the software running right.

Among the things that *PCW* is likely to see over the coming 100 issues, therefore, is a trend towards bigger overall systems that are generally more expensive. This will occur because the corporate market has bigger requirements than the individual user, and wants its systems to work. This means they have to be well engineered and reliable, and that costs money.

We are also likely to see a fundamental shift of emphasis away from PC hardware onto communications hardware and software as the centre of everything that is considered *sexy* in computer technology.

The box on the end of the line will become far less important to the corporate user than the line itself. A good, working network of Pets will be much better than any number of poorly connected ATs. Network systems, multi-user systems and their relevant operating software will be more significant than any standalone machine (especially if it won't interface to any standard network).

The boxes themselves are going to become more powerful in general, though there will be the opportunity for lower power, dedicated task machines. It would seem that the general trend towards more power is one of the inevitabilities of technology. More powerful chips are being produced, and because of the economics of semiconductor production, they end up costing the same as earlier, less powerful devices. The result is that the end user gets them in a box whether they are needed or not.

The corporate market is likely to need them, however; these are *big* users in more ways than one, and will consume as much memory and processing power as is available.

Two areas are going to become particularly important over the coming few years. One is operating systems generally. MS-DOS is coming to the limits of its usefulness in its currently available forms and, unless factors such as the 640k limit are removed or modified, it will be found too restrictive for many corporate users.

MS-DOS is also not well suited to the world of larger, intercommunicating systems where the complexities of mixing file and record locking systems with accurate control of transaction processing between multiple processors and physical file systems, require considerable operating system power.

There could, therefore, at last be the emergence of Unix as a major operating system, as well as networking software systems such as Novell's NetWare, which lots of companies already swear by.

The other area where corporate users will consume power below the line is in operator front-end systems. Here, users will find they need to know nothing about the computer or the applications program. All they have to do is follow the onscreen instructions and enter the required data as the system demands. This will be of much more use than all the icon-oriented graphics front-ends put together to the corporate systems manager.

And in the home market? Who knows what might happen there. Companies such as Sinclair, Acorn and Commodore have all fallen foul of trying to sell computers as consumer items. As with the business market, they have used up the customers. The games machine business will tick over gently but the next development will probably be in smart *things* such as ... well, anything you can think of, really. If they make money out of computerised pets this year, then anything is possible. END


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100
99
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97
200

tial users of this package a similar integrated package running on a Macintosh or even an IBM PC – they would never touch Qoffice again. To my micro-orientated outlook, it really is that bad!

I had my doubts whether to include the Telephone Manager in 'Applications software' — it's so integral that it could be considered as part of the system. Until a UK-approved modem is installed, there is nothing you can do with it apart from look at it. However, the telephone functions distinguish the machine from the competition, and in all respects it looks like a bundled application.

The telephone functions are accessed by opening the Telephone item from the Office menu. This leads you into a list of names and numbers from which you can dial people and online computers. Functions available from here include: timing a call; automatic redialling; single-key dialling; and putting a call on hold.

In addition to these 'standard' telephone functions, there are others that go beyond what you would normally expect and which make the machine potentially very useful for anyone who frequently uses the telephone. The Unix PC automatically maintains a log of all incoming and outgoing calls, complete with duration and phone numbers. A second window can be opened, into which you can copy any text that's coming in from an online system, and an optional Electronic Mail option allows you to control electronic mail from this window.

One of the biggest advantages of the Unix PC as far as applications software is concerned is that any software you purchase for it will be compatible with any of the larger machines in the Olivetti AT&T Unix range.

Possibly because the Unix PC could be considered a rival for present or forthcoming Olivetti machines, it is being treated very much as an entry point for larger systems. The base model, with 512k and a 10Mbyte disk, will not be available in the UK as it is considered to run too close to Olivetti's present business machines.

Documentation

Users used to joke about the manuals for the IBM 370 mainframe outweighing the machine itself. With the Unix PC it's no joke — a complete set consists of eight hefty manuals. Combine this with the three manuals which accompany the Qoffice application, and you have a pile of documentation which easily outweighs the machine.

To be fair, you only initially receive three manuals: the *Telecommunications Guide*, the *Unix Guide* and the machine's own *Guide*. Also included is a thin *Introductory Guide* which I used extensively throughout this Benchtest. If you were to seriously consider programming the Unix PC, you would need at least the further five *Programmer's Guides* — possibly more.

On the whole the documentation is very thorough but more than a little staid in style, and is certainly not suitable for inexperienced users.

Prices

The Olivetti-AT&T Unix PC with 1Mbyte of RAM and a 20Mbyte hard disk costs £5495, which makes it a competitive entry into the small multi-user business micro field. There are many peripherals available at the time of writing, including tape streamers, expansion boxes and external hard disks. Olivetti is treating the machine very much as an entry point for an entire range of Unix machines, all the way up to a £100,000 64-user mini.

Conclusion

Olivetti will probably be annoyed that I've referred to the machine as the Unix PC throughout this review and not, as the company prefers, the 3B1, but to my mind the whole essence of the machine is that it is a true desk-top PC which runs Unix.

My views of Unix have changed during the course of this review. Originally I thought that it was the best thing since sliced bread in all respects; now I think it has the potential, but that awful user interface must be concealed from the user. AT&T has tried to do this with the Office windowing system, but the company hasn't gone far enough in making it a true, easy-to-use desk-top PC.

Technically, I was impressed with the Unix PC's hardware. It uses a beefed-up version of my favourite processor, the 68010; it operates a virtual memory system; and is generally well designed and put together. As a communications tool it has a lot to offer, with two phone lines, an internal modem and some well produced telecommunications.

But, overall, I was left with a feeling of disappointment. The Unix PC doesn't quite attain the level I expected after reading the specification. If you are a dedicated Unix user who occasionally requires a less knowledgeable user to use the system, it may be suitable, or if a larger Unix system is already installed, it may be just the machine for, say, a reasonably-sized office. If you require a small office machine, however, I would strongly recommend a close look at the more traditional IBM machines, or, if Unix is important, the Torch Triple X.

No Benchmarks are available for the Unix PC due to the system's lack of Basic.

PCW wishes to thank Buttell Computers ((01) 993 1433) for the loan of the Unix PC. END

Technical specifications

Processor:	Motorola 68010 running at 10MHz
ROM:	16k containing bootstrap loader
RAM:	1Mbyte expandable to 2Mbytes internally, or 4Mbytes in total
Keyboard:	Detachable 103-key full-stroke
Display:	12in green-on-black display; 720 by 348 pixels resolution
Size:	470mm × 470mm × 470mm including monitor
I/O:	RS232C, Centronics, three modular telecom jacks (two incoming, one outgoing)

In perspective

The market for Unix computers at a desk-top price has only just begun. The most obvious of the Unix PC's current competitors is the Torch Triple X, which offers everything the Unix PC does but at almost £2000 less. Despite this, the Unix PC is likely to attract more support than the Triple X, purely due to the former having the combined might of the telecom giant AT&T in the US and Olivetti in Europe behind it.

Technically, the Unix PC is way ahead of IBM's small multi-user system, the PC/AT. However, for a business buying its first multi-user machine, I have to recommend it takes a look at the vast range of applications software available for the PC/AT, or at one of its better clones.

There are many other multi-user systems from various companies such as ICL and North Star. These usually run Concurrent DOS and Concurrent CP/M, which have rather more applications available, but little is being done to develop new applications for these systems.

Multi-user networking in style

The new Minstrel 4

The designers of Minstrel 4 were given a simple brief: produce a world-beating, cost-effective and practical multi-user system.

And do it with style.

Minstrel power – 80186 master and HTS 186 dual processor slaves

They passed the latter test with flying colours. But looks aren't everything. Inside this beautifully engineered chassis, you'll find a close coupled TurboDOS† network that holds the key to all your multi-user computer projects.

Now, and for the future.

Minstrel 4 is a multiprocessor machine – every user of the system gets a DEDICATED CPU and 512 Kb RAM. This virtually eliminates the response time degradation you often find on timeshare minicomputers and so-called supermicros.

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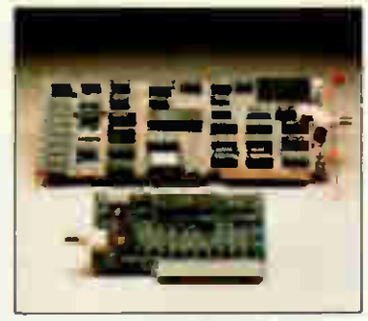
Minstrel workstations – come complete with function keys and business graphics potential

Minstrel 4 has unprecedented networking capability. The Winchester controller has built in ARCnet. You can network IBM PCs, ATs, Apricots, Olivettis and all lookalikes if required. Gateways to IBM and ICL mainframes are available. Most important, you can network Minstrel 4s together – 255 of them to be precise.

Minstrel 4 supports CP/M, MP/M, MS DOS (including version 3.1 with file and record locking) and has PC DOS emulation, so you can run nearly all the popular business packages.



You can even network stand-alones into the Minstrel System, using Minstrel ARC net cards

Storage capacity is only limited by your budget. A single Minstrel 4 holds up to 160 MBytes formatted disk capacity, with onboard streaming back-up of up to 60 MBytes. Direct memory access means you can download 20 MBytes onto tape in less than 4 minutes. Higher capacity drives can be supplied.

A two user Minstrel 4 system, complete with tape back-up and terminals will cost you less than £7,000. Additional workstations, just over £1,000 per user, a price/performance package you'll find unbeatable.

At last there is a serious alternative to the minicomputer, with the sort of costs and flexibility you'd associate with a micro. It's called Minstrel 4, and you should find out more about it. Write or call us for details.

Minstrel design – fast tape back-up for safety and convenience

With Minstrel, expansion is integral, not an afterthought

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BENCHTEST

Compaq Portable II

Despite the uncertainty of the IBM PC/AT market, Compaq has decided to launch a cut-down version of the PC/AT in the shape of the Portable II. Smaller and lighter than its peers, the machine took Peter Bright by surprise.

Compaq Computer Corporation has had a short, but highly distinguished, career. It started off by daring to compete with IBM and invented the idea of the IBM-compatible transportable micro.

Compaq's original product is still available, but its range has now broadened to include IBM PC/XT and IBM PC/AT-compatible desk-top and portable micros, all of which are technically superior to IBM products. This strategy has turned Compaq into a company which recently recorded turnover topping half a billion dollars.

Although the IBM PC/AT market is still in a state of flux, and it still has to be proved that the AT portable market exists at all, Compaq has decided to launch its second portable AT clone. Called the Portable II, it boasts an 8MHz 80286 processor and a 10Mbyte hard disk in a package 30 per cent smaller and 20 per cent lighter than previous Compaq portables. We decided to take a look.

Hardware

While I have always had great admiration for Compaq machines *technically*, you could hardly describe them as works of art *aesthetically*. And the Portable II is no exception. In fact, externally, there is very little to choose visually between the Portable II and any other Compaq Portable.

In fact at 17.7in wide by 7.5in high

by 13.9in deep, the Portable II represents a 30 per cent decrease in volume from the Portable 286. More importantly, perhaps, at 25lbs for the basic machine and 26lbs for the hard disk machine, the Portable II is some 20 per cent lighter than the Portable 286. While a 20 per cent weight reduction is to be welcomed, I still found the machine cumbersome to lug around.

When the machine is rigged for carrying, there's very little external evidence that it's a computer at all. The keyboard attaches to the front of the machine via two rather insubstantial clips. I soon found that unless I was very careful doing them up, the keyboard would drop off when the machine was put down.

The only object on the rear panel of the machine is a nice, large, warm leatherette carrying handle. The comfortable nature of this handle almost compensates for the machine's otherwise ungainly appearance when it is being carried around.

Setting up the Portable II when you have arrived at your destination requires two things: (1) a suitable power point; and (2) strong finger nails. The reason for the former is obvious, and the latter is necessary because the ineffective keyboard clips I mentioned earlier can play havoc with your beautifully manicured hands.

Once the clips are released, the keyboard can be removed to reveal the front panel of the computer. The mouldings for the front panel are finished in a darker shade than the rest of the casings, which are finished in standard business computer cream.

Most of the space on the left-hand side of the front panel is taken up by a 9in green monochrome display. To its right are a 10Mbyte half-height, 5.25in hard disk and a third-height, 360k IBM PC-compatible 5.25in floppy disk drive. This is hidden by a little flip-up cover which incorporates a piece of transparent red plastic so that you can see the drive access LED.

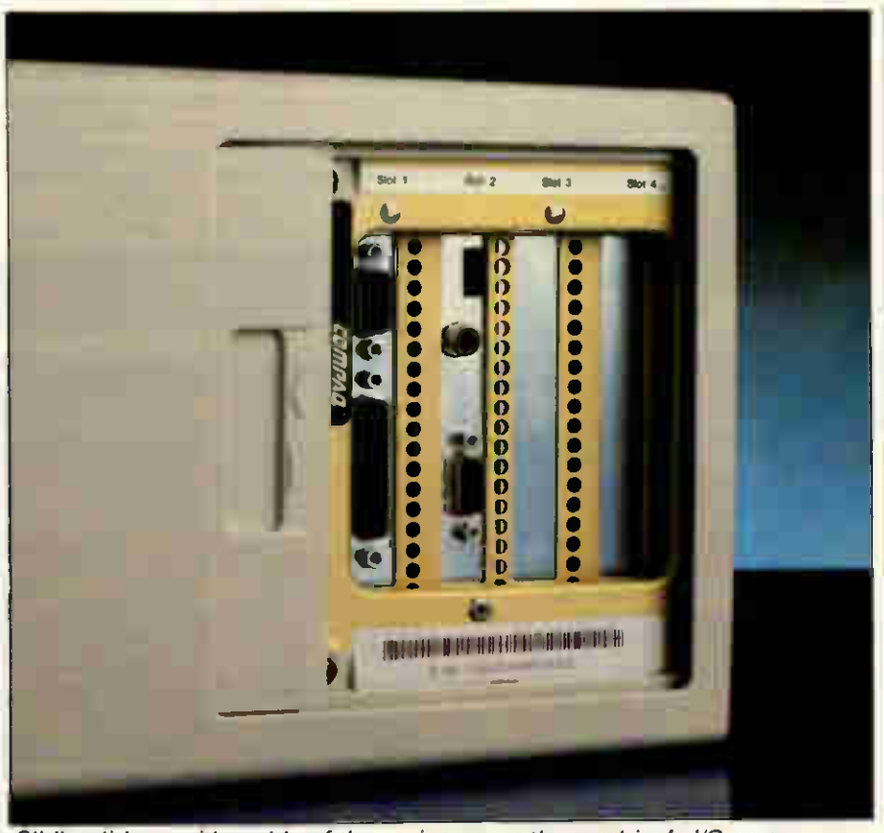
Below the disk drives is a small rotary knob which controls the brightness of the display, and a hole which the keyboard cable disappears into. Unlike most other portable micros, the keyboards on all Compaq portables are always permanently attached to the rest of the system via a short length of coiled cable. When the system is rigged for carrying, the cable disappears into the hole in the front panel so that it doesn't snag.

Both the left and the right side panels on the Portable II house sliding lids which cover I/O connections. On the left-hand side, the cover slides back to reveal the on/off switch, vents for the internal fan and the socket for the power cable. The right side cover reveals plates for four IBM expansion cards. On the basic machine two of these are taken up by an RGB/composite video card and an RS232 serial/Centronics parallel printer card. This leaves two slots (one IBM PC standard and one IBM PC/AT standard) free for the user to add his own cards.

The Compaq Portable II looks rather ungainly when packed for carrying

The final area of interest on the outside of the machine is a large hatch on the underside of the main unit. This incorporates two hinges: one at its edge to allow it to be opened; and one in the middle which allows the cover to fold back on itself. This arrangement means that it is possible to lock the cover in place to form a foot on which the system box can rest, which allows you to alter the viewing angle of the screen without having to resort to a pile of old telephone directories.

As well as serving as an adjustable foot, the cover also hides a large compartment designed to house the power cable when the system is being carried around. Included in the compartment is a dummy mains socket which holds the mains plug in



Sliding lids on either side of the casing cover the machine's I/O ports

working because even the IBM PC/AT won't run it.

I was totally amazed to find that Flight Simulator actually does run on the Portable II. I don't know how Compaq has achieved it, because it has managed to do something even IBM can't do.

As well as being supplied with MS-DOS version 3.1, the review machine was also supplied with Microsoft Basic version 3. This is not the place for a review of Basic 3's features, but it does seem to represent a marked improvement over GWBasic which is supplied with most other IBM compatibles.

When a file is accessed using the 'Open' command, it can now be 'Shared' — allowing other processes to read and write to the file; 'Lock Read' — which stops other processes from reading the file; and 'Lock Write' — which stops another process writing to the file. There is also a 'Lock Read Write' mode which stops both read and write operations from other processes and, finally, there is a compatibility mode which disables the locking process to allow old Microsoft Basic programs to run.

In addition to the facilities provided by the improved 'Open' command, Basic 3 also has a 'Lock' command which allows record locking as opposed to the file-locking provided by the 'Open' statement. This allows you to build a greater degree of flexibility into your programs and should allow you to produce true multi-user networked applications programs written in Basic.

In addition to its improved file-handling features, Microsoft Basic 3 also has a range of new and improved features in other areas. While I can't go into them here, *PCW* should be doing a full review of Microsoft Basic 3 in the near future.

Documentation

The review machine was supplied with three manuals — one for MS-DOS verson 3.1 and two for Basic version 3. Retail systems will also be supplied with an owner's manual covering the set-up and care of the machine, but this was not available at the time of writing.

All three manuals supplied with the review system were spiral-bound in hard covers and were produced to a very high standard indeed. The text was properly typeset and presented in a logical, if somewhat technical, manner.

My one criticism is that the layout is quite bland with no use of colour. I appreciate that colour printing is expensive, but it would have helped to break up what were sometimes long tracts of boring text.

Prices

The Portable II will be available in three configurations ranging from a single floppy disk machine to a 10Mbyte hard disk system with one floppy. At the time of writing UK prices have not been fixed but, as a guide, US prices range from $3199 to $4799.

Conclusion

Rather against my better judgment, I ended up positively liking the Porable II. When I first saw it I let out a small sigh and exclaimed 'Oh, no, not another AT clone, and a portable at that!'

However, with the exception of Olivetti, Compaq is my favourite IBM clone manufacturer, and I should have known that the Portable II would probably be a notch or two above the rest of the pack.

Technically, the Portable II gives you more power than an IBM PC/AT and nearly as much power as a DeskPro 286 in a much smaller, neater package. However, one or two things lead me to think of it more as a very high-performance IBM PC/XT rather than as a straight AT clone.

First off, the Portable II only has a 10Mbyte hard disk compared with 20Mbytes for most AT clones. Also it only has a 360k floppy disk drive, compared with the 1.2Mbyte drives fitted to most other AT clones including Compaq's own Portable 286. Finally, the Portable II only has two spare expansion slots which is far fewer than most AT clones. There is nothing wrong with this; in fact, for many people this will be a positive advantage — there is no point in paying for features you don't want.

All in all, if you want more power than an IBM PC/XT can provide (which isn't difficult), but you don't want all the unnecessary bits and pieces in an IBM PC/AT or clone, then the Compaq Portable II could be the one for you. END

Technical specifications

Processor:	Intel 80286 running at 6 or 8MHz
RAM:	Up to 640k on the motherboard. Up to 2.1 Mbytes using an IBM slot
ROM:	16k
Mass storage:	One 10Mbyte hard disk, one 360k IBM PC compatible floppy disk drive
Dimensions:	17.7in(w) x 7.5in(h) x 13.9in(d)
Keyboard:	84-key IBM PC/AT-like layout
Display:	9in green screen dual mode IBM monochrome/ IBM colour graphics adaptor compatible
I/O:	Four IBM PC/IBM PC/AT compatible expansion slots. Two available to the user
Operating system:	MS-DOS version 3.1

In perspective

At first sight, the Portable II seems to sit somewhat uncomfortably in Compaq's product range. As far as desk-top machines are concerned, Compaq has the DeskPro IBM PC/XT compatible and the DeskPro 286 IBM PC/AT-compatible. Both of these are very good, successful machines.

As far as portables are concerned, Compaq already has the original Portable/Plus IBM PC/XT compatible and the Portable 286, which is a full function IBM PC/AT clone. So how can the company have room for another IBM PC/AT portable?

I believe the answer lies in the fact that, although on paper the Portable II is an IBM PC/AT clone, functionally it's more like a high-performance PC/XT. If you think of the machine in this light, then it starts to make more sense for the user who wants a portable with more power than an IBM PC/XT, but who doesn't need all the extra features, weight and bulk associated with a true IBM PC/AT clone. In these terms the Portable II can take sales both from potential IBM PC/XT and IBM PC/AT buyers.

If it works, this positioning could be very interesting. The only other machine that I can think of which is being marketed in this way is the Olivetti M24SP. This achieves the same ends from another angle by using a souped-up 10MHz 8086 processor rather than an 80286. The main difference, of course, is that the Olivetti M24SP is a desk-top machine rather than a portable.

Overall, what at first sight looks like rather strange positioning could turn out to be very clever. A company such as Compaq doesn't achieve turnover of more than $500,000,000 against IBM without making good machines based on sound marketing principles.

RM NIMBUS
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> Very shortly, we expect IBM to announce a new, smaller, faster version of the PC. It will use an 80186 chip and have 3.5in. disc drives. That is, in performance and appearance, it will try to match the outstanding Nimbus micro from Oxford-based Research Machines Ltd.
>
> **Practical Computing**

> For a firm that wants a business machine with powerful graphics at a budget price, the Nimbus is in a class of its own.
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RESEARCH MACHINES
MICROCOMPUTER SYSTEMS

Remembrances of times past

This month we celebrate the 100th issue of PCW. *To mark the occasion we asked past editors to recall their time in the hot seat. Meyer Solomon remembers how it all began . . .*

More years ago than I care to remember, I enrolled for a programming course. For me, it was a step to the most exciting universe of all — a universe that was both the product and the subject of imagination. Imagine — through programming, you could simulate how a universe evolves according to some given laws!

And then I attended the course. The standard of teaching gave fresh meaning to tedium. The content of the course made a vacuum look like the atmosphere of Venus. After completing the course somehow, I dutifully registered in what was known as the executive register. I took delight in the irony of a computer printout informing me, month after month, that there were no openings for me as a computer programmer. Have you ever felt that you were being saved for a more suitable fate — like hanging, perhaps?

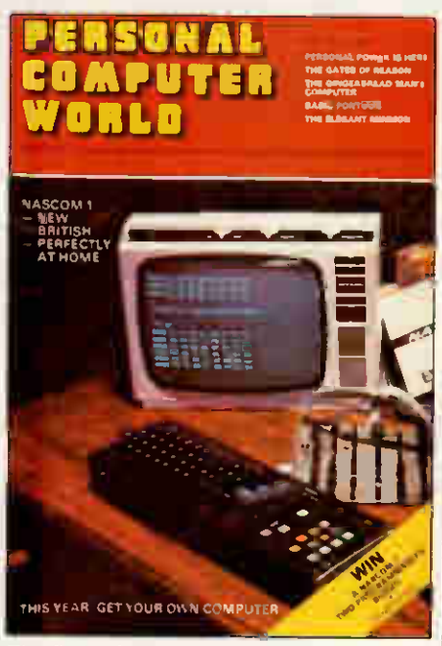
I never lost my conviction that there was more to programming than punched cards. In 1976, I visited my brother in Massachusetts. There I came across magazine articles (which I still have) on a microprocessor-based computer — the Altair. Can you think of anything more pleasing than the feeling that you have wished a product into existence?

Returning to London, I resumed clearing tables, writing my novel, and dreaming. I knew a certain, large Yugoslav who had a vast interest in life, who always had one money-making project or another on the boil, and who seemed successful enough to own two colour television sets. It turned out that he, too, had a consuming interest in personal computers, and one fateful evening he asked if I would be interested in editing a magazine which he would fund.

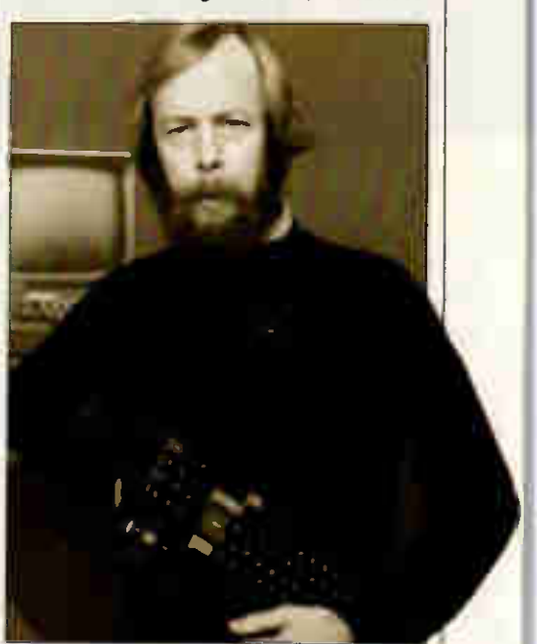
A friend (David Leach) and I thought up a name: *Personal Computer World*. Publicity leaflets were printed and strewn like manna at a conference to launch a British personal computer, the Nascom. One of the first people to contact us was Tony Osman of *The Sunday Times*. He took us at our word, and mentioned us in the colour section; one thousand people wrote to us.

Guess who else contacted us? It was Guy Kewney, who must then have been approximately one light year ahead of anyone in the UK as far as personal computing was concerned, through his championship of it in the pages of the industry weekly, *Computing*. Once again, without having met me, and on the basis of one phone call, he took us at our word and mentioned the *PCW*-to-be, instead of pouring scorn and doubt on the idea, as he could so easily have done.

You would be right to think that I place the greater part of the credit for *PCW* into the accounts of certain names — those just mentioned, in at the very start, and those who sought us out to write for *PCW*. Without exception, they knew far more than I did, but realised that I was wise enough to understand that. And we had wonderful readers. I do not think that any other kind of magazine has the kind of readership that personal computer magazines have. They seem to me to be generally more active, more intelligent (and, fortunate-



The first, of many



In the beginning there was Guy Kewney

ly, seem also to have a greater sense of the absurd).

In 1977, a few hundred bytes of memory seemed like a lot of real estate. Things began improving in 1978, but price was a great barrier. The Apple was, of course, the most glamorous of the early computers. It might be the first and last recorded instance of a homebrew computer being transformed into a mainstream success by a groundswell of enthusiasm of the sort one usually associates with the amateur.

The Nascom was good value for its time, as were the first Commodore Pet and Tandy computers. Research Machines was there early, with its characteristic emphasis on good product and straightforward dealing. And Acorn, too, showing the beginnings of that brilliant design flair which has today culminated in the RISC processor. Two very good machines, the DAI and the Sorcerer, were not as successful as they deserved to be.

How could I forget Clive Sinclair, who at the time was holding out the promise of our being able to control entire nuclear power stations? But seriously, whatever his vicissitudes, and however things turn out, he is a latter-day hero, far more deserving of large-scale funding than certain people who have hopped blithely from company to company, leaving just before responsibility could be pinned on them.

Meyer Solomon
Editor: May '78 – May '79

The dream comes true

Meyer Solomon was the first-ever editor of *PCW* and is really one of the nicest people you could ever meet. He and Angelo Zgorelec ran the magazine at a time when microcomputers were almost unheard of. Their brave pioneering work came to an end in the middle of 1979 when Angelo sold the magazine to Felix Dennis who, oddly enough, had just signed me up to work with an experienced publishing man, Bruce Sawford, on the creation of a new computer magazine. My 13 years' computing experience plus Bruce's long magazine experience made us the obvious choice to take over *PCW*.

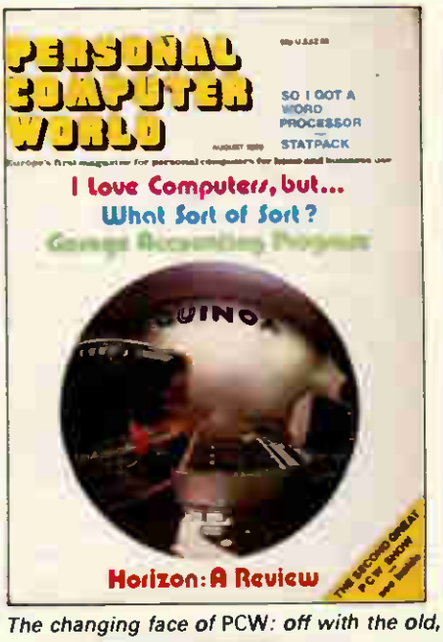
With Paul Carpenter as art director, we completely redesigned and relaunched *PCW*, introducing several new sections, some of which survive to this day. Guy Kewney is the *PCW* equivalent of lettering in seaside rock. Break open any issue since our first, September 1979, and there's Guy haranguing the industry and providing all sorts of interesting news. JJ Clessa is the only other survivor from those days. We introduced Benchtests, Computer Answers, Young Computer World (RIP), Interrupt (for readers to 'soapbox'), Transaction File and the Programs/Micromart section. Calculator Corner, presided over by Dick Pountain and which became hugely popular, started the following month.

Those were the days of the personality: Tim Keen, Mike Sterland, Tim Moore, Bill Cannings, Alan Wood, Julian Allason and Bruce Everiss, to mention just a few. These people had the courage to get involved with the embryonic personal computer business and their names were constantly in the headlines. Now, anonymous grey suits and matching faces seem to be more appropriate. Mike Sterland (Personal Computers), Tim Moore (Kuma) and Alan Wood (Digitus) made their original ideas work. The rest have moved on to other things.

In those days, heavy business computing was done on machines like the North Star Horizon or the Cromemco System Three. Further down-market, the Tandy TRS–80, the Apple II and the Commodore Pet battled it out for pole position. Hobbyists had to make do with micros like the Nascom, the Ohio Superboard or the UK101.

A year later, *PCW* had doubled in size, and the main new machines were Sinclair's ZX80, Acorn's Atom and, further up-market, the SuperBrain. By now we had introduced a few more regulars: Yankee Doodles, Chip Chat, Microchess and SubSet. In November 1980 we launched Computer Town — a computer literacy project to be held in places such as town halls and libraries; this was before schools and Government managed to get their fingers out.

The Benchtest became PCW's hallmark and marked a new era in machine reviewing



The changing face of PCW: off with the old, on with the new (August/September '79)

Apparently, around eight Computer-Towns are still running today.

Nineteen-eighty-one saw an awful lot of fuss about a project we uncovered called The Last One. It also saw the introduction of Banks' Statement and TJ's Workshop (now 'RIP'). I bowed out at the end of the fourth *PCW* Show, but, in my last couple of weeks as the magazine's editor, we got two scoops: the Osborne 01 and the IBM PC.

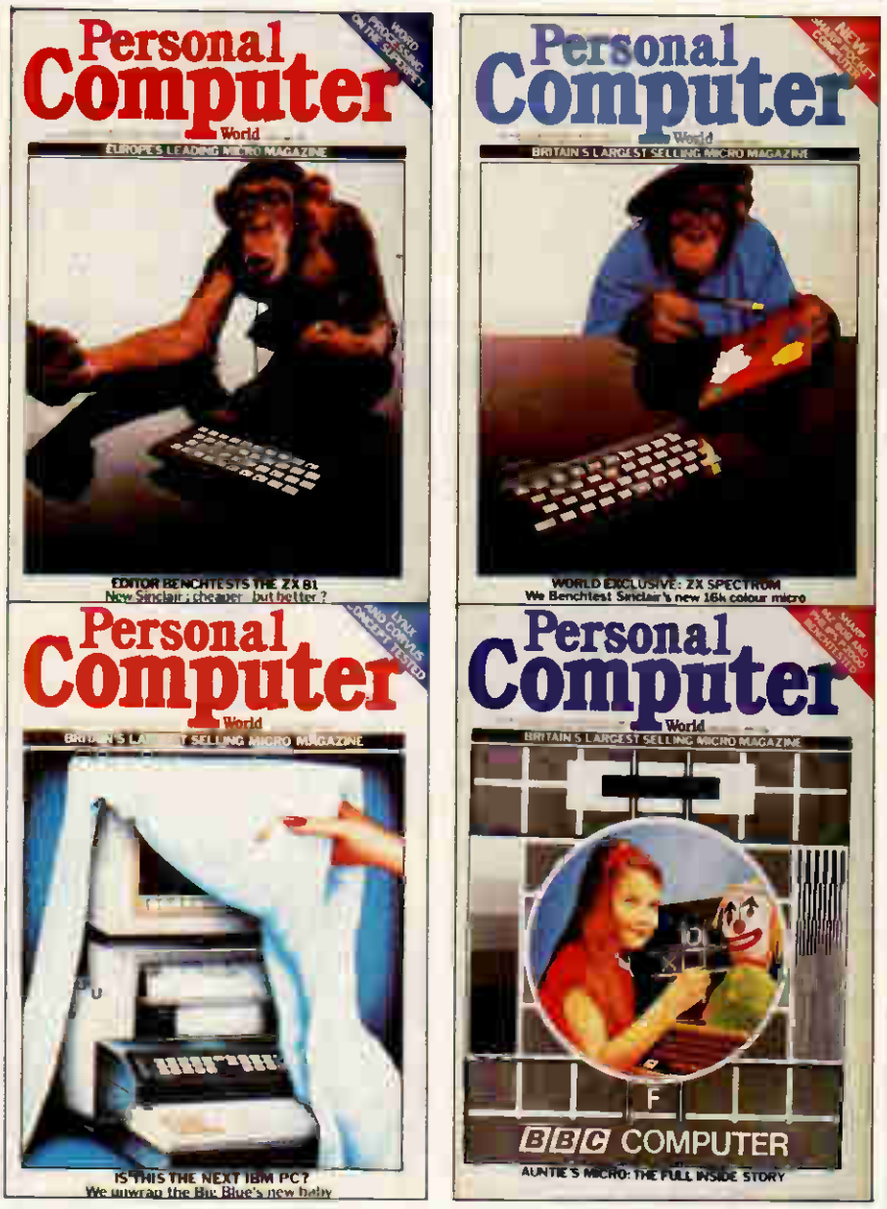
Now, the IBM PC has changed everything. The stunning rate of change has slowed as IBM first established the standard and then made sure that changes were incremental only. As the installed base grew, so did the supporting industry of software and hardware. Apart from Apple, no-one seems to be really trying to change the *status quo*. Those who have tried 'pop-up' applications and switcher-like programs have tasted the forbidden fruit. They want machines with huge memories and hard disks, so that they can switch from task to task with minimum fuss. They'd like very high-resolution screens. With the need for multi-tasking and better displays comes the need for faster machines. IBM appears to be resisting pressure for such change, content to develop the market at a speed which suits its business plans.

Eventually Apple will bring out a fast, open-architecture machine with a decent-sized screen and built-in hard disks. I say Apple should get its product spec up and its prices down as fast as possible in order to build up a real user base. (Incidentally, the Amiga seems a lovely machine, but where does it fit at its price? In the home? In the office? Hmmm.)

Today we have cellular telephones, wafer scale integration and parallel processing, and the Japanese have a television whose resolution is so good it's like looking through a window. In the quest for true artificial intelligence, much is being learned about how we think and interact with computers. Let's see where these technologies may lead.

Your machine will get to know your way of working. As it detects regular work patterns or keyboard entry sequences, it will store them away. Next time you embark on the same task it will ask: 'Do you want me to do that?' Little by little, like a personal assistant, it will take over your menial tasks. Its photographic-quality screen will be able to display any information and will not strain your eyes.

Lap-tops will have huge memories and low power but a clearly visible colour display. Many will be 'paired' to a mother computer on your desk which itself may be part of a net-



Suddenly there were micros to suit every budget – from home to business to schools

Garrulous Martin Banks: lost for words

David Tebbutt: star of page and screen

work. When you're away from the office, your lap-top will be able to stay in contact with any computer, including 'mother', through its cellular modem. You will be unaware of where your lap-top gets its information. You will ask for information on 'Bloggs and Co' and it will be delivered to your screen, perhaps from the lap-top's own memory, perhaps by calling 'mother', or perhaps from Companies House. You will be able to talk to the machine or use a keyboard displayed on its touch-sensitive screen.

The PC game will gravitate towards the big players as the cost of entry rises, and we will, therefore, tend to progress at the speed dictated by those huge companies and their commercial interests. Perhaps the thing we should all pray for is that IBM gets some real competition: an alliance of AT&T or DEC with Apple is the kind of thing that's needed. That way we'll all benefit as they battle for competitive advantage.

David Tebbutt
Editor: May '79 – Nov '81

The golden era

PCW: *private investigator extraordinaire*

Year of the Mouse

It was a Bank Holiday Monday in 1981. The West End was deserted, the *PCW* office was empty — apart from me and *PCW*'s publisher, Felix Dennis. In Boca Raton, Florida, it was just a normal working day.

Word had reached *PCW* that IBM was about to launch its long-awaited personal computer, and we were determined to get our hands on it. The difficulty was to convince IBM's public relations people that the lunatic who kept phoning every half-hour really meant business. Another difficulty concerned the logistics of Benchtesting a computer on the other side of the Atlantic: there were only half a dozen machines and they were all in Boca Raton.

Finally, after numerous telephone calls, IBM agreed that if we could get to Boca Raton, we could play with its new toy. Two days later, David Tebbutt was on his way. A month later, *PCW* hit the streets with — as far as we could establish — the first published full review of the machine in the world. (This was because the US magazines typically had a lead time of three months, opposed to our one month.)

We all knew that when IBM entered the market, the impact would be considerable; I don't think any of us realised exactly *how* considerable. Even IBM seemed a little uncertain: the basic machine came with 16k of RAM, a built-in cassette interface and Basic in ROM. Early IBM literature showed happy families grouped around the system in their living rooms . . .

That particular issue of *PCW* contained a review (also by David Tebbutt — it was his month) of the Osborne 01, another machine which was to have a great impact on the industry, and, ironically, the inspiration for one of IBM's few failures, the 'portable' version of the PC.

The Osborne succeeded because it was cheap and came with lots of free software; the IBM PC succeeded because . . . well, because it was made by IBM. The rest of the industry noted Osborne's success, assumed it was all to do with portability and rushed out dozens of unwieldy boxes. Then the industry noted IBM's success and started making IBM-compatible machines. A few machines tried to win both ways by producing portable, IBM-compatible computers.

As both trends — portability and compatibility — spread like wildfire, the phenomenon of 'white-line marketing' began to appear. This involved the massive promotion of products which in reality stood zero chance on the market. The theory was that the marketing departments were so out of their heads from the inhalation of certain powders that *every* product was the fastest, most powerful, cheapest and *best*, regardless of commercial realities. Megabucks went down drains and up noses in the marketing of these products and the industry boomed: *PCW* grew to 400 pages, dozens of other magazines sprouted, 16-year-old programmers were buying Ferraris, share prices rocketed and even national newspapers started carrying computer sections . . . it clearly couldn't last.

The crunch has been well documented — perhaps a little too well. The reality is that while those heady days are over for good, the computer industry, both home and business, is doing very nicely, thank you; it's just that the phenomenal growth curves have flattened rather sharply.

IBM's total domination of the micro industry is now a fact of life, and is both good and bad. Good, because it brought a measure of standardisation which was badly needed. Bad, because it has stifled so many good, creative ideas.

For such a high-tech industry, it is surprisingly conservative in many ways and the influence of IBM has worsened this aspect. (For instance, why must so many clone makers copy IBM's grotesque styling and terrible keyboard layout so exactly?) The industry has settled into much-needed stability and respectability, thanks to IBM, but, in my opinion, this is now being carried to a narcoleptic extreme.

One example: for years, the computer industry has stuck to a standard screen format of 80 columns by 24 or 25 lines. This dates back to the days of punched cards and has no relevance to modern computing needs. As the majority of personal computer users eventually want their work to appear on pieces of paper, why aren't we moving rapidly to screen formats which echo the familiar physical page shape? The Great Communicator, reviewed in the February issue of *PCW*, offered an A4 screen as an option, but at a ridiculous cost. Corvus produced a novel full-page screen some years ago: you could use it upright for word processing, or lay it on its side for spreadsheets, but again it was ex-

pensive. We should now all be moving towards high-resolution, A4-size screens: the latest desk-top machines have the computing power to drive them, but sadly we're all condemned to waiting to see if IBM thinks it's a good idea.

Some might say that the industry has become boring. Well, I suppose it has in some respects, but it was inevitable. While the time I spent at *PCW* fortunately coincided with the industry's most exciting period, the stream of constant new developments, particularly on the software side, still provide immense interest.

Predicting the future in this business is a foolhardy venture. But the next 100 issues of *PCW* will be just as interesting as the first 100 — of that at least you can be sure.

Peter Rodwell
Editor: Nov '81 – April '83

Heady days

Micros were viewed with suspicion when I joined *Computing* newspaper early in 1981. They belonged with bearded boffins found in garages and attics at strange hours of the night – a far cry from the aloof, all-powerful world of company data processing departments. *Computing* consigned stories about them to a ghetto page, buried inside, with its own special label, 'personal'.

As no-one else seemed interested, I found myself writing more and more about these curious creatures which began to sprout, Triffid-like, everywhere. Despite the scepticism of mainframe programmers and the derision of systems analysts, micros were being born. Suddenly, the UK was the international champion of the home computer, its eager buffs having acquired twice as many machines per head as the US.

Where the people went, however idiosyncratic their whim, so the media piled in after. Television, radio, papers and magazines briefed correspondents to ferret out the computer stories for which the British public seemed to have acquired such a voracious appetite. The BBC broke all its habits and backed a piece of hardware, thereby rocketing ambitious Acorn to a market valuation eventually topping £200m.

In May 1983 I found myself editing *PCW*. They were heady times: the industry in a permanent state of euphoria and full of surprises. Apricot, instantly covetable, adorned the front cover of our Show issue, capturing everyone's imagination. The Macintosh, launched the following year at a fraction of the price of its mother, the Lisa, seemed to promise that soon, small and friendly computers would be affordable for all.

Each month it was tough deciding which of the multitude of new machines to Benchtest, and there was endless heated debate as to which operating systems or whose printer to recommend.

It was uncharted terrain. *PCW* — ever the pioneer — went to court for printing a routine enabling BBC Micro disk owners to unlock cassettes they had bought and load them onto floppies for fast reloading. And as British Telecom procrastinated over approval for modems, we agonised over whether to publish a review of the newest unbeatable-value offerings before they were okayed. We did.

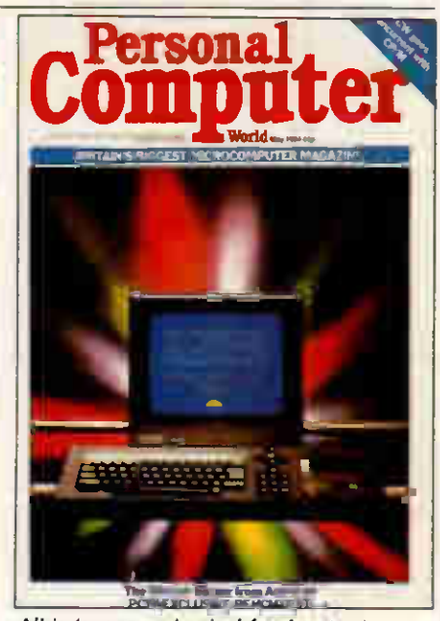
Magazines, like micros, multiplied. Journalists and publishers alike watched incredulous as the down-market *Your Computer* shot ahead of *PCW* in circulation figures to over 120,000. *PCW*'s sister publication *Personal Computer News*, looked, for an uncomfortable few months, like stealing the ground from under us as a weekly version of our own unique mix. Then the bold publishing gamble *Soft* magazine enticed away some of our best writers.

But as early as the summer of 1981, there had been warning signs for those who chose to read them. The *PCW* team had been justly proud of its world exclusive Benchtest of IBM's new personal computer. Though destined not officially to reach the UK for two more years, the

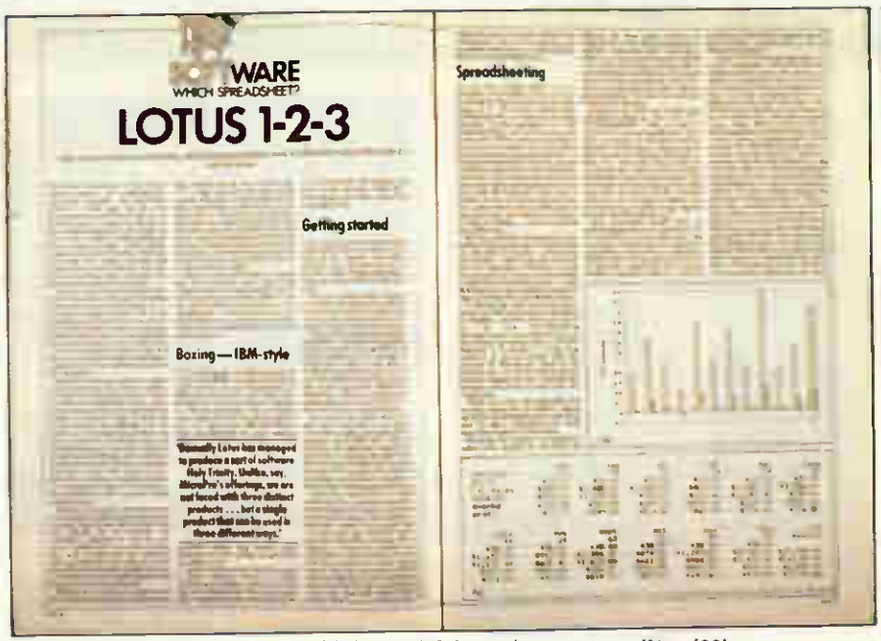

BENCHTEST
ACT APRICOT
Hardware

The October 1983 issue provided the opportunity to taste the forbidden fruit

Coleco's Adam: a box full of tricks?



All is 'sugar and spice' for Amstrad



WARE

WHICH SPREADSHEET?

LOTUS 1-2-3

Getting started

Boxing — IBM-style

Spreadsheeting

Integrated packages arrived, with Lotus 1-2-3 coming out tops (Nov '83)

Jane Bird

brooding threat of the Jolly Blue Giant was depicted in sinister shadowy letters on the August issue's front cover. Not the huge head start of Sirius, nor the ingenuity of ACT in Birmingham, could stem the Big Blue flood when it finally came.

Nor did the bookstalls escape the heat — a myriad of fat, glossy mags which had fought for shelf space and divided readers into ever more specialised groups, gave way to slim volumes and spaces. Virtually the only new launches were for IBM users.

PCW thrives. And to a former editor, it is good to see that some things don't change. Guy Kewney clearly still demands constant vigilance to keep him in check, and garrulous Martin Banks waxes lyrical as ever — winning a national prize in the process.

Yet the mood is very different now. In 1983 it would have been unthinkable for a columnist to reflect, as David Ahl did earlier this year, on the 'general dullness' of the personal computer industry, and the 'almost total lack of anything innovative'.

Even now, the industry is prone to dismissing its ills as the product of 'irresponsible' newspaper reports by people like myself in the national press — blaming the bearer for the bad news.

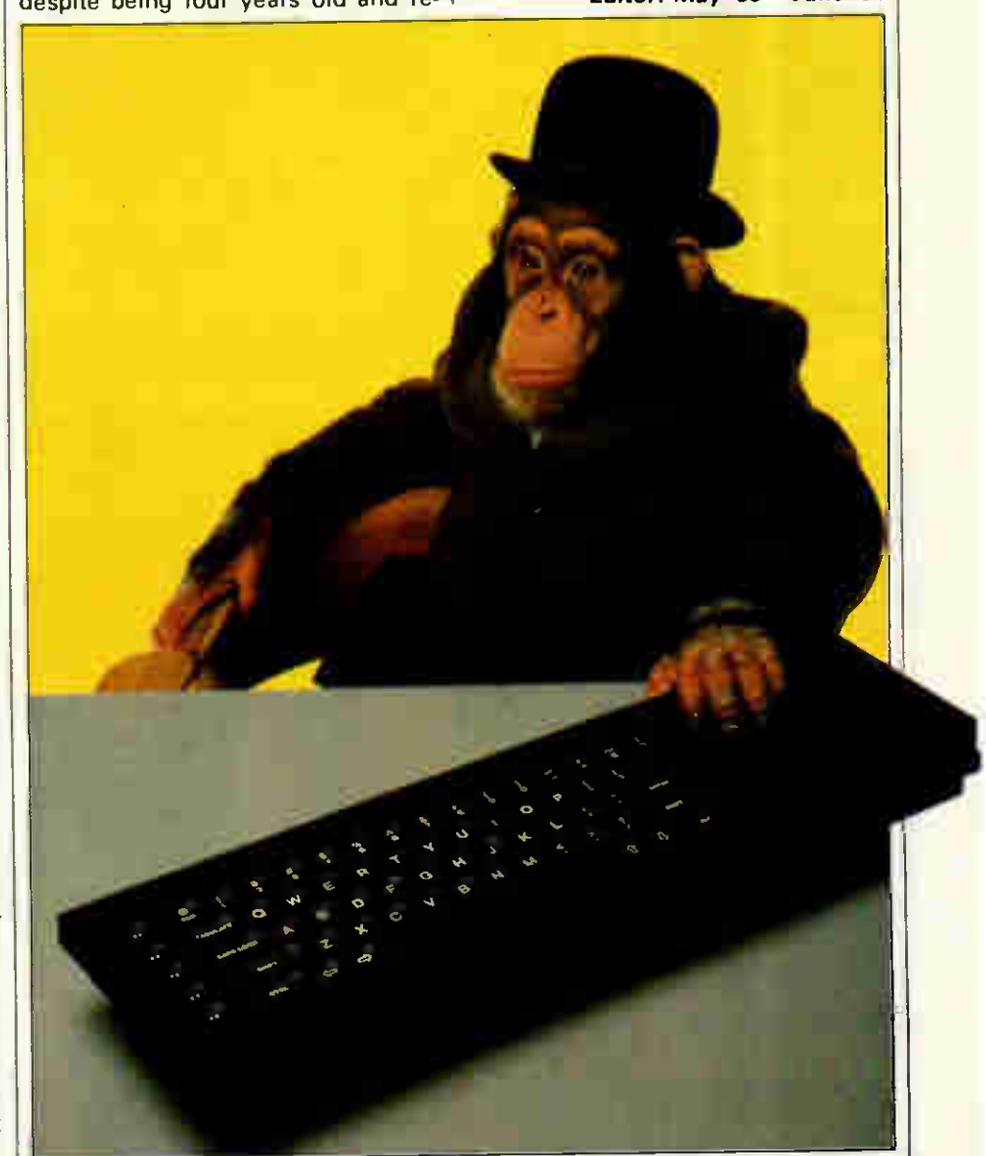
Ahl reported the appearance at Comdex of Microsoft's much-vaunted Windows — but hang on: *PCW* was reviewing that in my day. Such events kill the myth that in the computer business, everything is obsolete as soon as it's for sale. Some pundits believe that the new offerings from Atari and Commodore will put techno-thrills back into lacklustre home computing, but I wouldn't put my money on it.

While many micros dubbed 'future-proof' have failed, the irrepressible Sir Clive Sinclair's Spectrum is still the top-selling home machine; this despite being four years old and rejected by the patriotic BBC.

It is not the technical innovators who have inherited personal computing, whether you buy IBM for safety or Amstrad for simplicity. Marketing men have won the latest round.

But not all is gloom for the boffins in the attic. Down in the bargain basement is an Aladdin's cave of knock-down micros and cast-off add-ons of every description.

Jane Bird
Editor: May '83 – June '84



Paradoxically some might believe the QL ended up 'making a monkey' of Sinclair

The bubble bursts

It was autumn when I arrived to edit *PCW* – leaves were turning brown and micros were falling from heaven. Unfortunately, a lot of them crash-landed.

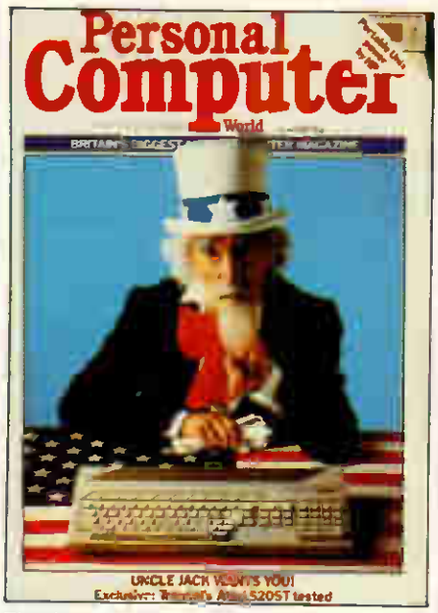
The MSX machines were the first of the casualties – they went from pride of place to the bargain basement in next to no time. Commodore's Plus/4 took the same downward trend, while the Enterprise failed to follow the Starship.

On a brighter note, Apple announced the Fat Mac towards the end of 1984. Still a long way from being the perfect Macintosh, the 512k machine made it easier to write sophisticated software for what remains the easiest micro to use. It's still a shame about the keyboard, though. Better news on this front came from ICL with its OPD – at last a 'Sinclair micro' with a comfortable keyboard. To compensate for this astute improvement, British Telecom decided to sell the machine under the daft name of Tonto.

IBM took a more straightforward approach to the title of its new micro, the PC/AT. The 'AT' stands for 'advanced technology' – well, it was the shape of things to come in that it was multi-user and based on Intel's 80286. And you could twizzle the logo around so that if you stood the system box upright on the floor, the intitials IBM remained the right way up.

And then 1985 arrived – The Year of the WIMP. Mice proliferated and no self-respecting software package came without a selection of windows, icons and pull-down menus. Digital Research's GEM was among the first – Microsoft's Windows and

The Plus/4 missed its goal by a long shot



The American Dream Machine?

IBM's own TopView took up the challenge later in the year.

All these fancy operating environments, however, failed to stop an unexpected revival in good old CP/M. Commodore's 128 offered three micros in one box – the 64, a CP/M machine and the 128 itself (and not, you'll note, the Plus/4). Then Amstrad replaced the tape deck in its 464 with a disk drive to produce the 664 – before, to the fury of 664 purchasers, gong on to offer full CP/M on the 6128 later in the year. Not content with that, Amstrad came up with the 8256 which included a printer as well.

What were the other UK manufacturers doing while Amstrad was making all this money? The answer is: not so well. Sinclair, the man and not the micro company, tried a move into the motor industry before running out of road. Acorn was taken over by Olivetti. And Apricot wrestled with its problem of having too many machines and too little compatibility.

More promising developments came from the US – from Commodore (the company Jack Tramiel left) with its Amiga, and from Atari (the company he went to) with its 520ST.

That was the year that was in terms of machines. On a more mundane level, my strongest memories are of wondering whether the stream of PC and then AT clones would ever run dry (it never seemed to); of lifting software manuals which would have served as useful props in a body-building course; of struggling with portable machines whose screens appeared to have been designed with contortionists in mind; and, on a brighter note, of trying (and failing) to improve my performance at chess with Psion's package for the Macintosh – a true, if expensive, marriage of soft and hardware.

Much Ado about Something

Less satisfactory marriages consisted of machines such as IBM's PC/AT and packages such as Symphony. Judging from the phone calls I received, this was one of the more popular combinations among first-time users – first and last-time users at that. This was definitely not the dish to sit before a new and untrained user. Many purchasing decisions were, as ever, based on the slimmest of research; for example, one irate user rang to complain that he'd bought a new machine, only to discover that none of his old software would run on it. Then there were the stories of people cutting down 5¼in disks to fit into smaller drives. And that's just a selection to indicate the sometimes immense gap between wanting to make the most of a micro and actually being able to do so.

On the other hand, though, many users were more than making the most of their machines. Some of the programs *PCW* published put their commercial rivals to shame (as did our do-it-yourself memory expansion kit for the Mac), while others managed to condense some of the techniques involved in such things as expert systems into fewer lines of Basic than I would have thought possible.

The range of machines used by *PCW* readers – and the range of things readers did with them – was one of the most enjoyable things about the job. While the micro industry has changed beyond all recognition from its origins – boxes are shifted these days rather than machines sold, and companies such as Commodore wouldn't dream of running indulgences like the Petjet – the fun has not gone out of things for the user.

Graham Cunningham
Editor: July '84 – Sept '85

After the rush . . .

In the closing months of 1985, as I took over the editor's chair at *PCW*, the talk was all of the disasters of the past and the disasters still to come. The keynote address at Comdex Fall, the industry's Greatest Show on Earth, was called 'Surviving the Industry Downturn' and was delivered with fine gloom by the head of not-supposedly-shaky Hewlett-Pakard. Heads were being shaken over the chances of the supposed competitors to IBM, the home micro market had disintegrated, Commodore had posted $100 million losses, both Apple's founders had left for more congenial surroundings, and Sinclair and Acorn still teetered ever-so-gently close to the brink.

Worst of all, the oldest of computer magazines, David Ahl's *Creative Computing*, had its shutters lowered after 10 years by owner Ziff-Davis; *PCW* was, of course, unashamedly modelled in its early days on David's . . . well, creation.

Perhaps, the cynics will say, that's one reason we are celebrating now, after 100 issues and eight years, rather than hanging on hoping to clock up the full 10 . . .

But of course that's not the case, and a lot of the gloom in the micro and micro magazine businesses is equally misplaced. As someone once said: it isn't what you don't know that hurts you, but the things you know that ain't so. We *know* that IBM has completely taken over the business market; that the home computer market doesn't exist; that dealers are sharks who give no support and are always ready to fold; that software doesn't work and costs so much to promote that no new products are emerging; and that the bubble in schools' computing has been burst by the withdrawal of Government financial support. And naturally, we all know that micro users today are hard-eyed businessmen and profit-seekers.

'Shall I compare thee to a summer's day; thou art more beautiful.' Peter Jackson receives the Computer Journal of the Year award sponsored by H-P and The Times

As vociferous groups of *PCW* readers will be quick to respond, all of that *ain't so*. Or at least, it is such a superficial view of things that it loses all meaning in the real world.

Sure, IBM has two-thirds of the business micro market just as it has two-thirds of every computer market it is in; but the third that's left is still worth billions and leaves enough room for Apple to ship 600,000 units of a 'failure' in the shape of the Macintosh. There are a couple of million home computers in the UK getting various amounts of use, and the success of the Atari ST (the availability of assemblers and compilers for a machine is a good measure of success – and the ST has dozens) shows that there is demand for a cheap-end computer in the home as well as outside it. Some dealers *are* sharks who would remove your rings while shaking hands, but many aren't; and the bad ones weed themselves out by losing the repeat business that is now coming through, following the first micro wave. Schools and universities, naturally enough as the homes of the most intelligent and enthusiastic computer users around, are still active and being actively wooed by the industry for innovative work.

And, most obvious of all, hundreds of thousands of people in the UK enjoy using computers, learning more about them, and exploring the boundaries of what they can do. Those people, if you'll pardon some trumpet-blowing, are the readers of *PCW*. There is no rule which says that users of Lotus 1-2-3 on an IBM PC inside a large corporation have to hate the machine they work on. Equally, there is no reason why a Spectrum owner should not be interested in and inspired by machines well out of reach and power range. Early issues of *PCW* carried a couple of features reviewing the PDP-11 minicomputer alongside 6800 evaluation boards with hexagonal input, and no-one thought it strange.

PCW's coverage must stay wide and open, and the new *PCW* Online service should help to keep that going.

The nice thing about producing a magazine for enthusiasts is that you can rely on the readers to keep you on the right track and scream loudly if there are things they don't like. In the current climate, it would help if they could scream even more loudly at the people who say the business is dead, and who seem so unhappy with annual growth of 25 per cent rather than 30.

Peter Jackson
Editor: Sept '85 – present day

1986 heralds the arrival of Unix micros

Apple's Mac goes into overdrive

Tune into the wireless

Robin Mudge looks at the way in which the micro has changed the design of the radio receiver and made short wave listening a much more approachable activity. Part Two next month.

Contrary to popular belief, the information revolution didn't start with the coming of the microprocessor, but with the transmission of the first transatlantic radio message by Guglielmo Marconi, way back at the beginning of the twentieth century.

Now, almost every country in the world transmits its voice by radio waves. Every year the number of nations becoming involved in radio broadcasting increases dramatically. Programmes range from political propaganda, through popular entertainment, information and news; their places on the radio dial and transmission schedules are published each year in large tomes like the *World Radio and TV Handbook* and the *Guide to Utility Stations*.

Whereas the microprocessor didn't start this revolution, it has certainly made Short Wave Radio Listening more accessible to the ordinary person. The radios, or more correctly receivers, have been reduced in size from these giant war-type receivers found in government surplus stores, to small portables with the power to pull in signals from all corners of the globe.

The control of them has been simplified and extended to a point where even the strange blips and blops of morse and radio telegraphy can be easily decoded and printed onto paper. So, for those of you who can put up with less than hi-fi sound quality and a lack of pictures, the short wave radio can provide an intriguing source of information, without having to connect your micro to the telephone.

History

Short Wave Listening, or SWL in radio jargon, was very popular in the 1920s-30s and the war years. Indeed, there were almost as many radio magazines then as there are computer magazines now. During the war, radio carried all sorts of information, and the public soon became quite adept at tuning into stations from different parts of the world, hoping to pick up hot news. Government agencies were particularly keen on monitoring the short waves; clandestine messages and other secret codes made up a substantial proportion of the transmissions.

In fact radio became a substantial psychological weapon. Sefton Dellmar ran a British radio station that pretended to be one of German military origin. Radio Atlanta, broadcast to the German U-boat service, was picked up by a huge German civilian audience. Later this station, transmitting from a hugely powerful transmitter on the south coast, imitated the ordinary civilian stations with some pretty devastating results

The hobby lost popularity for a while, but recently it has become more popular again, along with people's increased interest in world events. This trend has led Sony and Philips, among others, to bring out a new range of portable radios which offer many of the facilities found on proper short wave receivers.

Before discussing these new transistors though, what is so special about these short waves and what do they carry? It's got a lot to do with the way that radio waves travel through space: radio propagation. A radio waves path is affected by the weather, the season, the sun's activity and the time of day: it's a wonder that they get anywhere at all! Some of the waves hug the surface of the earth and can travel fairly long distances; these are called ground waves. Others travel upward – sky waves – and eventually encounter the outer atmosphere, where they can be reflected back to the earth by layers of electrically-charged particles called the ionosphere. These waves often bounce back and forth many times and in the process travel from one side of the earth to the other.

Both ground waves and sky waves offer useful features for getting messages about the place. Whether a radio signal travels as a ground wave or a sky wave is dictated mainly by its frequency, the low frequencies being ground waves and the high sky waves.

Theory

On to the theory. All radio waves, in common with all other electromagnetic radiation (radio, heat, light, x-rays and gamma rays), have a frequency and wavelength, both of which are immutably linked by the simple formula:

$$\text{Frequency} = \frac{\text{The speed of light}}{\text{Wavelength}}$$

The speed of light (and radio waves) is 299820 kilometres per second.

The best way to think of waves is to imagine one in the sea, edge on. These waves have a series of peaks and troughs; the distance between successive peaks or troughs is the wave's length, and as the wave moves, its frequency is the number of wavelengths that pass a fixed point in one second. The wavelengths in which we are interested range from 6000 metres to 10 metres in length — that's a frequency of 50KHz (kilo meaning a thousand and Hz meaning frequency measured in cycles a second) and 30MHz (mega meaning million).

The frequencies that most good shortwave radios can tune into are

Illustration by David Hughes

separated into three broad bands. Very Low Frequencies (VLF – Long Wave in Old English) stretch from 10KHz to 550KHz. These frequencies carry morse code and radio teletype, weather reports and other utility messages. Medium Frequencies (MF), or Medium Wave, stretch from 540KHz to 1600KHz (1.6MHz) and carry the domestic radio transmissions with which we are all familiar. Then come the ubiquitous short waves, or more correctly High Frequency (HF), stretching from 1.6MHz to 30MHz. It's this huge range of frequencies in which the short wave listener is most interested. They carry an enormous range of information ranging from clandestine and underground groups, ship-to-shore telephone, weather reports and a whole wealth of foreign radio stations like the *Voice of America* and *Radio Moscow*, beaming their thoughts and interpretations of world events as far as the prevailing propagation conditions will allow. On the short wave the world is literally at your fingertips. There are plenty of books listing what is transmitted where, and when; right across the entire frequency range from 50KHz to 30MHz. The times of transmissions are given in UTC (Universal Time Coordinated) which is, as near to making no difference, Greenwich Mean Time.

Mixed up with all these stations are the radio amateurs, more usually called 'Hams'. The Short Wave Listener (SWL) is not necessarily a Ham; Hams have to pass an exam testing their knowledge and practical ability in all things to do with the technology of radio before they are licensed to transmit radio messages. The exam, the RAE (Radio Amateur Exam) is controlled by the Home Office which also makes sure that the Wireless Telegraphy Act is put into practice. This act relates to SWL as well. It is illegal to receive anything other than international domestic broadcasts and radio amateurs, and the fines for doing so are quite stiff. If you accidentally tune into a non-amateur or domestic broadcast you must tune off it immediately. It's also strictly forbidden to pass on any accidentally overheard information to a third party. This is understandable: imagine you accidentally tuned into a ship-to-shore telephone conversation between two business colleagues, you might well hear some information which might be of value to a business competitor; without the protection of the Wireless Telegraphy Act, the consequences are obvious.

Requirements

Back to the short wave receiver; what do you need to become a short wave listener? This depends on how seriously you want to pursue the hobby. If you are only interested in picking up strong signals from transmitters in the larger countries on a very casual basis, or if you travel extensively and wish to stay in contact with Britain's *Points of view* via the BBC's *World Service*, then one of the new range of small portable radios is for you, costing between £150-£300.

If you are more serious and want to capture signals from the most remote of locations (DXing in radio terms), then a more sophisticated receiver will be needed, costing anywhere between £400-£1000. These receivers are more sensitive, selective and stable than the smaller portables. This means that they can capture weaker, more distant signals and sort them out from the morass of surrounding ones. Having done that they can stay in tune without drifting slowly away from the station over long periods of time.

To be a proper communications receiver, the radio must have a number of essential features. The most important is the ability to receive signals transmitted using a number of different modulation techniques. (This is the way in which sound or digital information is superimposed on a radio wave, which then carries it to its destination — the carrier wave. The most common are Amplitude Modulation (AM), Frequency Modulation (FM), Single-Side Band (SSB) and Carrier Wave only (CW). Both AM and FM use up quite a lot of radio space. SSB and CW signals use much less and so are used by amateurs in order to cram as many signals as they can into the narrow frequency bands allocated to them. Due to their efficient use of radio space, SSB and CW are also beginning to find favour in some commercial applications.

Listening to an SSB or CW signal on AM is impossible, so if you want to hear the amateurs, the set you choose must be able to decode them. Other useful features to look for are special filters to make the SSB and CW signals clearer by eliminating interference, and controls that effect the rate and finesse to which you can tune the set. The best place from which to buy a receiver is an amateur radio supplier rather than an ordinary hi-fi dealer.

Next comes an antenna, or aerial. The portables come with their own telescopic short whip antenna but for more serious listening and better results a more substantial one will be necessary. The simplest is a 'long wire antenna', which is just that, a long wire; the longer the better. It can be suspended from the roof to some other convenient point, either horizontally or down the side of the house. A feeder cable is then connected to it which leads into the house where it is plugged into the receiver. There are many commercial antenna around, many of which are very large and highly directional. The directional ones are much more sensitive to weak signals than a long wire, but they have to be mounted on a rotating device so that they can be pointed in the direction from where the signal is expected.

A useful and compact type is the Active Antenna. This contains active components which amplify the weak signals before they get to the receiver. Two types worth looking at are manufactured by Datong Electronics and Dressler UK. They cost between £55-£90. Both come with their own power supply and connecting cables.

Whether you choose a portable or a larger communications receiver, the design of the receiver will have been radically affected by the microprocessor. Its introduction brought about two broad changes: size and flexibility. The tuning range of these receivers is vast, from 10KHz in some cases, to 30MHz. In older sets the bit that does the tuning looks rather like a set of bacon slicers (the variable capacitor). It took up a lot of space and was badly affected by temperature changes and physical knocks. This has been replaced by a special computer-controlled tuning synthesiser which is unaffected by temperature and knocks and is an order of magnitude smaller. The miniscule Sony ICF-7600D is testimony to this; it measures only 12cm × 18cm × 3cm and is very light. It tunes from 153KHz to 19.999Mhz in 5KHz steps.

The flexibility has increased enormously with the control possibilities offered by the microprocessor. They include: direct entry of the frequency from a keyboard; memories to store known stations; the ability to automatically switch between stored stations searching for active ones; and so on. All these are included in the smaller short wave receivers from Sony, Philips and the British Uniden 2000

The larger ones offer this and more. The Japanese manufacturers Icom, Yeasu and JRC all produce receivers in the £500-£1000 range which can be connected to an external microcomputer via their own built-in parallel or RS232 interface. Software is available for most popular micros which will turn the receiver/computer combination into a very versatile scanning receiver.

The scanning receiver lets you enter large numbers of station frequencies, identification notes and receiver

control information into a memory bank. These can then be scanned automatically with the receiver stopping at any of them which start transmitting and recording the results on an audio tape recorder.

If you don't know what specific frequencies to listen out for, then the system will search all those between a present upper and lower limit. Each package offers many variations on this theme, but the overall advantage of this combination is that you don't have to sit by the receiver all the time — you can go off and do other things and come back later to listen to the tape. You can also take advantage of the diurnal variation in the propagation conditions by letting the system search for stations transmitting on frequencies that are active while you're out of the house.

Most microcomputers transmit a great deal of radio waves themselves. These can badly interfere with the communication receiver and so the micro's case usually has to be screened by spraying the inside with zinc paint (having first taken the circuit board out!)

For people more interested in using the radio as a scanning receiver and not wanting to tie their micro up to it, there is a very good dedicated micro controller for the Icom and JRC range of receivers. Called the POCOM PFC-100, it's Swiss-made and supplied by Dewsbury Electronics at £450. This unit is an intelligent programmable frequency controller. It's built into a well designed plastic-covered metal case measuring 282 × 67 × 220mm and weighs 2.4kg. On the front is an array of push button keys that control all its functions, and a liquid crystal display that shows what's happening. Once the unit is connected to the receiver's interface with just one cable, it's ready for action.

All the receiver's functions can be controlled from the keyboard directly. There are one hundred memories which can store the station's frequency, the text describing it, the reception mode (AM, SSB, CW, FM) and, on the NRD-515, even the bandwith, automatic gain control and attenuator can be set. There are also six 12-volt switchable outputs (for turning on different accessories) which can be set in any combination on any memory location.

All one hundred memories can be continually scanned and individual dwell (pause) times for each set. They can be split into groups of 10, and then each group scanned at different times using the system's versatile clock. This is a useful feature, especially for listening to groups of stations with a common interest. There's also a special 'wobbler' mode which causes the receiver to continually tune either side of a station's expected transmission frequency by any selectable amount. This covers the possibility of the station transmitting off frequency slightly and, therefore, under normal fixed modes, be lost.

The controller will search between any two frequencies in any tuning steps and at a variety of speeds. The set can, of course, be used manually, but has the advantage of being able to store all of its settings when an interesting station is found, at the touch of a button.

Scanning receivers of this sophistication do not guarantee the reception of those elusive DX stations. For those you have to spend time at your set. It takes operational skill and an understanding of the propagation effects of radio to really become a DXer. But they can considerably enhance the pleasure of short wave listening and certainly extend the use of the rather expensive equipment.

This combination of the Icom and PFC-100 is very versatile, and a joy to use. The only thing to come near it is the professional receiver range from the British company Vigilant. It's model vvvvv has two hundred memories and the receiver is of the very highest quality. At £3000 it is the lowest-cost professional receiver around, but you'd have to be a very keen amateur SWL to buy it!

Familiarisation

While listening around the short wave bands, you're bound to come across lots of radio telegraphy. This sounds like a conglomeration of blips, blops and chirping noises, most of which are unintelligible to the unaided ear. The microprocessor has leapt in here as well. With a suitable terminal unit which turns the audio signals into digital ones, it can decode these sounds and print the result on paper or display it on a VDU.

There are a number of different codes in use today but probably the easiest to recognise is the one that Marconi used to transmit his first message: the letter 's', from Poldhu in Cornwall to Signal Hill in Newfoundland. This is a Dot Dash code invented earlier by Samuel Finlay Morse, and named after him.

In Morse code each letter and number is represented by a series of dashes and dots, the letter A is .–; B–...; C–.–.; and so on, right down to ––.. which is the letter Z. Numbers are represented in a similar fashion, 0 being –––––; 1 .––––; 2 ..–––; down to ....– which is 9. On the radio you hear them as a pulse of single-pitched tone, the length of which dictates whether it is a dot or a dash, sounding rather like DAH DIT DIT DIT for B and DAH DIT DAH DIT for C.

Improvements

The 1940s saw the introduction of a new code in an attempt to improve the reliability and speed of data transmission. Called the Baudot code, it was used on machines made by the Teletype Corporation of America. This method of data transmission by radio became known as Radio Teletype or RTTY for short. The code is made up of five data units (bits) representing alphanumeric characters, with a start and stop bit added to tell the machine how to separate each one (Asynchronous). Each bit can have a value of 1 or 0. In radio terms this is called a Mark and Space respectively, after the very early telegraph machines that made inky marks on long strips of thin paper tape. When transmitted over a wire, each bit can be represented by a current or no current; over the radio this is translated into two audio tones. More recently several new methods of RTTY have been introduced: these are TOR, ASCII and Packet Radio

TOR stands for Telex over Radio, of which there are two types, FEC and ARQ. FEC or Forward Error Correction transmits everything twice to try and overcome the constant problems of signal fading and interference on the short wave bands. The characters are interleaved, producing a fairly large gap between the first transmission of a character and the second, allowing time (hopefully!) for any spurious interference to die down. Using this method messages are transmitted to large numbers of receivers, but even FEC can be badly disrupted by interference. For this reason ARQ, standing for Auto request, came in.

ARQ is much more complicated and is intended for transmission of information between only two stations. It requires each end of the data link to have both a transmitter and a receiver. The information sender transmits data in blocks of three characters in such a way that the information receiver can test them for corruption by interference. If they are correct, then the information receiver sends an all clear message back; if not, a request for a repeat of that block is sent. Using this method virtually error-free messages can be sent over long distances, even in the poorest of radio conditions.

Unlike the Baudot code which includes a start and stop bit in each character, TOR does not. Both ends

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of the communication link need to have their transmitters and receivers synchronised with each other. If they go out of sync, then the message becomes garbled.

ASCII transmissions and packet radio have come in with the increased use of microcomputers to decode RTTY. They use data formats similar to those with which computer users are already familiar. Using RTTY, messages can be sent at much higher data rates and with much greater reliability than other methods have allowed.

Objectives

The technology Marconi used was only capable of transmitting telegraphy by pulses, but while it is easy for us to transmit by voice telephony, you may well ask what is the point of all these codes. The answer is twofold. Firstly, voice transmissions use up lots more of the limited radio space; and secondly, RTTY is not as badly affected by interference — where a voice transmission might be completely obliterated by poor reception conditions, an RTTY signal can get through.

For these reasons some of those blips, blops and chirping sounds carry some interesting information. For example, most of the world's press agencies broadcast their news stories by some kind of RTTY on the short wave bands. It's fascinating to watch rows and rows of Teletype printers in a news room churning out news reports from all over the world, and also amazing how little of it actually gets into our newspapers, or on to television.

Just as there are publications listing utility stations on the Short Wave, so there are publications listing RTTY stations. The rules of the Wireless Telegraphy Act apply equally with RTTY. You are only allowed to receive amateur transmissions unless you have a licence to receive those transmitted by the coastal stations for shipping.

Radio teletype used to be, and still is in some places, decoded by mechanical teletype machines. These are large and limited in their application. Some people use them on an amateur basis but the microcomputer has made the reception of RTTY much more convenient.

There are two types of terminal unit: dumb and intelligent. In both cases, the terminal unit takes the audio signals from the loudspeaker or recorder socket of a communications receiver and turns them into digital signals representing the marks and spaces of the telegraphic code. The dumb ones pass these on to a separate computer where software decodes the telegraphy into text. The intelligent ones have a microprocessor and software built-in, decode the telegraphy and send it out of an RS232 or similar port, for printing or further computerised processing.

For dumb terminals prices range from £70 to £150, and a range of software for most popular home micros is available. Each of the telegraphic codes requires different circuitry to enable the audio signals to be decoded into digital form, so the cheaper ones usually only decode Baudot RTTY and Morse. The more expensive ones will also decode TOR and ASCII. The intelligent ones will usually decode Morse, Baudot, TOR (FEC and ARQ) and ASCII; some will even decode packet radio. ICS Electronics makes an intelligent terminal which can be used with its own software or with any micro running a standard communications package. The unit is controlled from the micro, but once it has been set up the actual decoding is done by its own ROM-based software.

Skills

Whichever one you choose, you will have to develop some special listening skills. There are three possible variables associated with any RTTY signal: the two-tone frequency shift, the Baud rate, and the polarity of the mark and space tones – but more on this next month.

Information

For more information about all aspects of RTTY, it's worth joining BARTG, the British Amateur Radio Teleprinter Group which is dedicated to all aspects of amateur data communications.

The nice thing about RTTY is being able to find an interesting station and then leave the radio alone, coming back later to read the telegraphy in peace; a scanning receiver and dedicated RTTY decoder makes it even nicer.

Whichever computerised communications system you choose:
DIT DIT DIT DIT, DIT DAH, DIT DAH, DIT DAH DAH DIT, DAH DIT DAH DAH, DIT DAH DIT DIT, DIT DIT, DIT.

Next month: The micro and radio telegraphy END

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Spectrum 128

The Spectrum 128 has many original features, but is sadly lacking in some of the 'basics', such as a screen and a disk, which might have been expected of a Spectrum upgrade. Guy Kewney finds out just what is offered in return for a high price tag.

The Spectrum 128 is so simple to describe that it hardly seems worth the bother of writing it down: it's a Spectrum with more memory and a few new features, none of which is remarkable, or first-of-its-kind, or even available at a new low price. Indeed, the price of the Spectrum 128 is £179 (or is planned to be, at the time of writing) and to get the benefits of the new machine, you need the 'optional' editing keypad, costing £20.

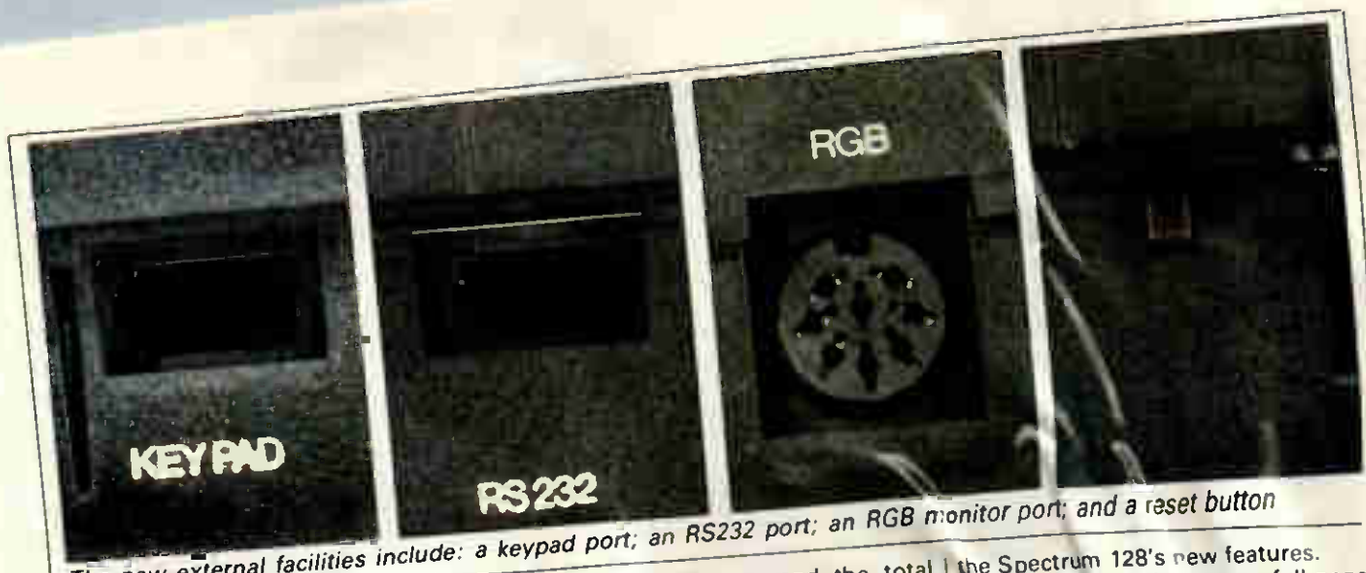
Logically, there is only one conclusion to draw: there are going to be lots of 'special offers' in the shops. Word has reached me of disks for the Spectrum, using CP/M. I've heard reports that the 'optional' keypad will actually be offered free – and, certainly, there's a space in the packaging where it would fit uncannily well.

I hope all these rumours and reports are true because, really, without these possible 'free' extras, the new Spectrum isn't much of a bargain for the money.

The Spanish Spectrum 128 is not the same machine, but is (although Clive will thank you not to mention this in Madrid) a test bed for this one. It has several little features which are not the same as on the 48k Spectrum, and you can't call it a disaster because word is that Sinclair has sold 25,000 Spanish 128's. But it did annoy software producers.

System specification

Your first question will be: why should I buy a Spectrum 128, instead of an ordinary Spectrum Plus? Answer: you get lots of extra goodies, which are: a RAM disk; no dot crawl on a television; sound on the television, no internal speaker; proper three-voice synthesised sound, not just *beep*; a space bar that works; a serial printer socket, usable for Midi synthesisers; a monitor plug with two types of output — RGB, and composite video output; a handy calculator, if you're using Basic; no more complicated hunt-the-right-key Basic keyboard problems; absolute compatibility with the 48k Spectrum (bar a few POKEs); a full-screen editor for Basic; a better Basic than Spectrum Basic, as well as the original; a big, solid lump of radiator fin — a heat sink — which should mean a more reliable machine; and the hope of bigger,



The new external facilities include: a keypad port; an RS232 port; an RGB monitor port; and a reset button

faster, more reliable games.

That's the good news. What you might wish you were getting includes: a joystick port; the 'optional' £20 keypad and editor box; a disk or even a microdrive interface; a display; a printer cable; a keyboard that you can read, instead of the typographer's scrambled egg that this machine inherits from the Spectrum; and a keyboard that you can type on, instead of wobbly cushion covers in an arbitrary non-qwerty order.

All the grouses notwithstanding, there is no question that I'd rather have this than a 'real' Spectrum. It's a very noticeable improvement. The question that buyers will have to answer in their own minds is simple: in a world where the Amstrad 6128 is being sold complete with screen, disk and CP/M for £250 (mono) or £340 (colour), isn't £180 a lot to pay for a very ordinary games box?

The three features which stand out are the RAM disk, the sound chip and its serial output, and the total compatibility with the old machine. The total compatibility is really quite uncanny — I've never before known a micro manufacturer to produce Mk II that will really and truly run all the old programs written for Mk I. This one does. But will anyone write programs for Mk II?

Rather stupidly, I'll start by assessing the Basic; stupidly, because it doesn't really matter whether the new Basic is faster, slower, nicer, or whatever — no-one judges a micro on its Basic any more.

Basic 128

The new Basic looks identical to the old Spectrum Basic and, indeed, will run the old Basic programs, apart from one or two PEEK and POKE commands which might have been left in by mistake. It is slower (around seven per cent) on the identical programs, but faster on the programs which take advantage of the Spectrum 128's new features.

The Basic includes a new, full-page editor with an automatic Renumber command, and, for the first time, keywords are typed in letter by letter. If the Basic were an important part of the machine you could happily spend hours debating the wisdom of this. If it's a good idea now, why did we have keys with four, or five, different functions before? On the other hand, if we don't need to have those crazy multi-function keys, why can't we have a clean keyboard? For example, to type 'greater than' on the old 48k Spectrum, you hold down the Symbol Shift key and press R. On the new one, you do the same. But on the old machine, you have another single key for <> (meaning not-equal – greater than, or less than)). On this machine, the <> is there on the W key, just like the < and the >, but if you press Symbol Shift and the W key together, nothing happens. You have to type

Inside: the new-format circuit board includes a sound chip, and lots of cheap diodes to prevent voltage spikes

Symbol Shift R and then Symbol Shift T.

I suppose, after you've had the machine a month or so, you get used to it. Sinclair's logic is that it had to do it, to be compatible with the old machine. You either agree, or you don't.

New Basic commands

Spectrum: this is the simplest new command, and turns your 128k system into a 48k system. It will then run all your old tapes, I (almost) guarantee (I do know of one it won't but I don't think you'll get excited about it) and behave exactly like a 48k Spectrum, even to the single-keystroke Basic.

Play: to make music, either connect your Spectrum 128 to the TV, plug in a cassette recorder and pop in a music tape — yes, the music will emerge from the TV loudspeaker — or use the Play command.

To set up a tune, you have to convert the notes into a Basic string. Codes decide how long the notes are, where the rests come, where it repeats, and so on. For example:

```
10 LET a$= "T18006(CDEC)(5EF7G)
   (3GAGF5EC)5Cg7C9CgC"
20 PLAYa$
```

Play three strings simultaneously, and they'll give you harmony. You can also specify eight strings (a$ through h$) to drive eight Midi-based synthesisers or drum kits, plugged into the serial port.

The system is perfectly adequate and an improvement on the old system of buying add-on Midi interfaces for the 48k Spectrum. It makes you wonder why Sinclair didn't include a disk interface, too.

'!': this is the magic fairy dust which transforms the normal tape loading and saving commands into lightning-fast RAM disk controls. Load! loads *from RAM disk; it can be a program*, a picture, data, or a data file. Similarly, Save! creates a file on RAM disk.

Here's the problem — Basic has no error-handling. If you try to create a file which already exists, Basic will die; if you try to load a file that doesn't exist, Basic will die. I haven't found a way (obviously, there must be one, using PEEK) to find out which files are in the RAM disk. Cat! is fine, because it tells you, but it doesn't tell Basic.

The speed of the RAM disk is, as you'd expect, phenomenal. I've used a little Benchmark of my own, in the past, to test RAM disks, but unfortunately that assumes a 16-bit computer which can PEEK and POKE numbers larger than 256. My Benchmark uses a thousand iterations, but the job of extrapolating from the eight seconds to run 256 iterations on this machine, to the 30-odd seconds on an IBM PC, involves too many unknowables. Consequently, I've left out the details and, anyway, comparing a 48k RAM disk with the 360k RAM disks on the IBM family is meaningless.

Benchmarks

All the Benchmark comparisons are in the melting pot, following the discovery of an error in back numbers of *PCW*. Initially, I decided that the Spectrum 128 ran ordinary Spectrum Basic faster than the old machine. Then, getting suspicious, I dug out the old machine and re-ran the Benchmarks.

Aargh! We've been maligning the Spectrum! It goes faster than we said! (Can we persuade Sinclair Research to spend a fortune advertising the fact that the machines are better than we thought?) Simple misprints, I think.

No, I'm *not* typing all eight Benchmarks into an old rubber-keyed Spectrum just to see if it really is slower. You do it, if it's that important to you. The Benchmarks otherwise appear to be identical from Spectrum 48 to Spectrum 128 — in 48k mode.

On the 128k Basic, they run slower because the interpreter has to stop every few microseconds to see if it has to change memory pages. However, that doesn't matter a tiny piece. If you look at the place where most time is wasted on the Spectrum, you'll quickly discover an audio tape cassette player occupying the space.

As a way of replacing the audio player, the RAM disk compensates for this slight slowdown more than a little. Examples include the programs that used to come on three tapes because there wasn't room in memory for them, but now come on one (admittedly, it takes 15 minutes to load) and can load all together.

Editor

The old Spectrum has a usable editor, where the top of the screen shows your listed program and you type in new lines at the bottom. I quite like it but it isn't a proper screen editor, where you change things on the screen and they change in Basic.

This one is. Wonderful! To use the full power of the page editor, you need the extra plug-in keypad/cursor keys. This costs £20, which is a diabolical liberty.

Bundled kit

With the Spectrum 128 are two Ocean games: Daley Thomson Super Test, a sport simulation (re-written, Ocean assures me, and *much* better than the 48k version) plus an adventure story, Never-Ending Story, based on the film. This game used to come in three parts, and now it all fits into the machine at once. Ocean is planning to put it on microdrive cartridges.

A power supply, cables for connection to a tape recorder, and (possibly, it is undecided at the time of going to press) a monitor cable, with no plug on the display end, are bundled with the machine.

Conclusion

If you have to use a TV as a display, then it's nice to lose the annoying shimmering effect which is caused by 'dot crawl' on the old Spectrum. On the other hand, Alan Sugar is offering a machine with its own monitor.

If you are fed up with 48k memory and want to run longer or over-laid programs, the 128k Spectrum is a really nice move forward on the old. On the other hand, just about everyone else (bar Acorn) includes a disk in the price these days. And even the BBC Micro has a disk operating system, though at the price you might expect a CD ROM. . .

A heat sink should eliminate many of the old 'catatonic' machines that turn themselves off after two hours. On the other hand, I leave most of my computers switched on for weeks (it's better for them!) — isn't this standard behaviour?

The sound output is a vast improvement on *beep*, and takes no time off the program in the way *beep* does. And the sound is almost as interesting as the old Commodore 64 sound (a bit simpler to program, admittedly).

In other words, the Spectrum 128 is very much nicer than the old Spectrum, but pretty damn ordinary compared with anything else. It's a calculated gamble, I suppose. Already, there is a good list of programs and products, specifically designed to work only on the 128k version, and so some software and hardware people are obviously convinced that it will sell. I just wouldn't like to predict how well.

Sinclair Research says that this is an 'evolutionary' product. I say the company had better get a screen and disk out for it, or it runs the risk of having produced just a better dinosaur.

Of course, Sinclair could always cut the price . . .

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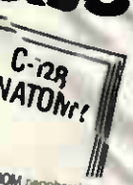

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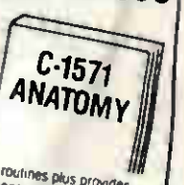

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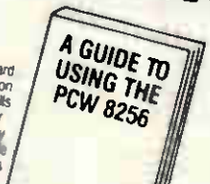

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In the never-ending fight against hackers, pirates, or anyone else trying to invade your system, computer security is big business.

Everywhere, devices are springing up for the protection of hardware, software, computer rooms and data. Increasingly sophisticated devices are appearing on the software front, while some companies have set up shop to fight the physical removal of equipment.

Two security measures which have been around for some time are data encryption and the use of dongles, neither of which are often explained.

Data encryption works by encoding a message which you need to protect, which is then decoded at the receiving end. The encoding is done via a particular program designed for the purpose.

Single-key encryption is the normal method used, although it is fraught with complications, as the sender and the receiver use the same key.

In a large network, the problem of managing these keys is enormous — a large electronic fund transfer network linking 100,000 terminals to approximately 100 banks would use 10 million individual keys, all of which would have to be changed frequently, according to BT researchers.

Experts, therefore, see public key encryption as the answer to computer security. The fact that this uses two keys — one for encryption and a second for decryption, means that the two keys form a unique combination, so the author of the message must always be who he says he is.

The idea is that once a message has been encoded, neither the sender nor an eavesdropper will be able to decipher it: messages can only be decoded by the second key, held by its owner. Although slower than single-key encryption, lack of speed is compensated for by the apparent security of the system.

The public key system means that the public directory need not be kept under tight security, and can be referred to whenever the caller needs to send a private message over a public data network using his own private key.

Two British banks are already using public key encryption on their data networks, and computer data banks containing sensitive personal information on individuals are also expected to adopt the system.

A public key encryption chip is reported to be under development by British Telecom, although spokesman David Orr couldn't give any details on how rapidly (or otherwise) things are progressing.

The principles of public key encryption were first worked out in 1975 by Whitfield Diffie and Martin E Hellman, electrical engineers at Stanford University, Connecticut, and the first practical implementation was developed in 1977 by Ronndal R Rivest, Adi Shamir and Leonard Adleman, computer scientists at the Massachusetts Institute of Technology.

Dongles

Basically a small piece of hardware, a dongle is usually comprised of a chip inside a cartridge which is encased in black plastic. This sits on the back of a micro, decked out in its black plastic mac, and without its presence you can't run the software that comes with it. The software contains a recorded program which checks to see if the dongle is pre-

sent, so each package is sold with a different dongle.

When the program is run, it tries to read the dongle, and if this isn't found, it bombs out the program and produces a message on the screen stating the obvious — that is, that are using an illicit copy.

ng a dongle means that you can copy a disk as s as you like, the copies less they can find this running the program e micro, disk and

clumsy way ises', the are au- software his object. , you would have to break into the program and get rid of the part that detects the dongle. How it got its rather bizarre name is anyone's guess. Ask any software house whether it uses dongles and it will reply: 'What's *that*?'

A company called Forecaster in Slough offers a number of software protection devices, although its main product is duplicating equipment. Sales manager John Dockett says: 'Our work is nearly always for micros. Our speciality is encryption onto custom software to prevent copying, and customers include Ashton-Tate and Lotus.'

The company is also the UK agent for Access Key, a dongle which works optically. Sold in kit form at £24.15, it consists of a 'domino-sized device.' You enter some special encryption into the program to be protected, and before you can gain access to the program, the computer will produce four flashing spots of light on the screen. At this point, you touch the screen with the domino, and the lights change into a password. This password is displayed on a tiny screen built into the domino, and you enter this number into the micro which then allows you past the password and into the program. This method is used by small companies, as well as central government, research establishments and the police.

Micros protected by Foremaster products include the Macintosh, the Apple, the Commodore, the BBC and the Apricot — the company has a tailor-made, disk-based protection

SECURITY

scheme for each one. The contents of the disk are added to the program to be used, and they can be used a set number of times, the minimum being 200. Normally used on business programs, there are a variety of titles including Superlock for the IBM, Century for the Apple II, Maclock for the Mac and Toughbrook for the Commodore 64. The advantage being that no password passes around. Instead, only random numbers whizz about — different ones each time — which makes the system very secure. It's also low-cost, with the calculator costing around US$100 and associated software being loaded onto the mainframe, meaning little tampering with the micro.

Solomonides is able to supply this system, although it is relatively new, and points out that any alternative may cost a few thousand dollars instead. He also stresses that writing encryption programs requires highly specialised knowledge and experience, as might be expected. 'The writer must be very knowledgeable about the operating system he is working with, so that the software encryption intercepts the addresses that are associated with physical devices which store data, such as disk drives,' he says. 'You need a competent mathematician who is also experienced in security and programming.'

'PCs are configured to be easy to work with and make changes on; therefore they are difficult — something he couldn't do with an illicit copy.'

The company reckons that for every original copy of WordStar, there are four illicit copies in use. WordStar 2000 was copy-protected, but MicroPro withdrew it because it was causing installation problems on certain machines. Like many commercial packages, users could make three copies of the program, which would record how many times it was copied.

Software houses specialising in games have developed a number of defences. Firebird recently began using a product called Lenslock to protect its games; the first to use the system is Elite, for the Spectrum. Consisting of a special lens and instruction sheet, which come with the game, Lenslock looks like an ordinary looking-glass surrounded by plastic.

Spokesman Phil Pratt

'You need the lens to be able to read the letters intitially produced onscreen, which appear as an absolute mess. Looking through the lens, you can read the characters, which you then tap into the machine to start the game.'

Anyone developing a protection device, however, will have to hope he doesn't fall foul of the MOD or the Patent Office, which seized a product called Copylock two years ago (February 1984) from Jim Lamont, boss of JLC Data.

Lamont claimed that tape copying would be impossible using the device, which he described as 'a coded imprint, invisible in use on the master tape, which only appears when someone tries to copy it.'

Lamont intended to license it so that the price of applying it to tape wouldn't work out higher than 2p per copy. However, the MOD and the Patent Office got there first and ran off with it, for the purpose of checking whether it was a danger to national security, and Lamont hasn't seen it since.

It is possible that the unfortunate Lamont inadvertently developed something the same, or similar, to that used by the MOD, but, not surprisingly, neither the MOD nor JLC Data will confirm whether this is the case.

Even the Met has got in on the security act. In autumn 1983, the police launched a property-marking scheme to aid the return of stolen property as a means of proving ownership. The system means grafting your postcode onto your goods, with your house number following on; for example, if you live at 3 Apple Tree Lane and your postcode is PSA 1AA, the system number would be PSA 1AA3. If you move or sell the goods, you simply add a cross to the old number and insert the new one, using a panel pin or marker.

The FBI is also leaving its mark. Fingerprint analysis combined with a personal ID number makes up a fingerprint analysis system being evaluated at FBI Headquarters in Washington DC. Designed to restrict physical access to high-security areas as well as access to computers and cash-point machines, the Model IDX-10 biometric security system provides electronic fingerprint identification and is made by Identix Inc of Los Altos, California. It consists of a central microprocessor and at least one 'personal verification' terminal. Users have to insert a finger into the PVT scanning bay so that the print can be photographed, and the result is then associated with the appropriate PIN and stored in the unit's memory. All this takes one minute.

When you come to use this unit, prompts on the LCD screen instruct you to enter your PIN and insert a finger into the bay. The unit takes seven seconds to figure out if you are who you should be, and verification then appears onscreen.

Anyone inserting someone else's finger for a laugh will be met with a ghastly noise, according to Identix, as well as a message on the screen telling you to cut it out (the fooling around, not the finger). Don Wald, vice president of engineering for Identix, says the system can lock an adjacent door (one way of keeping staff in the office), log the time of attempted entry and store the culprit's fingerprint for future ID. The system is based on a Motorola 68000 chip, 512k RAM, an 11Mbyte hard disk and back-up floppy, and up to 60 terminals can be linked to each computer.

A recent study by market research firm Frost & Sullivan in the US noted that information security products will be worth over $1.5 billion in 1989, more than doubling 1985's figure of $741.13 million. Computer security is expected to account for nearly 95 per cent of all information security revenue there. Another US market research company, International Resource Development Inc, estimates that the amount spent on data communication and encryption products will hit US$121m in 1987.

Computer crime is considered a national crisis in the US, and Futurex Inc, a company specialising in security systems for banks, government agencies and insurance companies, suggests that serious, embarrassing crimes committed against large financial institutions are not publicised as no-one is going to want to admit to them and risk losing their credibility. But perhaps if the companies involved could overcome their pride, they might get together to organise a solution.

Many millions of dollars are said to have been lost, and firms often don't prosecute because of fear of embarrassing publicity. A survey by the American Bar Association on computer-aided crime found that about half the respondents had suffered from crime of this sort in the past year. Of these, one third didn't report the crime, and 39 per cent reported the crime but didn't identify any suspects.

Protection

There are a number of companies in the UK dealing with protection; one, Selmor Engineering, provides a variety of devices to stop people walking off with hardware. Locking devices such as MicroSecure, DiskSecure and MonitorSecure come in kit form and cost between £13.85 and £26, depending on the combination of kit you choose. The finished result makes your PC look as though it has been wired up to a large drip — but surely that's a small price to pay when you consider that any burglar would have to stagger out with a whole desk attached to a micro?

Action Computer Supplies in Brentford supplies low-cost security alarms for protecting printers, PCs and other computer equipment, for £11.95 a time. These fit under the unit you want to protect, and result in horrible 105-decibel noises being emitted if someone decides to carry off your equipment.

Sales director Dick Sheppard describes it as an effective deterrent against casual theft, especially bearing in mind the sheer inconvenience caused by the theft of an item such as a PC. Although anyone with any sense will be insured, the cost in business time caused by theft of this kind is a real inconvenience.

Guardmaster, a new company based in Slough, was set up in December 1985 at the same headquarters as Corkey Control Systems (UK) Ltd. While Corkey specialises in access control to computer rooms, Guardmaster protects actual hardware. Corkey managing director Tim Copeman describes the new business thus: 'On the whole, we bolt micros down to desks to stop people walking off with them — the idea is to beat dishonesty. You can't easily walk off with a mainframe, but a micro is a different story,' he says.

The company also supplies card-operated locks and other security devices which cost from £100 upwards, for manufacturers and end users. 'The problem in the computer environment is that damage can be caused by people who know what they're doing, as well as those who don't,' he says.

Final thought

Mike Brown, technical manager at Micronet, practically sums up the whole area of security. 'You can never come up with something totally foolproof because people are adaptable and very clever, much more so than machines, and will always come up with a way of cracking something,' he says. END

Suppliers

Company	Tel no
Action Computer Supplies	(01) 903 3921
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Corkey Control Systems (UK)	(0753) 822428
PA Computers & Telecommunications	(01) 828 7744
Business Simulation	(0892) 863105
Foremaster	(0753) 820981

Thanks for the memory

Samuel Dick describes the functions of a memory management unit, and explains why such a unit is an invaluable aid in extracting the maximum performance from a micro.

The ability to extract a quart out of a pint jug has, like alchemy, long been sought after by mankind. Today, the problem reappears in the computer world — the quest continues to extract the maximum performance out of any computer. As software has become more complex, it has grown in size; operating systems and compilers with storage requirements near 1Mbyte are not uncommon, and applications programs can certainly exceed them in size. In many cases, such as digital image processing, it may be the data to be manipulated which takes up the space.

The increasing complexity in software has been matched by the improvement in hardware performance. Processors are intrinsically more able due to their rich instruction sets and different addressing modes. They are increasingly supported by intelligent peripheral handlers, floating-point math chips, and real-time interrupt control units. One of these support chips is the Memory Management Unit (MMU). Totally transparent to the high-level applications programmer, the memory management unit has helped systems programmers to tackle the space problem created by the ever-increasing size of software packages. With common processors, like the 68000 or National Semiconductor's NS16000 series, which routinely have 16Mbyte address spaces, the MMU's function is becoming more important.

Filling the jug

To understand how the MMU goes about its task, we must look at how a computer goes about executing a program. Typically, the program will have been written in a high-level language such as Pascal or Fortran, and will have been stored on a disk or tape as source code. In order to translate the source code into an executable form (machine code), the

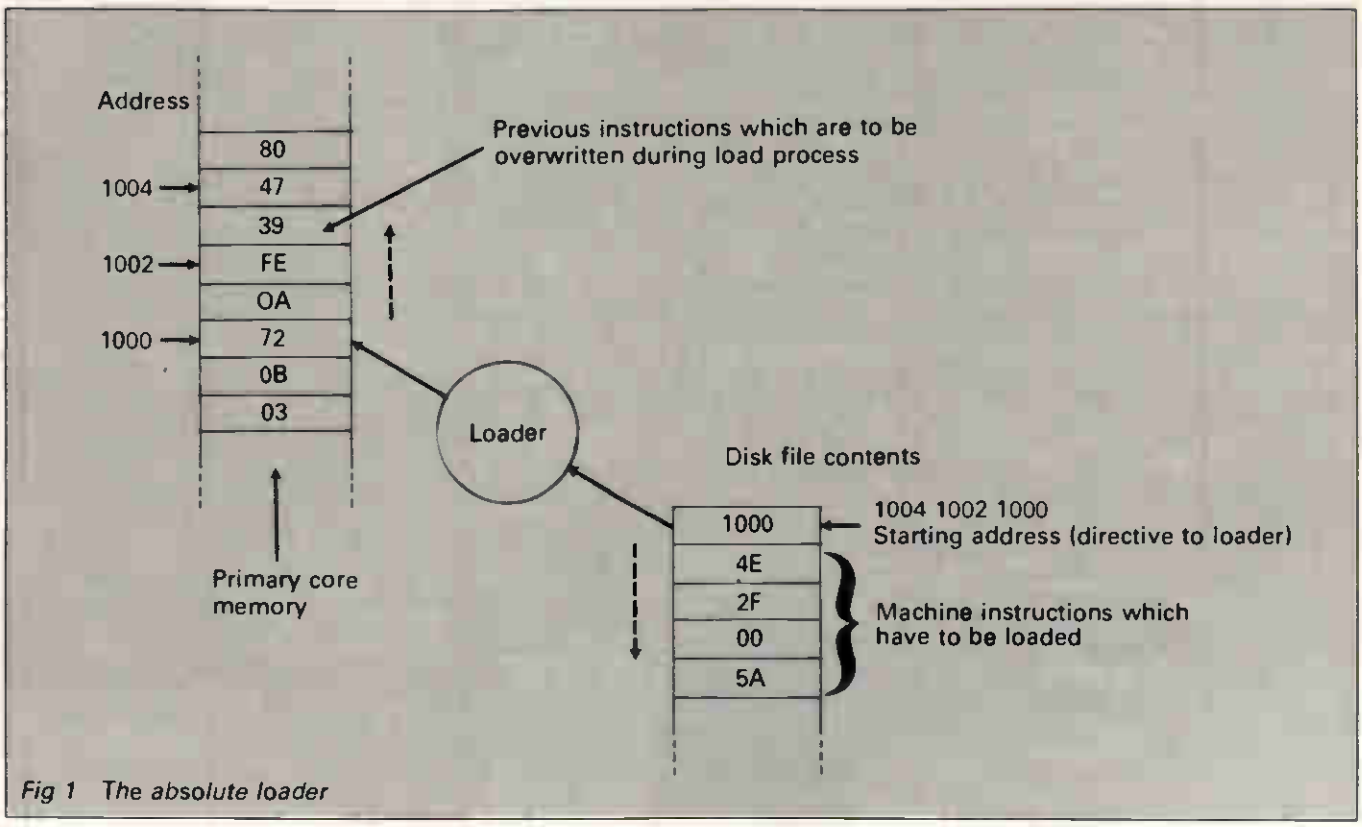


Fig 1 The absolute loader

Machine code (6800)

Address	Contents
0000	7F CLR 8005 ; clear location 8005
0001	80
0002	05
0003	86 LDAA FF ; load accumulator A with 255
0004	FF
0005	B7 STAA 8004 ; store accumulator A to location 8004
0006	80
0007	04

Relocation table

Address	Contents	
Arbitrary	00	0001 and 0006 are two addresses which
+1	01	require relocation in the above machine code.
+2	00	The addresses starting at 0001 and 0006 will
+3	06	have an offset added to them before execution
+4		

Fig 2 Relocation schematic

source is compiled to produce object code. Object code is rather like machine code, except that references to code called in by the program are left in dummy form. For example, a user might have written a program which is required to write to the VDU screen (a Basic 'Print' command, for example). At compile time, the compiler will translate the Print command into a call to a system subroutine which has the task of writing the required string to the VDU. However, the actual address at which the system routine starts will not be appended — only its name will be sent to the object file.

This may seem to be an example of double-handling, but its advantages will be explained eventually. The task of going through the object file and inserting the machine code referred to by the compiler's calls to routines is handled by the linker. The linker reads in the object file and searches in system and/or user libraries of subroutines to complete the references made by the compiler, and outputs the resultant executable image. The executable image is a file of the machine code instructions that will be resident in the machine's core when the program is run.

At run time, the operating system loads the executable image into core. To take a simple system, the image will have a start and end in the processor's address space and will be present in core for the duration of its life — that is, until the running program ends.

The Run command sets the program counter to the start address of the image, and execution commences. Such an 'absolute loader' (Fig 1) relies on the addresses used in the executable image being those that will be used as the program runs. For example, if a program uses a GOTO instruction, then the compiler will have translated it into a JMP $12E3 instruction where 12E3 is the hexadecimal address of the GOTO's destination. The addresses used as destinations of GOTOs or subroutine calls must be known at link time. The linker produces machine code for the executable image exactly as it will be at run time.

However, this simple loader has its disadvantages. The processor's address space may not be clear of other programs and memory-mapping addresses for peripherals, so the loader might have to transfer the program into different parts of memory, depending on the space available.

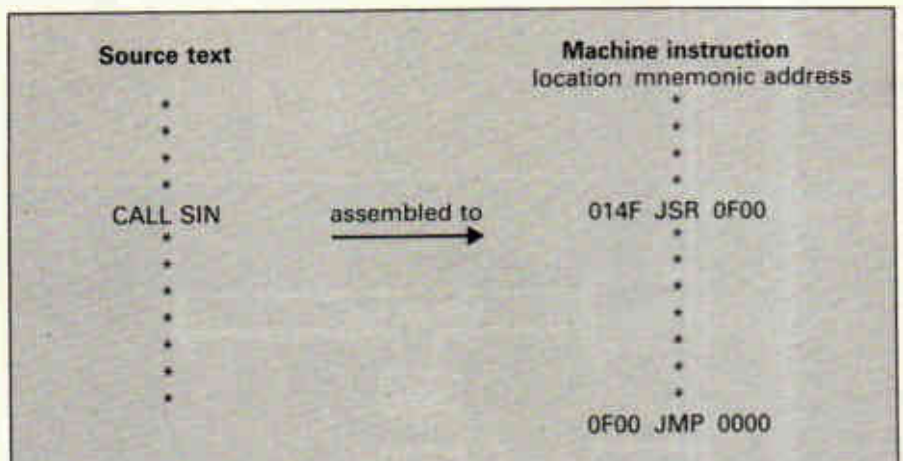
To solve this problem, the relocating loader is used and the compiler is designed to produce object code which is compatible with the loading technique. Now, the executable image may be placed anywhere in core because the image stored on disk or tape does not contain absolute addresses — instead, it contains offsets calculated relative to the start of the program. When the program is loaded, a constant is added to all the offsets to produce the absolute address. This is illustrated in Fig 2.

The simple relocating loader allows you to place a program anywhere in the processor's address space by changing the constant, and the final decision about where it is placed can be deferred until the program is run. In a large multi-user machine, user A's program might be run in the space $115A to $12FF today but in $1044 to $11E9 tomorrow, because those are the only locations in core which are not being used by any other users (this fact will not necessarily be known by the user and will not affect the running of the program).

Quarts into pint jugs

With old computers, small users would stand in awe of large users who, when they piled their stacks of punched cards on the computer operator's table, would write 'Full Core' on their Job Request Card. This two-word incantation signified that their job was so large that the whole of the processor's memory (which might have been only 32 kilo-words) was required. Today, such precautions are not necessary due to the advent of 'virtual memory'.

The concept of virtual memory is simplicity itself. When you consider the way in which a processor runs a user's program, you see that the processor is only executing one instruction at a time; as far as it is concerned, the other parts of the prog-



Linker uses a jump instruction with dummy jump address, and places SIN and 0F00 in the symbol table

Once the linker locates the SIN function, the dummy jump address (0000) will be replaced with the real address of the function

Symbol table

Function	Address of Jump
SIN	0F00

Fig 3 Linking

ram might not exist.

Virtual memory systems recognise this, and only keep a small part of the user's program in core at any time. The part in core is, of course, the section of the program which is executing or about to be executed by the processor. The remainder of the program is held on disk, and can be called into core within a few milliseconds when it is required.

The memory of the processor — both the actual core of the machine and the disk space allocated as virtual core — is partitioned into 'pages' which are typically 512 bytes in size: a 16Mbyte address space will have 32k pages. Most of these pages will be held on disk — 'swapped out to disk' — while perhaps only 1Mbyte or 2k pages will be resident in the machine's memory. Now you can see why quarts *do* fit into pint jugs — it's just that not all of the quart is in the jug at any one time!

The pages come in two varieties: physical pages, which are pages of real memory — 'core'; and virtual pages, which are purely a software convenience. To see how the pages work and how the processor organises its memory at run time, let's consider an example.

A user runs a program on the machine. The operating system allocates the program 20 pages (virtual), which are numbered from, say, 101 to 120. The program starts at page 101 and ends at page 120. When the system loads the program, only five physical pages are available in core, so pages 101 through 105 are loaded into memory and the processor starts to execute code contained in virtual page 101. As execution proceeds, page 105 is finished with, and as there is no more physical memory containing program instructions, virtual pages 101 through 105 are swapped out to the disk and the next five virtual pages are brought in to core. When that has been done, execution of the program continues.

This is the importance of the relocating loader — being able to swap pages of program code to and from core relies on being able to execute code anywhere in the address space.

Invisible to the CPU

Keeping track of which virtual pages are in core and which are swapped out to disk would be very wasteful of processor time: it would have to calculate the physical address for each memory access from the virtual address.

Enter the Memory Management Unit. Each time the processor attempts to access a memory location, for either a read or write operation, the MMU translates the virtual address contained in the software to the physical address. If the physical address is in core, the memory access proceeds. If the required location is not resident in core, the MMU will set about loading the page of memory containing the required location from disk into core. This translation and loading is invisible to the processor and the user; all the user sees is a large program or large arrays of data being handled effortlessly by the machine.

The translation procedure is performed by the MMU with the help of the operating system. Inside the MMU, a table is maintained of correspondence between virtual and physical pages — rather like a dictionary which allows us to translate between languages. This table is maintained by the operating system and the MMU, and is typically known as the Page Translation Cache.

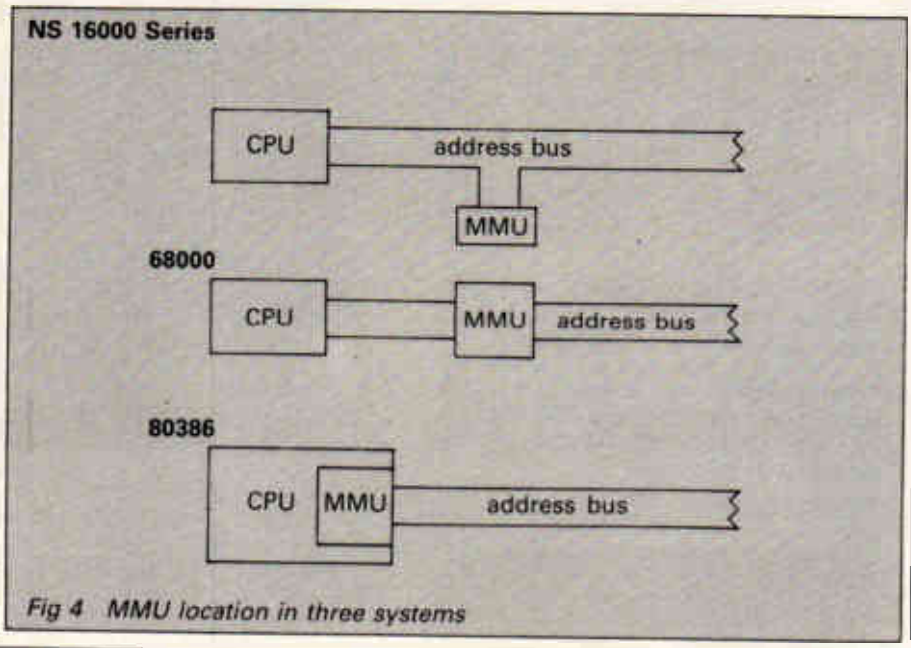


Fig 4 MMU location in three systems

Apart from memory management, the MMU performs other duties.

Within the MMU, the operating system can set protection flags on a page that, for instance, allows read-only access or access only to privileged users. Protection is important on most multi-user systems: it helps prevent the hacker syndrome and, in real-time applications, where a multi-million dollar facility is being controlled online, it can prevent software bugs from spreading catastrophe.

Dynamic (at run time) debugging is simplified by the MMU because it can carry out hardware breakpoints during program execution, and can also trace the last few operations of a program before, say, a conditional GOTO. Anyone who has ever used a dynamic debugging tool appreciates the immense aid it represents — the ability to make the processor watch certain variables (to see when they change value), examine the value of or deposit a new value into a variable while the program is running greatly eases detection of non-syntax errors.

The MMU can also keep an eye on hardware errors. Most memories have sophisticated error correction and control hardware built-in, and virtual memory systems help the computer engineer to design-in robustness. When the machine runs its diagnostics, extensive checking of physical memory takes place. If a fault is found, the software marks the page in which the error occurs as 'unavailable'. As the operating system is accustomed to shunting pages of virtual memory around to place them in unused physical pages, the avoidance of bad pages of physical memory does not cause severe problems; a large number of bad pages will only slow down the machine because more swapping has to be done to avoid them.

Working together

With memory management units proving so useful in address translation and debugging, it is obvious that they should be an integral part of any system architecture. How do the processor and the MMU work together? The exact method is dependent on the processor.

The National Semiconductor 16000 series processors (which range from 8-bit through to 32-bit CPUs) use a different technique to Motorola's 68000. When a 16000 series processor wakes up after a Reset command, it checks to see if an MMU is present. If the MMU is not present, memory accesses take four clock cycles: the address is placed on the address bus during the first cycle while the data is read-in during the

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Clock cycle:	one period of the system's timing oscillator
Handler:	hardware and software designed to allow the processor to control a peripheral
Linker:	a program which 'joins together' the various procedures in a user's program
Loader:	a program which loads primary memory from the secondary store
Offset:	that part of an address which represents the location of a byte within a page
Page:	an arbitrarily-defined section of memory — typically 512 bytes
Page fault:	a state generated when the page required by the processor is not in core
Page number:	that part of an address which defines which page a particular address occurs on
Page table:	a section of memory (which may be within the memory management unit) in which the map giving the relationship between virtual and physical addresses is kept
Physical address:	the address which will be present on the address bus of the memory
Relocation:	the process of moving a section of code in memory or altering the addresses within a section of code so that the code executes in a manner independent of its place in core
Symbol table:	a section of memory used by the linker which acts as a cross-reference dictionary for the calling address of subroutines, functions, and so on
Virtual address:	the address which is placed on the address bus by the processor — a notional address which has to be translated by hardware into a physical address

Fig 5 Glossary

fourth cycle. However, if the MMU *is* present, the processor configures itself so that memory accesses take five machine cycles. The processor places the virtual address onto the address bus during the first cycle. On the second cycle, the MMU places the translated (physical) address onto the bus and issues a Physical-Address-Valid signal. The data is latched into the processor during the fifth cycle when the Read-Data strobe has been activated. Contention over the address bus while the MMU is in control of it is prevented by the processor placing its address port into a high-impedance state, leaving the MMU to specify the physical address.

If the MMU has to update its internal translation table or a page of virtual memory has to be brought into core, the MMU goes about the action autonomously.

The 68000 processor also has an MMU chip. Unlike the NS16000 series MMU, the 68000's unit is placed in the address bus between the processor and the memory. If a page is selected and results in an access violation because the page of virtual memory has to be loaded into core, the 68000 idles until the page is made available. In multi-tasking systems, the idle time would be allocated to another user so that no machine time is wasted.

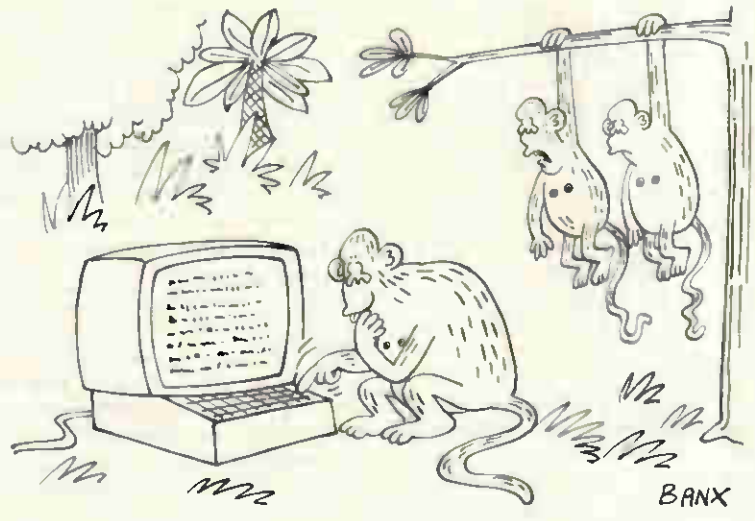
The Intel 80386 processor contains a memory management facility within the processor chip itself, which breaks the memory space of the processor into pages just like the other processors. Intel uses larger pages (4k), which allows the 4Gbyte physical address space of the machine to be mapped within the registers held in the processor.

Conclusion

What do virtual memory and the MMU mean to the average user? The advantages are really only apparent on large systems, although there is nothing to stop MMUs being used on 8-bit micros. With large, powerful machines, virtual memory gives the programmer freedom from having to worry about fitting a program into the physical (core) memory of the machine. Images, perhaps 2048×2048 pixels in size, can be handled using a machine with only 1Mbyte of core. As code has to be able to be used at any address in core, compilers and linkers produce machine code that can be shared between users so that the machine gives a truly interactive feel. Virtual memory brings us one step closer to having the perfect machine which is free from all physical contraints — just what the users want.

And the MMU? It just sits quietly by the processor, helping as required. The MMU lets even the processor forget that it has a limited physical memory, and guards sections of memory against illegal access. If someone is debugging, it helps the processor watch for users' program breakpoints.

And what of the future? An attractive scenario is one where each individual has a powerful, personal workstation — almost a return to single-user systems. As the price and physical size of fast-access semiconductor memory continues to decrease, it is tempting to speculate that the importance of virtual memory will decrease. The full addressing range of even 32-bit processors may be fully implemented as core — then quarts *will* fit into pint jugs. END



'He's already working on his third novel.'

SCREENTEST

Microsoft Logo

Microsoft Logo is a comprehensive version of the Logo language for the Apple Macintosh, but it does have its faults.

Owen Linderholm tests it out.

The only language for the Macintosh which Microsoft has produced prior to Logo is Microsoft Basic. When it first appeared, as version one, criticism was levelled at it because it did not make sufficient use of the Mac's features. This was remedied in version two, which allowed full control of windows, pull-down menus, and so on.

Microsoft Logo, unlike Microsoft Basic, has not been written by Microsoft but by Logo Computer Systems Inc. It also has the sanction of the father of the Logo language, Seymour Papert. My expectation was that a version of Logo which had been approved by the highest authority, and which was to work on the Macintosh, would be a very exciting product. In some respects Microsoft Logo easily lived up to my expectations, but in others I found it hard not to feel disappointed.

In use

The Microsoft Logo package comprises a single disk and three manuals: a *Reference Manual*, a *Guide to Programming* and a *Quick Reference Guide*. The disk includes various files apart from the language itself: there are several Logo demonstrations; and various files concerned with configuring Logo to suit your preferences and the amount of memory available. I was pleased to see this, as other versions of Logo I have looked at only recognise a maximum of 64k memory.

Not surprisingly, Microsoft Logo is heavily influenced by the Macintosh, with separate windows for different purposes. Initially the display shows two windows — one labelled Text, the other Graphics. The menu bar at the top of the screen shows three options — File, Edit and Debug.

Communication with the language is via the text window, where there is a flashing cursor which can be moved using the mouse and pointer. Any text typed is inserted on the text window at the cursor. Initially I couldn't make the language react to anything I typed, but the documentation states that the Return key moves the cursor to the start of the next line. What I needed was the Enter key. On the American version of the Macintosh keyboard this has the word 'Enter' printed on it; the British version has a symbol like a letter K on its side. I discovered this by trial and error.

The demonstration programs written in Logo which accompany the language show that this version of Logo is certainly capable of some very powerful things. Almost all the Macintosh features can be controlled; the only exception is pull-down menus, and no indication as to how to use these is available at the time of writing.

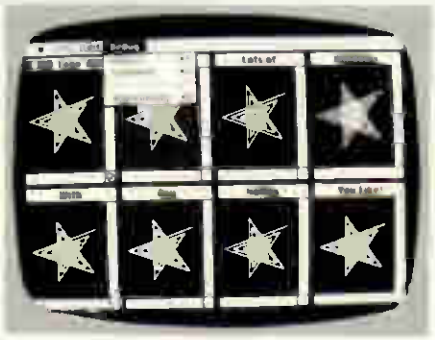
Logo is a structured language but is slightly unusual in that it is modular, and is related to Lisp in the way that it uses lists and properties. Microsoft Logo has all the commands of a standard Logo for list processing, program control, workspace management, turtle graphics, variable assigning and mathematics, and these all work as expected. However, there is one difference in the format of standard commands between Microsoft Logo and other versions of Logo I have used, and this is the IF command. On previous encounters, the command consisted of IF followed by a predicate such as :A = :B followed by one or two lists of commands. If the predicate was true, the first list was executed; if not, the second list was executed, if it existed, otherwise the next command was executed. Microsoft Logo separates these two possibilites into two commands, IF and IFELSE, with one or two lists to be executed respectively. Fortunately, this does not make it too difficult to convert programs to Microsoft Logo from other versions.

The standard Logo convention of having a separate editor for inputting procedures is adopted by Microsoft Logo. This can be activated from a pull-down menu or from the standard text entry window. Control of editing, such as inserting and deleting, is as delightfully simple as it always is on the Macintosh. When editing is finished, control drops back to the text window and a message appears confirming that all the procedures entered have been defined.

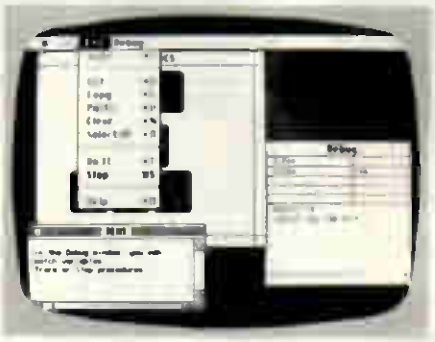
Procedure execution is straightforward and output is directed to the text or graphic windows as appropriate, and everything is fine until a bug is discovered in the program. I found it very difficult to work out how to use the debugging facilities available, and when they were working I found them extremely unfriendly. Debugging information is directed to a debug window which has to be opened separately. To be of much use, the editor window also needs to be open, showing the listing of the procedure being debugged, and the text and graphics windows should be open to examine output. All these open windows have to be continually moved about and resized while debugging is taking place, which makes the process slow and irritating. It also means that graphics displays are sometimes overlaid and destroyed if another window needs to be expanded.

Interfacing

The most interesting part of exploring the language is finding out how



Demonstration Logo programs



Editing and debugging

well it interfaces with the Mac's facilities which are not available on other machines. Previous languages such as Mac Pascal and Microsoft Basic have done this very well, and I had great hopes. A look through the manual convinced me that a comprehensive attempt has been made, apart from one glaring omission — pull-down menus. As a test of windows, graphics and mouse control, I wrote a simple, quick painting program which used a small oval brush shape. All it did was check that the cursor (controlled by the mouse) was in the graphics window. If it was and the mouse button was pressed, then a small black oval was drawn at the cursor position. The program then looped around. The program was approximately 10 lines in length and worked perfectly after some debugging of the graphic window.

Microsoft Logo's new, extra graphics commands allow the following facilities: choosing fonts and patterns; designing patterns; setting plotting width; drawing lines and shapes; filling; and changing cursor shape and font styles. These all worked as expected and quickly.

The new window commands are very interesting. Windows are set up as text or graphics and each has to be named; output can then be directed to any open window by giving the name. Commands are available to convert between whole screen coordinates and those within a particular graphics window. Windows can be moved and resized under program control as well as saved to and loaded from disk. Mouse commands are as expected, with the cursor/pointer tied to the mouse position and primitives to check the state of the button and the window the cursor is in. Logo primitives are basic commands within the language and are, effectively, automatically-defined procedures.

Surprisingly, considering Logo's educational bent and the fact that it makes no claims to being a serious systems programming language, the disk access and filing commands are extensive. They allow the complete construction of things such as disk-based random access databases, and in some ways this makes sense considering Logo's underrated potential as a list processing language.

The available workspace management commands include some to control which disks are in the Macintosh, to remove comments from procedures and to hide procedures from view, as well as the usual ones to show contents of the workspace and to tidy it up.

Apart from the usual variable assignment commands, Macintosh Logo also fully covers properties. Any Logo word can have a property list associated with it (a property list is a list of attributes and values which are associated with a particular name). For example, Fred (hair black eyes blue weight 175 shoe 9) is an obvious property list associating the given values with the name Fred. A full set of primitive procedures is implemented to control and access these property lists.

Sieve	4secs
Willow	78secs
Hamlet	13secs
Street	26secs

Fig 1 Benchmark results

An additional data type is allowed in Microsoft Logo: this is the array. One qualm I have always had regarding Logo is that it does not have a data structure like an array where data can be stored and retrieved extremely quickly, without having to look for it as with lists. An array in Microsoft Logo is, effectively, a list which has a specific number of elements. Elements of the array are accessed by their position within the array. It is also possible to convert a list into an array and *vice versa*. Some of the operations that apply to lists can also be applied to arrays, such as Count, MemberP, EmptyP, and so on.

One interesting addition to the mathematical calculations that can be perfomed are the commands Annuity and Compound which calculate annuities and compound interest. These are available presumably because they are part of the libraries available to Macintosh software developers.

In February 1985 *PCW* reviewed three versions of Logo for the BBC Micro, and four primitive Benchmarks, plus their listings, were given: two w… graphics; … manipulatio… prime numbe… Eratosthenes. W… tle graphics proce… recursively on the scre… other graphics program, drew a street scene consisting of four houses getting progressively smaller. The results of these Microsoft Logo Benchmarks on the Macintosh are shown in Fig 1. The results are considerably faster than those given for the BBC versions of Logo, but then they should be, given that the processor running them is a 68000 rather than a 6502.

The results for the Hamlet Benchmark vary considerably, depending on how large and how full the text window is that output is directed to. The figure given is an average of several, ranging from eight seconds to 20 seconds.

Documentation

The documentation accompanying Microsoft Logo is extensive and thorough. The *Guide to Programming* manual is really a guide to programming in Logo, with specific emphasis on the Macintosh and Microsoft Logo. Novice Logo users should find it an easy introduction to the language and this particular implementation.

The other main guide is the Logo *Reference Manual* which gives all the definitive answers. It is useful for people who know Logo and who simply require the finer details of how it operates.

Conclusion

Microsoft Logo is a powerful version of Logo, and has many facilities which make use of the capabilities of the machine on which it runs, the Apple Macintosh. It is suitable for people who wish to learn Logo or who wish to program in the language more seriously. Its structure conforms closely to previous standards, except in one detail — the use of the IF command.

Nevertheless, the interface with the user and the interface between the language and the machine are not as good as they could, and should, be. Experienced Macintosh users may find the language clumsy, although those new to it may not notice anything untoward. The package is rather expensive, even for educational users, although for those who want a comprehensive version of Logo with access to considerable power and memory, there is little to compete with it.

Microsoft Logo is available from Microsoft or its dealers at a retail price of £145, discounted to approximately £100 for educational users. END

SCREENTEST

Déjà Vu

If you think you've seen it all before, take a look at Déjà Vu from Intelligent Environments. This jotter-cum-database is also a first-class decision modeller, writes David Tebbutt, although some of its concepts look vaguely familiar . . .

When Intelligent Environments first launched Déjà Vu, it billed the product as an intelligent database, a decision modeller and an electronic notepad. Wisely, the company has decided to reduce the confusion and concentrate on decision modelling as the primary application.

It is worth pointing out to those who would like help with complex decisions that they can also use Déjà Vu as a jotter-cum-database inbetween bouts of decision-making.

Sticking to Déjà Vu's primary purpose, it enables its user to model very complex decisions in a very straightforward way. The presentation of the program on the screen is excellent — a feature which is unfortunately not shared by its manual. To be perfectly frank, you would understand Déjà Vu much more quickly simply by using it, rather than trying to glean any insight from the manual. All is not lost though. I called Intelligent Environments to announce the bad news, and the company admitted that it already knew and had commissioned a new ('extended' was the word used) manual.

I don't want to labour the point because Déjà Vu is a very neat product, but if the manual had been better written it would have knocked a day to a day-and-a-half off my learning process. As it was, it took me two days to fully understand the product. Don't wait for the new manual if you need the product now, just keep a copy of this review — it may come in handy.

Decision-making

At the most superficial level, decision-making is simply a case of choosing between alternatives (called 'Options' in Déjà Vu). We ponder our options until one emerges the winner. The more systematic among us may even list the options in order of preference. You won't be surprised to learn that Déjà Vu presents its conclusions in exactly that way.

Before we reach our decision, we will have examined all the factors which affect the final outcome. If choosing a car, for example, we will have looked at the various common features — seating capacity, petrol consumption, top speed, insurance group, and so on. Some cars may even have unique features which separate them from the others and these need to be taken into account. Power-assisted steering or a sun roof might fall into this category. Each option may be assessed on the features it has in common with the others and then the overall 'score' for each may be adjusted according to the unique features. Deeper down in the decision might be sub-options or more detailed contributory factors. For example, petrol consumption will comprise urban cycle and high speed figures. In this way we plunge ever deeper into the details of a decision and somehow, miraculously almost, we decide, then act. And breathe a sigh of relief, because complex decision-making is certainly tough on the old brain.

Business decisions, like where to apply information technology next, are very complex, and to model the entire area which contributes to the decision is not easy unless you have access to something like this package. It enables you to build hugely complex models full of options, special factors and weightings. What's even more useful is that you can play 'what if' by tweaking the importance or weighting applied to each piece of information supplied. Time after time, Déjà Vu will re-evaluate the model and present its new conclusions, usually in a matter of a few seconds.

There is absolutely no doubt that the really great (and the really awful) human decisions owe much to 'gut feel', and you may be sceptical of a system which offers the facilities described here. But it is also true that the more we understand the component parts of our decision-making processes, the more frequently will our 'instincts' prove to be right. Déjà Vu enables you to create a map of the problem area which you can roam around and experiment with, gradually gaining the sort of insight which leads to the great 'instinctive' decisions.

Structures

Déjà Vu's complexity is derived from a number of very easily understood concepts. First of all, you may hold any number of decision models in memory at the same time, subject to memory limitations. This is useful when common factors affect different decisions; it saves re-entering information for each decision model. Since the information is already in memory, albeit in a different model, Déjà Vu provides simple copying facilities to enable you to duplicate entries (but more on that below). Each model bears a name of up to 30 characters and Déjà Vu maintains a list of these called the 'Subjects' list, or page.

A page is a list of items which may be longer than the display area of the screen. Additional information on the page, but off the screen, is indicated by arrows at the top and bottom of the display, depending on where the screen window is in the page. All Déjà Vu printing activities are based on these pages.

Importance and table details

An Options page and Index window

The final result

Detailed results – by Option

Detailed results – by Point

Each subject, or decision model, will have all the parameters and options relating to that decision descending from it in a hierarchy of pages, sub-pages, sub-sub-pages, and so on. Apart from the Subjects page there are only two other types of page — 'Options and Points'. The Options page is a numbered list of alternatives to choose between. In our car example, the top-most Options page might have listed cars such as the Mini, Nova and Fiesta. But, since most decisions require lower level options to be selected, Options pages are allowed anywhere in the model.

The Points pages carry facts about decisions; criteria if you like. Again, from the car example, you might expect to see entries for the number of seats, the fuel consumption, the top speed, and so on. Values are attached to these Points and it is the combination of these values which leads Déjà Vu to decide the ranking of the various Options under consideration. The only problem is that having given a Point a value, this is shared by all other Points of the same name. As we shall see shortly, this can be overcome and it is also not 100 per cent true. But first, you need to learn more:

— Each Option or Point may have its own lower level Points and/or Options page attached to it. In this way, we break down decisions into ever-smaller details. The results from the lowest level pages are passed up to the next level which in turn are evaluated and passed up to the next level until eventually the results are attached to the entries in the top-most list of Options. (See the Calculation box for details of the method used.)

This may be clear for entries which have just Points or just Options hanging from them but we need to consider the case of entries with both Points and Options attached to them. This is where we overcome the problem of different Options sharing the same Points. When an entry has both Points and Options attached to it, Déjà Vu treats them as an Option/Point matrix. Each Option/Point pair is treated separately. In our car example we can have a Fuel Consumption Point on each car Option.

This is how a simple decision model might look:

Subjects page
Car decision
  Options page
  1. Mini
  2. Fiesta
  3. Nova
  Points page
  Seating capacity
  Fuel consumption
  Top speed

This could be visualised as a matrix (as shown in Fig 1)

I find it convenient to imagine Déjà Vu model structures like this:

An entry on any type of page
Options . . . . . Points
page page

The dotted line between the Options and Points pages reminds me that if both exist beneath an entry, then they are combined to form a decision matrix. And there is no reason why you shouldn't have complex structures involving endless nested matrices. In fact one of the examples given by Intelligent Environments is that of an economic model where companies are assessed in the form of a matrix; the results of these assessments are passed up to a higher level matrix which is looking at industry sectors according to the same criteria.

How to score

Now it's all very well to know that we can combine these structures into models of ever-increasing complexity. What we need to understand is how the values are assessed for each Point and Option.

Déjà Vu can only get values from the Points entries, so all the Points at the lowest level in the model are evaluated and the results passed to the level above. The only exception to this is in the case where we have a Point and Option page pair. In this case, the matrix is evaluated and the results attached to each Option in the list. The Déjà Vu user may attach a weighting to a Point in order to reflect its importance. In this way we may decide that seating capacity is more important than top speed, but less important than fuel economy. When the score arrives from down below, it is modified by this weighting before being attached to the higher level Point.

Once the ball starts rolling you will find results being passed up from Options pages, but which ones? The answer is either the highest score or whichever one the user forces up. We will see later that models may be evaluated ('analysed' in Déjà Vu jargon) under Déjà Vu control (Auto) or by the user (Manual).

We will also find values being passed up to Options which already have values coming in from a paired

	Seats	Fuel	Speed
1. Mini			
2. Fiesta			
3. Nova			

Fig 1 Matrix layout

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SCREENTEST

Points page. Déjà Vu uses one set to modify the other before attaching a final value to the Option. Phew! I hope that makes sense. Perhaps if we move on to see how weightings and scores are attached to Points it will become clearer. A Point's weighting is attached following entry of the Point name.

Simply press Tab and an 'Importance' weighting appears, preset to 50 per cent. You may vary this from 'Forbidden' through −100 per cent to +100 per cent and 'Essential'. This is done by pressing left and right arrow keys and watching the scale grow and shrink according to your needs. A press of the minus or plus key changes the sign and, on colour screens, the colour of the scale. This weighting is unique to this occurrence of the Point and is applied to any score which it receives from the user.

Having weighted the Point, we can attach a table of possible replies the user may give. This is entirely optional but it does make life a lot easier for the user and enables you to build a tidier and more consistent model. This may not be entirely clear until we look at evaluation next, but if the user is invited to think up answers during Analyse, there is a fair chance that he won't be very clever at dreaming up replies and values 'on the fly'. For example, let's say 'Petrol consumption' came up. The user, unprompted by your suggested replies, might go for 'heavy', 'moderate' and 'low' and attach scores of −50 per cent, 0 per cent and +50 per cent which wouldn't be too bad. On the other hand they might try to answer to the last decimal point '38.6 per km at 56 mph' and then try to think of a value for that answer which differentiates it sufficiently from all past and future petrol consumption figures they will need to load into the model. Take my recommendation and build some standard 'Reply Tables' before you let Déjà Vu loose on anyone, yourself included.

Having entered the weighting, press Tab again and a 'Tables' window will appear, inviting you to give your table a name. Type the name followed by Tab and an associated 'Values' window appears. In this you may type a 12-character description of a reply and a value to associate with it. Do this for each of the replies then, during Analyse, all the user will need to worry about is selecting from one of the plain English answers provided. Further help may be given by attaching a 'Footnote' at the bottom of the screen; for example: 'Please give an indication of the fuel consumption of this car. Sum the three standard figures given in the brochure, divide the result by three and select the appropriate answer from the reply window.' And, just in case you're counting, you may have up to 240 characters of Footnote.

Analysing the model

You may roam around the model, evaluating bits and pieces as the fancy takes you (Manual mode) or you may pass control to Déjà Vu, which will work round the model systematically, pausing to ask you questions whenever it finds a gap in its knowledge (Auto mode). We'll take the latter route, although it's worth noting that you may switch modes whenever Déjà Vu pauses to ask you a question.

'We ponder our options until one emerges the winner. The more systematic among us may even list the options in order of preference. You won't be surprised to learn that Déjà Vu presents its conclusions in exactly that way.'

Choose your Subject and press F3. From now on you will be helped through by a combination of Questions (*nèe* Points), Footnotes and Reply windows. Once a reply is selected, it is multiplied by the weighting for the Point and the result displayed as a scale and as a percentage against the Point. Each page of Points is presented in turn and you may alter your replies before moving to the next page by pressing F3.

I must say that the screen presentation and ease of use of Analyse is very impressive, an important factor when you consider that this is the part most likely to be used by inexperienced people.

The final results are presented as your Options listed in descending score sequence. Again, the scores are shown as both scales and absolute percentages. If you want to enquire more deeply into the results, press F9 ('Switch' in Déjà Vu jargon) to see a detailed analysis of the Points associated with that Option.

Alternatively, a whack of F4 will produce an onscreen breakdown of all the Points for all the Options. Ctrl/P will produce a printed copy of the report. As you can see, Analyse is the simplest part. It is also very fast which encourages experimentation. 'What if' modelling is not the tedious, time-consuming affair it is with some packages. It is almost instant once you've changed the parameters. And you are not restricted to changing replies: it's a simple matter to pop back into Déjà Vu's Edit mode and play around with weightings and even the Points and Options themselves.

In use

By now you will have realised that Déjà Vu is not at all a bad product to use. Considering its complexity, I think the authors have done a good job. Analyse of course is a doddle as we've just seen, so let's take a closer look at Edit mode and see what that's like to use. Edit is the bit that looks after you as you key in details of the Subjects, Points and Options. It has two other modes which let you fool around with the Index and with the Tables. The Table Edit is nice because it means you can do your thinking about replies and values away from the clutter of the model itself.

Most Edit facilities are intuitive — Ins, Del and arrow keys all do what you'd expect. A special 'Line mode' accessed from F5 introduces one or two nice touches. With this facility, you may operate on lines as a whole — insert and delete are the obvious options but here are a few more:

— the 'Up' arrow switches the current line with the one above.

— the 'Down' arrow does the opposite.

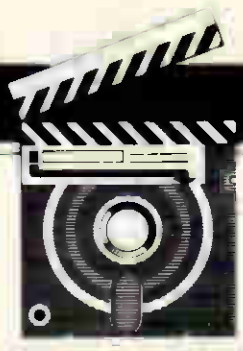
— 'S' sorts the page either alphabetically or by weighting.

— 'E' replaces the current entry with its Points.

— '+' and 'P' allow you to move entries around the model.

The Sort and Expand facilities I found most powerful: the Sort because it helps you tidy up Pages and Reply tables for presentation to the user; and Expand because it meant I could whip an entry out of the Index (always accessible from F7) and pull all its lower level Points onto the current screen. Sometimes you will want the same Points listed on several different pages; this is the quickest way of doing it.

Forgive me for not mentioning the + and P option. Intelligent Environ-



SCREENTEST

Calculation

Déjà Vu gathers two sets of figures for a page of Points, then combines them to give an overall total. One set is calculated for all the positive Points (the Pros) and the other for the negatives (the Cons).

To calculate the result for a single Point, Déjà Vu takes the Reply Score and multiplies it by the Importance Weighting for that Point, dividing the whole by 100.

Separate totals are accumulated for the page for both negative and positive results.

Also adjusted totals are calculated for both negative and positive results in which each result has an increasingly marginal effect on the adjusted total. With AT = Adjusted Total so far and R = Result for this point, the formula is:

$$AT+((100-AT) \times R)/100$$

The final calculation which gives the overall page total is as follows: where
PAT = Pros Adjusted Total
CAT = Cons Adjusted Total
SPR = Sum of Pro Results
SCR = Sum of Con Results
((PAT x SPR) – (CAT x SCR))/SPR + SCR

ments borrowed that, and quite a few other ideas, from a program I wrote called BrainStorm. I really can't decide whether to be peeved or flattered.

Moving around the model is a doddle. Press F10 to expand the current line to its lower level components and F8 to go back up again. If the 'owner' (my description) of the current page exists on more than one other page, a press of F8 will bring up a window of 'References' which lists all the possible pages you can refer to. The most recently used is highlighted at the top of the list so if you want that one, simply press [Enter] or F8 again. The others are ranked in order of the most recent use — a nice touch, but confusing if you don't know Déjà Vu is being clever. F9 switches between paired Points and Options.

The Index deserves special mention because it is so neat. You may access an entry in three different ways. Press F7 and the Index window opens with the current line highlighted. You may use the Pg and arrow keys to move around.

More exciting than that is that if you type a letter the index moves to the first word starting with that letter. Press another letter and focus switches to the word starting with both the letters. The letters, incidentally, are displayed either flashing or in a different colour to the rest of the entry. In this way you can quickly move to the item you want. The third alternative is to press F7 again and to type in a string of characters — Déjà Vu will alight on the next entry containing that string.

Documentation

I've really said all I want to say on this subject. The manual is a very thorough reference document which looks as if it was written by someone intimately familiar with the product but totally unfamiliar with the sort of person who would use it. The result is that you have to read something like 96 pages before you start gaining an insight into this rather excellent program. In case you missed the earlier comments, Intelligent Environments is apparently commissioning some sort of rewrite.

The onscreen documentation is much more helpful than the manual. A double press of F1 gives contextual help (and it *is* helpful) at all times.

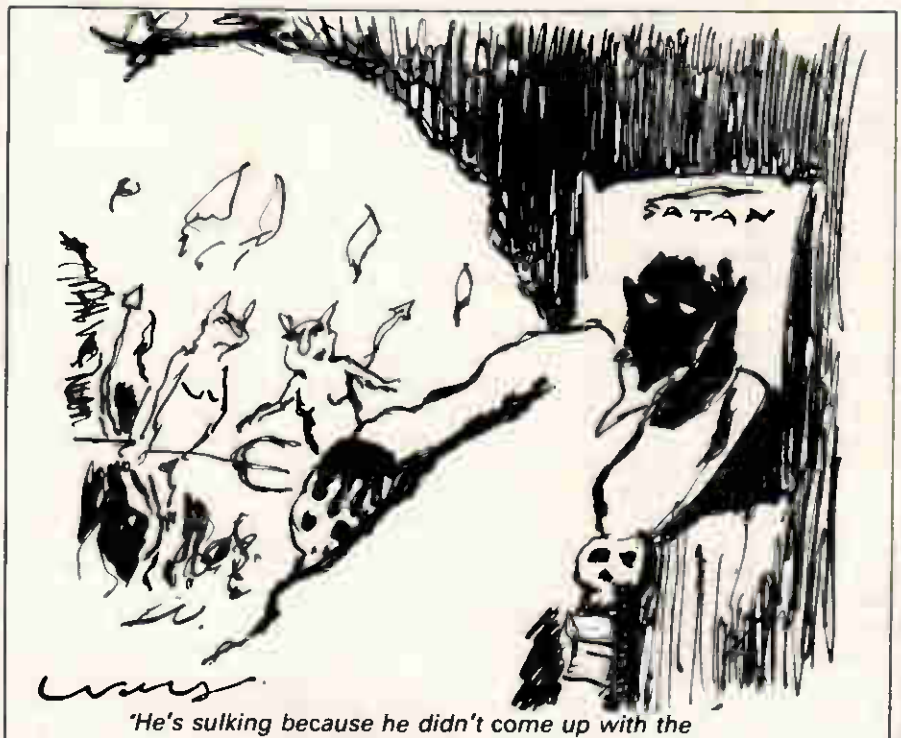
Price and supplier

Déjà Vu runs on IBM PCs and compatibles with at least one floppy disk and 256k memory. It costs £295 plus VAT and is available from Intelligent Environments Ltd, 20 Crown Passage, London SW1Y 6PP. Telephone: (01) 930 2967.

Conclusion

Before settling down to write this review, I spoke to Russell Hart at Otis Elevators about his experience with Déjà Vu. Like me he had great trouble getting into the product because of the manual but once he got going he found that it suited his requirements perfectly. Russell is a business planner at Otis and has used Déjà Vu to build a company model against which he can test strategic implications of various courses of action. The model contains details of every company process (around 75 of them) and the strategic elements of each process. As well as helping Otis, Russell is preparing his Master's thesis on this subject. He has also used Déjà Vu for staff evaluation and selection and for picking winners on the 'gee-gees'. Twelve out of fifteen winners sounds pretty good to me — and he didn't place a single bet! Russell is delighted with Déjà Vu. He is an experienced computer user — Lotus 1-2-3, Knowledgeman, AutoCAD and Multimate — and he's still very keen on Déjà Vu after three months' use.

Need I add more? The manual's a dog, the product's a gem. I could be picky about all sorts of details but there isn't much point. The real question is: Does it do what it sets out to do in a usable way?' and the answer is an unqualified 'yes'. END



'He's sulking because he didn't come up with the idea of computer bugs.'

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Electronic mail is often presented as the epitome of fast and efficient communication. But while the rapidly increasing popularity of datacommunications is all too the good, we have, argues Surya, still got a long way to go.

Nineteen-eight-six has been heralded the Year of the Modem: electronic mail promises the end of delayed post, lost documents and 'telephone tag'. Online information databases proclaim themselves as the final solution to the need for fast, accurate information. Traditional telex terminals are a dying breed, as even a humble electronic typewriter can be adapted to send and receive telexes. Datacommunications is king.

Last year was something of a celebration period for the datacommunications industry. Electronic mail, once the preserve of large computer companies and a few enlightened individuals, is now almost a household phrase. Telecom Gold has expanded from a mere 200 mailboxes in 1982 to over 21,000 today, and this number is expected to double by the end of the year. The modem has, during the same period, been transformed from an expensive mainframe and minicomputer peripheral to a sub-£100 box owned by thousands of ordinary hobbyists. In today's business micro systems, a modem is almost as essential as a printer.

And yet the datacommunications industry can ill afford to sit back and rest on its laurels. The present-day industry is a mass of confusion, inconsistency and disinformation. The very fact that datacommunications is achieving such popularity is indication enough that the time has come to make radical and widespread changes to the way in which the industry operates. The three keywords of its future must be education, standardisation and rationalisation.

Some of the changes I suggest in this article are radical: they will require reorganisation, effort and a willingness to overcome the technical difficulties. Not least, they will require financial investment. But adapting to suit the changing requirements of your customers is hardly a radical move from a marketing viewpoint: it's simple economic sense. For every inexperienced user struggling with the likes of IPSS, there are at least 10 others who have never even considered using any form of computer communications because of the perceived difficulty involved. For every online database user, there are a hundred potential users who aren't even aware of the existence of services which could be saving them time, effort and money. For every electronic mail user, there are thousands of people using antiquated telex machines simply because they believe electronic mail to be complex and uncertain. Not only are these potential comms users deterred now, but the chances are that a great many of them will remain prejudiced even after changes have been made. The need for action is urgent.

Education

Comms is no longer the exclusive domain of the expert computer user. More and more of today's users are neither experienced nor interested in the technicalities of computing. Their requirements are straightforward: they want a service which is efficient, reliable and, above all, easy to use.

Of course, the actual ease of use of a service is only half the issue; perhaps less than half. At least equally important is the way in which the service is *presented* to the user. A poor advertisement, and potential customers won't even bother to pick up the phone. A muddled leaflet or brochure, and you'll never hear from them again. An incomprehensible manual, and you will hear from them again. And again. And again!

The phrase 'computer literate' has become part of the English language. But while those outside the industry are perhaps beginning to appreciate what computers can and cannot do, comms is still shrouded in mystery, myth and muddle. While most people are aware that electronic mail is the computer equivalent of telex, few appreciate the advantages that it offers. While some are aware that Prestel is an online information service which allows them access to such information as train timetables, news and weather, few are aware of the vast and varied range of up-to-the-minute information available in this and other information databases.

A significant part of the educative process is simply to present the public with straightforward, accurate information in a comprehensible form. That this commodity appears sadly lacking is a responsibility which must be shared by service providers, software and equipment suppliers, dealers and the press. In a time when the largest untapped market for datacommunications products and services is the naive computer user, advertisements, brochures and manuals for modems, communications software and online services are still being aimed at the professional comms user.

And if jargon such as 'the service is accessed at 300-baud CCITT originate, using eight data-bits, one start, two stop, even parity, Xon/Xoff handshaking with optional XModem protocols and/or EPAD error-checking' isn't enough to deter people, the prices are. And yet, used correctly, dial-up computer services are not spectacularly expensive: the problem is simply one of education.

Let's take the example of an online database which offers information on limited companies registered in the UK. With a connect-time charge of £120 an hour, it seems at first glance a very expensive service. But in just 10 minutes' use, you can get a complete analysis of a potential customer or partner: balance sheet, directors' interests in other companies, parent and subsidiary companies, a credit rating ... all for just £20. Compare that with the cost of sending one of your employees down to Companies House, and it seems very reasonable. Think about the possible consequences of not having the information when you need it, and £20 becomes a ludicrously insignificant figure.

Similarly, with electronic mail. A connect charge of 10.5p per minute is an expensive way to send mail if you sit online while you compose replies to your business correspondence. But log off, write your mail offline using your word processor and then log on again to transmit the

Illustration by Simon Cooper

completed file, and you can send a message faster than a courier for less than the cost of a first-class stamp. If we are to encourage people to take advantage of computer communications, then education on this level is every bit as important as demystifying the jargon.

But presenting users with clear and accurate factual information is only one of the things needed to convince people that comms can work for them. Equally important is to introduce widespread and sensible standardisation.

Standardisation

Standardisation is arguably the most complex, emotive and confused issue in the entire computer industry. The benefits, in terms of simplicity, convenience and efficient use of resources, are self-evident, and yet these have to be weighed against the equally apparent disadvantages. The two microcomputer standards currently on offer are MSX for the home market, and IBM for business. Neither are anything to write home about. It's an uncomfortable dilemma which will doubtless be with us for a long time yet.

But standardisation of the data-communications industry is much simpler to achieve, and presents far fewer drawbacks. There are really only three baud rates in use, for example: 300, 1200 and 1200/75. And yet one 300-baud service requires eight data-bits, one start and two stop with even parity and Xon/Xoff handshaking, while another demands seven data bits, one start and one stop with odd parity and Sin/Sout protocols. There's no particular gain to be had from either; they are simply arbitrary settings which could be easily changed.

Similarly with modems.The Hayes protocol, a set of standard codes by which comms software can control the settings of a modem, is a great step in the right direction, and thankfully seems to be achieving widespread acceptance. But manufacturers are still continuing to produce modems which require different signals from the computer. Tandata recently released a beautiful intelligent modem called the TM512. It's completely automatic, does everything you might ask of it, has built-in memory for storing telephone numbers and is *totally useless* to me because it is controlled using non-standard codes. I can either throw away my existing, Hayes-compatible software and buy Tandata's own package, or buy a less attractive Hayes modem. A friend of mine has the opposite problem. Her auto-answer, auto-dial modem is Hayes-compatible, but her auto-answer, auto-dial software isn't — as she discovered only after buying both. Consequently her system neither auto-answers nor auto-dials.

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package isn't the end of it, of course. There's that most wondrous of beasts, the RS232 cable. The RS232 cable is, of course, an internationally-agreed standard. Except that we all know that it isn't. My Macintosh has a 9-pin rectangular modem socket. My Tandy 100 has a 25-pin rectangular socket. My modem has a five-pin DIN-socket.

Some machines have male plugs, others have female sockets. Some cables use nine wires, others use seven, five or three. Some carry DTR on one pin, others prefer a different pin; others don't use it at all. Some machines want DCD to be high, others need it low. Some want five volts, others insist on 12.

Creating a standard RS232 socket, cable, power requirement and wiring system is simple. *PCW* has already published one ('A superior standard', December 1985). Unfortunately, CCITT has published a different one, RS has one different to both and nobody uses any of them.

We must standardise. When the industry was young, and its relatively few users were quite happy with manual modems, suss-boxes and software configured by typing 1s and 0s against a list of options, a standard was a luxury to be considered in the dim and distant future, if at all, but that future has now arrived. Not only have many of today's users never heard of a suss-box, but those of us who have are becoming increasingly irritated with the frequency of its use.

There's nothing difficult about standardisation. Dial-up services could meet tomorrow to agree standard settings and protocols for each baud rate and have it in operation the same day. Modem manufacturers and software houses could switch to the Hayes standard with their next releases. Modem and micro manufacturers could adopt the *PCW*-standard cable in future machines. It's *not* difficult, it's *not* time-consuming and it's *not* expensive.

Rationalisation

The dictionary definition of rationalisation is 'to make sane', and nowhere is this need greater than in the field of computer communications. Much of this task would be achieved by the kind of standardisation I have mentioned. For the rest, let's start with IPSS.

International Packet SwitchStream is an eminently sensible idea. Instead of calling distant and overseas computers directly, and running up huge telephone bills, simply call your local PSS node and let the IPSS network connect you. Data is transmitted through this network efficiently using data 'packets', and the low cost is either passed onto the user directly as a PSS invoice or is included in the cost of the dial-up service.

IPSS is also a strong candidate for the '1986 Most Ludicrously Unfriendly Computer System in Existence' award. When you dial your local node, nothing happens. You have to send two carriage-returns, a two-character code identifying the type of terminal you are using and then another carriage-return before PSS will even acknowledge your call. After the briefest of unintelligible messages, it then sits there waiting for you to type 'N' followed by a six-letter ID and a six-digit password. This done, it then displays the welcoming prompt 'ADD?'. This is PSS's way of saying: 'Thank you for calling, which service would you like to be connected to?' You then respond by entering 'A' followed by a number containing at least 11 digits.

British Telecom, the operator of the PSS network, would no doubt claim that this user-indifferent approach is for security reasons, to make life difficult for hackers. Well, apart from the fact that there's not a hacker in existence who couldn't log on to PSS in his sleep, I've just told the world (well, *PCW*'s readership at least) how to do it.

'But,' I hear you call, 'you've forgotten about MultiStream. This offers a much friendlier way of accessing PSS.' No, my friends, I haven't. MultiStream is at best a half-measure, and at worst an irrelevance. A half-measure because the menu system it offers has to be set up in advance by the user, and an irrelevance because it doesn't allow access to the international PSS network. And the major use of PSS in this country is to access US databases.

The rational approach to PSS is to install a front-end to the system which firstly has a more welcoming and friendlier log-on sequence, and secondly requests you to type in the name of the service you require. An alphabetical list of services can be hash-searched almost as quickly as a numeric one, and it is a simple matter to include a 'near miss' search pattern to take care of mis-spellings and similar. Telecom Gold, for example, has a program which does this extremely effectively.

Electronic mail services need to install similar front-ends to their mail programs. It's ridiculous to have to enter a mailbox number when you could enter a name. Most services offer a facility which allows you to set up your own cross-referencing file so that you can mail regular contacts by name, but this is only a partial solution.

There are problems to this approach, of course. Names are not always unique. And we may not know whether to address mail to an individual or his company. But these problems are nothing new: they already exist, and have been overcome, in user directories. And even a £130 bulletin board system allows me to address mail to a named user.

Online information systems, too, require reorganisation. Free-text searches, tree-style menus and page numbers all have their advantages, and all should be offered in any database system. If I want to take a look at the business software directory on Prestel, for example, I know that this begins on page 60023, and typing this page number is the fastest way of getting there. If I want to check out tomorrow's weather in Yorkshire, I'm not sure offhand which page it is on but I know that I can find it by following the 'News and Weather' menu tree. If I want to get as much information as I can on a particular species of ant, then I would have no idea where to start, so a free-text search on the name of the species would be my best hope.

Again, there is a need for standardisation as well as rationalisation here. A free-text search is straightforward: I start with a general word such as 'ant' and then qualify it using logical operators (AND, OR, EOR, and so on) until I am left with a manageable number of entries. Or at least it would be straightforward if all databases used the same commands and syntax. They don't, of course.

Conclusion

Finally, one of the most fundamental aspects of rationalisation is to ensure that the service offered meets the requirements of its customers. Dial-up services frequently don't. We put up with their shortcomings from necessity rather than choice. Most dial-up services are in their infancy in terms of both ease-of-use and the facilities offered, and many of them bear a closer resemblance to an untidy hotch-potch of miscellaneous features.

It is not my intention to criticise what has been done in the past: rather to point out the changes which must be made in the future. Electronic mail is an excellent means of contacting people, but I can't leave the data equivalent of an answering-machine in my mailbox telling anyone who mails me that I am on holiday and won't receive their message for a fortnight.

Datacommunications has tremendous potential. But only through careful tailoring to its users' needs, can that potential be realised. END

SCREENTEST

Paradox

Paradox is an American package, similar to Lotus 1-2-3, which aims to bring together facilities from both spreadsheet and data management systems. Kathy Lang takes a look at how the capabilities merge.

Until about eighteen months ago, software writers maintained a clear distinction between spreadsheet packages and data management systems (DMSs). Spreadsheets handle information in a single rectangular table, held in the memory of the micro, and concentrate on good numeric processing with lots of functions; most also include direct graphical display of the spreadsheet. The essence of such packages is interaction, so control is exercised either directly from the keyboard, or through sequences of keystrokes stored in a file for subsequent re-use. Typical spreadsheets for the business market include Lotus's 1-2-3 and Sorcim's SuperCalc.

Data management systems, on the other hand, handle information in discrete records, usually allowing you to view just one record at a time; where the package allows several sets of records to be related, displaying and editing information from the whole set is allowed. Graphical display is rarely included. Control over DMSs ranges from the menu/keystroke approach used by the simpler packages, through combinations of menus and the ability to store keystroke sequences, to command languages of varying degrees of power up to that of a conventional programming language. In the upper part of this market, first dBasell and now dBaselll are the market leaders.

With the advent of the so-called integrated packages, these distinctions began to blur. Even with a closely integrated package such as Symphony, however, you must still define to the package which area of your worksheet is really a database, and it's possible to corrupt data by making mistakes in cell references. The data must still be contained in a single regular table, with no possibility of explicitly relating dissimilar sets of records. Furthermore, all the data must still be held in memory (even though, if you use an extra memory board, this may be an indirect rather than an obvious limitation). In loosely integrated packages such as Smart and Open Access, the distinction between spreadsheet and data management system is clearer, to the point where they can be purchased as independent modules.

A further step down the road towards marrying the spreadsheet and data management approaches is represented by Reflex (reviewed in *PCW*, February). Reflex allows you to view your data either as a rectangular table or as a full-screen form showing a single record, and includes powerful calculation features and graphics. (It is also very cheap). But Reflex retains the usual spreadsheet limitation of requiring all data to be in memory, and does not allow you to define relationships between two or more sets of dissimilar records.

Into this arena now steps a package which is being hailed in the US as the answer to these problems. For problems they are, in that, for many people, the need is to handle data using a combination of traditional data management and spreadsheet techniques, without the difficulties which have hitherto impeded that approach. Paradox, from an American start-up company called Ansa, is so called because it aims to provide powerful features in a way which people will find easy to use. These features borrow extensively from both the spreadsheet and data management camps, to the point where the documentation includes two brief booklets: one an introduction for users of 1-2-3; and the other for dBase users.

Like so many new packages in the business market these days, Paradox is at present available only for the IBM PC and close compatibles. It comes on four disks (one of which contains example data tables) which, when installed on your hard disk, will take up just over 1Mbyte, and needs 512k memory to run. Paradox is copy-protected, using the method which does not require the system disk to be checked whenever the system is loaded, and has one back-up system disk in case your original is deleted or corrupted beyond the possibility of uninstalling it. (Sympathise though I do with software suppliers concerned to combat rip-off merchants, I still feel that people should think carefully before coming to depend heavily on copy-protected software, especially from an as yet unproven company.)

The basic Paradox display shows a menu of options and then, once a set of records is loaded, a table with up to 22 rows, each containing a record, on the screen. At that stage, apart from the use of names for column labels rather than letters and/or digits, the display appears quite like that of Lotus 1-2-3. You can load many tables at a time, and resize the image each table presents to enable you to see several at once. (As an alternative, records can be displayed in a form mode, using either the standard form supplied or one designed by the user.) The table approach extends to many areas of Paradox; for example, if you ask to see a subset of records from a table, these will be displayed in a special, temporary table set up by Paradox

and called Answer, which can be handled just as any user-defined table. A table is also used to define queries — each row contains one group of selection criteria, and each field to be included in the Answer table is 'ticked', giving a visual indication of your choices.

A most unusual feature of Paradox is its memory management: a table will be kept in memory if possible, dramatically speeding up operations for small databases. If a table is too large to be held in main memory, Paradox will keep some of it on disk and 'page' it in as necessary. In addition, the disk version of the table being updated is amended regularly, to ensure that changes are not lost if the system fails. You can force this disk updating more frequently if you like, but at least Paradox takes some of the responsibility — a major objection to using large memory boards with conventional packages is the danger of losing data if the system goes down between your (usually lengthy and therefore irregular) saves.

Unlike most packages which use the table display approach, Paradox allows you to relate tables together when constructing queries, to add records from one table to those in another, and to check the validity of records in one table against values in another. These relationships are, however, only as permanent as the queries or updates themselves — they do not constitute a permanent part of the file definitions, as in packages such as Everyman; in this, Paradox is more like the dBase family.

The dBase similarity extends to the Paradox programming facilities, which considerably extend the interactive capabilities. You can record a sequence of keystrokes and store it as a 'script'; this script, which contains visible equivalents of all function keys, control keys, and so on, can be edited with the Paradox script editor, and extended using commands such as While/Endwhile which are not appropriate at the keyboard.

Constraints

The main constraints and features of Paradox are shown in Fig 1. The limit on record size shown is for keyed records, and at 1350 characters is rather on the low side. For records without a primary key, you can have up to 4000 characters per record. Date fields can be stored in two formats — MM/DD/YY and DD/Mon/YY, and shown in other formats in reports, but nowhere is the DD/MM/YY format used in Europe to be found, nor is there a special Time format field.

File creation & indexing

Creating a table in Paradox is quick and easy: you just name the table, and then enter the name and type of each field. For alphabetic fields, you give the maximum length as well. If the file is to be indexed, the field or fields which comprise the key must come first in the record; Paradox does not allow duplicate keys. The primary uses of the key are to ensure the correctness of the data (for instance, by stopping you storing two customer records with the same number), and to order the display of complete records, thus in turn speeding access by primary key.

Relationships between tables are not set up at file creation, but are temporarily established when they are required for queries or for table amendment.

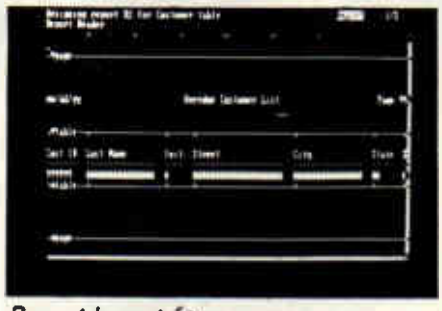
Secondary indexes are not set up explicitly in Paradox; rather, they are related to specific sets of selection criteria. For example, if you set up a query which you execute frequently, perhaps to extract information about all customers whose balances exceed a given sum and have been outstanding for a specified period, you can request an option called 'Query speed-up'. This will set up secondary indexes to the file or files upon which the query is based, in order to speed up the retrieval process. These indexes are not updated when records are changed, but they are amended when next a query is invoked that uses the indexes. No penalty is therefore carried on data entry, but there is some overhead when queries are asked. The extent of this overhead will depend on the size and nature of your application, and needs watching. For example, in my Benchmarks, the extraction of 20 records from 1000 took 27 seconds without an index, and eight seconds with an index — but the index took 54 seconds to build, and to rebuild after records had been changed. (Fig 2 shows the remainder of the Benchmarks. They were carried out on a 512k system, and I am assured by Ansa that, relatively fast as most of these times are, a 640k system would be significantly faster.)

When a table has been set up, its structure can be modified at any time without penalty; unlike the great majority of packages, appropriate modifications are made to reports, saved queries, and so on, to ensure that they still match the new table structure. (Some products even oblige you to reconstruct all reports based on tables whose structure is changed.)

Data input & updating

Paradox allows data entry and updating either in its Table view – that is, with one record per line, or in a Form view, in which each record occupies one or more screens. Editing allows you to make changes *in situ* to existing records. Data entry can be carried out either directly into the table concerned, or into a blank table and then added into the relevant table. For either mode, you can set up a variety of data validity checks, such as checking the range or pattern of data entered, ensuring that a value already exists in another table, giving a default value for a field, or making keyboard entry of a field value mandatory. While entering data, you can use a 'ditto' instruction to give a field the same value in consecutive records.

If you enter data into a blank table for subsequent merging with the original table, you avoid the danger of unwittingly changing existing records, and the manual recommends this approach. However, using the interactive facilities directly, you cannot prevent the entry of keys which



Report layout form

Standard form for customer record

Creating a new table

Three tables in view

SCREENTEST

duplicate existing records, and when these are added to the original file, the original records will be overwritten. You could avoid this danger by using Paradox's script-writing feature to check for existing records when the data is entered or when the update is made.

When editing data at the keyboard, there are two ways to find the record you require. You can use the cursor keys to scroll through the table, looking for the records to be changed, which would be a sensible approach where you are identifying records by their key. Or you can set up a query to select the subset of records to be edited; the selected records will be held in the separate Answer table, in which you can edit them before adding them back into the original table. (The manual appears to suggest that, in this case, the edited records would be thrown out because they duplicate records in the original file. In practice they replace the originals, as you would hope.)

In addition to interactive changes, you can set up automatic changes to all or a group of records, again through the query facilities ('Ask' on the Paradox main menu), thus enabling you to, for instance, increase the prices of a group of products by 10 per cent. If you need more sophisticated editing, you can set up a script using the full power of Paradox's command language PAL.

Screen display

Tables can be displayed onscreen either in a list format, one record per line, or in a form, one record per screen or screens. Moving between form and list view is achieved by toggling a function key. You can have as many tables open as you like (up to the maximum permitted by the amount of memory you have), and you can move about between them by using two function keys. The list format starts by showing all fields (allowing you to scroll sideways to see those that are off the screen), and up to 20 records at a time, but both these parameters can be adjusted to show fewer fields and/or records. This then makes it possible not only to have more than one table open, but to see them on the screen together — rather like using windows.

The use of tables is endemic in Paradox. For example, when you set up queries, the results are displayed in an Answer table; when you use the automatic updating feature, the old versions of the records are displayed in a table called Changed. If you are used to spreadsheet displays, this approach will seem very familiar. For those with more conventional data management experience, the form facility should fulfil most needs; a default screen format is provided for each table, and in addition you can set up a maximum of nine forms using paint-a-screen techniques. A big advantage is that a form developed in the interactive part of Paradox can be used as a basis for data entry or query presentation within scripts created in PAL. A form may extend over many screens, and you can move up and down within these screen pages with a single key.

Any report can be displayed either onscreen or on the printer, so for viewing records you can use the full formatting power of the report generator.

Printed reports

Paradox includes an extremely powerful report generator, giving great flexibility of design and formatting. However, it operates on a complete table; each table has a default report format and up to nine formats designed by the user. Reports operate on only one table at a time, so if you want to select a subset of records or fields, or to show information from more than one table, you must first set up the appropriate table using the Ask facilities.

As report formats relate explicitly to particular named tables, it becomes a four-stage process to produce a selective report, even when using an existing report design and preset selection criteria. The process is simple, and can be automated with a script, but it is not as easy or flexible as one would expect in a package of this type.

Selection & sorting

The selection of records for display through the Ask menu option could be said to be the heart of Paradox — certainly it is an area into which considerable development effort has been put. This is a welcome change from packages which seem to think that the goal of a data management system should be to get data in a subset of fields or records or both.

You fill in a query table, which consists of one or more rows with the same headings as the table to be queried. The process is highly visual, and very straightforward for the most part. For example, to choose a field for display, you give it a tick (by pressing a function key); all fields may be chosen by ticking the leftmost column, which contains the record numbers added by Paradox. To specify conditions a field must meet if a record is to be displayed, you enter the condition(s) in the field in the query specification table. Within a row, all conditions specified must be met for the record to be included; if more than one row of selection criteria is used, then a record must fulfil all the criteria in any one row.

Selection uses a wide range of options: these include comparison operators such as equal, less than, and so on; wild codes to match any character or any group of characters (these use the 1-2-3 conventions rather than the more usual DOS characters); the ability to choose re-

Max file size	65000 records
Max no fields	255
Max digits	15
Special disk format?	
Link to ASCII files	YV
Fixed rec structure?	Y
Amend rec structure?	Y
Link data files?	Y
No sort fields	NS
Max key length (chars, fields)	NS
Data validation	G
Unique keys	OP
Store calculated data	IN,BA
Store selecn criteria	P
>1 criterion /field?	Y
Browsing methods	SW
Reference manual+	***
Reference card+	***
Hot-line?	D
Max record size (chars)	1350/4000
Max field size	255
Max prime key length	NS
File size fixed?	N
Data types	N,C,D,$
Fixed record length stored?	Y
No data files open	ML
No keys	NS
Subsidiary indexes kept up-to-date?	Batch
Screen formatting	D,P
Report formatting	P,D,L
Totals & statistics	Y
Combining criteria	A,O,N
Wild code selection?	AF
Interaction methods	M,PL
Tutorial guide+	****
Online help+	****

Note: Maximum five stars possible

For a full explanation of abbreviations, see 'Database dossier', page 188, January 1985 issue

Fig 1 Features and constraints

Quite simply, it leaves other word processors lost for words.

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cords with blank entries in a field; and an unusual match called 'like'. This allows you to search for values that are close to the one you enter — for instance, if you cannot remember exactly how to spell a foreign surname. Matches may be with constants or with other field values.

You can also ask queries of combinations of tables. When doing so, and in several other query situations, Paradox uses a common mainframe software technique called 'Query by example', in which you enter an example of the type of value you expect to find in the field, and use this to connect fields or tables together. For example, if you have a customer file containing customer number, name and address, and an order file containing order number and details including the number of the customer who made the order, you would relate the two by entering an example value in the customer number field of the customer table, and exactly the same example value in the customer number field of the order table. The ticked fields in the two tables would then be shown in a single answer table, each showing one customer/order combination.

Where you regularly ask the same query, it is possible to speed up retrieval of the specified records by asking Paradox to build secondary indexes of the fields concerned. Whether this will in fact speed things up depends on a number of factors, including the amount of memory you have, and the extent to which you change the data between queries; for the indexes are updated, not when the table is changed, but when the query is issued. The total amount of time to update the indexes is likely to be less using this approach, and of course it avoids any time penalty when updating records, but in some circumstances it may take longer to recreate the indexes than to carry out the query without using them — I certainly encountered an example of this when carrying out my Benchmarks. I would prefer to see the package take a little longer — a second or two — to save each record, rather than taking a good deal longer when retrieving records in queries. It's worth emphasising, though, that this trade-off arises only when you cannot fit all your data into memory.

If your table has a key, it is displayed in key order; if it does not, it is shown in entry order. When you select records using Ask, the Answer table is shown in order by the first field selected. If you want alternative orderings, the Sort option can be used to sort a keyed table into another in the new order, or to sort a non-keyed table into another or into itself.

Calculation

Paradox's calculation facilities are powerful, and include a wide variety of functions in addition to the usual arithmetic operators and brackets. You can include calculated fields in data entry, calculate field values and aggregate them in Ask and Report, and make calculated changes to records in Ask.

BM1	Time to add one new record	3secs
BM2	Time to select record by primary key	4secs
BM3	Time to select record by secondary key	8secs
BM4	Time to access 20 records from 1000 sequentially on three-character field (same field as in BM2 key)	24secs
BM5	Time to access record using wild code	29secs
BM6	Time to index 1000 records on three-character field	50secs
BM7	Time to sort 1000 records on five-character field	2mins 40secs
BM8	Time to calculate on one field per record and store result in record	2mins 22secs
BM9	Time to total three fields over 1000 records	1min 39secs
BM10	Time to add one new field to each of 1000 records	4mins 39secs

Time to import a file of 1000 records: 3mins 50secs

Notes: NT = Not tested; NP = Not possible; + = including scrolling. Where two times are given, first is access to first record, second is access to each subsequent record

Fig 2 Benchmark times recorded on IBM PC/XT/H

Multiple files

Within the interactive part of Paradox, connections between files are made only through Ask. If you want to query files, you must set up relations between them through an Ask table, in the manner described under 'Selection & sorting'; such queries can be saved for subsequent re-use, but do not have any effect upon updating. (You can, though, check values in one file when entering data in another.)

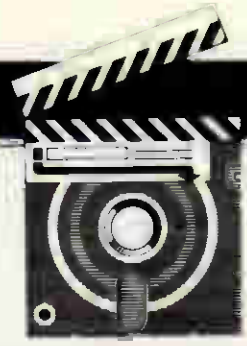
If you want to update several tables from a single data entry exercise, you must either carry out the operations explicitly each time, or set up a script to automate the process. This is very similar to the approach taken by such packages as the dBase family and Knowledgeman, but contrasts with those systems, such as Powerbase and Everyman, which regard relationships between tables, as well as within tables, as central to correct data analysis. Its flexibility is at once a strength and a weakness: the advantage is that you don't need to fix the overall data structure at the start, but can link files flexibly as you require. The drawback is that this very flexibility makes it much harder to achieve data integrity, because checks about the validity of data in linked tables must always be made explicitly, rather than being inherent in the defined relationships between the tables.

Tailoring

Paradox has a full command language, very similar to dBaseIII (including procedures with parameters), but with some extra features such as arrays of memory variables. Ansa expects people to start using these features via the script recording mechanism, which allows you to string keystrokes together and record them in a script for later re-use. The script can subsequently be edited and expanded, using both keyboard commands (with function keys being represented by visible equivalents) and non-interactive commands such as conditionals (IF/THEN/ELSE) and loop control (for example, WHILE/ENDWHILE). An editor for scripts is included in Paradox, but you can edit them with your favourite word processor if you prefer. When complete, scripts are held in an intermediate form which should be faster in execution than a full interpreted form.

Links with outside

Paradox includes the ability to import and export files in a variety of formats, including Lotus 1-2-3 .WKS files, dBase .DBF files (Paradox can distinguish for itself between dBaseII and dBaseIII data files), DIF and pfs



SCREENTEST

files, and ASCII text files with any delimeter. Exporting and importing are very simple — not, as I know to my cost, a universal attribute!

User image

The basic Paradox approach is centred on the use of tables to store data and to handle queries and data entry. You can use forms as an alternative to tables, but you can't avoid tables. Control over Paradox operations is based on a combination of menus and function keys. The current menu is shown if you press F10, and is displayed along the top row of the screen. Menu options can be selected either by moving a highlighted bar with the cursor (in which case, an explanation of the menu option appears below it) or by pressing the first letter of the option name. Most menus have sub-menus, and some of these show further options. So far, the approach is very similar to that of other packages aimed at naive users, but probably owes more to Lotus 1-2-3 and other spreadsheets than to conventional database systems.

Within tables, you can move around using the cursor keys, go to individual records using an equivalent of the spreadsheet GOTO, and use Ask to find an individual record. Function keys are used to provide further movement and control functions, such as putting ticks in query fields, and moving up and down images on the screen.

When you become experienced, you will want to automate operations you perform regularly. To do this, you can record sequences of keystrokes in a script, or enter such commands directly using Paradox's own editor or any plain text editor or word processor. The command language includes a variety of statements which would not disgrace a programming language, allowing you complete control over processing, including the ability to set up menus, re-assign function keys and, if you wish, hide Paradox from the user altogether. This takes the ability to control processing much further than spreadsheets permit, though no further than the most advanced data management systems.

Nevertheless there are, as you might expect in such a new package, some rough edges. The production of reports on subsets of data is one good example, where you must go through a four-stage process to carry out an operation which, in a command-based package like dBaseIII, can be achieved in a single statement. I also had some problems persuading Paradox to allow me to edit a table when I had carried out several successive operations on a variety of tables since starting the system; Paradox is not always very good at releasing memory when it should. Ansa suggests, and it seems likely to me, that these problems (which can be remedied by leaving Paradox and restarting) do not arise when your system has 640k memory.

That brings up another point, that Paradox's unique mixture of virtual memory processing and regular disk saves can be expected to be exceptionally effective on small to medium-sized databases, but might not be so effective for larger files. On a 512k system, my Benchmarks on a 1000-record data table were no faster overall than comparable disk-based systems, but on the basis of handling smaller example tables, I would expect a significant improvement with a bit more memory. However, Paradox does not at present support any extended memory boards such as the Intel Above Board, but this must be an early development, and would greatly affect the effectiveness of the product for large databases.

Documentation

Paradox comes with an impressive — not to say intimidating — array of documentation, including an introduction with tutorial examples, a user's guide (which includes a menu 'road map'), a guide to the PAL language, and two booklets — one for Lotus 1-2-3 users and one for dBase users. The documentation is well laid out and imaginatively presented, but it is organised totally around the Paradox menu and command options. This is fine most of the time, but occasionally makes it hard to find out how to do something which is not directly provided for in the menus.

Conclusion

Paradox has an extensive range of functions, and takes a novel approach to combining the best elements of data management and spreadsheet methods of analysing structured data. It also has an extensive range of facilities for system developers. It should be clear by now that the interactive approach used by Paradox owes a good deal to that of Lotus 1-2-3, so many people will be drawn to it as a way of getting data management facilities in a form with which they are already familiar. By and large, that would be a reasonable approach if the absence of graphics within the package does not worry you, and provided you accept that at least some of the functions you want to perform are likely to be tedious unless you are prepared to learn a little about scripts. This may not be as easy as all that, since the progression from keyboard use may be less natural in a package which builds individual commands on-screen as models of how stored commands work.

For those who are starting from scratch, the conclusion is less obvious. In particular, the table approach is not well suited to all kinds of data, and Paradox is not cheap, so it is well worth doing some initial exploration of your data and its properties before you decide (and perhaps even experimenting with one of the cheaper packages such as Reflex if your data will fit into the memory you have).

But there is no doubt that Paradox is a force to be reckoned with, and should prove a powerful stimulus in the direction of integrating spreadsheet and database facilities. END

Summary

Supplier:	P&P Micros
Telephone:	(0706) 217744
Cost:	£550
Systems:	PC
Version reviewed:	1.0
Type:	S,N
Features:	Data management system: looks like a spreadsheet. Powerful data selection and reporting throughout. Can relate separate files. A keyed file must have a unique key (may be several fields). Stored key sequences plus full command language
Drawbacks:	Reporting on linked tables rather clumsy: tables not always ideal. Performance on large files needs watching
Ease of use:	At basic level very good, including menus and very visual form-filling. Transition to programming may not be easy

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READER SURVEY 1986

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The best magazine is the one which reflects its readers' needs. The only way to find out how we are doing is to ask you, so even if you don't normally fill in forms, we'd like to hear from you. Furthermore, if you help us, we will be helping the starving people of Ethiopia. For every 10 completed questionnaires returned, we will donate £1 to one of the charities listed below (please tick your preference):

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Oxfam – Ethiopian Appeal ☐

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Fill in the form and pop it in the post by 18 April 1986. **No stamp is required** – see the end of the questionnaire for the **Freepost** address.

1 How often do you purchase *PCW*? (Please tick box.)

Every month ☐ 01
Once every two months ☐ 02
Once every three months ☑ 03
Are you a subscriber? 04 ☐ Yes 05 ☑ No

2 *PCW* has many regular features – please rate as follows:

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Newsprint	☑ 01	☐ 02	☐ 03	☐ 04
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Letters	☑ 09	☐ 10	☐ 11	☐ 12
Banks' Statement	☐ 13	☐ 14	☑ 15	☐ 16
Hardware Benchtests	☐ 17	☑ 18	☐ 19	☐ 20
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Checkouts	☐ 25	☐ 26	☑ 27	☐ 28
Bibliofile	☐ 29	☐ 30	☑ 31	☐ 32
Screenplay	☐ 33	☐ 34	☑ 35	☐ 36
Computer Answers	☑ 37	☐ 38	☐ 39	☐ 40
Networks	☐ 41	☐ 42	☐ 43	☑ 44
End Zone	☐ 45	☑ 46	☐ 47	☐ 48
SubSet	☑ 49	☐ 50	☐ 51	☐ 52
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3 What would you like to see in *PCW* that isn't there? Please attach a separate sheet if required.

T.J's Workshop or similar

4 Do you have any other comments about *PCW* (good or bad)?

Again, please attach a separate sheet if required.

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Up to 2 ☑ 01 3–5 ☐ 02 6–8 ☐ 03 9–11 ☐ 04
12–15 ☐ 05 15+ ☐ 06

SPECIAL FEATURES

6 Please rate the following list of special features. (Please tick)

	VERY INTERESTED (would read in-depth)	QUITE INTERESTED (would read but not in-depth)	MILDLY INTERESTED (would glance at)	NOT INTERESTED (would not read)
Emerging technologies	☐ 01	☑ 02	☐ 03	☐ 04
Hardware – how it works	☑ 05	☐ 06	☐ 07	☐ 08
Software – how it works	☑ 09	☐ 10	☐ 11	☐ 12
Programming languages	☐ 13	☐ 14	☑ 15	☐ 16
Over the horizon – speculation	☐ 17	☐ 18	☑ 19	☐ 20
Applications/case studies	☐ 21	☐ 22	☐ 23	☑ 24
Hardware projects	☑ 25	☐ 26	☐ 27	☐ 28
Software projects	☑ 29	☐ 30	☐ 31	☐ 32
Networking	☐ 33	☐ 34	☐ 35	☑ 36
Online services	☐ 37	☐ 38	☐ 39	☑ 40
Graphics	☑ 41	☐ 42	☐ 43	☐ 44
Animation	☐ 45	☑ 46	☐ 47	☐ 48
Education	☐ 49	☑ 50	☐ 51	☐ 52
Artificial intelligence	☐ 53	☐ 54	☑ 55	☐ 56
Natural languages	☐ 57	☐ 58	☑ 59	☐ 60
Engineering/scientific	☐ 61	☑ 62	☐ 63	☐ 64
CAD/CAM	☐ 65	☑ 66	☐ 67	☐ 68
High-powered computing	☐ 69	☐ 70	☑ 71	☐ 72
Operating systems	☐ 73	☐ 74	☑ 75	☐ 76
Processors	☐ 77	☑ 78	☐ 79	☐ 80

PERSONAL COMPUTERS OWNED

7 Do you you own a personal computer? (Please tick)

YES ☑ 01 NO ☐ 02

Do you use a personal computer? (Please tick)

YES ☑ 03 NO ☐ 04

Do you plan to buy a personal computer system in the next 12 months? (Please tick)

YES ☐ 05 NO ☑ 06

If you reply yes to any of the above, which of the following categories apply? (Please tick)

	OWN AND USE			PLAN TO BUY		
	Own & use at home	Own & use at work	Use at work	To own personally	To own & use at work	To use at work
Amstrad	☑ 01	☑ 02	☐ 03	☐ 04	☐ 05	☐ 06
Apple II	☐ 07	☐ 08	☐ 09	☐ 10	☐ 11	☐ 12
Apple Mac	☐ 13	☐ 14	☐ 15	☐ 16	☐ 17	☐ 18
Apricot	☐ 19	☐ 20	☐ 21	☐ 22	☐ 23	☐ 24
Atari ST	☐ 25	☐ 26	☐ 27	☐ 28	☐ 29	☐ 30
BBC	☐ 31	☐ 32	☐ 33	☐ 34	☐ 35	☐ 36
Commodore 64/128	☐ 37	☐ 38	☐ 39	☐ 40	☐ 41	☐ 42
Amiga	☐ 43	☐ 44	☐ 45	☐ 46	☐ 47	☐ 48
IBM PC/AT/XT/ Compatibles	☐ 49	☐ 50	☑ 51	☐ 52	☐ 63	☐ 54
RML	☐ 55	☐ 56	☐ 57	☐ 58	☐ 59	☐ 60
Sinclair Spectrum	☐ 61	☐ 62	☐ 63	☐ 64	☐ 65	☐ 66
QL	☑ 67	☐ 68	☐ 69	☐ 70	☐ 71	☐ 72
Sirus/Victor	☐ 73	☐ 74	☐ 75	☐ 76	☐ 77	☐ 78
Other	☐ 79	☐ 80	☐ 81	☐ 82	☐ 83	☐ 84
	☐ 85	☐ 86	☐ 87	☐ 88	☐ 89	☐ 90

(please specify) _____

READER SURVEY 1986

PERIPHERALS

8 What peripherals do you own? What peripherals are you planning to purchase in the next 12 months? (Please tick)

PRINTER:	OWN	PLANNING TO PURCHASE
Laser	☐ 01	☐ 02
Daisywheel	☐ 03	☐ 04
Dot matrix	☑ 05	☐ 06
Other	☐ 07	☐ 08
Monitor	☑ 09	☐ 10
Modem	☐ 11	☑ 12
Plotter	☐ 13	☐ 14
Graphics tablet	☐ 15	☐ 16
Mouse	☐ 17	☑ 18
Expansion/add-on boards	☑ 19	☐ 20
Disk drive	☑ 21	☐ 22
Other (please specify) LIGHT PEN	☑ 23	☐ 24

9 How much do you expect to spend on peripherals in the next 12 months? (Please tick)

	FOR PERSONAL USE AT HOME	FOR USE AT WORK
Up to £50	☐ 01	☐ 02
Up to £100	☐ 03	☐ 04
Up to £500	☑ 05	☐ 06
Up to £1000	☐ 07	☐ 08
Up to £2000	☐ 09	☐ 10
Up to £5000	☐ 11	☐ 12
£5000+	☐ 13	☑ 14

SOFTWARE

10 What do you presently use your personal computer for? (Please tick)

	AT HOME	AT WORK
Word processing	☑ 01	☑ 02
Database management	☑ 03	☐ 04
Accounts	☐ 05	☐ 06
Spreadsheets	☐ 07	☐ 08
CAD/scientific/engineering	☐ 09	☐ 10
Business graphics	☐ 11	☐ 12
Presentation graphics	☐ 13	☐ 14
Programming	☑ 15	☑ 16
Project management	☐ 17	☐ 18
Education	☐ 19	☑ 20
Financial planning	☐ 21	☐ 22
Electronic mail	☐ 23	☐ 24
Online information services	☐ 25	☐ 26
Networks	☐ 27	☐ 28
Mainframe comms	☐ 29	☑ 30
Adventure games	☑ 31	☐ 32
Arcade games	☑ 33	☐ 34

11 Would you be interested in accessing an online information service written and produced by *PCW*'s editorial staff? (Please tick)

YES ☐ 01 NO ☑ 02

12 If you use an online service, what is your approximate budget per month?

Up to £10 ☐ 01 Up to £25 ☐ 02 Up to £100 ☐ 03 £100+ ☐ 04

13 How much money do you expect to spend on software in the next 12 months? (Please tick)

	FOR PERSONAL USE AT HOME	FOR USE AT WORK
Up to £50	☐ 01	☐ 02
Up to £100	☑ 03	☐ 04
Up to £500	☐ 05	☐ 06
Up to £1000	☐ 07	☑ 08
Up to £2000	☐ 09	☐ 10
Up to £5000	☐ 11	☐ 12
£5000+	☐ 13	☐ 14

GENERAL DETAILS

14 Name: D.L. POULTON

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15 Age (please tick):
13–19 ☐ 01 20–25 ☐ 03 26–35 ☑ 05 36–45 ☐ 02 46–65 ☐ 04 Over 65 ☐ 06

16 Sex (please tick): Male ☑ 01 Female ☐ 02

17 Which category does your job title fall into? What type of industry is your company involved in? (Please circle)

	Insurance, banking, finance	Government/national/local	Transport, communications, utilities	Manufacturing – computer equipment	Manufacturing – other	Wholesale/retail/selling computer equipment	Mining, construction, oil, chemicals	Media: publishing, advertising	Education/health/law	Computer services	Consultancy
MD/chairman/owner/partner	01	02	03	04	05	06	07	09	09	10	11
Director level	12	13	14	16	16	11	16	19	20	21	22
DP management	23	24	25	26	27	26	29	30	31	32	33
Other systems/programming	34	36	36	37	36	36	40	41	42	42	44
Professionals	45	46	41	48	49	50	81	52	53	54	55
Engineering	56	52	58	59	60	61	62	63	64	65	66
Education	67	68	69	70	71	12	22	24	75	16	71
Scientist, technologist, researcher	78	79	80	81	82	83	84	85	86	87	89
Student	89										

18 Company size (please tick)

Up to 25 ☐ 01 26 to 50 ☐ 02 51 to 100 ☐ 03 101 to 150 ☐ 04
151 to 250 ☐ 05 251 to 500 ☐ 06 500 to 1000 ☑ 07
1000+ ☐ 08

19 Do you authorise expenditure on computer products and services for your department/company? (Please tick)

YES ☐ 01 NO ☑ 02

20 Please indicate your income bracket.

Up to £8000 ☐ 01 £8000 to £15,000 ☐ 02
£15,000 to £20,000 ☑ 03 £20,000+ ☐ 04

Many thanks for the time you have spent completing this questionnaire. Please return it to the address below by 18 April 1986 — no postage is required:

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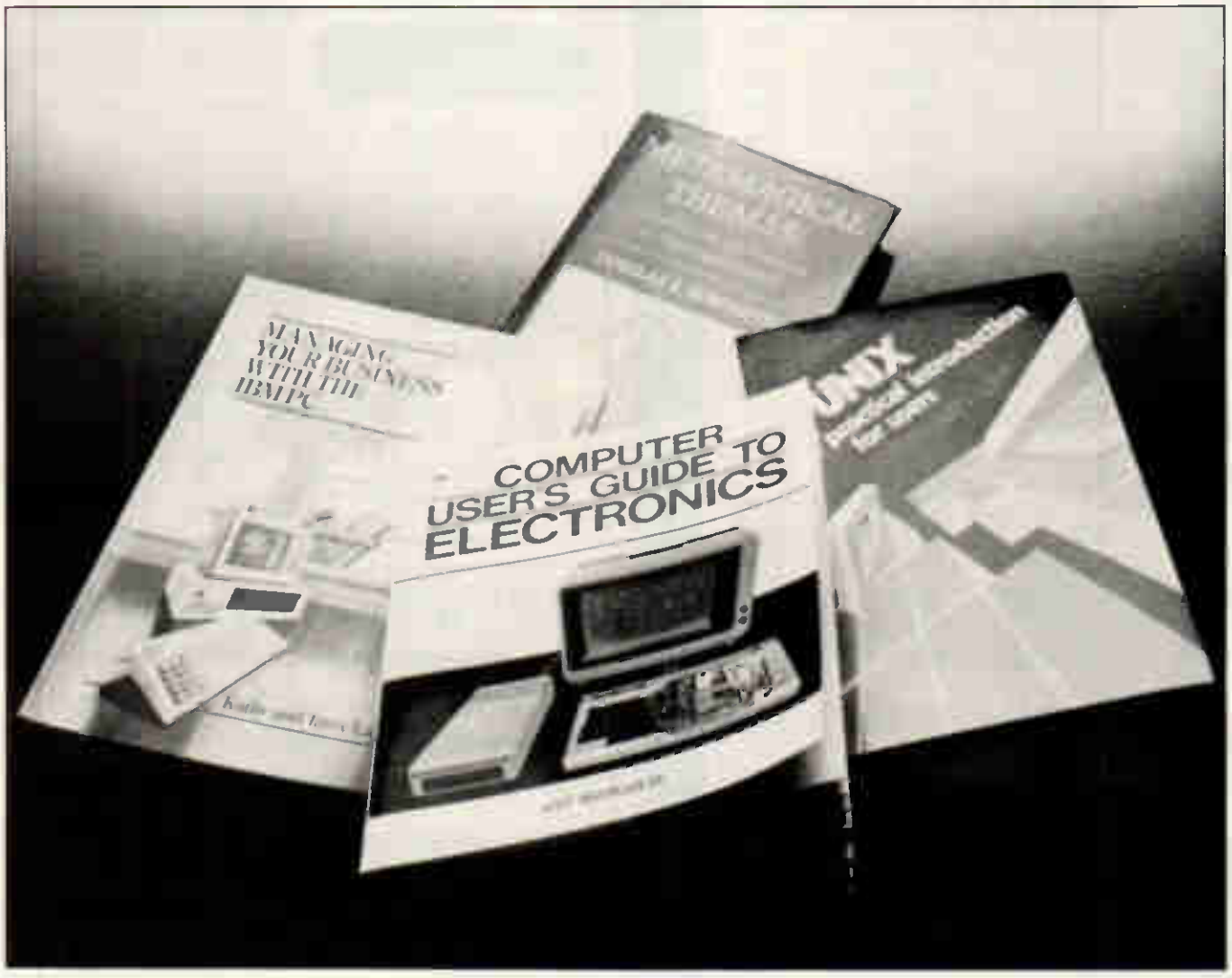
END

BIBLIOFILE

If you're in the mood to confront hefty essays and tackle the intricacies of electronic faults, this month's book review is for you. David Taylor is your host.



Mad as a Hofstadter

Title: Metamagical Themas: Questing for the Essence of Mind and Pattern
Author: Douglas R Hofstadter
Publisher: Viking
Price: £18.95

None but the highest of brows should tackle this dense and hefty tome: a kind of Old Hofstadter's Almanac of essays by a Pulitzer Prize-winning polymath, recently given *carte blanche* in the indulgent columns of *Scientific American*.

The result is a brain-twisting rummage through some thornier thickets of scientific, literary and artistic thought, often combining the author's passions for mathematics, music and philosophical fireworks.

And, of course, for feisty phrases like *Metamagical Themas*, which gets a questing essay all to itself.

We're in the coruscating company of one who is best known for *Gödel, Escher, Bach* ('a metaphorical fugue on minds and machines') and one who perseveres in swerving pursuit of patterns in perception, pointers toward the nature and nub of intellect, cognition, or, come to that, having fun with Rubik's Cube, unscrambling DNA and why lately we seem hell-bent on blowing ourselves to thermonuclear bits.

Don't imagine it's an easy read. But it is, if you can take it, a teasing and entertaining one: as for instance where Hofstadter, contemplating exaggerated claims often made for Artificial Intelligence, asks us to acknowledge what vexing complexity there is in the letter 'a' — on the face of it so simple and elementary an object for any smart-thinking machine to grasp, yet in practice one which may readily be represented in umpteen typographical fonts and styles, never mind human handwriting flourishes, all so subtly different as to defy precise geometrical analysis.

Figure that one out and you still have 25 letters to crack, and that's just the English alphabet. So see how long it takes you to teach a machine to pick out faces in a crowd,

Hofstadter says.

And God forbid, quips he, that we ask a computer to come up with a formula which represents the essence of Bach. 'But even though I find the prospect repugnant,' Hofstadter adds, 'I am greatly attracted by the effort to do as much as possible in that direction. Indeed, how could anyone hope to approach the concept of beauty without deeply studying the nature of formal patterns and their organisations and relationships to Mind? How can anyone fascinated by creativity and beauty fail to be intrigued by the notion of a 'magical formula' behind it all, chimerical though the idea certainly is . . . or fail to see in computers the ultimate tool for exploring their essence?'

Myself, I can quite easily fail on that, but I wouldn't deny that Hofstadter is a captivating live-wire who, whether he's musing on life's pith and moment or just joshing with The Magic Domino, commands and holds attention. If by chance you're questing for a thought-provoking book of snippets to read on the loo, this one's a winner.

Art'll fix it

Title: Computer User's Guide To Electronics
Author: Art Margolis
Publisher: Tab (John Wiley in UK)
Price: £14.20 (paperback)

Art says you need to have mastery over your machine. It's not enough, Art says, to run your software, maybe program some; you gotta understand what's cooking in there.

It isn't any kind of manual or analogue machine you have with a micro. It's a digital electronic entity. To figure it, you should learn electronics from the bottom up. That way you'll appreciate what the machine does much better, so you'll use it better. And if it malfunctions, why — maybe you can fix it. Art, by the way, is himself a service technician.

Well. If you can take the gee-whiz presentation, this is a lively and fast-moving introduction to computer electronics. You get a pretty detailed picture of how the MPU chats up the RAM, ROM and I/O chips, get to know analogue from digital and how interface circuits perform the switch. In no time the motherboard seems like one of the family. Art's a good teacher.

But. I'd hesitate to endorse Art's gung-ho approach to trouble-shooting faults. He makes it all sound a cinch, but computers aren't only delicate, they're potentially deadly besides. Remember: all of Art's mains voltages are the US's 120 volts. Make a single mistake with the UK's 240 volts and the chances are that will be that.

I'm all for absorbing the theoretical know-how of the digital world, but extemely cautious of hands-on tinkering until you know precisely what you're at. Art's book, good as it is, is not enough. If you're determined to lay spanners on any micro's innards, first get thoroughly trained.

Handsome is as handsome DOS

Title: Unix – A Practical Introduction for Users
Authors: RJ Whiddett, RE Berry, GS Blair, RN Hurley, RJ Nicol and SJ Muir
Publisher: Ellis Horwood
Price: £21.50 (hardback) £9.50 (paperback)

Nothing from the tea-lady, but practically everyone else at Lancaster University's Department of Computing seems to have had a hand in compiling this worthily austere Unix primer, in itself a commendable example of versatile multi-tasking. But whether any of us outside the Lancs campus still gives much of a damn whether Unix ever fulfils its never-ending potential is, alas, another matter.

It'll soon be 20 years since Ma Bell started work on Everyman's Operating System, and still we're told that the best is yet to come. For all its linking and portability virtues (real or imagined) Unix remains lumbered by its greed for RAM and lack of bit-mapped graphics in its bid to supersede CP/M and MS-DOS. Mac's icons look far more commercially hot.

The sad fact is that Unix was devised at a time when CPUs were quite scarce and pricey. Today, when micros costing a few hundreds can have a 68000 onboard, one-man-one-micro no longer looks cost-ineffective. Besides, IBMs by the million are scarcely likely to throw in the towel when every DOS update brings the system closer and closer to the Unix Shangri-La.

One way and another, I'd have thought that if Unix isn't yet quite a dead duck for the micro market, it's looking pretty peaky as time goes by. But the lads from Lancs insist that it is 'extremely popular' and a snap to grasp on any number of machines, so they take us by the hand through the filestore and show how to edit text with 'vi', handle software tools in Unix and format documents with such nattily-named programs as 'nroff'.

Their pay-off is examining the Unix shell. It provides, they maintain, 'a sophisticated and productive programming environment.' I dare say, but it also provides a striking reminder of just how hideously hostile Unix commands now seem in these days of little pictures and mice. Ask an experienced Mac user to try finding a file, not by pointing to it and tapping the button, but by keying into Unix:

```
$ temp=/usr/temp/tempa=dummy
$ echo $tempa
dummy
$ echo $(temp)a
/usr/temp/a
$
```

If you and Unix would like to be introduced, this book will make the acquaintance. I just wonder whether you'll want to become firm friends.

Easy PC

Title: Managing your business with the IBM PC
Authors: Kathy and Terry Lang
Publisher: Holt, Rinehart and Winston
Price: Not known

The Doctors Lang, no strangers to regular readers of *PCW*, are plainly not ones to mess about with the metamagical or obscure when: (a) countless businesses are still bursting to be told what desk-top computers might do for them; and (b) the huge majority of business PC buyers will plump for IBM and clones.

The hard part is, as usual, to find a tone of voice which does not patronise the commercially astute, yet cannot take it as read that they'll necessarily know a damn thing about PCs. The Langs succeed in so far as this slim paperback is both lucid and digestible at defining likely needs, but they're in danger of skimping in the interests of brevity.

The likely needs they identify are planning and forecasting business accounts with a spreadsheet, presenting results graphically, managing database files, word processing, simple accounting packages and such desk-top helpmates as diaries and calculators, plus the wherewithal to set up occasional comms links to BT Gold and the like.

So far, so fine: tips and pointers, potential pitfalls identified. It's easily-followed, well structured advice. But I might feel a bit short-changed were I to wonder whether my PC could, for instance, whack off a Telex. The Langs explain: 'There are several ways to send messages using your PC. One possibility is to buy a special adaptor, which connects directly to the PC, but these are quite expensive. It is also possible to send telex messages via BT Gold provided you have made special application.'

And that's that. It's true, concise and accurate. On the other hand, it hasn't got you far.

Perhaps the book should be twice as fat, but then perhaps only half as many people might feel up to reading it. All-purpose primers for business computing tyros are, as I say, notoriously difficult to judge. I'd give this one alpha minus. END

SCREENPLAY

Our regular update of the best leisure software takes a more diverse approach this month, as Stephen Applebaum looks at three unusual and thought-provoking games for the Macintosh and the IBM PC.

The American way

Title: NFL Challenge
Computer: IBM PC, PC/XT
Supplier: Challenge UK
Format: Disk
Price: £125

The Americans have an inordinate predilection for statistics, and nowhere is it more obvious than in the field of sport. You only have to watch Channel 4's coverage of American Football to discover a fascinating world of facts and figures, whose inhabitants communicate in a strange argot, indecipherable to those on the periphery.

Even with its innumerable hurdles for the uninitiated, American Football has swept across the UK, providing new fodder for the armchair sportsmen who have grown fat on a bland diet of soccer, snooker, and darts.

Television is the major purveyor of the sport, but Challenge UK plans to introduce it to a wider audience by distributing an IBM-based football simulation called NFL Challenge.

Simulation is a much used and abused term in computer game circles, but NFL Challenge has more right to the epithet than most. It views the game not from the perspective of the player, or even the spectator, but rather the master strategist — the coach. He is the brains of the team, controlling the action either from the bench, or while pounding up and down the sideline. Therefore, the player takes the role of the team coach, the worrier who views the game with a clinical eye and the strategic bent of a chess player.

When the game is first loaded, players are asked to choose their teams. Some knowledge of the way in which a team plays is helpful here, although not necessary. Each player is also given a choice of which side of the keyboard he wishes to use. The layout employed is quite simple; the right-hand player uses the numeric keypad, while his opponent uses the function keys down the left-hand side. Next, a computerised coin is tossed to see who kicks and who receives.

After some whirring of the NFL disk as the program loads the various files of data on the participating teams, the screen display changes to feature a grid representing the playing area, and boxes giving the coaches a chance to look at their team roster — a collection of hieroglyphics apparently representing the players' statistics, making a substitution, or starting the game.

Before going any further, here's a brief résumé of the rules. The basic idea is for the offensive team to make its way up the field by gaining distance through a number of downs. At least 10 yards must be made in a series of four downs, or possession is handed over to the opposition. Having reached the end zone, the attacking team is awarded a touchdown and a kick at goal.

Yardage is gained through a number of set offensive moves which are outlined in a playbook. This invaluable text is split into six sub-groups containing short-yardage plays, long-yardage plays, a group of special plays, and three groups for all situations.

Each move is represented graphically, which is a blessing, because names like Shotgun Draw Trap and Slot X,Y,Z Streak are rather too obscure when you're under pressure to make a move.

The six groups mentioned earlier are further sub-divided into five risk-gain categories. A play with a short risk-gain factor gives a team a good chance of making up a short distance with little risk involved. Plays designed to gain large amounts of ground logically involve more risk, and therefore should not be undertaken lightly, as the result can affect the game's outcome.

The defending team's coach has a similar manual to that of his counterpart, except it contains four groups of defensive plays. Here the names become really American, featuring such moves as the dubious Over Twist Willy (I kid you not), 10 Blitz Man and 10 Man Under. These, like the offensive moves, are divided into different yardage plays.

When each player has called his move, the display changes to an enlarged version of the playing grid, with the teams represented by red crosses for the defenders and green circles for the attackers – the shapes employed by real-life coaches to demonstrate plays to their teams. After taking up their specified formations, the crosses and circles rush about, frantically going through the moves called by the coaches.

If you're playing NFL Challenge on an IBM with colour graphics capability, the play sequence is replayed in

slow motion, giving you a better chance to see what happened, and what went wrong.

Not every move will be played in the exact form that is given in the playbooks, as a lot depends on the situation at the time; that is to say, it depends a lot on the abilities of the the players making up the two teams. For instance, if a player realises he is blocked, he'll try and change his strategy, altering the overall pattern of play.

Not everthing is certain in American Football. During a set play a player could fumble (drop the ball), the ball could be intercepted, or the quarter-back could be sacked — a term used when a quarterback is brought down in the middle of throwing the ball.

One of NFL Challenge's most powerful features is its customisable team roster file, which stores information on the 28 NFL teams in ASCII format. Loading the file into a word processor, such as WordStar, enables you to update the teams' statistics as the season develops.

A full game of NFL Challenge takes an hour, bar time-outs, and has very few low spots throughout. Its most disappointing feature is its sound, which is no better than the beeps and buzzes elicited from the Spectrum. Less annoying, though rather more surprising, is the fact that the computer only plays an average game against a human opponent.

NFL Challenge's only other drawback is its price. Even with all the team and player data, two playbooks, a separate NFL playbook, a *User's Guide*, and official NFL recommendation, the price tag of £125 is still excessive, and will probably limit its appeal to the executive games market. Its price notwithstanding however, which is too high for the British games market, NFL Challenge is a superb sport simulation that is not only fun to play, but also teaches you more about the game than even Nicky Horn can achieve on TV.

Thanks to Computer Business Systems for providing us with NFL Challenge. The company can be contacted at Sommerville House, 20 Southernhay East, Exeter EX1 1NS.

Ever get that feeling...?

Title: Deja Vu (A Nightmare Comes True)
Computer: Macintosh 128k, Mac XL
Supplier: Mindscape
Format: Disk
Price: Not available

The ironically-titled Deja Vu is one of a new crop of *avant-garde* games from US-based Mindscape. With its familiar lack of modesty, Mindscape asserts that: 'Deja Vu is like no other adventure you've experienced,' a statement certainly true in my case.

Deja Vu literally dessimates the barrier between the action that takes place onscreen and the player's experiences, by allowing interaction with almost everyone and everything appearing in the game's brilliantly-drawn screens. Clever exploitation of the Macintosh's versatile screen-handling means that Deja Vu has an infinite number of possibilities, giving the program an air of ambiguity more akin to the real world than a clinical computerised version of what that real world should be.

French in title, but pure Americana, Deja Vu is set in a sleezy underworld which could have come straight from the pen of Raymond Chandler; it's more sordid than apple pie, and full of innuendo and stereotypical characterisation.

The first thought that crosses your mind as you lie on the floor of a squalid toilet in a small downtown bar, is that things can only get better. You stagger out of the room, your brain shot through with a potentially lethal cocktail of truth drugs, hoping to find the antidote and the reason for your being where you are. A farrago of unconnected memories flashes through your head, only to be swallowed up by the chemical pall that has enveloped your mind.

This is the state in which you find yourself at the start of Deja Vu: drugged up to the eyeballs and on the brink of death. Only by finding the cure will you survive long enough to discover who set you up, whose corpse is dumped in the boot of the car ominously parked outside the bar, and who's prowling about your office. Confused? You will be.

Deja Vu's greatest asset is the way in which it grabs the player by the throat, dragging him down into its turgid depths, from the very start; there's little time to orientate yourself before being informed that you're turning into a vegetable — a truly marrowing experience.

Very little of Deja Vu requires the player to touch the computer keyboard, most moves being made via a menu stretching across the top of the screen, obviating wordy typed commands.

The gathering of objects is a particularly interesting and inventive feature of the game. Using the Macintosh's icons to the full, Deja Vu's programmers have littered the game's various screens with a plethora of items which can be lifted and dragged from one part of the display to an inventory window at the side of the screen. Pointing to Open in the menu, then pointing to an object, allows you to study the window's contents.

An impressive example of how objects can be manipulated occurs at the beginning of the program. Hanging on the inside of the lavatory door is a large overcoat; relocating the garment in the inventory and then opening it, reveals several smaller icons representing such things as a wallet, an ID card, sunglasses and money. Opening the wallet produces another window displaying its contents. There are so many windows within windows that playing Deja Vu can be akin to dismantling a Russian Babushka.

An option called Operate in the menu enables you to use the equipment which has been diffused throughout the various windows. Operate causes one piece of equipment to have an affect on another: to unlock, say, a door, you'd select a key, click on Operate, and then point to the door in the graphic area of the screen you want to open. Firing a gun is similar in style, except the door becomes the target.

Deja Vu is graphically superb, has a strong storyline, and is, above all else, funny. A wry sense of humour pervades almost every corner of the game, some jokes cropping up in graphical form, while others are subtly inserted into little gems of text; a hooker goes out like a red light when you hit her, while a pet dog bites you and sends you for stitches. Muggers prowl the streets of Chicago and, it appears, always bump into you. One particularly keen character confronts you time and time again, but can be seen off with a right-hander, blackening his eyes and breaking his nose.

Deja Vu is a program beyond reproach. Although it isn't the last word in 16-bit software, it is a massive step forward, and heralds a new era in computer gaming.

Games that wizards play

Title: Wizardry
Computer: Macintosh
Supplier: Sir-Tech Software Inc
Format: Disk
Price: £59.90

In the ephemeral world of computers, it is rare to find a game which has stood the test of time as well as Sir-Tech's Wizardry. It has been at the forefront of the micro-fantasy movement since 1981, diverting, enthralling, challenging and exciting new adventurers in its various incarnations for the past four years.

Wizardry is Tolkienesque, being full of characters with ridiculous names and eccentric lifestyles. Of course there's the obligatory mad megalomaniac, although this time, with a name like Trebor, he sounds as if he could simply be sucked to death. His arch rival is Werdna, an evil wizard with a notorious penchant for helping old ladies half-way across the street and then stealing their purses (a metaphor for the State of the Nation in 1986?)

The future of Wizardry rests precariously on the outcome of the struggle between Trebor and Werdna. To accomplish his plan of world domination, Trebor must first recover a magical amulet appropriated from him by Werdna, who has ensconced himself and the artifact within a skein of tunnels below a fortified town.

The embittered Trebor has instituted an Elite Guard to recover the amulet. Individuals are only qualified to enter this crack force after proving their mettle in Werdna's Maze.

As if there weren't enough creatures in the Maze already, the player must enter it, train his own merry band of psychopaths, and then liberate the amulet from both Trebor and Werdna, hopefully killing the latter in the process.

Characters are initially recruited from the Training Ground in the town. They come in a variety of morphological forms, including the appropriately un-godly Human, Elf, Dwarf, Gnome and (I can't think of anything original) Hobbit. Temperaments are less numerous, ranging from good, through neutral, to evil. Good and evil characters don't mix, so your party of six can only consist of all evil, or all good and/or neutral ones.

Before lumbering a character with an inadequate disposition, players should first peruse the Wizardry manual for information regarding which temperament is the most advantageous for what genus of creature. Applying the wrong one invariably forms a weak link in the party chain, leaving other members to fill the gap.

Six physical and psychological traits determine the class into which a character originally falls and the situations it's best suited to. There are eight different classes, only five of which appear to be accessible from the outset of play: Fighter, Mage, Priest, Thief and Bishop. There's also a Samurai, although that appears to be out of reach, initially. Even higher than the Samurai are the Lord and the Ninja, two forms that can only be reached after many hours of play.

Characters in the three clerical classes can all perform spells of one kind or another and although Priests can only perform Priest spells, and Mages Mage spells, a Bishop can cast both.

The first time I played Wizardry, I sent my party into the Maze under the delusion that they were kitted out with the necessary accoutrement for battle. It was like sending a cow into an abattoire with the hope that it would come out in a fit state to produce milk: bare flesh is a hopelessly poor defence against raw steel. With one group already six feet underground, I returned to the Training Ground to recruit another band of hapless souls. This time, however, I took then to the village shop where I bought them designer armour, Emmanuel robes and several offensive weapons. I was ready!

Werdna's Maze is depicted as a 3D view along the various corridors. Movement is initiated by pointing an arrow in the direction you want to go, then clicking on the mouse to instigate the move. Entering an area containing beasties turns your arrow into a sword. Small icons representing the foe replace the view of the maze, while a list of your party members appears in the lower half of the screen.

If you surprise the Maze dwellers, the computer gives you the chance to run or engage them in combat. Selecting the latter option allows you to delegate actions to your party members. Only the front three are able to fight, but Mages and Priests can cast spells wherever they are in relation to the *mêlée*.

First-level clerics (that's those on the lowest level of experience) only have very simple spells which cause the least amount of damage. As they progress up the ecclesiastical ladder, they gain experience and more potent spells. Level seven Mages, for instance, can cast what is termed a 'Titowait', the effect of which can be likened to '... a small, well contained, nuclear fusion explosion.'

Money and experience are the rewards for winning a fight. Experience is the more important prize in the early stages of the game, though money becomes all the more necessary as it progresses.

Occasionally, you have to return to the surface to rest your party in the local Hotel. Only here can a character move up a level.

Also on the surface is the Temple of Cant, where the dead can be restored to life — for a small fee, of course. For this very reason, money takes on a greater importance as the adventure continues, especially as the cost of reanimation is always increasing.

There is little more to Wizardry than what I have described here. Most of your time is spent scouring the Maze's various levels for creatures to kill, before finally coming face to face with Werdna. The time spent on this enterprise could be phenomenal, as even at the time of going to press, it is still not clear exactly where the wizard has hidden himself. Our only clue to his whereabouts is the late discovery of an additional five levels, on top of the four we already know about.

Wizardry is brimming over with features which liven up the proceedings, such as designing your own icon when a character reaches the seventh level, and the odd lurid description outlining the painful death of one of your people. Best of all is the way in which teams lost in the Maze can be rescued by more experienced squads, even after the game has been put back onto the shelf for another day. END

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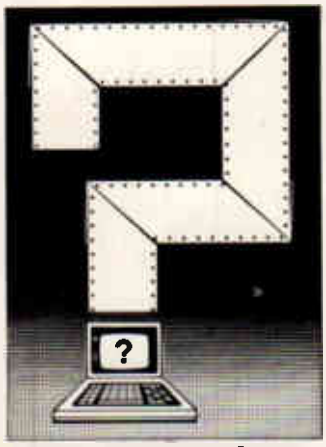

Software review

I am involved in theoretically starting a small business dealing mainly in software, as a project at university, and I have come across the problem of promoting my efforts. When you review software in your magazine, do you approach the supplier to get the software, or does the supplier approach you?

Also, could you explain how the copyright system works for software?
David Kelsey, Coventry, West Midlands

Some firms send software to *PCW* 'blind' — that is, they just post the package to us in the hope that we'll take an interest. Alternatively, other suppliers send a concise summary of the features of their product, together with a contact address and number — we contact them later if we consider the program might be of interest to our readers. In either case, correspondence should be directed to the editor, Peter Jackson, who will pass material on to the appropriate reviewer.

British Copyright law is embodied in the 1956 Copyright Act and the 1985 amendment to the Act, which confirmed the fact that computer software could be copyrighted in much the same way as literary or artistic work. The law says — in essence — that you are entitled to a monopoly over the exploitation of your original work (expressed in some 'fixed form', like a program listing) until 50 years after your death. During this time no-one else may reproduce your work, or a direct adaptation of it, without permission.

Copyright law expresses the fact that ideas are 'intellectual property' once they have been expressed formally. Of course, you can't copyright the ideas themselves, but just the expression of them, and the work must have been done in your own time, with your own tools. You cannot copyright programs that you write 'in the course of your employment' unless your employer says otherwise.

You don't need to 'register' copyright work in the UK — it is copyright as soon as it is expressed in a 'fixed form'. However, you may have to sue other people in the civil courts if you believe that they are reproducing your work without permission and you want to defend your rights. This can be expensive, and most cases are usually settled 'out of court'. If you feel that your copyright is being infringed, you should start by sending a solicitor's letter pointing out your claim, and follow your nose from there.

You must be able to prove that there are striking similarities between your program and the copy, and that the copier had a chance to see your program. It is important to be able to prove that your work pre-dated the copy. You can establish this when you finish the copy, by sending the listing to yourself by registered post, and then keeping it in a safe place, or by sending a copy and an appropriate fee to a 'software registry'.

In many other parts of the world you have to indicate that a program is copyright, by writing your name, the year and the copyright symbol — a letter C in a CLOSED circle — in a prominent place. Some countries — such as the USA — also require you to send a copy of the program to an official registry.

New type of answer

We're making a few changes to Computer Answers this month, in an attempt to make the column more readable and more relevant.

Computer Answers is PCW's help column. Simon Goodwin has experience of almost all popular small computers (and a good many of the unpopular ones!). He offers advice about all kinds of hardware and software problems through the pages of the magazine. Most problems are shared by many readers, so the column is not just aimed at prolific letter-writers. We also welcome letters from readers in response to published queries.

Two points should be noted. Firstly, we can't answer abstract questions such as 'What computer/printer/monitor should I buy?' — just as an agony aunt can't tell you who you should marry. The question depends entirely on your abilities and needs, and these can't be assessed sensibly by post. Secondly, we can only reply through the pages of the magazine; please don't send saes.

That said, we can answer a vast range of questions and we do find space to reply to most of the queries you send in; if anything, we could do with more, to avoid repetition and to help us make our replies more general. So, if you're 'stuck', drop PCW a line. We should be able to help, and your enquiry may assist someone else.

Elite Atari letters...

Could you please tell me what I need to make my Atari 800XL into a word processor?

All I want to do is display and alter words on the screen and then have them printed out in Elite (if that means large type) letters, on A4 sheets. At present I have the Atari keyboard, a TV and an Atari recorder.
J Chapman, Erdington, Birmingham

...ideal Atari printer

I have an Atari 800XL with disk drive. I have just purchased a word processor program but, unfortunately, do not have a printer. I have borrowed a colleague's Atari 1027 but have not found it to be completely reliable. A friend has recommended one of the Epson printers but the interface would cost an extra £70. Unfortunately, money is limited and I can only afford £200–£250.
J Bryant, Frodsham, Cheshire

You can put together quite a useful word processing system around an Atari 800XL; the cassette system is not really fast or reliable enough for this application (although you can do anything with a cassette system if you're stubborn enough!). You'll probably need a 1050 disk drive, which gives you 127k of storage for £129.

You can't really avoid using Atari's own drives and printers, as the machine doesn't have standard Centronics or RS232 interfaces. You can add these, but — as you have found — the cost is probably prohibitive. Atari's own add-ons use the non-standard, rather slow, serial bus, via the large wedge-shaped socket on the side of the computer.

When you have the drive, you can buy a disk copy of the standard word processor, Atariwriter, for £14.99. This used to cost £65 on ROM cartridge. The Atari 1027 printer, at £137 or thereabouts, is the only low-cost, letter-quality printer that you can plug directly into your machine. It is slow and rather fragile, since it is based on a typewriter mechanism, but it should be

reliable if you treat it with care. The letters are normal typewriter-size (the term 'Elite' refers to the fact that there are 12 characters per inch, across the page).

Amstrad wp memory expansion

I have recently purchased an Amstrad PCW8256, and I have a spare 'Byte Drive 500' 3in disk drive. Is it possible to connect this up as drive B of the Amstrad?

Do you have any information about the extra memory sockets inside the computer?
R A Jacob, Hampton, Middlesex

The socket for 'drive B' is specifically set up to accept Amstrad's 1Mbyte drive, so it won't accept a 'normal' 40-track, 3in device. You might be able to connect the Byte Drive internally, but I don't know how and I wouldn't like to try it, especially as you might have some trouble getting the software to recognise it.

The RAM sockets are similarly hard to use. They were intended for 64k of chips, back in the days when the PCW8256 was designed to be a PCW8128, with two 64k banks of memory. In the event, the price of 256k chips fell to the point where it was pointless to use 64k parts, and the machine was shipped with a single 256k bank. The other sockets are not properly driven or decoded to cope with memory in addition to this, according to Amstrad. This does seem plausible when you consider that Amstrad itself has not announced an upgrade using the sockets, and nor has any third-party supplier. As Amstrad put it: 'If it were easy, we'd have done it by now.'

Engineers within Amstrad and outside are working on the problem, so it might be worth waiting to see what turns up. But, in the meantime, I would not advise you to dive in, soldering iron smoking — you'll probably just break the 256k you've already got.

QL news

What is the address of the English 'supplement' *QL User*? Could you tell me how to contact QL groups or clubs in the UK?
Julio Pereira Proenca, Lisbon, Portugal

The QL publishing scene has had a fairly traumatic past and it is still in a state of some confusion.

First of all Sportscene published a magazine called *QL User*, then EMAP came out with another magazine with the same title. A few threats were exchanged and EMAP emerged victorious, only to close its title down 18 months later. In the meantime a rather poor 'free' magazine called *QL World* started up.

The publishers of *QL World* have now taken over *QL User*, and re-christened themselves *Sinclair QL World Incorporating QL User* (SQLWIQLU for short?). At the time of writing an issue of the new magazine has not been published, so it is a bit hard to know whether or not the title can be recommended. The publishers are based at 80-82 Upper Street, Islington, London N1 0NO (I hope the last part of the postcode is not prophetic).

Even the non-profit-making Independent QL User Group has suffered an identity crisis. It started out as IQLUG, and then changed its name to QUANTA. The group publishes a disorganised but informative monthly newsletter, and organises regular workshops and regional meetings. The chairman of QUANTA (and the UK 'C' User Group) is Leon Heller and he can be contacted at 8 Morris Walk, Newport Pagnell, Bucks MK16 8QD. His phone number is (0908) 613004.

Oric/Amstrad merger

I am interested in buying an Amstrad CPC6128 as a replacement, of sorts, for my Oric-1. However I already have several programs for the Oric and have no wish to sell it — not that it is worth much anyway.

Would I be able to use the Amstrad monitor (from a colour system) and the built-in power-supply with my Oric?

When using the cassette recorder as a back-up, would I be able to use the Oric lead?

Could the Amstrad load text files generated by programs such as Tansoft's 'Author', at the Oric's 2400 baud speed?

Would it be practical to use the Oric as a peripheral, such as an intelligent printer buffer, maybe by swapping data between the cassette ports?
Timothy J Ruffle, Sperrymore, Co Durham

The Oric RGB port should drive the Amstrad monitor without any problems. The monitor expects four signals: one for each colour, red, green and blue; and one for 'synchronisation' — to tell the display when to start a new line or frame.

The Amstrad computer varies the relative intensities of the colour signals to give more than eight colours — the limit if you just turn the colours on and off in combination — but the Oric can't do this, so you won't get any of the 'new' colours available from the Amstrad.

The monitor supplies power to the CPC6128, but it produces two smoothed supplies, nominally of five and 12 volts. I believe the Oric expects nine volts (though you should check this), so it doesn't seem likely that the supplies will be compatible. You could try running the five volt rail into your Oric power socket — it might work and would be unlikely to cause any damage, so long as you get the polarity right — but the 12-volt supply will probably cause the Oric to overheat.

The Amstrad uses a similar lead to the Oric, but the connections at the computer end are different — you'll need a five-pin DIN plug. Appropriate leads, designed for use with the TRS-80 Colour Computer, are available from Tandy shops. Your recorder should be fully compatible.

The format used for Amstrad tapes is quite different from that used by the Oric, so you will not be able to read them unless you're willing to write some quite complicated machine code. You'd also need some kind of 'buffer' amplifier, so this is not a sensible solution unless you're a brilliant hacker with a lot of time on your hands.

Amstrad tells me that someone *has* written a routine that allows its computers to read Spectrum data tapes, but the technique is of limited usefulness — it is no good for transferring programs.

The ideal way to transfer data between the machines is via an RS232 port, but even this can be tricky — this is probably the favourite topic for 'Computer Answers'! RS232 ports are optional extras on both machines, so it would be cheaper to buy a 'dedicated' printer buffer.

Apricot video

I have access to a Sirius and an Apricot Xi. Is there any simple interface and software I could obtain to allow me to create titles and other graphics on a colour TV?

As a hobby I make educational slide material but I find decent slide titles difficult to make — I'm fed up with Letraset, good though it is. I have in mind taking still photographs of the colour screen. What do you think?
Peter Hogg, Hartlepool

Neither the Sirius nor the Apricot Xi support colour as standard — there used to be a colour option for the Sirius, but it was expensive and I cannot trace anyone who stocks it nowadays. You can plug an Apricot 7220 colour board into an Xi, but it slows down the system very noticeably and it only works with an RGBI monitor, such as the Sony model which Apricot supplies. The colour cards for the Xen machine should work in an Xi, at a sensible speed, but you'd be well advised to 'try before you buy', and once again there's no TV output.

The second problem comes when you try to draw your slides. Not all graphics programs are compatible with the colour cards. The GEM system, for the Apricot F1, works in colour, but a version is not available on the Xi.

To be honest, you'd be much better off buying a cheap colour graphics home computer and using that to make your slides. The hardware cost will be smaller and the software should be cheaper too. Consider obsolescent machines such as the Atari XE series or the Acorn Electron — these can often be purchased for £50 or less, and graphics software is widely available.

When you take your photo, use a long exposure – perhaps a quarter of a second – in a darkened room, for best results. The long exposure evens out the 'roll bar' effect as the display is refreshed. You'll need a tripod or some other support for the camera. END

Newcomers start here

Peter Tootill explains the rudiments of computer communications.

Let's assume that you have obtained a modem and 'terminal software'. The latter is what turns your micro into a computer terminal, taking your keystrokes and sending them to the modem for onward transmission to the distant computer that you are communicating with. It also takes the incoming characters and displays them on your micro's screen.

The first hurdle in getting your micro online is connecting it to the modem. The easiest way around this is to make sure that you are given a connecting cable for your computer with the modem when you buy it. Different micros have different connectors on their modem ports (usually called RS232, or serial ports). If you tell the supplier what type of micro you have, he should be able to provide the right cable. Don't forget that some micros need an additional card, or other interface, before they can be used with a modem. IBM PCs, Commodore 64s and Spectrums are all examples of micros which don't have an RS232 port as standard.

For your first sessions online, you won't need a sophisticated terminal package; in fact, the simpler the better — a 'dumb' terminal program is perfectly adequate. If the software allows, set the RS232 parameters, then choose 8-bit word length — no parity, one stop bit. Then select the baud rate appropriate to the system you have chosen for your first call — probably 300 bits/sec.

Having bought the right connectors, connected your micro to the modem and loaded your terminal software, you are ready to go. It's a good idea to check that all is well by switching the modem to its Test mode, if it has one. In this mode, it echoes back to your computer everything received from it (the manual will show you how to do this). If what you type on your keyboard in this mode appears on the screen, then all should be working properly.

If all is well you can now choose a system to call, but there are a few points to watch here. Firstly, make sure that the system you call is compatible with your modem and software. U21 (300/300 bits/sec) systems are the most common, and most modems will work with these. Next, pick a few numbers from the list on the opposite page, and make sure that they are running at the time you want to call. (Please don't call a part-time system outside system hours: it leads to a lot of aggravation for the people who run it.) Bulletin boards are good systems to start with as they are designed to make it as easy as possible for first-time callers.

The next thing is to set your modem to 'Originate' mode (you are originating the call) and to the right speed (U21 for a 300-baud BBS). Now dial the number of the chosen system (if it is a 'ring-back' system, you will need to let the phone at the other end ring once or twice, and then dial again — this tells the computer that the next call is for it).

When the system answers, you should hear a high-pitched tone from its modem. At this point, switch your modem online (or put the handset in it, if you are using an acoustic type). The carrier light on the modem, if it has one, should light up, and you should see a welcoming message appear on your screen. If all you see is garbage, the most likely reason is that your word length and parity are different from the sytem you have called (most systems work with 8-bit words and no parity, but if you have problems, you could try seven bits and even parity). If nothing happens, try pressing Return a few times. If the carrier light still doesn't light up you probably have the wrong modem setting for the system you are calling. U23 systems won't respond to U21 modems, for example.

When you make contact with a system, the first thing it will do is ask for your name. A BBS will then check to see if it recognises you from a previous call. If not, it will need to know certain things about the computer you are using to call it, in order that it can talk to you in the most convenient way, so it will ask you questions: one will probably be about the screen width you are using, which is simple; the others will be about 'nulls' (one-character pauses) and 'line-feeds'. The nulls question is to find out if your terminal needs a pause at the end of each line. It mostly applies to printer-type terminals, and is necessary to allow the print-head time to go to the start of the next line, before any more data is transmitted. It is usually safe to answer '0' to the 'How many nulls?' question, and if you want to play safe, you could ask for, say, five nulls.

The line-feed question arises because some computers automatically start a new line after a carriage return; but with others, the cursor just goes to the start of the line it is on, and needs a line-feed as well to make it start a new line. If you are not sure, say yes; if that's wrong, lines will be double-spaced on your screen. Better that than being wrong the other way and having everything that is sent to you appearing on one line, which can be very difficult to follow! Some BBSs have a standard list of computers to choose from, and if yours is included you won't be asked these questions, which makes life easier. If you give the wrong answers, there is usually a command on the system to allow you to change things later.

Calling a viewdata system, such as Prestel, is a lot simpler. All Prestel terminals work the same way, so there is no need for questions about nulls, and line feeds. All you are usually asked for is your name or ID.

When you are logged on to the system, you are on your own. Most systems operate from a series of menus and are designed to be simple for new callers. END

UK free networks

(01)200 7577)TUG-Tandy Users Group 24 hrs....300
(01)262 1629)TBBS Capital 24 hrs. 300
(01)346 7150)Marctel 24 hrs....300 & 1200/75
(01)348 9400)TBBS London 24 hrs....300
(01)429 3047)OSI 24 hrs ring back....300
(01)455 5380)NNBBS London 24 hrs V.21/23
(01)542 3772)WBBS Wimbledon sat-mon 7pm-8am V.21/23
(01)542 4977)TBBS Rovoreed 7pm-7am Mon-Fri, w/e 24 hrs...300
(01)638 2034)Cyber2one - Atari 24 hrs....
(01)658 6942)Typnet Budget typesetting 24 hr.
(01)679 1888)Distel 24 hrs....300
(01)679 6183)Distel 24 hrs....300 & 1200/75
(01)735 6153)Brixton ITeC 24 hrs 1200/75v
(01)883 5290)N88S London 9pm-8am w/e 24 hrs 300 & 1200/75. [number may change soon 11/85]
(01)888 8894)Gnome (The Great Goblin) 24 hrs....(2 lines) 1200/75v
(01)941 4285)Metrotel 24 hrs....1200/75v
(01)954 9847)Dark Crystal (Dark Crystal) 24 hrs....300 & 1200/75
(01)960 4742)ITCU Exch & Mart 24 hrs
(01)968 7402)Communitel 24 hrs 1200/75v
(01)985 3322)Hackney BBS V.23
(0204) 43082)Bolton BBS 10pm-8am, w/e 24hrs 300
(0206)862 354)Pete's Place 24hr.
(021)430 3761)CBABBS Central Birmingham Atari BBS. 24 hrs (closed Thursday) (Mick Coleman) 300
(0223)243 642)Acorn BBS 1200/75v
(0222)464 725)Cardiff ITeC 24 hrs 1200/75v
(0224)641 585)ABERDEEN ITEC 24 hrs....1200/75
(0224)647 158)NBBS Aberdeen V.21/23 24hr
(0224)781 919)Aberdeen Commodore BBS 24hr. runs on C64
(0247)455 162)SBBS II (The Irish Man)County Down, N. Ireland2100-2300 ring back;2300-0900 direct, 1200/75/300
(0258)54 494)Blandford 24 hrs....300
(0268)25 122)BITEC 24 hrs....300
(0268)710 637)RICBBS (Mag40056) 5pm-10pm weekdays, 24 hr w/e.
(0295)720 812)Bloxan 10pm-7am daily 300
(0376)518 818)REACT 24 hrs....300
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● APRICOT PC. 2 x 315k disk drives, 256k RAM with 9" monitor. In good working condition. £900. Tel: Colin (01) 675 4998 (Weekdays after 7pm).
● FOR SALE. Open university course PT502 microprocessors and product design costs £425, sell £300 only. Tel. (01) 482 1635 ask Hektor. I. Rondello, 22 Longmeadow, Torriano Avenue, London, NW5 2SJ.
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● ATARI 520ST software swap or buy. Send your list. Exchange experiences and news about ST hardware, software. Reply to everybody. Dino Greco, Via Roma 75, 80055 Portici, Napoli. Italy.
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MICROCHESS

Kevin O'Connell looks back at the overwhelming success of Hegener & Glaser's Mephisto machines at the 1985 World Microcomputer Championship in Amsterdam.

In the 1985 World Microcomputer Championship, the fifth, played in Amsterdam, the West German chess computer manufacturer Hegener & Glaser was spectacularly successful with its team of three Mephisto machines.

The results of the tournament were:

(1) Mephisto Amsterdam I,8 out of 8;

(2-3) Mephisto Amsterdam II, Mephisto Amsterdam III 7;

(4) Princhess 6 (Sweden), 4½;

(5-6) Novag Blitz Monster Y (Hong Kong, Plymate Y (Sweden), 4;

(7-10) Orwell X (West Germany), Orwell Y (West Germany), Plymate Z (Sweden), SciSys Turbostar K (Hong Kong), 3½;

(11-14) Novag Blitz Monster Y (Hong Kong), Orwell Z (West Germany), Plymate X (Sweden), SciSys Turbostar 440 (Hong Kong), 3;

(15) SciSys Turbostar G (Hong Kong), 2½;

(16) Novag Blitz Monster X (Hong Kong), 1.

Results in the Amateur group were:

(1) Nona (Holland), 7 out of 7;
(2) Rebel (Holland), 4;
(3) Tumult (Romania), 3½;
(4) Kempelen I (Hungary), 1½;
(5) PK83 (Holland), 0.

It was interesting to see that the only non-Dutch entries in this section both came from Eastern Europe.

The huge success of the Mephisto team was due to three important factors: these machines did contain the strongest program (the same one in all three, but running significantly faster in the Amsterdam I incarnation), they did not have to play against each other which was lucky, since in many cases the opposition went out of its way to lose.

Those of you who read Microchess last month will be aware of one very good reason why programs from the same stable should not play against each other. On the other hand, in an event like this, when teams of identical programs are permitted, only a small edge is necessary to make it appear that one program is invincible.

My abiding memories of the games from this tournament are of Mephisto sitting and doing nothing quite well, simply waiting for its opponents to make decisive mistakes, which they were all kind enough to do, even though several of them stood better at various

MICROCHESS

times. The game which follows is a representative example.

White: Orwell X. Black: Mephisto Amsterdam I. Opening: Nimzowitsch/Larsen Opening.

1	Ngl-f3	d7-d5
2	b2-b3	Bc8-g4
3	e2-e3	e7-e5
4	Bf1-e2	Nb8-c6
5	0-0	—

5 Bcl-b2 is rather better — it puts pressure on the black e-pawn and, after 5 . . . e5-e4, provides piece support for the knight on d4. Incidentally, 5 . . . e5-e4 there would be terrible, making White's dark-shaped bishop a superb piece.

5	. . .	e5-e4
6	Nf3-d4	Bg4xe2
7	Qdlxe2	

7 Nd4xe2 is preferable, retaining fluid piece play against Black's ossified pawn centre.

7	. . .	Nc6xd4
8	e3xd4	Qd8-e7?

This is just a complete waste of time. The queen should have gone straight to d7, or to f6, or nowhere at all.

9	Bcl-a3	Qe7-d7
10	Ba3xf8	Ke8xf8
11	Nb1-c3	Ng6-f6
12	f2-f3	c7-c6

Chessboard 1

13	Ra1-e1	

13 f3xe4 is fine: 13 . . . d5xe4 14 Nc3xe4 Qd7xd4+ (14 . . . Ra8-e8? 15 Ne4xf6!) 15 Ne4-f2 with a very slight edge for White.

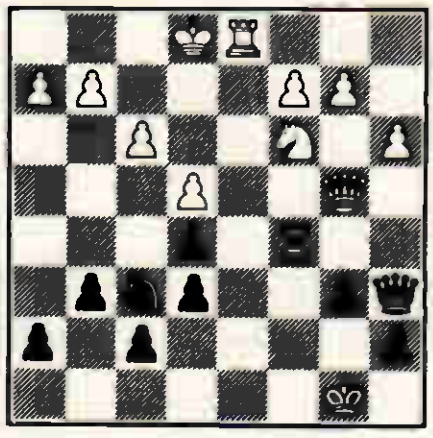
13	. . .	Ra8-e8
14	d2-d3	e4xf3
15	Qe2xf3	Qd7-g4
16	Re1xe8+?	

This is a serious mistake, ceding the e-file, bringing Black's king into the centre and helping to prepare the entry into the game of the black rook on h8. Simply exchanging on g4 and then putting the knight, temporarily, on d1 was much better.

16	. . .	Kf8xe8
17	Qf3-e3+	Ke7-d7
18	Rf1-f4	Qg4-g5
19	Qe3-e5	h7-h6
20	Qe5-e3?	

Still, White would have been all right after 20 Qe5xg5, but now the last black piece gets into the act and all three combine together very forcefully.

20	. . .	Rh8-e8
21	Qe3-h3+	Kd7-d8
22	g2-g3	



Chessboard 2

22	. . .	Re8-e1+
23	Kgl-f2	Re1-cl

Winning material.

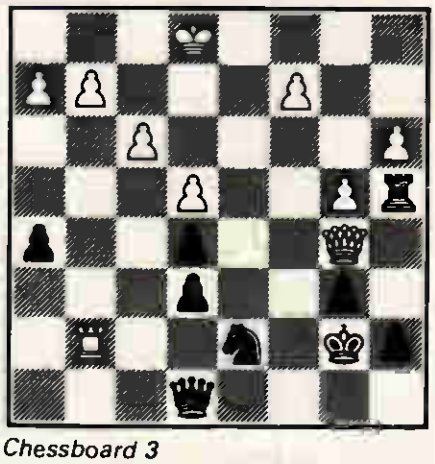
24	Nc3-e2	Rc1xc2
25	a2-a4	

White can do nothing constructive or even defensive.

25	. . .	Rc2-b2
26	Qh3-g2	Rb2xb3
27	Qg2-f1	Qg5-g6
28	Ne2-c1	Rb3-b4
29	Qf1-d1	Nf6-h5
30	Rf4-h4?	

Of course if the rook goes back to f3, then the d4 pawn falls, but this is a hopeless place for the rook.

30	. . .	Qg6-f5+
31	Kf2-g2	Rb4-b2+
32	Nc1-e2	g7-g5
33	Rh4xh5	Qf5-g4



Chessboard 3

34	Kg2-f2	

Or 34 Rh5xh6 Rb2xe2+ 35 Kg2-g1 (otherwise 35 . . . Qg4-f3+ and mate next move) and now black has a choice between 35 . . . Re2-g2+, winning the queen, and 35 . . . Qg4xd4+ 36 Kg1-f2, winning the queen since Qd1xe2 is forced to avoid mate.

34	. . .	Qg4xh5
35	Qd1-f1	Qh5xh2+
36	Kf2-f3	f7-f5
37	a4-a5	c6-c5
38	a5-a6	c5-c4
39	Qf1-e1	

White is completely stuck. Note that if 39 d3xc4, then 39 . . . Rb2-b3+ is the end.

39	. . .	c4xd3

0-1 (White resigns).

Everything falls to pieces now; for example, 40 Ne2-c3 (to stop the black queen from giving mate on e4) 40 . . . Qh2-g2+ 41 Kf2-e3 d3-d2 is the end — if there is nothing better next move, Black plays d2-d1N+!

NUMBERS COUNT

Calling all graphics enthusiasts. This month Mike Mudge examines the overlap between geometry and number theory.

We draw on the entire plane squares of unit size, like those found on graph paper; the vertices of these squares are called 'Lattice Points'.

Such points have been the subject of many interesting mathematical investigations since the time of Karl Friedrich Gauss (1777-1855).

We give, in increasing order of difficulty, five questions relating to these lattice points together with the state of the art regarding their solu-

NUMBERS COUNT

tion as known to the author. Each is followed by a programming problem where it is assumed that the programmer has access to at least a minimal graphics facility, involving the ability to display lattice points, also circles having a given centre and radius together with straight lines passing through two given points.

Question 1 (due to Hugo Steinhaus, the author of the highly recommended work *Mathematical Snapshots*). For every positive integer, n, does there exist in the plane a circle having in its interior exactly 'n' lattice points?

The answer is known to be yes; however, we have to allow the coordinates of the centre to be not only non-integer but also irrational, by which we mean not of the form a/b where a and b are integers. (A Schinzel.)

Problem A. Write a computer program to count the number of lattice points within a circle having a given centre and radius. Graphical output would enhance this considerably.

Question 2 (due to J Browkin). For every positive integer, n, does there exist in the plane a square containing exactly 'n' lattice points?

The answer is again known to be yes; however, the proof is considerably more difficult than that for the circle.

Problem B. Write a computer program to count the number of lattice points within a square defined by two adjacent vertices. (Note that there are, in general, two different answers: why?)

Graphical output is again desirable.

Question 3. For every positive integer, n, does there exist a set of 'n' lattice points lying on the circumference of some circle, and such that the distance between any two of them is an integer (when expressed in terms of the mesh spacing of the lattice)?

Answered in the affirmative by W Sierpinski.

Problem C. Construct and display such sets of 'n' lattice points for n = 3,4,5 . . ., together with the associated circle upon which they lie.

Question 4 (due to K Zarankiewicz, 1951). For a positive n greater than or equal to three, consider the n^2 lattice points (x,y) where x and y are positive integers less than or equal to n, denote the set of these points by R_n.

What is the smallest positive integer k (dependent of course on n, so we write k(n)) for which *each* subset R_n having k(n) points contains nine points in three different rows and three different columns?

It is known that k(4) = 14, k(5) = 21, k(6) = 27 (W Sierpinski), and that k(7) = 34 (J Brzezinski).

Problem D. Write a computer program to display the n^2 lattice points and allow the user to select k(n) of these (or to delete $n^2 - k(n)$) before determining a set of nine points satisfying the above condition.

Initially restrict the program to n = 4,5,6 and 7 but, hopefully, extend the values of k(n)!

Question 5 (due to Mazurkiewicz *c* 1914). Does there exist in the plane a set of lattice points with which every straight line in the plane has exactly two points in common?

The answer is yes and has been established using the logical tool known as the axiom of choice; however, no concrete example of such a set is known.

Problem E. How can the computer help here?

Readers are invited to submit their attempts at some (or all) of the above problems to: Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Wolverhampton, Staffordshire WV4 5NF. Tel: (0902) 892141.

Submissions, which must reach me by 1 July 1986, will be judged using suitably vague criteria. A prize will be awarded for the best entry received.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided.

Expanded reviews of previous problems together with, subject to the approval of the contributor, copies of detailed programs from the winning entry may also be requested. However, in the interests of efficiency, interested readers are urged to contact the prizewinner directly.

October review

Responses to the topic of continued fractions were extremely varied. In addition to the references given in *PCW* (October 1985), mathematically inclined readers should consult *Exercises in Number Theory* by DP Parent (Springer Verlag 1984, ch 9).

The future interest in applied numerical continued fractions seems likely to lie in investigating the relationship between the CF expansion of an algebraic number (that is, a number which is the root of a polynominal equation with integer coefficients) and the properties of the sequence of quasi-random numbers nx − [nx], n=1,2,3. . .where [nx] denotes the greatest integer not greater than nx (the computer function Entier of Int).

Thus $n\sqrt{2} - [n\sqrt{2}]$ yields values approximately .4142, .8284, .2426, .6569, .0711 and so on.

Such numbers may be used to model a Uniform Distribution over the interval 0,1 for certain simulations; that is, Monte-Carlo Techniques and, in particular, numerical integration. Extensive references are available on request.

This month's prizewinner is Richard F Tindall of 26 Poplar Close, Great Shelford, Cambridge for an extensive submission combining analytical methods with the use of a NewBrain in Basic and a TI59 calculator.

Much of Richard's work is concerned with the determination of an empirical function for the longest periods of second-degree algebraic numbers.

(See CD Patterson and HC Williams' *Some Periodic Continued Fractions with Long Periods. Mathematics of Computation* (Vol 44 No 170 pp523-532 April 1985) including the square root of 46257585588439 with period 25679652. Their paper mentions the work of GF Voronoi, *On the generalisation of the algorithm of continued fractions*, Doctoral Dissertation Warsaw 1896 in Russian (any volunteers to translate?)

LEISURE LINES

Brain-teasers courtesy of JJ Clessa.

Quickie

No prizes, no answers, but which of the following words is the odd one out?

Laughing, Mangled, Default, Thirsty, Canopy.

Prize puzzle

A certain nine-digit number is comprised of each of the digits 1–9. If the number is divided by one of the digits, it gives an eight-digit quotient which contains each of the remaining digits.

If I tell you that the original number does not end in 8, can you tell me what it is, and what is the digit by which it must be divided to satisfy the above requirements?

Answers on postcards, please, or

LEISURE LINES

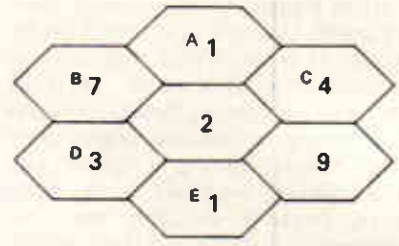
backs of envelopes, to reach us not later than 30 April 1986. Send your entries to Leisure Lines, April Prize Puzzle, *PCW*, 32-34 Broadwick Street, London W1A 2HG.

January prize puzzle

Most readers spotted the deliberate mistake in the January puzzle. Since you've all been complaining that the problems are too easy, I thought I'd slip a crafty error into one of the clues. Keep your eyes peeled.

The winner is Mr S Fox of Barnstable. Congratulations, Mr Fox — your prize is on its way.

The winning solution is:



ACC NEWS

Join a computer club and get more out of your machine. Rupert Steele tells you how.

The personal computer industry is a very special one. Home computers are a good deal more complicated to use than TVs or HiFis, and differ from one manufacturer to another, unlike most consumer goods. This means that many of the people who own, or are thinking of owning, home computers might experience difficulty in using them other than for playing games. Games are of course great fun and not to be decried, but people who limit their use of the machine to games are not getting the maximum out of their computer. This problem is particularly acute for those who own less popular or discontinued micros, as it becomes increasingly hard to find software or books relevant to their machine.

Enter computer clubs. These are associations of computer enthusiasts, usually run by and for the members, but occasionally run as a business sideline by a proprietor. Many are 'local' clubs which meet typically in church halls, community centres or educational institutions; here enthusiasts and beginners can get together to use various kinds of home and personal business computers, so that ideas and (non-copyright!) software can be pooled, tips shared and, quite often, friendships made. Some local clubs will restrict their interest to one or two machines; this leads to meetings being more directly relevant to members' particular interests, but a good deal of the variety can be lost. Most local clubs (whether single-machine or not) will have a combination of meetings, with informal 'workshop' meetings mixing with slightly more formal presentations or talks.

The other main type of computer club is the postal club. Usually aimed at a particular micro, this club produces a newsletter or similar information sheet on a regular basis. This type of group is especially valuable when a manufacturer goes out of business or otherwise fails to support an existing micro. Such 'user groups' tend to specialise in sending out technical information, programming tips and information about where spares and software can be obtained.

The Association of Computer Clubs (ACC) acts to bring together the common interests of computer clubs around the UK. It is a democratic organisation, run by and for its member clubs, providing such common services as insurance and publicity. The ACC runs ClubSpot 810, one of the most highly-accessed areas on British Telecom's Prestel system, through its Communications subcommittee. The ACC also sponsors the formation of new computer clubs, with the availability of a free information kit and a service to put potential members in touch with their nearest club. The ACC is presently reviewing its internal organisation with a view to improving the efficiency of its services to UK computer clubs.

Attention NewBrain users! As you will know, the NewBrain was a technically sophisticated micro that never caught on, with only 18,000 having been made. With a lack of support from the manufacturer, various groups have been set up to support the machine and its users. Probably the largest such group is NBUG, run by Gerald McMullon of 36 Armitage Way, Cambridge CB4 2UE. This group has 2000 members (membership is free!) and a very large amount of software including some source code. A small fee (£5 a year plus postage) secures six issues of the newsletter. A smaller group, which has a software library, but which may not presently be publishing a newsletter, is INGROUP. This is run by Anthony D Hodge of 15 St John's Court, Wakefield WF1 2RY. For details about either group, send an sae.

Also from Cambridge, I have received a copy of the *Cambridge ComputerTown Newsletter*. This is a very active group, supported by a wide range of local businesses and institutions, which meets at the Lending Library, 1st Floor, Central Library, Lion Yard, Cambridge. Bob Waixel has stepped down as chairman through pressure of other work, and the helm has been taken by Eric Willner. Eric's address is 8 Clare Street, Chatteris, Cambs PE16 6EJ or call (03543) 5793. Being a ComputerTown, this group sees one of its major aims to be to bring computing to the attention of the general public. The dates for the next few meetings are 19 April (provisional), 17 May, 14 June and 27 September. Call Eric to find out more.

Also in the area is the Huntingdonshire Computer Club. The secretary of the club is John Childs, of 57 Manor Gardens, Buckden, Huntingdon, Cambs PE18 9TW. Send an *sae* to John for more information.

A little further afield, we have news of the West Herts 80 Users' Association. This group is involved with Genie, Tandy, Amstrad, BBC and Commodore computers. The secretary is Brian Larkin at 82 Church Street, Leighton Buzzard, Beds LU7 7BT and his phone number is (0525) 373813. The club meets on alternate Tuesdays, 7.30-10.30pm at St Stephen's Parish Centre, Station Road, Bickett Wood. There is a specialist group on computing techniques.

I have received a note from the newsletter editor of the Harpenden Micro Group. It's an interesting newsletter with a session on QL networking, where the group had three QLs linked on a network all working together. This group has links with the local branch of the professional British Computer Society (BSC), and a chairman who writes witty articles in the newsletter. Meetings are held on alternate Mondays (but I don't know the venue), so you should contact Harry Fisher of 38 Piggots Hill Lane, Harpenden, Herts or call Har-

ACC NEWS

penden 2700.

Are you an MSX user? Lee Simpson, of 3 Mayfair Place, Tuxford, Newark, Notts NG22 0JD, has written to me about 'The MSX Club'. It's a postal club with a regular newsletter containing computer game tips, competitions, reviews, programming information and a 'contact' feature about other clubs. In addition to all this, the club subscription is low: £3 for the first year and then £1 for subsequent years. To find out more, contact Lee by letter or call Retford (0777) 870485.

I have had a useful information sheet from the Amstrad User Software Database (AUSD). This non-profit organisation is run by and for Amstrad computer users and provides free public domain software (mainly contributed by its users) and a newsletter containing articles and programming information contributed by the members. AUSD can usually arrange for prospective users who are within travelling distance to get some 'hands-on' experience of hardware and software, and it also has a database listing commercial programs that may be of interest to members. For details send an *sae* to AUSD, PO Box 11, Gosforth, Newcastle upon Tyne NE3 1RP.

Finally this month, I have had a letter from 'London Facilities Limited'. One of its jobs is to sell computer systems repossessed under HP agreements. The company says that some of its equipment is quite decent, so it will be offered for sale through computer clubs. Call (01) 739 7765.

For a mention in this column, to notify the ACC of a new or existing computer club, or to obtain address labels for mailing information to computer clubs, write to Rupert Steele, 12 Philbeach Gardens, London SW5 9DY or call (01) 370 0601.

For any other enquiry, including the address of your local computer club or that of your micro's user group, write to John Bone, ACC chairman, 3 Claremont Place, Gateshead, Tyne & Wear NE8 1TL, or call (091) 477 3339.

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making arrangements, in order to avoid wasted journeys due to cancellations, printers' errors, and so on.

Hanover	CeBit, Hanover Fair — World Centre for Office & Data Technology Exhibition. Contact: Deutsche Messe und Ausstellung, (01) 651 2191	12-19 March
London	Olympia, The 9th Informational Technology & Office Automation Show. Contact: BED Exhibitions, (01) 647 1001	24-27 March
Birmingham	Metropole Hotel, NEC. CADCAM Conference '86. Contact: EMAP, (01) 837 3699	8-10 April
Utrecht	Royal Netherlands Industries Fair (Jaarbeurs), Europe Software '86. Contact: (30) 955 911	8-10 April
Glasgow	Scottish Exhibition & Conference Centre, 5th Scottish Computer Show & Conference. Contact: Cahners Exhibitions Ltd, (01) 891 5051	15-17 April
Glasgow	Anderston Centre, ACT Users' Show. Contact: Trade Exhibitions Scotland, (0764) 4204	15-17 April

WRITING FOR PCW

Your chance to contribute to the magazine.

We're offering readers the chance to get rich (well, at least richer) and to influence what's published in the magazine — by writing for it. We welcome approaches from would-be writers, including those who have never appeared in print before. It's often users with practical experience who have the most interesting things to say, so don't worry if your prose is less than perfect, we can take care of the polishing.

If you have an idea for a feature write, with a brief synopsis, outlining the proposed structure and content. If your article is already written, then send it in for consideration. Remember to put your name and address on both the covering letter and the manuscript — along with a daytime phone number if possible. Manuscripts should be typed or printed out (dot matrix output is fine), in double-line spacing with ample margins top and bottom and on each side.

We'll try to return all submissions sent in with a suitable sae, but make sure you keep a copy of everything you submit as well for reference.

Any accompanying program listings should be supplied on disk or cassette, ideally with a printout as well.

Bear in mind that it's worth taking a look at the Back Issues advertisement to see what sort of things we have already published — after all there's no point in reinventing the wheel. And please be sure to tell us if you've contacted another magazine (perish the thought): it would be very awkward if the same article appeared elsewhere. Frankly, we're more likely to accept something which has been offered exclusively to us.

Finally, we do pay for published work — the rate is £65 per 1000 words, and payment usually follows about four-six weeks after publication. END

Come out of your shell

If you consider yourself to be an expert on a particular subject, why not give others the benefit of your knowledge by creating an expert system? Sergio Vaghi presents an example of DOS as an expert system shell which contains many useful characteristics.

Many specialised domains of knowledge can be represented in the form of structured decision trees such as the one shown in Fig 1. Examples vary from the expert knowledge needed for the classification or identification of objects, from plants and animals to certain types of medical consultations, from fault diagnosis in complex machines to investment advice, and from simple games to the selection of mathematical routines from a software library. Tree-structured expert knowledge can then be used as the basis of an expert system (ES) (see also 'Playing by the rules' by Ed Stenson, *PCW*, November 1985 for a method to build decision trees).

If you plan to develop an expert system of this type, or simply wish to gain experience in this area of artificial intelligence (AI), this article will help you.

When you have organised the expert knowledge, you are confronted with the problem of translating it into computerised form. Two main alternatives currently exist: coding the knowledge base in an AI language such as Lisp or Prolog (although in certain cases a procedural language can also be suitable); or using a generic mechanism of inference, a so-called expert system shell. The first approach requires, of course, that you know the language in question. Learning it may or may not be worth the effort, depending on your application and on whether you intend to write many expert systems in future.

Expert system shells are programs which are commercially available and can be used in different ES applications, provided that the knowledge base is coded with a structure and syntax understandable by the shell. Structure and syntax are kept very simple, so that even someone with no programming experience can easily write the code.

Shells can be written in high-level languages such as Pascal and Fortran, or even in Basic; their prices range from less than £40 to well above £1000. The source code is not always included and you will use the shell as a black box attached to your knowledge base — a rather unsatisfactory situation.

If you use a PC running under PC-DOS/MS-DOS (DOS for short), ver-

Strategy

s0 — (No suitable strategy available)
s1 — Call purchase
s2 — Synthetic long stock
s3 — Bull spread
s4 — Protected stock purchase
s5 — Bullish call calendar spread
s6 — Covered call writing
s7 — Uncovered put writing

Table 1 Option strategies (subset)

Questions

q1 — Are you bullish, bearish or neutral on the stock?
q2 — Risk you are ready to take (limited/large/unlimited)?
q3 — What is the reward you are after (limited/large/unlimited)?
q4 — Do you prefer a position including the stock (yes/no)?
q5 — Do you prefer to take a spread position (yes/no)?

Table 2 List of questions (subset)

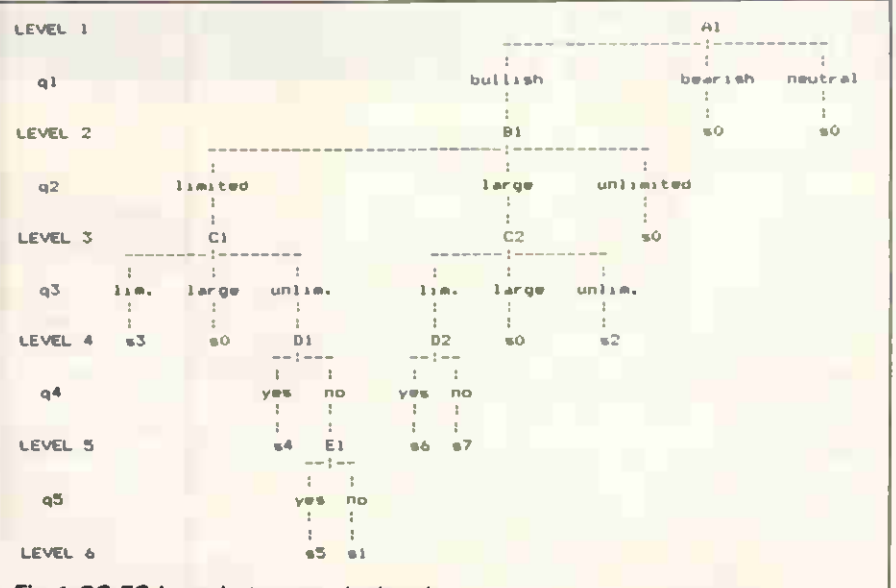


Fig 1 OS-ES knowledge tree (subset)

```
ECHO OFF
CLS
REM ---------------------------------------------------------------
REM                          start.bat
REM ---------------------------------------------------------------
ECHO .
ECHO            OPTION  STRATEGIES - EXPERT  SYSTEM
ECHO                    ver. 0.00  (subset)
ECHO .
ECHO                Copyright 1986 by S.Vaghi
ECHO .
PAUSE
IF EXIST facts DEL facts
kb ?
REM ---------------------------------------------------------------
```

```
ECHO OFF
CLS
REM ---------------------------------------------------------------
REM                              kb.bat
REM ---------------------------------------------------------------
REM
REM
REM                              RULES
REM                              -----
REM
REM ..... level 1
REM
:a1
      IF %1 == bullish GOTO b1
      IF %1 == bearish GOTO s0
      IF %1 == neutral GOTO s0
      ECHO %0 %%1 ? > $.bat
      GOTO q1
REM
REM .....level 2
REM
:b1
        IF %2 == limited GOTO c1
        IF %2 == large GOTO c2
        IF %2 == unlimited GOTO s0
        ECHO %0 %1 %%1 ? > $.bat
        GOTO q2
REM
REM ..... level 3
REM
:c1
            IF %3 == limited GOTO s3
            IF %3 == large GOTO s0
            IF %3 == unlimited GOTO d1
            ECHO %0 %1 %2 %%1 ? > $.bat
            GOTO q3
REM
:c2
            IF %3 == limited GOTO d2
            IF %3 == large GOTO s0
            IF %3 == unlimited GOTO s2
            ECHO %0 %1 %2 %%1 ? > $.bat
            GOTO q3
REM
REM .....level 4
REM
:d1
              IF %4 == yes GOTO s4
              IF %4 == no GOTO e1
              ECHO %0 %1 %2 %3 %%1 ? > $.bat
              GOTO q4
REM
:d2
              IF %4 == yes GOTO s6
              IF %4 == no GOTO s7
              ECHO %0 %1 %2 %3 %%1 ? > $.bat
              GOTO q4
REM
REM .....level 5
REM
:e1
                IF %5 == yes GOTO s5
                IF %5 == no GOTO s1
                ECHO %0 %1 %2 %3 %4 %%1 ? > $.bat
                GOTO q5
REM
REM ---------------------------------------------------------------
REM
REM
REM
REM                              QUESTIONS
REM                              ---------
REM
```

```
REM
REM
:q1
      ECHO Are you bullish, bearish or neutral on the stock ? >> facts
      ECHO Are you bullish, bearish or neutral on the stock ?
      ppp
REM
:q2
      ECHO Risk you are ready to take (limited/large/unlimited) ? >> facts
      ECHO Risk you are ready to take (limited/large/unlimited) ?
      ppp
REM
:q3
      ECHO What is the reward you are after (limited/large/unlimited) ? >> facts
      ECHO What is the reward you are after (limited/large/unlimited) ?
      ppp
REM
:q4
      ECHO Do you prefer a position including the stock (yes/no) ? >> facts
      ECHO Do you prefer a position including the stock (yes/no) ?
      ppp
REM
:q5
      ECHO Do you prefer to take a spread position (yes/no) ? >> facts
      ECHO Do you prefer to take a spread position (yes/no) ?
      ppp
REM
REM
REM
REM ---------------------------------------------------------------
REM
REM
REM
REM                              SOLUTIONS
REM                              ---------
REM
REM
REM
REM
:s0
      rec [NO_SUITABLE_STRATEGY_AVAILABLE]
REM
:s1
      rec CALL_PURCHASE
REM
:s2
      rec SYNTHETIC_LONG_STOCK
REM
:s3
      rec BULL_SPREAD
REM
:s4
      rec PROTECTED_STOCK_PURCHASE
REM
:s5
      rec BULLISH_CALL_CALENDAR_SPREAD
REM
:s6
      rec COVERED_CALL_WRITING
REM
:s7
      rec UNCOVERED_PUT_WRITE
REM
REM
REM ---------------------------------------------------------------
```

```
ECHO OFF
PROMPT $G
REM ---------------------------------------------------------------
REM                          ppp.bat
REM ---------------------------------------------------------------
```

```
ECHO OFF
CLS
REM ---------------------------------------------------------------
REM  bullish.bat, bearish.bat, neutral.bat, limited.bat, large.bat,
REM  unlimited.bat, yes.bat, no.bat
REM ---------------------------------------------------------------
ECHO %0 >> facts
$ %0
REM ---------------------------------------------------------------
```

Fig 2 Listing of the files in OS-ES (subset)

Fig 2 continued

```
ECHO OFF
CLS
REM ------------------------------------------------------------------------
REM                              rec.bat
REM ------------------------------------------------------------------------
REM
        ECHO                                                        >> journ
        ECHO          ********************************              >> journ
        ECHO                                                        >> journ
        ECHO                                                        >> journ
        ECHO                  Record of the consultation            >> journ
        ECHO                  --------------------------            >> journ
        ECHO                                                        >> journ
        TYPE facts                                                  >> journ
        ECHO                                                        >> journ
        ECHO          Recommended strategy ..... %1                 >> journ
        ECHO                                                        >> journ
REM the following line contains the nonprintable character (Ctrl)g after ECHO
        ECHO 
        ECHO .
        ECHO          Recommended strategy ..... %1
        IF NOT %1 == [NO_SUITABLE_STRATEGY_AVAILABLE] GOTO lab1
        ECHO                                                        >> journ
        ECHO .
        ECHO .
        ECHO          If you want to backtrack to the previous node enter
        ECHO                              b
:lab1
        ECHO .
        ECHO .
        ECHO          The record of this consultation has been added to file
        ECHO                              journ
        ECHO .
        ECHO .
        ECHO      ---------- End of the consultation ----------
        PROMPT =
REM ------------------------------------------------------------------------
```

sion 2.00 or later, you perhaps have a better alternative — using DOS itself as an expert system shell. It will be shown in this article that DOS can be used as an inference engine for expert systems based on deterministic, tree-structured knowledge, not directly involving numerical calculations. All you have to do is write the knowledge base using the simple syntax of the DOS batch files, which essentially amounts to the most direct form of structured English. It's simpler than Basic, and it comes 'bundled' with your machine.

DOS as an ES shell

The minimum that is required from an ES shell is the ability to perform conditional testing (of the type IF ... THEN ...), branching (of the type GOTO ...), and input/output management suitable for interactive use of the program.

In DOS, conditional testing is provided by the batch sub-command IF [NOT] condition command, where the condition parameter is one of the following:
ERRORLEVEL number
string 1 = string 2
EXIST filespec
and command is any DOS command. NOT condition is true if condition is false.

Branching is performed by the GOTO label sub-command, which causes commands to be executed beginning with the line immediately following :label.

I/O management is rather more complex, if interactive use is desired. Output can easily be obtained by the sub-command ECHO [ON:OFF message]. ECHO message displays the string message onscreen and can thus serve for communication with the user. ECHO OFF inhibits screen display of the commands following it in the batch file, and can be used to avoid displaying useless messages onscreen.

Interactive input to a batch file requires, on the contrary, a programming trick, as the usual way to provide input to a DOS batch file is to pass the values of the replaceable parameters when the file is called. Dummy parameters — represented by the symbols %1 to %9 in the code — are replaced, at execution time, by the actual parameters which follow the name of the file when called. DOS does not offer the feature, present in the more powerful operating systems of minis and mainframes, of allowing the user to be prompted — during execution — for a missing parameter.

How this problem can be solved will be explained when I present an example of an expert system.

Other features of DOS used in the example are:
— the aforementioned possibility of transferring parameters to a batch file;
— I/O redirection with the TYPE command and ECHO sub-command, to direct text and messages to a file; and
— the DOS commands CLS, to clear the screen, and PROMPT, to change the prompt, which, with the PAUSE and REM sub-commands, will help in adding a cosmetic touch to the expert system.

Only a small number of internal DOS commands and batch subcommands are needed in our example. All the other DOS commands can, however, be used and may prove helpful in certain applications.

Desirable features

An expert system should, first of all, be easy to write and maintain. I personally find Lisp and Prolog programs often hard to read, which also means they're difficult to debug and maintain, because errors can easily slip into the code and go undetected. A friendly interface with the user is also desirable. Interactive use is generally required, with reasonably efficient error-trapping for the less experienced or occasional user. A 'help' facility can be useful.

Backtracking — that is, the possibility of going back to the previous decision node — is also important as it allows the user who has reached the end of a limb to go one step back and choose a different path, without having to start the consultation from the beginning.

Another essential feature is the possibility of tracing and recording a consultation. This is invaluable during debugging of the program, and convenient for the user, who gets a complete record of the session.

Easy access to a database directly from the ES — for example, to provide a detailed description of a given recommendation — can also be handy in certain cases.

It may be appropriate to let the user ask, during the course of the session, why a certain question is asked, or how a certain conclusion has been reached. Depending on the application, 'how' and 'why' capabilities are often desirable and sometimes essential.

The example chosen for this article, and which will be completely developed to the point where you can run it on your PC, is a subset of a real expert system currently under alpha-testing.

Option Strategies' - Expert System (OS-ES) provides investment advice in the area of listed stock options. Although this is perhaps a somewhat unfamiliar field to many *PCW* readers, I have chosen OS-ES instead of the 'toy' expert systems so often found in academic literature — such as a fictitious psychiatric session or the 'twenty questions' game — to show that, within the limits spelled out later, you can indeed develop absolutely 'serious' and useful expert systems with DOS.

I'll briefly explain what OS-ES is about. Listed stock options are security contracts which give the right to buy (call option) or sell (put option) a given number of shares of the underlying stock for a fixed price within a limited period of time. Option contracts can be bought or sold in the exchanges, where they are listed in the same way that it is done for the

```
C>start


.
          OPTION  STRATEGIES - EXPERT  SYSTEM
                  ver. 0.00  (subset)
.
               Copyright 1986 by S.Vaghi
.
Strike a key when ready . . .
Are you bullish, bearish or neutral on the stock ?

 bullish


Risk you are ready to take (limited/large/unlimited) ?

>limited


What is the reward you are after (limited/large/unlimited) ?

 limited



.
       Recommended strategy ..... BULL_SPREAD
.
.
       The record of this consultation has been added to file
                           journ
.
.
     ---------- End of the consultation ----------

C>
```

Fig 3 Example of consultation as it appears onscreen

```
C>start


.
          OPTION  STRATEGIES - EXPERT  SYSTEM
                  ver. 0.00  (subset)
.
               Copyright 1986 by S.Vaghi
.
Strike a key when ready . . .
Are you bullish, bearish or neutral on the stock ?

>bullish


Risk you are ready to take (limited/large/unlimited) ?

>large


What is the reward you are after (limited/large/unlimited) ?

>large



.
       Recommended strategy ..... (NO_SUITABLE_STRATEGY_AVAILABLE)
.
.
       If you want to backtrack to the previous node enter
                           $
.
.
       The record of this consultation has been added to file
                           journ
.
.
```

Fig 4 Example of consultation including backtracking

Fig 4 continued

```
     ---------- End of the consultation ----------

C>$



What is the reward you are after (limited/large/unlimited) ?

>unlimited



.
       Recommended strategy ..... SYNTHETIC_LONG_STOCK
.
.
       The record of this consultation has been added to file
                           journ
.
.
     ---------- End of the consultation ----------

C>
```

```
          ************************************


               Record of the consultation
               --------------------------

Are you bullish, bearish or neutral on the stock ?
bullish
Risk you are ready to take (limited/large/unlimited) ?
limited
What is the reward you are after (limited/large/unlimited) ?
limited

       Recommended strategy ..... BULL_SPREAD


          ************************************


               Record of the consultation
               --------------------------

Are you bullish, bearish or neutral on the stock ?
bullish
Risk you are ready to take (limited/large/unlimited) ?
large
What is the reward you are after (limited/large/unlimited) ?
large

       Recommended strategy ..... (NO_SUITABLE_STRATEGY_AVAILABLE)


          ************************************


               Record of the consultation
               --------------------------

Are you bullish, bearish or neutral on the stock ?
bullish
Risk you are ready to take (limited/large/unlimited) ?
large
What is the reward you are after (limited/large/unlimited) ?
large
What is the reward you are after (limited/large/unlimited) ?
unlimited

       Recommended strategy ..... SYNTHETIC_LONG_STOCK
```

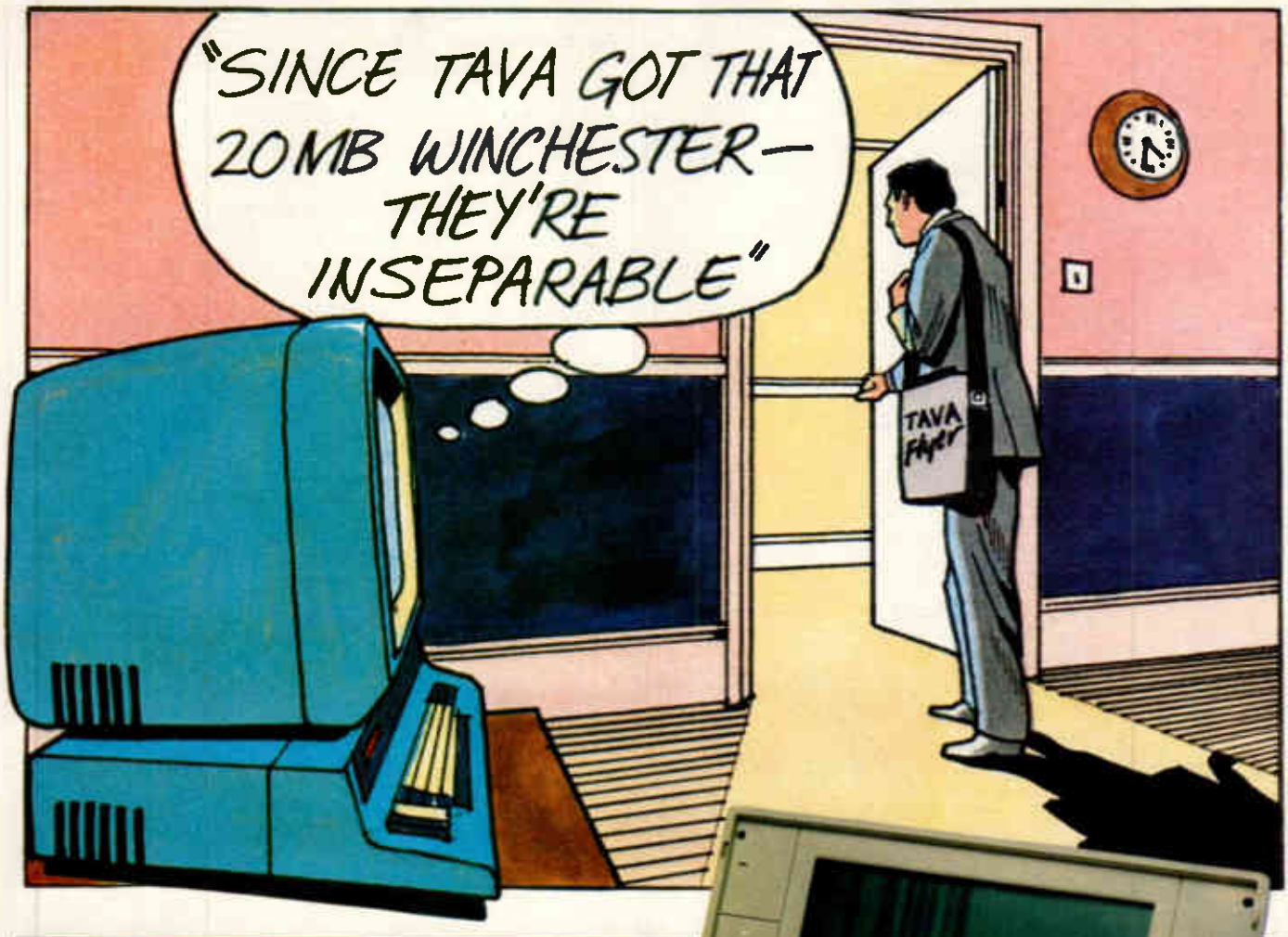
Fig 5 Printout of the file 'journ' with the record of the consultations

shares of a stock. The attraction of options for many investors and portfolio managers is that they can be used, alone or in combination with the shares of the underlying stock, to implement various advanced investment strategies.

Considering that option strategies can be very complex and the money involved is often quite substantial, this is an ideal application field for expert systems.

OS-ES, of which the example given here is a subset, assists the investor in the selection of a suitable option strategy, depending on factors such as the attitude of the investor towards the stock, the risk he or she is prepared to accept, and others. Our subset of OS-ES covers the particular case in which the investor is 'bullish' on the stock — that is, he believes that the price of the stock will rise during the lifetime of the option. The complete expert system also includes the cases when the investor is 'bearish' on the stock — that is, he believes that the price will decline, or when he is neutral.

Here's a word of warning: as I have stated, OS-ES is, at the time of writing, still under testing, so if you do invest in options please refrain



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from using this subset for your investment decisions.

Writing the system

The knowledge base of our expert system is contained in Tables 1 and 2, and in Fig 1.

The option strategies considered are listed in Table 1. Each strategy is characterised by certain attributes: strategy s3 (bull spread) is, for example, suitable for an investor with a bullish attitude towards the stock, ready to take a limited risk only, and accepting a limited reward on the investment. These attributes are translated into answers to the relevant questions listed in Table 2. For the bull spread strategy the answers to the first three questions are bullish, limited, limited. This, in turn, is reflected in the position of the strategy in the knowledge tree in Fig 1. The other ramifications of the tree are built up in the same way for the other strategies considered.

The tree itself consists of levels and nodes. The expert system reasons along paths, from one node to the other, asking questions whenever a piece of information is needed and then moving to the corresponding node at a deeper level, eventually reaching a solution: that is, a recommended option strategy (note that strategy s0 is included for the cases when no suitable strategy is available with the attributes specified by the user).

Following the sub-tree in Fig 1 it is possible to code the knowledge base as a DOS batch file, which I have called kb.bat. It consists of three sections — 'rules', 'questions' and 'solutions'.

We start at level one, node A1. The answer to the first question, q1, will correspond to the first dummy parameter, %1, in kb.bat. If %1 is equal to bullish, we move to node B1. If %1 is equal to bearish or neutral, the recommended solution will be 'no suitable strategy available', because only the 'bullish' sub-tree of the knowledge base is considered. If %1 is equal to none of the above, this means that either it is the first time that the ES has come to this node, or a 'non-acceptable' answer was entered. In either case, the program will prompt you for more information.

All this can be coded very simply:

```
:a1
      IF %1 = bullish GOTO b1
      IF %1 = bearish GOTO s0
      IF %1 = neutral GOTO s0
      .....
      GOTO q1
```

to be included at the beginning of the rules section.

In the questions section we will include the following:

```
:q1
      ECHO Are you bullish, bearish
      or neutral on the stock? >>
      facts
      ECHO Are you bullish bearish
      or neutral on the stock?
```

and in the solutions section:

```
:s0
      rec (NO_SUITABLE_
      STRATEGY_AVAILABLE)
```

At the beginning of a consultation, when kb.bat is called for the first time, %1 will not be equal to any of the three acceptable answers to the first question (bullish, bearish, neutral) and control will be transferred to label :q1, where OS-ES will ask the question and also write it into file facts. To get the answer it must, at this point, return control to you, and it is here that the programming trick to mimic interactive input is required. In the rules section, before GOTO q1, we will have inserted the command ECHO %0 %%1? > $.bat which, when executed, creates a new batch file, $.bat, containing one line only — kb %1?. (Remember that the dummy parameter %0 is always replaced by the name of the batch file in which it is contained, and that %%1 becomes %1 when output is directed to another file.)

In the questions section, just after the second ECHO command with the text of question q1, we insert ppp. This is a call to a separate batch file, ppp.bat, consisting of two lines:

```
ECHO OFF
PROMPT $G
```

The effect of calling ppp.bat is twofold: the execution of kb.bat is interrupted; and control is returned to the keyboard. The prompt is changed to '>'. The following two lines will thus appear onscreen:

```
Are you bullish, bearish or neutral
  on the stock?
  >
```

You will then enter the appropriate answer just after the prompt. This particular question admits, as we have seen, three acceptable answers — bullish, bearish and neutral. We will have created three identical batch files — bullish.bat, bearish.bat and neutral.bat — containing the following four lines:

```
ECHO OFF
CLS
ECHO %0 >> facts
$ %0
```

When the answer bullish, say, is entered it is written to the file 'facts', just after the line containing the question asked. The batch file $.bat is then called, which, remember, contains one line only — kb %1? . At call the dummy parameter %1 is replaced by the name of the calling batch file (that is, bullish) to obtain kb bullish?.

At this point kb.bat is called again, with bullish replacing %1 and ? replacing %2. At node A1 the first IF test is fulfilled (bullish = bullish is true) and the next command to be executed will be the one following label :b1.

What we have managed to do, in short, is to make the ES ask for the information it needs.

When the answer is entered the ES starts again from the first rule, but — being now in possession of the relevant information — it moves to the next node in the tree. This control strategy is called forward chaining in AI terminology.

In the process it has also recorded question and answer, so keeping track of the conversation with the user (tracing capability), and changed the prompt to emphasise that you are within the program environment.

Convenient error-trapping is also automatically provided. You must distinguish here between 'acceptable answers' for a given question and 'legal answers' for the entire ES. Acceptable answers for a given question are those which transfer control to a new node or to a solution. Acceptable answers for question q1 are bullish, bearish or neutral; they are also legal answers, as are all the other acceptable answers for all the other questions in the tree. In our example, bullish, bearish, neutral, limited, large, unlimited, yes and no are all legal answers, and the ES contains eight identical batch files with these file names.

Error-trapping works as follows. If a legal, but not acceptable, answer is entered — for example, if yes is entered in reply to q1 — the question is repeated, because the conditions in the IF sub-commands at node A1 are not true. If an illegal answer is entered — for example, bullis instead of bullish — the following message is displayed:

Bad command or file name

simply because the batch file bullis-.bat does not exist. In both cases the prompt '>' follows, and you can enter an acceptable answer.

But let's come back to node A1. Had the answer to the first question been bearish or neutral, control would have been transferred to label :s0 in the solutions section of kb.bat. The batch file rec.bat would have then been called with the parameter: (NO_SUITABLE_
STRATEGY_AVAILABLE).

The file rec.bat is the output manager of the expert system. It has three functions: displaying the recommended strategy onscreen; writing it into a file 'journ' preceded by the information contained in the file 'facts' (that is, the list of questions

asked and answers received); and, in the case of the strategy s0, instructing you on how to backtrack, if desired, to the previous decision node. Backtracking is possible because $.bat maintains a 'memory' of the facts learned by the system so far.

The original prompt is finally re-established, indicating that you have left the program environment. The listing of rec.bat in Fig 2 shows the details of the implementation.

Coding the other ramifications of the knowledge base is now just a matter of repeating, at each node, what has been done at node A1. At each level a new question is included in the questions section, and a new dummy parameter is added when ECHO-ing to $.bat. If a question is irrelevant to certain solutions, the corresponding level in the tree is ignored; therefore, only relevant questions are asked, provided that the tree is properly structured. At certain nodes, a new solution is reached and added to the solutions section.

The resulting code is straightforward and easy to read, as you can see by simple inspection of the listing of kb.bat in Fig 2. Just remember that all legal answers must be present in the ES as batch files: in our example, these are bullish.bat, bearish.bat, neutral.bat, limited.bat, large.bat, unlimited.bat, yes.bat, no.bat. (Note that unlimited.bat will actually be unlimite.bat, as in DOS a filename can't exceed eight characters; this has, however, no practical consequence here.)

Now we need a way to start the program. This can be done through a file, start.bat, which may contain the title and some information on the ES, and must include, at the end, the following two lines:

```
IF EXIST facts DEL facts
kb ?
```

The first line deletes — if it exists — the file 'facts' containing the trace, now useless, of the previous consultation, and the second line actually starts the program by calling kb.bat with '?' as first parameter. All you have to do to start a consultation is to enter 'start' after the prompt.

This, rather lengthy, description can be summarised by saying that the entire expert system consists of the following elements:

— a starter (start.bat);
— a knowledge base (kb.bat) containing three sections — rules, questions and solutions); and
— the I/O management files (ppp.bat, rec.bat, bullish.bat, . . ., no.bat).

A listing of all the files which constitute the expert system of Fig 1 is shown in Fig 2. The code is reasonably self-explanatory, and you should have no problem in following it with the help of Fig 1. In order to improve legibility I have reserved capital letters for the DOS commands and the solutions, and used a structured style in writing the code. The sub-command ECHO OFF occupies the first line in all files, to avoid the situation where all the following lines will be shown onscreen. Only useful messages will appear instead.

With the exception of ppp.bat, all files include the command CLS in the second line to clear the screen. In practice you will see ECHO OFF briefly flashing on the screen, and then the next useful message or the prompt. The impression of a completely interactive system is almost perfect.

Fig 3 shows an example of consultation as it appears on the screen; Fig 4 is a consultation including backtracking; and Fig 5 is a printout of the file 'journ' with the record of the above consultations.

You may wish to run the ES on your PC and see how it behaves in actual use. At the end of the session, consisting of one or more consultations, you can print out the file 'journ' which contains the complete record of the session; 'journ' should then be deleted, unless you want the record of the next session to be appended to it. The other two files created during the session — $.bat and facts — are automatically dealt with by the program and you don't have to worry about them.

Using a RAM disk

An expert system using DOS as an inference engine is fairly slow, especially if it runs directly from disk. This is due to the frequent jumps from one batch file to the other, and the fact that the GOTO sub-command does not immediately transfer execution to the line following the label, but lets the system also scan all the lines inbetween. This considerably slows the execution, particularly when the system has reached a deep level in the tree. Much strain is also imposed on the disk drive, which is kept busy all the time.

A better method is to copy the ES, together with any external DOS command used, into a RAM disk and run it from there. The increase in speed is remarkable and there is no overload on any disk drive. A further marginal increase in speed can also be obtained by using a run-time version of the program, where all the comment lines (those beginning with REM) have been suppressed. Nonetheless, you shouldn't encounter any problems when running the OS-ES subset.

The complete OS-ES comprises, in the present version, eight levels and more than 20 strategies. It runs quite efficiently in RAM, and is barely acceptable when run from disk. More complex expert systems may, however, become unacceptably slow.

Limitations

The major limitation of DOS as an ES shell is the inability to perform mathematical calculations other than the simplest form of equivalence. The batch sub-command IF string 1 = = string 2 command actually compares the ASCII values of the characters in string 1 and string 2. Thus, while 2 = = 2 is true, 1+1 = = 2 is false (for the same reason as = = A is false, so watch out when using both capital and small letters in the code). Consequently, DOS can be used as an inference engine only for expert systems not involving mathematical calculations.

Nondeterministic systems requiring fuzzy logic are typically excluded, since probabilities can't be calculated, but there are many applications for which this is not a serious constraint.

Another limitation is that only up to 10 dummy parameters — %0 to %9 — can be specified within a batch file. As %0 is reserved to the file name, this means that in practice the expert system can only contain up to nine levels, although this limit can perhaps be increased by clever use of the SHIFT sub-command, which allows command lines to make use of more than 10 replaceable parameters. But nine levels are not too bad, and there is no limit to the ramifications between levels (that is, the number of acceptable answers to a given question).

Conclusion

DOS can be used to develop simple expert systems with many desirable characteristics. The knowledge base is easy to code, read, maintain and update. Friendly interface, backtracking capability, error-trapping and tracing/recording facilities are all available.

It is worth noting that what is possible with DOS is certainly possible with the more powerful operating systems used in minis and mainframes. Coding is equally easy, interactive I/O and a larger choice of commands are available, mathematical calculations of some complexity are possible, and execution speed is not a problem. Using operating systems as inference engines may indeed prove a convenient way, in certain cases, to develop expert systems without having to learn a new programming language or buy expensive commercial shells. END

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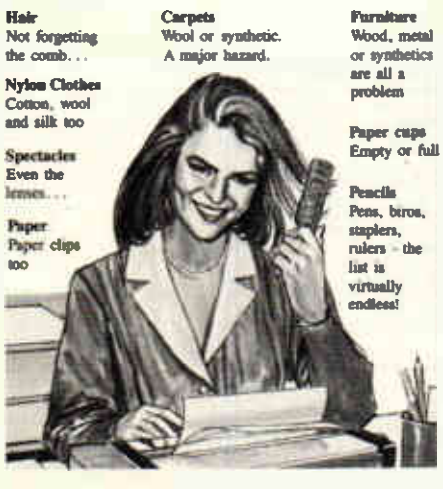

Q4. ***Why do women generate more Static than men?***
Because the soles of their shoes are usually thinner! So they generate more voltage when walking about the office.

Q5. ***Why has this man just greatly increased the static risk?***
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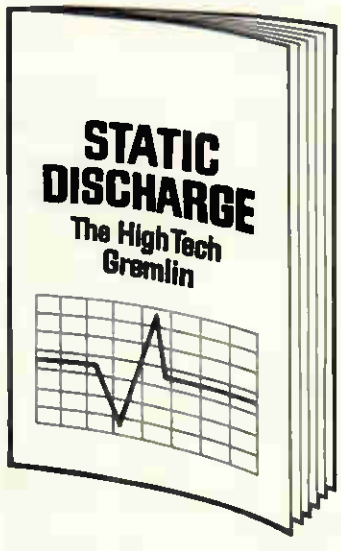

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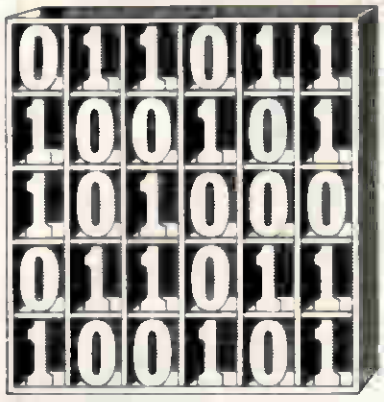

David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to SubSet, PCW, 32-34 Broadwick Street, London W1A 2HG.

68000 SERIES CONDITION CODES ACCESS

In August 1985 I explained how access to the Condition Codes Register in User Mode required a different instruction for the 68000 and 68008 side of the family (MOVE SR, <EA>) to that of the 68010 and 68020 virtual machines (MOVE CCR, <EA>).

So far, only Terry Browning of Wells has attempted to provide a useful, truly portable routine to put the CCR on top of stack — ready for use within a subroutine or for RTR exit. Terry describes the result PSHCCR (Datasheet 1) as 'a mess, taking about 200 cycles to execute.'

Without denigrating Terry's programming skill, I have to agree that, despite a hint of elegance, PSHCCR is undoubtedly a costly way to read the 68000's flags.

Nevertheless, the only alternative to this or a similar routine is to rely entirely on the system software's ability to trap an illegal instruction or privilege violation and return the CCR state from the exception. This, too, is likely to be quite slow because of the lengthy internal interrupt processing. Furthermore, exceptions are bound to introduce timing uncertainties when precise timing could be crucial.

DATASHEET 1

```
;
;= PSHCCR        68000-series MOVE from CCR to User Stack.
;
;JOB             68000-series fully portable push of CCR to User
;                Stack (A7) without using "MOVE CCR,-(A7)" (not
;                available on 68000 or 68008) or "MOVE SR,-(A7)"
;                (not available on 68010 or 68020).
;ACTION          Clear CCR copy register, D0.
;                FOR each condition code: ZNVC
;                { IF condition set
;                  { Set copy bit in D0, 4 bits higher. } }
;                Rotate copy register right through eXtend 4 bits
;                shifting all copy flags to correct bit position.
;                Stack CCR copy register below return address.
;
;CPU             68000-series.
;HARDWARE        None.
;SOFTWARE        None.
;
;INPUT           None.
;OUTPUT          Copy of CCR on User Stack top (A7).
;                (Stacked SR system byte = 0.)
;                No other registers or flags affected.
;ERRORS          None.
;REG USE         None.
;STACK USE       (User Stack, A7): 4.
;                (PSHCCR increases program stack use by 2.)
;RAM USE         None.
;LENGTH          6B
;CYCLES          68000: 178 + 18 for each set N,Z,V,C flag.
;                68008: 332 + 14 for each set N,Z,V,C flag.
;                68010: 178 + 10 for each set N,Z,V,C flag.
;                68020: 135 + 1 for each set N,Z,V,C flag (max).
;
;CLASS 1         *discreet       *interruptable      *provable
;                *reentrant      *relocatable        *robust
;
;
PSHCCR MOVEM.W D0-D1,-(A7)      ;Use D1 to make 2-byte      48A7
                                ;workspace and save D0 on   C000
                                ;top of stack.
       SF      D0               ;Initially clear all flag   51C0
                                ;bits in D0.B, using "SF"
                                ;since "CLR" affects CCR.
;
;..."BSET" affects Z flag, so begin synthesis with Z. Build CCR
;...copy in D0 left shifted 4 bits for later rotate to get X.
PCCRZ  BNE     PCCRN            ;Okay if Z reset, else set  6604
       BSET    #6,D0            ;corresponding D0 bitno. +4. 08C0
                                ;                           0006
PCCRN  BPL     PCCRV            ;Okay if N reset, else set  6A04
       BSET    #7,D0            ;corresponding D0 bitno. +4. 08C0
                                ;                           0007
PCCRV  BVC     PCCRC            ;Okay if V reset, else set  6804
       BSET    #5,D0            ;corresponding D0 bitno. +4. 08C0
                                ;                           0005
PCCRC  BCC     PCCRX            ;Okay if C reset, else set  6404
       BSET    #4,D0            ;corresponding D0 bitno. +4. 08C0
                                ;                           0004
PCCRX  ROXR.B  #4,D0            ;Rotate X into D0, shifting E810
                                ;"flags" to correct places.
       ANDI.W  #$00FF,D0        ;Clear D0(15-8) for zero    0240
                                ;system byte on stack.      00FF
       MOVE.W  4(A7),2(A7)      ;Move stacked return addres 3F6F
                                ;up stack (down memory) by  0004
                                ;2 bytes to make room for   0002
       MOVE.W  6(A7),4(A7)      ;copied CCR to go on return 3F6F
                                ;stack top. Use word ops to 0006
                                ;ensure no overwriting.     0004
       MOVE.W  D0,6(A7)         ;Put copied CCR to return   3F40
                                ;stack top (below ret addr). 0006
       MOVE.W  (A7)+,D0         ;Restore D0.                301F
       MOVE    4(A7),CCR        ;Restore CCR from stack copy 44EF
                                ;(system byte not affected). 0004
       RTS                      ;Exit with CCR on stack top. 4E75
```

QUICKER Z80 SOUNDEX

SOUNDX (Datasheet 2) from James Day of Plymouth is a far speedier version of John Hardman's routine (June 1985). Although timing will vary considerably depending on the string being processed, James estimates that his routine will execute on average some five times faster than the original SOUNDX. It is also five bytes shorter and uses two bytes less stack space.

Much of the speed increase is as a result of random table access rather than the sequential read used by John's routine. The letter to be encoded is added as offset to the table base address and the corresponding code value (0 to 6) read of.

One very useful trick used by James is not to follow the convention of converting the letters' ASCII values to simple offsets in the range 0 to 25 but instead to form a displaced base address to the table such that the lowest valid offset will index the first value in the table.

Another trick, which shortens the table by one byte and gains a slight increase in speed, is to disregard 'A' when testing for validity since a null code would be returned anyway.

DATASHEET 2

```
;
;= SOUNDX        Letter sequence to 4 character SOUNDEX code.
;
;JOB             To encode a letter sequence as a single upper case
;                letter followed by 3 decimal digits such that
;                phonetically similar sequences produce identical
;                codes.
;ACTION          Read 1st (upper-case) source character.
;                IF character is letter (A to Z)
;                { Write letter to result.
;                  WHILE result < 4 bytes AND digit > NULL.
;                    { Save last digit (or 1st letter).
;                      Read (upper-case) source character.
;                      Convert to Soundex code digit.
;                      IF digit <> last digit
;                        { Write digit to result. } } }
;                IF result < 4 bytes
;                { Pad result with '0's. }
;
;CPU             Z80
;HARDWARE        Source memory. Destination RAM.
;SOFTWARE        None.
;
;INPUT           DE addresses 1st byte of source string.
;                  Source string should terminate with a null byte.
;                HL addresses 1st byte of 4-byte SOUNDEX destination.
;OUTPUT          All registers and flags unchanged.
;                Destination contains 4-byte SOUNDEX code of source.
;ERRORS          None.
```

```
;REG USE     DE HL
;STACK USE   10
;RAM USE     None.
;LENGTH      95 (code: 70, appended table: 25).
;CYCLES      Depends on source contents.
;
;CLASS 2      *discreet       *interruptable      *promable
;*****>       *reentrant      -relocatable        *robust
;
;
SOUNDX PUSH AF          ;Save registers and flags          F5
       PUSH DE          ;used in SOUNDX.                   D5
       PUSH HL          ;                                  E5
       PUSH BC          ;                                  C5
       LD   B,4         ;Count for 4 SOUNDEX characters.   06 04
       LD   A,(DE)      ;Get 1st source character,         1A
       AND  0DFH        ;ensure upper case,                E6 DF
       CP   'A'         ;and test for letter (A to Z)      FE 41
       JR   C,PADEND    ;skipping to pad out with          38 2F
       CP   'Z'+1       ;'0's if not letter.               FE 5B
       JR   NC,PADEND   ;                                  30 2B
       JR   STORE       ;Else save initial letter          18 22
;
SAVOLD LD   C,A         ;Save copy of last char/code.      4F
;
NEXTCH INC  DE          ;Address next source character     13
       LD   A,(DE)      ;and get it.                       1A
       AND  A           ;Test for source string end        A7
       JR   Z,PADEND    ;skipping to '0' pad if so.        28 23
       AND  0DFH        ;Ensure upper case and test        E6 DF
       CP   'B'         ;for within table range (B to Z)   FE 42
       JR   C,NEXTCH    ;looping to get next character     38 F5
       CP   'Z'+1       ;if non-letter or 'A' (vowels      FE 5B
       JR   NC,NEXTCH   ;have no SOUNDEX code).            30 F1
       PUSH HL          ;Save destination pointer and      E5
       LD   HL,SNDTAB-'B' ;use HL to address table at      21 lo hi
       ADD  A,L         ;offset allowing for ASCII codes.  85
       LD   L,A         ;Add source upper-case letter      6F
       LD   A,0         ;code to index corresponding       3E 00
       ADC  A,H         ;SOUNDEX code in HL.               8C
       LD   H,A         ;                                  67
       LD   A,(HL)      ;Get SOUNDEX code and              7E
       POP  HL          ;restore destination pointer.      E1
       AND  A           ;Test for null code and go get     A7
       JR   Z,NEXTCH    ;next source char if so.           28 E2
       CP   C           ;Test for repeat of last code      B9
       JR   Z,NEXTCH    ;and get next char if so.          28 DF
;
STORE  LD   (HL),A      ;Write char/code to destination    77
       INC  HL          ;and index next dest. byte.        23
       DJNZ SAVOLD      ;Repeat for 4 SOUNDEX bytes.       10 DA
       JP   SXEXIT      ;Go exit.                          C3 lo hi
;
PADEND LD   (HL),'0'    ;Write '0' to destination and      36 30
       INC  HL          ;index next destination byte.      23
       DJNZ PADEND      ;Repeat for 4 SOUNDEX bytes.       10 FB
;
SXEXIT POP  BC          ;Restore registers and flags       C1
       POP  HL          ;used in SOUNDX and exit           E1
       POP  DE          ;with pointers unchanged.          D1
       POP  AF          ;                                  F1
       RET              ;                                  C9
;
SNDTAB DEFB '123'       ;          BCD                     31 32 33
       DEFB 0,'12'      ;          EFG                     00 31 32
       DEFB 0,0,'2'     ;          HIJ                     00 00 32
       DEFB '245'       ;          KLM                     32 34 35
       DEFB '5',0,'1'   ;          NOP                     35 00 31
       DEFB 0,'62'      ;          QRS                     00 36 32
       DEFB '3',0,'1'   ;          TUV                     33 00 31
       DEFB 0,'2',0     ;          WXY                     00 32 00
       DEFB '2'         ;          Z                       32
```

8086 SOUNDEX

NAMEX (Datasheet 3), from Finbarr Murphy of Ireland, is a SOUNDEX routine for the 8086. Finbarr wrote it after reading an article by Bob Chappel in *Microcomputer Printout* (August 1982) and says that he has used it successfully with dBaseII on his IBM PC. As written, the routine can cope only with strings up to 11 letters in length, assumed to be surnames. These must be preloaded into the routine's workspace terminated with a carriage return character.

One aspect of SOUNDEX coding missed by all of John Hardman, James Day and myself is that (rarely) the initial letter may be repeated, as in the names FFOULKES and LLOYD. Both SOUNDX routines will erroneously include the code for the repeated occurrence after the letter — for example, LLOYD will be encoded as L430 when it should be L300. Finbarr's NAMEX guards against this happening by always encoding the initial letter as the first SOUNDEX byte, so allowing repetition testing on it, and replaces it by the actual letter only after the full code has been found.

NAMEX makes fairly good use of the 8086 string processing instructions, both as simple primitives and with the REPeat prefixes for iterative processing. The sequential table search is performed by the combined instruction 'REPNE SCASB' which utilises the auto-incrementing address in register DI and alphabet length count in CX. The corresponding code is then read from the location 25 bytes greater than the value in DI after a match is found.

Were BX not being used as count register, a far quicker method of table lookup, making better use of the 8086 instructions is suggested by James Day's SOUNDX. After validating the character in AL as a letter, load BX with a value 41 less than the address of the codes table (so the offset 'A' indexes the first entry) and use 'XLAT' to read into AL the value contained in location [BX+AL].

Note: Finbarr, please let me know your full address as soon as possible. END

DATASHEET 3

```
;
;= NAMEX      11-letter name to 4 character SOUNDEX code.
;
;JOB          To encode a sequence of up to eleven letters as
;             a single upper case letter followed by 3 decimal
;             digits such that phonetically similar sequences
;             produce identical codes.
;ACTION       Set result to default '00000'.
;             Read 1st (upper-case) character.
;             IF character is letter
;             [ Write character to firstchar store.
;               WHILE character NOT terminator AND count <=4
;               { Read (upper-case) character.
;                 IF character is letter
;                 [ Convert to SOUNDEX code.
;                   IF code NOT '0'
;                   [ IF count=0 OR code<>lastcode
;                     { Write code to result.
;                       Increment count. ] ] ] ]
;               Move firstchar to result. ]
;
;CPU          8086/8088
;HARDWARE     Possible storage and table use of memory if not
;             appended to program.
;SOFTWARE     None.
;
;INPUT        Name of 1 to 11 letters, terminated by carriage-
;             return (0DH), must be in NAME storage.
;OUTPUT       SOUNDEX code in CODE storage terminated by '$'.
;             ('0000$' output for invalid name).
;ERRORS       None if input conditions observed.
;REG USE      F
;STACK USE    10
;RAM USE      Input and output storage and conversion table is
;             directly addressed.
;LENGTH       169 (code : 99, table: 52, storage: 18).
;CYCLES       Not given.
;
;CLASS 2      -discreet       *interruptable      -promable
;-*----*      -reentrant      -relocatable        *robust
;
;
NAMEX  PUSH  AX             ;Save registers used          50
       PUSH  BX             ;in NAMEX.                    53
       PUSH  CX             ;                             51
       PUSH  DI             ;                             57
       PUSH  SI             ;                             56
       CLD                  ;Clear for auto-increment.    FC
       XOR   BX,BX          ;Clear result counter.        33 DB
       LEA   DI,[FCHAR]     ;Address result storage,      8D 3E lo hi
       MOV   CX,5           ;count for 5 bytes,           B9 05 00
       MOV   AL,'0'         ;using AL='0', initialise     B0 30
       REP                  ;result store to              F2
       STOSB                ;to '00000',                  AA
       LEA   SI,[NAME]      ;Address input source name    8D 36 lo hi
       LODSB                ;and get 1st character,       AC
       AND   AL,0DFH        ;ensuring upper-case.         24 DF
       CMP   AL,'A'         ;Test for character is        3C 41
       JL    ERROR          ;letter (A to Z) and          7C 3F
       CMP   AL,'Z'         ;skip out in error            3C 5A
       JG    ERROR          ;if not.                      7F 3B
       MOV   [FCHAR],AL     ;Save 1st character and       A2 lo hi
       JMP   FIRST          ;go get its SOUNDEX code.     EB 07
;
AGAIN  LODSB                ;Get next character and       AC
       CMP   AL,0DH         ;test for <CR> terminator,    3C 0D
       JZ    EXIT           ;ending if so, else           74 2B
       AND   AL,0DFH        ;ensure upper-case.           24 DF
;
FIRST  MOV   CX,26          ;Set table letter count,      B9 1A 00
       LEA   DI,[LTAB]      ;address letter table         8D 3E lo hi
       REPNE                ;and search until match       F2
       SCASB                ;of character or CX=0         AE
       JCXZ  AGAIN          ;in which case, get next.     E3 EE
       MOV   AL,[DI+25]     ;Get corresponding code       8A 45 19
       CMP   AL,'0'         ;and test for '0', go         3C 30
       JNZ   EXCEPT         ;write code if not, else      75 06
       CMP   BX,0           ;if not 1st character         81 FB 00 00
       JG    AGAIN          ;go get next one.             7F E1
;
EXCEPT LEA   DI,[BX+CODE]   ;Address current result      8D BF lo hi
       CMP   AL,[DI-1]      ;byte and if repeat, go       3A 45 FF
       JZ    AGAIN          ;get next character.          74 08
       STOSB                ;Else write code digit        AA
       INC   BX             ;and point to next.           43
       CMP   BX,4           ;If not end then go           81 FB 04 00
       JL    AGAIN          ;process next character.      7C D8
;
EXIT   MOV   AL,[FCHAR]     ;Finally, transfer 1st        A0 lo hi
       MOV   [CODE],AL      ;letter to SOUNDEX code.      A2 lo hi
;
ERROR  POP   SI             ;Restore registers            5E
       POP   DI             ;used in NAMEX.               5F
       POP   CX             ;                             59
       POP   BX             ;                             5B
       POP   AX             ;                             58
       RETF                 ;Long return.                 CB
;
FCHAR  DB    0              ;1st letter storage.          00
CODE   DB    4 DUP(0),'$'   ;SOUNDEX code result          00 00 00 00
                            ;storage.                     24
NAME   DB    12 DUP(13)     ;Input name space.            0D 0D 0D 0D
                            ;It must terminate with       0D 0D 0D 0D
                            ;carriage-return.             0D 0D 0D 0D
LTAB   DB    'ABCD'         ;Letter to SOUNDEX code       41 42 43 44
       DB    'EFGH'         ;conversion table.            45 46 47 48
       DB    'IJKL'         ;                             49 4A 4B 4C
       DB    'MNOP'         ;                             4D 4E 4F 50
       DB    'QRST'         ;                             51 52 53 54
       DB    'UVWX'         ;                             55 56 57 58
       DB    'YZ'           ;                             59 5A
       DB    '0123'         ;SOUNDEX code digits          30 31 32 33
       DB    '0120'         ;in alphabetic order.         30 31 32 30
       DB    '0224'         ;                             30 32 32 34
       DB    '5581'         ;                             35 35 30 31
       DB    '0623'         ;                             30 36 32 33
       DB    '0102'         ;                             30 31 30 32
       DB    '02'           ;                             30 32
```

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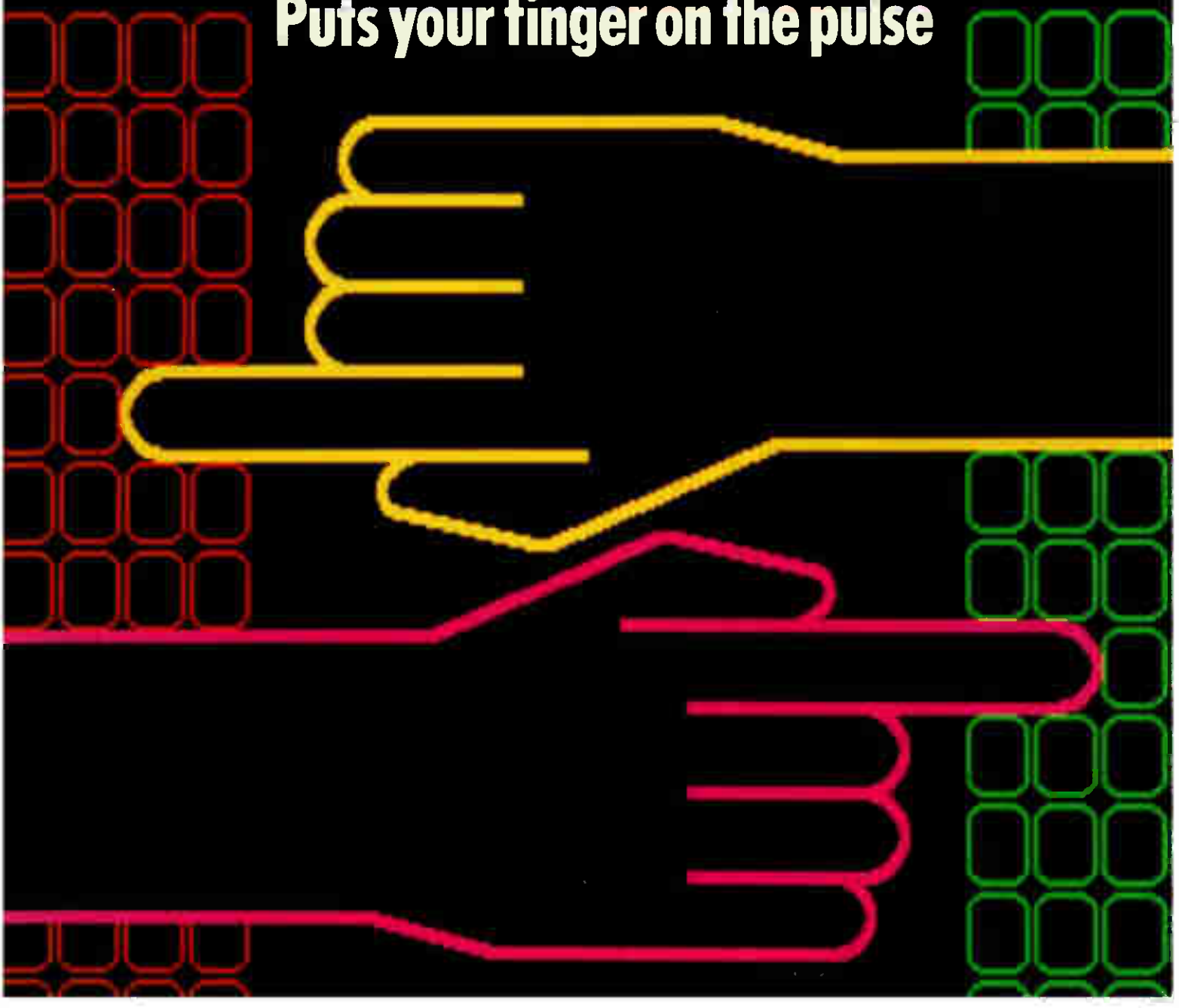
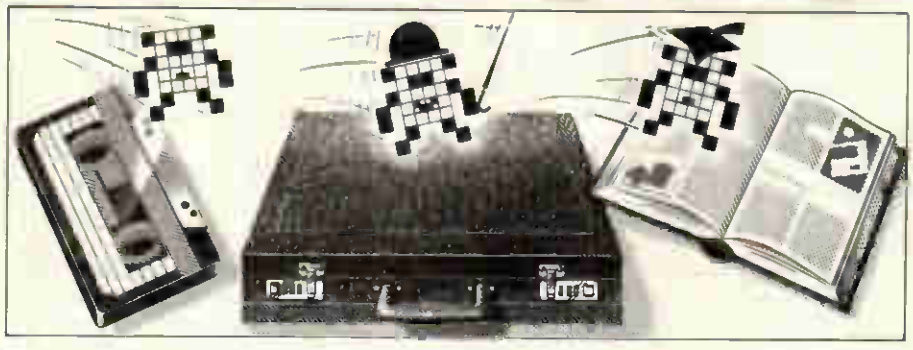


PROGRAM FILE



Games

Scientific/mathematic

Business

Toolkit/utilities

Educational/Computer Aided Learning

Owen Linderholm selects the best of readers' programs. For details on submitting your own, see the end of this section.

Happy birthday to us! This is the 100th issue of *PCW*. Many people have been regular readers of Program File for a long time; others are new to the section and have no idea of its past. To refresh some readers' memories and to give others a glimpse of *PCW*'s history, there follows a brief overview of Program File over the past 100 issues of the magazine.

The first issue of *PCW* appeared in January 1978, and even then it was publishing program listings. A program listing section called Programs started in the 21st issue, September 1979. In the 46th issue, October 1981, TJ's Workshop began, with a mix of hardware and software tips for terminal junkies. In January 1983 the first Program of the Month award was made, and the Programs section was renamed Program File in the 81st issue, September 1984. TJ's Workshop was merged with an expanded Program File in February this year.

To give some indication of the type of program that appeared in Program File and to show how the section has changed, here is a list of the contents of the programs section for every tenth issue since September 1979, with a brief comment on each list:

September 1979 Issue 21

Machine	Program
Casio fx201-P	2D manoeuvring for a spaceship
Apple II	Number memory tester
Basic	Creating acronyms
Commodore Pet	Orbital simulation
6800 code	Limited time response subroutine

This short selection of programs accurately reflects the type of machines available at the time: programmable calculators; the Apple and the Commodore Pet; and home-brewed systems based on chips like the 6800.

July 1980 Issue 31

Machine	Program
Pet	Cat and mouse game
Pet	Golf game
TRS-80	Extra graphics characters
UK101	Black box game
Pet	Robot NIM game
UK101	Graph plotter

The programs editor for this issue complained about receiving too many programs which were rehashes of old, familiar themes. This is as true today as it was then, with many people submitting versions of Hangman, Breakout, character set editors, sprite editors, simple monitor/assemblers, and so on. The mix of machines available had increased and a British-made micro, the UK101, had arrived, although it was based on the American Ohio Scientific Superboard.

May 1981 Issue 41

Machine	Program
TRS-80	Demon Hunts
Pet	Zap
UK101	Get Them
Acorn Atom	Missile Dodge

The American machines were now joined by the first proper British machine, and this was the beginning for Acorn. The programs' content reflects the simple arcade game image of that year, when Space Invaders was taking the pubs by storm.

March 1982 Issue 51

Machine	Program
Nascom	Business documents
ZX81	Graph plot
TRS-80	Solitaire
TRS-80	Ducts (childrens' educational)

The programs here are rather more serious, as the personal computer is recognised as more than a toy.

January 1983 Issue 61

Machine	Program
Vic	Connect 4
Vic	M/c monitor
Atari 400,800	Character set mover (Program of the Month)
Vic	UFO
Pet	Forth Teacher
Vic	Doppler
BBC	Gomoku

The next level of home computer power now appears, with the advent of the BBC Micro and the long-surviving Atari machines.

November 1983 Issue 71

Machine	Program
Vic 20	Robotank (Program of the Month)
Acorn	Scramble
NewBrain	Easyprint (text editor)
Osborne	Magsearch (database)
Atom	Decision-Maker
BBC	Real-time clock
Dragon	World (rotating globe)
BBC	Screendump to Tandy CGP115
BBC	Envelope designer (sound)
Oric 1	Raspo
BBC	Bearings (from co-ords)
Lynx	Star Trek

1983 was one of the boom years for personal computers, with six British micros appearing in the list. The range of program coverage has expanded from simple games and utilities to the tentative exploration of more interesting fields.

September 1984 Issue 81

Machine	Program
Spectrum	SP-Easel (business graphs) (Program of the Month)
Atari	Autorun (menus)
C64	Basic assembler
BBC	Equation solver
BBC	Astrorun
C64	Honeypot
BBC	Function key lister
Apple II	Menu

The Commodore 64 made its debut in this issue, but in fact programs for the machine had been appearing for many months.

PROGRAM FILE

July 1985 Issue 91

Machine	Program
C64	Turboload 64 (Program of the Month)
Spectrum	Speech
Epson HX-20	HX-Modem
MBasic	Compress
QL	Shading
BBC	Revenge of the flying bunnies
BBC	Ramspool
Sirius	Bank account
BBC	LSTFMT (formats listings)

By 1985 Program File had settled almost into its present form, publishing useful and serious programs with a smattering of games and unusual, original programs.

PCW Online, our online database, will be starting up soon. One of the services which this database will offer is a facility to allow users to download software from the database. The software available will initially be a selection of public domain programs for various machines, plus all the programs in the Program File and a selection of programs from previous issues. All you have to do to obtain these programs — and save yourself some typing — is to join the service, log onto it and download your chosen programs onto disk. Initially this service will only be available to subscribers, but when sufficient demand has been generated, it will be available to everyone.

Once again, I must stress the type of programs I would like to see in Program File. Original ideas and applications that can be performed well by a micro are more than welcome, as are good utility programs and routines to be incorporated in longer programs. Any games submitted must be both original and challenging.

Programs should not be too long since people will not be willing to type them in (exceptions can be made for extremely high-quality programs such as the Expert System published last month). There should not be too much machine code or too many long data statements, as these are especially tiresome to type in. Small amounts are acceptable, but commented source code is preferable.

I am also concerned that it should be as easy as possible to convert programs to different machines. This means that programs in standard Basic, or standard forms of other languages, will be more welcome. Any parts of code that are specific to a particular machine or which rely on specialised hardware should be carefully explained.

Most people would like to know how the programs they use work, so all submissions must be accompanied by documentation or comments that explain how the unusual parts of the code work.

All submissions should be on cassette or disk, with a separate listing. If your submissions are to be returned, they must be accompanied by a stamped addressed envelope. Further details on submitting programs are given at the end of Program File.

This month's Program of the Month has an educational flavour. It has been written for very young children, and is unusual in that the author has taken extreme care to ensure that the program is as easy to use, understandable and coherent as possible. The program, simply called Order, has been written by JC O'Callaghan who works in the educational computing field. Its purpose is to introduce the concepts of ordering sets of objects to the very young. A full explanation of the reasoning behind the program is given before it.

Other programs this month include Commodore 64 Stock, a simple stock control and re-order database for small businesses or shops. The Tatung Einstein receives very little support, so Einstein Random Access Database should be welcomed by users of this machine. For Spectrum owners, there is a program to produce formatted output of listings.

Tips include a graphics hint for the Atari 520ST, how to use your Epson HX-20 as a printer buffer for another micro, and a screendump for the Memotech machines.

Program of the Month

BBC Order

by JC O'Callaghan

This program allows young children to practice and solve problems which relate to ordering sets of objects, and it was designed with some specific aims in mind.

Firstly, as there exists a shortage of serious educational software for the very young, the program should be targeted at that age range.

Secondly, the age at which children are able to appreciate the concepts of bigger, smaller, biggest, smallest, and so on, tends to be well below their reading age. Consequently, normal methods of providing work for children on these concepts, — say, worksheets or workcards, tend to be of little use due to the language limitations. Therefore, no language should be needed for the part of the program the children use.

Thirdly, most parents and teachers are bound to have different ideas and preferences for the presentation of material to their children. However, almost all educational programs provide the user with only one fixed method of presentation and only a limited amount of flexibility concerning the level of work. The program, therefore, should allow the parent or teacher to decide upon the exact method of presentation and give maximum choice over the widest range of possible problems.

The program Order goes a long way to fulfil these three aims.

The children have to put into order five sets of shapes. They are presented with five large boxes containing these sets, below which are five empty boxes. The order of the boxes on the top line has been randomly mixed so that the sets are no longer in order. The task for the child is to transfer the boxes from the top row into the bottom row, in the correct order. For example, the top row might contain, in this sequence: two triangles, five squares, one star, three triangles, four stars. After transfer the bottom row should contain: one star, two triangles, three triangles, four stars, five squares.

When the problem starts, each set of shapes on the top row will, in turn, change colour from white to blue. A set from the top row is transferred to the bottom row by pressing the space bar, while that set is coloured blue. If the choice made is a correct one the program will move on; if not, the incorrect set on the

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● EDUCATIONAL	YES ☐ NO ☐	● SMALL BUSINESS	YES ☐ NO ☐	● DESIGN	YES ☐ NO ☐	● CONTROL	YES ☐ NO ☐

System illustrated includes 512K Ram fast 68000 processor, half megabyte 3½" disk drive, high resolution b/w, monitor, GEM mouse and FREE word processing, graphics, basic and logo software. Options include double sided 1 meg. disk drives, 10/20 megabyte hard disks, colour monitors and cdrom players (laser disks).

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bottom row will be wiped out and the child will have to try again.

This continues until the correct set of shapes has been put into all five empty boxes on the bottom line. When this happens, there will be a match-up between each set and the number of shapes in each set; for example, under a set containing three stars, the number three will appear.

At the end of each problem, the child must press the space bar to move on.

The key part of the program comes at the beginning, when the parent or teacher makes certain choices from the two 'selection pages' which determine the type of problem to be solved. Below are a set of descriptions outlining the various components of the selection pages:

SHAPES: typing in B, T or S will make sure that only boxes, triangles or stars will appear in the sets of information. Typing M, on the other had, will mix them up so that some of the sets might be triangles, some stars, and so on.

FEEDBACK: here, the user has the choice of T for ticks, X for crosses and ticks, and S for sound only. Many parents and teachers do not like to see a lot of crosses on childrens' work, and this option provides them with the chance to decide on what type of response the child should get for correct and incorrect answers.

ORDER: the problems can either be set in ascending (A) or descending (D) order.

POSITION: R for random will result in the position of the shapes being randomly arranged in each set, and will make the problem more complex. However, if P for pattern is selected, the shapes will be positioned in a sequence which has a building block effect, which means that the bottom row will be filled before the next row is started on. As you can see, this building block effect provides the child with some help as to which of the sets should be selected:

```
                  *
   *   **   ***   ***  ?
 ***  ***  ***   ***
```

For the same descending problem, the shapes would be arranged this way:

```
 **   *
 ***  ***  ***  **   ?
 ***  ***  ***  ***
```

This means that the general slope of the shapes will coincide with the slope in the picture clue explained later in this introduction.

RANGE: the number of possible shapes in each set can vary from one to nine. R will select a random range of numbers. If a specific range is required, you must type in the lowest number in that desired range; for example, typing in 2 will select the range two – six.

ELIMINATION: when this option is selected, an incorrect choice is eliminated from the top row; this will make the choice easier next time around. If mistakes are continually made, then after four incorrect choices, the correct choice will be the only one left.

PICTURE: if you select this facility, a picture of an incline will be drawn. The slope of the incline will be going up if the problem is an ascending one and down if it is descending. Depending on the type of problem, a man will also be placed at either the bottom or top of the slope. This should provide some help to the child in deciding what kind of problem has been set. At the end of the problem, when the correct soloution has been arrived at, the man will then either move up or down the slope towards the opposite end of the incline.

TIME DELAY: this fixes the time, in seconds, that each individual set is made available for selection by the child. After the period of time has expired, the next set will be made available, and so on. This means that the speed of the program can be matched to the need of each individual child. Only values between one and 60 will be accepted.

NUMBER OF QUESTIONS: this option sets the number of questions that will be presented to the child on a particular type of problem. Up to 20 questions may be selected. However, a particular type of question may be continually repeated by entering zero for this option. This instructs the program to keep repeating questions on the type of problem that has been decided upon, and an R will appear instead of zero when the Return key is pressed.

The space bar will have to be pressed to move on from the end of each question. If there are still more questions, the next one will be displayed; if not, then the program will return to the selection pages. To get out of the repeat cycle, the Escape key must be pressed at the end of the question to bring the program back to the selection pages. This facility is available any time at the end of a question in case a sequence of questions needs to be halted.

SOUND LEVEL: the user has the choice of 0, 1 or 2 which correspond to no sound, sound at half the normal volume and normal volume. These three options will only allow the entry of numbers, and only two of them at most. When the correct number has been entered, the Return key must be pressed. Prior to pressing the Return key, alterations may be made to any entry by using the Delete key.

After setting the problem it will be necessary, especially when a child is first using the program, for the parent or teacher to explain what is happening and what is expected of him or her. For the first few times, it may even be advisable for the parent or teacher to work through a few problems with the child. After using the program the child should, from the visual clues, be able to decide what kind of problem it is and how to solve it.

Pressing the Break key at any time will cause the program to start all over again.

A suggested progression of problems is tabulated in Fig 1.

FEEDBACK, PICTURE, NUMBER OF QUESTIONS and SOUND are all a matter of personal preference and are therefore not included in Fig 1.

Apart from the first four selections, Fig 1 only attempts to indicate the range of possible problems. There are many more intermediate steps that could be inserted into the table.

Generally, you should concentrate on a single concept at a time. For example, the first four selections in Fig 1 only change one parameter — the shape. This way, the child is able to see that the problem is not affected by the type of shape but by how many shapes there are. After that, the next progression is to increase the number of shapes. The rest of the table indicates the general trend you might take. The order in which the parent or teacher introduces the different concepts will, of course, depend upon personal preference.

SHAPES	B	T	S	M	B	M	T	M	S	M	B	M	M
ORDER	A	A	A	A	A	A	D	D	D	D	D	A	D
POSITION	P	P	P	P	P	P	P	P	P	P	P	R	R
RANGE	1	1	1	1	4	5	2	3	R	R	R	R	R
ELIMINATION	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
TIME	5	5	5	5	5	5	4	3	2	1	1	1	1

Fig 1 A suggested progression of problems

PROGRAM FILE

```
  100MODE 7
  110PROCfront
  120PROCsetup
  130PROCinit
  140REPEAT
  150MODE5:PROCsetup1
  160PROCputinorder
  170PROCcorrect
  180PROCmoveon
  190UNTIL pass%=nq% OR flag=FALSE
  200RUN
  210:
  220:
  230:
  240DEF PROClayout:X=XX
  250FOR I%=1TO5:GCOL0,1:PROCbox(X,YY+BB,X+AA,YY):PROCbox(X,YY+2*BB+VV,X+AA,YY+B
B+VV):GCOL0,3:PROCoutline(X,YY+BB,X+AA,YY):PROCoutline(X,YY+2*BB+VV,X+AA,YY+BB+V
V):X=X+AA+HN:NEXT
  260ENDPROC
  270:
  280DEF PROCbox(X1,Y1,X2,Y2)
  290PLOT4,X1,Y1:PLOT4,X1,Y2:PLOT85,X2,Y1:PLOT4,X2,Y2:PLOT85,X1,Y2
  300ENDPROC
  310:
  320DEF PROCdelay(time)
  330TIME=0:REPEAT UNTIL TIME=time
  340*FX15,1
  350ENDPROC
  360:
  370DEF PROCrandom
  380IF N%=1 THEN RR=RND(5)
  390RND(1)=0:I%=0
  400REPEAT
  410R=RND(5)+RR-1
  420flag=TRUE
  430FORK%=1TOI%
  440IFR=MO(K%)THEN flag=FALSE
  450NEXT
  460IF flag=FALSE THEN 410
  470I%=I%+1:MO(I%)=R
  480UNTIL I%=5
  490ENDPROC
  500DEF PROCplot
  510GCOL0,3:XT=XX
  520FOR K%=1TO5:PROCorder(XT,YU,MO(K%)):XT=XT+AA+HN:NEXT
  530ENDPROC
  540:
  550DEF PROCarrow(num,col):GCOL0,col
  560XA=XX+104+(num-1)*(AA+HN):YA=YY-20
  570PLOT4,XA,YA:PLOT4,XA+104,YA-100:PLOT85,XA-104,YA-100
  580ENDPROC
  590:
  600DEF PROCwhitarr
  610GCOL0,3:PLOT4,XA,YA-16:PLOT4,XA+80,YA-80:PLOT85,XA-64,YA-80
  620ENDPROC
  630:
  640DEF PROCselect
  650PROCdelay(500)
  660SOUND1,-14*21,100,6
  670XT=XX
  680K%=1
  690IF NT%(K%)=FALSE THEN 780
  700VDU19,0,7,0,0,0:GCOL0,0:PROCorder(XT,YU,MO(K%)):PROCoutline(XT,YU,XT+200,YU
+200):VDU19,0,4,0,0,0
  710time=del*100
  720*FX15,1
  730TIME=0:sel$=INKEY$(time):time1=TIME
  740IF sel$=" " THEN sel=K%:GOTO810
  750IF time1<(time-2) THEN time=time-time1:GOTO 730
  760IF NT%(K%)=FALSE THEN 780
  770VDU19,0,7,0,0,0:GCOL0,3:PROCorder(XT,YU,MO(K%)):PROCoutline(XT,YU,XT+200,YU
+200)
  780XT=XT+AA+HN
  790K%=K%+1:IFK%>5THEN670
  800GOTO690
  810GCOL0,3:XT=XX+((AA+HN)*(pos-1)):PROCorder(XT,YY,MO(K%))
  820flag=FALSE:IF O%=1 THEN O=pos-1 ELSE O=5-pos
  830IF MO(K%)=RR+O THEN flag=TRUE:PROCright(XT,50):GOTO860
  840PROCwrong(XT,50)
  850IF E%=1 THEN NT%(K%)=FALSE
  860PROCdelay(500)
  870ENDPROC
  880:
  890DEF PROCright(XR,YR):GCOL0,1:A=AA/10:B=BB/10
  900FOR S%=200 TO 250 STEP 5:SOUND1,1,S%,1:NEXT
  910IF N%=3 THEN ENDPROC
  920PLOT4,XR+A,YR+3*B:PLOT4,XR+2*A,YR+4*B:PLOT85,XR+3*A,YR+B*3:PLOT4,XR+A,YR+3*
B:PLOT85,XR+3*A,YR+B:PLOT4,XR+3*A,YR+B*3:PLOT85,XR+B*A,YR+B*7:PLOT4,XR+7*A,YR+B*
B:PLOT85,XR+3*A,YR+B*3:ENDPROC
  930DEF PROCwrong(XW,YW):GCOL0,1:A=AA/10:B=BB/10
  940FOR S%=60 TO 10 STEP -5:SOUND3,1,S%,1:NEXT
  950IF N%<>2 THEN ENDPROC
  960PLOT4,XW+A,YW+2*B:PLOT4,XW+2*A,YW+B:PLOT85,XW+B*A,YW+7*B:PLOT4,XW+7*A,YW+B*
B:PLOT85,XW+A,YW+2*B:PLOT4,XW+A,YW+7*B:PLOT4,XW+2*A,YW+B*B:PLOT85,XW+B*A,YW+2*B:
PLOT4,XW+7*A,YW+B:PLOT85,XW+A,YW+7*B:ENDPROC
  970:
  980DEF PROCsizshape
  990FOR I%=1 TO 5:P=RND(3)
 1000IF P=1 THEN MO$(I%)="B" ELSE IF P=2 THEN MO$(I%)="T" ELSE MO$(I%)="S"
 1010NEXT
 1020ENDPROC
 1030:
 1040DEF PROCtriangle(xt,yt)
 1050PLOT4,xt,yt:PLOT4,xt+48,yt:PLOT 85,xt+24,yt+48:ENDPROC
 1060:
 1070DEF PROCorder(xc,yc,nc):x=xc
 1080IF O%=1 THEN PROCorderand:GOTO1100
 1090IF O%=1 THEN x=x+128
 1100FOR II%=1 TO nc
 1110IF MO$(K%)="B" THEN PROCbox(x+16,yc+64,x+64,yc+16)
 1120IF MO$(K%)="T" THEN PROCtriangle(x+16,yc+16)
 1130IF MO$(K%)="S" THEN PROCster(x,yc)
 1140IF O%=2 THEN x=x+64 ELSE x=x-64
 1150IF II% MOD 3<>0 THEN 1180
 1160IF O%=2 THEN x=xc ELSE x=xc+128
 1170yc=yc+64
 1180NEXT
 1190ENDPROC
 1200:
 1210DEF PROCdouble(A$,K,L)
 1220A%=&A:X%=0:Y%=&A:D=&A00
 1230FORN=1 TO LEN(A$)
 1240B$=MID$(A$,N,1)
 1250?D=ASC(B$)
 1260CALL (&FFF1)
```

PROGRAM FILE

```
1270VDU23,240,D71,D71,D72,D72,D73,D73,D74,D74
1280VDU23,241,D75,D75,D76,D76,D77,D77,D78,D78
1290MOVE K,L:PRINTCHR$(240);:VDU10:VDU8:PRINTCHR$(241);
1300NEXT N
1310ENDPROC
1320:
1330DEF PROCsort
1340flag=TRUE
1350FOR I=1 TO 4
1360IF MD(I)<MD(I+1) THEN 1420
1370flag=FALSE
1380t=MD(I):MD(I)=MD(I+1):MD(I+1)=t
1390IF QZ=2 THEN 1410
1400FORJZ=1TO9:t=MX(I,JZ):MX(I,JZ)=MX(I+1,JZ):MX(I+1,JZ)=t:t=MY(I,JZ):MY(I,JZ)=
MY(I+1,JZ):MY(I+1,JZ)=t:NEXT
1410t$=MD$(I):MD$(I)=MD$(I+1):MD$(I+1)=t$
1420NEXT
1430IF flag=FALSE THEN 1340
1440ENDPROC
1450:
1460DEF PROCorderand
1470FOR I1Z=1 TO 9
1480IF MX(KZ,I1Z)=0 THEN 1520
1490IF MD$(KZ)="B" THEN PROCbox(xc+MX(KZ,I1Z),yc+MY(KZ,I1Z)+48,xc+MX(KZ,I1Z)+48
,yc+MY(KZ,I1Z))
1500IF MD$(KZ)="T" THEN PROCtriangle(xc+MX(KZ,I1Z),yc+MY(KZ,I1Z))
1510IF MD$(KZ)="S" THEN PROCstar(xc+MX(KZ,I1Z)-16,yc+MY(KZ,I1Z)-16)
1520NEXT
1530ENDPROC
1540:
1550DEF PROCsiz
1560FOR KZ=1 TO 5
1570T(1)=RND(9)
1580FOR I1Z=1 TO MD(KZ)
1590T=RND(9):flag=TRUE
1600FORJZ=1TOI1Z-1
1610IF T(JZ)=T THEN flag=FALSE
1620NEXT
1630IF flag=FALSE THEN 1590
1640T(I1Z)=T
1650NEXT
1660FOR I%=1 TO 9:MX(KZ,I%)=0:MY(KZ,I%)=0:NEXT
1670FORI%=1 TO MD(KZ)
1680MX(KZ,T(I%))=XM(T(I%)):MY(KZ,T(I%))=YM(T(I%))
1690NEXT:NEXT
1700ENDPROC
1710:
1720DEF PROCsetup
1730DIM MD(5),MD$(5),T(9),XM(9),YM(9),MX(5,9),MY(5,9),MT%(5)
1740YY=367:XX=39:AA=200:BB=200:HH=40:VV=120:YU=YY+BB+VV
1750ENVELOPE1,1,0,0,0,0,0,0,60,-10,0,-2,120,30
1760ENVELOPE 2,4,50,-15,-15,10,20,20,126,0,0,-126,126,126
1770FOR I%=1 TO 9:READ XM(I%),YM(I%):NEXT
1780DATA 16,16,80,16,144,16,16,80,80,80,144,80,16,144,80,144,144,144
1790PROCdefine
1800ENDPROC
1810:
1820DEF PROCpicorder
1830COL0,3:PLOT4,XX,YY+BB+10:PLOT4,XX+(5*AA)+(4*HH),YY+BB+10
1840IF QZ=1 THEN PLOT85,XX+(5*AA)+(4*HH),YY+BB+70 ELSE PLOT 85,XX,YY+BB+70
1850COL0,1:PLOT5,XX,YY+BB+10:PLOT5,XX+(5*AA)+(4*HH),YY+BB+10:IF QZ=1 THEN PLOT
5,XX+(5*AA)+(4*HH),YY+BB+70 ELSE PLOT 5,XX,YY+BB+70
1860IF QZ=1 THEN MOVEXX-8,YY+BB+48:PRINTCHR$(245)
1870IF QZ=2 THEN MOVEXX-8,YY+BB+104:PRINTCHR$(245)
1880OOZ=-1:ENDPROC
1890:
1900DEF PROCdefine
1910VDU 23,245,28,28,73,62,8,28,34,34
1920VDU 23,246,93,93,42,28,8,28,28,28
1930ENDPROC
1940:
1950DEF PROCinit
1960PROCsetitle(1)
1970PRINT"  SHAPES REQUIRED";TAB(23,2);"Boxes";TAB(38,2);"B";TAB(23,3);"Triangl
es";TAB(38,3);"T";TAB(23,4);"Stars";TAB(38,4);"S";TAB(23,5);"Mixture";TAB(38,5);
"M"
1980PRINT'" ";CHR$129;"FEEDBACK REQUIRED";TAB(23,7);"Ticks only";TAB(38,7);"T";
TAB(22,8);CHR$129"Ticks and X's";TAB(38,8);"X";TAB(22,9);CHR$129"Sound only";TAB
(38,9);"S"
1990PRINT'" ";CHR$131;"ORDER REQUIRED";TAB(23,11);"Ascending";TAB(38,11);"A";TA
B(22,12);CHR$131;"Descending";TAB(38,12);"D"
2000PRINT'" ";CHR$133;"POSITION OF SHAPES";TAB(23,14);"Random";TAB(38,14);"R";T
AB(22,15);CHR$133;"Pattern";TAB(38,15);"P"
2010PRINT'" ";CHR$134;"RANGE REQUIRED";TAB(23,17);"Random";TAB(38,17);"R";TAB(2
2,18);CHR$134;"Selected     1-5"
2020PRINT'" ";CHR$130;"ELIMINATION REQUIRED";TAB(23,20);"Y or N";TAB(38,20);"?"
2030PRINT'" ";CHR$132;"PICTURE REQUIRED";TAB(23,22);"Y or N";TAB(38,22);"?"
2040PROCflash(8,2):PROCnoflash(22,2):FOR I=1TO4:PROCflash(37,1+I):NEXT
2050T$=GET$
2060IF T$="B" THEN S%=1 ELSE IF T$="T" THEN S%=2 ELSE IF T$="S" THEN S%=3 ELSE
IF T$="M" THEN S%=4 ELSE GOTO 2050
2070PROCnoflash(8,2):FOR I=1TO4:PROCnoflash(37,1+I):IF S%<>I THEN PRINT" "; EL
SE PRINTCHR$(255);
2080NEXT
2090IF S%<>4 THEN FORI%=1TO5:MD$(I%)=T$:NEXT
2100PROCflash(8,7):PROCnoflash(22,7):FOR I=1TO3:PROCflash(37,6+I):NEXT
2110T$=GET$
2120IFT$="T" THEN N%=1 ELSE IF T$="X" THEN N%=2 ELSE IF T$="S" THEN N%=3 ELSE G
OTO2110
2130PROCnoflash(8,7):FOR I=1TO3:PROCnoflash(37,6+I):IF I<>N% THEN PRINT" "; ELS
E PRINTCHR$(255);
2140NEXT
2150PROCflash(8,11):PROCnoflash(22,11):PROCflash(37,11):PROCflash(37,12)
2160T$=GET$
2170IF T$="A" THEN OZ=1 ELSE IF T$="D" THEN OZ=2 ELSE GOTO2160
2180PROCnoflash(8,11):PROCnoflash(37,11):IF OZ=1 THEN PRINTCHR$(255); ELSE PRIN
T" ";
2190PROCnoflash(37,12):IF OZ=2 THEN PRINTCHR$(255); ELSE PRINT" ";
2200PROCflash(8,14):PROCnoflash(22,14):PROCflash(37,14):PROCflash(37,15)
2210T$=GET$
2220IF T$="R" THEN QZ=1 ELSE IF T$="P" THEN QZ=2 ELSE GOTO 2210
2230PROCnoflash(8,14):PROCnoflash(37,14):IF QZ=1 THEN PRINTCHR$(255); ELSE PRIN
T" ";
2240PROCnoflash(37,15):IF QZ=2 THEN PRINTCHR$(255); ELSE PRINT" ";
2250PROCflash(8,17):PROCnoflash(22,17):PROCflash(37,17):PROCflash(34,18)
2260T$=GET$
2270IF T$="R" THEN NZ=1 ELSE IF ASC(T$)>48 AND ASC(T$)<54 THEN NZ=2 ELSE GOTO22
60
2280PROCnoflash(8,17):PROCnoflash(37,17):PRINT" ";:PROCnoflash(34,18):PRINT"
";:IF NZ=1 THEN PRINT TAB(38,17);CHR$(255); ELSE PRINT TAB(38,18);T$;
2290IF NZ<>1 THEN RR=VAL(T$)
2300PROCflash(8,20):PROCnoflash(22,20):PROCflash(37,20)
2310T$=GET$:IF T$="Y" THEN SZ=1 ELSE IF T$="N" THEN SZ=2 ELSE GOTO2310
2320PROCnoflash(8,20):PROCnoflash(37,20):PRINTTAB(38,20);T$;
```

PROGRAM FILE

```
2330PROCflash(0,22):PROCnoflash(22,22):PROCflash(37,22)
2340T$=GET$:IF T$="Y" THEN OO%=1 ELSE IF T$="N" THEN OO%=2 ELSE GOTO2340
2350PROCnoflash(0,22):PROCnoflash(37,22):PRINTTAB(36,22);T$;
2360VDU7:PROCflash(0,24):PROCanswer:IF X$="N" THEN 1960
2370PROCinit1
2380PROCenv:pass%=0
2390ENDPROC
2400:
2410DEF PROCgetnum(lim%,gpos)
2420XX$=""
2430T$=GET$:IF ASC(T$)=127 AND LEN(XX$)=0 THEN2430
2440IF ASC(T$)=13 AND LEN(XX$)=0 AND lim%<>28 THEN 2430
2450IF ASC(T$)=13 THEN 2500
2460IF ASC(T$)=127 THEN PRINTT$;:XX$=LEFT$(XX$,LEN(XX$)-1):GOTO2430
2470IF LEN(XX$)=2 THEN2430
2480IF ASC(T$)<48 OR ASC(T$)>57 THEN 2430
2490PRINTT$;:XX$=XX$+T$:GOTO2430
2500gnum%=VAL(XX$):IF gnum%>lim% OR (gpos=3 AND gnum%=0) THEN VDU7:VDU31,36,gpos:PRINT"   ";:VDU31,36,gpos:GOTO 2430
2510IF gnum%=0 AND lim%=28 THEN XX$="R"
2520IF LEN(XX$)=1 THEN VDU 31,36,gpos:PRINT"  ";XX$;" ":ENDPROC
2530IF LEN(XX$)=2 THEN VDU 31,36,gpos:PRINT" ";XX$;" ":ENDPROC
2540:
2550DEF PROCflash(hpos,vpos)
2560VDU31,hpos,vpos:PRINTCHR$(136);
2570ENDPROC
2580:
2590DEF PROCnoflash(hpos,vpos)
2600VDU31,hpos,vpos:PRINTCHR$(137);
2610ENDPROC
2620:
2630DEF PROCoutline(ox1,oy1,ox2,oy2)
2640PLOT4,ox1,oy1:PLOT5,ox2,oy1:PLOT5,ox2,oy2:PLOT5,ox1,oy2:PLOT5,ox1,oy1:ENDPROC
2650:
2660DEF PROCrub
2670XT=XX+((AA+MM)*(K%-1))
2680IF K%=2 THEN VDU19,0,7,0,0,0:GCOL0,3:PROCorder(XT,YU,NO(K%)):PROCoutline(XT,YU,XT+288,YU+288)
2690IF K%=1 THEN GCOL0,1:PROCbox(XT,YU+88,XT+AA,YU):GCOL0,3:PROCoutline(XT,YU+88,XT+AA,YU)
2700GCOL0,1:XT=XX+((AA+MM)*(pos-1)):PROCbox(XT,YY+88,XT+AA,YY):GCOL0,3:PROCoutline(XT,YY+88,XT+AA,YY)
2710GCOL0,2:PROCbox(XT,35+88,XT+AA,35):ENDPROC
2720:
2730DEF PROCstar(sx,sy)
2740PLOT4,sx+24,sy+56:PLOT5,sx+56,sy+24:PLOT4,sx+24,sy+24:PLOT5,sx+56,sy+56:PLOT4,sx+40,sy+64:PLOT1,0,-48:PLOT4,sx+16,sy+40:PLOT1,48,0:ENDPROC
2750:
2760DEF PROCinit1
2770PROCsettitle(2)
2780PRINT'" ";CHR$134;"TIME DELAY IN SECS";TAB(23,3);"(max 60)";TAB(39,3);"?"'"
";CHR$131;"NUMBER OF QUESTIONS";TAB(23,5);"(max 20)";TAB(39,5);"?"'" ";CHR$(129);"SOUND LEVEL";TAB(23,7);"(0.1.2)";TAB(39,7);"?"
2790PROCflash(0,3):PROCnoflash(22,3):PROCflash(38,3):VDU31,36,3:PROCgetnum(60,3):PROCnoflash(0,3):del=gnum%
2800PROCflash(0,5):PROCnoflash(22,5):PROCflash(38,5):VDU31,36,5:PROCgetnum(20,5):PROCnoflash(0,5)
2810IF gnum%=0 THEN nq%=-1 ELSE nq%=gnum%
2820PROCflash(0,7):PROCnoflash(22,7):PROCflash(38,7):VDU31,36,7:PROCgetnum(2,7):PROCnoflash(0,7)
2830sl=gnum%/2
2840VDU7:PROCflash(0,9):PROCanswer:IF X$="N" THEN 2770
2850ENDPROC
2860:
2870DEF PROCanswer
2880PRINT" Selection O.K.        Y or N          ?";:REPEAT:X$=GET$:UNTIL X$="Y" OR X$="N":ENDPROC
2890:
2900DEF PROCsettitle(num1%)
2910CLS:PRINTTAB(0,0);CHR$130;"SELECTION PAGE  PART ";num1%;TAB(0,1);CHR$146;"////////////////////":ENDPROC
2920:
2930DEF PROCsetup1
2940IF OO%=-1 THEN OO%=1
2950VDU19,2,2,0,0,0
2960CLS:GCOL0,130:CLG:GCOL0,1
2970VDU23;11,0;0;0;0
2980VDU5
2990PROCrandom
3000PROCoptions
3010pos=1
3020VDU19,3,2,0,0,0:VDU19,1,2,0,0,0:PROClayout
3030ENDPROC
3040:
3050DEF PROCcorrect:XT=XX
3060PROCsort
3070IF O%=1 THEN rr=RR ELSE rr=RR+4
3080IF O%=1 THEN J%=1 ELSE J%=5
3090IF O%=1 THEN t=1 ELSE t=-1
3100IF O%=1 THEN san1%=48:san2%=56
3110IF O%=2 THEN san1%=104:san2%=96
3120FOR I=4 TO 36 STEP 8
3130IF O%=1 THEN K%=J% ELSE K%=6-J%
3140GCOL0,0:PROCorder(XT,YY,NO(J%)):PROCoutline(XT,YY,XT+288,YY+288)
3150T$=CHR$(48+rr):SOUND1,-14*8,100,6
3160PROCdouble(T$,XT+76,YY-62)
3170XT=XT+AA+MM
3180IF K%=1 AND OO%=-1 THEN GCOL0,2:MOVE XX-8,YY+88+san1%:PRINTCHR$245:GCOL0,1:MOVE XX+148,YY+88+san2%:PRINTCHR$245
3190IF K%>1 AND OO%=-1 THEN GCOL0,2:MOVE XX+148+(K%-2)*(AA+MM),YY+88+san2%+(K%-2)*12*t:PRINTCHR$245:GCOL0,1:MOVE XX+148+(K%-1)*(AA+MM),YY+88+san2%+(K%-1)*12*t:PRINTCHR$245
3200J%=J%+t
3210rr=rr+t:PROCdelay(300)
3220NEXT
3230IF OO%=-1 THEN PROCflashman
3240IF nq%<>-1 THEN pass%=pass%+1
3250ENDPROC
3260:
3270DEF PROCputinorder
3280PROCplot:PROCarrow(pos,1):PROCwhiterr:VDU19,3,7,0,0,0:VDU19,1,1,0,0,0
3290FORI%=1TOS:HT%(I%)=TRUE:NEXT
3300IF OO%=1 THEN PROCpicorder
3310PROCselect
3320IF flag=FALSE THEN PROCrub:GOTO 3310
3330pos=pos+1
3340GCOL0,3:XT=XX+((AA+MM)*(K%-1)):PROCorder(XT,YU,NO(K%)):PROCoutline(XT,YU,XT+288,YU+288):PROCarrow(pos-1,2)
3350IFpos<=5 THEN 3280
3360ENDPROC
3370:
3380DEF PROCoptions
3390IF H%=4 THEN PROCsizeshape
```

PROGRAM FILE

```
3400IF Q%=1 THEN PROCsix
3410ENDPROC
3420:
3430DEF PROCflashman
3440SOUND1,2,100,210
3450xm%=XX+148+4*(AA+MM):ym%=YY+88+man2%+48*t
3460FORI%=1 TO 10
3470COL0,1:MOVExm%,ym%:PRINTCHR$245:PROCdelay(50)
3480COL0,2:MOVExm%,ym%:PRINTCHR$245:GCOL0,1:MOVExm%,ym%+8:PRINTCHR$246:PROCdel
ay(50)
3490COL0,2:MOVExm%,ym%+8:PRINTCHR$246:NEXT
3500COL0,1:MOVExm%,ym%:PRINTCHR$245:ENDPROC
3510:
3520DEF PROCsoveon
3530flag=TRUE
3540*FX15,1
3550a=ASC(GET$)
3560IF a=27 THEN flag=FALSE:ENDPROC
3570IF a=32 THEN ENDPROC ELSE 3550
3580:
3590DEF PROCenv
3600ENVELOPE1,1,0,0,0,0,0,0,60,-10,0,-2,120,1,30,1
3610ENVELOPE2,4,50,-15,-15,10,20,20,126,0,0,-126,126,1,126,1
3620ENDPROC
3630:
3640DEF PROCfront
3650VDU23;11,0;0;0;0
3660*FX4,1
3670*KEY10OLD|MRUN|M
3680*FX229,1
3690PRINTTAB(15,10);CHR$134;CHR$141;"ORDER.";TAB(15,11);CHR$134;CHR$141;"ORDER.
";TAB(16,13);CHR$134;"by";TAB(11,15);CHR$134;"J.C.O'Callaghan."
3700PROCdelay(300):ENDPROC
```

Commodore 64 Stock

by PA & DC Stanford

This program provides a simple stock control program for small shops or businesses and individual use. The operation of the program is fairly self-explanatory and all data entry is fully error-trapped. The program deals with stock and re-order levels, cost and selling price, stock value, re-order value, and can provide printouts either alphabetically or by part number.

All control codes in the listing have accompanying REM statements to explain their purpose. The program is written to run with a Commodore MPS 801 printer, but could easily be adapted, not only for other printers, but also for other computers. The program is intended for use with a disk drive, but could be modified to work with a cassette by changing all references to 'disk' to read 'cassette', and by substituting the following lines:

10080 OPEN 1,1,0,FI$

12090 OPEN 1,1,1,FI$

```
1 REM********STOCK***************
2 REM
3 REM
4 REM********COPYRIGHT************
5 REM
6 REM****PA&DC STANFORD 1985******
7 REM
8 REM
9 REM-------------------------------------------------------------------------
10 CLR:DIMPN(255),PN$(255),DE$(255),BL(255),RE(255),CP(255),RP(255)
11 DIMZA(255),ZX(255)
50 REM*****MAIN MENU*****************
60 POKE53280,15:POKE53281,15
70 REM CLR-GRN
80 PRINT"{CLR}                    ";EN;" ENTRIES"
90 REM RED-  2*CRD BLU
91 PRINT"{RVS}     1  {OFF}SET UP NEW FILE"
81 REM RED-CRD BLU
82 PRINT"{RVS}     2  {OFF}LOAD FILE FROM DISK"
83 REM RED-CRD BLU
84 PRINT"{RVS}     3  {OFF}SAVE FILE TO DISK"
85 REM RED-CRD BLU
86 PRINT"{RVS}     4  {OFF}EDIT FILE"
87 REM RED-CRD BLU
88 PRINT"{RVS}     5  {OFF}ADD NEW STOCK"
89 REM RED-CRD BLU
90 PRINT"{RVS}     6  {OFF}REPLENISH/DEPLETE STOCK"
91 REM RED-CRD BLU
92 PRINT"{RVS}     7  {OFF}PRINT-OUT "
92 REM RED-CRD BLU
93 PRINT"{RVS}     8  {OFF}CLEAR FILE/EXIT"
96 REM BLK-  4*CRD BLU
97 PRINT"{HOME}{DOWN}{DOWN}ENTER CHOICE..{2 LEFT}"
100 GET A$:IFA$=""THEN100
110 A=VAL(A$):IFA<1ORA>8THEN100
111 REM CLR
112 PRINT"{CLR}"
115 ONAGOTO1000,10000,12000,4000,2000,3000,5000,20000,
120 END
1000 REM*********SET UP NEW FILE**********
1001 IFF1=0THEN1055
1009 REM CLR-PUR
1010 PRINT"{2 DOWN}THIS WILL ERASE EXISTING FILE"
1010 REM RED-  6*CRD
1011 PRINT"{RVS}{3 SPACE}    CONTINUE (Y/N)"
1030 GET A$:IFA$=""THEN1030
1040 IFA$="N"THEN50
1050 IFA$<>"Y"THEN50
1055 F1=1
1056 CLR:DIMPN(255),PN$(255),DE$(255),BL(255),RE(255),CP(255),RP(255)
1057 DIMZA(255),ZX(255)
1057 REM BLU-CLR
1058 PRINT"{CLR}"
1059 REM RED
1060 INPUT"{2 DOWN}ENTER TOTAL NUMBER OF ENTRIES      ";EN$
1065 EN=VAL(EN$):IFEN<1OREN>255THEN1050
```

PROGRAM FILE

```
1070 FORN=1TOEN
1074 REM CLR-RED
1075 PRINT""ENTRY NUMBER ";N
1079 REM BLU
1080 PRINT"ENTER PART NUMBER (EG A1009)"
1090 GETA$:IFA$=""THEN1090
1092 IFASC(A$)<65ORASC(A$)>90THEN1090
1093 REM RED-  2*CRD
1094 PN$(N)=A$:PRINT"▸▸▸";A$;
1095 B$=""
1096 FORM=1TO4
1098 GETA$:IFA$=""THEN1098
1100 IFASC(A$)<48ORASC(A$)>57THEN1098
1101 PRINTA$;
1102 B$=B$+A$
1103 NEXTM:PRINT:PRINT:PN$(N)=PN$(N)+B$:GOSUB40000:IFF9=1THEN1075
1104 PN(N)=VAL(B$)
1105 REM ORN
1106 INPUT";ENTER DESCRIPTION";DES(N)
1108 IFDES(N)=""ORLEFT$(DES(N),1)=" "THEN1106
1109 DES(N) =LEFT$(DES(N),30)
1109 REM RED-  2*CRD
1110 INPUT"▸▸ENTER CURRENT STOCK LEVEL";SL$
1111 IFSL$=""THEN1110
1112 IFASC(SL$)<48ORASC(SL$)>57THEN1110
1114 SL(N)=VAL(SL$):IFASC(SL$)<48ORASC(SL$)>57THEN1110
1119 REM BLU-  2*CRD
1120 INPUT"▸▸ENTER RE-ORDER LEVEL";RE$
1121 IFRE$=""THEN1120
1122 IFASC(RE$)<48ORASC(RE$)>57THEN1120
1125 RE(N)=VAL(RE$):IFASC(RE$)<48ORASC(RE$)>57THEN1120
1129 REM PUR-  2*CRD
1130 INPUT"▸▸ENTER COST PRICE  £";CP$
1131 IFCP$=""THEN1130
1132 IFASC(CP$)<48ORASC(CP$)>57THEN1130
1135 CP(N)=VAL(CP$):IFASC(CP$)<48ORASC(CP$)>57THEN1130
1139 REM RED-  2*CRD
1140 INPUT"▸▸ENTER RETAIL PRICE  £";RP$
1141 IFRP$=""THEN1140
1142 IFASC(RP$)<48ORASC(RP$)>57THEN1140
1145 RP(N)=VAL(RP$):IFASC(RP$)<48ORASC(RP$)>57THEN1140
1149 REM CLR-BLK
1150 PRINT"▸▸";PN$(N) +" "+DES(N)
1159 REM CRD
1160 PRINT"▸STOCK LEVEL  : ";SL(N)
1169 REM CRD
1170 PRINT"▸REORDER LEVEL: ";RE(N)
1179 REM CRD
1180 PRINT"▸COST PRICE   : £ ";CP(N)
1189 REM CRD
1190 PRINT"▸RETAIL PRICE : £ ";RP(N)
1199 REM   7*CRD-RED
1200 PRINT"▸▸▸▸▸▸▸▸ IS THIS ENTRY CORRECT (Y/N)"
1210 GETA$:IFA$=""THEN1210
1219 REM CLR-RED BLK
1220 IFA$="N"THENPRINT""ENTRY NUMBER ";N:PRINT"▸";PN$(N):GOTO1106
1225 IFA$<>"Y"THEN1210
1228 NEXTN
1240 F1=1
1250 GOTO50
2000 REM*****ADD NEW STOCK**************
2010 IFF1=0THEN50
2019 REM CLR-BLU
2020 INPUT"▸▸HOW MANY ITEMS TO ADD ";TP$
2030 IFTP$=""THEN2020
2035 TP=VAL(TP$):IFTP<1THEN2030
2036 FORM=EN+1TOEN+TP
2038 REM CLR-RED
2039 PRINT""ENTRY NUMBER : ";N
2040 EN=EN+1
2041 REM CLR-RED-  7*CRD-  7*CRR
2042 IFEN>254THENEN=EN-1:PRINT"▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸FILE FULL"GOTO50
2045 REM BLU
2046 PRINT"ENTER PART NUMBER (EG A1009)"
2048 GETA$:IFA$=""THEN2048
2050 IFASC(A$)<65ORASC(A$)>90THEN2046
2059 REM RED-  2*CRD
2060 PN$(N)=A$:PRINT"▸▸▸";A$;
2070 B$=""
2075 FORM=1TO4
2078 GETA$:IFA$=""THEN2078
2080 IFASC(A$)<48ORASC(A$)>57THEN2078
2085 PRINTA$;
2090 B$=B$+A$
2100 NEXTM:PRINT:PRINT:PN$(N)=PN$(N)+B$
2110 PN(N)=VAL(B$)
2120 FORM=1TOEN-1
2130 IFPN$(N)=PN$(N)THENF2=1:F3=M
2140 NEXTN
2149 REM CLR-BLK-  5*CRD-  6*CRR   3*CRD
2150 IFF2=1THENPRINT"▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸▸NUMBER EXISTS";PRINT"▸▸▸"PN$(F3);" ";DES(F3)
2160 IFF2>1THENFORX=1TO2000:NEXTX:EN=EN-1:F2=0:GOTO2040
2169 REM ORN
2170 INPUT"ENTER DESCRIPTION";DES(N)
2172 DES(N) =LEFT$(DES(N),30)
2173 REM RED-  2*CRD
2174 INPUT"▸▸ENTER CURRENT STOCK LEVEL";SL$
2176 IFSL$=""THEN2174
2178 IFASC(SL$)<48ORASC(SL$)>57THEN2174
2180 SL(N)=VAL(SL$):IFASC(SL$)<48ORASC(SL$)>57THEN2174
2181 REM BLU-  2*CRD
2182 INPUT"▸▸ENTER RE-ORDER LEVEL";RE$
2184 IFRE$=""THEN2182
2185 IFASC(RE$)<48ORASC(RE$)>57THEN2182
2186 RE(N)=VAL(RE$):IFASC(RE$)<48ORASC(RE$)>57THEN2182
2189 REM PUR-  2*CRD
2190 INPUT"▸▸ENTER COST PRICE  £";CP$
2192 IFCP$=""THEN2190
2194 IFASC(CP$)<48ORASC(CP$)>57THEN2190
2195 CP(N)=VAL(CP$):IFASC(CP$)<48ORASC(CP$)>57THEN2190
2197 REM RED-  2*CRD
2198 INPUT"▸▸ENTER RETAIL PRICE  £";RP$
2200 IFRP$=""THEN2198
2205 IFASC(RP$)<48ORASC(RP$)>57THEN2198
2210 RP(N)=VAL(RP$):IFASC(RP$)<48ORASC(RP$)>57THEN2198
2214 REM CLR-BLK
2215 PRINT"▸▸";PN$(N);" ";DES(N)
2217 REM CRD
2218 PRINT"▸STOCK LEVEL  : ";SL(N)
2219 REM CRD
2220 PRINT"▸REORDER LEVEL: ";RE(N)
2221 REM CRD
2222 PRINT"▸COST PRICE   : £ ";CP(N)
2223 REM CRD
```

PROGRAM FILE

```
2224 PRINT"▽RETAIL PRICE : ▷ ";RP(N)
2225 REM   7*CRD-RED
2226 PRINT"▷▷▷▷▷▷▷▷  IS THIS ENTRY CORRECT (Y/N)"
2227 GETA$:IFA$=""THEN1210
2230 IFA$="N"THEN2046
2232 IFA$<>"Y"THEN2227
2240 NEXTN
2250 GOTO50
3000 REM ******REPLENISH**DEPLETE********
3010 IFF1=0THEN50
3015 XX=0
3019 REM CLR-BLU
3020 PRINT"▽▽ENTER PART NUMBER (EG A1009)"
3022 GETA$:IFA$=""THEN3022
3026 IFASC(A$)<65ORASC(A$)>90THEN3022
3027 REM RED-   2*CRD
3028 PRINT"▷▷▷";A$;:TP$=A$
3030 B$=""
3031 B$=B$+A$
3032 FORN=1TO4
3034 GETA$:IFA$=""THEN3034
3036 IFASC(A$)<48ORASC(A$)>57THEN3034
3038 PRINTA$;
3040 B$=B$+A$
3044 NEXTN:TP=VAL(B$)
3045 XX=0
3050 FORN=1TOEN
3055 IFB$=PN$(N)THENXX=N:N=EN
3060 NEXTN
3064 REM CLR-RED-   4*CRD-   4*CRR
3065 IFXX=0THENPRINT"▽▷▷▷▷▷▷▷▷NO SUCH NUMBER":FORX=1TO2000:NEXTX:      GOTO3015
3069 REM CLR-BLK
3070 PRINT"▽▷";PN$(XX);" ";DE$(XX)
3074 REM    3*CRD
3075 PRINT"▷▷STOCK LEVEL : ";SL(XX)
3079 REM    2*CRD-RED
3080 INPUT"▷▷NEW STOCK LEVEL  :";SL$
3085 IFSL$=""THEN3070
3090 SL(XX)=VAL(SL$):IFSL(XX)<0THEN3070
3099 REM CLR-   2*CRD-BLU
3100 PRINT"▽▷▷";PN$(XX);"      STOCK NOW : ";SL(XX)
3109 REM PUR-   2*CRD
3110 PRINT"▷▷   IS THIS CORRECT (Y/N)"
3120 GETA$:IFA$=""THEN3120
3130 IFA$="N"THEN3070
3140 IFA$<>"Y"THEN3120
3150 GOTO50
4000 REM******EDIT FILE****************
4010 IFF1=0THEN50
4015 XX=0
4019 REM CLR-BLU
4020 PRINT"▽▽ENTER PART NUMBER (EG A1009)"
4022 GETA$:IFA$=""THEN4022
4023 REM F1
4024 IFA$="▷"THEN50
4026 IFASC(A$)<65ORASC(A$)>90THEN4022
4027 REM RED-   2*CRD
4028 PRINT"▷▷▷";A$;:TP$=A$
4030 B$=""
4032 B$=B$+A$
4035 FORN=1TO4
4038 GETA$:IFA$=""THEN4038
4040 IFASC(A$)<48ORASC(A$)>57THEN4038
4042 PRINTA$;
4044 B$=B$+A$
4048 NEXTN:TP=VAL(B$)
4050 FORN=1TOEN
4052 IFB$=PN$(N)THENXX=N:N=EN
4058 NEXTN
4059 REM CLR-BLK-   3*CRR-   5*CRD
4060 IFXX=0THENPRINT"▽▷▷▷▷▷▷▷▷NO SUCH NUMBER":FORZ=1TO2000:NEXTZ: GOTO4015
4064 REM CLR-PUR
4065 PRINT"▽▽   F1 TO CHANGE ANY OTHER TO CONT."
4069 REM CRD-BLK
4070 PRINT"▽▷PART NUMBER: ";PN$(XX)
4072 GETA$:IFA$=""THEN4072
4073 REM F1
4074 IFA$<>"▷"THEN4100
4074 REM CRU
4075 PRINT"▽
4077 REM CRU-RED
4078 INPUT"▽▽PART NUMBER: ";PN$(XX)
4079 IFPN$(XX)=""THEN4078
4082 IFASC(LEFT$(PN$(XX),1))>90THEN4078
4084 IFASC(LEFT$(PN$(XX),1))<65THEN4078
4085 IFLEN(PN$(XX))>5THEN4078
4086 PN(XX)=VAL(RIGHT$(PN$(XX),4))
4090 IFPN(XX)<1THEN4078
4099 REM BLK
4100 PRINT"▷DESCRIPTION : ";DE$(XX)
4105 GETA$:IFA$=""THEN4105
4119 REM F1
4120 IFA$<>"▷"THEN4200
4127 REM CRU                                        "
4128 PRINT"▽
4129 REM CRU-RED
4130 INPUT"▽▽DESCRIPTION : ";DE$(XX)
4135 DE$(XX) =LEFT$(DE$(XX),30)
4136 IFDE$(XX)=""ORLEFT$(DE$(XX),1)=" "THEN4130
4199 REM BLK
4200 PRINT"▷STOCK LEVEL : ";SL(XX)
4205 GETA$:IFA$=""THEN4205
4209 REM F1
4210 IFA$<>"▷"THEN4226
4214 REM CRU                                        "
4215 PRINT"▽
4219 REM CRU-RED
4220 INPUT"▽▽STOCK LEVEL: ";SL(XX)
4225 IFSL(XX)<0THEN4220
4225 REM BLK
4226 PRINT"▷RE-ORDER LEVEL: ";RE(XX)
4227 GETA$:IFA$=""THEN4227
4227 REM F1
4228 IFA$<>"▷"THEN4240
4228 REM CRU                                        "
4229 PRINT"▽
4229 REM CRU-RED
4230 INPUT"▽▽RE-ORDER LEVEL: ";RE(XX)
4232 IFRE(XX)<0THEN4230
4239 REM BLK
4240 PRINT"▷COST PRICE : ▷";CP(XX)
4250 GETA$:IFA$=""THEN4250
4259 REM F1
4260 IFA$<>"▷"THEN4200
```

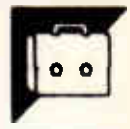
PROGRAM FILE

```
4263 REM CRU
4264 PRINT"")                                                  "
4264 REM RED-CRU
4265 INPUT"X"COST PRICE : £";CP(XX)
4270 IFCP(XX)<0THEN4265
4279 REM BLK
4280 PRINT"BRETAIL PRICE : £";RP(XX)
4290 GETA$:IFA$=""THEN4290
4299 REM F1
4300 IFA$<>"#"THEN4350
4304 REM CRU
4305 PRINT"")                                                  "
4309 REM RED-CRU
4310 INPUT"X"RETAIL PRICE : £";RP(XX)
4320 IFRP(XX)<0THEN4310
4349 REM PUR-  2*CRD
4350 PRINT"@@F1 TO RETURN TO MENU"
4359 REM BLU
4360 PRINT"ZANY OTHER TO CONTINUE"
4370 GETA$:IFA$=""THEN4370
4379 REM F1
4380 IFA$="#"THEN50
4390 GOTO4000
5000 REM*********PRINT-OUT************
5005 IFF1=0THEN50
5019 REM RED-CRD BLU
5020 PRINT"@         1   ZCURRENT STOCK"
5029 REM RED-CRD BLU
5030 PRINT"@         2   ZSELECTED ITEMS"
5039 REM RED-CRD BLU
5040 PRINT"@         3   ZRE-ORDER LIST    "
5049 REM RED-CRD BLU
5050 PRINT"@         4   ZRETURN TO MENU   "
5059 REM BLK-  7*CRD
5060 PRINT"SELECT FOR PRINT-OUT"
5070 GETA$:IFA$=""THEN5070
5080 A=VAL(A$):IFA<1ORA>4THEN5070
5090 ONAGOSUB6000,6200,6400,6340
5100 GOTO50
6000 REM*****PO CURRENT STOCK********
6004 GOSUB8000:GOSUB30000: REM SORT
6005 OPEN4,4
6006 PRINT#4,"STOCK LIST"
6007 PRINT#4,"----------"
6008 PRINT#4,:PRINT#4,
6010 PRINT#4,"PART NO.              DESCRIPTION               SL    RL     CP";
6011 PRINT#4,"        RP"
6015 PRINT#4,"---- ---              -----------               --    --     --";
6016 PRINT#4,"        --"
6017 PRINT#4:PRINT#4
6020 FORXX=1TOEN
6025 N=XX(XX)
6030 PRINT#4,CHR$(16)"01"+PN$(N);CHR$(16)"11"+DES(N);
6050 PRINT#4,CHR$(16)"45";SL(N);CHR$(16)"50";RE(N);
6060 PRINT#4,CHR$(16)"56";CP(N);CHR$(16)"65";RP(N)
6070 NEXTXX:CLOSE4
6100 GOSUB41000:RETURN
6200 REM***PO SELCTED ITEMS**********
6202 YY=0:YZ=0
6204 REM CLR-  3*CRR-  3*CRD-RED
6205 INPUT"ENTER PART NUMBER";TP$
6210 TP=VAL(RIGHT$(TP$,4))
6215 XX=0:YZ=0
6220 FORN=1TOEN
6230 IFTP=PN(N)THENXX=N:N=EN:YZ=1
6240 NEXTN
6241 REM CLR-BLK-  5*CRD-  5*CRR
6242 IFYZ=0THENPRINT"NO SUCH NUMBER":FORZ=1TO2000:NEXTZ:GOTO6205
6245 IFYY=1THENOPEN4,4:GOTO6285
6250 OPEN4,4
6260 PRINT#4,"PART NO.              DESCRIPTION               SL    RL     CP";
6265 PRINT#4,"        RP"
6270 PRINT#4,"---- ---              -----------               --    --     --";
6275 PRINT#4,"        --"
6280 PRINT#4:PRINT#4
6285 N=XX
6290 PRINT#4,CHR$(16)"01"+PN$(N);CHR$(16)"11"+DES(N);
6295 PRINT#4,CHR$(16)"45";SL(N);CHR$(16)"50";RE(N);
6298 PRINT#4,CHR$(16)"56";CP(N);CHR$(16)"65";RP(N)
6299 CLOSE4
6299 REM CLR-BLU
6300 YY=1:PRINT"ANY MORE (Y/N)"
6310 GETA$:IFA$=""THEN6310
6320 IFA$="Y"THENYY=1:GOTO6205
6330 IFA$<>"N"THEN6310
6340 RETURN
6400 REM******RE-ORDER LIST************
6405 GOSUB8000:REM SORT
6406 XX=0:OPEN4,4:YY=0
6407 IFYY=0THENPRINT#4,"RE-ORDER"
6408 IFYY=0THENPRINT#4,"--------"
6409 PRINT#4,
6410 PRINT#4,
6412 PRINT#4,"PART NO.              DESCRIPTION               TOP/UP REQD."
6413 PRINT#4,"---- ---              -----------               ------ -----"
6414 PRINT#4,
6420 FORKK=1TOEN
6425 N=ZX(KK)
6430 IFSL(N)>=RE(N)THEN6800
6645 YY=1
6660 PRINT#4,CHR$(16)"01"+PN$(N);CHR$(16)"11"+DES(N);
6670 PRINT#4,CHR$(16)"50";(RE(N)-SL(N))
6800 NEXTKK
6810 CLOSE4:GOSUB42000
6820 RETURN
8000 REM***SUB/ROUTINE SORT ALPHA****
8004 REM CLR-BLU-  4*CRR-  5*CRD RED
8005 PRINT"       NUMERIC ORDER
8009 REM BLU-  4*CRR-  2*CRD RED
8010 PRINT"       ALPHA.. ORDER
8019 REM BLK- 10*CRD
8020 PRINT"ENTER CHOICE.."
8030 GETA$:IFA$=""THEN8030
8040 A=VAL(A$)
8050 ONAGOTO8060,9000
8060 IFF5=1THENRETURN
8069 REM BLK
8070 PRINT"    SORTING.... PLEASE WAIT!":     REM*****NUMERIC SORT************
8071 ZY=99990
8072 FORP=1TOEN
8073 ZA(P)=PN(P):NEXTP
8075 ZY=PN(I)+1
8080 FORI=1TOEN
8083 FORN=1TOEN
8088 IFZA(N)<ZYTHENZY=ZA(N):ZX(I)=N
```

PROGRAM FILE

```
 8089 NEXTN
 8090 P=ZX(I)
 8091 ZA(P)=999999
 8092 ZY=99998
 8094 NEXTI
 8095 F5=1:F6=0:RETURN
 9000 IFF6=1THENRETURN
 9004 REM BLK
 9005 PRINT"@   SORTING.... PLEASE WAIT!";      REM******ALPHA-SORT*************
 9006 P=1
 9080 FORI=65TO90
 9089 FORN=1TOEN
 9010 IFASC(DES(N))=ITHENZX(P)=N:P=P+1
 9020 NEXTN
 9030 NEXTI
 9035 F6=1:F5=0
 9100 RETURN
10000 REM******LOAD FILE FROM DISK*****
10001 CLR:DIMPN(255),PN$(255),DES(255),SL(255),RE(255),CP(255),RP(255)
10002 DIMZA(255),ZX(255)
10005 FI$=""
10009 REM CLR-BLU RED
10010 INPUT"ENTER FILENAME$ ";FI$
10020 IFFI$=""THEN10000
10029 REM CLR-PUR
10030 PRINT"  INSERT DISK"
10039 REM RED- 10*CRD-  5*CRR
10040 PRINT"[illegible] SPACE WHEN READY"
10050 GETA$:IFA$<>" "THEN10050
10060 POKE53280,5:POKE53281,5
10069 REM CLR-WHT
10070 PRINT"    LOADING "FI$
10080 OPEN1,8,3,"0:"+FI$+",SEQ,R"
10090 INPUT@1,EN,FI$
10100 FORN=1TOEN
10110 INPUT@1,PN(N),PN$(N),DES(N),SL(N),RE(N),CP(N),RP(N)
10115 NEXTN
10120 CLOSE1:FI=1:        GOTO50
12000 REM******SAVE FILE TO DISK*********
12005 FI$=""
12010 IFF1=0THEN50
12019 REM BLU-CLR
12020 INPUT"ENTER FILENAME";FI$
12030 IFFI$=""THEN12020
12039 REM CLR-PUR
12040 PRINT"    INSERT DISK"
12049 REM  10*CRD-  4*CRR
12050 PRINT"[illegible] SPACE WHEN READY"
12060 GETA$:IFA$=""THEN12060
12070 POKE53280,2:POKE53281,2
12079 REM CLR-WHT
12080 PRINT"  SAVING ";FI$
12090 OPEN1,8,3,"@0:"+FI$+",SEQ,W"
12100 A$=CHR$(13)
12110 PRINT@1,EN;A$;FI$
12120 FORN=1TOEN
12130 PRINT@1,PN(N);A$;PN$(N);A$;DES(N)
12140 PRINT@1,SL(N);A$;RE(N);A$;CP(N);A$;RP(N)
12145 NEXTN
12150 CLOSE1:GOTO50
20000 REM******CLEAR/EXIT**********
20009 REM CLR-BLK-  0*CRD RED
20010 PRINT"[illegible]       F1    TO CLEAR FILE"
20019 REM BLK-  3*CRD RED
20020 PRINT"[illegible]       F3    EXIT PROGRAM  "
20030 GETA$:IFA$=""THEN20030
20039 REM F1
20040 IFA$="@"THENRUN
20049 REM F3
20050 IFA$<>"["THEN20030
20060 FORN=100TO0STEP-1
20069 REM BLK-CLR
20070 PRINT"@"";N
20080 GETA$:IFA$<>""THENRUN
20090 NEXTN
20100 SYS64738
20200 END
30000 REM****KEY TO PRINT-OUTS**********
30010 OPEN4,4
30015 PRINT@4,:PRINT@4,
30016 PRINT@4,:PRINT@4,
30020 PRINT@4,"*****************************"
30030 PRINT@4,"*  SL.....STOCK LEVEL*"
30040 PRINT@4,"*  RL.....RE-ORDER LEVEL*"
30050 PRINT@4,"*  CP.....COST PRICE :  *"
30060 PRINT@4,"*  RP...RETAIL PRICE :  *"
30065 PRINT@4,"*****************************"
30060 PRINT@4,:PRINT@4.
30070 CLOSE4
30080 RETURN
40000 REM******CHECK FOR ENTRY**********
40010 A=VAL(BS)
40015 FORNN=1TOEN
40019 REM CLR-RED
40020 IFA=PN(NN)THENPRINT"[illegible]NUMBER EXISTS";FORX=1TO2000:NEXTX:F9=1:RETURN
40030 NEXTNN:F9=0
40040 RETURN
41000 REM*****TOTAL STOCK VALUE*******
41010 TC=0:TR=0
41020 FORNN=1TOEN
41030 TC=TC+(CP(NN)*SL(NN))
41040 TR=TR+(RP(NN)*SL(NN))
41050 NEXTNN
41060 OPEN4,4
41065 PRINT@4,:PRINT@4,
41070 PRINT@4,:PRINT@4,"     TOTAL STOCK VALUE"
41080 PRINT@4,"
41090 PRINT@4,"RETAIL.............. £ ";(INT(TR*100))/100
41100 PRINT@4,"COST................ £ ";(INT(TC*100))/100
41110 CLOSE4:RETURN
42000 REM*******TOTAL RE-ORDER VALUE*****
42010 RX=0:RY=0
42020 FORNN=1TOEN
42030 IFSL(NN)>=RE(NN)THEN42060
42040 RX=RX+(CP(NN)*(RE(NN)-SL(NN)))
42050 RY=RY+(RP(NN)*(RE(NN)-SL(NN)))
42060 NEXTNN
42070 OPEN4,4
42075 PRINT@4,:PRINT@4,
42080 PRINT@4,:PRINT@4,"      TOTAL RE-ORDER VALUE"
42090 PRINT@4,"
42100 PRINT@4,:PRINT@4,"RETAIL.......£ ";(INT(RY*100))/100
42110 PRINT@4,"COST.........£ ";(INT(RX*100))/100
42120 CLOSE4:RETURN
50000 END
```

PROGRAM FILE



Einstein Database

by Nick Cooper

This program is a random access database and runs under Xtal-Basic. The program starts up with a title screen and a prompt to press a key. If Esc is pressed, the program is exited; if I is pressed, an introduction will be printed from which a further key press will take you to the main program. Pressing any other key from the title screen will also take you straight into the program.

When the program is asked to find a particular record, you will have to select the required index followed by the search key, which is the particular word or phrase you wish to look for. This key may be up to eight characters long. When entering records into the database, the Delete key and the cursor keys may be used.

The introduction within the program provides information about getting started. It is suggested that you experiment before starting on serious use, so that you can get the feel of the program.

```
    0 REM ************************
    1 REM *                      *
    2 REM * RANDOM ACCESS -      *
    3 REM *          DATABASE    *
    4 REM *    (c) N.G.Cooper    *
    5 REM *                      *
    6 REM *       3/11/85        *
    7 REM *                      *
    8 REM ************************
   11 REM *                      *
   12 REM *  BATH, AVON. BA1-6DA  *
   13 REM *                      *
   14 REM ************************
   15 REM *   Saved as RFBF.XBS  *
   16 REM ************************
  100 RST:CLEAR
  110 GOSUB 7000:IF FIN THEN 200          REM   Front Page
  120 GOSUB 900:GOSUB 600:GOSUB 700:      REM   Initialise  &  Get File-Name
  130 IF FIN THEN 200
  140 IF NWF% THEN GOSUB 6000:GOTO 160  REM   Set-up New File
  150 GOSUB 6900:                         REM   Set-up Old-File
  160 GOSUB 300:                          REM   MAIN LOOP
  180 IF FIN THEN 200
  190 CLEAR:GOTO 120:                     REM   Re-start Without Front Page.
  200 RST:END
  210 STOP
  297 REM
  298 REM   ***  MAIN MENU LOOP   ***
  299 REM   ======================
  300 CLS:MD%=0:GOSUB 500:MD%=1
  310 PRINT@2,4;"O P T I O N S :":PRINTTAB(3);"3333333333333333";CJ$
  320 RESTORE 9000:ION 4,0:FOR X=0 TO 5:READ A$:IF X<1 THEN TCOL 0,15:ELSE TCOL
 2,15
  330 PRINT@11,(X*2)+7;X;". ";A$;CJ$:NEXT :ION 4,1
  340 TCOL 9,0 :PRINT"Enter Option Number :";:TCOL 15:CH%=VAL(INCH$)
  350 IF CH%>5 THEN 390
  360 ON CH% GOSUB 1000,2000,3000,4000,690
  370 IF CH%=0 THEN FIN=1:GOTO 400
  380 IF CH%=5 THEN 400
  390 GOTO 300
  400 RETURN
  497 REM
  498 REM   ***  Print  Header    ***
  499 REM   ======================
  500 TL%=LEN(TL$):TSP%=21-TL%/2:TCOL0,15:PRINT@TSP%,0;TL$:PRINT@TSP%,1;MUL$("-
 ,TL%):TCOL 15,0
  510 IF MD% THEN  TCOL15,2:PRINTCHR$(30);MD$(CH%):PRINT"  MODE  ":TCOL 15,0
  520 RETURN
  550 TCOL 0,0:PRINT@ 0,22;CV$;A$;:TCOL 15,0
  560 RETURN
  597 REM
  598 REM   ***     INITIALISE      ***
  599 REM   ======================
  600 RESTORE 9010:DIM MD$(5):FOR X=1 TO 5:READ MD$(X):NEXT
  601 CU$=CHR$(21):REM Clear to EOL
  602 CV$=CHR$(22):REM Clear to EOS
  603 CJ$=CHR$(10):REM Cursor Down
  604 CO$=CHR$(7) :REM Beep
  605 CX$=CHR$(24):REM Clear Line
  610 S$=CHR$(&D0)+CHR$(&A)
  620 DEF FNC(X)=(26*X)+5
  630 E$=CHR$(27):ul$=E$+"-"+CHR$(1):uO$=E$+"-"+CHR$(128):REM underline on/off
  640 CI$=CHR$(15):CO$=CHR$(18):REM Compressed on/off
  650 DEF FNX(X)=((X-1)MOD 10)*6 :DEF FNY(X)=ABS(X>10)*17+6
  660 DEF FNPF%(X)=VAL(MID$(PF$,X,3))-1
  670 DIM IDX%(999),IDX$(999)
  680 RESTORE 9020:DIM OO$(7):FOR X=0 TO 7:READ OO$(X):NEXT
  690 RETURN
  697 REM
  698 REM   *** Get F/name & Validate ***
  699 REM   ============================
  700 CLS:NAME$="":X=0:TCOL 15,4:PRINT@10,4;"WHICH FILE ?":PRINT@18,5;"########
 ########":TCOL 15,0:NF%=0
  710 PRINT@5,7;"Open New-File Y/N or (ESC) _";CHR$(8);:K=INCH:IF K=89 OR K=121
 THEN PRINT"YES":NWF%=1:ELSE PRINT"NO"
  720 IF K=27 THEN FIN=1 :GOTO 840
  730 PRINT@5,9;"Enter File-Name :";:TCOL 15,6:PRINT"          ";:PRINT@22,9;
  740 X=X+1:IF X>8 THEN 800
  750 K=INCH:IF K=13 THEN 800
  760 IF K=25 AND X>1 THEN PRINTCHR$(K);:X=X-1:NAME$=LEFT$(NAME$,X-1):GOTO 750
  770 IF K=>97 AND K<=122 THEN K=K-32
```

PROGRAM FILE

```
   780 IF K<33 THEN 750
   790 PRINTCHR$(K);:NAME$=NAME$+CHR$(K):GOTO 740
   800 TCOL15,8:PRINT CJ$:IF NAME$="" THEN  700
   810 NFILE$=NAME$+".FBI":NFILE$=NAME$+".FBN"
   820 DRIVE$:REN NFILE$ TO NFILE$ :REM       Error Trapped '''
   830 IF ERR=26 AND NWF% THEN PRINTERR$:DIR"$.FBI":PRINT"Press Any Key to Conti
nue :";:K=INCH:NWF%=0:GOTO 760
   840 REM
   850 IF ERR=25 AND NWF%=0 THEN PRINTERR$;" found as ";NFILE$:DIR"$.FBI":PRINT"
Press Any Key to Continue";:K=INCH:GOTO 780
   860 RETURN
   897 REM
   898 REM   ### Set Error Handler ###
   899 REM   ==========================
   900 ON ERR GOSUB 9900:RETURN
   917 REM
   918 REM   ### Modify Idx. Input ###
   919 REM   ==========================
   920 TL%=LEN(TEMP$):RES$=""
   930 IF ASC(LEFT$(TEMP$,1))<33 AND TL%>0 THEN TL%=TL%-1:TEMP$=RIGHT$(TEMP$,TL%
):GOTO 930
   940 IF TL%>0 THEN TEMP$=LEFT$(TEMP$,8):TL%=8
   950 FOR LOOP =1 TO TL%:K=ASC(MID$(TEMP$,LOOP,1)):IF K=>65 AND K<=90 THEN K=K+
32
   960 RES$=RES$+CHR$(K):NEXT:TEMP$=RES$
   970 RETURN
   997 REM
   998 REM   ###  ADD a Record     ###
   999 REM   ==========================
  1000 CLS:GOSUB 500:PRINT@10,10;"Data Entry Y/N";:K=INCH:IF K<>89 AND K<>121 TH
EN RETURN
  1010 GOSUB 1450:REM Clear Input Array
  1020 PRINT@4,3;CV$;"Enter Data as prompted :";:Y=1
  1030 GOSUB 1500:REM Input Routine
  1040 A$="Is this record Correct Y/N ":GOSUB 550:K=INCH:IF K<>89 AND K<>121 THE
N 1030
  1070 IF Y<20 AND SIZE>RSZ%+100 THEN A$="Anymore Entries Y/N ":GOSUB 550:K=INCH
:IF K=89 OR K=121 THEN Y=Y+1:GOTO 1030
  1080 REM Process Input-Data
  1090 NREC%=Y:A$="Please Wait While Data is Processed":GOSUB 550
  1100 REM Get Master-File Status
  1110 OPEN NFILE$,FM$,RSZ%:INPUT @FM$,0;FSZ%,FRE%,FEXT%:CLOSE
  1120 REM Save New Records in Master-File Free-Records
  1130 FOR Y=1 TO NREC%:IF FRE%(=FEXT% THEN OPEN NFILE$,FM$,RSZ%:INPUT#FM$,FRE%;
NFRE% :ELSE NFRE%=FRE%+1:FEXT%=FEXT%+1
  1140 CLOSE
  1150 OPEN NFILE$,FM$,RSZ%:PRINT@FM$,FRE%
  1160 FOR X=0 TO NF%: PRINT REC$(X,Y);: NEXT:CLOSE
  1180 REC$((NF%+1),Y)=STR$(FRE%)
  1190 FRE%=NFRE%:NEXT Y
  1200 REM Update Index-Files
  1210 REM Set Index-File Name
  1220 LF%=NF%+1:FOR X=0 TO NKF%:ION 4,0:ION 5,0:KFILE$=NAME$+".FB"+STR$(X):ION
4,1:ION 5,1:KF%=KF%(X)
  1230 REM Modify Index Field(s)
  1240 FOR A=1 TO NREC%:TEMP$=REC$(KF%,A):GOSUB 920:IDX$(A)=TEMP$:IDX%(A)=VAL(RE
C$(LF%,A)):NEXT A:IF NREC%<2 THEN 1290
  1250 REM Sort Index Field(s) (Insertion Sort)
  1260 FOR A=2 TO NREC%:D$=IDX$(A):D%=IDX%(A):FOR C=A TO 2 STEP -1:IDX$(C)=IDX$(
C-1):IDX%(C)=IDX%(C-1)
  1270 IF D$ => IDX$(C) THEN IDX$(C)=D$:IDX%(C)=D%:C=2
  1280 NEXT C:IF D$ < IDX$(1) THEN IDX$(1)=D$:IDX%(1)=D%
  1285 NEXT A
  1290 SEP$:OPEN KFILE$,FK$:CREATE "D.DAT",FDF$:A=1:IF FSZ%=0 THEN 1340
  1300 REM Sort Index Field(s) into Index Files
  1310 FOR B=1 TO FSZ%:INPUT@FK$;D$:INPUT D%
  1320 IF A(=NREC% AND D$=> IDX$(A) THEN PRINT@FDF$;IDX$(A);S$;IDX%(A):A=A+1:GOT
O 1320
  1330 PRINT@FDF$;D$;S$;D%:NEXT B
  1340 IF A(=NREC% THEN FOR B=A TO NREC%:PRINT@FDF$;IDX$(B);S$;IDX%(B):NEXT B
  1350 CLOSE:SEP 44:ERA KFILE$:REN "D.DAT" TO KFILE$
  1360 NEXT X
  1370 REM Store New Master-File Status
  1380 FSZ%=FSZ%+NREC%
  1390 OPEN NFILE$,FM$,RSZ%:PRINT@FM$,0;FSZ%;S$;FRE%;S$;FEXT%:CLOSE
  1400 A$="Press (ESC) for Menu":GOSUB 550:K=INCH:IF K<>27 THEN 1000
  1410 GOSUB 1450
  1420 RETURN
  1440 REM Clear Input Array
  1450 FOR X=0 TO 20:FOR Y=0 TO NF%+1:REC$(Y,X)="":NEXT Y,X
  1460 RETURN
  1497 REM
  1498 REM   ###  Input  Routine   ###
  1499 REM   ==========================
  1500 ANF%=NF%+1
  1510 REM PRINT"Enter No. of Lines per Page :";:TLP%=VAL(INCH$(1));:IF TLP%<1 OR
 TLP%>8 THEN PRINTCHR$(13);CU$;:GOTO 1510
  1520 TLP%=7: NP%= ANF%/TLP%:REM No. of pages
  1530 IF ANF% MOD TLP% THEN NP%=NP%+1
  1540 FOR PAGE = 1 TO NP%
  1550 LOP%=TLP% : REM Lines on Page
  1560 IF PAGE = NP% AND (ANF% MOD TLP%) THEN  LOP%=(ANF% MOD TLP%)
  1570 PRINT@0,5;CV$
  1580 FOR LINE = 1 TO LOP%
  1590 REC%=((PAGE-1) * TLP%)+(LINE-1)
  1600 TCOL2,15:PRINT@0,FNC(LINE-1);FD$(REC%);TAB(12,46);:TCOL15,0:PRINT REC$(RE
C%,Y)
  1610 NEXT LINE
  1620 IF CH%<>4 THEN GOSUB 1600:REM Input Loop
  1630 IF PAGE<NP% THEN A$="End of Page"+STR$(PAGE)+" NEXT PAGE Y/N or (ESC)":GO
SUB 550:K=INCH:PRINT:IF K=78 OR X=110 THEN 1570
  1640 IF X=27 THEN PAGE=NP%
  1650 NEXT PAGE:PRINTTAB(8,32)
  1660 RETURN
  1670 REM Input Loop
  1671 REM ==========
  1680 X%=(PAGE-1)*TLP%: X=0
  1690 I$="":NC%=NC%(X%): PRINT@1,FNC(X);
  1700 FOR L=1 TO NC%:IF L=>NC%-1 THEN BEEP1
  1710 X=INCH:EXIT=0:IF K<32 THEN GOSUB 1820:ON EXIT GOTO 1740,1710
  1720 IF L=1 THEN  PRINTCU$;
  1730 PRINTCHR$(X);:I$=I$+CHR$(K)
  1740 NEXT L:EXIT=0:  IF I$<>"" THEN   REC$(X%,Y)=I$
  1750 IF K=27 THEN 1800
  1760 IF X=11 AND X>0 THEN X=X-1:X%=X%-1:GOTO 1690
  1770 IF K=11 THEN 1690
```

PROGRAM FILE

```
  1780 PRINT@11,FNC(X);CU$;REC$(X%,Y):X=X+1:X%=X%+1:PRINTTAB(0,32)
  1790 IF K<LOP% THEN 1690
  1800 RETURN
  1810 REM Control Key Press Handler
  1811 REM ==========================
  1820 IF L=1 AND (K=13 OR K=10 OR K=11 OR K=27) THEN L=NC%:EXIT=1: GOTO 1880
  1830 IF K=25 AND L>1 THEN PRINTCHR$(K);:L=L-1:I$=LEFT$(I$,L-1):EXIT=2:GOTO 188
0
  1840 IF K=25 THEN REC$(X%,Y)="":L=NC%:PRINT@11,FNC(X);MUL$(" ",NC%):EXIT=1
  1850 IF K=27 THEN K=13:I$=""
  1860 IF K=13 THEN L=NC%:EXIT=1
  1870 IF EXIT=0 THEN EXIT=2
  1880 RETURN
  1997 REM
  1998 REM   ### DELETE a Record ###
  1999 REM   ==========================
  2000 CLS:GOSUB 500:IF FSZ%<1 THEN PRINTCO$;"FILE EMPTY " Press Any Key ";:K=I
NCH:RETURN
  2010 PRINT@10,10;"Delete Data Y/N";:K=INCH:IF K<>89 AND K<>121 THEN RETURN
  2030 GOSUB 2900:REM FINDREC
  2040 IF EXIT THEN 2400
  2050 X%=0
  2060 GOSUB 2800:REM DISPREC
  2070 IF EXIT THEN 2400
  2080 PRINT:PRINT CO$;" DELETE This Record YES/NO ? ";:K=ASC(INCH$(1)):IF K<>89
 AND K<>121 THEN 2400
  2140 OPEN "MFILE",FM$,RSZ%:PRINT#FM$,L%;FRE%;"FREE":PRINT#FM$,0;FSZ%-1;I$;L%;I$
;FEXT%:CLOSE:FRE%=L%
  2150 FOR X=0 TO NKF%:IOM 4,0:IOM5,0: KFILE$=NAME$+".F0"+STR$(X):IOM 4,1:IOM5,1
:OPEN KFILE$,FK0:CREATE "D.DAT",FD0
  2160 SEP 0: FOR Y=1 TO FSZ%:INPUT#FK0;D0:INPUT D%:IF D%=L% THEN 2180
  2170 PRINT#FD0;D0;I$;D%
  2180 NEXT Y:CLOSE:ERA KFILE$:REN "D.DAT" TO KFILE$
  2190 CLOSE:SEP44:NEXT X
  2200 FSZ%=FSZ%-1
  2400 CLOSE:GOSUB 5900:REM Exit
  2420 K=INCH:IF K=13  AND L% THEN X%=X%+1:GOTO 2060
  2430 IF K=13 THEN 2000
  2440 IF K<>27 THEN 2030
  2450 RETURN
  2497 REM
  2498 REM   ### FIND RECORD ###
  2499 REM   ==========================
  2500 TCOL0: PRINT@0,5;CV$;TAB(3);"Press <ENTER> to ABORT ";:TCOL 2:PRINT" or :
";:PRINT
  2510 TCOL,15:FD%=0:FNT 2,0: IOM 4,0:IOM 5,0:FOR X=0 TO NKF%:PRINT@4,K+7;X+11;".
";FD$(KF%(X));TAB(20);NEXT:FNT 0,0
  2520 TCOL8,0:PRINT@2,18;CU$;"Enter Index Number and <ENTER> :";:TCOL15:INPUT""
;I$:X=VAL(I$):IF K=0 THENEXIT =1:GOTO 2550
  2530 IF X>NKF%+1 THEN PRINTCO$;:GOTO 2520
  2540 KF%=X-1:KFILE$=NAME$+".F0"+STR$(KF%)
  2550 IOM 4,1:IOM 5,1: RETURN
  2560 :REM Enter Search-Key and Search (Binary)
  2570 TCOL 8:PRINT CJ$;TAB(5);"Enter ";:TCOL 15:PRINTFD$(KF%(KF%));TAB(22);:TCO
L 8:PRINT"for Search";TAB(50);:TCOL 15
  2580 INPUT";";TEMP$: GOSUB 920:SK$=TEMP$:KFL%=TL%: GOSUB 2720:REM Load Index F
ile
  2590 B%=1:T%=FSZ%:IF SK$=CHR$(0) THEN FD%=1:GOTO 2710
  2600 FOR X=1TO1 :REN Repeat Loop
  2610 M%=(B%+T%)/2:A$=LEFT$(IDX$(M%),KFL%)
  2620 IF A$<>SK$ THEN X=0
  2630 IF A$< SK$ THEN B%=M%+1
  2640 IF A$ >SK$ THEN T%=M%-1
  2650 IF B% > T% THEN K=1
  2660 NEXT X
  2670 IF B%> T% THEN FD%=0
  2680 IF B%<=T% THEN FD%=M%
  2690 IF FD%=0 THEN EXIT=2 :GOTO 2770:REN EOF
  2700 IF FD%>1 AND LEFT$(IDX$(FD%-1),KFL%)=SK$ THEN FD%=FD%-1:GOTO 2700
  2710 RETURN
  2720 SEP 0 :OPEN KFILE$,FK0:INPUT#FK0:FOR X=1 TO FSZ%:INPUT IDX$(X):INPUT IDX%
(X):NEXT:CLOSE FK0:SEP 44: RETURN
  2730 : REN Store All Matches
  2740 LOC$="":FNT4,0:IOM 4,0:IOM 5,0
  2750 LOC$=LOC$+STR$(IDX%(FD%)):FD%=FD%+1:NLOC%=LEN(LOC$)/4:IF NLOC%<60 AND LEF
T$(IDX$(FD%),KFL%)=SK$ THEN 2750
  2755 PRINT TAB(10);NLOC%;" ";:TCOL 0:PRINT"Records Found":TCOL 15
  2760 FNT 0,0: IF NLOC%=60 THEN EXIT=3:REN Too many records found
  2770 IOM 4,1:IOM 5,1:  RETURN
  2797 REM
  2798 REM   ### DISPLAY RECORD ###
  2799 REM   ==========================
  2800 L%=VAL(NID$(LOC$,(X%*4)+1,4)):IF L%=0 THEN EXIT=2 :GOTO 2890:REN EOF
  2810 GOSUB 5000:REN Load M/File Record
  2820 PRINT@0,5;CV$;:TCOL 6,11:PRINT"Record No."IL%:TCOL 15,0
  2830 PRINT: IF KF%(KF%)>4 THEN TCOL 6,11:PRINTFD$(KF%(KF%));TAB(12,46);REC$(KF%
(KF%),0):TCOL 15,0
  2840 FOR X=0 TO 4:IF X=KF%(KF%) THEN TCOL 6,11
  2850 PRINTFD$(X);TAB(12,46);REC$(X,0);:TCOL 15,0:NEXT:PRINTTAB(6,32)
  2860 A$= MD$(CH%)+" This Record Y/N";:GOSUB 950:TCOL0:PRINT" or (ESC) :";:TCOL
15:K=INCH
  2870 IF K<>89 AND K<>121 AND K<>27 THEN X%=X%+1:GOTO 2800
  2880 IF K=27 THEN EXIT=1
  2890 RETURN
  2898 REM FINDREC Subroutine
  2899 REM ==================
  2900 GOSUB 2500:IF EXIT THEN 2930
  2910 GOSUB 2570:IF EXIT THEN 2930
  2920 GOSUB 2740
  2930 RETURN
  2997 REM
  2998 REM   ### EDIT a Record ###
  2999 REM   ==========================
  3000 CLS:GOSUB 500:IF FSZ%<1 THEN PRINTCO$;"FILE EMPTY " Press Any Key ";:K=I
NCH:RETURN
  3010 PRINT@10,10;"Edit Data Y/N";:K=INCH:IF K<>89 AND K<>121 THEN 3950
  3030 GOSUB 2900 :REN FINDREC
  3040 IF EXIT THEN 3500
  3045 X%=0
  3050 GOSUB 2800:REN DISPREC
  3055 IF EXIT THEN 3500
  3060 Y=0:GOSUB 1500:REN VDU Output Routine + Input loop
  3140 TCOL8:PRINT@0,22;CU$;"Store Record Y/N or (ESC) ";:TCOL15:K=INCH:IF K<>27
 AND K<>89 AND K<>121 THEN 3060
  3150 IF K=27 THEN EXIT=1:GOTO 3500
  3160 PRINT@0,22;CU$;"Please Wait While Data is processed"
```

PROGRAM FILE

```
  3170 OPEN #FILE@,FM@,RSZ%:PRINT@FM@,L%
  3180 FOR X=@ TO NF%:PRINTREC@(X,@):NEXT:CLOSE
    3200 FOR X=@ TO NKF%:IOM 4,@:IOM5,@:KFILE@=NAME@+",FB"+STR@(X):IOM4,1:IOM5,1
  3205 TEMP@=REC@(XF%(K),@):GOSUB 920:REC@(KF%(X),@)=TEMP@
  3210 OPEN XFILE@,FK@:INPUT #FK@:SEP @
  3220 CREATE "D.DAT",FD@:PRINT #FD@
  3230 F1=@ : F2=@
  3240 FOR Y=1 TO FSZ%: INPUT@FK@;D@:INPUT D%
   3250 IF F1=@ AND D@=>REC@(KF%(K),@) THEN PRINT@FD@;REC@(KF%(X),@);S@;L%:F1=-1
  3260 IF F2=@ AND D%=L% THEN F2=-1:GOTO 3280
  3270 PRINT@FD@;D@;S@;D%
  3280 NEXT Y:IF F1=@  THEN PRINT@FD@;REC@(KF%(X),@);S@;L%
  3290 CLOSE: ERA KFILE@:REN "D.DAT" TO KFILE@:SEP 44
  3300 NEXT X
  3500 CLOSE:GOSUB 5900:REM Exit
  3520 K=INCH:IF K=13  AND L% THEN X%=X%+1:GOTO 3050
  3530 IF K=13 THEN 3000
  3540 IF K<>27 THEN 3030
  3550 RETURN
  3997 REM
  3998 REM    ***  OUTPUT RECORDS    ***
  3999 REM    ============================
  4000 CLS:GOSUB 500:IF FSZ%<1 THEN PRINTC@;"FILE EMPTY '' Press Any Key ";:K=I
NCH:RETURN
  4015 REM PRINT@@,5;CV@;
  4020 PRINT@2,5;"OUTPUT OPTIONS :";PRINT@2,6;"3333333333333333"
  4030 TCOL8,15;PRINT@84,8;OO@(8):TCOL 2:PRINT@4,18;OO@(1)
  4040 PRINT@4,11;OO@(2):PRINT@4,13;OO@(5)
  4050 TCOL15,@:PRINT@3,15;"Multipla Records With Selected Fields":TCOL 2,15
  4060 PRINT@4,17;OO@(6):PRINT@4,18;OO@(7)
    4070 TCOL@,@:PRINT:PRINT"   Enter Selected Option :";:TCOL 15:OO%=VAL(INCH@)
  4080 IF  OO%>9 THEN PRINTC@;:GOTO 4000
  4090 PRINT:IF OO%>4 THEN GOSUB 5750:REM Printer Ready ?. Set PF@ (Field Choice
s)
  4095 IF OO% THEN TCOL 15,2:PRINT@3,3;OO@(OO%):TCOL 15,@
  4100 ON OO% GOSUB 4200,4300,4130,4130,4600,4800,4900,4130,4130
  4110 IF OO%=@ THEN  RETURN
  4120 GOTO 4000
  4130 BEEP 1 : RETURN
  4199 REM Output Option 1. VDU / Selected / Single Rec. + Matches
  4200 GOSUB 2900: REM FINDREC
  4210 IF EXIT THEN 4260
  4220 X%=@
  4230 L%=VAL(MID$(LOC@,(X%*4)+1,4)):IF L%=@ THEN EXIT=2 :GOTO 4260:REM EOF
  4240 GOSUB 5000: REM Load M/File Record
  4250 Y=@:GOSUB 1500:IF K<>27 THEN A@="LAST Page. Quit Record Y/N ":GOSUB 550:K
=INCH:IF K<>89 AND K<>121 THEN 4250
  4260 GOSUB 5900 :K=INCH:IF K=13  AND L% THEN X%=X%+1:GOTO 4230
  4270 IF K=13 THEN EXIT=2 :GOTO 4260
  4280 IF K<>27 THEN 4290
  4290 RETURN
  4299 REM Output Option 2. VDU / All records from Index
  4300 GOSUB 2500:IF EXIT THEN 4360:REM Choose Index
  4310 TCOL @:PRINTCJ@;"  Set Starting point Y/N";:TCOL15:K=INCH:PRINT: IF K<>89
AND K<>121 THEN GOSUB 2720:FD%=1:GOTO 4340
  4320 GOSUB 2570:IF EXIT THEN 4360:REM Search Index
  4330 L%=IDX%(FD%):GOSUB 5000
  4350 Y=@ :GOSUB 1500 :IF K<>27 THEN A@="LAST Page. Quit Record Y/N ":GOSUB 550
:K=INCH:IF K<>89 AND K<>121 THEN 4350
  4360 GOSUB 5900:K=INCH:IF K=13 AND FD%(FSZ% THEN FD%=FD%+1:GOTO 4340
  4370 IF K=13 THEN EXIT=2:GOTO 4360
  4380 IF K<>27 THEN 4300
  4390 RETURN
  4399 REM Output Option 3
  4400 REM
  4500 REM
  4599 REM Output Option 5. Printer / Single Recs.+ Matches / All Fields
  4600 GOSUB 2900:IF EXIT THEN 4690:REM FINDREC
  4610 GOSUB 5700:NC%=RSZ%+5:IF NC%<80 THEN  GOSUB 5560:REM Printer Col.Heads
  4630 X%=@
  4640 GOSUB 2800:IF EXIT THEN 4690:REM Display part/rec.
  4660 GOSUB 5600:REM Print Record
  4690 GOSUB 5900:K=INCH:IF K=13 AND L% THEN X%=X%+1:GOTO 4640
  4710 IF K=13 THEN EXIT=2 :GOTO 4690
  4720 IF K<>27 THEN 4600
  4730 RETURN
  4799 REM Output Option 6. Printer / All Matches / Sel. Fields
  4800 GOSUB 2900:IF EXIT THEN 4840:REM FINDREC
  4810 GOSUB 5400:IF EXIT THEN 4840:REM Set Print Fields
  4830 X%=@
  4840 L%=VAL(MID$(LOC@,(X%*4)+1,4)):IF L%=@ THEN EXIT=2 :GOTO 4860
  4850 GOSUB 5000: GOSUB 5600: K%=X%+1: GOTO 4840
  4860 GOSUB 5900:K=INCH
  4870 IF K=13 THEN EXIT=2: GOTO 4840
  4880 IF K<>27 THEN 4800
  4890 RETURN
  4899 REM Output Option 7. Printer / All Records / Selected Fields
  4900 GOSUB 2500:IF EXIT THEN 4900:REM Set Field Choice
  4910 GOSUB 5400:IF EXIT THEN 4900: REM Set Print Fields
  4920 TCOL @:PRINT@@,5;CV@;"Set Start Point Y/N ";:TCOL 15:K=INCH:PRINT:IF K<>8
9 AND K<>121 THEN GOSUB 2720 :FD%=1:GOTO 4940
  4930 GOSUB 2570 :IF EXIT THEN 4900:REMSearch
  4940 L%=IDX%(FD%):GOSUB 5000:REM Load M/File Record
  4950 GOSUB 5600:REM Print Record
  4960 IF FD%(FSZ% THEN FD%=FD%+1:GOTO 4940:REM Next Record
  4970 EXIT = 2
  4980 GOSUB 5900:K=INCH
  4990 IF K=13 THEN EXIT=2 :GOTO 4900
  5000 IF K<>27 THEN 4980
  5010 RETURN
  5390 REM Enter Print Field Choices
  5399 REM ============================
  5400 PRINT@8,5;CV@;"Choose Fields by No. or 'A' for All:" : PF@=""
  5410 IOM 4,@:IOM 5,@:FMT 2,@:FOR X=@ TO NF%:TCOL @,15:PRINT@FNY(K+1),FNX(X+1);
 X+1;" ";:TCOL 2:PRINT FD@(K);TAB(30);:TCOL15,@
  5420 NEXT:FMT 2,@:IOM 5,1:IOM 4,1:TCOL 15:Y=@:NC%=5
  5430 TCOL@:PRINT@@,Z@;CU@;"Enter Field for Printing :";:TCOL 15
  5440 PRINT@25,Z@;CU@;:INPUT":";A@: A%=VAL(A@):IF A%>NF%+1 THEN BEEP1:GOTO 5440
  5450 IF A@="" OR Y>NF% OR Y>20 OR A@="@" THEN  IOM 4,1:GOTO 5530
  5460 IF A@="A" OR A@="a" THEN GOSUB 5700:NC%=RSZ%+5:GOTO 5540
  5470 LPF%=LEN(PF@):FOR X=1 TO LPF% STEP 3
  5480 IF VAL(MID$(PF@,X,3))=A% THEN X=LPF%:BEEP 1: GOTO 5440
  5490 NEXT:L=NC%(A%-1):IF L<10 THEN L=10
  5500 NC%=NC%+L :FMT 2,@: PF@=PF@+STR@(A%):Y=Y+1:FMT @,@
  5510 TCOL1,15:IOM 4,@:IOM 5,@:FMT 2,@:PRINT@ FNY(A%)-3 ,FNX(A%));Y:FMT @,@:IOM
 4,1:IOM 5,1:TCOL15,@
  5520 GOTO 5440
```

PROGRAM FILE

```
  5530 IF PF$="" THEN EXIT=1:GOTO 5550
  5540 LPF%=LEN(PF$):IF NC%(0 THEN GOSUB 5560:REM   'pr.nt header'
  5550 RETURN
  5560 T%=5:LPF%=LEN(PF$):PRINT#1:FOR X=1 TO LPF% STEP 3:PF%=FNPF%(X):PRINTTAB(T
%);U1$;FD$(PF%);U0$;:T%=T%+3
  5570 L=NC%(PF%):IF L<10 THEN L=10
  5580 T%=T%+L:NEXT:PRINTCJ$:PRINT#0
  5590 RETURN
  5598 REM Print Out Record
  5599 REM ================
  5600 IF NC%<80 THEN 5650:REM Horizontal Print-Out
  5610 PRINT#1;U1$;"Record No.";L%;U0$;CJ$
  5620 FOR X=1 TO LPF% STEP 3:PF%=FNPF%(X)
  5630 PRINTCJ$;FD$(PF%);TAB(15,46);TAB(28,32);C0$;REC$(PF%,0)
  5640 NEXT:PRINT:PRINT#0:RETURN
  5649 REM Horizontal Print-Out
  5650 FNT3,0:IOM4,0:IOM 5,0:PRINT#1;L%;:IOM 5,1:IOM 4,1:FNT0,0
  5660 T%=5:LPF%=LEN(PF$):FOR X=1 TO LPF% STEP 3:PF%=FNPF%(X):PRINTTAB(T%);REC$(
PF%,0);
  5670 L=NC%(PF%):IF L<10 THEN L=10
  5680 T%=T%+L:NEXT:PRINT:PRINT#0
  5690 RETURN
  5697 REM
  5698 REM  ### All P/Fields  PF$  ###
  5699 REM  ============================
  5700 PF$="":FNT 2,0:FOR X=0 TO NF%:PF$=PF$+STR$(X+1):NEXT:FNT0,0
  5710 LPF%=LEN(PF$):RETURN
  5748 REM Check Printer Status
  5749 REM ====================
  5750 IF (INP(&20) AND 8) THEN TCOL*:PRINT"PAPER OUT";C0$;" >> ";:WAIT &20,8,8:
TCOL15,0:PRINTCX$;
  5760 IF (INP(&20) AND 4) THEN TCOL9:PRINT"PRINTER OFF";C0$;" >> ";:WAIT &20,4,
4:TCOL15,0:PRINTCX$;
  5770 RETURN
  5798 REM Load M/File Record
  5799 REM ==================
  5800 SEP 0: OPEN #FILE$,FM$,RS2%:INPUT #FM$,L%: FOR X=0 TO NF%:INPUT REC$(X,0)
:NEXT :CLOSE FM$:SEP 44
  5810 RETURN
  5897 REM
  5898 REM   ###  EXIT Handler     ###
  5899 REM   ==========================
  5900 : PRINT@0,5;CV$;:IF EXIT THEN TCOL 1,11:ON EXIT GOSUB 5940,5950,5960:BEEP
 1:EXIT=0:TCOL 15,0
  5910 TCOL 0,15:PRINT@0,7;"Press <ESC>  for Menu":TCOL 2:PRINTCJ$;"  or <ENTER>
 for next Record"
  5920 PRINTCJ$;"  or  'Any'  for New Search-Key.";:TCOL 15,0
  5930 RETURN
  5940 PRINT MD$(CM%);"ABORTED":RETURN
  5950 PRINT"End of File":RETURN
  5960 PRINT"Too many records found. Retry.":RETURN
  5997 REM
  5998 REM   ###  New File SET-UP  ###
  5999 REM   ==========================
  6000 CL$
  6010 PRINT@11,4;"SET - UP a New File":PRINT@11,7;"####################"
  6020 PRINT@5,8;"Enter Information when prompted,";TAB(50);"and Press <ENTER>.
  6030 PRINT@1,12;CV$;"Database Title ";:INPUT TL$
  6040 TL$=LEFT$(TL$,17):IF TL$="" THEN 6030
  6050 TL$=TL$+" DATABASE"
  6060 GOSUB 500
  6070 PRINT@0,2;"Correct Y/N ";:K=INCH:PRINT@0,2;MUL$(" ",15);:IF K<>89 AND K<>1
21 THEN 6000
  6080 PRINT@1,12;CV$;"How Many Fields ";:INPUT": ";NF%:IF NF%<1 THEN 6000
  6090 PRINT@5,14;NF%;"Fields. Correct Y/N ";:K=INCH:IF K<>89 AND K<>121 THEN 60
00
  6100 NF%=NF%-1:DIM FD$(NF%),KF%(NF%),REC$(NF%+1,20),NC%(NF%):RS2%=0
  6110 GOSUB 6500: REM Set Field Names
  6120 GOSUB 6600: REM Set Field Sizes
    6130 PRINT@0,5;CV$;PRINT@1,12;CV$;"The ";FD$(0);" is the primary Key Field"
  6140 PRINT TAB(5);"Do you need any other (upto 9) Key-      Fields for Search
Purposes. Y/N ";
  6150 K=INCH:IF K<>89 AND K<>121 THEN 6190:REM Jump the next section
  6160 Y=1:FOR X=1 TO NF%
  6170 PRINT@1,12;CV$;FD$(X);" is a KEY Field Y/N ";:K=INCH:IF K=89 OR K=121 THE
N KF%(Y)=X:NKF%=Y:Y=Y+1
  6180 IF Y>9 THEN X=NF%
  6190 NEXT:PRINTCJ$:PRINT"Please Wait While Files are Initialized"
  6200 REM
  6210 IOM4,0:IOM5,0:FOR X=0 TO NKF%
  6220 KFILE$=NAME$+".F$"+STR$(X)
  6230 CREATE KFILE$,KF%:CLOSE: NEXT:IOM4,1:IOM5,1
  6240 FSZ%=0:FRE%=1:FEXT%=0
  6250 CREATE MFILE$,FM$,RSZ%:PRINT#FM$,0;FSZ%;80;FRE%;80;FEXT%:CLOSE FM$
  6260 CREATE MFILE$,FI$;PRINT#FI$
  6270 PRINTTL$;80;NF%
  6280 FOR X=0 TO NF%:PRINTFD$(X);80;NC%(X):NEXT
  6290 PRINTNKF%:FOR X=0 TO NKF%:PRINTKF%(X):NEXT
  6300 CLOSE
  6310 RETURN
  6497 REM
  6498 REM   ###  SET FIELD NAMES  ###
  6499 REM   ============================
  6500 PRINT@0,3;CU$;TAB(5);"Enter Field Names :-"
  6510 FOR X=0 TO NF%:FD$(X)="Field"+STR$(X+1):NC%(X)=9:NEXT
  6520 Y=0:GOSUB 1500
  6530 PRINT@0,22;CU$;"Are ALL Field Names Correct Y/N";:K=INCH:IF K<>89 AND K<>
121 THEN 6520
  6540 FOR X=0 TO NF%:FD$(X)=REC$(X,0):NEXT
  6550 PRINT@0,3;CU$
  6560 RETURN
  6597 REM
  6598 REM   ###  SET FIELD SIZES  ###
  6599 REM   ============================
  6600 NCM%=40:PRINT@0,3;CU$;TAB(5);"Enter Field Sizes :-"
  6610 FOR X=0 TO NF%:REC$(X,0)="___ Characters":NC%(X)=3:NEXT
  6620 Y=0:GOSUB 1500
  6630 PRINT@0,22;CU$;"Are ALL Field Sizes Correct Y/N";:K=INCH:IF K<>89 AND K<>
121 THEN 6620
  6640 RS2%=0: FOR X=0 TO NF%:NC%(X)=VAL(REC$(X,0)):IF NC%(X)>NCM% THEN NC%(X)=N
CM%
  6650 RS2%=RSZ%+NC%(X)+2 : NEXT: PRINT@0,3;CU$
  6660 RETURN
  6897 REM
  6898 REM   ###  Old File SET-UP  ###
  6899 REM   ============================
```

PROGRAM FILE

```
  6900 PRINTCJ0;"Please Wait While Files are Loaded"
  6910 OPEN #FILE0,FI0:INPUT #FI0
  6920 INPUT TL0,NF%
  6930 DIM FD0(NF%),NC%(NF%),REC0(NF%+1,20)
  6940 RSZ%=0:FOR X=0 TO NF%:INPUT FD0(X),NC%(X):RSZ%=RSZ%+NC%(X)+2: NEXT
  6950 INPUT NKF%:DIM KF%(NKF%)
  6960 FOR X=0 TO NKF%:INPUT KF%(X):NEXT:CLOSE
  6970 OPEN #FILE0,FM0,RSZ%:INPUT #FM0,0:FSZ%,FRE%,FEXT%:CLOSE
  6980 REM
  6990 RETURN
  6997 REM
  6998 REM   ### Front Page Etc. ###
  6999 REM   ========================
  7000 TCOL 6,15:CLS 32
  7010 A0=MUL0("O",22):B0="O"+MUL0(" ",20)+"O"
  7020 PRINT@4,3;A0:FOR X=0 TO 5:PRINT@4,6+X;B0:NEXT:PRINT@4,12;A0
  7030 TCOL4:PRINT@6,7;"EINSTEIN  DATABASE":TCOL6:PRINT@6,8;"!!!!!!!!!!!!!!!!!!"
  7040 TCOL1:PRINT@8,18;"(c) N.G.Cooper"
  7050 TCOL 3:PRINT@1,19;"Press  'I'  for Introduction";TAB(34);"22222 'Any' to
RUN"
  7060 TCOL6:PRINT@7,21;"'ESC' to Quit Program";
  7070 K=INCH:TCOL 15,0:CLS 40
  7080 IF K<>73 AND K<>105 AND K<>27 THEN 7130
  7090 IF K=27 THEN FIN=1:GOTO 7130
  7100 TCOL ,15:CLS
  7110 TCOL4:PRINT@11,1;"EINSTEIN  DATABASE":TCOL6:PRINT@11,2;"""""""""""""""""
+"
  7115 TCOL4:RESTORE 7140:FOR X=1 TO 6:READ A0:PRINTA0:NEXT
  7120 TCOL 1:PRINT:PRINT"Press ANY Key )";:K=INCH:TCOL15,0
  7130 RETURN
  7140 DATA "This Program is a simple general purpose Database.  Each  record  i
s  indexed    against any specified Field
  7150 DATA "Indexes,  Field Names,  Field Sizes and  the Heading are  all  defi
ned  by  the  user."
  7160 DATA "All prompts are  self-explanatory  and   in most cases the (ESC) ke
y has  been   programmed  to  allow  exit"
  7170 DATA " from  any  routine."
  7180 DATA "Numeric data is held and  sorted  alpha- betically; so any numeric
data should"
  7190 DATA " contain leading-zeroes  to  achieve  a  true numeric order.
  9000 DATA "Quit Program   ","Add a Record   ","Delete a Record","Edit a Record
","Output Records ","Change File    "
  9010 DATA " INSERT "," DELETE "," EDIT  "," OUTPUT "," CHANGE "
  9020 DATA "0. or (ESC). QUIT Output Mode "
  9030 DATA "1. SCREEN    Selected         "
  9040 DATA "2. SCREEN    Browse           "
  9050 DATA "3. YOUR CHOICE "
  9060 DATA "4. YOUR CHOICE "
  9070 DATA "5. PRINTER   Single Records   "
  9080 DATA "6. PRINTER   Selected Records "
  9090 DATA "7. PRINTER   All Records      "
  9097 REM
  9098 REM   ### Error Handler ###
  9099 REM   ========================
  9900 IF ERL=820 THEN GOSUB 900: RETURN
  9999 TCOL 15,0: PRINT@0;ERR$;" @ ";ERL:END
  9999 STOP
```

Spectrum Program Printing Utility

by GM Gittings

The second issue of Interface 1 provides a POKEable address to set up the number of characters printed before a line feed and carriage return, and this program easily makes use of this. It opens the relevant printer channels and allows specification of character fonts; the program to list is then specified with the location from where it is to be loaded. Listing to stream (#) 5 dumps the listing to the printer.

The program works with all Epson-compatible printers, but can work with others if the control sequence is changed. It should be noted that the program will not work with proprietary printer units such as the Kempston printer interface.

```
    3 REM Prevents flashing
      border and sets caps lock.
    4 CLS : POKE 23750,7: POKE 23
658,8
    5 LET baud=19200: REM Change
    the value of baud to suit the
    baud rate of your printer
   10 CLEAR #: PRINT AT 0,4;"PROG
RAM LISTING UTILITY";AT 1,6;"(Ep
son Compatible)";AT 3,4;"(c) B.M
. Gittings 1985"
   15 PRINT AT 5,0;"------------
```

PROGRAM FILE

```
  ----------";'; FLASH 1;
"**PUT YOUR PRINTER ON-LINE NOW*
*";'; FLASH 0;"----------
----------"
  20 FOR z=1 TO 3: BEEP .3,15: B
EEP .3,0: NEXT z: PAUSE 200
  25 PRINT AT 5,0;"
                          PRES
S A KEY              PRINTER BLEE
PS IF IT IS SET OK "
  30 PAUSE 0
  34 REM Open printer channels
  35 FORMAT "b";baud
  40 FORMAT "t";baud
  45 OPEN #4;"b"
  50 OPEN #5;"t"
  54 REM Send 4 Bell Characters
  55 PRINT #4;CHR$ 7: PRINT #4;C
HR$ 7: PRINT #4;CHR$ 7: PRINT #4
;CHR$ 7
  59 REM Set American Char Set
  60 PRINT #4;CHR$ 27;CHR$ 64;CH
R$ 27;CHR$ 82;CHR$ 0
  61 LET A$="": LET B$="": LET C
$="": LET D$="": LET A=5
  62 PRINT AT A,0;"OPTIONS:";: G
O SUB 1000
  98 REM Set Character Font
  99 LET A=A+2
 100 PRINT AT A,0;"Enter charact
er style: ";: INPUT "Standard, E
lite, Enlarged or    Condensed
";a$: PRINT a$;: GO SUB 1000
 105 IF LEN A$<2 THEN PRINT AT A
+2,0;"Ambiguous Reply": GO TO 10
0
 110 LET B$=A$( TO 2)
 120 IF B$="ST" THEN GO TO 200
 130 IF B$="EL" THEN PRINT #4;CH
R$ 27;CHR$ 77: GO TO 200
 140 IF B$="EN" THEN PRINT #4;CH
R$ 27;CHR$ 87;CHR$ 1: GO TO 200
 150 IF B$="CO" THEN PRINT #4;CH
R$ 27;CHR$ 33;CHR$ 4: PRINT #4;C
HR$ 27;CHR$ 65;CHR$ 10: GO TO 20
0
 160 BEEP .5,-10: PRINT AT A+2,0
;A$;" is not an option": GO TO 1
00
 199 REM Set Emphasised Print
 200 LET A=A+2
 202 PRINT AT A,0;"Emphasised pr
```

PROGRAM FILE

```
int?      ";: INPUT "Yes or No
 ";A$: PRINT A$;: GO SUB 1000
 205 IF LEN A$<1 THEN GO TO 202
 210 IF A$(1)="Y" THEN PRINT #4;
CHR$ 27;CHR$ 69: GO TO 300
 220 IF A$(1)="N" THEN GO TO 300
 230 BEEP .5,-10: PRINT AT A+2,0
;A$;" is not an option": GO TO 2
02
 299 REM Set no. of chars per
     line
 300 LET A=A+2
 302 PRINT AT A,0;"Enter Charact
ers per line: ";: INPUT "10 to 8
0 (32 is normal)  ";A$: PRINT A$
;: GO SUB 1000
 305 IF LEN A$<1 THEN GO TO 302
 320 IF A$<"10" OR A$>"80" THEN
BEEP .5,-10: PRINT AT A+2,0;"Val
ue outwith limits": GO TO 302
 330 IF B$="EN" AND A$>"40" THEN
 BEEP .5,-10: PRINT AT A+2,0;"To
o long for enlarged text": GO TO
 302
 335 LET B=INT (VAL A$)
 339 REM Poke in Page width
 340 POKE 23729,B: PRINT #4;CHR$
 27;CHR$ 81;CHR$ B
 399 REM Inquire from where the
     program should be loaded
 400 LET A=A+2
 402 PRINT AT A,0;"Load file fro
m:       ";: INPUT "Drive or Tap
e?  ";A$: PRINT A$;: GO SUB 1000
 410 IF a$<>"DRIVE" AND A$<>"TAP
E" THEN BEEP .5,-10: PRINT AT A+
2,0;a$;" is not an option.": GO
TO 402
 499 REM Inquire filename
 500 LET A=A+2
 502 POKE 23658,0: PRINT AT A,0;
"File for listing:      ";: INPUT
 "Enter name  ";b$: PRINT b$;: G
O SUB 1000: POKE 23658,8
 510 IF LEN b$>10 THEN BEEP .5,1
0: PRINT AT A+2,0;"Name too long
": GO TO 502
 520 IF B$="" THEN BEEP .5,10: P
RINT AT A+2,0;"Must give a file-
name": GO TO 502
 530 IF A$="TAPE" THEN GO TO 570
```

PROGRAM FILE

```
 549 REM If loading from Mdv
     inquire which drive
 550 LET A=A+2
 551 PRINT AT A,0;"Drive Number:
     ";: INPUT "Enter number
 (1 or 2)  ";d$: PRINT d$;: GO S
UB 1000
 559 REM Put your own values
     here if you don't have two
     drives
 560 IF d$<"1" OR d$>"2" THEN BE
EP .5,-10: PRINT AT A+2,0;"Drive
 number ";d$;" unavailable": GO
TO 551
 565 LET d=INT (VAL d$)
 569 REM If all options are
     correct continue, otherwise
     loop back to beginning
 570 PRINT AT 20,0;"  ARE ALL TH
E VALUES CORRECT ?": INPUT "
    Yes or No ";C$
 580 IF C$(1)="N" THEN BEEP .5,-
10: LET A=5: GO SUB 1000: GO TO
60
 581 REM IF C$(1)="N" THEN BEEP
.5,-10: FOR E=1 TO 13: PRINT AT
E+6,0;"
       ";: NEXT E: GO TO 60
 589 REM Put closing message on
     screen
 600 CLS : PRINT AT 5,1;"LOADING
 ";B$;" FROM ";A$;" ";
 602 IF A$="DRIVE" THEN PRINT d
 605 PRINT AT 10,3;"LIST#5 LISTS
 TO PRINTER";AT 11,3;"==========
==========="
 607 PRINT #5;"PROGRAM PRINTING
UTILITY": PRINT #5;"(c) B.M.Gitt
ings": PRINT #5;';"Listing of ";
B$;'''':
 609 REM Load file for printing
 610 IF A$="DRIVE" THEN LOAD *"M
";d;B$
 620 IF A$="TAPE" THEN LOAD B$
 630 STOP : STOP : STOP : STOP
 999 REM *** Clear from current
       line to bottom of screen.
1000 PRINT "                    "
1010 FOR X=A+1 TO 21
1020 PRINT AT X,0;"
                    "
```

PROGRAM FILE

```
1030 NEXT X
1040 RETURN
7999 REM Reverse Paper Feed
8050 CLS : PRINT AT 10,0;"PRESS
SPACE BAR TO REVERSE FEED";'';"
  BREAK STOPS THE PROGRAM"
8060 PAUSE 0
8100 PRINT #4;CHR$ 27;CHR$ 106;C
HR$ 15
8150 GO TO 8060
8996 REM Save prog on microdrive
8997 ERASE "m";1;"print_util"
8998 SAVE *"m";1;"print_util" LI
NE 4
8999 VERIFY *"m";1;"print_util"
```

Spectrum Variable Lister

by Kurt Carroll

This machine code routine for the 48k Spectrum allows you to list the variables that have been set up in memory, and their values. It is only for use with Basic programs.

Type in the Basic program and save and verify the program, plus the code it generates. Type NEW and CLEAR 64999, which must always be typed before loading in the machine code, and load in the machine code that you have saved.

The routine can now be used at any time by typing RANDOMIZE USR 65000. If it works incorrectly, reload the Basic program and check that all the data statements are correct. Remember that no variables will be listed unless a program line that uses some has been executed.

The list of variables can be directed to the ZX printer by typing POKE 65001,3, and returned to normal by typing 65001,2. When a number or character array is listed, the contents of the array are not listed, but the number of bytes reserved for the array and the number of dimensions are printed. When the control variable for a For/Next loop is listed (the current value of the loop variable), the value that the loop is counting up/down to and the step value are given.

The routine is 245 bytes long and occupies memory from 65000 to 65244; it is not relocatable.

```
10 BORDER 0: PAPER 0: INK 7: CLS
20 CLEAR 64999: LET A=65000
30 READ N
40 IF N=999 THEN  GO TO 70
50 POKE A,N: LET A=A+1
60 GO TO 30
70 PRINT AT 0,10;"SAVE BASIC": SAVE "VARLIST"
80 PRINT AT 0,10;"SAVE MACHINE CODE": SAVE "VARLIST" CODE 65000,245
90 STOP
100 DATA 62,2,205,1,22,42,75,92,62,13
110 DATA 215,126,254,128,200,230,224,95,62,224
120 DATA 187,40,22,62,192,187,40,45,62,160
130 DATA 187,40,49,62,128,187,40,69,62,96
140 DATA 187,40,70,24,79,126,214,128,215,62
150 DATA 61,215,35,205,196,254,62,204,215,205
160 DATA 196,254,62,205,215,205,196,254,35,35
170 DATA 35,24,191,126,230,160,215,62,36,215
180 DATA 24,78,126,230,192,215,35,126,203,127
190 DATA 32,3,215,24,247,230,127,215,62,61
200 DATA 215,35,205,196,254,24,157,126,230,224
210 DATA 215,24,47,126,215,35,62,61,215,205
220 DATA 196,254,24,140,126,230,32,215,62,36
230 DATA 215,62,61,215,35,70,35,70,35,120
240 DATA 177,202,240,253,197,229,126,215,35,11
250 DATA 120,177,32,248,225,193,9,195,240,253
260 DATA 17,215,254,175,205,10,12,35,229,229
270 DATA 221,225,221,110,0,221,102,1,229,221
280 DATA 94,2,22,0,28,28,167,237,82,229
290 DATA 193,205,189,254,62,233,215,221,78,2
300 DATA 6,0,205,189,254,209,225,35,35,25
310 DATA 195,240,253,205,43,45,205,227,45,201
320 DATA 126,35,94,35,86,35,78,35,70,35
330 DATA 229,205,182,42,205,227,45,225,201,128
340 DATA 32,69,76,69,189,999
```

PROGRAM FILE

QL Mailmerge

by Matthew Cockerill

This simple mailmerge program takes data from Archive and incorporates it into Quill text files. To use the program, create a document in Quill in the normal way, but when you want to include a field from Archive, mark it by typing in the field name enclosed in hash marks (#). Then, instead of saving the document, print it to a microdrive file.

Export a file from Archive containing all the fields to be used in the document and, finally, run the mailmerge program. It will print out a series of documents, each using data from a different record from the Archive file. Remember that the length of the field will affect justification; also remember that the program uses export and print files, not database or document files.

```
100 REMark ***********************mail_merge*********************************
110 CLS
120 OPEN #6,ser1
130 INPUT "Name of QUILL print file ?";qf$
140 IF qf$(1 TO 3)<>"mdv" THEN qf$="mdv1_"&qf$
150 INPUT "Name of ARCHIVE export file ?";af$
160 IF af$(1 TO 3)<>"mdv" THEN af$="mdv1_"&af$
170 PRINT "Loading text file"
180 z$="":REMark will hold the text of the document
190 fnum=1
200 OPEN_IN #5,qf$
210 INPUT #5,dud$:REMark header inf not needed
220 REMark rather inefficient method is used due to ROM bug
230 REPeat input_data
240   z$=z$&INKEY$(#5)
250   IF EOF(#5) THEN EXIT input_data
260 END REPeat input_data
270 CLOSE #5
280 PRINT "Merging data"
290 DIM field$(40,20):REMark enough for most purposes
300 OPEN_IN #5,af$
310 REPeat input_keys
320   field$(fnum)=fileinput$
330   fnum=fnum+1
340   IF last THEN EXIT input_keys
350 END REPeat input_keys
360 fnum=fnum-1:REMark last one isn't a field
370 REMark make search keys
380 DIM key$(fnum,20)
390 FOR key = 1 TO fnum
400   key$(key)="#"&field$(key)&"#"
410 END FOR key
420 REMark find the keys
430 REPeat all_records
440   print$=z$
450   FOR search= 1 TO fnum
460     text$=fileinput$
470     REPeat check
480       pos=key$(search) INSTR print$
490       IF pos=0 THEN EXIT check
500       print$=print$(1 TO pos-1)&text$&print$((pos+LEN(key$(search))) TO)
510     END REPeat check
520   NEXT search
530   PRINT #6,print$
540   IF EOF(#5) THEN EXIT all_records
550 END REPeat all_records
1000 REMark
1010 REMark ********FUNCTION RETURNING ONE ENTRY FROM ARCHIVE FILE********
1020 REMark
1030 DEFine FuNction fileinput$
1040 REMark 2 lines to ignore the quotation marks ARCHIVE sends with strings
1050 q$=INKEY$(#5)
1060 IF q$=CHR$(26) THEN STOP
1070 IF q$='"' THEN q$="":numeric=0:ELSE numeric=1
1080 REPeat inp
1090   z$=INKEY$(#5)
1100   IF z$='"' OR numeric AND z$="," THEN
1110     IF INKEY$(#5)=CHR$(10) THEN last=1:RETurn q$:ELSE last=0:RETurn q$
1120     END IF
1130   END IF
1140   q$=q$&z$
1150 END REPeat inp
1160 RETurn q$
1170 END DEFine
```

Atari 520ST Graphics

by Douglas Harvey & Paul Lake

Atari Personal Basic on the 520ST makes extensive use of windows, and can display high-resolution graphics pictures created elsewhere. If interaction is required a window is drawn, spoiling the picture. A set of graphics routines (VDI) similar to GSX graphics can be called from Basic; these can access the whole of the screen, including windows. This program makes use of the VDI input/output

facilities, and INP(2) is the input statement to receive a character from the keyboard. After initialisation, VDISYS(1) is utilised to transfer the characters to the required screen position without drawing a window box.

After the VDI POKEs in lines 1000-1040 have been initialised, the character size may be changed. The additional subroutine to provide the variable character is:

```
2000 POKE contrl,12:POKE contrl+2,1:POKE ptsin,0
20005 POKE ptsin+2,variable
2010 VDISYS(1):RETURN
```

The default variable value is 13 and should be entered through VDI before finishing, otherwise editing may be affected. For smaller characters, the variable may be set to four or six; for larger characters, to 25 or something similar.

```
10   REM obtain a string variable not exceeding ten chars.
20   xpos=528:ypos=280:GOSUB 1090:GOSUB 1000
30   a$="":FOR x=1 TO i:IF a(x)=95 THEN a(x)=32
40   a$=a$+chr$(a(x)):NEXT x:END
1000 FOR i=1 TO 10
1010 a(i)=INP(2):IF a(i)=32 THEN a(i)=95:REM trap space
1020 IF a(i)=8 OR a(i)=127 OR a(i)=203 THEN i=i-2:
     GOSUB 1160:i=i+1:a(i)=32
1030 IF i<1 THEN i=1
1040 IF a(i)=13 THEN 1080
1060 IF a(i)<46 OR a(i)>123 THEN 1010 ELSE GOSUB 1150
1070 NEXT i:i=10
1080 RETURN
1090 REM  initialisation
1100 COLOR 1,1,1,1,1
1110 POKE contrl,8 : REM required for character display
1120 POKE contrl+2,1:REM required for character display
1130 POKE contrl+6,11:REM 11 character positions required
1140 POKE ptsin,xpos:POKE ptsin+2,ypos:RETURN
1150 REM  vdi output character routine
1160 FOR  x=1 TO i  :POKE intin+2*x,a(x):NEXT x
1170 FOR x=i+1 TO 11:POKE intin+2*x,32:NEXT x
1180 VDISYS(1):RETURN
```

Epson HX-20 HX-Buff

by PJ Milewski

This short program is designed to allow the HX-20 with 16k expansion to be used as a 27k printer buffer for another computer. The RS232 parameters for the host computer (X$) and printer (Y$) are given in line 40.

When the program has been saved, it can be run. The machine code section will load in and the loader section will delete itself; type in CLEAR 300,n where n is the size of RAM you want to use. (It is safer to select approximately 27000 rather than the maximum.)

To use the program, connect the distant computer and Run. Press PF2 to clear the RAM file. Make sure that the ready signal is on the LCD before anything is sent from the host computer, then use the host computer as if it were connected to a serial printer that is switched on. As soon as the HX-20 receives any input, a telephone sign will appear on the LCD. If the RAM file fills up, an XOFF signal will be transmitted and you will be given the option of printing, clearing or finishing. To print, connect the HX-20 to a printer, run the program again and press PF1.

Other functions are: PF4 to set up function keys to load other programs through the RS232 port; and PF5 to end the program.

```
10 '*******
20 'HX-BUFF
30 '*******
40 WIDTH20,12:CLEAR600:X$="(68N1F)":Y$="(68N13)":GOTO220
50 '***SUBS***
60 'Loadm if nec.
70 IFPEEK(26J3)=128 AND PEEK(26J4)=0 THEN RETURN
80 SOUND10,5:GOTO570
90 'Open$
100 OPEN"1",1,"COM0:"+X$:OPEN"0",2,"COM0:"+X$:RETURN
110 'Ramfile size trap
120 PRINT"  *RAMfile FULL!*":SOUND10,5
130 PRINT"  Any key to cont":B=INPUT$(1)
140 PRINT"1-Print 2-End":PRINT"3-Clear";:Z=VAL(INPUT$(1))
150 IFZ ANDZ<4 THENONZ GOTO350,490,420
160"GOTO140
170 'Keys
180 KEY1,"WIND":KEY2,"LIST":KEY3,"STAT"+CHR$(13):KEY5,"LOGIN"
```

PROGRAM FILE

```
190 KEY4,"STATALL"+CHR$(13):KEY6,"SCREEN":KEY7,"GOTO":RETURN
200 '*****************
210 'Initialize
220 FORI=1TO7:KEYI,"":NEXT:POKE&H16E,0
230 SCREEN0:CLS:WIDTH"COM0:",255:POKE361,0
240 DEFUSR4 =2628:DEFSTRA,B:DEFINTC-Z
250 GOSUB70:SCROLL9,0
260 ONERRORGOTO520
270 GOSUB100:CLS
280 PRINT"Ready..."
290 '*****************
300 'Chat
310 A="":POKE125,4:CHAR=USR4(CHAR):POKE125,0:J=PEEK(&H16E)
320 POKE&H16E,0:ONJ-240GOTO350,420,310,440,490,310,310,310,310,310,120
330 '*****************
340 'PF1 RAM transfer
350 CLS:PRINT"*TRANSMIT=> RS232*..";:CLOSE:OPEN"O",2,"COM0:"+Y$
360 IFCHAR<255 THENZ=CHAR ELSEZ=255
370 DEFFILZ,0:Y=CHAR;1=0
380 IFY<Z THENDEFFILY,Z*I:X=Z*1+Y:GET%0,A:PRINT#2,A;:GOTO400
390 GET%1,A:PRINT#2,A;:1=I+1:Y=Y-Z:GOTO380
400 PRINT"*"+STR$(X)+" BYTES SENT*":GOTO280
410 'PF2 Clear RAM
420 CLS:PRINT"Clear RAM:":INPUT"Are you sure";A:IFA$<>"Y"THENCLS:GOTO280
430 EXEC2797:PRINT"RAM Cleared":GOTO280
440 'PF4 Program load
450 KEY5,"LOGIN":KEY6,"CLOSE"+CHR$(13)+"MERGE"+CHR$(34)+"CON"
460 KEY7,"O:(68N1F)"+CHR$(34)+CHR$(13)
470 PRINT"PF6-7 for LOADing..":PRINT"NB LOGIN!":END
480 'PF5 Finish
490 CLS:PRINTCHAR;"Bytes in RAM":GOSUB180:END
500 '*****************
510 'Error routine
520 SOUND10,5:PRINT"Error"+STR$(ERR)+" in"+STR$(ERL)
530 PRINT#2,CHR$(19);:PRINT"Any key to cont":B=INPUT$(1)
540 CLS:RESUME58
550 '*****************
560 'Hexloader
570 TITLE"HX-BUFF":RESTORE680:READN$,A%,B%
580 PRINT"Program     ";N$;:IFPOS(0) THENPRINT
590 PRINT"Start ";HEX$(A%);" End ";HEX$(B%)
600 PRINT"=";B%-A%+1;"bytes of data"
610 IFPEEK(&H500)*256+PEEK(&H501)<=B%THENPRINT"MEMSET reset to";B%+1;:
MEMSETB%+1:RESTORE680:READN$,A%,B%
620 PRINT"Hex loading now..":D=CSRLIN
630 FORI=A%TO B%:READC:POKEI,C:NEXT 'Loading
640 SOUND20,3:LOCATE0,D-1:PRINT"Loading complete.";:DELETE570-
650 '******* *******
660 'DATA statements start here:
670 '*****************
680 DATABUFFHEX,2624,2810
690 DATA0,127,56,1,60,127,10,64,206,128,0,9,230,0,193,32,38,7,188,5
700 DATA162,43,2,32,242,8,140,128,0,42,5,255,10,65,32,3,126,10,230,254
710 DATA1,194,39,7,140,0,120,44,17,32,28,246,10,67,39,23,127,10,67,134
720 DATA17,189,255,118,32,13,246,10,67,46,8,124,10,67,134,19,189,255,118,189
730 DATA255,157,129,0,39,17,189,255,154,129,254,38,3,126,10,193,189,255,118,196
740 DATA3,38,249,189,255,121,196,1,38,185,254,10,65,167,0,8,140,128,0,42
750 DATA45,255,10,65,141,21,126,10,103,134,19,189,255,118,124,10,67,56,252,10
760 DATA65,179,5,162,237,2,57,246,10,64,39,1,57,124,10,64,95,189,255,73
770 DATA134,150,189,255,79,57,198,251,247,1,110,32,212,254,5,162,198,32,231,0
780 DATA8,140,128,0,43,248,57
```

Memotech Screendump

by Eric Roy

This short subroutine, starting at line 9000, will dump any size of graphic screen to any Epson or DMX-compatible printer. On entry to the subroutine, the variable VSN should contain the number of the screen you want to dump.

```
100 REM      MEMOTECH MTX MICROS
110 REM  Demo program and subroutine to
120 REM dump  any size  graphics screen
130 REM to Epson, DMX type printers.
140 REM  Full  size  screens dumped  to
150 REM centre of paper.
160 REM       by Eric Roy.  July 85
170 REM-------------------------------
180 REM  Demo VS Screens 4, 3 & 2
190 REM-------------------------------
200 CRVS 4,1,1,1,30,22,32
210 CRVS 3,1,2,6,12,10,32
220 CRVS 2,1,20,4,10,16,32
230 VS 4: COLOUR 2,6: CLS
240 PRINT "VS 4"
250 FOR R=10 TO 80 STEP 10
```

PROGRAM FILE

```
260 CIRCLE 120,90,R
270 NEXT R
280 VS 3: COLOUR 2,10: CLS
290 PRINT "VS 3"
300 COLOUR 3,1
310 ANGLE 0
320 FOR SQ=0 TO 10
330 PLOT 15+SQ*5,15+SQ*5
340 PHI 0
350 DRAW 20: PHI PI/2
360 DRAW 20: PHI PI/2
370 DRAW 20: PHI PI/2
380 DRAW 20
390 NEXT SQ
400 VS 2: COLOUR 2,3: CLS
410 PRINT "VS 2"
420 COLOUR 3,4
430 FOR R=0 TO 2*PI STEP 0.4
440 ANGLE R: PLOT 40,60
450 FOR S=0 TO 9
460 PHI PI/6: DRAW 10
470 NEXT S
480 NEXT R
490 REM------------------------------
500 REM  VSN = Screen number to dump
510 REM------------------------------
520 CLOCK "000000"
530 LET VSN=4: GOSUB 9040: LPRINT TIME$
540 CLOCK "000000"
550 LET VSN=3: GOSUB 9040: LPRINT TIME$
560 CLOCK "000000"
570 LET VSN=2: GOSUB 9040: LPRINT TIME$
580 STOP
9000 REM------------------------------
9010 REM  Subroutine to dump screen.
9020 REM  First calculate screen size.
9030 REM------------------------------
9040 LET VSI=65373+(VSN*15)+3
9050 LET VX=PEEK(VSI)
9060 LET VY=PEEK(VSI+1)
9070 LET VW=PEEK(VSI+2)
9080 LET VH=PEEK(VSI+3)
9090 LET VX=VX*8-1
9100 LET VW=VW*8-1
9110 IF VY=0 THEN  LET VY=191 ELSE  LET VY=VH*8-1
9120 REM------------------------------
9130 REM  Now calculate start position
9140 REM  of screen on paper. and total
9150 REM  number of bytes to send.
9160 REM------------------------------
9170 LET LM=INT((480-256)/2)+VX
9180 LET N1=MOD(LM+VW+2,256)
9190 LET N2=INT((LM+VW+2)/256)
9200 REM------------------------------
9210 REM  Draw line around screen.
9220 REM------------------------------
9230 VS VSN
9240 LINE 0,0,VW,0: LINE VW,0,VW,VY
9250 LINE VW,VY,0,VY: LINE 0,VY,0,0
9260 REM------------------------------
9270 REM  Set printer line feed to 8.
9280 REM------------------------------
9290 LPRINT CHR$(27)+"A"+CHR$(8)
9300 FOR GY=VY TO 6 STEP -8
9310 REM------------------------------
9320 REM  Send LM+VW+2 bytes of data.
9330 REM------------------------------
9340 LPRINT CHR$(27)+"K"+CHR$(N1)+CHR$(N2);
9350 FOR C=0 TO LM
9360 LPRINT CHR$(0);
9370 NEXT C
9380 FOR GX=0 TO VW
9390 LET GD$=GR$(GX,GY,8)
9400 LPRINT GD$;
9410 NEXT GX
```

PROGRAM FILE

```
9420 LPRINT
9430 NEXT GY
9440 LPRINT CHR$(27)+"@": REM  Reset printer
9450 RETURN
```

BBC Tabkeys

by Ross Hunter

This machine code utility allows any keys, when pressed with the Tab key, to act similarly to the function keys. It has been set up to enter several Basic keywords, using their initial letters together with the Tab key. X and Y will enter the integer variables X% and Y%, and the numbers 0 through 7 will enter the respective modes. The effect of pressing Tab and R at the same time would be the same as typing the whole keyword Repeat.

The strings associated with each word can easily be changed by altering the Data statements at the end of the program.

Tabkeys works with Basic II and *should* work with Basic I, but this has not been tested. Once typed in, Tabkeys should be saved before running in case of typing errors and so that the data statements can be altered to make different versions of the program.

The machine code and data may be stored in any free area of memory by altering lines 50 and 60. If these lines are not altered, then the machine code and data can be saved from two pages of memory by *SAVE TCODE 900 B00.

```
100REM Tkeys
110REM (C) Ross Hunter 1985
120REM BBC B
130:
140code=&900
150data=&A80
160osbyte=&FFF4
170evntv=&220
180temp=&71
190buffer=0
200second_key=&70
210first_key=&ED :REM  When two keys are pressed &ED contains the internal
220REM                 key number+128 of the first key pressed.
230tab_key=&80    :REM  &80 is the internal key number+128 of the TAB key.
240:
250FOR pass=0 TO 2 STEP 2
260P%=code
270[ OPT pass
280:
290\STORE THE ADDRESS OF start IN THE EVENT VECTOR
300LDA #start MOD 256
310STA evntv
320LDA #start DIV 256
330STA evntv+1
340:
350\STOP THE TAB KEY MOVING THE CURSOR FORWARD
360LDA #218
370LDX #0
380JSR osbyte
390:
400\ENABLE CHARACTER ENTERING INPUT BUFFER EVENT
410LDA #14
420LDX #2
430JSR osbyte
440:
450RTS
460:
470\SAVE REGISTERS
480.start
490PHP:PHA
500TXA:PHA
510TYA:PHA
520:
530\CHECK TO SEE IF THE TAB KEY IS PRESSED
540LDA first_key
550CMP #tab_key
560BNE fin
570:
580\THE Y REGISTER HOLDS THE ASCII VALUE OF THE LAST KEY PRESSED
590\STORE THE LOWER CASE VALUE OF THE LAST KEY PRESSED IN second_key
600TYA
610ORA #32
620STA second_key
630:
640\SEARCH THE DATA FOR A BACKSLASH SYMBOL FOLLOWED second key
650LDX #&FF
660.search
670INX
680.again
690CPX #&FF
700BEQ fin
710LDY data,X
720CPY #ASC"\"
730BNE search
740INX
750LDY data,X
760CPY second_key
770BNE again
780:
790\INSERT THE DATA INTO THE KEYBOARD BUFFER
800.print
810INX
820LDY data,X
830CPY #ASC"\"
840BEQ tab_fin
850STX temp
860LDX #0
870LDA #&8A
880JSR osbyte
890LDX temp
900BNE print
910:
920\RESTORE REGISTERS AND RETURN TO BASIC PRINTING THE SECOND KEY PRESSED
930.fin
940PLA:TAY
950PLA:TAX
960PLA:PLP
970RTS
980:
```

PROGRAM FILE

```
    900\RESTORE REGISTERS AND RETURN TO BASIC NOT PRINTING THE SECOND KEY PRESSED
    910.tab_fin
    920PLA:TAY
    930PLA:LDX @buffer
    940PLA:PLP
    950RTS
    960:
    970) NEXT pass
    980:
    990REM  Read the DATA as an ASCII character or ASCII value or a TOKEN.
    1000X%=0
    1010REPEAT
    1020READ B$
    1030byte=ASC(B$)
    1040IF VAL(B$)<>0 byte=VAL(B$)
    1050data%!X%=byte
    1060X%=X%+1
    1070UNTIL B$="END" OR X%=256
    1080IF B$="END" data%!X%-1!=0
    1090:
    1100CALL mcode
    1110END
    1120:
    1130REM  The total DATA must not exceed 256 bytes.
    1140REM  If the DATA is less than 256 bytes the last DATA statement must
    1150REM  read END.
    1160REM  The DATA that is to be inserted into the keyboard buffer must be
    1170REM  preceded by a backslash symbol and then the lower case ASCII
    1180REM  character or value of the key to identify it.
    1190REM  The DATA for each key should not exceed 21 bytes.
    1200DATA \,a,A,S,C
    1210DATA \,b,B,S,O,S,T
    1220DATA \,c,C,N,R,S,!
    1230DATA \,d,D,A,T,A
    1240DATA \,e,E,O,D,P,O,O,C
    1250DATA \,f,F,O,N
    1260DATA \,g,G,E,T,S
    1270DATA \,h,N,!,W,E,N
    1280DATA \,i,I,P,P,U,T
    1290DATA \,l,L,E,N
    1300DATA \,m,M,O,D,E
    1310DATA \,n,N,E,X,T
    1320DATA \,o,O,N
    1330DATA \,P,P,R,I,N,T
    1340DATA \,r,R,E,P,E,A,T
    1350DATA \,s,S,T,E,P
    1360DATA \,t,T,O
    1370DATA \,u,U,N,T,I,L
    1380DATA \,v,V,D,U
    1390DATA \,w,W,I,D,T,H
    1400DATA \,8,241,0,R,I,13
    1410DATA \,9,241,0,Y,I,13
    1420DATA \,40,22,0
    1430DATA \,49,22,1
    1440DATA \,50,22,2
    1450DATA \,51,22,3
    1460DATA \,52,22,4
    1470DATA \,53,22,5
    1480DATA \,54,22,6
    1490DATA \,55,22,7
    1500DATA \,127,21
    1510DATA END
```

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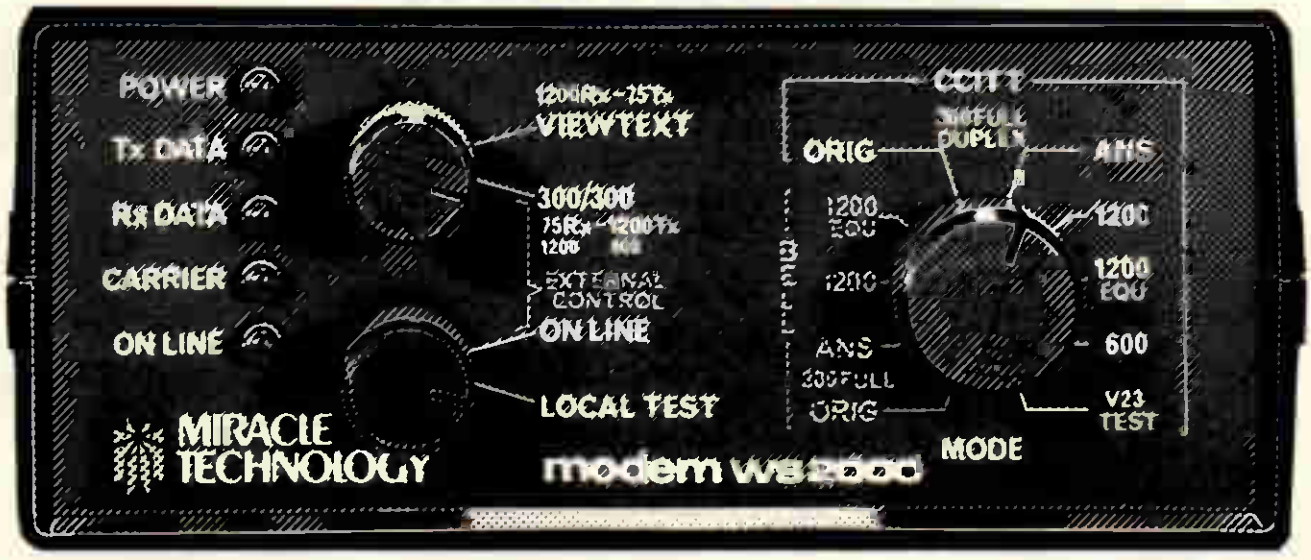

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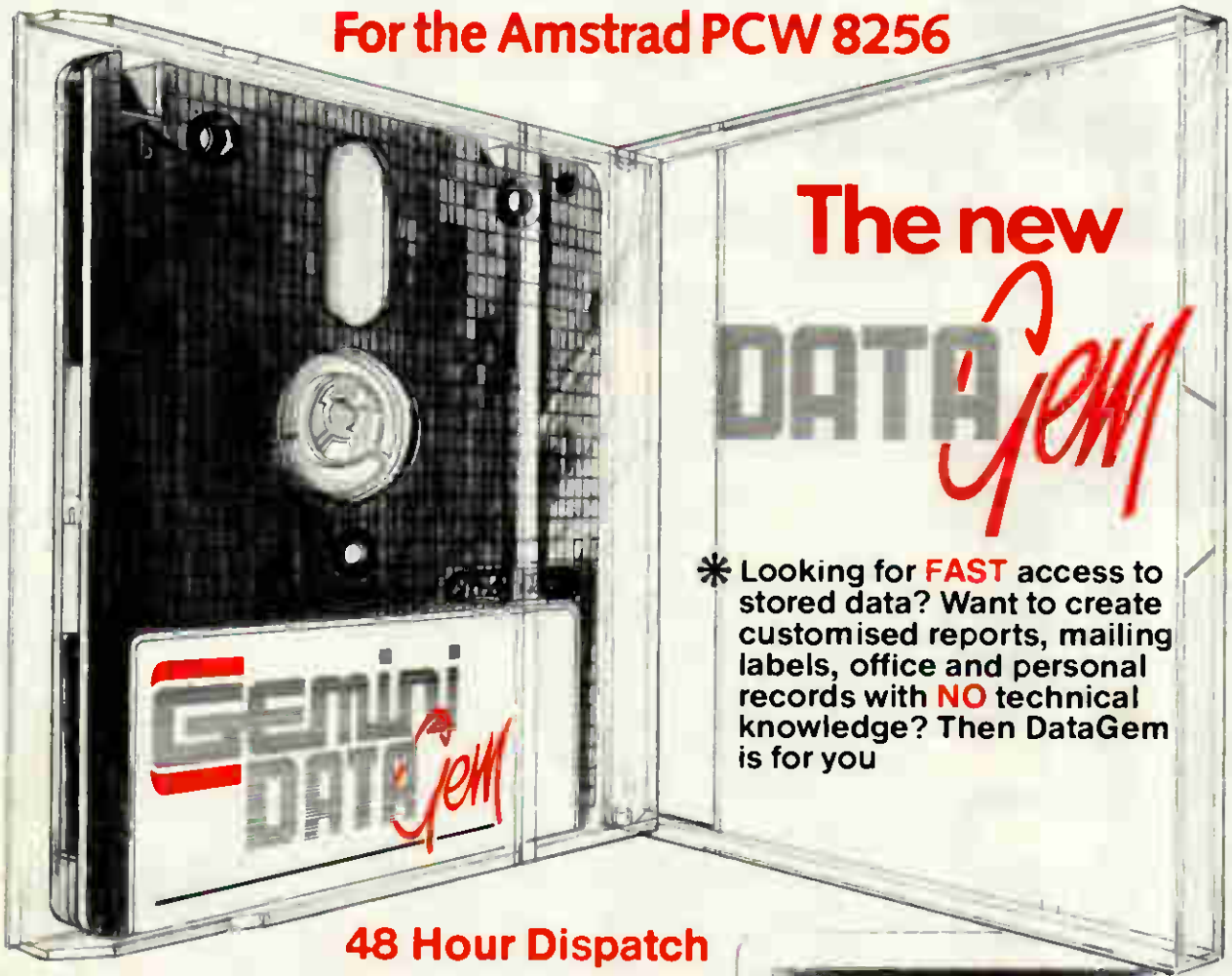

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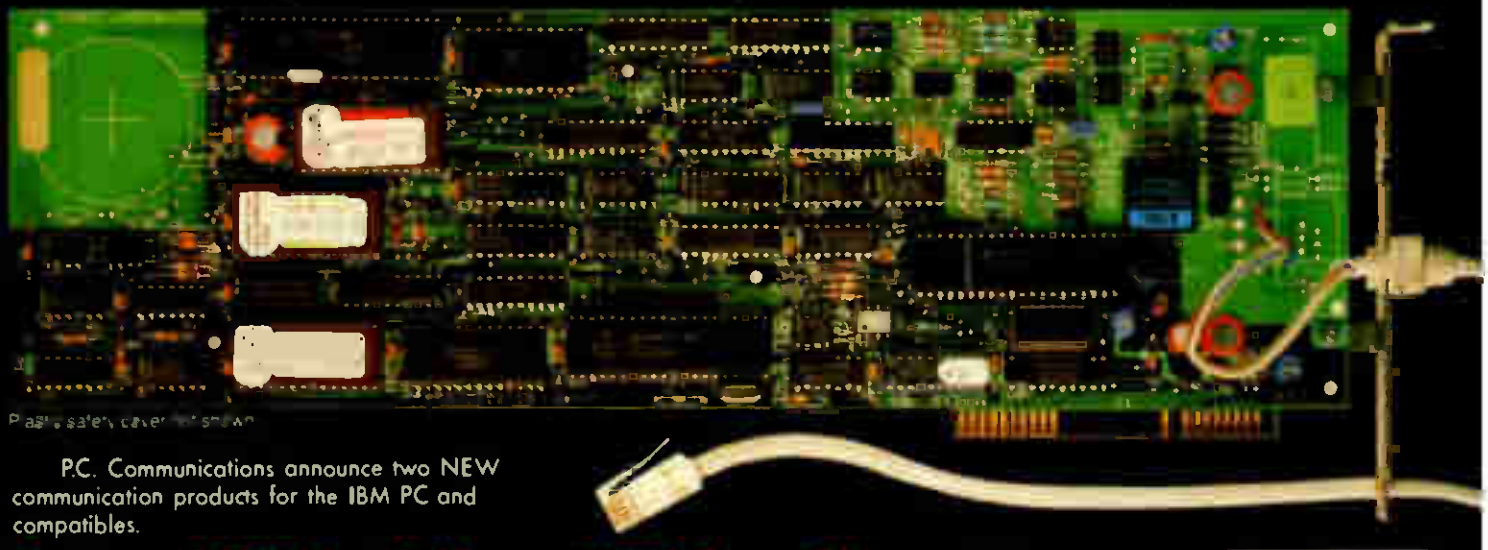

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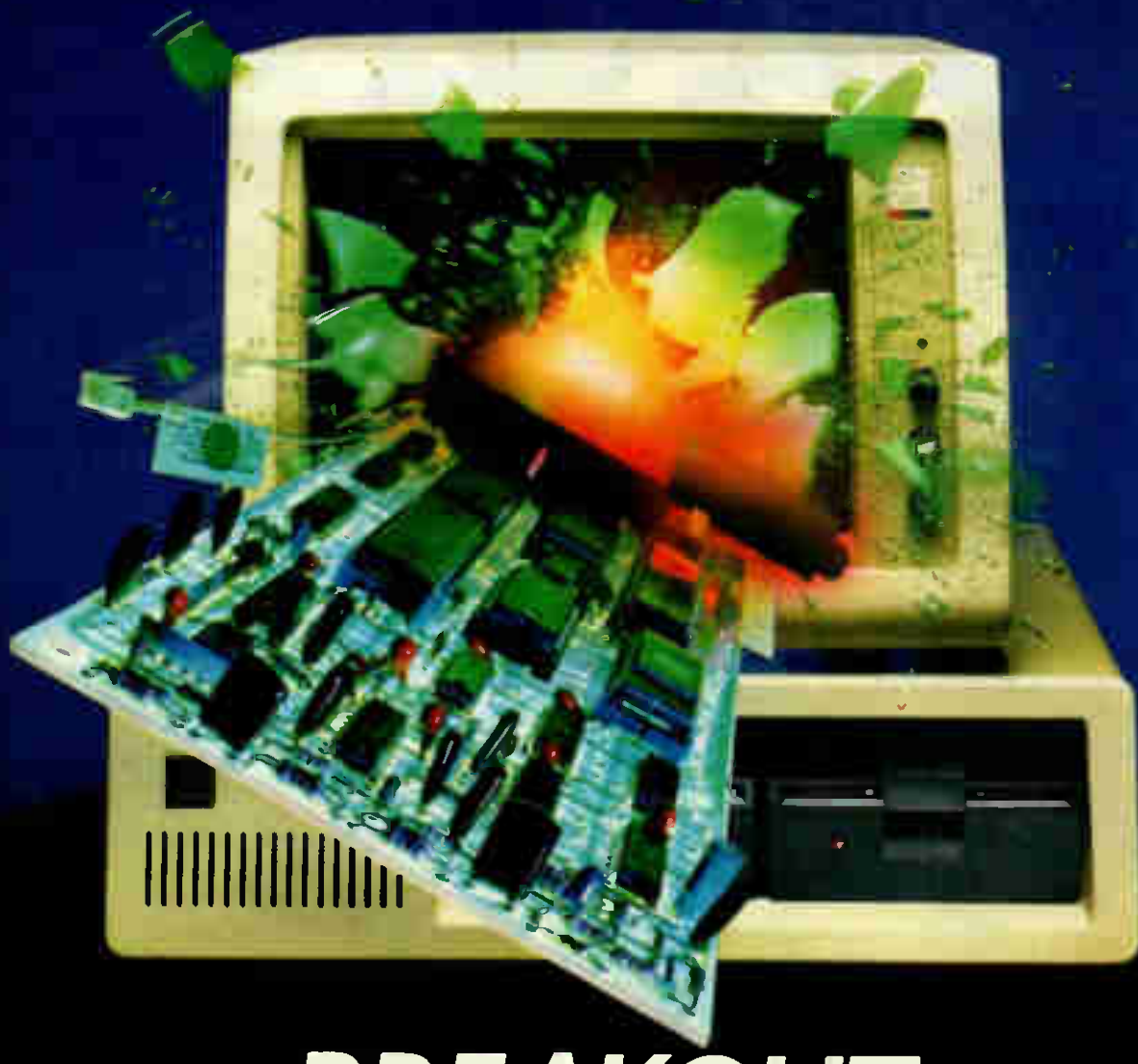

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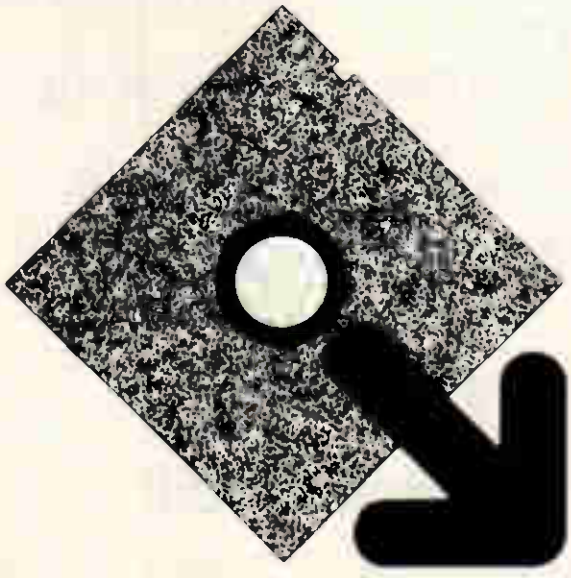

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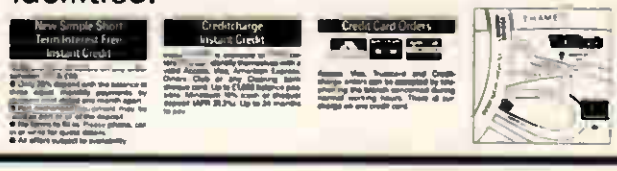

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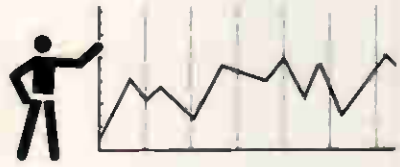

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The Gemini M-F-B 2 now comes with a 12 month free format update service.

The 8" drive shown may be omitted from the system.

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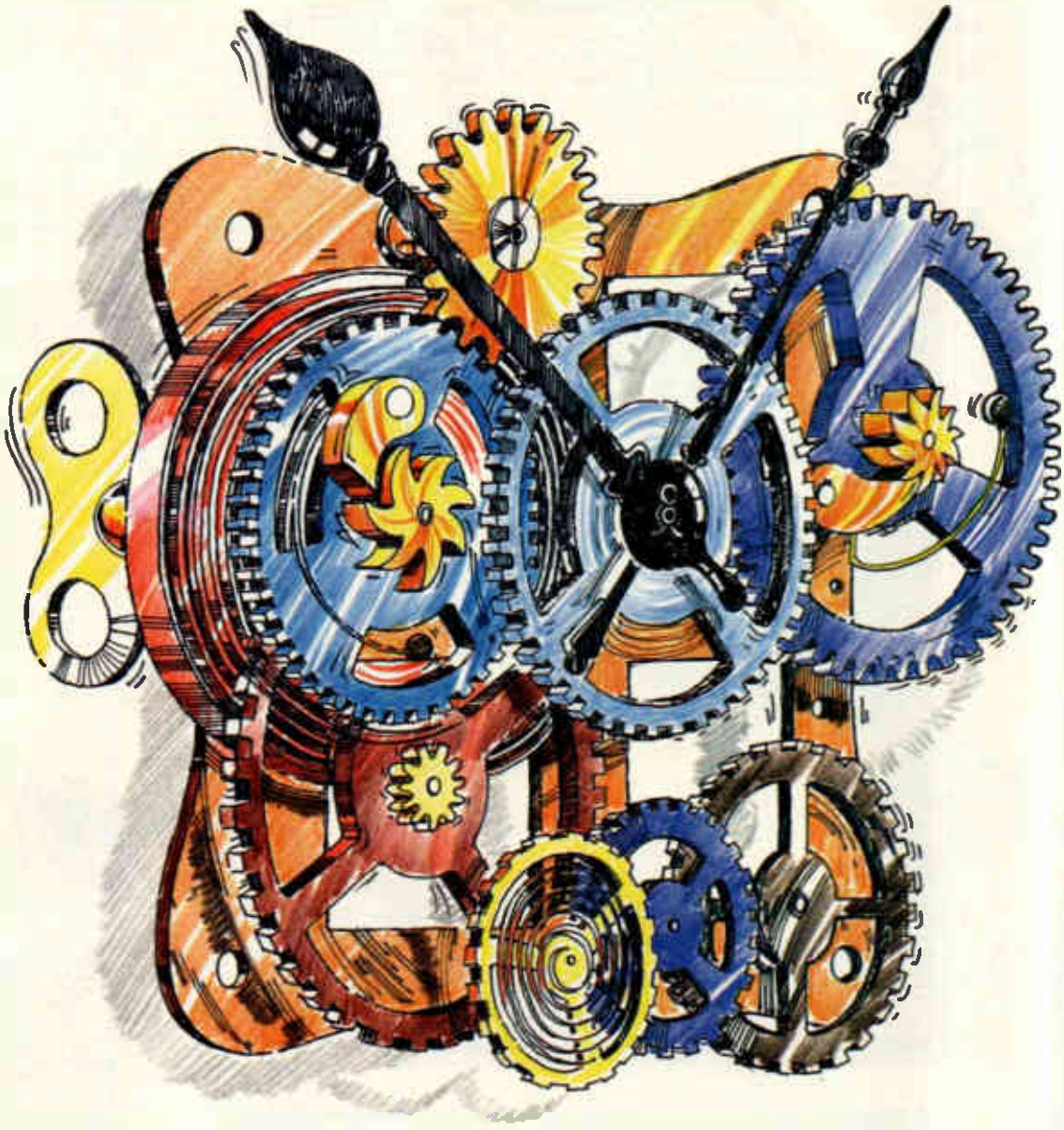

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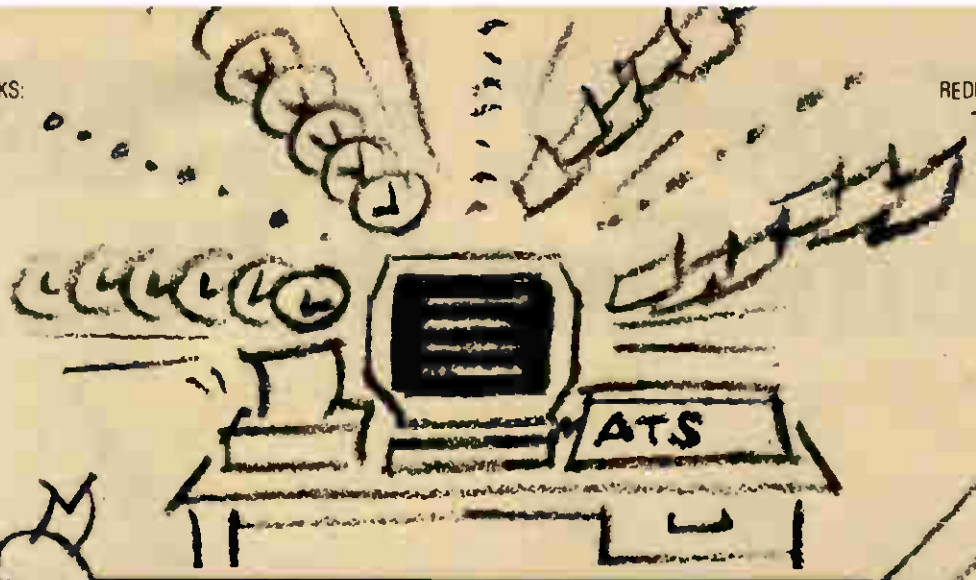

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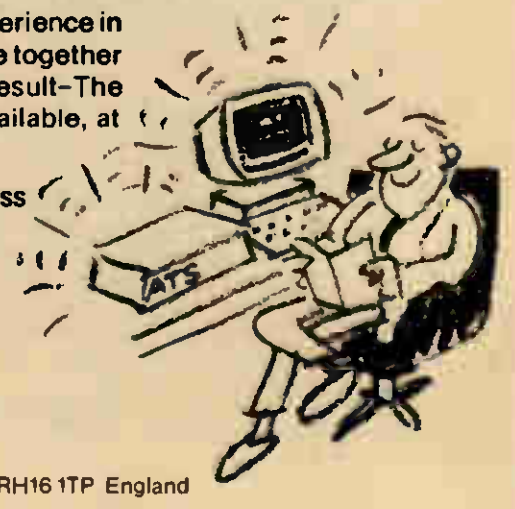

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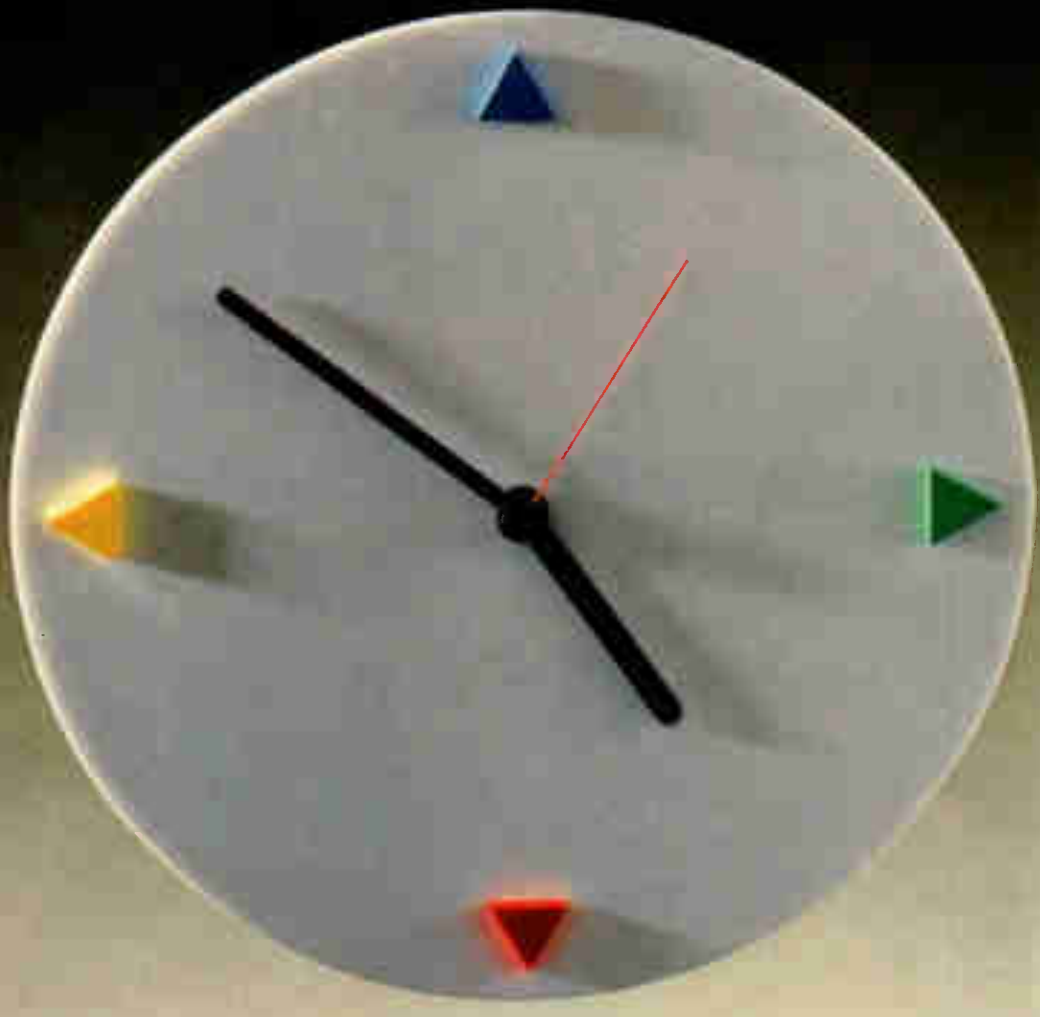

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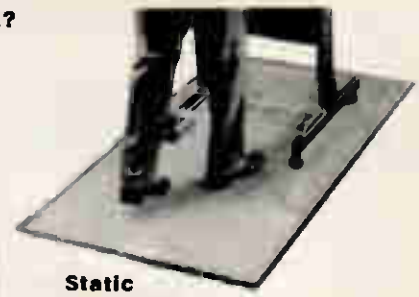

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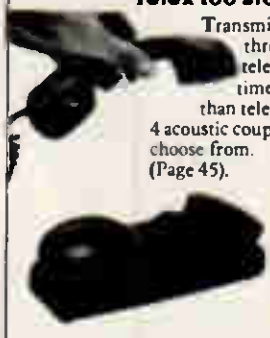

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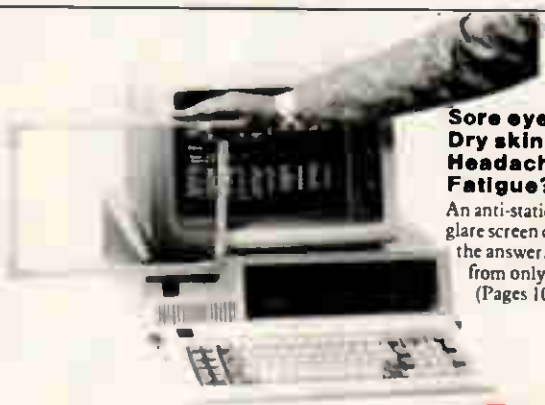

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Not all assemblers are supplied with a linker. Check before ordering.

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We stock many items for which there is no space in these advertisements.

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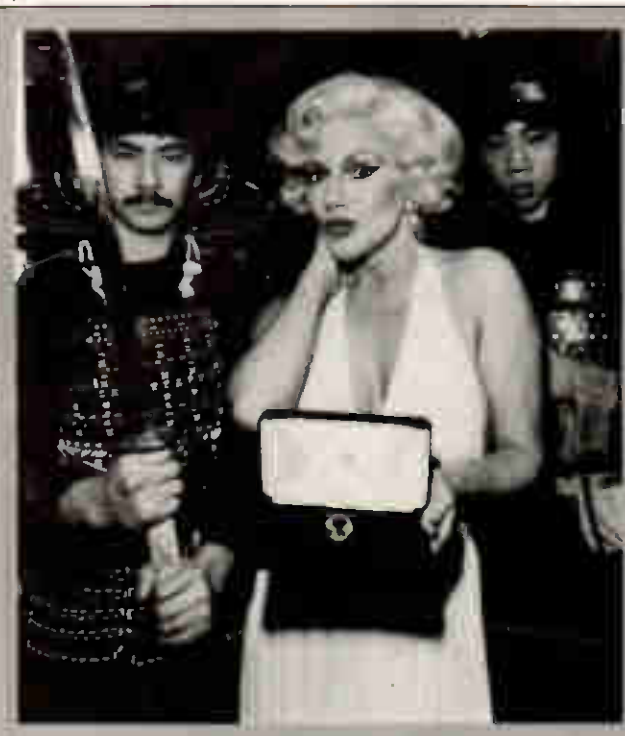

Shogun, it's been good to know you: *Mitsubishi, for reasons best known to itself, chose Marilyn Monroe not-really-lookalike Stephanie Lawrence to launch its Diamond range of floppy disks. Once you've accepted that, the rest follows logically. Diamond disks, so you have a big diamond worth millions, as big as the Ritz, geddit? Then you have Marilyn holding it, and then of course you need security men, so why not take a couple of oriental Group 4 men and dress them in ludicrous costumes with big swords . . .*

The workings of the Japanese mind remain, as they say, inscrutable.

Apres moi, le deluge: *the man minus the bowler hat has just joined the exodus from ACT to Tandon Computer, where former Sirius 1 and Victor supremo Chuck Peddle presides over UK chief and former ACT star Jamie Minotto.*

And this man is Chris Buckham, formerly a main board member at ACT and now a consultant to Tandon on recruiting IBM dealers to sell Tandon's cheapo-cheapo clones.

The woman in the bowler hat symbolising IBM is not Chris Buckham, and is not — are you listening, copyright-holder Bubbles Inc SA? — portraying the little tramp character at all, no, not a bit.

Still, the duel challenge must have come from IBM; Buckham obviously had choice of weapons. He could still get a good caning, though . . .

Memo from marketing

To: The hand-picked team

Re: The great and secret anniversary push

Well, strange as it may seem, we survived the Christmas rush — or perhaps spavined shuffle would be a better description — and following the grand vizier's examination of the entrails on the top floor, it turns out that celebration is in order.

(Except for the sales manager, of course, whose metaphorical entrails they were.)

It transpires that, having bent its brains to the problem of counting up to 60 without removing its collective shoes and socks, your board has calculated that our fifth anniversary occurs next month. And naturally enough, it has asked me to run some ideas up the flagpole and try to improve our chances of surviving the next five years — or five minutes, come to that.

Well, where have we been in the last five years? Back in 1981, we were selling clapped-out 8-bit computers at grotesquely-inflated prices. Now we are selling clapped out sort-of-16-bit computers at even-more-grossly-inflated prices (thanks to inflation). Plus ça change, plus c'est la same old rubbish, if you ask me.

But how to celebrate this great anniversary that I have 10 minutes' notice to promote? Simple. The motif is cables . . .

Think back and you will remember that five years ago, we were shipping wonderful systems with Z80 processors, 64k RAM, WordStar, and all that sort of stuff. We were also shipping printers like the Diablo 630 and 1640, which could be used for ballasting the QE2, and also vibrated themselves along the table and into the WPB unless watched carefully and sandbagged in. And NB: we did not supply a cable that connected them.

Those were the days. Caveat emptor, or caveat sucker as we used to call it. Give 'em the machine, give 'em the printer, and then refuse to take phone calls when they panicked about plugging one into another. And then, and then, sell 'em the cable they needed for £40 and make sure it didn't work properly!

It brings tears to my eyes, thinking of the bank balances we got out of putting right the things we'd done wrong. And we didn't even have to do them wrong on purpose; micro engineers, on the wages we paid in 1981, could be guaranteed to connect every wire in every cable to every other at random to find out if something worked.

But enough nostalgia — after all, even in 1986, we can get some YTS orang-utan for 3p a week for two years — and back to business.

Wouldn't it be nice to say: 'We give you all the connections you'll ever need' and then add: 'We also sell computers' in brackets? Along with photos of all the beautiful cables we produce at prices that would make Getty think twice, we've already proved that customers don't care what hardware they buy — they buy ours, after all — so our unique selling point must be the bits of wire. And don't mention software, for God's sake: we've still got half of the buyers convinced that we actually wrote WordStar and let them use it out of charity.

No, it's got to be something concrete, marginally useful and ruinously expensive, and cables qualify on every count. So does the chairman of course, but that's another story . . .

Please eat the last paragraph after reading, and think ribbons and PVC sheathing!

Yours entangledly,
Charles

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