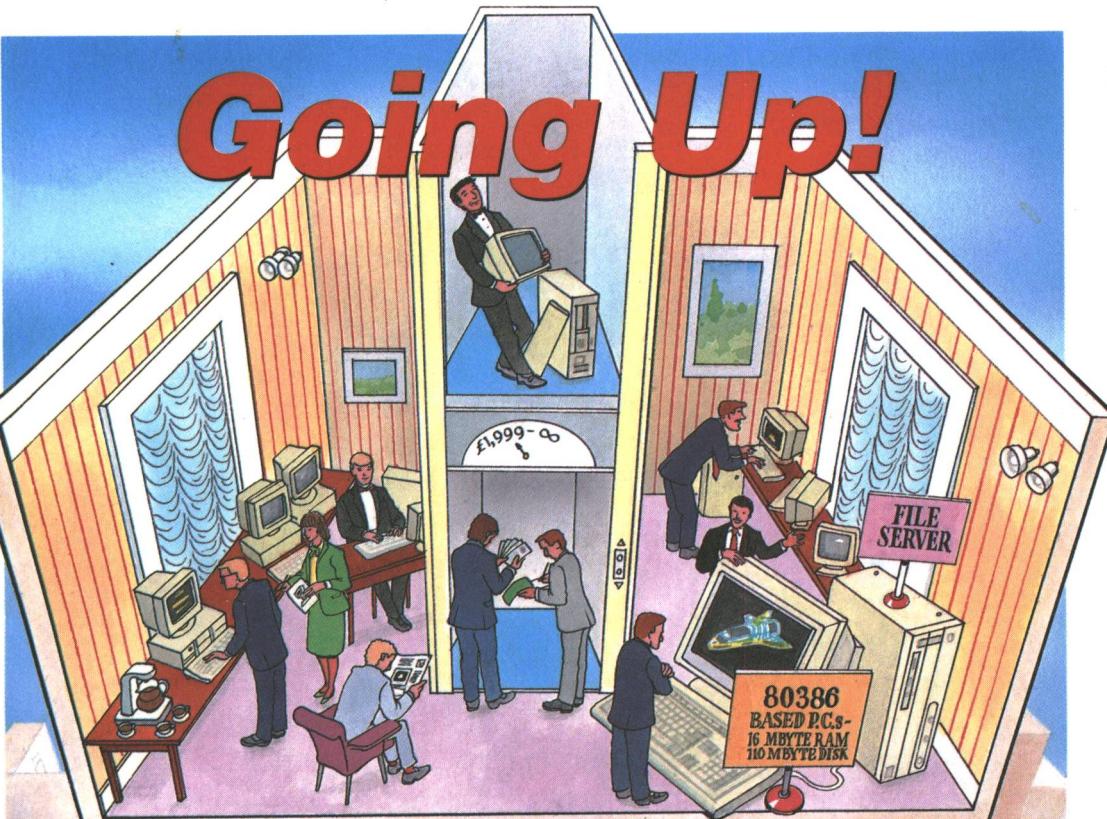
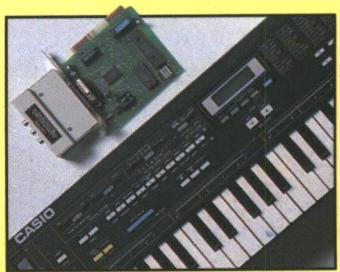


PC PLUS

Going Up!



Entering the world of 80286 and 80386-based PCs.



MUSIC MAKERS
PCs and instruments
talking via MIDI



GET ORGANISED!
Three time-management
programs compared

New Series - Learn C
programming with our
free *SuperDisk* compiler

Cumana's hard disk for
the Amstrad PPC

War in Middle Earth -
Tolkien meets the PC

Chi-Writer scientific
word processor

Borland's Turbo
Assembler

PLUS - Help Screens, Good
Software Guide, Factsheet
and your letters

Our grateful thanks for making MSDOS® so user-unfriendly.

We're featuring products in our 89 ads: phone or write for the complete Paperback 64 page catalogue: it's free!

If DOS wasn't so downright obtuse and tricky, we might not have needed to produce *TopDOS version 4...* and just think of all the terrific features that you might have missed.

Even the so-called 'user friendly' operating environments cannot solve most of the basic problems that PC users find themselves saddled with. Have you ever asked yourself ...

"I created it around a month ago, what did I call it... and where did I file it?"

Have you ever looked at the root directory of a hard disk to find that you (or someone else) has just cluttered it by copying a load of files there instead of the intended subdirectory? You have? Join the club.

TopDOS cannot do the impossible, but amongst its myriad of attributes, it will get you all the available information from the minimum of clues to help you pick your way out of the most seemingly impossible filing shambles.

Here's a few things that TopDOS offers the PC User: phone or ask for a leaflet describing the rest

Full command line editing: insert, delete, auto completion, command history. *TopDOS* provides users with a DOS command programming language to simplify operation.

Aliases: create custom resident commands by stringing DOS commands together.

Help: complete on-line help for the DOS user explains all DOS commands (plus the ones added by *TopDOS*) and allows you to modify and add to the list of commands described.

A memory resident plain text editor with complete key customisation.

A host of extensions to DOS: features like sorting directories by size, date, extension.

Important before & after date/time features that allow you to look for files created or altered on a given day at a given time. 43 line EGA option for tree and edit features.

Archiving facilities on plain DOS media: including replicating tree structures.

Real time operation across networks, and immediate display of tree/ directory.

Set file attributes, move files (copy/delete), archive, query on copy etc. *TopDOS* even allows you to change disks when the target disk fills up.

What reviewers have to say...

"As a program that offers to improve DOS, **TopDOS** is a marvel" - *InfoWorld*

"One way to make DOS better, if not the best, is a product called **TopDOS**. Its HISTORY command is worth the price of admission alone...."

- *Business Software*

"**TopDOS** is a well-designed, well-executed product. It comes with an excellent manual and quick reference card, augmented by on-line help" - *PC Tech Journal*

"I wouldn't be without **TopDOS** now: Excellent" - *Karl Dallas, PC User*

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Fax 0245 263969, Telex 995143
Paperback Software is available at Dixons,
Ryman, Comet, Wilding and good computer
stores everywhere

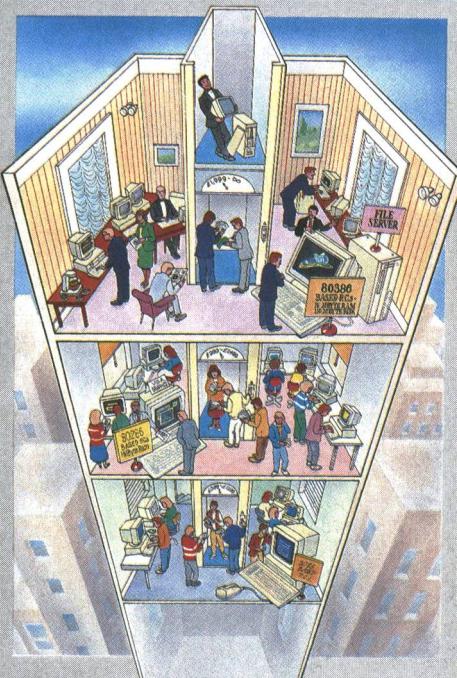


**Best of all,
TopDOS.4 costs just
£69.95 inc VAT.**

A small price to pay to solve most of the problems that you and DOS create for yourself.

MSDOS is a trademark of Microsoft, *bless 'em!*

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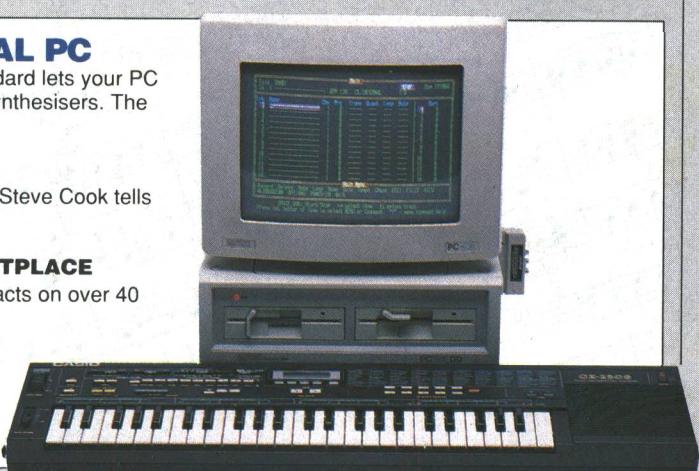
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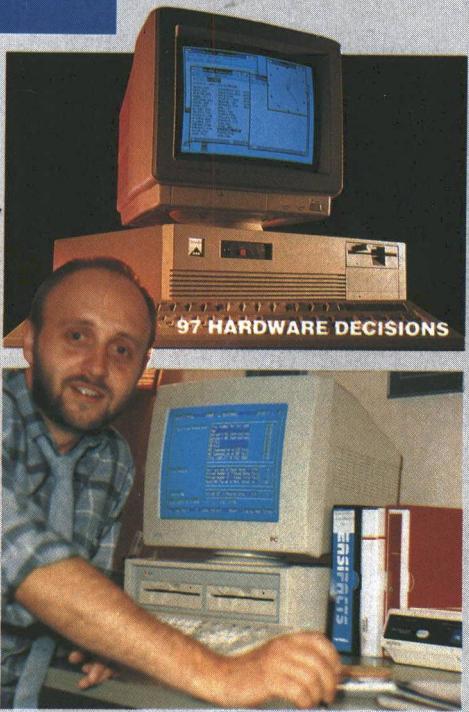


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PC PLUS

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ABC

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AUDIT OF
BUREAU OF
CIRCULATIONS
31,911
January-June 1989

THE NEW MAN

Yes, yet more people arrive at PC PLUS. This month it's Mike Hardaker, who joins us as staff writer. Mike's pedigree as a PC expert couldn't be better – his first job on leaving university was as a systems engineer with IBM, providing software support to end-users, dealers and sales people on the whole of the PC and PS/2 range.

Incidentally, the PC PLUS Ed reckons that systems engineers are the finest, most hard working people in the computer business, but this is not thought to be in any way connected with the fact he was once an SE himself, back in the dim distant days when programmers were programmers, and punched cards ruled!

OOPS!

A couple of boo-boos from last month. First, in Roman Iwaschkin's survey of Shareware and Public Domain word processors, we said that PC Write was available in the U.K. as shareware up to version 2.6. This is incorrect – Sage have exclusive U.K. marketing and distribution rights to all version from 2.5 onwards. Sorry about that!

Second, in our news item on Pink Software last month, we inadvertently quoted a public relations company's telephone number instead of Pink's. This turned out to be someone's private flat, lent to the PR man in question! Pink are really on 01-455 2117.

CHANGE OF NUMBER

We've had quite a few phone calls from readers trying to obtain the special Amstrad mouse driver, reviewed in June last year, which lets Microsoft Windows run on the PC1512 and PC1640. The problem was that the supplier, M & G Facilities of London, had changed their

TIME STANDS STILL

Eagle-eyed readers who have ripped this month's SuperDisk from its envelope and typed the magic word **PCPLUS** may notice something a bit strange – the opening screen says 'January 1989'. Rest assured, we're not trying to palm you off with old stock – this is the genuine March 89 disk, complete with *Mix C!*

The reason is simple, good old-fashioned error when making up the title screen display, but by the time it was noticed the disks had been duplicated, and since re-duplicating 50,000 disks costs extremely large amounts of money, we hoped you wouldn't mind if we left it as it is!

HAMBONE by Mike Flanagan



What About The 286?

As a computer journalist specialising in PCs, I'm often asked the question 'Paul, what is the point of the 80286?' – well no, to be honest, I've been asking myself that question lately, and now I'm beginning to see the answer.

The biggest problem facing the 80286 processor is that it's already been superceded by its bigger brother the 80386. While the 286 is a 16-bit chip which offers only marginal performance gains over the 8086, and in practice very little functional advantage, the 386 is a mighty 32-bit device (i.e. it exchanges data with the outside world four bytes at a time), and has 'memory management' features which make it suitable for running true multi-user operating systems. Such systems rely on the processor chip providing physical barriers against inter-program data corruption, and although the 286 has some limited protection features, it's the 386 which really does it properly.

With 386 prices falling all the time, the 286 can look like an unnecessary halfway house – if you want something more than a cheap 8086-based PC, you might as well buy something that's got some future prospects. However, as Apple Computer Corporation discovered with Visicalc and the Apple II, it's often software which sells the hardware, and here the 286 has an ally in the new generation of PC applications.

These programs, such as Aldus PageMaker and Ashton-Tate's dBase IV, have broken faith with the principle that software should run OK on a basic PC, and better on a faster one. On an 8086 machine they're just that bit too sluggish, due to their size and complexity, but on a 286 they run just fine. The same applies to much modern graphics software, including Microsoft's Windows.

The 80286 PC – not a new machine, having started with the IBM PC/AT in 1984 – looks like having a second career as the true corporate personal computer of the early 1990s, the stand-alone, single-user threshold machine for the new breed of mega software.

P.S.

phone number, leaving a rather un-communicative Fax on the old line (wonder if anyone tried faxing it?). M & G are back on speaking terms again, on 01-876 1670.

NEWWORD LIVES!

Last month's review of budget word processors by Simon Williams brought a howl of fax-borne protest from Mr. William Poel, supremo at Paperback Software (nee NewStar), and distributor of, among others, the *NewWord* series of word processors.

On page 58, we implied that Paperback/Newstar was no longer able to sell *NewWord* 3, the very Wordstar-alike product which we use to produce PC PLUS. Not so – in fact, Paperback are still selling both *NewWord* 2 and *NewWord* 3, with versions for a bewildering array of operating systems, including CP/M for *NewWord* 2. The only version which is no longer available is *NewWord* 3 for IBM's PC-DOS – but the MS-DOS version, which runs on all PC Clones, would very probably function OK on Big Blue kit anyway. Sorry, William!

NEXT MONTH

- WIN an Epson GQ3500 laser printer, plus the brand-new *Freedom of the Press PostScript* display language processor software, in our exclusive PC PLUS competition.

- Mix Editor and the amazing Mix C-Trace free on the SuperDisk.

PLUS

- Computerise your tax returns with our tax planning programs.
- Two Lotus-compatible spreadsheets – the new *Legend: Twin Level 3 plus Numbers Up*
- Ultra-low cost networking with the \$25 network.
- *GEM Artline* – Digital Research's up-market graphics system.
- More low-cost word processors, plus the best of shareware databases surveyed.
- Sell your used equipment with PC PLUS free reader ads!
- PLUS Learn C, Absolute Beginners, Help Screen, Games Reviews and much, much more

On sale March 16th

Another Year of the 1512



Tandon cut prices

Tandon have cut the prices on their 80286 and 80386 PCs.

Until March 31st, the Tandon 286 costs £999 (+VAT) and the Tandon 386 costs £1,999 (+VAT). It is worth pointing out that this 386 machine uses the full 80386 processor, not the cheaper and slower 386SX.

More info from Tandon on 0800-800 486.

Mini-micro

Bell Labs have managed to create minuscule 'plastic bags' holding semiconducting clusters of 100 to

10,000 atoms in a regular pattern. In a decade or two, this advance could lead to a PC invisible to the naked eye, yet more powerful than a supercomputer. Now that's what we call a real microcomputer!

A Wee D-Ram

The shortage of memory chips which has plagued the PC industry in recent months will soon be over, according to the Japanese Ministry of International Trade and Tourism (MITI). The MITI has predicted that production of 1Mb D-Ram chips will grow by 60% in 1989. The production of 256K chips will actually drop by 10%, but this only reflects the shift to 1Mb technology by the PC manufacturers.

Amstrad bundles mono monitor in portable push.

Hurry, hurry, hurry – for one month only (until the end of February), Amstrad are throwing in a 12" Monitor, valued at £115, with double drive models in their PPC portable range, that is the PPC 512DD at £631 and the PPC 640DD at £746.

However, *caveat emptor* (as they say in Brentwood). The screen in question only allows emulation of IBM's neolithic MDA (Monochrome Display Adapter) mode. This is fine for text, but does not allow even a single graphic to be shown. So word processing at home will be somewhat easier, but you still won't be able to see your charts (or any interesting games) unless you sit at a strange angle to the built-in screen.

A cynic might argue that if Amstrad can afford to give away monitors, surely they could afford to drop the price of the PPC, letting users choose a more suitable screen for modern applications. Hardened purchasers might ask whether anyone would actually consider paying £115 for a monochrome screen. But then, there's no such thing as a free monitor, is there?

News has come in that Amstrad have renewed their agreement with Migent U.K. to bundle Migent's *Ability* integrated software suite with the 1512 PC (and the 1640 PC, but only for users in mainland Europe) for at least another year. Powerful rumours circulating in the trade also suggest that the company will be bundling Release One of Lotus' *Symphony* – the 'industry standard' integrated software suite – with the newer 2000 series of PCs.

Taken together, these two pieces of information suggest that Amstrad will not be abandoning 5.25-inch

technology for at least another year – at least, not while satisfying their contract with Migent. Migent, in the guise of Julia Allen, describe such an inference as 'reasonable'. Amstrad, unfortunately, were not available for comment on the matter.

Anyway, the 1512 continues to be rather good value – even if it is not exactly the last word in advanced technology.

European users will undoubtedly be chuffed to hear that *Ability* has been translated by Amstrad into a number of languages including Portuguese and Modern Greek.

PC2086 Problem

A little more on Amstrad.

The company has issued a technical bulletin to its dealers warning of a problem in the hard disk controller of some early PC2086 HD systems. The problem affects only the first shipment of the PC2086 – with a 'strike rate' of some 15% or so. Its symptoms are data read and write errors experienced when using the hard disk.

The problem is simple to fix, however, involving the installation of a ceramic capacitor between the controller and the system board. This capacitor prevents power surge from damaging the disk, and all PC2086 HD systems shipped after the 18th January have it fitted by the factory. Those who bought their PC from an earlier shipment can have the alteration fitted free by their Amstrad dealer.

It must be stressed here that Amstrad are unusual in the PC industry in actually using their own proprietary fixed disk controller, most companies buying in from other manufacturers. Therefore, only Amstrad machines are affected by this problem.

However, if you are unfortunate enough to be affected, it will be necessary for your disk to be reformatted by the dealer – erasing all your files and reminding you how wise you were to keep backups of everything.

Oh... you do keep backups of everything, don't you?

£999 80386 arrives!

Or at least that's what Solihull distributor Digital Matrix's press release proclaims. Don't all rush at once though; it turns out that the £999 (plus VAT) machine comes with just a single 1.44 Mbyte floppy drive, 512K of RAM (not exactly enough to run OS/2), and not even a display adaptor card, let alone a monitor or a serial port.

Adding VGA colour graphics, a 2Mbyte memory upgrade, a 65 Mbyte hard disk, serial ports and a mouse brings the total to £2,335 – a fair bit more than £999, but still £650 less than the 14" high-res Amstrad PC2386 (all prices exclusive of VAT). Shame they didn't just say that in the first place, really. Digital Matrix are on 021 704 1399.



This thrusting, go-ahead young man wearing the currently fashionable striped shirt and paisley tie is Martin Moth, new PR Manager of peace-loving funsters MicroProse.

Although not related to the more famous Tiger and Gypsy Moths, Martin is nevertheless an ex-RAF air ace and therefore superbly qualified to front for the makers of such games as *Gunship*, *F-15 Strike Eagle* and the recent *F-19 Stealth Fighter* (reviewed in January's PC PLUS).



Brown Bag death rumours 'somewhat exaggerated'

Rumours have been rampaging through the UK software industry once again, the story this time being that Brown Bag, providers of the popular PC Outline and Homebase shareware packages, have pulled down the shutters on the British arm of their operation and retreated to their base in the States. Users who attempted to call Brown Bag's London number for registration or support found they were dialling an unattended telephone. Senior figures from leading British shareware distributors have been hoping to acquire the UK rights to Brown Bag's packages after receiving calls from users unable to contact the suppliers.

PC PLUS rang Brown Bag's California HQ, where Chairman Sandy Schupper described the

unanswered telephones as an 'unfortunate' circumstance caused by 'staff problems'. Schupper described himself as 'very upset' about the whole affair, adding 'I've pulled my hair out about it: Brown Bag has always had – and still has – a very substantial interest in and commitment to our European customers.' Schupper told PC PLUS that the problems would disappear 'within two days', either by 'resolving' the staff problems (alleged by UK sources to be a mass walk-out) or by sending a team over from the States to man the 'phones until a more permanent solution is found.

This means that everything should be okay by the time you read this. So, if you have been trying to get through to Brown Bag and have given up in frustration, try them again – you might get through this time.

Brown Bag are on 01-831 1106. If you don't have any joy, Head Office in the USA can be reached on (010 1) 408-559 4606.

Dixons Make PS/2 More Attractive

High-street retailers Dixons have chopped the prices of IBM Personal System/2s sold by them. Prices (all excluding VAT) are £799 for the twin diskette Model 30-002 and £1,099 for the 20MByte Model 30-021 – in both cases for a mono system with mouse, keyboard and PC-DOS 3.3. A colour monitor can be had for an extra £200 in either case. This is still a smidgen more expensive than an equivalently configured Amstrad, of course, but it's worth remembering that IBM equipment – like that of Mercedes, Porsche and other prestige brands – can hold its second-hand value rather better than that from other manufacturers.

DELL
COMPUTER CORPORATION

New UK Headquarters

Dell Computer Corporation, Millbank House, Western Road, Bracknell
Berkshire RG12 1RW Telephone: 0800 414535 Fax: 0344 860187
With effect from 23rd January 1989

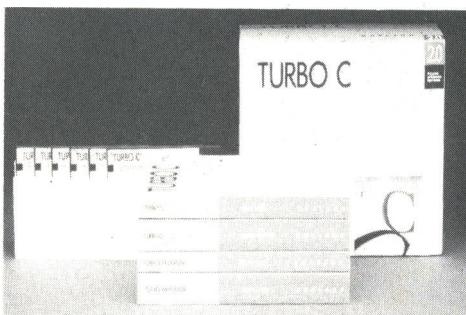
● Here it is – the world's first Filofax-compatible press release! The clever folk behind this one are Dell Computer Corporation, and its main purpose is to announce Dell's move to spanking new UK headquarters at Bracknell. However it also includes a tear-off, post-paid sales enquiry card which you can keep filed in your Fax until you feel the need to send it off. In the meantime, anyone desperately wanting one can phone Dell on 0800 414535.

Upgraders lose out in Turbo pricing jungle.

The 'reduced' upgrade prices offered to software users who wish to take advantage of developments in their favourite programs may not always be quite the bargains they seem. A good example is the increasingly strange pricing policy of Borland International, producers of the popular Turbo series of programming languages.

Users of Turbo C 1.50 may know that an upgrade to the potent Turbo C 2.0 Professional is available direct from Borland – and only Borland – for £129 + VAT (plus £5 for delivery). Compared with the Recommended Retail Price (RRP) for Turbo C 2.0 Professional of £199.95 this seems to represent a considerable saving – or that's what they'd like you think, anyway. However, few dealers and distributors actually charge the RRP, for the very simple reason that if they did nobody would buy anything from them. The inevitable discounting leads to variations in price, and long-time readers of PC PLUS will know that it pays to shop around.

PC PLUS duly shopped around for a copy of



Turbo C 2.0 Professional (the full licence, not an upgrade) and managed to find it at HP Software for the delightfully low price of £130 plus VAT. As this includes delivery, the total cost is actually some £4.96 less than Borland's own price for the upgrade. Incidentally, the upgrade and the full package are identical, except for the details of user registration.

This highlights an interesting anomaly in the pricing structures of the PC world. Software manufacturers tend to sell programs to distributors and dealers at discount levels of

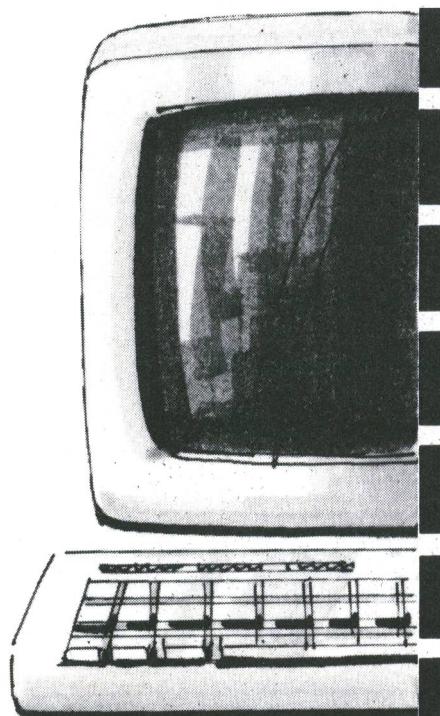
between 40 and 50 per cent – which allows people like HP Software to sell at a discount of 35 per cent and still remain profitable (and therefore in business). It doesn't take much in the line of lateral thinking to realise that when suppliers like Borland sell upgrades direct to users at an 'altruistic' 35 per cent discount, they are actually making some 10 or 15 per cent more on the deal than they normally would.

PC PLUS asked Borland why it was possible to get a full licence for less than the price of an upgrade. 'We're not interested in competing with anybody,' Denis Moran from Borland's Marketing Department told us, 'And anyway, there's only so much we can do to make the price of the upgrade less than that of the full product.'

Well, perhaps there is – one thing might be to sell the user upgrade at the distributor's wholesale price as a way of ensuring it always costs less than the full licence. Just a thought...

HP Software are on (0279) 506601/2.

When you buy a whole new Amstrad system, why use only half of its potential?



A Message from Amstrad's Chairman.....

Dear Amstrad Computer User,

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or Ring (091) 510 8787 NOW!

PC+/KP/3

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It pays to belong!

Cobol Seven Times as Popular as C.

OK all you Pascal, C and Assembler hackers, put down those split-screen editors and pick up your coding sheets! Yes, according to a recent survey, job advertisements in the computer industry look for Cobol programming skills seven times more frequently than they do for expertise in C. Of course, this includes all types of computers up

to the biggest mainframes, but it still makes you think. C, as it happened, came fourth in the popularity stakes. Fourth Generation Languages (4GLs) are very slightly more popular than C, and (believe it or not) that old workhorse language RPG III engenders about 50% more interest.

This RPG III figure seems startling, as the language is only really used on IBM's System/38 and AS/400 mini-mainframes. So the

moral of the story might be that if you want to earn a bit more, get yourself an RPG compiler for your PC, and learn this boom language. Or you could just play it safe and dust off those creaking Cobol skills.

For those who care, Pascal and Assembler were the two least popular languages in the survey, being beaten by such well-known development tools as ICL's mind-bending Quickbuild and IBM's idiosyncratic PL/1.

DIRECTORY ENQUIRIES?

DIRECTORY ASSISTANCE v1.1b

£57.44 • Ctrl Alt Deli
(0908) 662759

There have been many attempts to put a friendly face on the MS-DOS prompt. Some enhance the commands already available and add powerful new ones to boot; others hide the A-prompt behind a menu system that can be operated with just the cursor keys and [return]. Many are quite successful, but most load memory resident which takes up precious RAM and can clash with other programs – even crashing the system completely.

Although *Directory Assistance* does add a few command enhancements its main selling point is as a front-end menu particularly suited to a hard disk system. The package, published by Individual Software, California, comes on both 5.25-inch and 3.5-inch disk in a 'video-pack' style box. The manual is a slim 26-page booklet but you can always resort to *Directory Assistance*'s other main asset; comprehensive help screens and a completely separate tutorial program.

The tutorial is extremely thorough, covering not only the application itself but also how to make good use of hard disks in general. It is interactive throughout, actually loading and automatically using *Directory Assistance* itself where necessary. In a corporate environment such a tutorial is a real bonus, as the DP Manager need only enter **instruct** at the MS-DOS prompt and let the program get on with the training.

The program can be loaded either in the conventional manner or memory resident, popping up over your main application whenever you hit [left shift] twice. In memory resident mode it takes up a rather large 164K of memory – as against *TopDos* which only takes up 38K and provides similar features (see review in January issue). This does however allow it to put in a fair turn of speed: while *TopDos* reads in the contents of each directory from disk as it is selected, *Directory Assistance* reads in

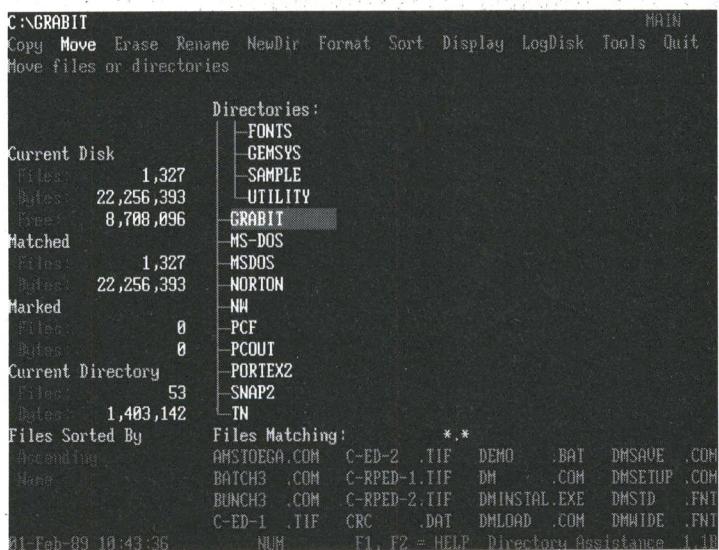
the whole file structure at the start. Skipping from directory to directory is much faster this way.

The program's main display makes excellent use of the screen. Copy, Move, Erase, Rename and other standard MS-DOS commands can be executed from the top menu, and act on files individually selected from the files display at the bottom. A variety of directory displays are possible too, and any of the file attributes can be changed from the menu. The Secure option allows you to encrypt and decrypt files so they can only be accessed with the correct password. There is also a powerful ShowAll command which displays all the files on the hard disk as though they were in one directory – powerful and dangerous!

Compared to something like *TopDos* though, there is a lot missing. Although the contents of a file can be viewed they cannot be edited. *Directory Assistance* does not offer the powerful macro facilities either. *PC Tools Deluxe* offers similar features but also provides extensive data recovery and backup tools that could prove invaluable – plus a powerful text editor. It is also a bit cheaper. MN

Win a copy on page 117!

PC PLUS VALUE VERDICT



• The main display of *Directory Assistance* is complex but clearly laid out. It also updates very quickly as you scroll through your sub-directories

SHORT'N TALL STORIES

Software

• Pink Software have announced a combined version of *TurboCAD* and *TurboCAD 3-D*. The new product is called *TurboCAD 3D* and retails at £114. Upgrades for existing *TurboCAD 2-D* users are available at £34.

Pink Software are on 01-455 2117

• Meridian Software has brought out *Disco*, a menu program and file organiser for owners of PCs with a hard disk which is designed to buffer the user from the grim realities of DOS. It costs £49.95 including VAT and will be reviewed soon by PC PLUS.

Meridian can be contacted on 01-850 7057.

• *Fastwire II*, a file transfer product developed by the American Rupp Brothers organisation, is now being distributed in the UK by Ctrl Alt Deli. It is aimed at users who wish to transfer their programs and data from their desktop PC to a laptop machine, and also for users switching from 5.25-inch to 3.5-inch technology (from a PC1512HD to a 2086 HD, for example). The package retails at £104 and includes either a serial or a parallel cable (to facilitate the transfer).

Ctrl Alt Deli are on (0908) 662759.

• From Coda Software comes *WordWizard*. It costs £24.95 and it solves your crosswords for you (it says 'ere). Apparently, it knows that 'Easter Eggs' is an anagram for 'Segregates' and so on. We'll review it soon. Coda are on 01-789 9551.

Hardware

• Epson have announced a portable PC, available in the UK from March 1st. The Epson PC AX Portable is a 12MHz 80286 machine with a 20MBYTE hard disk and it costs £2749 (plus the dreaded VAT). An expansion chassis for 2 AT-sized cards is also available.

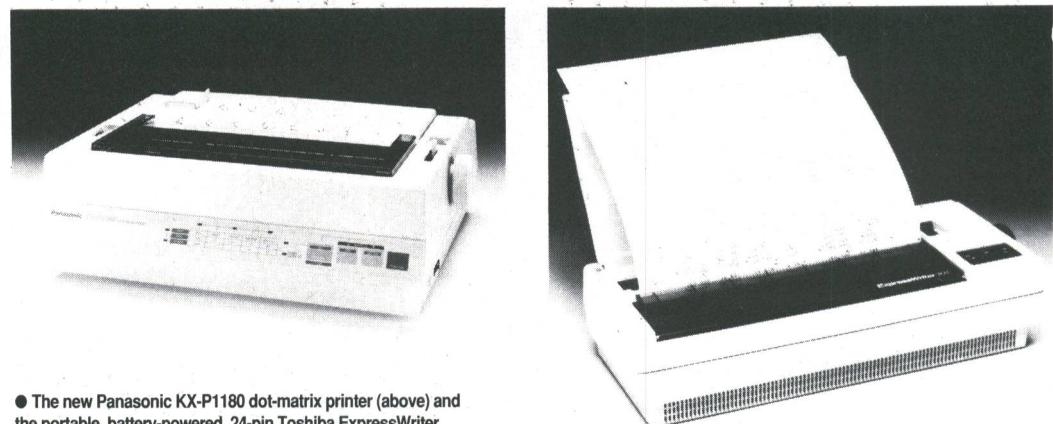
• Brother have announced a Hewlett-Packard compatible laser printer, the HL-8e, priced at £2294. It is rated to print at 8 pages a minute, and comes complete with 512K of memory.

Two new printers

Panasonic and Toshiba have both announced new dot-matrix printers.

The Panasonic KX-P1180 is an 80 column, 9-pin printer which can operate at 192 characters per second (cps) for drafts, and 38 cps for Near Letter Quality (NLQ). It costs £309 including VAT.

The Toshiba ExpressWriter 301 is a portable printer which can run on Ni-Cad batteries or mains electricity. It is a 24-pin printer which prints at 60 cps in draft mode, with 42 cps at NLQ. It weighs less than 4 pounds and costs £397 including VAT.



• The new Panasonic KX-P1180 dot-matrix printer (above) and the portable, battery-powered, 24-pin Toshiba ExpressWriter (right)

ALL-SEEING?**OMNIVIEW v4.10**

£78.20 inc p&p • Sunny Hill/In Touch
(0222) 882334

Most PC users are probably quite happy in the 640K playpen provided by the MS-DOS operating system. However, as high-speed 286 and 386 machines take over, the 640K barrier can irritate. Microsoft and IBM would like us all to break through with their OS/2, but *Omniview* is a less well known product that might provide all you need.

Like its nearest competitor *Desqview* (see *The Good Software Guide* for further details), *Omniview* is not an operating system but is loaded above MS-DOS.

Omniview allocates each application a suitably sized memory 'partition' as it is loaded. Initially, and whenever the program is in the foreground, this partition is held in the conventional memory of the machine. But as new programs are loaded earlier programs are moved into the background and *Omniview* looks for other places to put them.

If the machine is endowed with additional memory above the 640K limit, *Omniview* can store programs in various Expanded Memory Specification (EMS) formats. It can also store partitions on disk, preferably hard, although again these partitions are held frozen ready to be reloaded into memory when the program is called to the foreground. Up to 10 programs can be loaded in this way.

Most of this process is automatic, although it can be monitored by loading the *Omniview Status* program which displays the memory allocation and status for each partition. But before *Omniview* can load your applications it needs to know a few things about them first.

This is done by filling in a 'Program Form' (one rather better designed than that of *Desqview*). *Omniview* needs to know the start-up command and directory, and how much memory a program requires. Programs that can make use of expanded memory can still do so under *Omniview*,

although you may need to limit the amount they grab to ensure room for *Omniview* to do its thing.

The Program Form also allows you to allocate priorities to the application, and the number of 'clock ticks' *Omniview* devotes to it before moving on to another. *Omniview*, like all PC multi-tasking programs, works by skipping from one program to another at lightning speed so that it appears as though more than one thing is being done at once. Obviously the performance of each program is degraded, but by how much depends on how cleverly the system allocates processor time. *Omniview* allows you to fine tune the system fairly comprehensively.

A very straightforward menu system is provided for entering and modifying Program Forms and as a control panel for switching between applications, however *Omniview* also provides a number of separate utility programs that allow virtually all the system's features to be implemented from the MS-DOS prompt or from within batch files. Once a system has been set up using these commands,

Omniview becomes completely transparent.

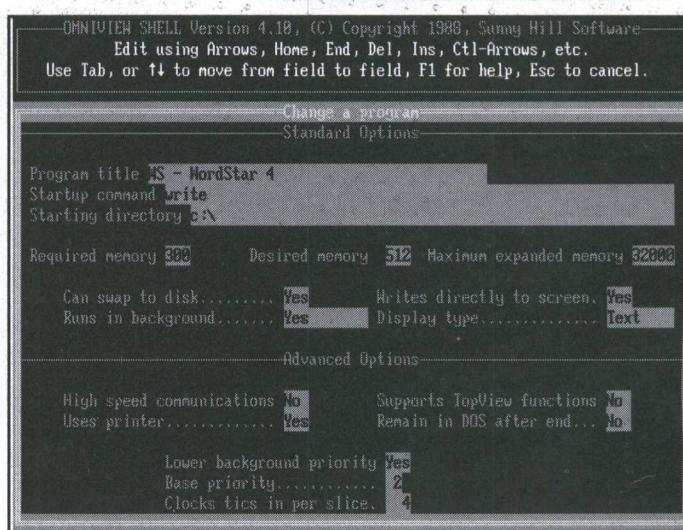
On a 80386 based machine with sufficient expanded memory for all programs to run in the background, *Omniview* works extremely well. The only hiccup is when [Alt], [Ctrl] and [Caps Lock] occasionally get confused after switching partitions, but this can be quickly

cleared by tapping each key in turn before continuing.

Applications seem happy to co-exist in partitions up to around 500K in size, and this can be increased on occasion.

On a straight 8086 machine with 640K of RAM, *Omniview* can switch programs to and from a hard disk, but this is by no means instantaneous: it takes around 20 seconds to swap two 500K partitions, but it must be remembered that you are then presented with your work already loaded, exactly as it was when you left it.

Quite a handy program then, although it lacks several of the features offered by *Desqview*. Programs run in full screen mode only, so no setting up convenient sized windows, and there is no provision (in this version at least) for cutting and pasting between applications, despite the blurb on the cover. Nevertheless it does come with a powerful macro developer, and with an API disk (Application Program Interface) containing *Omniview* functions for Microsoft and Turbo C, assembler and Turbo Pascal. Excellent value, especially for the single user who wants to take advantage of an expanded memory board. MN

PC PLUS VALUE VERDICT ■ ■ ■ ■ ■

Will you be working with an alien network?



Or one that's more down to earth?



Working with some computer networks can be like a close encounter of the complicated kind. But the sign of true intelligence is not making a network complex. It's making it simple.

SIMPLE TO INSTALL

New MainLan can only be described as 'simplicity itself'. It is designed with smaller businesses in mind and comes complete with everything you need. And installing it couldn't be easier.

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A simple step by step guide shows you *exactly* what to do. And in our experience, a complete novice can have a system up and running in less than an hour.

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computer jargon.) And it operates from a simple master menu.

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But don't mistake 'simple' for 'unsophisticated'. At £199 for each PC, MainLan has the features of systems twice the price.

It has file transfer and printer sharing. Electronic mail and hard disk sharing. (There's no need for a dedicated file server.)

G

It is also compatible with networking versions of favourite software programs such as dBase III, Lotus, Paradox and Word Perfect to name but a few. (There'll even be a version for IBM's new Micro Channel Architecture available in the very near future.) MainLan just doesn't need a 'boffin' to make it all work.

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Non-Event of the Year So-Far

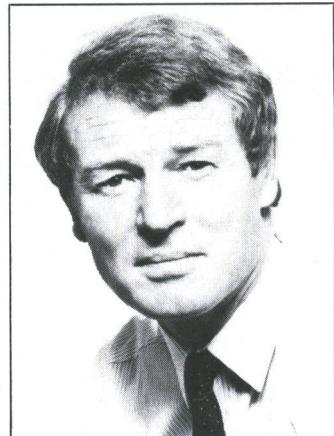
The national newspapers became unusually interested in PCs during the first days of 1989, the cause of this excitement being the notorious 1813 virus. This virus (so called because it is 1813 bytes long) tags itself onto .COM and .EXE files, where it rests until the system clock tells it that the date is a Friday 13th.

It then turns rather mischievous and destroys any file you run.

According to our hysterical media, the whole country was affected – Every PC would lose its data! British business would grind to a standstill! The Stock Exchange would tumble! Nigel Lawson would be forced to declare the Yen as the only legal tender! England would beat someone at cricket! IBM would slash its prices...

Okay, so what actually happened? Well... it seems there were three (no, not a misprint – three, 3, III, 25% of a dozen) cases of the 1813 virus actually reported on Friday 13th January (although a few more have surfaced since). The media suddenly went all quiet.

But never mind, chaps. There's another Friday 13th in October. Then you can go frantic all over again, can't you?



● No, we haven't gone political here at PC PLUS. This pic of SLD leader Paddy Ashdown was sent to us by the organisers of the *Which Computer?* show (NEC Birmingham, 21–24 Feb), where Mr. Ashdown will be guest of honour at a lunch on the opening day, discussing with directors of 50 top computer companies the future of British information technology, trade and industry.

For the rest of us the *Which?* show is usually a worthwhile bash, with acres of products stands. Tickets on the door are £5, but if you ring 0792 792 792 right now you can still get free postal tickets – though not if you're under 18, as junior citizens are banned completely.

'Low-price' COBOL system breaks the £1,000 barrier!

Welcome to Expensive Products Corner, the section where we bring you no-holds-barred news of sky's-the-limit releases.

First, MBP Software and Systems (UK) have released *Lifetime Cobol*, a low-price version of their little-known *Visual Cobol* development system. Designed for the 'smaller developer', it features ANSI and RM/Cobol compatibility, plus a utility for developing data entry screens. This can be had for

as little as £750 + VAT if you only want to distribute your compiled programs to user departments, or £1,500 plus VAT if you're a software house selling your programs. MBP, a subsidiary of the £5 billion-turnover Hoesch group, describes *Lifetime* as 'a package that beats any other offer from a major supplier of standard COBOL.'

MBP are on 0707 52841, Microsoft are on 0734 500741.

● Meanwhile Unisys have announced the *Micro A*, a genuine mainframe-in-a-PC featuring a 48-bit processor and 12 Mbytes of RAM. Mounted on expansion cards inside a Unisys Personal Workstation 2 PC, the SCAMP (Single Chip A-series Mainframe Processor) runs Unisys's MCP/AS operating system and costs £25,000 (+ VAT) with mono monitor. Fervent MCP/AS users probably already know that Unisys' phone number is 01-965 0511.

On Line

The long awaited launch has finally happened. At last Hayes (of 'AT command set' fame) has hit the UK market with its new V series range of modems. Why the excitement? Well Hayes is to the modem market what IBM is to PCs.

Now just under £1,150 will buy you the Hayes Smartmodem 9600 +Quad V.42. The company claims that by employing its adaptive data compression feature data throughputs of 19,200 bits per second are possible. Sounds great but the Quad's 9600 mode uses something called 'ping-pong' technology which is definitely non-standard. Worse still the same money will buy a modem that works at 9600 bps simultaneously in both directions (ie full duplex). Therefore it remains to be seen if Hayes' pseudo full-duplex technology catches on. For comms enthusiasts the V series will be good news, however, simply because Miracom will probably reduce the price of its rival pseudo full-duplex modem, the Courier HST and Dowty might even do the same with its Quattro Plus!

with Tone 'the phone' Dennis.

Talking of which those nice people at Nestor contacted me about further offers of half price modems to genuine UK bulletin board operators. Those sysops (that's board speak for system operators) who can't afford the £570 for a Courier HST, are being offered Miracom's 2400e for £399 instead of the usual £799. The 2400 has a top whack of 2400 bps but it also offers MNP Class 5 error checking. Or with no MNP capability, for £288 sysops can have the WS3000. Interested parties should contact Ian Whipp of Nestor on 0635 523811.

Dialcom (Prestel and Telecom Gold's parent company) has just launched a new PC comms package called Communicator. It's really quite good. Which is understandable since Communicator is actually a cut down version of PMS' Dial-up. For £56.35 the program is good value especially for those who are comms novices and don't want to learn all about bits and bauds just to get onto Prestel. Dialcom are on 0800 200 700.

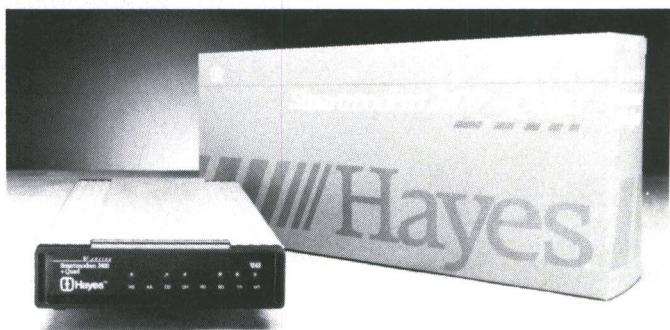
saga of my search for PC software compatible with the French Teletel service, I can reveal that a copy of *Olicom Jet* has at last arrived Chez Tone. I'm hoping to announce the name of a UK importer real soon but don't hold your breath.

Just to spite me for having said previously that the JT Fax card was unapproved, the board has now gained its approval sticker from BABT. It costs £343 from InterQuadram who are on 0753 36464. One feature which it is easy to miss about the JT Fax is the fact that it has a top speed of 4800 bps whereas most dedicated faxes and fax cards can manage 9600 bps. Roughly speaking it will therefore take

twice as long to send/receive. On the other hand it can cope with both text and graphics files. Methinks it's still a winner.

Martin Smith from the Trans-Atlantic Resources board sent a message to say he will probably be UK distributor for QMODEM version 4. I like to give more details but his board is always busy. Try your luck on 03752 5375.

Send your snippets to Tone the Phone's Telecom Gold mailbox (76:MTR007) or his Prestel mailbox (919993843).



For those who remember the



**1st prize - Mirrorsoft's Fleet St. Editor 3.0
PLUS the Cameron Handscanner**

YOU WIN!

JANUARY'S MIRRORSOFT DTP COMPETITION - THE RESULTS!

To win, you had to design a logo for your club, company or just yourself. Art Editor Jane Toft was truly impressed, and found choosing the prizewinners very difficult. Still, here goes... ●

On the left is first prize winner, **S. D. Peters, of Surbiton, Surrey**. The logo is 'for a fictitious company, *Picnic* that supplies paper plates, cups, serviettes, etc.'

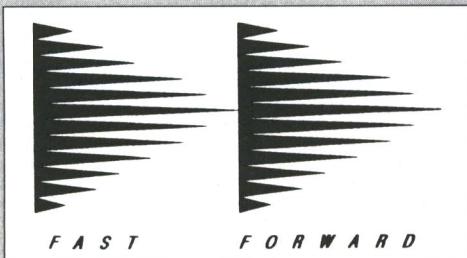
The design impressed us with its instant decorative appeal. This was combined with a clever blend of a landscape, and a symbolic overhead view of a cup and saucer, to produce a logo with the right 'feel' for its subject matter.

A winner!

Turn to page 117
for this month's
competition

Just missing out on a prize are the following highly commended entries; **Robert Silversides**, Clifton, Bristol. **Allan C. Mason**, Kingswinford, West Midlands. **Simon Phillips**, Leamington Spa. **Dave Archer**, Feltham, Middlesex. **Vijay Vithani**, Thamesmead, London. **Michael Shrubsole**, Hythe, Southampton. **Linda Jones**, Odiham, Hampshire. **Ian Hills**, Llandysul, Dyfed. **C. Hendry** (age 10). **David Hancock**, Ilminster, Somerset. **John Hunt**, Carnforth, Lancashire

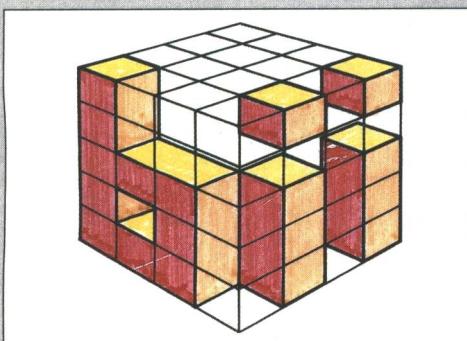
Five runners-up who receive Mirrorsoft's File Rescue Plus disk recovery software.



● Derek Thow, Newport, Gwent



● Hugh Cameron, Gainsborough, Lincs.



● Geoff Gurney, Bexhill-on-sea, East Sussex

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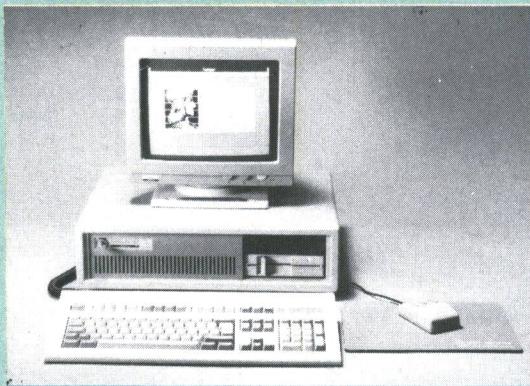
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The **Aries IBM PC® XT** compatible looks like a 'real' PC, runs software like a 'real' PC (but 3 times faster), expands like a 'real' PC, but please compare our sturdy steel case construction (with room for up to 4 drives) and price with an equivalent Amstrad system, to see why it's not quite fully 'Amstrad compatible'!

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Specification:

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- 8087-2 maths co-processor, optional.
- 640K minimum expandable to 1024K on system board, extra 384K RAMDISK available.
- 360K Single Floppy (optional 2nd Floppy/3.5"/20MB Winny/T. Streamer).
- CLOCK on System board, gives non stop DATE & TIME.
- 8 expansion slots.
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- Mono graphics/parallel card.
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- High resolution (1000 x 350 lines) State of the art, 14 inch Flat Screen Monitor.

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- GW-BASIC 3.21.

● FREE 12 month On-site Maintenance warranty (UK mainland) included in the price

Available in the following configurations:

- **System 1 – Aries PC-XT 88 including 14" hi-res monochrome Flat Screen monitor** £489
- **System 2 – Aries PC-XT 88 System 1 as above plus a 720K 3.5" Disc Drive fitted** £579
- **System 3 – Aries PC-XT 88 System 1 plus a 20MB Hard Disk fitted** £799
- **System 4 – Aries PC-XT 88 System 1 plus a 40MB Hard Disk fitted** £849
- **System 5 – Aries PC-XT 88/EGA hi-res Colour System, specifications as in 4, including Aries EGA Monitor/EGA Card and 40MB Hard Drive fitted.**

At a breakthrough price: £999

To start you up we include FREE £60 worth of PC Organiser software, consisting of: Wordprocessor, Database, Auto-Dialler, Desk Diary, etc.

... and also takes the fun out of choosing a PC-AT® compatible

For around the price of an Amstrad PC1640, with an 8MHz 8086 microprocessor, you can now buy a 12MHz 80286 PC-AT® compatible.

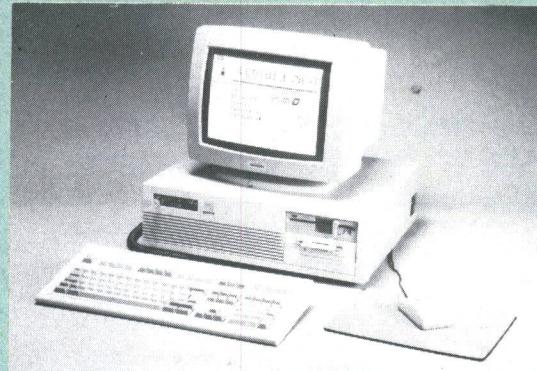
The new Aries 12MHz PC-AT® compatible starts at just £799* . . . and a 40Mbyte system with EGA monitor costs only £1399 !

So we're very sorry if we've taken the fun out of buying a PC for those who like to gamble with unknown names, or uncertain expandability, because with **Watford Electronics' trusted reputation**, you know you must be making the right choice.

* Full specs and pricing are described below.

All registered trademarks are acknowledged, and all information is believed to be correct at the time of going to press.

ARIES PC AT286



Specification:

- 80286 microprocessor.
- Optional 80287 Maths co-processor
- 640K RAM standard expandable on-board to 4MB.
- 1.2M Single Floppy (optional 2nd Floppy/3.5"/Winny/T. Streamer)
- CLOCK on System board, gives non stop DATE & TIME.
- 8 expansion slots.
- Serial/Parallel Card.
- Switchable Speed 8/12MHz Landmark test at 16MHz.
- 102 key keyboard.
- 150W power supply.
- GW-BASIC 3.21.
- Microsoft MS DOS 3.30.
- Mono graphics/parallel card (Herc. Compt.)
- Slide in metal case with function display.
- Legal BIOS and built in games port and clock.
- High resolution (1000 x 350 lines) State of the art, 14 inch Flat Screen Monitor.

- 102 key keyboard.
- HDD/FDD Card.
- 200W power supply.
- GW-BASIC 3.21.

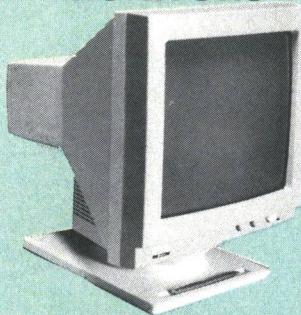
● FREE 12 month On-site Maintenance warranty (UK mainland) included in the price

Available in the following configurations:

- **System 1 – Aries PC-AT 286 including 14" hi-res monochrome Flat Screen monitor** £799
- **System 2 – Aries PC-AT 286 System 1 as above plus a 720K 3.5" Disc Drive fitted** £889
- **System 3 – Aries PC-AT 286 System 1 plus a 20MB Hard Disk fitted** £1099
- **System 4 – Aries PC-AT 286 System 1 plus a 40MB Hard Disk fitted** £1199
- **System 5 – Aries PC-AT 286 / EGA hi-res Colour System, Specification as in 4 including, Aries EGA Monitor/EGA Card & 40MB Hard Drive fitted.**

At a breakthrough price: £1399

MONITORS



WE stock a range of Monochrome and Colour monitors, to suit all needs.

ARIES MONITORS 14" Monochrome

These State of the Art monitors have been engineered for dual-frequency output on a chemically etched, Non-glare, Flat screen. IBM compatible, high resolution (1000 x 350 lines), band width: >20MHz. Other viewer-friendly features include front-mounted controls and swivel base to adjust viewing angle. Available in Green, Amber or Paper White.

Type	Description	Price
ArM1000G	- High Resolution Green	£93
ArM1000A	- High Resolution Amber	£95
ArM1000W	- High Resolution Paper White	£97

Aries 14" EGA Monitor

Stylishly designed, high contrast non-glare screen, 16-64 colours, switchable to green or amber screen for wordprocessing. EGA compatible. Resolution (720 dots H. x 350 lines V). Built-in Tilt & Swivel base.

Aries EGA Monitor	£299
EGA Card	£119
EGA Monitor plus Card	£379

Multisync Monitors 14"

● TAXAN 770 Plus – An autoscanning Ultra high res 14" Colour Monitor.	£445
● EIZO Flexscan 80605 – 14" colour. Has a staggering 0.28mm dot pitch	£459
● NEC JC/1401 P3EE – Intelligent Ultra high res 14" Autoscan freq. between 15 to 35KHz. Text switch provides 7 colours	£456

NEW

Aries 1458 Multisync VGA MONITOR

Like the Aries monochrome monitors, Aries 1458 is a state of the art, stylishly finished, flat screen, Enhanced Multisync Colour Monitor. It also works with a monochrome card. An auto-switching device changes modes without having to adjust the monitor. Its wide frequency range (15-45KHz) and multi-colour display allows increased options and flexibility. 0.31 mm dot pitch. Input Signal: TTL/Analogue, H-Sync 15-45KHz; V-Sync 47-100Hz; Bandwidth 35MHz; Resolution 800 x 600 Hiresolution Multi colour Display; Compatible with MGA, CGA, EGA & VGA – Analogue; – limited only by the video display adaptor; works with a monochrome card. Built-in tilt & swivel base.

Launch Offer – £349

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3.5" Hard Disc on a controller card. "Simply Plug and Play". For Amstrad 1512/1640 & XT compatibles.

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● WD-XT 30 MB	£239
For PC AT & AT Compatibles.	

● WD-AT 30 MB

£345

Hard Disk Drives (Bare Units)

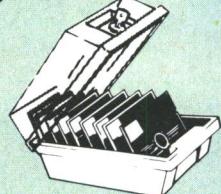
● WEHD20 21MB Hard Disk	£159
● WEHD30 30MB RLL Hard Disk	£179
● WEHD40/40mS 42MB HD including partitioning software	£215
● WEHD40/28mS 42MB HD including partitioning software	£299
● WEHD65 65MB HD RLL	£395

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Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption while in storage. The smoked top locks down. Dividers assist in efficient filing of discs.

● M35 – holds upto 50 5 1/4" discs	£4.95
● M85 – holds upto 95 5 1/4" discs	£6.95
● M25* – holds upto 25 3 1/2" Discs	£4.95
● M50 – holds 50 3 1/2" Discs	£6.50
● M10 – holds upto 10 Data Cartridges	£15

* Not lockable



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● WEXT100C XT Controller and Cables	£49
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● WEHD20(KIT) 21MB HD with XT-Amstrad Controller + Cables	£189
● WEHD30(KIT) 32MB HD with XT/Amstrad Controller + Cables	£229
● WEHD40 (Kit) 42MegB HD with XT/Amstrad Controller & Cable	£259

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● UC200 5.25" 360K 48tpi Double Sided Disc Drive	£85
● UC600 5.25" 1.2M 96tpi Double Sided High Density, Disc Drive	£99
● UC35/4 3.5" 720K Drive with 5.25" kit	£89
● UC35/6 3.5" 1.44M Drive with 5.25" kit	£99

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For XT & AT. 60MB External kit with software, short controller, cable and documentation. Backs up 60MB in less than 12 minutes.

Type: WE5000/Tape	£475
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ADD-ON CARDS

● 480 Auto Switch EGA Card, 256K RAM, compatible with CGA, MGA & EGA.	£119
● FLOPPY/HARD DISK Controller for AT	£129
● HARD DISK Controller for XT	£79
● MONOCROME GRAPHICS CARD (incl. Parallel printer port)	£34
● COLOUR GRAPHICS CARD – RGB Colour and Composite Video (includes parallel port)	£36
● RS232 CARD with 2 ports	£25
● MULTI I/O Card includes: Real Time Clock/Calendar, Serial/Parallel/Games	£43
● SERIAL/PARALLEL CARD (2 serial port, 1 optional)	£29

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Lifetime warranty on 3M Disks from Watford.	
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10 lifetime guaranteed discs in Plastic Library Disc Boxes.	
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● M35 – holds upto 50 5 1/4" discs	£4.95
● M85 – holds upto 95 5 1/4" discs	£6.95
● M25* – holds upto 25 3 1/2" Discs	£4.95
● M50 – holds 50 3 1/2" Discs	£6.50
● M10 – holds upto 10 Data Cartridges	£15

Genius Mouse

A very powerful mouse package, with programmable resolution of 200-800 DPI. Operates in 'PC Mouse'; Logimouse and Microsoft mouse modes. It has three large comfortable buttons and its RUBBER COATED STEEL BALL is smooth and easy to use on virtually any work surface.

The Dr. Halo III software supplied with the mouse is a professional art package. The features are:

- 256 Colour types
- Colour mixing facility
- Works with CGA, EGA, VGA & Hercules Displays
- Cut & paste, copy, erase, rotate & store
- Multiple choice fonts
- On screen help
- Facility to create stunning graphics which can be merged to show a slide presentation
- Library of precreated menus for use with popular utilities like: D Base I, II, III, Lotus 123, Visicalc, Supercalc, Wordstar, Symphony, etc.

The package is supplied complete with, a Mouse mat, (doubles as cutting pad), Mouse

Price: £39



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Ideal for Desk Top Publishing

An easy to handle, handy Scanner featuring 105mm scanning width. Its 200DPI resolution enables you to reproduce graphics and text on your screen.

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- Extensive support for Image Format
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- Several variations of shading
- True size Image Printing
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Launch Offer £130

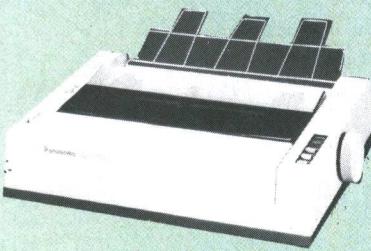
Genius Tablet

This extremely versatile, multifunction, top quality graphic tablet includes, both tablet and mouse functions.

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- Data Rate: 150 to 19,200 Baud (Switch selectable)
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- Supplied complete with Menu Maker & Dr Halo III Software packages.

Launch Price: £225

Panasonic KX-P1081



Attractively finished, bi-directional, logic seeking, IBM and Epson RX compatible command calls. Speed: 120 CPS draft mode, 24 CPS NLO. Character width range from 5 cpi to 17 cpi. Upto 40 downloadable characters. Functions include, proportional spacing, justification, centering, left and right ranging.

(Price includes **FREE** Lead (please specify machine type), and 1000 Sheets of fanfold paper.

WINTER SALE OFFER only: £139

Panasonic Printers

● KX-P1124 24 pin 80 col.	£269
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● KX-P1180 9pin 80 col. 192/38 CPS	£169
● KX-P1540 24pin 80 col.	
240/80 CPS	£435
● KX-P1592 9pin 136 col.	
216/45 CPS	£275
● KX-P1595 9pin 136 col.	
288/61 CPS	£409
● Panasonic KX-P4450 LASER PRINTER	
Latest technology at Watford's special offer price	£1499
● Spare Laser Toner	£29
● Optional A4 Laser Feeder	£55

Brother HR20 DaisyWheel Printer £339

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● Colour Jet 132 Printer	£515
● Paper Roll	£6
● Colour Cartridge	£14
● Black Cartridge	£8
● 100 A4 OHP transparencies	£55
● 8K Serial Interface Optional	£123
NEW	

Intergrex COLOURCEL NPQ Ink Jet Colour Printer £2695

NEC P2200 PINWRITER

24 pin; 80 column; 168CPS - 58CPS LO: Epson LO compatible, 2K Buffer; 7 resident FONTS. Friction & Tractor feed, front load single sheet feed, etc.

Price: £269

Spare Cut Sheet Feeder £65
Additional Font Cartridge £25
NEC P2200 Pinwriter Ribbon £6

● **NEC P6+** £459 ● **NEC P7 +** £575
● Colour Option £74 ● Serial Interface £73
● Cut Sheet Feeders: P6 £125; P7 £145

Star LC10 £175; LC10 Colour £215
Star LC24-10 £279; NB24-10 £399

EPSON PRINTERS

EX800	£415	LQ850	£430
EX1000	£564	LQ1050	£570
FX850	£315	LQ2500+	£839
FX1000	£425	LQ2550	£925
GQ3500 Laser	£1150	LX800	£179
LQ500	£275	SQ2500	£975

Securicor carriage on Printers £7

Epson Printer Accessories

Cut Sheet Feeders for
EX800 £149; EX1000/LQ2550 £210; FX800 £149;
FX1000 £179; LQ/LX800 £139;
LQ500 £75; LQ850 £135; LQ1050 £175.

Tractor Feed for
EX800/1000 £85; LQ800 £44; LQ850 £69;
LQ1050 £85; LQ2500 £195

Accessories
● EX800/1000 Colour Option £55
● EX800/1000 Colour Ribbon £18
● LQ2500 Colour Option £65

Epson Printer Interfaces
All these interfaces fit inside the printer.
RS232 £32 RS232 + 2K Buffer £52
IEEE 488 £40 RS232 + 8K Buffer £79
(Securicor Carriage on Printers £7)

RS-232 GENDER CHANGERS

Female to Female	£4.95
Male to Female	£4.95
Male to Male	£4.95
25 way Male to 9 way	£4.90
Female converter	£4.90

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
IBM PCs pair	—	£7.75
Brother HR15/20	£3.00	£5.00
DMP2000	£3.75	£4.75
EX/LQ800	£4.50	£4.50
EX/LQ1000	£7.50	£5.00
RX/FX80/85/800/MX80	£3.90	£4.95
RX/FX100/1000	£5.75	—
Kaga/Taxan KP810/815	£4.90	£4.00
LC10 (Black)	£4.25	£5.00
LQ500/800	£3.75	£5.00
LQ1050/LQ2500	£8.50	£5.50
LX80/86/800	£3.80	£4.50
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Panasonic KX1080/81	£4.00	£4.75
SQ2500	£23.00	£5.50
Star NL10	£3.75	£4.50

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Universal Printer Sharers/Changers

Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spaghetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments.)

Connects	Serial	Centronics
2 to 1	£20	£22
3 to 1	£27	£30
5 to 1	£36	£39

(Cables extra at £5 each. Please specify type required when ordering)

PRINTER LEADS

IBM Parallel lead 2 metres	£6
Double ended 36way Centronics lead 4'	£7
Double ended 36way Centronics lead 6'	£9
RS232 lead (various)	P.O.A.

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● 2,000 Sheets 9" x 11" Fanfold Paper	£12
● 1000 Sheets 9" x 11" NCR 2 Part Fanfold	£19
● 1,000 Sheets 15" x 11" Fanfold Paper	£9
● 1000 Sheets true A4 Fanfold Paper	£11
● 2000 Sheets true A4 Fanfold Paper	£19
● Teleprinter Roll (Econo paper)	£4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached.)

Carriage 1K Sheets £2.50. 2K Sheets £3.00

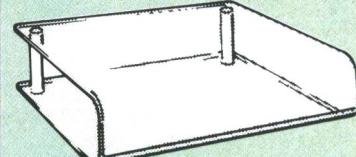
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£5.00
1,000 90 x 36mm (Twin Row)	£4.90
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

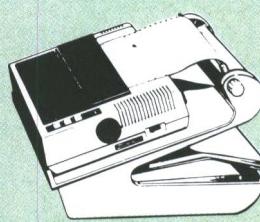
Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand. The printer sits on top and the fanfold paper rests neatly underneath, thus occupying the same space as the printer footprint.

Only: £16 (carr. £3)

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

80 Column version £23 (carr. £3.00)
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Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources which put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. A must for every computer user.

Protection for only £7.50

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SPIKES CLEANER UNIT

A 4 way mains distribution unit as above with a built-in Surge Arrester, providing protection for your complete computer system

£13.00 (carr. £1.50)

MEGABUFFER 256

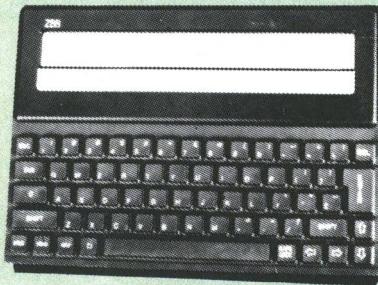


- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £149 (carr £5)

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The worlds first, truly portable Micro. It is A4 size, only an inch thick and weighs under 2lbs. Ideal for use when travelling or as a personal organiser.

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With every Z88 purchased from us this month, we are giving away absolutely FREE, 4 rechargeable batteries and a compact Mains Battery Charger.

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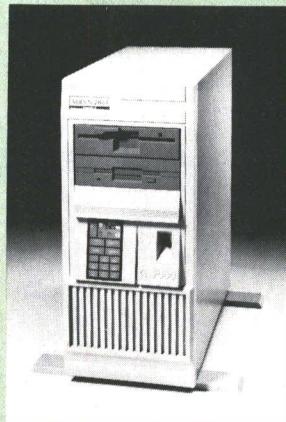
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Main Casing for PC XT	£59
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Aries NEAT 286

20MHz TOWER System



Aries NEAT 286 - 20MHz system with intelligent data protector (IDP). A compact tower super fast AT compatible, with switchable 16/20MHz CPU.

Features

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- Mini-tower chassis & case with 200W PSU
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Special introductory price £1995

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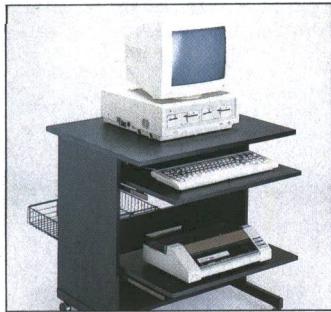
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Data Trolley was £69.00 now £62.10

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Locking 50+4 disk file provides covered storage for 50 5 1/4" diskettes, as well as a tier designed storage pocket in front for instant access up to four-in-use diskettes. Anti skid feet protect furniture and prevent slippage.

50+4 Disk Box was £15.63 now £12.27

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Orders can be in any combination of colours in packs of 10 diskettes. Each pack of diskettes comes complete with a set of coloured identification labels.

SPECIAL 10% OFF PRICES

	10	30	50
5 1/4" Bulk	£8.10	£7.29	£6.75
5 1/4" Plastic Case	£10.80	£9.90	£9.09
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BULK packed in plastic bags according to quantity ordered.
PLASTIC CASE supplied in plastic storage cases of 10 diskettes.

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Lexan Acrylic Anti-Glare Filter for PC 1512/1640

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The ultimate PC Housing System



Features:

- Attractive modern styling
- Rigid steel frame
- Scratch resistant surface
- Heavy duty castors

• Unique keyboard cable management

• Paper feed slots

• Built in lockable disk box

• Drawer mounted tidy tray

• Colour light grey

System Solver Desk was £149.95 now £134.96
(EXTENSION CABLES AVAILABLE - POA)

MOUSE PAD Was £4.95 now £4.46
MOUSE HOUSE Was £3.95 now £3.56

ACOUSTIC HOOD



At least 80% noise reduction

Moulded from extremely durable, high impact styrene, the hood will also protect your printer from dust and damage. The cover is transparent enabling you to check paper flow and print quality without opening the lid.

Available in two sizes to fit most printers.

Optional Stand for both 80 column and 132 column hoods provides storage for paper.

80 column hood	was £69.00	now £62.10
132 column hood	was £75.00	now £67.50
Stand for 80 column hood	was £21.00	now £18.90
Stand for 132 column hood	was £24.00	now £21.60

COPY HOLDER

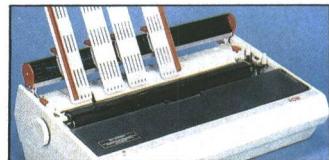
Universal Thingi copy holder was £6.99 now £6.29

SURGE PROTECTORS

Safeguard your Equipment from power surges/spikes

Plug	was £11.43	now £10.29
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MAXAFIT



is suitable for AMSTRAD PCW9512, DMP2000/3160/3250di and DMP 4000, LQ3500/5000di and most other PC printers.

MaxaFit will locate and align your cut sheet paper thereby saving you time and money. You can use ordinary cut sheet letterheads, memos, invoices, printed and quality papers for accurate printing.

MaxaFit is simple to use with paper guide arms that move smoothly and lock where required and the paper is fully supported to prevent sagging.

MaxaFit has simple fittings to permit speedy removal and replacement on your printer.

MaxaFit comes with a full set of operating instructions. If you have a non-Amstrad printer, please phone or write to check printer compatibility.

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ASSEMBLER VS. THE REST - A PROFESSIONAL REPLIES

A Smith (Mailbox, Feb PC PLUS) seems unable to understand why people bother to use high level languages. I have a degree in computer science, and worked for four years as an assembly language arcade game programmer plus another four writing business applications in high-level languages (Basic, Pascal and (ugh) Cobol), so perhaps I can comment.

Assembler programmers will spend hours writing short routines using the cleverest, tightest code to make the computer jump through hoops. However, ask them to write something that uses multiple disk files, double precision arithmetic or range checking for arrays and you'll soon find out their limitations. Unfortunately, the real world involves programming as rapidly and reliably as possible and in both of those areas assembly language falls flat on its face.

Lance Leventhal, the author of several reference books on assembly language programming, reckons that high level languages get programs written and debugged about ten times as fast as assembler. Of course the compiled code will be bigger and run (at best) twice as slow but this is not a major problem, as most business programs are tied to the speed of disk access or operator input.

In the life of a typical business program, more time is spent on maintenance than original writing. Trying to understand someone else's program is murder in any language, but assembler, with its endless source listings for routines which often do little more than print a few characters, is much harder than any half-decent high-level language. Portability is also a problem. If you wrote a program for a PCW and then had to move it on to a PC, which language would you prefer? In assembly you would have to totally rewrite it. Not so with the likes of Turbo Pascal which exists on both machines.

In my experience, Mr Smith's attitude is very common among those who write games. It is purely a matter of horses for courses. If you want small utility programs, arcade games etc then use assembly. For anything more complex, use a higher level language like Pascal or C.

David Bolton,
Blackpool

MAILBOX

This month an exponent of high-level programming answers last month's voucher winner, A. Smith, who claimed that low-level assembler was the only way to program, and a reader calls for more demonstration disks of commercial software.

Send your letters to Paul Stephens, PC PLUS Mailbox, 4, Queen St., Bath BA1 1EJ.

Personally I agree with you, although of course I'd defend to the death Mr. Smith's right to let the machine make him talk its language instead of vice versa, if that's what he really wants to do.

Mind you, every programmer has his or her prejudices. After many years in the business myself, I reckon that anyone who would willingly write a commercial application in Pascal, C or Cobol when they've got a dBase compiler to hand needs their head examined!

DEMONSTRATIVE

I wonder how many readers have found themselves in the same position as myself, knowing what I want to be able to do with my data, but not sure which piece of software I should buy. I read one review after another, scouring reports for the information I so desperately need. But at the end of the day, nothing can compete with a good demo of a program!

Come on, software manufacturers! Why not make demos available either through shareware companies, or directly through magazines? At the end of

the review you could have 'Demo Available through PC PLUS'. Not that there's anything wrong with a review or report of a product, it's just that the reader/customer should have the choice between reading about the product and seeing a demo.

As an example, I bought TurboCad. My main concern



CLASH OF VIEWS

I know from countless reviews of Word Processors in yours and other publications that their beauty is in the eye of the beholder. Nevertheless I do look for some consistent guidance from my favourite magazine. So in January I read the first part of Anne Swinfen's new series on using (among others) PC Type +. I was looking for a new WP so I proceeded to register my copy of the program.

What does February bring but a most comprehensive damning of PC-Type + by one of your reviewers: 'Frankly PC-Type + has had its day and there is little reason to bother with it now. ...take the massive spell-checker out of the argument and you aren't left with much.'

Is reviewer Roman Iwaschkin a bit of a crank? - or is the Swinfen series designed to boost Buttonware's declining

sales? I have no thought of being libellous, I am just puzzled and disappointed; to say nothing of £50 light!

Dr J H Chapman,
Oxford.

This is a case of relative vs. absolute values. Ask a reviewer from a car magazine about the current Ford Fiesta, which is due to be replaced this April, and he'd probably say something like 'Frankly it's had its day, with the latest generation of continental and Far Eastern challengers showing the flaws in the ageing Ford design' - yet in fact the Fiesta is a perfectly good little car which provides cheap, reliable motoring.

Likewise, PC Type + is a perfectly good, cheap word processor, and the fact that Roman Iwaschkin feels it's

been upstaged by the latest versions of its competitors doesn't detract from its basic fitness for its purpose.

The worst thing any software user can do is to worry about obsolescence - things move so fast that the program you buy today is almost certain to be 'obsolete' in a year, yet of course it will still be working exactly as well as the day you bought it.

There is such a thing as absolutely bad software, and when we come across it we try, as far as the lawyers will allow, to warn our readers to steer well clear of it. PC Type + isn't in this category - if it was, you can bet Ann Swinfen wouldn't be basing a series on it.

was how good the dimensioning facility was. Now, without the reviewer going into great detail about this aspect, there is no way of knowing how suitable it is. I took the risk and was glad I did, because the program is excellent and did exactly what I needed.

But why should I have to risk 70 quid to discover how suitable a program is? Only the customer can decide for him or herself whether a program will do what they want.

While I understand that there are demos around, I have only seen them on cover disks of magazines, and one advertised for an accounting package. How about a new market in 'Demoware', so we can get hold of them when we want? *D. Hodgkinson, Twickenham.*

Demonstration disks of commercial software are actually a bit more common than you seem to have found them. However I'm not sure that demos are such a perfect solution to the question of software evaluation.

The problem with demos is that if they're comprehensive enough to let you explore every facet of the program, then by definition they amount to almost giving the program away.

One way to get a very good demo indeed is to go into a software dealer and ask for one, since if they're a good dealer they will have a real working copy available. This is also an excellent way of finding out how much the dealer knows about the product, and therefore what sort of support you're likely to get if you need help. If you just want information on a specific point, then a phone call will also give you an indication.

But the best demo

system of all already exists – good old shareware, of course. In many cases you get the complete program, plus some documentation on the disk to help you check it out, which could hardly be fairer. Now if enough people were to treat shareware as demo software, and send in their registration fees when they decided to use the programs, then perhaps the idea would really take off...

HIGH STANDARDS

As a professional programmer, one of the things that I attempt to do through my work is to promote a greater understanding of computers and Computer Science. I was therefore interested in the articles by Dr Ann Swinfen on programming in Pascal, but somewhat saddened to see the style of the accompanying program examples.

The layout used reminded me of that used by some of the early BASIC programmers. The first thing any new computer student should be taught is how to lay out a program in a readable fashion, that is with sufficient indentation and comments to show the structure of the program, and hence increase its maintainability.

If you are trying to teach people through a medium such as a magazine, then you must take responsibility for the style employed. This world does not lack programmers. It does however lack good ones. *S Willcock, Stockport*

Our apologies to Ann Swinfen over this one. We often have trouble fitting program listings into our layouts (we don't want our pages to look like sheets of computer print-out!), and the first casualties of the



● Darren M Carter - on the map, for this month's Gem Gallery.

design process tend to be indentation and comments which Ann included in her original text.

Having said that, I didn't think they looked too bad – there are some programmers who have something approaching a fetish about acres of white space, and putting every little sub-clause on a separate line, and commenting every little burp and squeak in the program. The result is often the 'wood for the trees' syndrome of massive source listings with a program hidden in there somewhere. Moderation in all things!

NORTON - THE DOCTOR REPLIES

With reference to 'Norton Bites Back' (Mailbox, Jan 89), and my use of the term 'Nortoned' to describe a disk which has been trashed by a disk speedup program, I think I should point out that a data recovery business such as mine gets extra business when programs trash hard disks. So in pointing out the dangers of disk speedup programs I am if anything working against my own financial interests.

Obviously, 99.99 percent of the times you run a disk defragmenter, it will work – if it failed as often as once in 100 times, there would be an outcry. But I tend to see the other 0.01 percent of cases, and I feel it only right to warn people of the dangers.

At a recent user group meeting there were 120 people present, and I asked how many

had had a disk partially or completely trashed by a disk defragmenter.

There were three: one by Norton, one by Mace and one by PC-Tools. Can I ask for readers to speak out if they have experienced this problem? I think that PC users need to know.

Dr. Alan Solomon, S & S Enterprises,

MAILBOX

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MUSIC MAKER

The Musical Instrument Digital Interface (MIDI) standard is revolutionising the way music is played, composed, and listened to. Steve Cooke introduces us to how it all works

MIDI has evolved from a proposal made in 1981 by synthesiser-manufacturers Sequential Circuits for a 'Universal Synthesiser Interface'. The company were concerned that the advent of digital synthesisers, as opposed to the earlier analogue models, required a new form of external control signal to replace the older control voltage systems.

The MIDI system was developed in response to this need during 1981/82 and apart from some minor changes has altered very little since. The reason for this robustness is simply that MIDI, although it may not be ideal in certain respects, does at least offer the possibility of encapsulating in digital form almost all the nuances, player dynamics, and musical form of a live performance. Furthermore, the MIDI system is remarkably simple considering the task it accomplishes. That doesn't mean that you won't encounter difficulties in using it, since manufacturers of musical equipment just love to make the MIDI implementations on their kit as obscure, undocumented, and as idiosyncratic as possible. This article should, however, give you enough inside information to help you get started.

WHAT IS IT?

If you're familiar with the principle of controlling your serial printer using Escape codes, then MIDI should be a piece of cake. The system revolves round a simple serial connection made between your PC's MIDI interface and a MIDI-equipped musical interface using a straightforward 5-pin din plug and connecting cable – just like hooking up your Epson or modem.

The difference is that the interface operates at a very high speed of 31.25k Baud (i.e. over 30,000 bits of information per second). Every unit of information transmitted is recognised by the receiving device by its bit pattern. For example, two bytes valued at 243 decimal and 45 decimal would, if sent consecutively, instruct a synthesiser to select song number 45 from its internal memory.

Because this is a two-way interface, you can transmit from your computer to a MIDI instrument or vice versa, from one instrument to another, or even from one instrument/computer to many others simultaneously. You can do this both by splitting the signal and also by using MIDI's sixteen 'channels'.

These sixteen channels can each transmit information completely independently of each other and MIDI equipment can usually be programmed to respond to/send information on a specific channel or channels. This means that a single MIDI source – a musical composition program, for example – can send different signals to several MIDI instruments simultaneously, enabling you to conduct a one-man band in your attic. At the same time you can keep all these instruments in tune, in time, and under control.

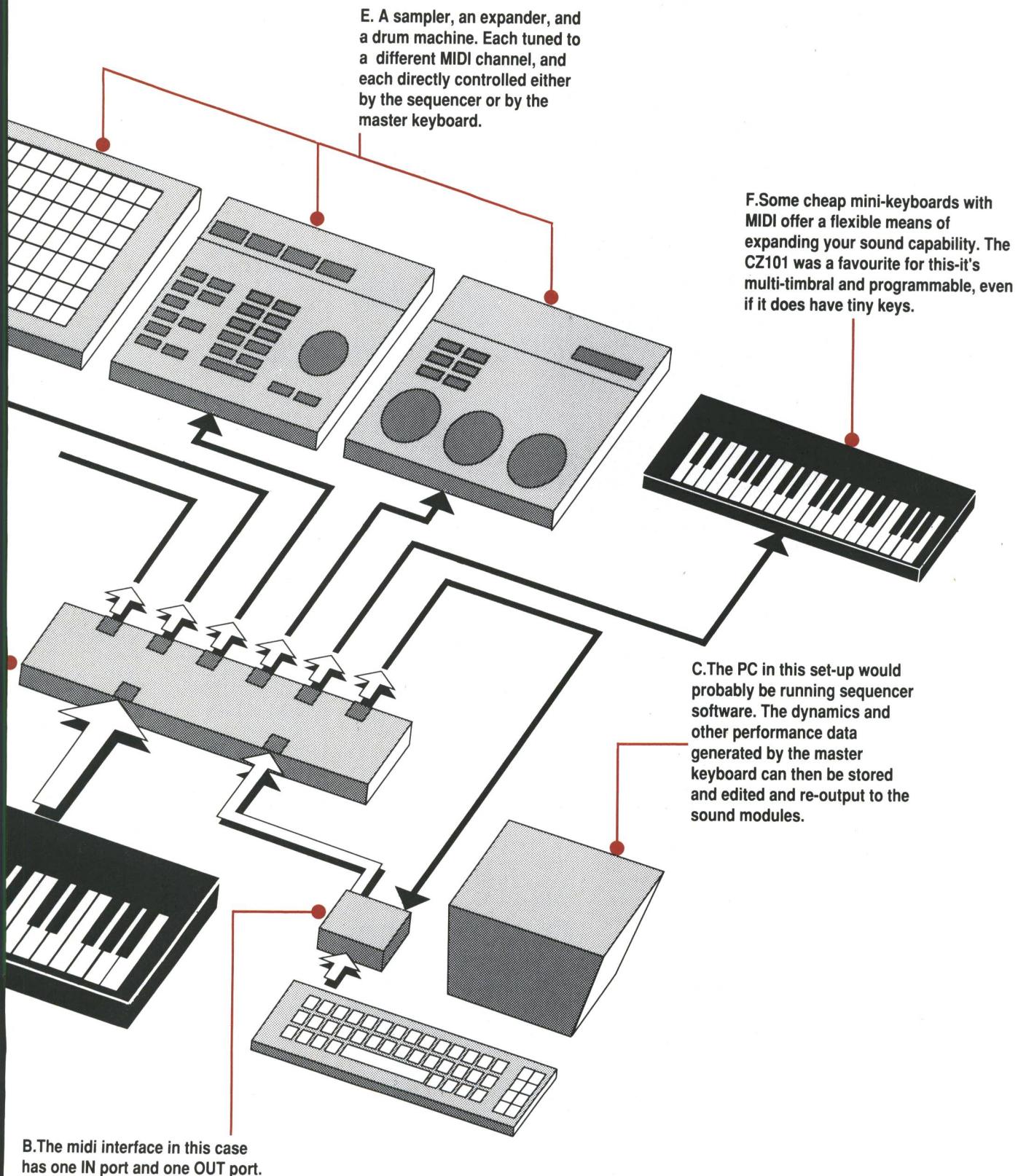
● A typical PC MIDI network.

How you connect up your network depends on the role you wish each instrument to play. Here you have a dedicated MIDI controller keyboard for programming four MIDI instruments in conjunction with a PC running the appropriate software.

D. A MIDI patchbay enables you to split the signal and control several instruments at once. Note that many instruments have a MIDI THRU port which outputs an exact copy of data received at the instrument's MIDI IN port. You can therefore daisy-chain instruments together using their THRU ports rather than use a patchbay, but you then run the risk of incurring MIDI 'delay' (see note). Some (more expensive) patchbays offer programmability and may combine other functions (e.g. processing the data that goes through them, perhaps to eliminate all pitch bend data if your sound modules can't respond to it and it is therefore clogging up the system).



A. Why buy lots of expensive MIDI keyboards when you can buy just one master controller keyboard and link it up to a series of expanders. Most synths these days are available in expander form (i.e. without the keyboard). The only drawback is that dedicated controller keyboards are rather expensive (Cheetah's products excepted).



You can even keep them out of tune and out of time – a useful facility for advanced MIDI musicians who want to break away from the inhuman accuracy of sequenced music.

At this point some people get confused by the apparent parallelism of this serial standard. How can you send 16 channels simultaneously along a 5-pin serial connection?! The answer is that

the parallelism is only apparent – the high speed of the serial interface means that, from the player's point of view, 16 instruments receiving 16 sequential commands will

appear to be responding simultaneously.

MIIDI UNMASKED

What sort of data is transmitted/received by MIDI instruments and what form does it take? Here goes for a complete breakdown of the bits and bytes...

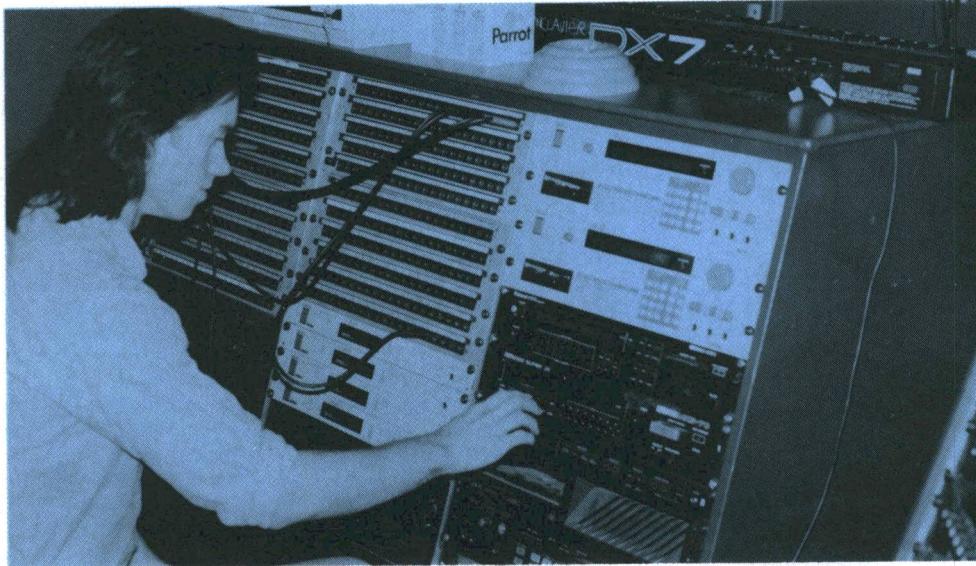
First, the string of bytes that flows between instruments can be broken down into two types: STATUS bytes and DATA bytes. The status bytes issue commands to the instrument and the DATA bytes provide any necessary additional...data, of course. For example, to play middle C on your keyboard, you would first transmit from your computer the status byte for NOTE ON, followed by a single data byte indicating which note was to be played.

Alternatively, pressing down on middle C on your keyboard would send the same data to your computer, which could of course store it in memory as two bytes, ready for processing by a sequencer, editor, or other MIDI software package.

Getting down to the nitty gritty, a MIDI instrument can distinguish between status bytes and data bytes by checking the seventh bit of each byte received. Any byte with bit seven set to one is a status byte. If its seventh bit is zero, it's a data byte. Binary magicians will immediately recognise that all status bytes, having the format 1xxxxxx, will reside in the range 128-255 and all data bytes, having the format 0xxxxxx, will be stuck in the range 0-127.

Typical status commands are note on, note off, key pressure (aftertouch), timing clock signals, and so on. At this stage, things get a teensy-weensy bit more complicated. Here goes...

First, it stands to reason that any packet of information may be destined either for all the instruments on your MIDI network, or for just those receiving on a particular channel. For example, suppose you've got a synthesiser and a drum machine hooked up to your PC and have written a great 4-part masterpiece. The synthesiser is 'polyphonic' (i.e. it can play more than one note at once) and is capable of responding to data sent on channels 1 to 3. You have very decently written your synthesiser parts on these



● **SAVING THE DYNAMICS** - MIDI is often accused of 'dehumanising' music by reducing it to numbers and enabling musicians to produce mechanically accurate performances. At Animal House studios they've discovered that by using SMPTE (see note opposite) to combine digital and analogue techniques, they can actually improve the final product in both musical and recording terms. One major benefit is that they can use MIDI to capture the dynamics of a performance and then apply that expression to different musical outlets.

HUM THAT HIT!

MIDI has caused a revolution in the music business, as Clive Mitten of Animal House recording studios can prove with a successful company that provides back-up for the stars, using Atari ST computers and MIDI systems. The big problem for musicians when producing records is not so much their performance, but the sound of the finished product. Getting the final mix just right depends on a whole range of dynamics and, if,

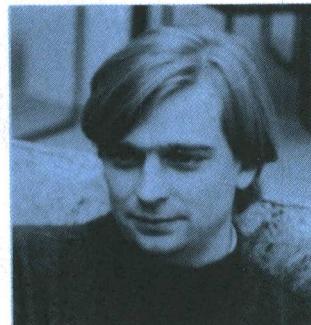
the end of the day, you find the guitar doesn't quite blend with the bass, you have no alternative but to locate a different instrument and reassemble all the musicians once again.

Because of the way MIDI stores the dynamics of a player's performance, musicians no longer need to do spend days in the studio (and thousands of pounds) doing endless replays. They can now store a single performance dynamic and – in the Animal House – choose from over 6000 sound-sources and waveforms held on disk.

The key to getting everything just right lies not only with the editing of MIDI data, but also with the use of SMPTE (see facing page), allowing you to sync analogue magnetic tape with digital MIDI data. In this way, certain elements of performance that do not lend themselves well to digitisation (e.g. the expression of a saxophone player) can still be recorded using traditional analogue techniques and then blended in during the final mix.

This means that producing a single for commercial

release can now take as little as three days and cost around £1000. Musicians can prepare MIDI data files before coming to the studio to save time and cost or, going to the other extreme, turn up at the studio with a tune in their head and no instrument or supporting musicians. 'There's a very famous musician,' says Mitten, revealing no names, 'who made his first big hit in this studio. He turned up one day, hummed a tune, and five days later walked out with a hit record.' Now THAT's the MIDI revolution! ●



● **Saving Grace** - Animal House recording studio boss Clive Mitten: MIDI's editing and sequencing facilities enable him to put together a single for under £1000

channels and it's raring to go. Your drum machine is all agog on channel 4, however. Both instruments are waiting to make whatever beastly noise you have concocted.

To cope with this situation, MIDI status commands are divided into SYSTEM messages and CHANNEL messages. System messages are responded to by all instruments on the network, and in this case we get the ball rolling by sending a system message for START. Channel messages, on the other hand, are each tagged with the identifying channel number and will therefore be responded to only by those instruments appropriately programmed.

These two forms of status byte are distinguished by their 'nybble' pattern. A byte, remember, is eight bits, comprising of two four-bit nybbles. A status channel byte identifies the relevant channel in its least significant nybble (bits 0-3). This nybble will therefore carry a value between 0 and 15 and the structure of a typical status channel command is shown in diagram 1.

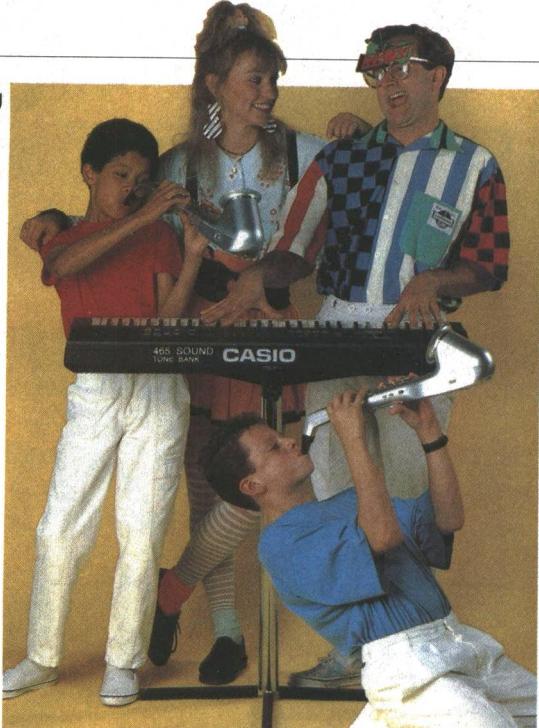
A status system command has its MOST significant nybble set to 1111, which means the value of the byte will fall between 240 and 255. See diagram 2 for a typical status system command. Thus by scanning the most significant nybble of any status byte received, a MIDI instrument knows immediately whether to (a) respond to it, because it's a system message with 1111 in bits 4-7 or (b) check the least significant nybble for the channel number and only respond if it is programmed to respond to that channel. System messages are rather more complex than their channel counterparts and we need to make a further sub-division of categories. The reason is that system messages may be required to do one of three jobs. They may deliver a simple command to the system to, for example, select a song number, or they may need to INTERRUPT other commands to send an urgent message – perhaps sending a clock pulse to keep everything in sync.

To do this, there are a special set of REAL TIME system messages, which fall in the range 248-255 and are therefore distinguished by having their 4th bit set to 1. If you were sending a NOTE ON channel message to a synthesiser, you could interrupt this in the middle with a clock pulse and the instrument would note it and then carry on processing the channel command.

Finally, in the system command department, MIDI allows you to issue manufacturer-specific commands to instruments. This you can send a special command to your Yamaha synthesiser to make it ring one of its special Yamaha bells or blow one of its special Yamaha whistles. In this case the first data byte following the SYSTEM EXCLUSIVE status command (11110000) contains a special ID number for the manufacturer concerned and the synthesiser will process succeeding data bytes accordingly until it spots one with the seventh bit set to 1 and therefore recognises it as a new status command (although there is an END OF SYSTEM EXCLUSIVE command if you want it). Every MIDI manufacturer gets their own ID and they program their instruments to keep a look out for it.

MIDI MODES

So far we've discussed the nature of MIDI data as it is transmitted and received. One of the most complicated bits of MIDI are the so-called MIDI modes, which determine how an instrument actually behaves when using the system.



These modes are designed to enable instruments of different types to make the best use of the MIDI system. For example, you may have a synthesiser that offers multitudinous (making several different SOUNDS simultaneously) as opposed to being just polyphonic (playing several different notes simultaneously).

There are four MIDI modes and their significance depends on whether the instrument in question is transmitting or receiving. The MIDI implementation of your instrument largely depends on which

modes it can operate in – some cheaper or older instruments, for example, can operate in one mode only. Check out diagram three for more details.

WHAT GOES IN...

...must come out – and that brings us to discuss the nature of the commands issued by MIDI. You can see how they are transmitted, but what do they do?

For a full MIDI specification, you can refer to diagram four, which lists the various MIDI codes and their functions. However, in general we can make some generalisations about MIDI data which help you to understand the power of the system and its possible application.

First, the control change information uses the format 1011Z, 0YYYYYYY, 0XXXXXXX where Z is the channel number as normal, Y is the controller number, and X is a value. This allows you to specify pitch bend and other (largely unspecified) performance categories. Combine this potential with the other codes and you can store very complete specifications for any musical performance.

Secondly, the growing number of polyphonic synthesiser which offer multitrackability (the ability to play several different SOUNDS, as opposed to just notes) simultaneously means that you can use the different channels to build complex layers of sound. A typical example of this is Roland's MT32 which offers,

with simple sounds, astonishing 32-note multitrackability and lesser degrees of flexibility as you build up more complex patterns from the 'partials' or basic sound building blocks.

Therefore, using MIDI, you can control, edit, store, and generate highly complex musical performances. It is truly a musical revolution and exploring its possibilities can bring the computer user enormous satisfaction. Go for it! ●

● ALL SYSTEMS GO

Here it is in brief...MIDI data is divided into STATUS bytes and DATA bytes; the former are distinguished from the latter by having their MSB (bit 7) set to 1.

Status bytes are divided into CHANNEL commands and SYSTEM commands. The latter are distinguished by having bits 4-7 set to 1 (i.e. 1111xxxx) and the latter use bits 0-3 to indicate the channel number.

System commands are further divided into straightforward system commands and REAL TIME commands. The latter are distinguished by having bit 4 set to one (11111XXX), falling in the range 248-255.

● SMPTE

Using SMPTE – the TV/film soundtrack synchronisation standard – MIDI can be linked to a taped sound source. In this way you can combine digital accuracy with analogue recording and reproduction. This offers tremendous benefits where certain instruments which are not ideal for digital processing (saxophones, for example) are required. What's more, it's a good way of synchronising to video in the current trend towards mingling sight and sound in rock videos.

● MIDI DELAY

Despite the high speed of the MIDI standard, it is possible to suffer from the dreaded MIDI delay when using many instruments connected together using their MIDI through ports. Data leaves the host instrument, enters the first, leaves via the Through port and enters the second...and so on until, on reaching the Nth, it has accumulated an audible delay. This is overcome by splitting the signal leaving the host using a MIDI 'patchbay' and thus sending the signal simultaneously to as many instruments as possible.

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- LCD Display & Turbo Switches on Front Panel.
- Memory Expandable to 16 Megabytes
- Optimized for OS/2 and ZENIX OS
- Keylock for Front Panel for added security

Specifications (All Fitted as Standard)

- AT Tower Case with 220W Power Supply
- 2 Mb RAM on Motherboard
- 1 x 1.2Mb 5.25" + 1 x 1.44Mb 3.5" Floppy Drives
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- Western Digital Controller
- I/O Card (1 Parallel, 1 Serial, 1 Optional Serial & 1 Game)
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OPTIONS & PRICES

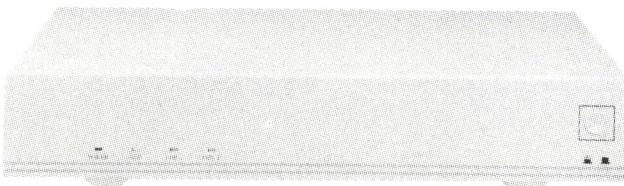
	MONO	EGA	VGA
RSC 386T 40Mb HARD DISK	£2229	£2379	£2479
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RSC XT Diskless Terminal Specifications:

CPU:	10 MHz 8086-1 CPU (8087 Co-processor option)
MEMORY:	640k DRAM on board
SYSTEM INTERFACE:	1 RS232 serial interface and 1 parallel
SLOTS:	3x 8 bit expansion slots. NOTE: two of these are used for Display and LAN cards.
DISPLAY INTERFACE:	Mono & Hercules compatible.
KEYBOARD:	102 Key Keyboard included.
BOOTROM:	8k Boot ROM space for diskless operation
DIMENSIONS:	41 (Wide) x 37.5 (Long) x 7 (High) – CM's
RSC XT D/L Terminal	£395.00

RSC – AT Diskless Terminal Specifications:

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MEMORY:	640k RAM on Motherboard (Option of 4Mb on Motherboard using 1Mb DRAM chips)
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SPEED:	12MHz 1 wait state.
SLOTS:	One 16 bit and Two 8 bit expansion slots. NOTE: Two of these are used for Display and LAN cards.
DISPLAY INTERFACE:	102 Key Keyboard included.
KEYBOARD:	MGA, Hercules compatible.
BOOTROM:	8K Boot ROM space for diskless operation
DIMENSIONS:	41 (Wide) x 37.5 (Long) x 7 (High) – CM's
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PCW 9512

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PC1640 DD/CD Colour + 32Mb Card £895.00
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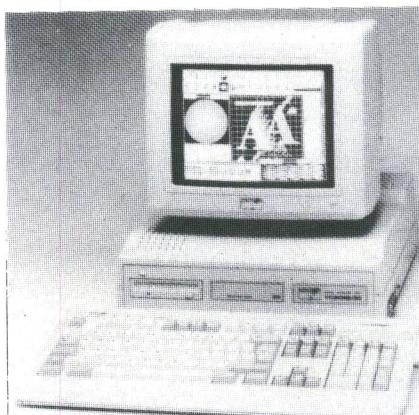
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- 30Mb Hard Disk option

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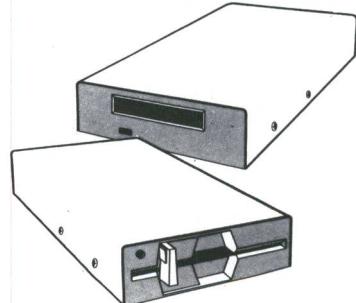
SD=Single Drive DD=Double Drive HD=Hard Disk All Systems Come with Monitors. 12MD=12" Mono Display 14CD=14" Colour Display HRCD= High Resolution Colour Display.



RSC's OWN COMBINATIONS (inc Western Digital Hard Cards)

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Epson PCe 20Mb

Epson PCe 20Mb (No Monitor & No Card)

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- OS/2 Compatible
- EGA Adaptor

Epson PC AX2 20Mb H/D (No Monitor)

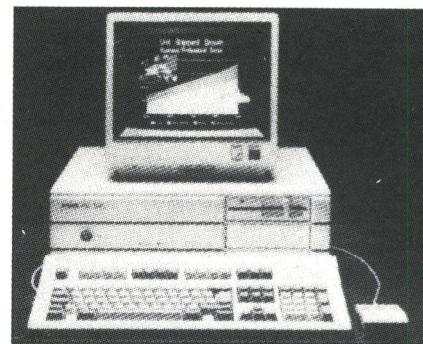
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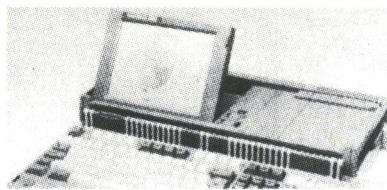
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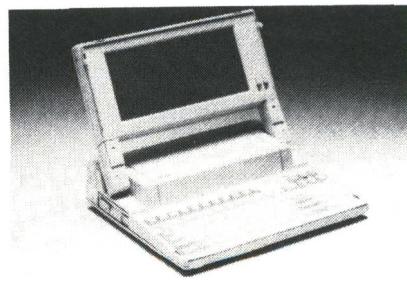
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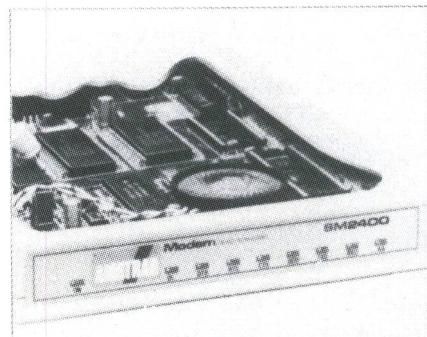
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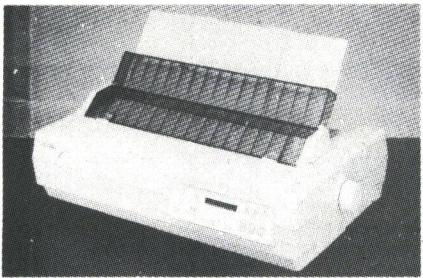
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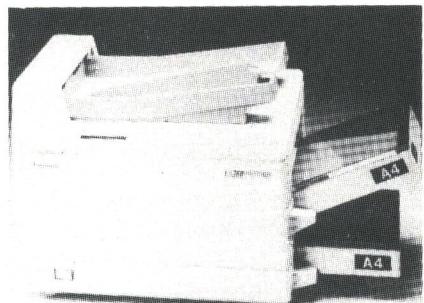
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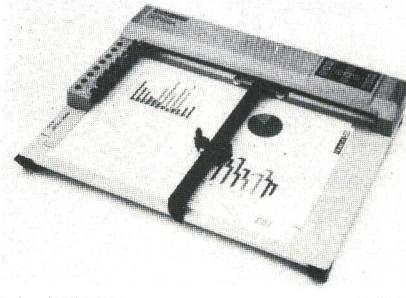
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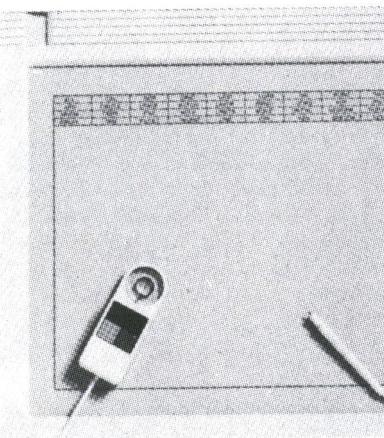
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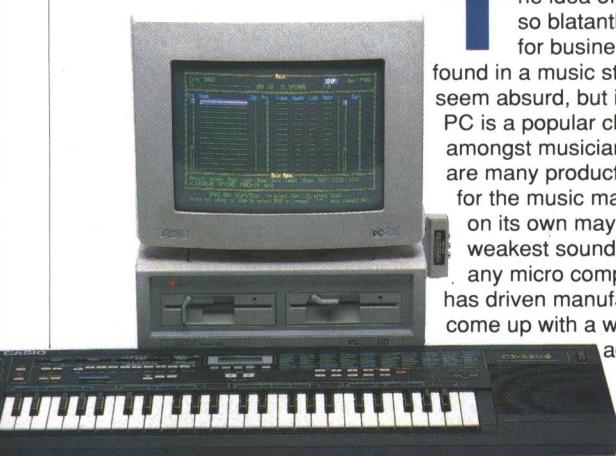


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MIDI ROUNDUP

Turn your PC into a powerful music computer – Matt Nicholson looks at what's important and what's not when it comes to MIDI



• The basic MIDI kit: as tested by PC PLUS: Amstrad PC, Voyetra interface and Casio Keyboard.

The idea of a computer so blatantly designed for business being found in a music studio may seem absurd, but in America the PC is a popular choice amongst musicians and there are many products available for the music maker. The PC on its own may have the weakest sound facilities of any micro computer, but this has driven manufacturers to come up with a whole range of add-ons, and one thing the PC is

particularly good at handling is add-ons.

Before the PC, or indeed any computer, can take part in a MIDI performance it requires a set of MIDI input and output sockets. The only micro to have these built in is the Atari ST, so they have to be added to the PC with a MIDI interface expansion card, slotting into the PC's expansion bus in the usual way.

There isn't really much to choose between most MIDI cards; they either do the job or they don't. However in 1984 the Roland Corporation, a major manufacturer of MIDI compatible musical instruments, produced a MIDI interface for the PC called the MPU-401. This differed from most such interfaces in being 'intelligent', and was largely responsible for turning the PC into a serious music computer.

INTELLIGENT INTERFACING

The MIDI signal is highly complex, requiring large amounts of data to be transmitted and received at high speed so the interface has really got its work cut out. Any delay shows up as timing problems in the music itself, and good time keeping is vital in any musical performance.

With a passive MIDI interface most of this is looked after by the PC itself. However the PC has a lot of other things to do besides look after the MIDI interface. A passive interface can easily start having timing problems if the MIDI system makes too heavy a demand on it.

Roland's MPU-401 has its own microprocessor on board, leaving the PC free to keep its own house in order. The result is a much more robust system that does not suffer from timing problems even with complex MIDI data. It also puts the PC at an advantage even over the Atari ST, as the ST's MIDI interface is passive, calling on the micro's main processor for all its operations.

When Roland released the MPU-401 it also made programmers' documentation easily available. As a result the MPU-401 became a standard, and most of the more powerful packages are written to its interface. It is also easy to program to the interface as it packs much of the low-level time-dependent routines into its onboard ROM. Passive interfaces require fast routines written in C or assembler if they are to overcome timing problems.

However MPU-compatible MIDI interfaces do tend to be more expensive. The original is well over £200, but these days compatibles exist for much less. Passive interfaces are cheaper, and often come with software that may satisfy your needs. Also, a programmer talks more directly to MIDI with a passive interface.

PUBLISHING AND NOTATION

Make & package	Price inc VAT	Texture	Sequencer Plus	Master Tracks	MIDI	IBM Card	9-pin matrix	24-pin matrix	HPlaser	Postscript	TIFF	EPSF	Comments
Dr T The Copyist MkI	£80	●	●	●	—	—	●	●	—	—	—	—	5 pages/score.
The Copyist MkII	£199	●	●	●	—	—	●	●	●	—	—	—	50 pages/score.
The Copyist MkIII	£299	●	●	●	—	—	●	●	●	●	●	●	100 pages/score, includes Adobe Sonata font.
Basic Composer	£50	—	—	—	—	—	●	●	—	—	—	—	Basic system from MCMXCIX or CMS.
Songwrite IV	£87	—	—	—	●	—	●	●	—	—	—	—	Available from CMS.
Passport Score	£795	—	—	—	●	●	●	●	—	●	●	●	
Songwrite Plus	£79	—	—	—	●	—	●	●	—	—	—	—	
Composer Card.	£110	—	—	—	●	●	●	●	—	—	—	—	For the IBM Music Feature Available from CMS
Personal Composer System/2	£425	—	●	—	●	●	●	—	—	●	●	●	Adobe Sonata font extra, only draft mode 9-pin.
K-Minstrel Kuma's	£30	—	—	—	●	—	Requires GEM drivers for output				Operates under GEM – see Sequencer tables.		
Windsong	£199	—	—	—	●	●	Requires Window drivers				See Sequencer tables		

SYNCHRONICITY

As well as the straight MIDI In and Out sockets, interfaces can provide sockets allowing the MIDI network to synchronise with timing signals from other systems like audio tape, film or video.

There are two basic types of timing signal: those that simply allow another system to lock onto the same rhythm; and those that include information about the position in the piece as well – how many minutes and seconds have passed since the start, say. The

STARTING OUT

There are one or two 'introductory kits' available to the intrepid MIDI explorer, so we duly linked up the Voyetra PC/Musicpak to a Casio CZ230S and an Amstrad PC1512, and jumped in.

The PC/Musicpak is available from Computer Music Systems on 01-977 4546 and comes with the V4001 interface and Sequencer Plus MkI software for £207. The CZ230S is a four-voice multi-timbral MIDI keyboard with built in rhythm generator at a price of £345, bringing the whole system up to £552 – almost the price of the 1512!

Plugging in the expansion card and setting up the software is fairly straight forward, despite some pretty brutal copy protection. Sequencer Plus MkI is still very powerful, despite being bottom of the Voyetra range, but thankfully it is reasonably easy to use once you have got used to some of the slightly odd key sequences. Notes are depicted as bars on a grid, with pitch, start

point and length being changed by manipulating their representation directly on screen. More complex details such as velocity, and the editing of MIDI events, is carried out more conventionally by filling out appropriate forms.

It rapidly becomes obvious that the limitation of this system is the keyboard. Not that the CZ230S is poor value, it's just that only four voices with no control of volume is not really sufficient. Nevertheless the CZ230S is capable of emulating a wide range of sounds very effectively, and comes with a very versatile drum sequencer of its own that can be synchronised to the MIDI clock.

The PC/Musicpak is undoubtedly a good starter kit that will serve long after you have outgrown a low-cost keyboard. The CZ230S is certainly good value, but you would soon be hankering after more voices and touch sensitivity.

MIDI system itself provides timing pulses and uses MIDI Song Position Pointers (SPP) to convey how many 16ths of a note have passed since the start of the piece. MIDI SPP is supported by the software and does not require special hardware.

FSK sync (Frequency Shift Keying) is frequently used to synchronise to a tape deck. This uses series of audio tones rather than pulses, which can easily be recorded onto a spare track of a multi-track tape recorder. Both the Roland MPU-401 and two of the Voyetra interfaces provide FSK in and out, although separate converter boxes can be bought that do the same job.

There are more complex systems (such as SMPTE) but these are well beyond the needs and pockets of most amateurs. The MIDI SPP system is probably enough for most needs, with FSK sync if you want to synchronise to a tape deck.

Some interfaces have a separate metronome output, usually producing a simple click that can be routed to an amplifier or a spare channel on the desk. The Roland MPU-401 actually has a built in metronome speaker. A metronome is handy, but you can always use a spare MIDI channel to generate one.

Some MIDI interfaces also boast two MIDI out sockets, the second really being a MIDI Through socket. This can be

● READ ALLABOUT IT

Probably the best book written about MIDI from the computer owner's point of view is surprisingly called 'MIDI for Musicians'. It is by Craig Anderton and costs £9.95 from Amesco Publications on (0284) 702600.

There are also a number of magazines worth looking out for. 'Music Technology', 'Sound on Sound' and 'Keyboard US' are to be found in many of the larger high street newsagents and frequently cover MIDI techniques and equipment.

● PAN PIPES

For those into comms there is PAN, the Performing Artists Network. Like most good things comms it is American, so write to PAN, PO Box 162, Skippack, PA 19474, USA or phone 0101-215 584 0300 (voice line).

If you can't afford long distance there is Route 66 on CIX. Computer Music Systems runs a small area within it.

● LOW RENT

If you fancy trying out some of these instruments before committing yourself, Audio Rents can rent you a Yamaha DX7 for £25 a day, a Roland D50 for £50 a day, or a Casio CZ101 for just £15 a day. They will even lend you an Olivetti M21 portable PC for £25 a day!

SEQUENCER SOFTWARE

Make and package	Price Inc VAT	No. of tracks	Notes in 640K	PPQN	Interface supported	Quantisation	Comments
Voyetra Sequencer Plus MkI	£97	16	60,000	96/192	MPU	Adjustable	See panel elsewhere
Voyetra Sequencer Plus MkII	£228	32	60,000	96/192	MPU	Adjustable	
Voyetra Sequencer Plus MkIII	£368	64	60,000	96/192	MPU	Adjustable	
Windsong	£199	16	–	–	MPU	●	Offers DMP features and runs under Windows. Available from CMS.
Passport Master Tracks Pro	£285	64	–	240	MPU	●	Supports MIDI File Standard. Being re-written to run under Windows.
Personal Composer System/2	£425	32	–	120	MPU	●	Integrated system, supports IBM Music IBM Feature Card. Available from CMS.
Cakewalk	£175	256	–	120	MPU	●	Powerful system from Twelve Tone Systems.
Magnetic Music Texture 2.5	£130	24	72,000	48/192	MPU	●	Available from MCMXCIX. Uses mouse.
Playrec	£80	16	–	–	IBM	–	Designed for use with IBM Music Feature Card.
Kuma's K-Minstrel	£30	16	3,200	–	Kuma	–	Runs under GEM providing DMP features, chords only works with Kuma Interface.
DHCP	free	16	–	–	DHCP	–	Comes with Alphatonics's interface.

MIDI INSTRUMENTS

No matter how powerful or expensive your computer software, the sound you produce is ultimately limited by the musical instruments themselves. There is a huge range of MIDI compatible instruments around, ranging from straightforward synthesiser keyboards through drum machines to MIDI guitars and woodwind. If you are not trained on a particular instrument it is probably best to start with a keyboard synthesiser.

The most important thing about a MIDI instrument is that it be Multi-timbral as well as Polyphonic. Polyphonic means the ability to play more than one note at a time – chords in other words. Multi-timbral means the ability to play more than one voice at a time – the ability to reproduce the sound of a saxophone at the same time as the bass drum, for example. Eight voice operation is preferable, although four will do if you are on a budget; but without this ability your MIDI compositions will be limited to the sound of a single instrument.

Some instruments provide individual outputs for each voice. This is very useful if you have further effects units that you want to apply to just one voice, or for panning across a stereo stage with a separate sound mixer.

Spending more gets you an instrument that can transmit and respond to velocity and aftertouch information. The velocity of a note is determined by how fast you press the key, and is

usually used to determine the volume of the sound. Aftertouch is the pressure with which the key is held down, and can be used to control any number of effects. Velocity and aftertouch sensitive instruments let you add subtlety and nuance to your music.

Most instruments provide a large number of preset musical sounds and sound effects. Some also provide for the downloading of additional voices, either from cartridge, from disk, or from your PC through the MIDI input.

At the top of the range are a number of luxury features, such as randomly changing the pitch of each note by a minute amount to give a more natural effect; or bending loud notes up in pitch to emulate a wind instrument. As usual you get what you pay for. Personal computers were not originally conceived as part of a MIDI system, so many synthesiser keyboards come with their own built-in sequencer. This is largely superfluous if you are using your PC as a controller, but means you have to be careful reading the instruments specification.

Amongst the cheapest multi-timbral MIDI keyboards available are those from Casio with the CT640, for example, coming in at £299. Yamaha have the highly rated PSS680 at £249 which can provide eight-part multi-timbral sound. If you want velocity and pressure sensitivity there is the Kawai K1 at just under £600, while an industry standard like the Roland D-50 or the Yamaha DX7 will set you back £1455 and £1699 respectively.

useful in a complex network, but expansion boxes giving up to four extra MIDI outputs cost only £10 or £20.

THE SOFT MACHINE

Once your PC has got its MIDI interface you are going to need some software, and here the benefits of an MPU compatible interface become clear: by far the majority of good quality MIDI software is written to the MPU standard. That is not to say that all non-MPU software is rubbish; however most recent development work has gone into MPU software, and will continue to do so – particularly in the States where, inevitably, most of the software comes from.

MIDI software falls into three basic categories: sequencers, voice editors and DMP systems (Desktop Music Publishing). Some packages, such as *Personal Composer System/2*, integrate more than one function – just as in the business market.

SEQUENCERS

A sequencer package essentially uses the computer's storage capacity to store and replay the many MIDI events that make up a performance, taking over the role of the multi-track tape deck in a recording studio. Details of each note's pitch, length and velocity (the speed at which the note was struck – its volume, in other words) are read through the MIDI In port to be stored, manipulated or played back. Other MIDI events such as program changes, pitch bend information and so on can also be recorded.

Just like a multi-track tape deck a sequencer can record on 16, 32 or even 64 tracks, and play back any combination while you record other tracks. And like on a tape recorder you can 'punch in' to a track to correct mistakes. The number of tracks relates very much to price, but 16 is more than enough to drive a mid-priced multi-timbral keyboard, for example. The number of notes a system can store is often quoted too, but again this is unlikely to be a limitation; particularly if you record your symphony on audio tape and don't mind using splicing tape.

The timing accuracy of the system is quite important, and is usually quoted in Pulses Per Quarter-Note (PPQN). However, this is unlikely to be a problem on all but the cheapest of software.

The ability to manipulate



One of the most popular MIDI instruments is the straightforward synthesizer keyboard. Above are two examples from opposite ends of the price range: Left, the Roland D-50, one of the most expensive models and Right, the Casio 640 from the more affordable end of the market.

VOICE EDITING SOFTWARE

Make & package	Price Inc VAT	Synthesizers supported	Graphic Display	Memory resident	Comments
Dr T Voice Editors	£99	Casio CZ, Kawai K3 Roland D50 and MT32 Yamaha DX and TX Ensoniq Mirage	–	–	
Bacchus DX7 Editor	£99	Yamaha DX7	●	●	
Bacchus TX81Z Graphic Editor	£175	Yamaha TX81Z	●	●	
Bacchus TX802	£220	Yamaha TX802 Graphic Editor	●	●	Too big to be memory resident!
Voyetra Sideman	£99	Yamaha DX & TX Casio CZ, Korg DW Roland D50	–	–	Supports Sequencer Plus file format.
Sound Quest	£99	Yamaha TX and DX Ensoniq SQ80 Casio CZ Roland D50	●	–	Available from MCMXCIX.
Personal Composer System/2	£425	Yamaha DX and TX	●	●	Part of integrated package, see other tables.
FB Master	£99	IBM Music Feature Card	●	●	For Yamaha FB-01 voice generator.

selected groups of notes all at once is useful, as is the ability to directly edit the MIDI output stream. This might seem rather esoteric, but unfortunately the MIDI system is not always that efficient and can get overloaded with unnecessary information – velocity information, for example, going to an instrument that does not implement it. This can cause timing problems, so the ability to edit this data directly is useful.

Quantisation is a handy tool that effectively pulls notes that are slightly out of time on to the nearest beat. It is effectively a way of cheating, and can result in music sounding too accurate – computerised even. The *Sequencer Plus* range allows you to adjust the amount of quantisation for a more 'human' effect.

Finally the type of display, particularly of the notes themselves, is important. Most sequencers use the 80-column text mode, displaying notes as lines on a grid or as text. Some, however, use a graphic mode to display proper musical notation on the stave. This is probably better for a musician used to reading music, and certainly in an educational environment. However, a reasonably well designed text-mode display is quite adequate for the rest of us, and many sequencer files can be read by DMP packages if you want a proper printed score.

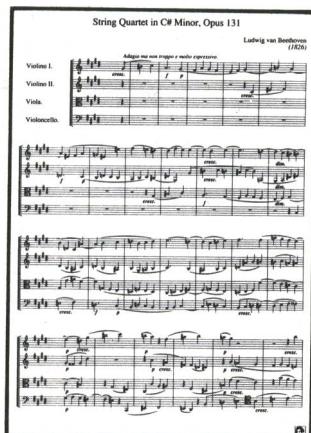
VOICE EDITING

Most synthesizers come with a range of preset sounds or 'voices', identified and selected by Program Number. However many also allow you to create totally new sounds for downloading into the instrument's memory. Voice editing software allows you to do this from the computer. By their nature they can work only with the synthesiser models for which they were designed, so if you own a weird keyboard you may be out of luck. If you are interested, CMS will look for one suitable for you.

The complexity of a voice editor really depends on the variables offered by the instrument. Particularly flexible are MIDI samplers, which can digitise real-life sounds and turn them into voices for a synthesiser. As the data being manipulated is analogue, some form of graphic display is handy. It also helps – on the smaller editors at least – if things can be memory resident.

MUSIC PUBLISHING

Desktop Music Publishing – the writing and printing of musical scores – obviously shares much with plain Desktop Publishing (DTP). Also obvious is that the quality of output depends largely on the output device. Most DMP packages support nine or 24-pin dot matrix printers.



● DMP from *Personal Composer System/2*.

For higher quality you need a laser printer, and some packages support the Hewlett Packard Laserjet or even Postscript files. This means full-scale typesetting, usually using Adobe's Sonata font. Some can also output TIFF or EPSF image files, letting output be incorporated with *Ventura Publisher* or *Pagemaker* documents.

Input to DMP can come from the computer keyboard, but it is useful if the package can read MIDI data directly. Many packages can also read the files created by popular sequencers, such as *Sequencer Plus*, *Texture* or *Master Tracks*.

MIDI ON A BUDGET

Whatever interface or software you buy, the most vital part of the system will be the

instruments themselves; the software may send velocity and aftertouch information to the keyboard, but if the keyboard doesn't implement it you won't hear it. MIDI keyboards can cost as little as £150, but expect to pay at least £300 for a usable range of features, and more like £500 to pick and choose from a decent range. A decent MIDI instrument with an MPU-compatible interface and even the most basic sequencer software will give you more pleasure than the most expensive software coupled with a limited MIDI instrument.

But most of all, give yourself plenty of time. Once you get into MIDI, you'll have problems finding time for anything else! ●

SUPPLIERS

● MIDI INSTRUMENTS:

Yamaha (0908) 71771
Roland 01-568 4578
Casio 01-450 9131
Kawai (0202) 296629

● PC MIDI SYSTEMS:

Kuma (07357) 4335
PCS 01-658 7251
Alphatonic (0954) 211480
EMR (0702) 335747

● MIDI SUPPLIERS:

CMS 01-977 4546
MCMXCIX 01-724 4104
Program Shop 01-316 7777
AC Marketing (0804) 26412

● The Voyetra V-4001, a Roland MPU compatible interface.



MIDI INTERFACES

Make & Model	Price Inc VAT	MPU Comp.	MIDI Outs	Metronome Out	Speaker	FSK Sync.	Roland 24-click	Other clock	Comments
Roland MPU-401	£219	●	2	–	●	●	●	–	The original.
Voyetra OP-4000	£168	●	1	●	–	–	–	–	Basic MPU clone.
Voyetra V-4001	£184	●	1	●	–	●	–	–	MPU clone with FSK sync.
Voyetra OP-4001	£198	●	1	●	–	●	–	●	As V-4001 but also with basic clock for older drum machines.
Program Shop MIDI Interface	£115	●	1	●	–	–	–	–	Basic MPU but very cheap.
Passport IBM P-4001	£150	●	1	●	–	●	–	–	From Passport Designs.
Kuma Midi Board	£195	–	2	–	–	–	–	–	Designed to work with Kuma's K-Minstral package.
DHCP Interface	£172	–	2	–	–	●	–	–	Includes sequencer software, available from Alphatonic.
EMR MIDI Card	£99	–	2	–	–	–	–	–	32 MIDI channels supported, software to come later.
IBM Music Feature Card	£395	–	1	–	–	–	–	–	Complete with Yamaha FB01 multi-timbral voice generator Available from CMS

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- Wheel Of Misfortune Based on the TV word-guessing game.
- Opus-1 Extensive general knowledge quiz.
- Trivia Quiz Many questions, 5 categories. 2 Discs.
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- War Game of strategy. Takes hours rather than days.
- Empire & Prince Life-cycle survival strategy games.
- Simulations each on a single disc: American Football * Baseball * Basketball * Rocket Launcher/Lander * Railroad.

BOARD & CARD GAMES

- Scrabble Good implementation of the board game.
- Sleuth Exciting murder mystery solving game.
- Word Domination The classic game of risk and strategy.
- Chess & Checkers Good quality full screen graphic versions.
- Chinese Checkers Unusual 6-sided version of draughts.
- Mahjong and Solitaire (Patience) (need CGA).
- Poker, Canasta and Heart 3 classic card games.
- Gin Rummy & Ultima-2 Two card game simulations.
- Blackjack & Pontoon - Pontoon is memory resident.
- Two Bridges Two versions of the card game.
- Quimbee (Yahtzee) and Five. Two dice-based games.

ADVENTURE GAMES

- Golden Wombat Of Destiny Intriguing and unusual adventure.
- Hack (Amulet Of Yendor) Extensive role-playing adventure.
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- Cave Quest Sent to Earth to seek fame and fortune.
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- Intercept & Mutant Invasion Two Sci-fi adventures
- Dark Continent & Nebula Two games by same author.
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- Keep Them Amused - Burger Blaster, Grime, Racer, Ninja, Caverns and Galaxy.
- Face The Action Batalia, Tank, Moonbase, Blort II, Gemini.
- Block & Tackle Nemon, Qix, Xonix, Blockade, Daleks, Berzerk.
- Lost Vegas - One Arm Bandit, Roulette, Backgammon, Wheel Of Fortune, and Biorhythms.
- Skill & Strategy - Sail (Yachting - not 1512) Teed Off (Golf) Stock Exchange, Big Rig (trucking simulation).
- Wit Your Pits Brainstorm, Battleships, Word Puzzle, Rogue.
- Mazing Games - Polymaze, Amaze, 3-Demon, Castle, Chase.
- PC Challenge - Chess, Othello, Entrap, PC Golf, Air Traffic.
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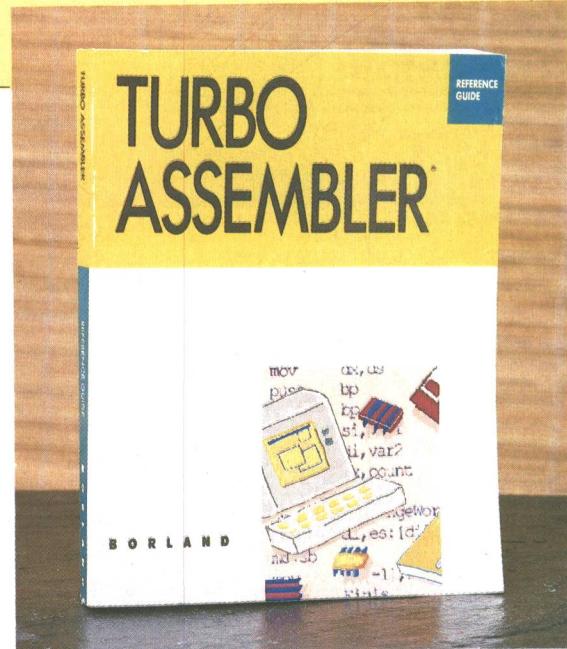
The PC isn't the easiest of machines to program in assembly language, and most people feel they need all the help they can get. Top of the wish-list has to be an assembler/debugger set that manages to be friendly without sacrificing power, but where can you find such a package?

Borland are clearly hoping they've got the answer in this latest addition to their Turbo range. It's a pricey, hefty piece of work, aimed – I'd guess – at professional programmers at least as much as at hobbyists.

The system has three main components: *TASM*, the package's high-speed assembler; *TLINK*, a linker; and *TD*, an interactive debugger. *TASM* is the backbone of the system.

TASM is designed as a direct competitor to MicroSoft's *MASM* Macro Assembler. 'Direct' here means that *TASM* does things the *MASM* way only slightly better, and that's a bit of a pity. *MASM* is a ponderous, complex beast: it's only your sort of tool if (a) you know exactly what you're doing and (b) what you're doing is writing an enormous .EXE application. It is not

• Turbo Debugger bristles with helpful features, such as the 'history list' suggesting a few likely choices of address here.



for beginners, hobbyists, programmers converting from other assembly languages, or people who just want to write small utilities with the minimum of fuss. Once you've waded through all the obscure, cumbersome assembler directives it insists on, you'll probably wish you'd stuck with *DEBUG*.

The sad fact is that, for all its faults, *MASM* is now an industry standard. For an assembler to sell to professional programmers these days, it more or less has to be able to assemble *MASM*-style source files. At any rate, Borland would have thrown away a huge volume of *TASM* sales if they hadn't built in *MASM* compatibility. Unfortunately they went a whole lot further than mere compatibility, producing something that's very much *MASM* with the obvious rough edges smoothed rather than a product in its own right. You'll still need most of those 'red tape' directives working with *TASM*, I'm afraid.

At this point, the only thing that could save you would be a really terrific manual – so it's just as well that Borland provide one. In fact *Turbo Assembler* comes with two mighty tomes, but it's the larger of them – the User's Guide – that will interest most buyers.

In its vast 600-page bulk the User's Guide covers just about everything you need to know about writing assembler programs on the PC, and does so in readable, comprehensible English. It explains not only the tough aspects of *MASM*-style assembler use but also general concepts like segmentation, indexing and binary arithmetic. If you want to write assembler routines for any of the other Borland language products, the User's Guide has a chapter for each one. It covers the 8086 instruction set in considerable detail too, and its section on common assembler pitfalls is solid gold. As a tutorial or conversion course, it's excellent stuff: you could pay £20 for a book on the same subject and not get as much useful information.

Above all, the User's Guide does a great job of demystifying all those MODEL, SEGMENT and ASSUME directives you need in your source files. It's so good on this that the companion Reference Guide, a mere pamphlet at 300 pages, is all but unnecessary. Numerous source examples and a standard 'SMALL' source file layout let you start coding almost straight away, and leave the red-tape problems until you've found your feet.

IN PASSING

As I've said, I think it's a shame that Borland couldn't have gone out on a limb a bit more over source code format. The conservative, *MASM*-clinging format they've gone for seems all the more strange when you compare

it with *TASM*'s highly unconventional underlying structure. *TASM* is a single-pass assembler, and that is a very odd thing to put on the market in 1989.

These days, most assemblers use a two-pass technique: that is, they read the source file twice before creating the object file. On the first reading, or pass, the assembler will work out the lengths of all the various instructions and data items, so that it can tell where different program components will end up relative to each other. On the second pass it will actually generate the program code, using the positional knowledge it gained on the first pass.

In practice there's quite a duplication of effort here. Once you've worked out how long a source instruction will be in object form, it's only a small step from there to actually produce the object code – so why not do the whole thing first time round and forget the second pass entirely? While this kind of approach would work quite well on some very simple programs, it wouldn't be much use for everyday coding styles. The problem is one of references.

There are whole classes of instruction that refer to other parts of the program, maybe to pass control to subroutines or access data. This is known as referencing. The object code for one of these instructions will contain information on where the referenced subroutine or piece of data is, so the assembler must have that positional knowledge before it can process the instruction properly. That's no problem if the reference is to an earlier part of the program – what's known as a backward reference – but things clearly won't work so well where an instruction refers to a point that the assembler hasn't yet reached.

Refinements on the basic single-pass idea allow the most important types of forward reference at the very least, but the received wisdom is still that two-pass is best. Those single-pass refinements always involve some kind of compromise, either in quality of code or in the type of forward references they make possible.

As single-pass assemblers go, *TASM* isn't actually too bad: its worst habit is wasting memory on some forward jumps, and even this can be avoided with a certain amount of extra effort. The main point is that *TASM* does put you to that extra effort of getting things in the right order in your source, or giving it approximate information about where things are in memory.

It's a matter of opinion, but I look on an assembler as something that does all the menial bits of machine code programming – the bits I'd find boring or inconvenient. It doesn't seem a very fair trade-off if I have to take on some of this drudgery to help it run faster.

DEBUGGING, TURBO STYLE

If *TASM*'s a bit disappointing, the debugging utility *TD* is a lot more fun. It has a wide range of features to help you get your programs running properly, and a friendly windows-and-menus front end to make those features easy to get at. 'History lists' are used to save you retying the same thing continually and a log window helps you keep track of what you're doing, and a strong set of conditional breakpoints should catch almost any bug you can think of, so on large projects *TD* should make the going a good deal easier.

For smaller programs you may well find *TD*'s power is something of a hindrance, mind you. All those features make it hard to find simple options like changing the area of memory you want to look at, or executing from a different address.

The Debugger manual isn't always helpful here either. You see, *TD* is designed to debug not only assembler but also Turbo C and Turbo Pascal programs. That's good news if you've got early versions of either compiler and could do with some debugging help (*TD* is bundled with the latest versions) but it's bad news if you

want to get a grasp of the product quickly. Browse through the manual and you'll find most of the information is completely irrelevant to the problem at hand.

Personally, I've never found debuggers terribly useful. When an assembler program goes wrong, it's usually quicker to track the problem down from its symptoms and a hard copy of the source. To quote the Debugger manual itself, 'When debugging a program, your greatest asset is simple thought.' On the rare occasions when you do have to reach for a debugger, *TD* would certainly be a good one to have handy – but only if you already know your way around it. ●

THE A86 ALTERNATIVE

Me, I'm sticking with Eric J Isaacson's beautifully straightforward *A86* assembler. It's a no-frills tool that's absolutely perfect for producing .COM files, but can still handle large projects admirably.

You can get *A86* as shareware from the usual sources, or pre-registered from Shareware Marketing (0836 739261) for £61.68 including debugger and manual.

For

- Excellent manuals
- Easy to interface code with Borland languages.
- Very powerful debugger.

Against

- Insists on cumbersome 'red tape' directives
- Cuts corners on forward references in your code.
- Can't generate program files directly.

MACHINE REQUIREMENTS

TASM needs a minimum of 256k memory. *TD* needs a heftier 348k, and also takes up a great deal of disk space – so a hard drive is a big advantage.

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ASSEMBLY LANGUAGE?

When you want to write a simple program quickly and easily, you use Basic. When you want something that runs rather faster, and don't mind taking a little longer writing it, you use C or Pascal. But when you're after the fastest possible finished program whatever it takes, you'll have to go for *machine code*.

Unfortunately, machine code is very unfriendly stuff. It's the native language of your PC's 8086, 8088 or whatever, and chips don't look at things the same way people do. Instead of variables to store characters or numerical values in, you just have memory locations. Instead of sensibly chosen command-words or familiar mathematical symbols for instructions, you just have numbers. Keeping track of which locations you've got your values in would be tough enough, but memorising the different instruction numbers and what they do? You'd have an easier time of it learning to write Chinese.

Be that as it may, machine code is just too powerful to give up on. The speed, compactness and complete flexibility it offers are absolutely unbeatable – but how can you get at them without prodigious feats of mental juggling? The answer is to use your PC's own power to help you tackle those coding problems. If you write your program using commands and

location names that mean something to you, and use a utility to convert these user-friendly commands into numbers that the 8086 can understand, you can get all the benefits of machine code without the dreadful bind of working with it directly.

The key thing here is that, although you're using command names that you find easy to remember, every command you write corresponds directly to a machine code instruction: in effect, the commands you're using are just a sugar-coated form of machine code. This sugar-coated command system is called *assembly language*, and the utility that converts it into machine code is called an *assembler*.

For added flexibility, some assemblers stop short of turning your *source file* (that is, your assembly language program) into machine code. Instead they produce a near-finished version of it called an *object file*. It takes a second program, the *linker*, to complete the conversion into a .COM or .EXE file. As its name suggests, the linker can actually combine several object files to create the finished machine code file. You can use this facility of the linker to your advantage: if you're developing a large program, you can write and assemble it in small chunks for linking together later on.

"Any rumours that I am to take over as Chancellor are totally unfounded."

CECIL PARKINSON JUSTIFIES HIS PURCHASE OF SAGE ACCOUNTING SOFTWARE.



I would like to take this opportunity to adamantly refute any rumours there might be. The suggestion that I am to be Chancellor now, or at any time in the future, is nothing more than conjecture, and my recent purchase of Sage Financial Controller has no bearing on the issue.

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It is totally understandable therefore, that with my ever increasing responsibilities within the Department, and my extensive extra-curricular activities, I have plumped for Sage Financial Controller.

As for the small minded tittle-tattle of El Vinos, and the deliberate misrepresentation of some Fleet Street rags, I will state again that I am very happy in my role as Head of Computer Science, and any reports as to my becoming Chancellor of this, or any other British university, are totally unfounded. Let this be the end of the matter. Thank you.

G

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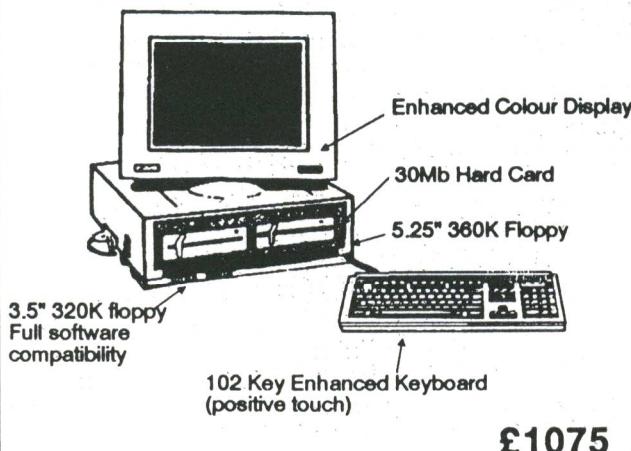
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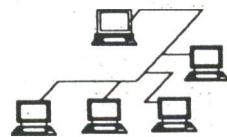
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In 1963, at the Berlin Radio Show, the electronics company Philips launched a wonderful idea called the Compact Cassette. Many companies had tried developing a compact, portable alternative to the gramophone, so the Compact Cassette was competing with many rival formats. The 8-track cartridge, for example, was already popular in the States. And yet in a matter of years these all faded away so that now, over 25 years later, the Compact Cassette remains the only domestic tape medium.

The benefits to the consumer are obvious. Anyone can go into any record shop throughout the world and buy an audio cassette knowing without doubt that it will work in any cassette deck, be it humble walkman or £1000 state-of-the-art.

Another example. Throughout the seventies the race was on to develop the video equivalent of the Compact Cassette – the domestic video recorder. Meetings were held to establish a standard tape format, but no agreement was reached and in 1978 the public was presented with two technologically similar but mutually incompatible formats in Sony's Betamax and JVC's VHS. The battle began, and customers had to decide from the start which camp to back. In the States Betamax became very successful, while in the UK JVC linked up with Thorn-EMI to capture the video rental market. Nowadays, in the UK at least, VHS has won the day.

CLEAR CUT

So what happened? Why is the audio cassette market so clear cut and the video market so confused? Back in 1963 the Compact Cassette's future was by no means cut and dried. Philips had a lot of clout in the market but there was plenty of competition

Philips took two steps that basically secured the future of the Compact Cassette. First of all it negotiated with a large number of music publishers to produce pre-recorded cassettes at the earliest opportunity. But most significantly it took the unprecedented step of giving other electronics manufacturers a Royalty-Free licence to produce products based round the Compact Cassette, and supplied the necessary manufacturing drawings free of charge. It also allowed them to display the Compact Cassette logo so that consumers knew what they were getting. In the video market, by contrast, the two sides were equally strong. If either side had been as imaginative or far-

MATTERS ARISING

Isn't it time we learnt from the past? Matt Nicholson looks at how industry standards past and present have benefited consumer and creator

sighted as Philips, then perhaps the consumer would not have had to make such an arbitrary choice.

But are industry standards always to the consumer's benefit? The prime standard in the micro-computer market is of course that set by IBM, and exists simply because of the company's shear size and clout in the market-place. However the standard has undoubtedly been helped considerably by IBM's tolerance of clone manufacturers. The actual code incorporated in the IBM PC ROM BIOS, the key factor when it comes to compatibility, is of course copyright, and IBM's policy is to 'protect its intellectual property rights'. However it does not regard the BIOS's functionality as intellectual property, and is quite happy for other companies to implement the same functionality provided they do not breach copyright.

'The 3.5-inch floppy disk would have been the accepted media long ago if IBM had adopted it on the AT.'

ENORMOUS BENEFIT

This has been of enormous benefit to consumers as they can buy software off-the-shelf in the assurance that it will run satisfactorily on a wide range of competing machines. It has also been of benefit to IBM of course, as consumers are always aware that the only 100 percent compatibles are those made by IBM. However it has held back technological development too – the higher capacity 3.5-inch floppy disk would have been the accepted media long ago if IBM had adopted it on the AT.

Friend of the Earth

Out on the flats of Somerset lives an old hacker by the name of Punchcard Pete. He's a friend of the soil, he's a friend of the earth and he owns a twin floppy Amstrad PC. He has been getting on to me about all them trees that go into making all them printouts that come out of all them paperless offices.

'What can we do?' I said, 'buy recycled paper!' he said. Not something you can buy in W H Smith, so I phoned the local branch of Friends of the Earth.

Recycled stationery is not that hard to find

and can usually be bought from your local alternative shopping centre (Friends of the Earth are in the phone book if you don't know where yours is). Recycled printout paper is not so common, but I eventually tracked down Zweckform UK on 0992 551777. This Danish company can supply packs of 500 sheets of 11 by 9.5-inch fanfold paper, complete with tear-off sprocket strips, for £6.95. Prices are comparable with the more exclusive high-street stationer, but not outrageous and perhaps if more people used it the price would come down.



An example in the computer world where the attempt to set a standard has been to the consumer's detriment is MSX – that ill-fated attempt by Japanese companies to establish a similar standard for the home computer. Initially it looked promising, as the combined might of household names like Sony, Toshiba, Canon, Fujitsu, Yamaha, JVC, Hitachi and Sanyo launched a range of mutually compatible micros back in 1984. However manufacturers already established in the market like Sinclair, Amstrad, Commodore and Atari showed no interest and continued to produce more advanced products at cheaper prices. MSX didn't stand a chance.

The problem was the inherent inertia of such a large group of companies: by the time they'd agreed anything the market had moved on and the standard became old hat.

It appears that standards are only likely to be beneficial and successful if they are either established while the market is still young, or by a company with enough clout to make them stick. An apparently altruistic policy at the outset can help enormously too, as the Compact Cassette shows. It is also apparent that a successful standard tends to benefit the creator as well as the consumer.

So why the current concern over the 'look and feel' of competitor products on the part of market leaders like Ashton Tate, Lotus and Apple? One of the great assets of the Apple Macintosh, for example, is that its operating system allows applications to 'look and feel' the same, so that users do not have to learn a whole new set of key-strokes whenever they load up a different package. Such a situation would represent a real step forward for the PC market, and everyone would benefit.

If IBM had decided to take out 'look-and-feel' suits against clone manufacturers the desktop computer market would be in a sorry state now, and it is doubtful whether IBM would have sold any more computers as a result. ●



● A lesson to all – The Compact Cassette is still alive and well after 25 years

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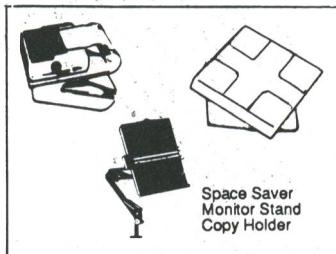
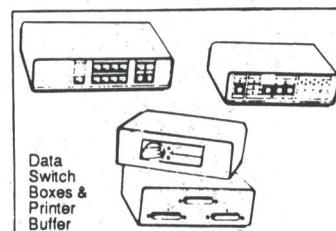
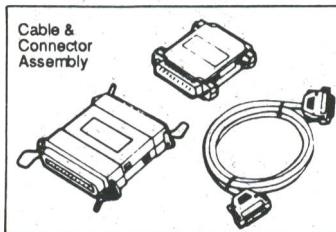
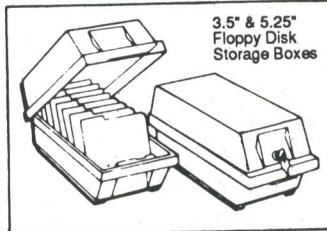
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GET TIME ON YOUR SIDE

Time is money! Steve Cooke looks at three packages that between them help you to save it, manage it, and charge for it...

Time management covers a multitude of different sins. In the first instance, there are programs that enable you to plan your activities over a long time in relation to a single project. The packages, known more accurately as 'project management software,' offer you the ability to define, plan, and schedule complex tasks as well as work out associated cash flows and resource requirements. Typical examples previously reviewed by *PC PLUS* include *In Control*, *Instaplan*, and *Super Project*.

Secondly we have programs that allow you to schedule simple projects on a linear basis (that is, finish task a, start task b, finish task b...and so on). These are similar in outline to the above, but more limited in their application. Facilities along these lines are often included in other packages – *Logistix*, for example.

Finally, there are programs that present you with calendars, note books, diaries, and 'alarm clocks' to help you schedule your daily activities.

It's the last mentioned category that we're concerned with here. Both *Big Plan* from Llogotron and *Primetime Personal* from In Touch offer you calendar/time facilities

linked to data files in which you enter your tasks and appointments. The programs then match up your work with your wristwatch and attempt to keep you, busy executive that you are, on top of your in-tray.

IT'S MONEY

In addition, we're also considering in this issue an unusual package called *Timeslips*. This program literally treats time as money – it tracks daily tasks in an environment where clients are charged on a time-basis (as in a solicitors' office, for example). It has some very unusual and powerful features and is well worth considering by anyone who charges on a time/expenses basis.

Without wishing to be cruel to software producers, there is one crucial test that any 'diary' program (as we'll call them) has to pass. It's pretty simple – is the program any better than a pencil and a personal organiser? Software companies gasp with horror when you suggest this comparison, but it has to be made, and the competition is stiff. After all, personal organisers are:

- instantly editable;
- instantly accessible;
- fully portable;
- customisable.

'Instantaneousness' can be offered by memory-resident software (*Primetime* offers this, *Big Plan* doesn't) but portability – and therefore accessibility at all times – is only really feasible if you work with a portable PC. If this isn't the case, then you have to realise that these programs really only offer their best to someone who rarely leaves their office and conducts most of their daily business from one place.

There is an alternative, however, and that is to train your appointments secretary (if you have one) in the use of one of these products. Under these circumstances, we could certainly recommend *Primetime* as a powerful time management tool which, if used by a secretary, could have lots of benefits. However, that takes us to the products themselves, so here goes...

PRIMETIME PERSONAL

£86.25 • In Touch
(0222) 882334/862209

Primetime is the only package here that can run in memory resident mode. At the touch of a key you get the screen shown on this page, offering you a calendar with the current date highlighted and the opportunity to edit or review different sections of the database.

Primetime is powerful as diary programs go. It can cater for priority tasks, tasks entered in advance, and classified tasks, and also keeps track of delegated tasks being carried out by others. During operation it maintains your schedule, highlighting possible appointment conflicts, automatically entering regular standing engagements, and constantly updating the priority of tasks previously entered.

In addition, you can use *Primetime* like a multiple alarm clock. Any task can have an alarm associated with it and whether you're word processing, spreadsheeting, or even plain snoring, the PC will beep away when one of



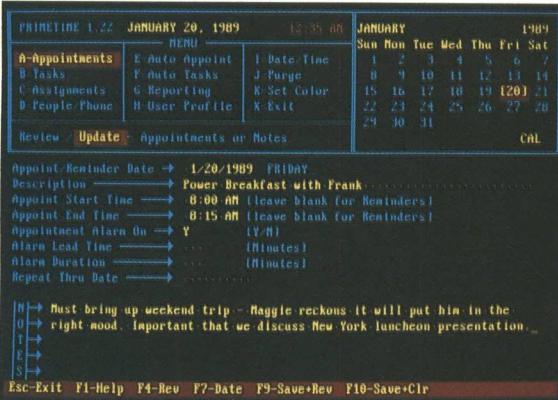
the ear-marked tasks comes up for attention.

Finally, if you need to make a phone call, *Primetime* enables you to use the contacts file within the package as a direct output device to a Hayes compatible dialler.

Primetime is also a very thorough package, with a large and comprehensive manual. It is highly flexible in the way it handles data, so you can enter dates in many different formats, including relative ones. Thus if on the 2nd December 1988 you entered a task for 1w, the computer would understand that as being one week ahead and substitute 9th December in the file.

Data entry ranges right through various specifications for AM, PM, 24 hour clock, backward references (last week, last month and so on). It's also thorough in the way it encourages you to be disciplined. While providing all the time management devices you're likely to need, it also stresses the importance of

• *Primetime* keeps your calendar in view and although memory resident packs a lot of features.



BIG PLAN

£99 • Liogotron
01-381 8745

In contrast to the comprehensive efficiency of *Primetime*, the only word I can think of to describe *Big Plan* is 'whimsical'. Whimsy first rears its head when you load the product. Not only is there no memory resident option, but – extraordinarily – it runs under GEM and that means that anyone not regularly working under this operating system is going to have their time cut out as well as managed.

Assuming you're a GEM user, however, what do you get? More whimsy, it appears, as the screen flashes up with a very attractive interface that includes an analogue clock, a thought for the day, and a notable anniversary or saint's day.

Behind all this prettiness lurks a standard diary management program much like *Primetime Personal* but less thoroughly implemented. That's not as bad as it sounds, however, since diaries are essentially simple and you don't need all the bells and whistles to keep your affairs in order. *Big Plan* has two main advantages – first, editing and entering data is simpler because of the GEM interface; second, its simplicity of presentation makes the program generally easier to use and less demanding on your time.

Like *Primetime*, *Big Plan* keeps track of delegated, prioritised, completed, and deferred tasks. It also allows you to set different work rates – a useful device that enables the program to make allowances for days on which you feel below par and wish to reschedule non-critical tasks.

Big Plan also features an alarm system, but here the simplicity lets it down somewhat, since you can only choose three settings for the alarm – 10, 5, and 1 minute(s) before the appointment. There are certain

disciplined use of the package. It's nice to see a software house acknowledging that its product is only as good as the people who use it.

Primetime is one of the better diary programs I've seen. At the very least it offers a dynamic way of storing all your task-related information and appointments and can, at the flick of a key, show you what you ought to be doing. My own feeling about programs like this, however, is that they tend to get caught in a cleft stick. The better they are, the more intrusive they become and the more demanding they become in terms of data entry and updating. That said, if the idea of a computerised appointments secretary appeals, this is probably the nearest you'll get to it. ●

For

- Good documentation.
- Powerful and comprehensive features.
- Flexible data entry.
- Memory resident.

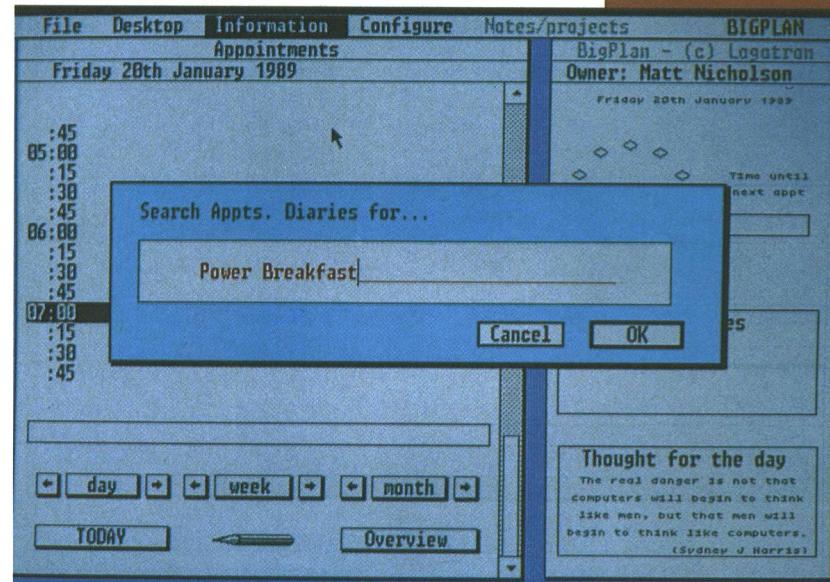
Against

- Do you really want to be a slave to a silicon appointments secretary?

PRIMETIME PERSONAL

RANGE OF FEATURES	■ ■ ■ ■ ■	OVERALL SPEED	■ ■ ■ ■ ■
EASE OF USE	■ ■ ■ ■ ■	DOCUMENTATION	■ ■ ■ ■ ■

PC PLUS VALUE VERDICT



• *Big Plan* looks fun to use, which may mean that you actually use it!

For

- Simple operation.
- Friendly front end.
- Good notepad system.

Against

- Perhaps a bit TOO simple.
- Runs under GEM – inconvenient for some.

BIG PLAN

RANGE OF FEATURES	■ ■ ■ ■ ■	OVERALL SPEED	■ ■ ■ ■ ■
EASE OF USE	■ ■ ■ ■ ■	DOCUMENTATION	■ ■ ■ ■ ■

PC PLUS VALUE VERDICT

ALTERNATIVES

For people wanting a less sophisticated form of time management, pop-up desktop utilities such as Borland's Sidekick or Brown Bag's PC Outline may be sufficient.

Or for the ultimate in low cost planning, how about Steve Thomas's *Dayplan* published on the September '88 Superdisk

advantages in being able to set alarms for longer than this – where an appointment involves a bus journey, for example, and you can't do this in *Big Plan* without setting up 'departure' as an additional appointment.

Big Plan isn't memory resident and that has to be a big minus. However, it does offer you a 'quickload' facility that enables you to switch rapidly from the program to any other .EXE, .COM, or .APP file (but not to a batch file). You can specify up to four commonly used programs running under GEM or DOS and these will be added to a special menu that enables you to jump straight to them and then, in some cases, return to *Big Plan* when you finish. In practise the system does make *Big Plan* more convenient, but it's still a long way from memory residence.

Finally, *Big Plan* boasts what it calls a 'project planner'. Basically this is a system of linked notepads that you can use to collect your thoughts about a single project composed of different tasks. You can then link

the notepads together in the appropriate sequence and the program incorporates this data into the daily schedule. This is a nice idea but to be honest I found it much quicker and more convenient to do this using pencil and paper! It's certainly not a project planner in the sense that one normally understands the term and doesn't provide any intelligent critical path scheduling or resource allocation.

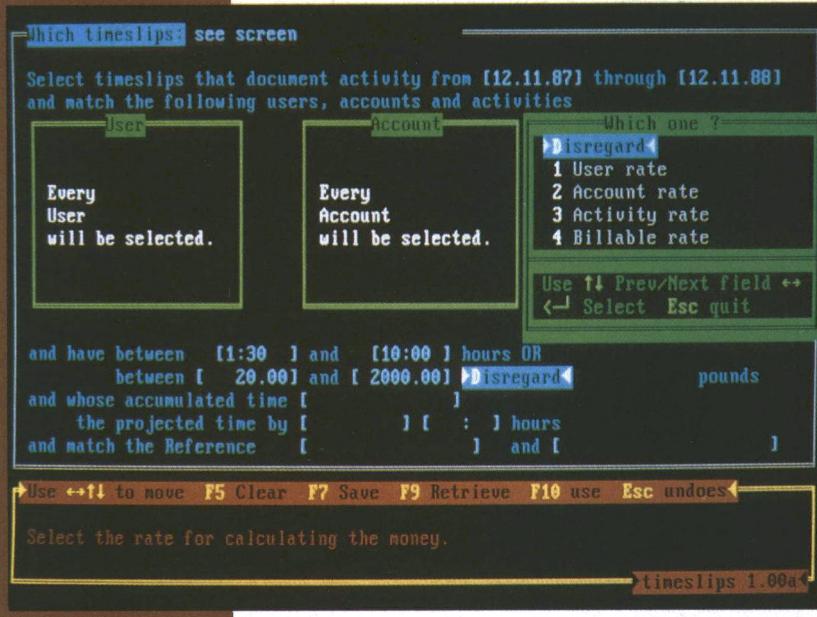
Big Plan is quite enjoyable to use and – most important – its simple format makes it feel more like a helpmate and less like a techno-dictator. There's also a degree of customisation available – you can edit the 'Thoughts for the day' file, for example – which can make a big psychological difference if the package is going to be staring you in the face for long periods. For that reason, many people may prefer *Big Plan*, though the program is considerably less flexible than *Primetime*. It's also more expensive. ●

TIMESLIPS

£80.50 • Mirrorsoft
01-377 4818

Timeslips is a marvellous program that succeeds by taking a simple objective and covering almost all the possible tasks involved. The premise is that time is money – literally – and that you will wish to charge

• Timeslips gets the bills out on time...



For

- Comprehensive.
- Powerful.
- Flexible.

Against

- Heavily dependent on system clock!

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SuperDisk

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- **MIX C:** Full version of top C compiler
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- **SNAKE:** Compulsive graphics game
- **LAKE:** 9999 landscapes in BASIC 2
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If the disk loads but causes inexplicable problems, turn to the end of this *SuperDisk* section where there are detailed instructions on using the disk. If you still have problems then write to our Bath address or ring 040 923 550 for help. This is normally available from 10 a.m. to 5 p.m. each weekday. Either way, include full details of exactly what equipment you own and what the symptoms are.

Do remember that the programs are only fully tested on the Amstrad PC1512. Some other PCs – particularly those with Hercules graphics (eg Mono PC1640) may cause problems.

MIX C
Analytical Engines Ltd

```

:quit :q:ins line f10-del line Ctrl/End-Delete to end of line
/* A program to calculate the area of several
circles of the same size */

#define PI 3.141593 /* Define a constant value for PI */
int number; /* Declare an integer variable */
float radius, area; /* Declare 2 float variables */

printf("Please input the radius of the circle:"); /* Put up a
message for the user */
scanf("%f", &radius); /* Read keyboard for value of radius */

printf("How many circles?"); /* Another message */
scanf("%d", &number); /* Read keyboard for number of circles */

area = PI * radius * radius; /* Calculate area of one circle */
printf("The area of the circle is %.4f\n", area);
area = number * area; /* Calculate total area */
printf("The area of %d circles is %.4f\n", number, area);

/* End of program */

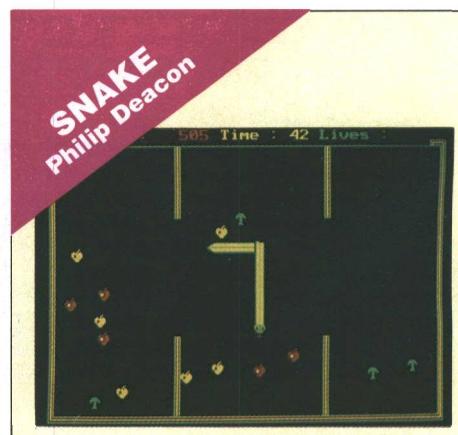
```

QREF
Graham Brown

```

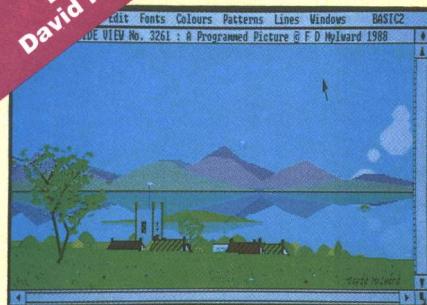
Q-REF by Carl Brown :UP :DOWN :F10 QUIT
DISKCOMP - Compare the contents of target drive
against contents of source drive.
DISKCOMP source-drive: target-drive: /A /B
Options
/A - Compare just the first side of the disks.
/B - Compare just the first eight sectors of each track.
NOTES
If no source drive specified current drive is default.
If source drive is the same as target drive then a prompt
will ask for source and target disks when required.
examples:
DISKCOMP A: B:
Compare disk in drive A with disk in drive B.

```



LAKE

David Mylward



There have been many programs which show off the graphic capabilities of BASIC 2, but none which have done it better than *LAKE*. This stunning program draws lakeside views complete with mountains in the background, sailing dinghies on the water and trees, houses, the old church tower, fences and fields of tulips in the foreground.

It doesn't stop with one such view, either. You can have up to 9,999 of them, each different, each unique and each repeatable, so if you find a view you like you can call it up at any time. Alternatively, you can run through them randomly and be surprised for a long time to come!

To run *LAKE*, load BASIC 2 and call up

the file selector box from the File menu by clicking on Load. Change the Directory entry in the selector box by pressing the up arrow and [Esc] and then enter **A:\BASIC2*.*.BAS**. Double click on *LAKE* to load the program, and then [F9] to run it.

When the program runs, you're asked for a display time between 10 and 100 seconds and to select a random sequence of scenes or a numbered scene, where you enter the number from the keyboard. Uses for the program? – David suggests you use it to amuse a convalescent child. When they start seeing monsters in the lake you know they're on the mend!

This is not a demonstration version of the *Mix C* compiler – Analytical Engines and *PC Plus* are together giving away a full version of this top quality C language program. You can use it to follow our tutorial series, which starts this month, or to write your own executable .COM programs. You could even send the results into *PC PLUS* for possible inclusion on the disk.

PC PLUS is supplying *Mix C* in two parts, the compiler and linker programs this month and the integrated text editor and trace debugger with the April issue.

Meanwhile you can still use the compiler to compile existing C source code from the tutorial text or from other C sources. You can

see what the compiler can do by running it from the *SuperDisk* menu. A short tutorial takes you through the mechanics of running the compiler and the linker and producing an executable .COM file, in this case an adaptation of one of the example files provided with the commercial *Mix C* package.

The compiler, editor and assorted overlay and auxiliary files are all held together in the *MIX C* sub-directory of the *SuperDisk*. Copy the entire contents of this sub-directory to another disk before using it, as there is no space available on the *SuperDisk* for compiling any C programs.

For your reference, this is what the different files in the *MIX C* sub-directory do:

CC.COM – the Mix C compiler

LINKER.COM – a program which links together object modules from the

CC.COM program to create .COM files

RUNTIME.OVY – overlay with shared i/o and

other functions

CLIB.MIX – library of standard C functions

CERRORS.DAT – Compiler error messages

STDIO.H – standard I/O header

STDLIB.H – header with miscellaneous

definitions

READ.ME – file with more details of Mix

products

To use the Mix C compiler all you need to do is type the name of the C source file after the name of the compiler. You don't

Anyone coming to MS-DOS for the first time is confronted with a whole heap of new things to learn. There are over 30 new commands, most of them with optional parameters which subtly alter their actions. To try and remember what they all do can be a real brain-twister. What you need is *QREF*, the computerised DOS manual, which calls up a full page of information on any named DOS command.

Run the program from the *SuperDisk* menu or by switching to the UTILS sub-directory and entering *QREF*. The program loads and then loads data from a separate data file. A list of DOS commands is displayed down the left-hand side of the

screen and information about one of them, highlighted at the bottom of the list, fills the rest of the screen.

You can move up and down the list with the up and down arrow keys or by typing the initial letter of a command. Repeated presses of the same key cycles the display alphabetically through each of the commands which begin with that letter. Thus, if you keep pressing [C] you'll cycle through CHDIR, CHKDSK, CLS, COMP and COPY. Press [F10] to leave *QREF*.

This isn't an end to the wonders of *QREF*, though. As well as using the information supplied in the *QREFDATA.DAT* file you can edit it to contain any information you like.

Make sure the editor you use to modify the file creates a 'plain' ASCII file and doesn't add any peculiar codes (*WordStar* wouldn't be any good, but *ED*, from the February 88 *SuperDisk* would do the job). Also work with a copy of *QREFDATA.DAT*, not the original!

Graham has provided full details of the file format in the *QREF.DOC* file in the same sub-directory. They are easy to follow and there's no reason why you shouldn't build up a series of data files, loading the one you want simply by changing its name.

If you put together an interesting *QREF* file, why not send it to the *SuperDisk*? We'll publish the best on a future disk.

There are a lot of games around based on the 'guide a snake around the screen to eat apples and avoid mushrooms' idea. The game has the same credentials as ping-pong, duck-shoot and hang-man, but we have resisted the temptation to include one on the disk until something a little different came along. It is just as well we waited, as Philip Deacon's *SNAKE* certainly has a few extras going for it.

Start *SNAKE* from the *SuperDisk* menu or by moving to the *AMES* sub-directory and typing *SNAKE*. You can leave it again from the high-scores screen by pressing [Esc]. The program loads to show a graphics screen and an offer of help. Read the rules of the game

and you'll realise that like all good games, they're very simple.

Start the game and control the snake using the [.] and [/] keys to steer left and right. The first difference between this and every other *Snake* type game we've come across is that the snake always moves left and right relative to its direction of travel. This is fine for all readers whose other burning interest is radio controlled models, but a tough system for the rest of us.

As you move around the screen gobbling yellow apples, a red one appears at some other point on the screen for every yellow one you swallow. You have to eat these as well, but this time it's a mushroom which takes its

place. Touch the mushrooms and you're a dead serpent. You can destroy the mushrooms by spitting venom at them with the space bar, though. The whole game is a sort of strategy-on-the-move, as you try and line up groups of apples for din-dins and decide how many red apples you can afford to eat before removing the last yellow one.

If you get through the first level, the second introduces partitions to slow you down. If you get through that one, level three has diagonal partitions which are well nigh impossible. The only reason I tell you all this is that *SNAKE* is one of the few games in which I have ever reached level three. 'Fraid I can't tell you what happens on level four....

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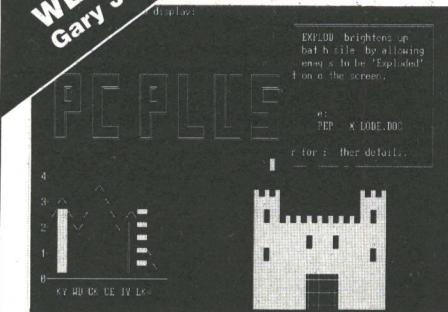
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WEASEL

Gary Jones



This unlikely sounding program demonstrates the powers of natural selection, but not in weasels. It actually does it with a given alphabetical phrase, and Gary has chosen 'Methinks it is like a weasel', which is fine by me. The idea behind the program comes from a book called *The Blind Watchmaker* by Richard Dawkins.

Rather simplified, the theory runs like this. If you assume organisms actually get more organised as they evolve, and that the best suited to their environment are most likely to survive to produce offspring, then evolution is not a process of random transition but is to some extent controlled. The program takes a completely random set

of letters and with each 'generation' uses a pre-set probability to decide whether a given letter will 'mutate' to another random one. If this is the case, and the new letter is in the target phrase, it is deemed to more closely suit its environment. With the default settings in the program, the target sentence is normally completed within 80 or 90 generations.

Why stick with this, though? You can alter the probability, the number of offspring per generation and the target phrase itself.

Run WEASEL from the *SuperDisk* menu or by moving to the *GAMES* sub-directory and typing its filename. Leave the program by selecting Q from the menu.

MIX C

(Continued)

need to use the filetype, as the compiler assumes the filetype .C. Once the file has been compiled, a new file, with a .MIX filetype and the same filename as the source file, will be saved to the disk.

Before you can run the finished C program, you have to combine the .MIX file with other code from the C libraries, or with other parts of a program, perhaps written in other languages, such as machine code. To do this you use another program, called a linker. The Mix C linker is helpfully known as LINKER. You type this program's name,

followed by the name of your C program, again without a filetype. LINKER assumes a filetype of .MIX for the main file and will link that file with anything else that your C program specifies. Finally, it will produce a third file, with the same name as the other two, but with a .COM filetype. This is the program you can run directly, by typing its name, again without the filetype.

So to recap, assuming you have a C program called AARDVARK.C which you want to compile. You type cc AARDVARK to compile the AARDVARK.C to a MIX file, AARDVARK.MIX. To link this program and turn it into an executable program you link it with the Mix C linker, using the command

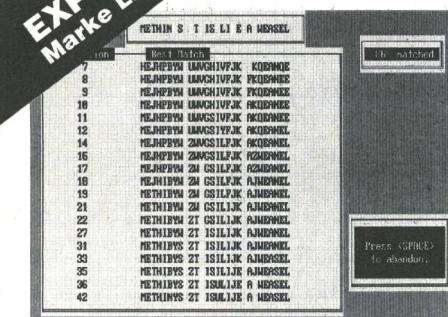
LINKER AARDVARK. This produces a file AARDVARK.COM which can be run by typing AARDVARK.

What happens if there's a bug in your program? (Shock! Horror!). This is where the Mix C trace-debugger and editor come into their own, but you'll have to wait until next month for details of those.

Although the C compiler supplied is more than adequate for following Dr Ann Swinfen's tutorial series, there is no documentation supplied with the product, and no example files. The commercial version of the compiler, with full manuals and example files, can be obtained from *Analytical Engines* at PO Box 35, Eastleigh, Hampshire SO5 5WU.

EXPLODE

Markie Landa



This lively little routine is very handy for brightening up the title screens of programs or batch files. It 'explodes' small files of text or character graphics onto the screen, finishing up at a pre-set position. The files themselves can be prepared with any editor which can handle graphics (again ED from our Feb 88 *SuperDisk* is a good choice). Calling EXPLODE with the filename of the text-based file and coordinates of its final resting place is all that necessary. Select the SHORTIES option from the *SuperDisk* menu to see the program in action. All the files for this demo are in the EXPLODE sub-directory of the SHORTIES sub-directory.

SHORTIES

Three short routines from A.D. Oliver, each of which gives further information if its name is typed without parameters. All can be found in the *SHORTIES* sub-directory:

SGR

This small utility sets the screen attributes to change colours, reverse video, bold characters and the like. Type its name followed by the desired screen attributes. If you want to use more than one in a single command, separate each parameter with a space.

CLR

A simplified version of *SGR* which clears the screen to a specified colour. Easy to use and the new colour survives most things except a reset. Simply type CLR followed by the number corresponding to your desired colour.

DRIVE

Mainly for use in batch files, *DRIVE* checks whether a specified drive is ready for access. Using the command, followed by the letters A or B returns an Errorlevel corresponding to the state of the named drive. An Errorlevel of 0 means the drive is ready, while 1 means it's not....

3.5 - INCH SUPERDISKS NOW AVAILABLE!

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We regret that without the 5.25 inch disk being returned we cannot provide the replacement.

HOW TO USE THIS DISK

The *SuperDisk* is designed to be as easy to use as possible and to run on any configuration of

Amstrad PC 1512, and on most IBM PC compatibles. However, making the most of some of the utilities on the disk requires some knowledge of the computer. For the less experienced, here is a brief guide.

1. First, boot up your computer in the normal way. If you have a hard disk machine simply turn it on. If it is a floppy-disk model, insert your MS-DOS system disk (Disk One for Amstrad owners) into the left hand drive and turn it on. Your machine is 'booted' if you are presented with either >A or C> on the screen. If it is a C-prompt then type A: [Return] to get the A-prompt.
2. Make a backup copy of your *SuperDisk*. To do this use the MS-DOS routine DISKCOPY (for full details see page 334 of the Amstrad PC), or else copy the contents into a sub-directory on your hard disk. Once you are back at A>, take out the 'master disk' from drive A and put it somewhere safe.
3. Put your *SuperDisk* backup disk into drive A (the left-hand drive), and type PCPLUS (as one word) for an introduction to the programs on the disk.

The *PC PLUS* software divides into three categories, each of which needs to be treated differently. Where necessary documentation has been included on the disk - either in the program itself or in a separate documentation file. These have the same filename as the program itself, but with the .DOC file extension. They can be read by a word processor, or by entering TYPE filename.DOC at the A-prompt.

> **Batch files** can be identified by the file-type .BAT after the filename. They are run by entering just the filename, followed by any parameters required. Some may use ANSI codes, in which case follow the instructions in 'Question and ANSI' below. You can examine the inner working of a batch file by entering TYPE filename.BAT at the A-prompt, and indeed it is often educational to do so. Batch files are simply text files, so you can load them into a word processor if you want to play with them or improve - but load as a 'non-document' file if you use a *WordStar* compatible.

> **Command files** can be identified by the file-type .COM or EXE after the filename, too. However unlike batch files they are written in a compiled language, or using DEBUG, and so cannot be examined in the same way.

> **BASIC 2** programs have the extension .BAS after the filename, and require the loading of GEM and BASIC 2 before they can be run. To load the program, start by calling up the file selector box and clicking on 'load' from the 'File' menu. Press the up arrow and [ESC] to delete the existing path and type A:/BASIC2/* .BAS (or on the named drive will then be displayed, and you can double click on the required filename to load the file. Run it by pressing [F9].

BASIC 2 files are text files, and can be examined in much the same way as batch files. BASIC2 programs are not compatible with IBM BASIC or GW BASIC, but can sometimes be converted, providing graphic commands are not used too extensively.

QUESTION AND ANSI

For the benefit of readers having trouble with programs which require the ANSI drive to be installed before they'll run properly, here's a brief explanation of what ANSI.SYS is all about.

ANSI (the American National Standards Institute) has established a set of standard codes which produce defined effects on the screen. Your PC knows nothing about these, though, unless told about them through a 'driver'. Amstrad provides this in the form of the ANSI.SYS file on your MS-DOS master disk.

To install the driver you must do two things:

1. Copy the file ANSI.SYS onto disk YOU USE TO START YOUR PC. It's no good copying it onto your program disk, data disk or anywhere else. If you start your machine from the hard disk (have no floppy in any drive when you switch on), the file must be in the root directory of the hard disk.
2. Add the line DEVICE=ANSI .SYS anywhere within the file CONFIG.SYS, which must again be in the root directory of the floppy or hard disk you use to start your PC. To edit the CONFIG.SYS file, use RPED or TIDBIT's editor.

The driver will load every time you start up, and any program using ANSI codes should get its message across.

NEW SUPERDISK ENQUIRY HOTLINE!

If you have an enquiry about our *SuperDisk*, please ring the following number:

040 923 550 during office hours.

SENDING IN SOFTWARE FOR THE DISK

1. Your program, unless it is just few lines, should be sent in on disk - we haven't got time to type in anything substantial.
2. The program must come with sufficient documentation for use to try it out and evaluate it. Ideally, this should be supplied on disk and as a print-out.
3. Your name, address, and a telephone number where you can be reached during office hours should be clearly written on a brief explanatory letter.
4. Your name, phone number, and the name of the program should be clearly written on the disk label.
5. The covering letter should contain the following signed statement:

The program (title) enclosed is completely my own work and has not been accepted, and is not under consideration, for publication by any other magazine, book or software publisher.

We ask for first world serial rights on anything we publish. This means, as in the above disclaimer, that the program is published in *PC PLUS* before any other magazine, worldwide.

SHORTENING THE ODDS

A few pointers to improve your chances of getting onto the *SuperDisk*:

1. If it's a single function routine (like DISKCOPY or XCOPY) write it in assembler if at all possible. Programs in Pascal or compiled Basic include extra code added by the compiler, which can be much larger than your routine. The smaller the routine the better - up to 5K is ideal.
2. Be original. Check the previous *SuperDisks* and don't submit something that has already been done - unless your version is vastly better. Also try to make sure that your program has broad appeal - a campanologist's program may interest you (or me) but won't necessarily appeal to everyone.

3. Think about the product - people don't word process in GEM so it's a waste of time doing a word count in Basic. Basic2 programs should be controllable both by mouse and keyboard.

4. Test, test and test again. Make sure your program runs properly - more software is rejected because we cannot get it to run than for any other reason.

5. If your program uses the screen make the display as attractive as possible - and preferably visible on a monochrome monitor. An attractive display looks good, makes people want to use the program and looks interesting in the magazine.

WARNING!

We make every effort to check the programs on the *SuperDisk*, but we cannot take responsibility for any damage caused to any of your data or programs as a result of using this disk. Keep copies of any important data, and never use the master disks of any valuable application.

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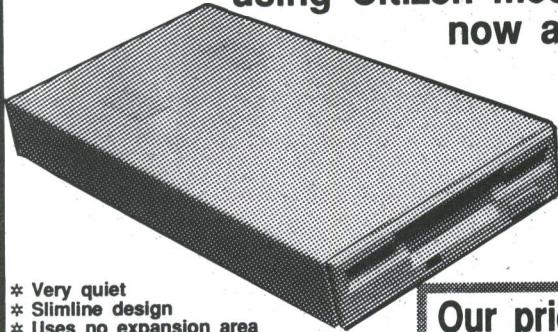
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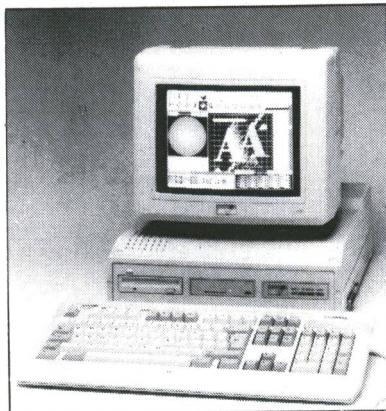
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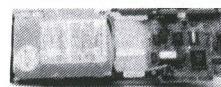
SPECIFICATIONS

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- ★ Parity checked RAM
- ★ 720K 3.5" Disk Drive
- ★ 30Mb hard disk option
- ★ VGA compatible with full EGA/VGA/Hercules compatibility
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SD=Single Drive DD=Double Drive HD=Hard Disk. All systems come with monitors. 12MD=12" Mono display 14CD=14" Colour display 12HRDC=12" High resolution colour display.

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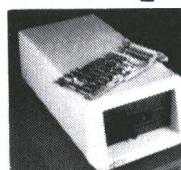


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*Please note that these monitors are only for use with the PC2086 range, and other IBM compatible machines.

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- ★ 512K RAM
- ★ Single or Double Drive
- ★ AC Mains Adaptor
- Amstrad PPC 512S
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PPC640

- ★ 640K RAM
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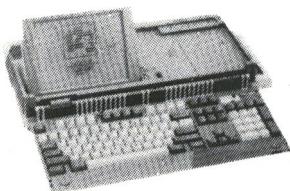
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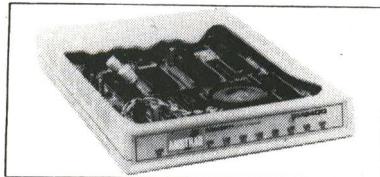
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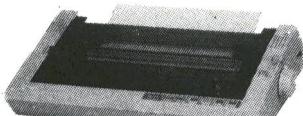
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LQ2550 Film	£10.00	£9.50	£9.00
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EX800/EX1000 Colour	£16.50	£16.00	£15.50
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C FOR YOURSELF

In a major new series Dr Ann Swinfen shows you how to program in today's most important high-level language, using the Mix C compiler free with this issue.

```
#include <stdio.h>
#include <stdlib.h>

#define DOS 0x21
#define VP++ 0x10

char b;
void v
main()
{
    C
    i
    p
    p
    n
    f
    n; t
    t-- {
    if (' ' < n no. %d
    }
    tid_
    puts( n e. );
}

void wipe(item_num)
{
    int item_num;
```

C was created by Dennis Ritchie in 1972 as a tool for writing operating systems, but it's now used by professional programmers the world over as a general purpose language. Its power and flexibility make it the most important programming language on the PC scene, but they also make it tricky to learn. That's where this series comes in.

Along with the *Mix C* software free on this month's and next month's *SuperDisks*, this series will take you through from first steps to a near-professional standard of C programming. No prior knowledge of programming is needed, though for the many readers who worked their way through our *Programming in Pascal* series we'll be pointing out any obvious parallels as we go.

GETTING STARTED

Once you've followed the instructions on the *SuperDisk* pages (pp56-60) to get the compiler set up properly, you're almost ready to go. For this issue only, you'll need a text editor that can produce straight ASCII files. Most word processors will do for this, though good alternatives would be RPED (bundled with Amstrad machines) or ED (free on the February 88 PC PLUS *SuperDisk*). COPY CON will do the job if all else fails: just use whatever you normally produce batch files with. (You may also want to have this month's PC PLUS Factsheet, p.156, on hand: it's a guide to using the *Mix C compiler*.)

WRITING A SIMPLE PROGRAM

To start with, let's try creating and compiling a simple **source file** (see glossary):

```
main()
{
    puts(" WOW! I am programming in C!! ");
}
```

Type the program into your editor exactly as given, being very careful with punctuation. (If you are a new-comer to programming, let me warn you here and now that the majority of the mistakes you'll make will be punctuation errors.) Having typed the source and checked that it is correct, save it with the filename FIRST1.C.

Now quit your editor, and use the *Mix C compiler* to turn your lines of text into an **object file**. Just type:

CC FIRST1

What happens now is that the C compiler (the file called CC.COM) reads your source file FIRST1.C and turns it into an object file called FIRST1.MIX. The program still isn't quite ready to run. It needs to be fed through a **linker** next. Type:

LINKER FIRST1

The linker will combine your object file with parts of the **library** CLIB.MIX, to produce the finished, **executable** file FIRST1.COM.

If you typed everything correctly, and the compiler

and linker didn't throw up any errors, you can now type

FIRST1

and your first program will run, printing the line

WOW! I am programming in C!!

on the screen.

If any errors have occurred, they'll almost certainly show up at the compile stage. The compiler will print a message on screen, with some indication of what the error might be. (This is where all those punctuation mistakes cause problems!) Correct the error with your text editor, and try again. If you didn't make any mistakes, try creating one artificially. Remove a bracket or the ';' from the source code, and try compiling again. It's a good idea to practice this error detection, so you know what to expect when the real thing happens.

Now examine the files in your current directory or on your floppy disk. You should find that you have

FIRST1.C FIRST1.MIX FIRST1.COM

that is, the source file, the object file and the executable file. Each simple program you write in C will produce these three files. Later, when we move on to more advanced work, you'll find you can write portions of your program in separate source files, each with its own object file, then link them all together to form one executable file for the whole program.

WHAT MAKES A C PROGRAM?

We have now written, compiled, linked and run a complete C program. It's time to think about the shape and structure involved in such a program. The building bricks out of which a C program is constructed are called **functions** (these resemble the procedures and functions of Pascal or the subroutines of BASIC). The most important part of the whole program – and the only thing which is compulsory in a C program – is itself a function, called 'main'. So the following would be a valid C program:

```
main()
{
}
```

This program doesn't do anything at all when you run it, but it does serve to illustrate the shape of the main function. The word 'main' is followed by a pair of round brackets (more about this kind of bracket later). Then the body of the main function is enclosed between a pair of curly brackets or **braces**. In our program FIRST1, the main function consisted of just one **statement**:

```
puts('WOW! I am programming in C!!');
```

A function may consist of one or more statements (or none at all!). For Pascal programmers: '(' behaves a bit like 'begin' and ')' a bit like 'end'. Notice that each statement must terminate with a ';'.

Every computer language has a 'structure', that is, a series of rules by which the parts are put together. As we have seen, C consists of statements, each terminating in a ';' and grouped together in functions, one of which is called 'main' and forms the cornerstone of the program. This is the key to the structure of a C program, and everything else we learn about structure will build on this.

Every computer language also has a 'vocabulary' of **keywords**. Keywords must only be used for their intended purposes, and should be typed in lower case. When you invent your own names for variables, data types, functions, and so on, you must avoid using the keywords for any of these purposes.

GLOSSARY

Braces: The curly brackets {} used in C to mark the beginning and end of a function definition.

Compiler: The heart of a C programming system, this is the utility that turns your program text into a near-finished program. The *Mix C compiler* is CC.COM.

Executable file: A .COM or .EXE file, which can be run directly from DOS simply by typing its name.

Function: A series of statements grouped together under a collective name.

Keywords: Words that have a specific meaning to the compiler, eg. if, and so cannot be used as names of variables etc in your source programs. Also known as **reserved**

words.

Library file: A collection of functions ready for inclusion in your programs at compile-time.

Linker: A utility which combines object files with library functions (and each other) to form finished executable files. The *Mix C linker* is the imaginatively named LINKER.COM.

Object file: The intermediate form taken by your program after it's been compiled but before it's been linked.

Preprocessor directive: A command carried out by the compiler before it actually compiles the source.

Source file: The program text you type in, and then feed into the compiler.

Statement: The smallest element of a C

In addition, there are certain built-in functions. So far we have met two of these: 'main' and 'puts'. We know what main is used for. The function name 'puts' is just short for 'put string' and means 'put on the screen the string of characters which now follows, enclosed between brackets and quotation marks'. So the correct way to use puts is

```
puts('These words are to be put on the screen.');
```

Function names are not reserved in the same way as the keywords, but you will generally want to avoid duplicating the names of any built-in functions.

DATA TYPES

Now it's time to move on to something a bit more advanced than our program FIRST1. A computer program has a structure and a vocabulary, but it also needs something to work on. Any information which is processed by a computer program is called 'data'. Data come in many shapes and sizes. We may want to do calculations on 'real numbers' (numbers with a decimal point). We may want to sort names into alphabetical order. We may want to check whether an answer is true or false. The numbers, the names, and the answers are all types of data.

FIG.2 – Preparing source code on RPED

```
ESC=done Break=quit f9=Ins line f10=del line Ctrl/End=Delete to end of line
main() /* A program to calculate the area of several
           circles of the same size */
{
#define PI 3.141593 /* Define a constant value for PI */
int number; /* Declare an integer variable */
float radius, area; /* Declare 2 float variables */

printf("Please input the radius of the circle: \n"); /* Put up a
               message for the user */
scanf("%f", &radius); /* Read keyboard for value of radius */

printf("How many circles? \n"); /* Another message */
scanf("%d", &number); /* Read keyboard for number of circles */

area = PI * radius * radius; /* Calculate area of one circle */
printf("The area of the circle is %.4f.\n", area);
area = number * area; /* Calculate total area */
printf("The area of %d circles is %.4f.\n", number, area);

} /* End of program */
```

● FIG.3 – Preparing source code on ED

```
main() /* A program to calculate the area of several
         circles of the same size */
{
    #define PI 3.141593 /* Define a constant value for PI */
    int number; /* Declare an integer variable */
    float radius, area; /* Declare 2 float variables */

    printf("Please input the radius of the circle: \n"); /* Put up a
        message for the user */
    scanf("%f", &radius); /* Read keyboard for value of radius */

    printf("How many circles? \n"); /* Another message */
    scanf("%d", &number); /* Read keyboard for number of circles */

    area = PI * radius * radius; /* Calculate area of one circle */
    printf("The area of the circle is %.4f.\n", area);
    area = number * area; /* Calculate total area */
    printf("The area of %d circles is %.4f.\n", number, area);

} /* End of program */

```

X-1 Y-1 HELP F1 EOF 21 first2.c 01 JAN 1989 18:16 low

Each piece of data used by a computer program falls into one of two categories: constant or variable. The value of a constant is given early in a program (or in a function within a program) and remains unchanged by anything the program does – its value is 'constant'. A variable's value may change during the course of the program – its value is 'variable'.

Also, it is clear that data items differ in other ways. 'Jones' is not the same kind of data item as '17.5'. So in C we find that we have certain pre-defined data types,

and the names of these types are keywords. It is important to handle the different types carefully, because the program will set aside the right amount of memory space for each type. If we tried to squash 'Jones' into the memory space allocated to '17.5', we would have problems! This need for care only arises with variables, because of the way their values keep changing.

This month we'll look at three standard data types, whose keywords are

int
float
char

The first two of these are the basic number types. An 'int' is an integer, that is, a whole number like 5 or -187. The keyword "float" stands for

'floating point number'. This is really just a fancy name for a number with a decimal point, that is a 'real number' like 4.87 or -0.2 or 5.00. Notice that 5 is an integer but 5.00 is a float. We'll be looking in more detail at floating point numbers in a later article.

The third data type 'char' stands for 'character'. Any keyboard character you see in front of you as you sit at the computer is of type char. For example, 'H', 'b', '%', '!', 'P', '+', are all of type char. There are other 'non-printing' characters which we will discover later.

DEFINING CONSTANTS AND DECLARING VARIABLES

Now we know something about data types, let's see how to use them in a program. Have a look at Fig.1. This program, FIRST2, is a little more sophisticated than FIRST1. At the beginning we define one constant, PI, which we set equal to 3.141593. We don't need to tell the compiler that this is a float – it can see that for itself. This is known as defining a 'symbolic constant' – that is, wherever a name (here PI) is used in the program, we want the compiler to substitute the value (here 3.141593). **#define** is a **preprocessor directive**, so it's carried out before the program is compiled. The correct form is

#define A B

which means 'wherever A occurs in the program, substitute B'. Notice that there must be at least one space on each side of the expression A and there is NO ';' at the end of the line. Many compilers also expect the **#define** to be written at the left margin, not indented.

We also declare two variables, radius and area, which are of type float, and one variable, number, which is an integer. Notice that it is common practice to use upper case for symbolic constants and lower case for variables.

Notice the difference. If a constant is of a standard type, we DON'T need to specify the type, but we MUST specify the type of all variables, so the right amount of memory can be set aside for them.

This program also makes use of more functions. The functions printf and scanf are part of the standard library of functions: printf prints the string in brackets on the screen, rather like puts (we'll discuss differences later).

USING THE LIBRARY

Mix C has 29 keywords, which form the core of the C language. Any additional 'vocabulary' takes the form of pre-defined functions, and these vary from one compiler to another. They're grouped together in libraries, for the linker to 'consult' when creating the executable file. If you examine your Mix C files, you will find that CLIB.MIX is the second largest file. This contains the library of all the built-in functions, in object code form. As we go along, we will learn to use all of these functions, and the linker will automatically sort out which ones your program requires, without your needing to do anything.

It is also possible to build up (or buy in) extra libraries of functions for special purposes. These can also be linked into your programs, and we will see how to do this next time. So in C language can be seen as

Later on we'll find out more about how these various bits are put together, and how we can use

KEYWORDS + STRUCTURE

+

MAIN LIBRARY OF BUILT-IN FUNCTIONS

+

OPTIONAL ADD-ON LIBRARIES

special techniques to make our programs more compact or faster.

`scanf` reads input from the keyboard. When followed by `%d` it expects an integer, when followed by `%f` it expects a float. It then allocates the input to the correct variable. The expression `&radius` means 'the position in memory set aside for the variable radius'. `scanf` reads the input for radius and stores it in the correct memory location.

TIDY OUTPUT

You may have noticed one or two more small points about FIRST2. In the statement

```
printf('Please input the radius of the circle: \n');
```

what does the `\n` mean? When you run the program, no `\n` appears on the screen. All it does is force the cursor to move down to a new line.

Also, when we want to print a float or an int (either constants or variables) we place a `%f` or a `%d` at the appropriate point in the `printf` statement, then list the corresponding data at the end. Thus

```
printf('The area of the circle is %f.', area);
```

will take the value of area and print it in the correct place, where the `%f` occurs.

Floats can come out looking rather user-unfriendly, so it is a good idea to tidy them up. In our program, instead of the statement above, we have

```
printf('The area of the circle is %.4f .', area);
```

By inserting the `.4` we force the output of area to be given to 4 decimal places. Try altering the output lines of FIRST2 to give different numbers of decimal places, or leave out the number of decimal places altogether.

EASY-READ PROGRAMS

C is a very compact language, often using punctuation

where other computer languages use keywords. This makes it even more baffling than most when you return to a program after the first fine creative flourish. The solution is to intersperse your program liberally with comments. These will be edited away by the compiler and so do not affect the efficiency of the executable version, but they will make life much easier for you as a programmer. Comments should be enclosed between a `/*` and a `*/`, like this

```
/* How useful to make a comment here! */
```

A comment can be placed on its own line, on the same line as a piece of code, or even run over several lines. Just don't put it inside a piece of text to be printed on screen or it will be assumed to be part of the text. To show you how comments are used, FIRST2 contains several: these should also help you understand how the program works.

WHAT HAVE WE LEARNED?

We've covered a good deal for one tutorial! We've discussed the structure of a C program, built up from blocks known as functions, with the principal one called 'main'. These functions are made up of a series of statements each ending with a `;` and enclosed between braces.

We have discussed the 29 keywords of C, and learned our first 3 of these – `int`, `float` and `char` – which specify three key data types. We have used 3 of the standard library functions – `puts`, `printf` and `scanf` – and seen some ways of neatening presentation. We know how to declare variables and to define constants using `#define`.

Next month we will learn how to use several more library functions, how to define our own functions, and how to include additional libraries. ●

FIG.1

In this program we define a constant, declare variables, and use new library functions to scan the keyboard and print on the screen.

```
/* Program FIRST2.C */

main() /* A program to calculate the area of several
circles of the same size */
{

#define PI 3.141593 /* Define a constant value for PI */
int number; /* Declare an integer variable */
float radius, area; /* Declare 2 float variables */

printf("Please input the radius of the circle: \n"); /* Put up a
message for the user */
scanf("%f", &radius); /* Read keyboard for value of radius */

printf("How many circles? \n"); /* Another message */
scanf("%d", &number); /* Read keyboard for number of circles */

area = PI * radius * radius; /* Calculate area of one circle */
printf("The area of the circle is %.4f.\n", area);
area = number * area; /* Calculate total area */
printf("The area of %d circles is %.4f.\n", number, area);

} /* End of program */
```



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DISCO gives you a set of easily created personalised menus which will run all your programs directly. The menus can be edited very simply from within the program so that a list of all your programs is presented to you on the screen in a logical and ordered way. A program can be selected by the press of a key. A menu entry may run a program or call a sub-menu of programs. For example you could set up a sub-menu to perform common DOS functions like DISKCOPY and BACKUP. DISCO permanently occupies very little memory (less than 10K) leaving the rest free for your applications.

DISCO can also show a menu of all executable files in any directory or on the whole disk (hard or floppy) at the press of a key. It is easy to change from one directory or disk to another to see what programs it contains. If you list the whole disk at once you can find any program straight away and see what directory it is in. Any file can be chosen and run from this directory menu.

DISCO can also perform many of the more common DOS commands from within the program. At the press of a key you can list all the files in order in a directory. They are never lost off the top of the screen, you can always scroll back to see them all. You can change directories automatically, specify which type of files to list, sort, copy, or delete or look at their contents. All this and more is done from a menu of commands on the screen.

Once you have used DISCO you won't want to go back to the bare DOS system prompt!

- + Run programs directly from your own personalised menus.
- + Automatically load a data file as you run a program.
- + Design your own menus within DISCO for the programs you use.
- + Menus may be nested (one menu entry calls another menu).
- + Menus easily edited, entries sorted or moved between sub-menus.
- + Menus will run all executable files (ie. all .EXE, .COM, .BAT files).
- + Menus will execute DOS commands (eg. DISKCOPY, FORMAT).
- + List (and run) all executable files in any directory or on whole disk.
- + Automatically return to menu after running a program.
- + Press key for pop-up context sensitive help messages.

- + Choose directory and list files in order. Scroll back through them.
- + Sort files in name, size or date/time order. Specify file type to list.
- + Select file from directory listing for copying, moving or deleting.
- + Tag files for bulk copying or deleting.
- + Rename file or directory. Add and delete directories.
- + View file on screen or print file (where practicable).
- + Complete with comprehensive but easy to read manual.
- + Manual includes examples of how to build menus and use program.
- + System requirements: DOS 2.0 or greater, 384K RAM or more.
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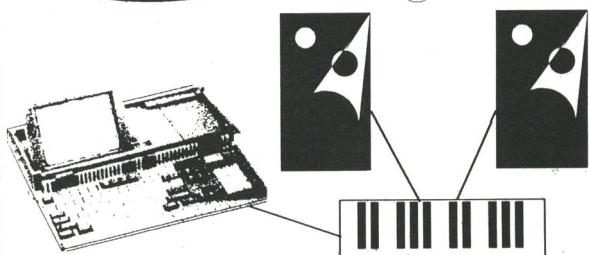
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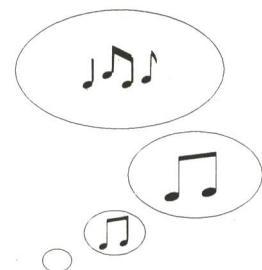
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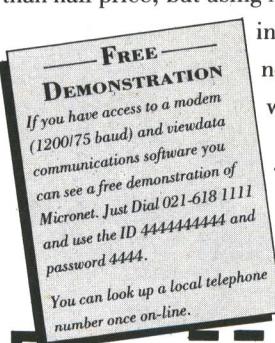
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CHI'S THE LIMIT

Most word processors can cope with text and a few effects like bold and underline. Ask them to produce foreign languages or scientific notation and they soon get lost, though. Simon Williams discovers why *ChiWriter* holds out hope for all budding theoreticians.

CHIWRITER

£92 • Shareware Marketing
0732 771344

If you want to process straight text and print it out, you are well served by the PC market. There are about 100 different word processors which do what you want, with varying degrees of ease and effectiveness. If you have specific needs, though, and need to produce characters not normally supplied with the IBM character set, your choices are reduced. There are specialised systems to do it, but general purpose multi-font word processors are as rare as battery eggs in a health food shop.

Most PC word processors use the machine's text mode. There are several reasons for this, but the most pressing from the point of view of the programmer is that a text screen is much quicker to update than a graphics screen. Thus, the finished program runs a lot quicker, but you are limited to the built-in character set. If you want to display other characters – a full Greek alphabet or a set of mathematical symbols, say – you have to resort to the graphics display, where you can define whatever characters you need.

FIRING UP

This is what *ChiWriter* does. The program began in the States as a shareware program, and in fact is still marketed in this country by one of the main shareware distributors. Its three disks and 150 page paperback manual are reminiscent of early versions of *Fontasy*.

The manual is well written and includes tutorial sections as well as reference. It also includes complete keyboard layouts for all the fonts supplied with the package. Installation is straightforward and *ChiWriter*

GRAPHIC SHAPES

The way *ChiWriter* handles its graphics fonts is to load information about them all when you start the word processor, and to make it possible to switch between any of them at any stage in creating a document. 12 different fonts are supplied with the package, including accented characters, symbols, Greek, line drawing, Orator, Script, Gothic and two maths fonts, plus two others which are versions of the default font but emboldened and underlined. A font designer is also supplied so you can put together your own fonts and incorporate them into *ChiWriter*.

The fonts are assigned to function keys and you can switch between them at any time. Two presses on the appropriate function key switches to the assigned font which then

becomes the current one. A single press switches only for the next character. This is useful when you just want to pull a single character from a non-current font, like a pound sign from the symbols font, for instance.

When it comes to producing super and subscripts you have first to alter the line spacing from the default of one to one and a half or two, to make space for the dropped or lifted characters. *ChiWriter* refers to these semi-lines as 'rows' and allows you to move freely between them. There are also some pre-defined key sequences (macros to the rest of us) which produce extended brackets, braces and integrals for mathematical.

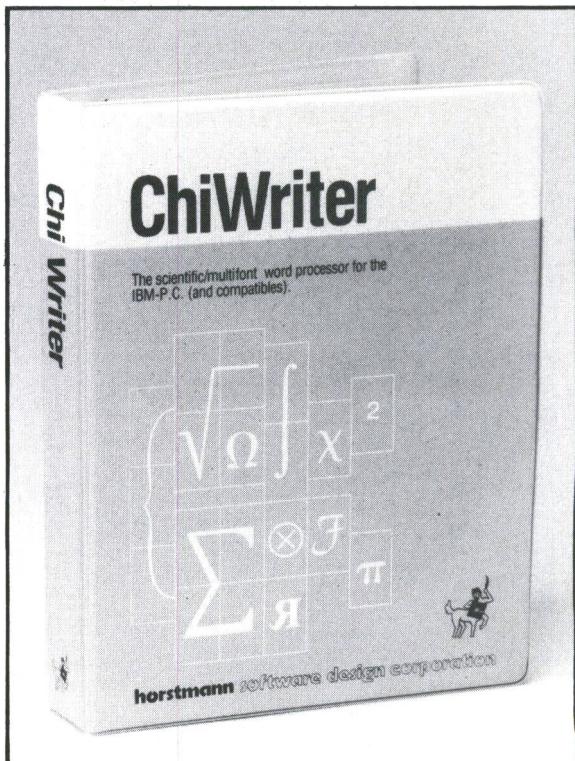
can run from floppies as well as a hard disk, but really needs at least a twin floppy machine.

The main text display is clean and uncluttered. A single status line at the top of the screen is complemented by a two-tier menu bar at the bottom. You don't have 22 lines of text in between, though. As the word processor uses a graphics screen, characters are rather larger than normal. At single spacing expect to see 17.5 lines of text. There is a secondary set of smaller, lower resolution fonts supplied if you need to see more of your document as you work.

A key thing about *ChiWriter* is that it works as you feel it should. It's been thought out well enough to do intelligent things like creating new rows when you try to create sub or superscripts which haven't been allowed for. The spelling checker lists alternatives to misspelled words in the right case and font for direct insertion into the text. Commands are nearly all control sequences, but the letters have been chosen to make some mnemonic sense. For example, [Ctrl] [F] formats a paragraph, [Ctrl] [T] toggles justification, and [Ctrl] [S] starts a search. Each option in the two level menu strip can be actioned with the cursor keys, by typing a highlighted letter, or by using the same letter with [Alt].

FOOT TO THE FLOOR

When you start using *ChiWriter* in earnest, you begin to



appreciate some other well-implemented features. Due to its graphic nature, *ChiWriter* presents you with an almost completely WYSIWYG display. The only exception is proportional spacing, which isn't shown on screen, though the program does print it out.

ChiWriter can handle footnotes automatically, indicating again its intended market. It does this by opening a secondary window on the screen for entry of the footnote text. Footnotes can be printed at the bottom of each page or at the end of the document.

The program can be set to backup your working document automatically, after a pre-set time interval you can specify at any time. Backup is not performed in the background, though, and takes a few seconds even with a short document and a hard disk. Documents can be saved in *ChiWriter*'s internal format or as ASCII files, though in the latter case you lose all the font and super/subscript information. Both types can be loaded into the program, and it will also read *WordStar* files, maintaining soft returns already in the text.

ChiWriter also employs a very sensible printing regime, whereby it uses the printer's own fonts as its standard output, only calling on the special fonts when the document specifies them, and printing them as a graphics dump. The logic behind this is that the printer's built-in font is likely to be of higher quality, and will almost certainly print quicker than one downloaded as graphics. You can certainly notice the difference; on an Epson LQ-850 the standard text printed in the single pass NLQ font which the printer normally produces. The scientific characters which had to be downloaded and printed as graphics took a lot longer. Overall, the print speed is of course slow for a word processor, but fast for a graphics program - a reasonable compromise.

ChiWriter can print graphics files from paint or charting programs, but you have to allow space for the graphics within the document by inserting blank lines. It's a shame, given the graphics screen used by *ChiWriter*, that it can't read in graphics files in the most popular formats.

Macros are supported, under the name of key sequences, and you can assign the commands to [Alt] plus letter sequences or give them names. You can employ macros to good effect to add accents to characters or produce repeatedly used mathematical constructs.

SLAMMING ON THE ANCHORS

What it really comes down to is that *ChiWriter* in its basic version is not that cheap. It's a very competent word processor, has a good, if slow, spell checker, but can't edit more than one document at once and has no mail

FEATURES

Block move	Yes
Search and Replace	Yes
Auto reformat	No
Word count	Only after spell check
Multi-file editing	No
Macros	Up to 51
Spelling checker	Yes
Mail Merge	No
DOS Commands	No
Help	Yes

Other features: Graphics based, Multiple fonts, Footnotes, Font designer.

RAM required	384K
Number of work disks	3
Hard disk option	Yes
Price including VAT	£92

Allen F. Henry, *Nuclear Reactor Analysis*, MIT Press, Cambridge, Mass., 1982, page 495
(A benchmark of the American Mathematical Society)

$$iB_r[\hat{a}_{k1}^n] = \frac{1}{2}(h_{n-1} + h_n) \int_0^R 2\pi r dr [\rho_k^{n*}(r)] \frac{d}{dr} [\Psi_1^n(r)],$$

$$[D_{r,k1}^n]^{-1} = \int_0^R 2\pi r dr \int_{z_n - \frac{1}{2}h_n}^{z_n + \frac{1}{2}h_n} [\rho_k^{n*}(r)] [B^{-1}(r, z)] [\rho_1^n(r)],$$

tables...

Physical Quantity	Operator	Coordinate Form
Energy		Allen F. Henry, <i>Nuclear Reactor Analysis</i> , MIT Press, Cambridge, Mass., 1982, page 495 (A benchmark of the American Mathematical Society)

• *ChiWriter* comes pretty close to the idea of WYSIWYG. Here's a screen dump of a section of a *ChiWriter* document with the same section of document printed on an Epson LQ-850.

$$iB_r[\hat{a}_{k1}^n] = \frac{1}{2}(h_{n-1} + h_n) \int_0^R 2\pi r dr [\rho_k^{n*}(r)]$$

$$[D_{r,k1}^n]^{-1} = \int_0^R 2\pi r dr \int_{z_n - \frac{1}{2}h_n}^{z_n + \frac{1}{2}h_n} [\rho_k^{n*}(r)] [B^{-1}(r, z)] [\rho_1^n(r)],$$

tables...

Physical Quantity	Operator
Energy	\hat{H}

merge facility. The counter-argument runs that it's written for a specialist purpose and that this type of feature isn't relevant. Nonetheless, to release *ChiWriter*'s full potential on anything but a very basic PC configuration, you need to spend quite a bit more than the package price.

A typical *ChiWriter* configuration on a modern PC, with a VGA or EGA screen and a 24 pin printer, would cost around £170, or £200 if you have a laser. For this kind of money there are still few other programs to compare with the multi-font facilities of *ChiWriter*, but the budget price the term shareware normally attracts has rather flown out of the window.

If you need a word processor to produce well-formed foreign or scientific characters easily then *ChiWriter* should be top of your short list. If you need a good general word processor with the occasional requirement for fancy fonts, think carefully about *ChiWriter*'s other facilities, or in some cases lack of them. You could buy a word processor and a copy of a fancy font program for the same money. ●

EXTRAS

You can add various goodies to your *ChiWriter* system, but as with all things, you have to pay: Hi-res screen (EGA) and 24 pin printer support disks are £23 each.

Laser printer support, the index generator and the chemical and Russian fonts are £57 each.

A set of HP laserjet and PostScript downloadable fonts in Times Roman, Italic and Bold, and the *ChiWriter* Scientific set, all in 10 12 and 18 point costs £136.

For

- Produces very good specialist fonts on screen and printer
- Controls are very intuitive and easy to use
- Automatic footnote creation
- Font designer included in package

Against

- Can only handle one document at once
- No mailmerge or database-style functions
- Hidden extra costs for hi-res screen or printer support

CHIWRITER

RANGE OF FEATURES	■ ■ ■ ■ ■	OVERALL SPEED	■ ■ ■ ■ ■
EASE OF USE	■ ■ ■ ■ ■	DOCUMENTATION	■ ■ ■ ■ ■

PC PLUS VALUE VERDICT

LIMITED ADDITION

At last the PPC gets a hard disk option. Mike Scialom gives us the low-down.

PPC HARD DISK

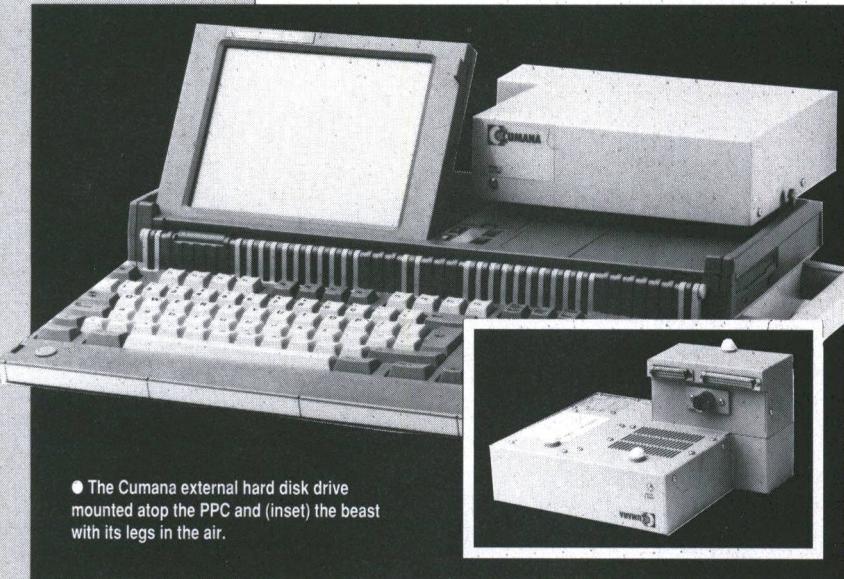
CPH 20-£533.60; CPH 30-£562.35 • CUMANA
0483 503121

It's more than a year now since Amstrad launched the PPC range of portable PCs. Despite a superb price, and some rather nice touches (the full-size AT keyboard in particular), the PPC is seen by some as the Machine That Nearly Was. There are two main reasons for this - one is the atrocious screen display and the other was the lack of a hard disk model.

Now, with the arrival of Cumana's PPC hard disk in two models (20 and 30 MBytes) we see at last some attention being given to the latter complaint.

PROGRESS

Progress it is, because with a hard drive the PPC starts to perform rather more like a 'real computer'.



For

- Quiet and fast
- Easy to install
- Acts as a mains adaptor

Against

- Takes up three ports without replacing them
- Expensive by PPC standards
- Makes the PPC much less portable

CUMANA PPC HARD DISK

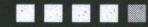
RANGE OF FEATURES



OVERALL SPEED



EASE OF USE



DOCUMENTATION



PC PLUS VALUE VERDICT



Styled in battleship grey, (a shade lighter than my PPC640) the basic unit does make your PPC resemble a pregnant rhinoceros, but that is being a little unkind - to the rhino, of course!

The unit plugs into three ports at the rear right of the PPC - the two expansion ports and the monitor DIN plug. The phone socket is fortunately left accessible, along with the serial, parallel and video ports so you can still use an external IBM compatible monitor (including the PC1640 range) a feature which many users will consider essential for serious work.

The whole unit holds together with two screws mounted at the rear of the casing. The finish is slightly weak - only one screw joins each pin port to the metal casing and this resulted in slightly twisted metal after the unit had been screwed and unscrewed five or six times. Having joined the three units together the main bulk of the drive sits to the right of the screen on two white plastic feet. Between the feet are two ventilation slots, which work well - even after several hours of usage the external drive was still only mildly warm.

The hard drive assumes control of the power supply, so you don't need the PPC transformer. The only switch on the new drive is the on/off one. The only other feature is a 'Drive C Active' light which shows you when the drive is in use.

SIMPLE TO INSTALL

Installation procedure is simple, with on-screen prompts allowing you to install the new drive. A .DOC file runs through the whole procedure for those who like to be doubly certain of what they are doing, and an automatic software installation routine is included which brings the whole installation procedure down to about 20 minutes.

The drive has an extremely satisfying chunky sound when in use. Noise level is acceptable, with the fan quickly assuming a background status that is not interfering. Copying files from the A-drive to the hard drive is fast, with access times also very acceptable. Having installed the drive, I encountered no problems and quickly found the usefulness outweighed the clumsiness of the design by a factor of about ten.

Altogether, the Cumana CPH 20 is a credible hard drive which does its job efficiently. The basic fault is that for £530-odd you want to feel you are buying something that works in more than just one respect. The lack of replacement ports and the clumsiness of the fitting arrangements mean that many serious computer users will have their opinion of the PPC confirmed - it's not for them.

In terms of pricing, one must hope that a cheaper model will come along soon because a PPC plus hard drive will set you back more than a thousand pounds - and you should be able to pick up a hard drive EGA system for that if you shop around. Moreover, the element of portability is by and large removed. All this makes the CPH 20 a machine for incurable PPC users only at the moment. ●

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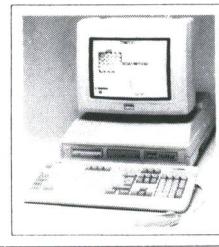
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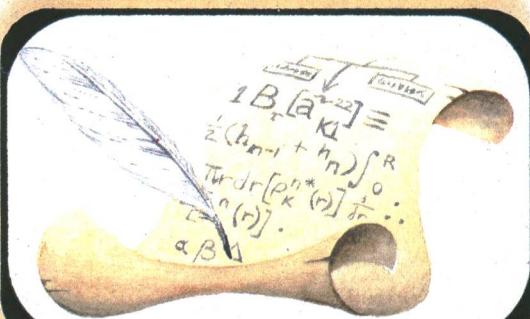
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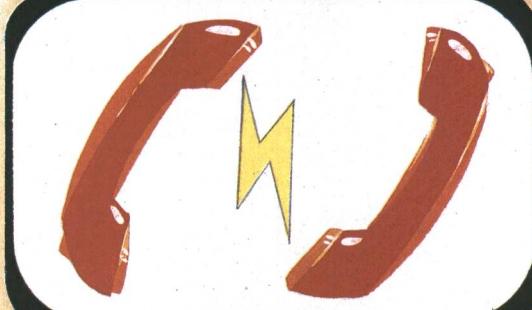
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**AMSTRAD-PPC
COMPANION**
Ian Sinclair
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Publishers
01-405 5606

What this book basically shows is that enough PPC's have been sold - 130,000 according to a very reliable source - to create a market for an expanded introduction to PPC computing for beginners, plus an assortment of hints and tips for the initiated.

Author Ian Sinclair is better known than most, occupying as he does an unsettling slot somewhere between being famous and ubiquitous. Since the PPC is also in uncertain territory, lying somewhere between fame and notoriety, it would seem a suitable match. The Sinclair style of straight-ahead no-nonsense prose gets straight into the subject, from how to set up your PPC to how to get the most out of the software. A tight introduction to MS-DOS had a great deal to teach about using basic commands. The functionality of the prose yields hints after hint, with

READING MATTER

This month the essential work on QuiCK BASIC 4, a guide to getting the most out of your PPC and advice on delving into the innermost workings of your PC.

explanations on the Autoexec.Bat file and the RPED command that are painless and effective.

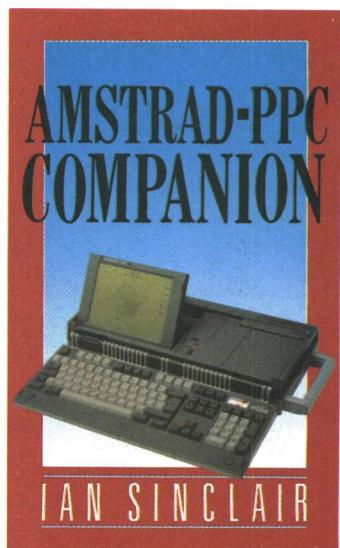
Sinclair moves on deathlessly to PPC Organiser, the integrated package bundled with the PPC, to which he devotes three chapters. If you use Organiser there is some merit in buying this tome, but there seems little here not available through the manual and direct experience.

More fruitful are the two chapters devoted to comms. The PPC includes comms package Mirror-2 with the 664 versions, and Sinclair offers a useful guide through the complexities of this software and the comms scene in general. Mirror-2's sign-on procedure is made to look

elegant and comprehensible - no mean feat! The use of Telecom Gold and MicroLink are explored, with Sinclair preferring MicroLink which he suggests is run with more imagination and enthusiasm. MicroLink has slightly cheaper file transfer facilities too. File transfer is explained in depth and excellently.

It's all very good, but it doesn't go nearly far enough for me. Sinclair misses the point of the PPC by not including 'hard disk' or 'monitor' anywhere in the index. None of the external ports is explained. Here is a machine which can be plugged into the 1640, extended through the use of a hard disk or monitor, used to dump work files to and from any other desk-bound PC, and has a million

and one applications through connection with the



THE NEW PETER NORTON PROGRAMMER'S GUIDE TO THE IBM PC AND PS/2

by Peter Norton & Richard Wilton
£19.95 • Microsoft Press
01-938 2200

Once you've decided to learn about the PC's innermost workings, your first step is to find a really good book on the subject. The problem is, the PC's not really one subject but three: hardware; ROM BIOS and the intricacies of DOS.

For years now, Peter Norton's *Programmer's Guide to the IBM PC* has been a rare source of across-the-board information. This new version includes data on VGA graphics and IBM's new PS/2 machines, but the main thrust of the book is the same: detailed reference material on DOS and the BIOS, with enough discussion to make this easily digestible.

The *Programmer's Guide* isn't just aimed at would-be code fanatics. Aside from offering an insight into the way a PC works. It also sets out to help high-level programmers write low-level subroutines, for those tricky little tasks that C and Pascal aren't really suited to. The book's overall approach assumes very little about your knowledge of assembler principles. There's even an appendix on hexadecimal arithmetic, code-snobs will be horrified to learn.

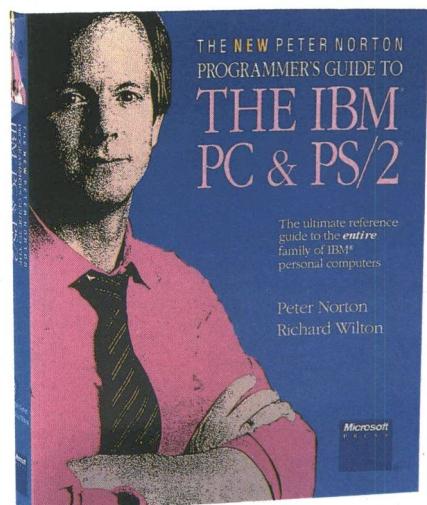
Obviously, with a scope that wide there's a danger of the book ending up as a jack of all trades. For example, its 120-page section on DOS can't possibly be as thorough as a 500-page specialist book like Ray Duncan's *Advanced MS-DOS*. But that's not entirely the point: the *Programmer's Guide* is meant to be practical rather than all-inclusive, and on those terms it scores pretty highly. Most programmers will find the book's reference sections cover both DOS and the BIOS in more than enough detail.

Indeed, there can be big advantages to a broad-based approach. Suppose you want to spice your program's screen output up a little with graphics and multi-coloured text. A book like this one can explain all the different levels of programming open to you - ANSI control sequences, BIOS calls or direct hardware access - but more importantly it can compare them. Crucially, the authors aren't afraid to come to firm conclusions. In the display example above they strongly warn against hardware dependency, but dismiss ANSI as 'too slow to be satisfactory' if you're dealing with significant amounts of text. Fans of straight talk and practical advice, form an orderly queue please!

The *Programmer's Guide* can't tell you everything you need to know as a beginner, and you'll certainly need some other reference works. Hardware detail is a little thin in places with that crucial chip, the

central processor, getting very little coverage. This must surely be the book's worst shortcoming: it doesn't give enough 8086 coverage to satisfy even the most undemanding programmer. That means you'll have to buy a specific assembler work before you can actually use your new-found knowledge, worst luck.

With that proviso, it's a book that's well worth and. It'll give you the broad overview you need to get started with, and fill in enough detail to see you writing useful programs and subroutines. AW



existing world of PC's, but here it is viewed in isolation. At the end of the day, you have to ask why one should pay £12.95 for this book when you get the

unpredigested original when you buy your PPC. For 512 owners it is not recommended.

Sinclair has not considered how to make the PPC optimally

productive. If you are new to computing and want a bit of hand-holding then this book is an excellent guide, and in its chosen field is the only one

available. However, there's a really interesting book about the PPC in use which is begging to be written and this isn't it. **MS**

USING QUICK BASIC 4

PHIL FELDMAN & TOM RUGG

£18.95 • QUE CORPORATION, INDIANA

If you have purchased the latest 16-bit BASIC compiler on offer from MICROSOFT, *QUICK BASIC 4*, and have felt daunted by the three volume manual, you would understand why an independent tutorial was necessary. This statement isn't intended to be a criticism of the *QUICK BASIC* manual as it's among the best manuals I have seen.

Actually, Feldman and Rugg's book is not all that much shorter; it contains nearly 700 pages. It's the style and the philosophy of their approach which makes it easier to read. The writer of an independent tutorial is always at an advantage compared with the author of the official manual. He may emphasize whichever parts he considers to be most important, or most in need of emphasis; whereas he who writes the manual must explain everything in the available space.

'Using Quick BASIC 4' is an excellent example of what a tutorial of this nature should be. An additional task, which the authors had to take on, was to give an explanation in depth of compiler techniques, as opposed to the use of interpreters. This was necessary, even though the differences are reduced due to the fact the *QUICK BASIC 4* uses threaded interpretation. Suffice to say that there are still major differences, and the authors succeeded very well in explaining them all in a language which is easily understood by most. The importance of this point is accentuated by the fact that most people programming in any dialect of BASIC have cut their teeth on interpreters, often without formal training in Computer Science.

Another point which the authors tackled rather well, is the thorough explanation given to topics such as: What are the differences between subroutines, subprograms and functions? How can we pass parameters to procedures? When should we use FOR..NEXT, DO..LOOP and WHILE..WEND structures? How to make use of error and event trapping? etc.

There is one more aspect of the book which I would like to emphasize, since I haven't got the space to emphasize all those which would deserve mention. Anybody who wishes to use *QUICK BASIC 4*, irrespective of their current level of attainment, will find many pages from which (s)he can learn a great deal. The book is particularly well structured in this respect; whether you are a complete novice to programming, one who has written many complex BASIC programs in any other version of the language, or an old hand at *QUICK BASIC* (that would be *QUICK BASIC 3*, since the new version 4 has not been on the market for long), you will find the book very useful.

Apart from the thoroughness of treatment, presented in an easily understandable form, the book is full of examples; many of them would also serve as a template for the reader's own programs.

In conclusion, I recommend that no one programming in *QUICK BASIC 4* should be without this book, in spite of its price. **LF**

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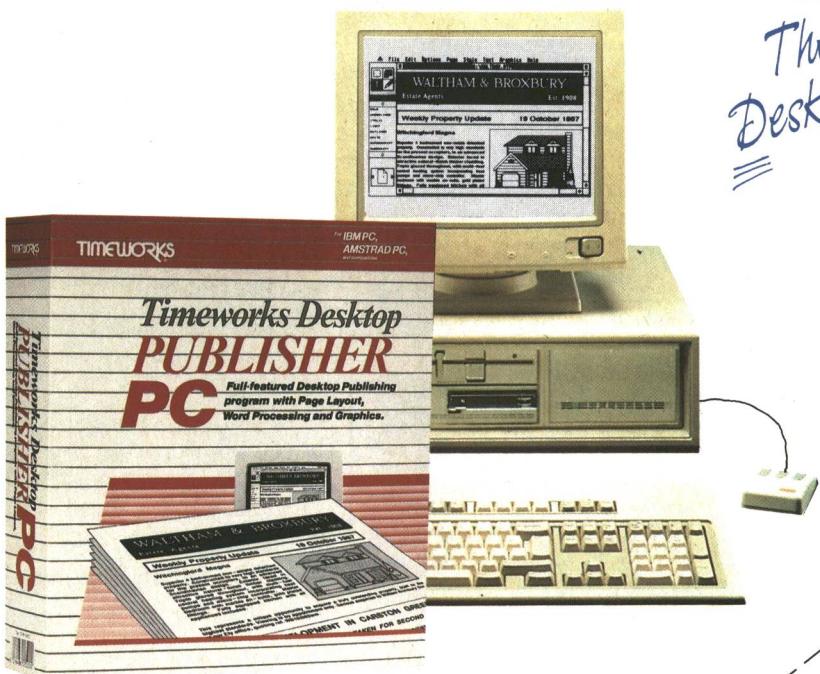
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DOWN TO DATABASE-ICS

The next installment of our series helping you to computerise your business. This month Dr Ann Swinfen examines some of PC File+'s more advanced features.

PROJECTS

First of all, I'd like you to make a copy of last month's **CUSTOMER** data base files. Either on your floppy data disk or on directory **c:\pc\file\data** you should have three files, **CUSTOMER.HDR** **CUSTOMER.INX** **CUSTOMER.DTA**. Later we'll examine what each of these holds, but for the moment just remember that any *PC-File+* database has these three parts - **.HDR**, **.INX** and **.DTA**. Make a second copy of these with:

```
COPY CUSTOMER.* CUST_2.*
```

When the copying finishes, start *PC-File+* and load in **CUST_2**. This is the one we are going to modify.

PROJECT 1: Modifying a database

Call up the Utilities menu with [F8], then take [N] from the Utilities (for Name).

You will be asked:

Which FIELD'S Name, Mask, Constant or Calcs to Change?

then choose **Field 1 (Surname)** by typing [1] followed by [F10]. You will then be asked:

Change (N) Name (M) Mask (K) Constant or (C) Calcs?

You can change a name with option [N]. This is particularly useful for adding [#] to a field name which you forgot to make a calculated field.

We want to ensure that the user only enters appropriate characters here, so we are going to provide a 'mask'. Option [M] is used when you want only certain characters to be entered. For example, you might want only upper case letters, only numbers, or only F, f, M, m

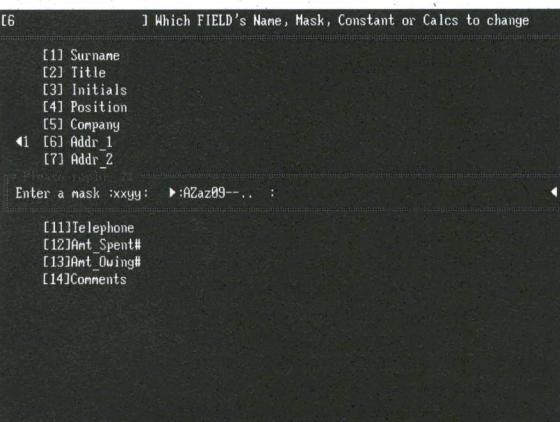


FIG.1 Entering a mask for a field.

to be entered (e.g. for the people's sex).

A mask is enclosed between two colons, and consists of pairs of letters. Here are some examples:

:AZ: only upper case letters
:09: only numbers
:Azaz: only upper and lower case letters
:FFffMMmm: only F, f, M, m

So, type [M] for Mask, and then:

:Azaz-- :

(note the two hyphens and two spaces). Press [Enter]. Now the user will only be allowed to type in lower or upper case letters, hyphens or spaces in this field. Now enter the following masks. Note that where a single character is allowable - like a hyphen - it must be typed twice, although AZ covers the whole range of characters from upper case A to upper case Z. Fig.1 shows the screen view when entering a mask.

HARDWARE CHOICE

For advice on choosing computer hardware for your business, see Matt Nicholson's article on page 96.

SEARCHING FOR DATA

Last month you looked through some records using the Find options. Now let's look at the most subtle of these options: S for Search. Load *PC-File+* with your **CUSTOMER** database and press [F2] or [F] on the main menu to call up the Find menu. Now press [S] for two further options: Simple search: - you 'fill in the blanks' and Complex search: - you type in a formula.

Type [S] for the simple search. You will see a data entry screen similar to the one you have used to enter information only this time with rows of *s instead of blanks for the data.

Type over the *s with the information you want to find. Look for a customer named Jones, who is based in Glasgow. Type in Jones at the beginning of the Surname ***ed area and Glasgow at the beginning of the Town ***ed area.

When you are ready to search, press [F10]. If there is such a customer, the full record for this customer will be shown on screen. If there are two or more customers called Jones and based in Glasgow, pressing [F] (for Find the next one) would bring them up.

By typing in the information at the BEGINNING of the ***ed area you are making a 'generic' search, which will only find a field which begins with the given characters.

There is also a 'scan across' search. If you type ~don on a Surname field, you will find all the names which contain the three

letters 'don' anywhere. Thus you could find Donald, MacDonald, Macdonald, Swindon... The tilde [-] must precede the search-group of characters in this situation.

Note that these searches do not differentiate between upper and lower case.

A third type of search is the 'wildcard' method. If you have a stock record where stock is classified with a code of four numerals and a letter, for example:

```
1321F Frozen Peas
1321N Fresh Peas
5576F Frozen Fish
9891N Fresh Cox's Apples
3141D Dried Tomato Soup Mix
```

you can do a 'wildcard' search for all the frozen foods coded by typing in _ _ _ _ F where the [_] is the underscore character. The four underscore characters ensure that an 'F' is searched for only in the fifth position of the code.

A fourth method is the 'soundex' search. *PC-File+* will attempt to find an entry which sounds roughly like the word you have typed in. If you precede your entry with a [?] and type in - say - ?RAWLINS, records containing 'Rollings', 'Rollins', 'Rawlins', and 'Rawlings' would all be found. Clearly this method can never be foolproof, but it has its uses.

There is also a Complex search which uses a formula you design, but that will come later.

This is what you should enter:

Field	Mask
2 Title	:AZaz----
3 Initials	:AZaz----
4 Position	:AZaz----
5 Company	:AZaz--
6 Addr_1	:AZaz09----
7 Addr_2	:AZaz09----
8 Addr_3	:AZaz09----
9 Town	:AZaz--
10 Postcode	:AZ09
11 Telephone	:AZ09
12 Amt_Spent#	:09..
13 Amt_Owing#	:09..

We'll leave the **Comments** field completely open. After typing in all the masks we'll enter one 'constant' field.

A 'constant' field is just a method of providing a default value, to save the database operator time. If you type in a default entry for a field, such as "Dundee" or "Amstrad Computer", it will appear whenever a record is entered, and can either be accepted or typed over. Put quotation marks around the default value, as shown. You can specify that the constant is provided only when Adding or Modifying by putting ***A** or ***M** after the word in

quotation marks.

Let's suppose most of your customers have addresses in London. We'll make London the default town name, which the user can alter if necessary. Still on the screen for modifying names, etc., select Field 9 **Town**, then choose **[K]** for Constant, type in "London" and press **[Enter]**. London will now appear as the town when you are entering a new record, but you can type over it if you wish.

When you have finished all these modifications press **[F10]**, then **[Q]** to Quit the Utilities. Try entering some new records now, to find out what you can and can't type in.

You could have made a field a 'calculated' field by entering something like **(fieldname1 + fieldname2 - fieldname3) .2**. (This example would add the first two, subtract the second and give the answer to two decimals.)

PROJECT 2: Cloning a database

It's very difficult to get your database design exactly right the first time around. After you have entered some records you suddenly realise you have made one of the fields too long. Or too short. Or you need an extra field. Or it would be better to enter the information in a different order.

Many database packages would force you to start again from scratch, design a new database layout, and then enter everything all over again. Very time-consuming and tedious in the extreme. **PC File+**, however, allows you to 'clone'. This means that you copy an existing database, modify it, then import into the new database the records which already existed in the original. You can, if you wish, retain both databases, provided you give them different names. This is particularly useful where you need similar sets of records with a considerable amount of overlap.

We now decide we want to add two fields to our customer database. Fields 1 to 13 will be the same and the **Comments** field will become Field 16. We want to add:

Field Number Name Length Mask

14 Prod_Type 20 :AZ09 :
15 Order_Due 1 :YYyyNNnn :

From the main menu choose **[F8]** then **[C]** for Clone. You will now find the entry screen displayed. This can be treated like a small word processor, and you will see in Fig.2 how I have rearranged the fields, added the new fields and inserted some text, to make the entry screen more user friendly. The number of spaces between the square brackets equals the size of the field. Leave one space between the field name and the left bracket. This method of working on the entry screen is called 'painting', and can be used instead of the 'fast' method when you first create a database.

When your screen is complete press **[F10]** and follow the on-screen instructions as explained above. As the existing fields are all retained with the same names just press **[F10]** as each field name appears to accept, for example, that **Town** becomes **Town** again. Press **[F10]** at each of the new fields also. Give your new database the name **CUST_3** and say **Yes** to transfer all records.

You will find you are still in the old database, **CUST_2**, so quit that and load **CUST_3**, then insert the masks for the new fields. The purpose of the mask in Field 14 is to allow you to enter codes for the type of goods a

SORTING DATA

Information may be entered into your database in a random order, as it comes to hand. However, very often you will want to examine the information in a specific order, such as alphabetic. This is particularly important when preparing reports. Let's see how we do such a **SORT**.

With the main menu on the screen, press **[F7]** or **[S]** for Sort. All your field names will be listed, and you will be asked for your 'Sort field #1': Type in the name of the field on which you want to sort, followed by **[F10]**. Then indicate whether you want an ascending (**[A]**) or descending (**[D]**) sort and press **[Enter]**.

You can have up to 10 sort fields. This means that you could have an ascending sort on surnames (Sort field #1), followed by an ascending sort on first names (Sort field #2), followed in turn by a descending sort on 'Amount of Custom in Last Year', given in a field called **Custom** (Sort field #3).

When you have entered all your sort criteria, press **[F10]**. You will be asked which drive should be used for the work area – give drive C: (if you have a hard disk) or B: (for twin floppies). As the sort proceeds, you will be kept informed of its progress.

When the sort is finished, check it has worked by using some of the Find functions.

SORTING ON PART OF A FIELD

You do not need to sort on an entire field. You will find that most surnames can be sorted on the first six or so letters – which can speed things up. If we choose **Surname** as a sort field, but enter it as

Surname, 1, 6

the sort will look only at characters 1 to 6. The first number gives the position of the first character to be used, the second number indicates how many characters should be used.

'FLIP' DATA

Sometimes you will store information in one order but want to print it out in another. The most common example of this is with names.

You might want to store surnames first, to ease sorting. But you could want to print the title and/or initials first. The 'flip' data feature does this. For an entry in a **NAME** field:

Jones~Mr E

the surname can be used for sorting but for printing or listing, his name can be 'flipped' to **Mr E Jones**. We can choose not to flip the data when printing. There is an option on the Report Menu:

Flip ~ data active

which we can make either **Y** or **N**. (We'll meet Reports next time.)

SPECIAL SORTS

Random Sort. To sort your records in a random order – to choose winners of a lucky draw, say – you need to do a Random Sort. Call up the Sort function as usual, and when you are asked for a sort field, type in **RANDOM***.

Roman Numeral Sort. To sort Roman numerals – the **Chapter** field of a 'books' database, perhaps – type **CHAPTER, R**, and the sort will be done for you. The comma followed by **R** triggers this.

Field names: 12 letters or less. Data locations: []
 Example: CITY [NEW YORK] Press (Alt)H for help
 Please make changes to your data-entry screen [21:00]

CUSTOMER FILE

Surname []	Title []	Initials []
Position []		
Company []		
Addr_1 []		
Addr_2 []		
Addr_3 []		
Town []		
Postcode []		
Telephone []		
Ant_Spent# []	Prod_Type []	Order_Due []
Ant_Owing# []		
Comments []		

● FIG.2 Cloning an entry screen.

customer buys, e.g. A5 R7 Q3. You could then search your database with ~Q in Field 14 and find all customers who buy goods with code letter Q. The mask for field 15 is just a Yes/No entry. You can then search for all customers with orders outstanding by searching for ~Y in this field (this will search for either Y or y).

PROJECT 3: A stock control database

Now we are going to create an entirely new database. Restart *PC-File+* and choose the 'paint' method of design, answering [N] to **Would you like to start with the picture from an existing file?**. You'll find yourself in a screen like the clone screen but without any text. The design of our **STOCK** database is shown in Fig.3, with the entry screen in Fig.4. First lay out the screen as shown – with the correct number of spaces between the brackets – then press [F10] when you are finished.

The masks for **STOCK** are shown in Fig.3 and these should now be entered, using [F8] option [N]. While on the same screen enter these special items:

Field Calculated Constant

```
5 Stock_Value (Unit_Cost*In_Stock) .2
8 VAT_Rate '0.15'
9 Unit_VAT (Price_Ex_VAT*VAT_Rate) .2
10 VAT_Inc_Prc (Price_Ex_VAT+Unit_VAT) .2
```

Explanation: The ordinary masks we've already met. The mask for the date field means that the current date will be inserted automatically whenever you add or modify a record, so you always know when the last entry was made for the stock item. The VAT rate can be altered if desired, but defaults to 15%. The three calculated fields are worked out for you automatically, to 2 decimal places.

Now try entering some stock records. You only need to enter **Code**, **Description**, **Unit_Cost**, **In_Stock** (the number in stock), **Order_Pt** (number in stock to trigger a re-order) and the selling **Price_Ex_VAT**. Just press [Enter] on all the other fields so all the calculations are done for you when you press [F10] to finish the record.

Next month, your most important challenge will be to produce reports based on your databases. You will also see how one database can be made to consult another.●

Field Name Length Mask

```
Code 4 :AZ09:
Description 20 :Azaz09 :
Unit_Cost 9 :09...:
In_Stock 3 :09:
Stock_Value 9 :09...:
Order_Pt 3 :09:
Price_Ex_VAT 9 :09...:
VAT_Rate 4 :09...:
Unit_VAT 9 :09...:
VAT_Inc_Prc 9 :09...:
DATE 8 :DD/MM/YY*09//:
```

● FIG.3 – Stock – Database Design

Field names: 12 letters or less. Data locations: []
 Example: CITY [NEW YORK] Press (Alt)H for help
 Please make changes to your data-entry screen [21:00]

STOCK CONTROL

Code [] Description []

Unit_Cost [] In_Stock [] Stock_Value []

Order_Point []

Price_Ex_VAT [] VAT_Rate [] Unit_VAT []

VAT_Inc_Price []

DATE: []

● FIG.4 – The entry screen for the Stock Control database.

Record number 2

STOCK

Code ►A5 Description [Wooden Trains]]

Unit_Cost [7.50] In_Stock [150] Stock_Value [1125.00]]

Order_Point [25]]

Price_Ex_VAT [12.75] VAT_Rate [0.15] Unit_VAT [1.91]]

VAT_Inc_Price [14.66]]

DATE: [03/01/89]

● FIG.5 – Calculations entered automatically.

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DA

During the last three months we have examined and quantified the main internal commands contained within MS-DOS.

It is now time to begin looking at the external ones.

In order to use any of these commands you must have the MS-DOS disk in the disk drive if you are using a floppy based machine. If you have a fixed disk on your PC, make sure you are in the directory which contains the MS-DOS files. Alternatively, check that the directory is available on the current PATH you have set up.

The power of MS-DOS lies in its ability to communicate with the outside world in a language that is as near to common English as is possible while still being specific to the commands you want to use. In order to reduce the amount of memory that the operating system uses these commands are split into two main parts.

The first consists of those that were considered to be vital and thus were included within MS-DOS itself – the internal commands.

The second set consists of those commands that are desirable but which will only be used occasionally and so they do not need to be loaded into the memory all the time – the External commands – and it is these that we will begin examining in this article.

Each command will be given in full, including its extension - although when you enter it you will normally not need to use this.

ANSI.SYS

ANSI is an acronym for the American National Standards Institute.

It pertains to a set of standards that were originally designed to produce specific effects in the early days of computers. This command controls the way in which the display, i.e. monitor, produces its effects. It is primarily used by a number of older software packages to create defined colour displays.

To use the command it must be included in the CONFIG.SYS file as a device by using the line

DEVICE=ANSI.SYS

This means that the command must be in the root directory of the disk that you are booting up your machine from, although on a hard disk machine you can modify the line to include the path to the directory that contains the program, e.g.

DEVICE=C:\MD-DOS\ANSI.SYS

which allows you to keep the root directory of your disk uncluttered.

ASSIGN.COM

This allows you to 'fool' the computer into believing that one drive is actually another one. Some application software, particularly older ones, require you to keep data and program files on separate disks which is fine if you are using a twin floppy machine but can be a nuisance if you have only one floppy drive. This command allows you to get round the problem because it makes MS-DOS treat one drive as another, e.g.

ASSIGN A=B

forces the computer to ignore the physical presence of Drive-A and always look to Drive-B whenever the application requests the former.

The command affects all subsequent calls for the disk drives and so you should be careful when using it. For instance there are a number of MS-DOS commands which are 'drive sensitive', e.g. **DEL** or **DIR**, these act on

ABSOLUTE BEGINNERS

Exploration of the potential mastery of MS-DOS, Alan Balfe this month embarks on an explanation of the External Commands of the operating system.

the designated drive - providing that it has not been reassigned using this command. Once the assignment has been activated it can be undone very simply by entering the command without any parameters, i.e. **ASSIGN**, and all the drives will return to their default status.

ATTRIB.EXE

Each file on your disks, whether it be a system, program or data file, possesses a number of attributes - e.g. the size, date and time of creation - all of which are visible whenever you use the **DIR** command. But there are also four others which you do not normally see and which affect how the file is handled by the computer itself. This command allows you to see and change two of the four.

If you enter

ATTRIB *.*

you will get a listing, similar to the **DIR** listing but without the size and date information but including the actual location of the file. However each file will be preceded by one or two letters, e.g.

A R A:\MS-DOS\ATTRIB.EXE

The first letter refers to the Archive Bit. Every time that you create or modify any file this bit is turned on, so that the letter appears whenever you use the command as above. It is mainly used by programs that make backup copies of your files, including **BKUP** itself (cf). Whenever a file is backed up the archive bit is turned off so that the computer knows which files have been duplicated and which haven't. You can turn the bit on and off yourself by entering **ATTRIB**

+A *.* or ATTRIB - A *.* respectively.

The second letter is the more important of the two, in the normal course of events as it refers to the files ability to be changed or deleted. The R stands for Read Only and any file that has this bit set cannot be erased or changed. Again you can alter this for yourself by entering

ATTRIB +R *.*

to turn the bit on, or

ATTRIB -R *.*

GENERATIONS OF SAFETY

In order to ensure maximum safety for your data you should get into the habit of backing up all of your files on a regular basis. One common method of doing this involves the use of three 'generations' of backups - referred to as the Grandfather, Father and Son (Excuse the sexism. - Ed)

The first backup is made onto the first set of disks and these are the Grandfather disks. The second backup uses the next set and these are the Father. The third backup uses the last set - the Son. When you come to do the fourth backup you use the original Grandfather disks, erasing the original data they contained, and they then become the new Son disks - the original son being promoted to Father and the Father becomes the Grandfather. Thus the process continues, ad infinitum.

In this way your data is always backed up such that you will only lose very little when you have a disaster with your working data.

BITS AND PIECES

Whenever a file is saved to your disk MS-DOS will normally use the first chunk of available space. If the file is small then this is not a problem - however if you are saving a large file the amount of space available might be less than the total necessary to it. In this case the computer puts part of the file in the 'hole' and then looks for the next available space and so on. With very large files the result can be that your file is scattered all over the place, i.e. it is non-contiguous or fragmented. This slows down the computer's ability to access the file and can also lead to damage to the file.

to turn it off. It is useful to make all your system files read only as it will protect them from being accidentally erased, especially if you have a hard disk where the inadvertent use of **DEL *.*** could wreak havoc with your files.

The other two attributes are **Hidden** and **System** but these cannot be seen or set using this command, instead you will need to use a utility program like **PC Tools**, **Norton Utilities** or **File Rescue Plus** which all contain the ability to change these attributes. Any file that is hidden will not show up when you do a directory listing, nor can it be deleted. System files are also not normally visible - they are used to control the actual hardware of the machine and should never be messed with. The two system files are **IO.SYS** and **MSDOS.SYS** (or **IBMBIO.SYS** and **IBMDOS.SYS**, if you have IBM's PC-DOS) and as double security they are also hidden and read only.

BACKUP

This is exactly what its name suggests it will be.

It is a program that will create backup copies of your files onto pre-formatted diskettes.

It will backup all those files, in the current directory, that have their Archive bit set to on. If you have changed this, using either the **ATTRIB** command or a utility, then your files will not be backed up. Once a file has been backed up MS-DOS will automatically change the Archive attribute to off so that it knows which files have been backed up for future reference.

One problem with this command is that different versions of it, e.g. those from MS-DOS 3.2 and MS-DOS 3.3, are not compatible - in other words you cannot make a backup with Version 3.2 and then restore it with Version 3.3, or vice versa.

Another problem is that the disks onto which you wish to make the backup copies must be formatted before use.

The final problem with the command is that you cannot ask it to backup specific files, it will copy every file in the source directory or drive.

When you make a backup a special file is created on each of the floppies used, called **BACKUP.LOG** which contains the details of the time and date of when the files were backed up, along with a list of all the files that were copied on that date and on which disk they are located.

You can add a wide range of parameters to the command, which has the format

BACKUP <Drive> <Pathname> <Drive>
<Parameters>

to produce a range of different conditions.

/S tells the command to backup the sub-directories as well as the files thus you can use the command to backup your entire hard disk - but have lots of floppy disks ready if you choose to do this.

/M forces the command to backup only those files which have changed since the last backup was made.

/A causes the command to add the new backups to the old ones already on a disk. In the normal course of events one backup will automatically delete a previous one but with this parameter you can prevent that from happening.

/D: <Date> tells the computer to only backup those files that were last modified on or after the date specified. Thus you can use the command to be selective about the files that are copied.

/P means pack as many files as possible onto each disk, i.e. fill the disk even if this means fragmenting the files.

/T: <Time> allows you to backup only those files that have been modified or created on or after the specified time.

/L: <Filename> this allows you to change the name of the default file that the command uses to store its information, i.e. **BACKUP.LOG**.

You can use the command to make backup copies of your files either to floppies or a tape streamer - which are the usual methods - or to your hard disk.

Backups are especially important if you have a hard disk machine as they provide you with protection against data loss in the event of a disk crash.

CHKDSK

An abbreviation for **CHecK DiSK**, this program will analyse your disks, either hard or floppy, and check the directories and files to make sure that they have been saved properly.

Once the analysis is completed it will then display a report of the disk's statistics as well as the computer's memory,

Checking a 20 Mb hard disk might give a report like this:

```
21282816 bytes Total disk space
98304 bytes in 6 hidden files
40960 bytes in 18 directories
8687616 bytes in 456 user files
12455936 bytes available on disk
```

```
655360 bytes total memory
307472 bytes free
```

It is possible to extend the report if you wish by adding **/V** to the end of the command and so force it list the name of every directory and file on the disk as the command encounters and checks them.

Alternatively you can use the command to check on a single file by entering

CHKDSK <Drive> <Path> <Filename>

in which case the computer will display a message if the file is non-contiguous - i.e. fragmented. You can use the wildcard characters with this command and so check a group of files.

These five commands have a wide range of applications, and you can spend a lot of time experimenting with them. Always remember, however, to use a 'scratch' diskette if there is any risk of corrupting your data.

Next month, we'll be looking at some more of MS-DOS's external commands.

QUICK GUIDE

ANSI.SYS - Controls the way in which the display produces its effects.

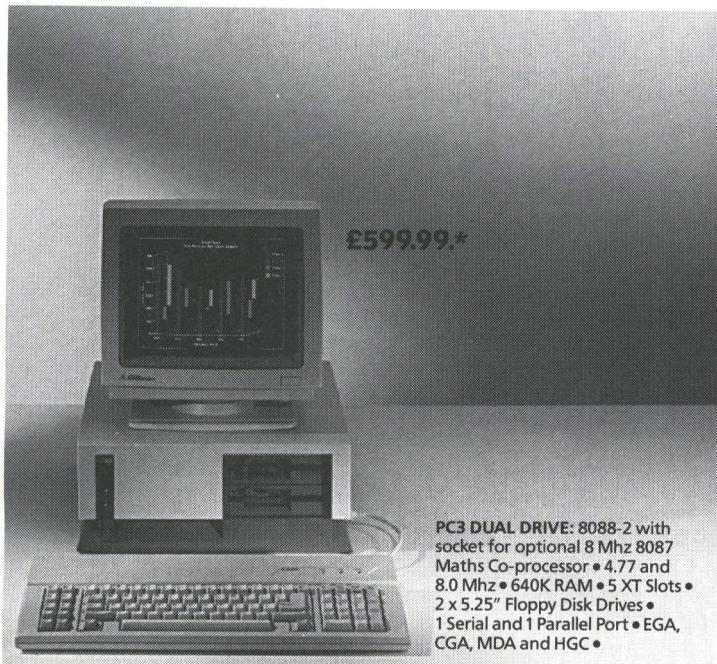
ASSIGN.COM - "Fools" the computer into believing one drive is actually another.

ATTRIB.EXE - Allows changes to be made to two of the four undisplayed file attributes.

BACKUP - A program to create backup of all files with the Archive Bit set to on.

CHKDSK - An abbreviation of **CHecK DiSK**. This will check that directories and files have been saved properly.

For those who think big.



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PC3 HARD DISK: 8088-2 with socket for optional 8 MHz 8087 Maths Co-processor • 4.77 and 8.0 MHz • 640K RAM • 5 XT Slots (1 occupied by Hard Disk) • 1 x 5.25" Floppy Disk Drive • 1 x 30 Mbyte Hard Disk Drive • 1 Serial and 1 Parallel Port • EGA, CGA, MDA and HGC •



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PC5: 80386 - 16 MHz socket for 80387 • 64K bytes of directly mapped Cache Memory • 2 Mbyte of RAM with parity • 1.2 Mbyte Floppy Disk • 60 Mbyte Hard Disk with high performance controller card allowing 1-1 interleaving and a 7.5 Mbits/sec data transfer rate • 4 AT Slots plus 1 XT Slot • PRICE: £2599.99* No Monitor • £2799.99* Atari mono EGA • £2999.99* Typical colour EGA •

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The Atari logo, featuring the stylized 'A' shape followed by the word 'ATARI' in a bold, sans-serif font.

IBM PC USER GROUP

This month the User Group Chairman, Dr Alan Solomon, examines the difficulties associated with IBM's database interrogator, Structured Query language

At the Programmers meeting, we covered Structured Query Language (SQL, pronounced either as the letters SQL or one word - Sequel). John Spiers of Oracle came to talk to us on the subject, and was an extremely interesting speaker. SQL isn't really a programming language, but more of a protocol used by database front ends to talk to database servers. It's a very straightforward language and aficionados say that they can type queries in directly using SQL. Ordinary mortals have to use front ends to translate a simple method to SQL.

SQL is a complete misnomer. It isn't terribly structured, and it isn't even standard, as every vendor has their own dialect. And it isn't only for queries - you also use SQL for putting data into the database. And it isn't really a language, except for databases. But it is the way that the world is going.

The problem that it addresses is the integrity of a database, which may be spread across several computers (or, of course, it may reside on only one PC). Imagine a banking system, in which my account is credited by £1, and your account is debited by £1. Now imagine that the computer crashes halfway through doing that job.

The database is inconsistent, and with most databases that you can buy for the PC, you have to look after that kind of thing yourself. This means a great deal of programming in a language like *dBase*, raising flags and checking them afterwards, or writing journal files, or whatever.

With a decent database, you have a thing called a transaction, and a transaction is either done completely, or not done at all. Let's assume that a machine crashes in the middle of a transaction. When it is brought up again, it detects that it was in the middle of a transaction when the disaster happened and it rolls back to the last point that you specified as complete.

The database is therefore guaranteed to be consistent at all times, although you do lose the transaction you were entering at the time of the crash, of course.

EXTRA INFO

Anyone who is interested in finding out more about SQL, can write to John Spiers. He gave out a very interesting little introductory booklet to SQL at the meeting. If you would like a free copy, a limited number are available from:

Oracle UK,
Bittams Lane,
Guildford Road,
Chertsey, Surrey, KT16
9RG

DBMS

This will be appreciated by anyone who has ever lost a large quantity of data to a so-called 'Data Base Management System' when the indices became inconsistent with the data, or when a file lost its header, or any of the dozens of accidents that can happen to a Data Base Mangling System. These accidents are what makes a market for the various products that repair damaged databases, which would not be necessary if DBMSs actually looked after your data.

SQL is non-procedural. You can't use SQL to tell the DBMS how it should access your data, or how it should search. You just define what you want, and it is up to the DBMS to work out the best way to find it. Where in most conventional DBMSs you tend to think in terms of records; in a SQL database, you think in terms of sets of records, called tables.

A table is exactly what you'd imagine; a number of rows of records, in a number of columns. You manipulate these tables using SQL commands such as *JOIN*, *AND*, *OR*, and *WHERE*. For example, here's a typical SQL query:

```
SELECT EMPLOYEE_NAME, JOB, SALARY
FROM EMPLOYEE_DATA
WHERE JOB = 'WELDER'
OR SALARY < '3000'
```

What you get back is a table in which the columns are employee name, job and salary, for any employee whose job is welder, or salary is less than 3000. Notice, we haven't had to tell the database how to do the search, only what it is we want. Notice also that we haven't told it how to format and display the data - that's because you can't. SQL is about talking to databases - how you display the data is another story. You might be writing a COBOL program, and the SQL gets the data that you will be then using, or you might be using a database front end that sends SQL to the server, and then the front end will let you format and report on the data.

BACKUP

One of the biggest unsolved problems of a distributed database, is how do you back it up? Consider a single database, which is partly stored in London, and partly in Manchester, and partly in New York. It could have the names stored on one machine, the addresses on another, and the phone numbers on a third, and any update to a record must update all three computers. Preserving the integrity of the database is a nightmare - you might successfully write to two of the computers, but find that the third is down, so you have to roll back the first two writes.

The biggest problem, is how do you back the system up in a consistent manner? You can't just copy the files onto tape - you might do it at a time when a record is updated on two machines, but not on a third.

The only solution available so far, is to take the whole database offline, and do the backup at all three sites at once. This is not, of course, very satisfactory. If you can think of a better way to back up a distributed database, rush down to your local patent office and patent it! ●

DATES FOR YOUR DIARY

The IBM PC User Group holds meetings regularly throughout the country, and also has several Special Interest Groups (SIGs) that hold their own get-togethers. Anyone is welcome although it is hoped that they join the User Group eventually.

Satellite meetings:

15th Feb - Bristol. Further details from Graham Harris (0272) 583534.

21st Feb - North West. More details available from Michelle 061-486 0779.

28th Feb - Glasgow. Contact Anne McKenzie at microstaff if you wish to attend.

14th March - General Meeting. Royal Aeronautical Society.

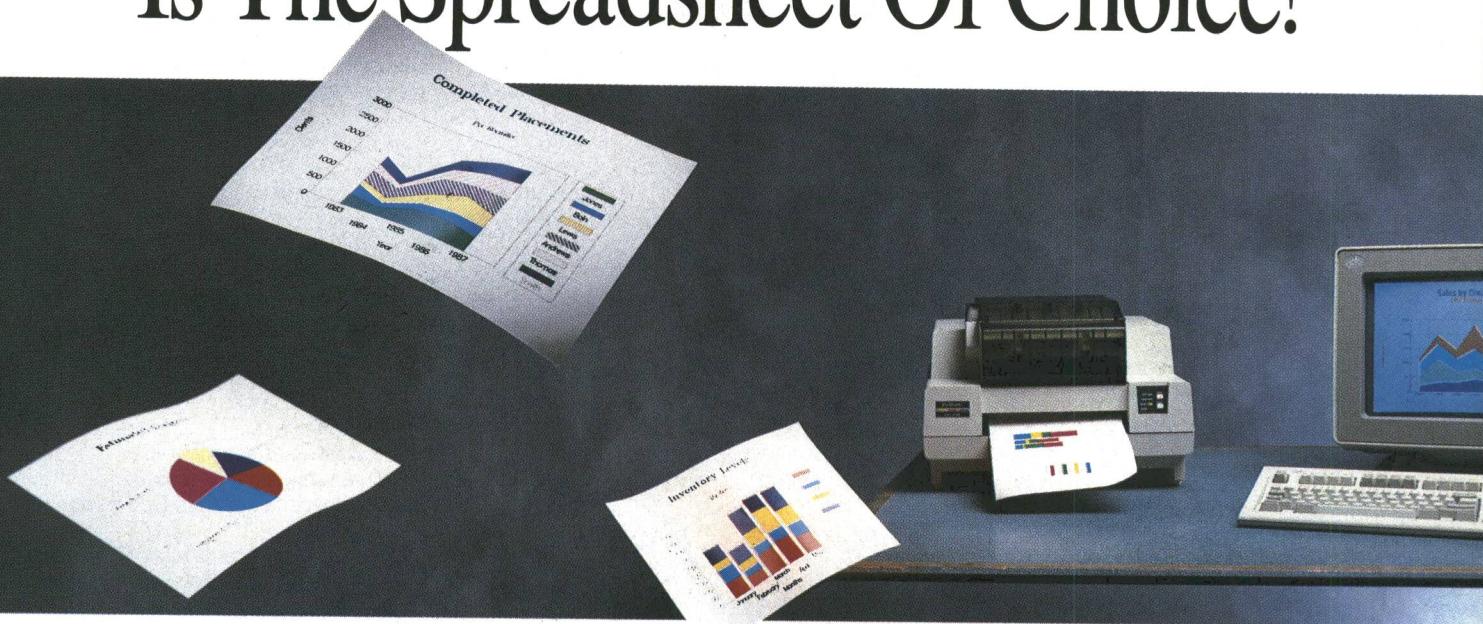
7pm - Dr Solomon will hold a surgery in the theatre.

7.30pm - There will be a discussion on viruses including a large-screen demonstration.

Details of membership and any other details may be obtained by contacting:

IBM PC User Group
PO Box 830 London
SE1 ODB
Phone: 01-863 1191

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In fact, Quattro offers a degree of compatibility that allows it to accept all the familiar 1-2-3 commands and use any 1-2-3 worksheets and macros, as well as data files created with other spreadsheets and databases. So with Quattro there's absolutely no retraining involved. If you know 1-2-3 — you know Quattro.

But Quattro takes its users beyond the old standard. It's not only faster, more powerful and easier to use, it includes a range of facilities that make it stand out from the crowd.

Take, for example, Quattro's presentation graphics — of such high quality that to match them you'd probably have to buy a separate standalone package. Quattro's greater macro capability, allowing you to record an unlimited number of macros and

follow their execution step by step. And Quattro's "minimum recalcs" which calculates only the formulas whose elements have changed — making it faster and smarter than the others.

These, and many more, are the benefits that Quattro users have come to expect as standard. They're benefits that are available today and are giving the people who have chosen Quattro a clear advantage over their competition.

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Which Computer, June 1988

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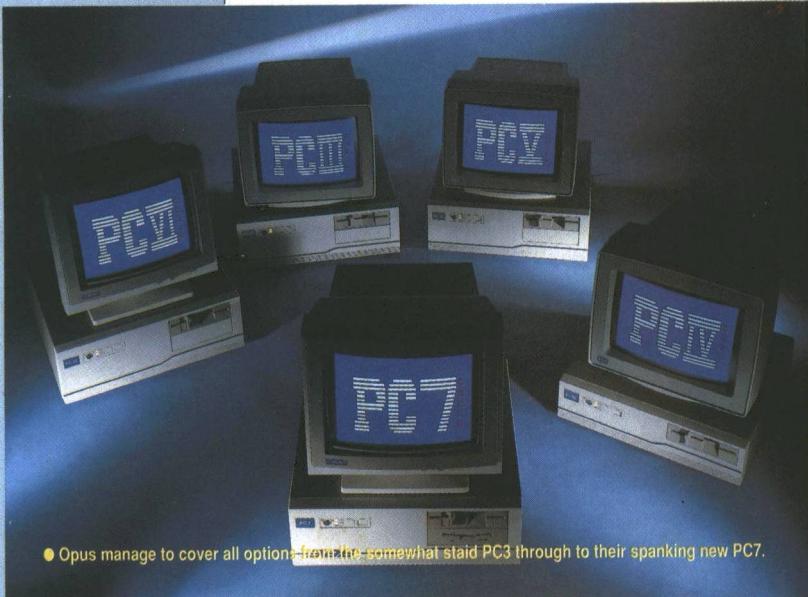
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HARDWARE DECISIONS

Are you tired of pootling about in the slow lane? Matt Nicholson looks at machines that could put the zest back into your software

Are you the sort of person who is quite happy driving a Lada, or do you need something a little more nippy, like an XR3 or Gti? Perhaps you can't live without the throb of a Porsche 928,



● Like Dell, CompuAdd sells direct by mail order – even providing an 0800 phone number. This 16MHz 80386 model looks exceptional value at under £2000, but a 4 Mbyte model with VGA graphics would set you back £3788.



● While the rest of the PS/2 range features IBM's new MCA expansion bus, the Model 30 286 shown here has the standard AT-style bus. For a 286 it is pretty slow at 10MHz, and you pay nearly £1000 extra for the name.

or maybe you really need a Volvo Estate or even a turbo-charged 20-ton lorry. The huge variety of vehicles that you can get around in these days wouldn't sell unless they each satisfied a particular need or a desire, and it is much the same with computers.

If you are looking for your first computer there is no reason to start at the bottom; and if you have a straightforward 8086-based PC like an Amstrad PC1512, for example, or even the humble IBM PC itself, there are plenty of reasons for wanting to upgrade to a more powerful machine:

- You might be running a hefty graphics-based application such as a CAD or DTP package, and need something a bit nippy just to make it bearable to use.
- You could be developing huge programs, and don't like waiting for them to compile.
- You work for a huge corporation and run a huge spreadsheet or a huge database. You need to be in the fast lane.
- You are setting up a network, and want something with a bit of power under the bonnet and plenty of space in the boot for the file server.
- You want something that is future-proof, and are worried about OS/2 and MCA compatibility.
- You want something on the desk that moves with the speed that matches your top-of-the-range leather-bound filofax and designer furniture.

Just as with cars, there are plenty of machines around that could satisfy each one of these needs. The problem is that the aptitude of a particular micro computer is rather less obvious than that of a road vehicle, so it is all too easy to end up with the Golf GTi or even the Porsche when you really needed the Volvo estate or the 20-ton lorry.

The IBM PC, when it was first launched back in 1982, set a standard that has effectively stood ever since. In 1983 an IBM XT, with 128K of RAM and 10 Mbyte hard disk, represented the forefront of technology would have cost £5147. Six years later that gets you an IBM Model 70 with a 16MHz 80386, 60 Mbyte hard disk and 4 Mbyte of RAM, and some (small) change. Technology has moved on, the price of old technology has dropped considerably, and obviously the IBM standard has had to move with the times.

But do you actually need all that technology? Wouldn't an older – and cheaper – specification do the job just as well? This could well be the case but, just as with cars, there are many factors to juggle when deciding on a suitable machine.



• Above, the Amstrad PC2386, exceptional value as our table shows.

• Right, bottom of Dell's range is the System 200. This 12MHz 80286-based machine looks competitive at £1249 plus VAT, but add VGA graphics and 4 Mbytes of RAM and the price goes up to a more realistic £3499.



THE SLOW LANE

All IBM's micro range is based on the Intel range of processors, the IBM PC itself being built round the 8088 chip. This is a 16-bit design, but with an 8-bit data bus to the outside world. Although the 8086 processor, which uses 16-bit words inside and out, actually predates the 8088, IBM chose to use the 8088 because back in the early eighties most of the chips and devices available were 8-bit. These days 16-bit devices are relatively cheap and plentiful so most PC clones use the 8086 processor.

The original PC ran with a clock speed of just 4.77MHz, which is too slow to consider these days for anything but the simplest of text-based manipulation. As our table shows some manufacturers still use the 8088, but a faster version running at 10MHz. However most use the 8086, with an 8MHz clock being common.

Nevertheless the 8-bit, 4.77MHz standard is still used on the expansion bus, into which expansion cards containing modems, networks, hard disk drives can be plugged. The 8-bit expansion card is still so common that both the later AT design and even many 386 models can still take the cards, although performance of 8-bit boards is not enhanced when plugged into such machines and can cause performance bottlenecks.

Both the 8088 and the 8086 have a 20-bit wide address bus, which limits memory capacity to 1 Mbyte. The PC design uses 384K of this for its own internal use, leaving 640K available to the user. The MS-DOS operating system, originally developed for the IBM PC and called PC-DOS on true IBM machines, was designed for these chips and so also restricts the user to 640K. It is this barrier, rather than any lack of power, that ultimately limits the usefulness of the PC design.

An 8MHz 8086 design is perfectly adequate for many single user purposes, provided too many memory resident 'pop-ups' aren't required and applications are primarily text based. As our table shows, a reasonable monochrome model could cost under £800 with hard disk, while you would expect to pay around £1,000 for colour EGA or VGA display. The limitations in power and space are soon felt when a professional graphics-based

application is loaded though, which includes most DTP or CAD packages and anything running under Microsoft Windows or Digital Research's GEM. Still, the chip has lasted 10 years!

ADDING ZIP

Although still 16-bit internally and externally, Intel's next chip was substantially faster than the 8086 because it was fundamentally more efficient. Although developed shortly after the 8088, it didn't appear in a micro until 1984 when IBM put it into the IBM AT. This used an 8MHz 80286 and was hailed as the fastest PC in town.

The main difference between the 8086 and the 80286 is the addition of another four address lines, allowing the chip to address 16 Mbytes of memory. In its Protected Address Mode the processor can access

OFF LIMITS

Although MS-DOS's main limitation is the 640K memory barrier, its 32 Mbytes limit on hard disk size can be just as irritating – particularly with 40 Mbytes rapidly becoming the norm and 60 or 90 Mbytes common. MS-DOS can cope by effectively dividing the disk into a number of 32 Mbyte partitions, but this is not really satisfactory.

Just released is MS-DOS version 4.0, which can support hard disk partitions of up to 4 Gigabytes. Unfortunately these are totally unreadable by previous versions, but the good news is that they do seem to be compatible with OS/2 version 1.1.

BREAKING THROUGH

Desperate for space, manufacturers have found ways of fooling MS-DOS into addressing more than 640K. Two main standards have evolved, first LIM EMS (Lotus/Intel/Microsoft Expanded Memory Specification) version 3.2 and then version 4.0.

These are hardware as well as software specifications, requiring special memory boards as well as software drivers. On 386 machines with standard extended memory, software drivers alone will do the job.

EMS works by paging memory above the 1 Mbyte barrier in and out of an unused part of the area below 1 Mbyte reserved for system software, effectively behind DOS's back. Programs like *DesqView* and *OmniView* (see this month's News Plus) can use EMS version 4.0 to multi-task on 286 or even 8086-based machines.

POWER AND SPEED

Just as with a car the perceived power and speed of a system depends on a host of factors, not all directly related to the engine itself. Obviously the processor affects the power considerably, and has a major influence on the capabilities of a machine. As the 'engine' of a computer, the processor chip is itself a complicated device made up of many components each affecting performance. However it is possible to isolate a number of parameters that give a good indication.

An obvious one is the speed at which it processes instructions, sometimes quoted as the number of instructions performed every second. Instructions may be simple or complex depending on how many individual operations they require, but the processor is driven by a clock so the rate of the clock ticks, the frequency of the clock in other words, provides a

reasonable indication.

Another major factor is the amount of data that can be processed at any one time – known as the word length. A 16-bit processor with a clock frequency of just 4MHz could appear as fast as an 8-bit processor running at 8MHz when it comes to shifting data around.

Data is transferred to and from memory chips, disk drives, interface ports and so forth by means of a 'data bus', which does actually look like a set of parallel tram lines on the printed circuit board. Although the processor may be able to deal internally with 16-bit or 32-bit words, the data bus may be narrower. This is usually done for cost reasons, both because 8-bit peripheral devices are cheaper than 16-bit, and because the cost of packaging a processor depends largely on the number of pins it needs.

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Wordstar prof—clone has pull-down menus.

can draw boxes IBM graphics, and now has spelling checker, mouse support and more flexible printing.

LQ V2—memory resident print enhancement, works alongside your word-processor.

Mindreader—guesses your next word, suitable for scientists, doctors etc.

New York Word—2 disks—powerful features include tables, macros, indexing, split-screen editing.

PC Outline—memory resident thoughts organiser, up to 9 outlines on-screen with re-sizeable windows.

PC Type + PC Label—3 disks—this version has 100,000 word spell-check and integrates with PC Calc & PC File.

PC Style—analyse your writing, word frequency etc.

PC Write 2.4—can display mathematical foreign characters, split-screen editing, uses ASCII files, max 64K.

TechPrint—similar to WSMX80 but aimed at technical document production.

Sail—text editor with ability to view multiple files in multiple windows.

Spell Check—for use on ASCII files, eg PC Write, also includes EZ file and EZ graph.

Screenwriter—a text formatter for playwrights.

Wordplan—can read 1-2-3 files directly and automatically updates when values change, does calculations, has pull-down menus, command language.

WSMX80—fancy print effects using Wordstar prof and your epson printer.

DATABASE MANAGEMENT

Card Index—simple filing system, can print out 3 cards.

Catalist—2 disks—powerful mailing list manager over 32,000 names and addresses per list, duplication detection, post code formatting for over 100 countries, merge/split, output on labels up to 8 wide, Rolodex cards, hard disk req.

Dbase III Screen Code Generator—plus utilities.

Dbase III + 2 disks—well, not quite, but Wampum reads, Dbase files, does reports, supports networking and more, requires hard disk.

DREAM 3 disks.—Data Retrieval, Entry and Management system, ideal for setting up your own applications.

FreeFile—well written good documentation.

File Express 2 disks,—popular, fully featured system.

HyperShell—multi-file Hypertext reference system, help system and menuing system, has intelligent text file viewer, directory browser/file manager, and applications user interface prototyping with pop-up menus etc.

Listmate—menu driven label production.

Mail Monster—compiled DBase III mailing list organiser.

Namefile—another popular mailing list controller.

PC File + 3 disks,—probably the most powerful, easy to use database manager available, at any price!

VCR—keep a track of your video cassettes and print labels etc.

SPREAD SHEETS

As Easy As—amazing Lotus 123 compatible spreadsheet, reads 123 files, macros etc.

Goal Seeker—for use with spreadsheet.

Lotus 123 Worksheets & Macros—includes cash flow, line-of-credit tracker, ratio analyser, state calculator, growth capacity calc, queue analysis, new venture budget, quote generator.

Lotus 123 Worksheets 3 disks—includes financial analysis, import util, linear stats, biostatistics, travel business expenses, flowchart symbols, stock portfolio analysis, rental property analysis.

PC Calc + (3 disks)—son of PC Calc, new features, more powerful, still integrates with PC File + & PC Type +, extensive manual.

Quickecalc—many advanced features, plus convert rows to columns, columns to pages, bar charts, line charts, macros, context-sensitive help.

Side Writer—print out ASCII files on their side, ideal for wide spreadsheets.

Symphony Worksheets & Macros (3 disks)—includes name and address notebook, appointment calendar, graphic macros with trig functions, two-column WP, chequebook, labels, resistance & tolerance or resistors.

Turbo Calc—includes a pop-up note-pad like Sidekick, with good editing facilities.

GAMES/TRIVIA

Adventure Solutions—hints and tips for popular adventures including Hitch Hikers Guide and Infocom.

Arcade Games (3 disks)—includes Bugs!, Jumpio, Datnoids, Nuclear Attack Simulation, 3-Demon, Kong, Bricks, Pyramid, Pitfall, PC-Golf.

Backgammon

Bermuda Triangle—sailing quest (EGA ONLY).

Casino Games—includes Bridge, Othello, Roulette.

Castle—popular adventure.

Cave Quest—fantasy role-playing game.

Hack—adventure, DND style.

Jacaranda Jim—adventurous exploits in outer space.

Games 14—Bandit, Mazes, Slot Machine etc.

Games 15—Star Wars, Sea Wolf, Frogger etc.

Games 16—Soviets, Bricks, FLIGHTMARE.

Games 17—Pac Man, Poker, Castle, Invaders etc.

Games 18—Breakout, Bugs!, Lander etc.

Get Lucky!—adult games.

Mahjong—like oriental rummy with PUNG'S, KONG'S & CHOW'S!

Monopoly/Tune Trivia—US version of famous board game, Tune Trivia like 'Name that Tune'.

Origami—paper folding (needs Basic interpreter).

PC Chess—play the computer or a friend, save load etc.

Pinball Rally—three versions of popular game.

Sleuth—murder adventure.

Spacewar—shoot 'em up with good graphics.

Trivia (3 disks)—The Trivia Machine has several categories and levels.

Trivial Towers (2 disks)—more trivia.

Wily the Worm—ladders, rolling barrels etc.

Zork Utilities—help for popular adventure.

BUSINESS/VERTICAL

Forms Creation—design, save forms, save forms with data, printout, EZ Forms Exec.

Front Office—multi purpose business management (3 disks).

Estate Agents System—storage and retrieval of information about properties, pending and closed sales, plus agents' details and helpful reports.

Estibid (3 disks)—contractors estimating, costing analysis includes sub-contractors, materials, transport costs etc.

Land Surveyors Tools—Surveysoft calculations include traverse, field traverse, inverse & radial inverse.

Lighthyear—business efficiency evaluation.

Make My Day—Time Management system, Appointment Calendar, Job Scheduler, Time Log and Expense Account Manager.

PC Tickle—Personal Schedule Organiser keeps track of important appointments/date.

Project Management—uses critical path analysis and can handle up to 1,000 tasks.

Stock Market Analyser—tools to gather, enter, chart & plot stocks and securities price fluctuations.

Stock Portfolio Management—Portworx provides portfolio cost valuation, current valuation and bar/line graphs of valuation change.

Stock Processing (Inventory)—includes levels, listing, ordering, editing, cash register module.

ACCOUNTS/FINANCE

Accounts Plus (3 disks)—includes full nominal ledger and product file linked to invoice production (Freeway UK).

Billing/Invoicing System (2 disks)—itemised invoices/bills with balance forward, finance charges, subtotals, balance due, also reports.

Budget Tracking (2 disks)—Departmental/Emberance Accounting, up to 12,000 monthly transactions.

Cashbook (2 disks)—5 bank accounts, 5 cash accounts payments/receipts posting, 100 nominal accounts/VAT codes, VAT summaries (Freeway UK).

Cash Trac—update of Personal Finance Manager, with checking accounts/print cheque, credit cards, pop-up calculator.

Corporate Financial Analyst (2 disks)—company accounts analysis and planning, needs no modelling or spreadsheet experience, (Computer Financial Models UK).

Payroll (3 disks)—latest legislation, (Freeway UK).

Simplified Bookkeeping—expenses, income, bank account, payroll, accts receivable and summaries.

Time & Money—home or small business, accounts and financial planning.

GRAPHICS

Altamira—design posters, cards, logos, garden/floor plans.

Dancad (2 disks)—from simple letterheads to complex 3D cog-wheels with animation & rotation, new version (2D/UK) has support for post-script laser printers (hard disk req).

DROEGE (2 disks)—Printed Circuit Board Design.

Express Graph—3D bar charts, pie charts, line graphs etc. from entered or imported data.

Finger Paint—paint program with Mac-like screen.

Gem Drawings/Paintings—extensive library.

Image 3D—wire frame modelling with view, zoom etc (CGA, EGA or VGA).

PC Graph—charts/graphs from PC File data.

PC Key Draw (4 disks)—latest version of popular CAD package now includes library disk, tutorial, and manual disks with superb demo and utility to convert graphics to IMG format for DTP.

PC Picture Graphics—produce, file & display your creations.

Slide Presentation—use camera to take snapshots of screen, then display as a slide-show, ideal for training, demonstrations etc.

The Draftsman (2 disks)—data graphs, slide shows from 123/Symphony/Visicalc.

Languages/Programming

A86/D86—probably the best 8086 assembler/disassembler around.

Basic Aids (4 disks)—G.W. basic.

B-Window/C-Window—windowing utils for Basic & C.

C Tutorial—for beginners to advanced.

C/Spoon Run—C—Programmer utilities.

Lisp—Xlisp programming language.

Logo—Jem version of turtle-based graphics language, popular with children.

Modula 2 Compiler (2 disks)—flexible but very powerful.

Modula 2 Tutorial (2 disks)—companion to the above.

MVP Forth (2 disks)—full implementation.

P-Basic—GW Basic compatible interpreter for Amstrads etc.

Pascal—three compilers on one disk, Tiny, Facilities & Visible.

Prolog—ADA implementation of 5th generation AI language.

QuickBasic—tools and utils.

SNOBOL 4—fantastic system designed to minimize programming time and effort without losing power and flexibility, produces .EXE files.

SDA (2 disks)—design screens for data input (Basic).

Turbo C Tutor (2 disks).

Turbo Pascal Tutor (2 disks).

Turbo Pascal Library (12 disks)—routines, programs, utils, statistics, sprites, animation.

SDA (2 disks)—design screens for data input (Basic).

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the full 16 Mbytes, and provide proper multi-tasking by protecting the memory allocated to one task from the other tasks. It is unfortunate that users are still waiting, four years later, for the operating system that can make use of this mode: OS/2 (see panel).

Meanwhile users have got by with good old MS-DOS, which operates on the 80286 – complete with 640K barrier – in its Real Address Mode. Nevertheless, even with this limitation, the AT design has much to offer.

First of all, it is considerably faster. As our table shows, most 286 models these days run at a speed of at least 10MHz, with 12MHz common and a few reaching 20MHz. Even at 10MHz graphics-based packages are very usable, and indeed Microsoft supply *Windows 286* specifically for the AT design.

Higher speed requires faster reactions from peripherals, so the AT introduced a new 16-bit standard for the expansion bus. Running at 8MHz, this can also take 8-bit cards designed for the PC; but the higher speed and capacity of the bus makes faster, more powerful expansion possible. In particular a number of memory expansion cards are available that enable the total memory of the system to be expanded up to the 4 Mbyte needed to run OS/2 sensibly.

Finally, IBM chose to up the capacity of the fitted 5.25-inch drive from 360K to 1.2 Mbyte, and this has become the standard 5.25-inch format for all 286 and 386-based machines. Software houses chose to stick with the old format rather than ignore the 360K market; and although nominally compatible, some 360K drives have problems reading a 360K disk that has been written on an AT-style drive. Some copy protection renders disks unreadable on a 1.2 Mbyte drive, too.

Meanwhile virtually everyone not producing IBM clones switched to the more durable, higher capacity (and more expensive) 3.5-inch disk. Thankfully IBM finally dropped the 1.2 Mbyte format in 1987 with its PS/2 range, and most major software houses now provide for both formats. The standard capacity of these disks is 720K, although 1.44 Mbytes is usual on higher-powered machines.

The 80286 micro has become very popular, with one market survey showing it taking 41 percent of the PC market for the first six months of last year, overtaking the 8088/8086's 39 percent. As our table shows a basic 286 machine can be had for a couple of hundred quid more than an 8086 model; and although a fast 286 with 4 Mbyte of memory costs at least £2,500, it is still likely to be a good £1,000 less than a 386 model. Note that the majority of the price difference is attributable simply to

the memory expansion, which could always be done in stages at a later date.

TURBO-CHARGED

Intel's most powerful chip to date is the 80386. Although launched late in 1985, machines making use of the chip have only just started to appear in volume; in the same market survey, 386-based machines accounted for just one percent of the market in 1987, and eight percent to June 1988.

The 80386 is a 32-bit processor inside and out, with the capability of addressing up to 4 Gigabytes directly. Standard clock rate is 16MHz, although 20 and 25MHz are common, with 32MHz rumoured later this year. It is considerably faster than an 80286, and requires a whole new breed of support chips and a whole new set of design techniques to cope; it's not a lot of use running at 25MHz if your memory chips can only respond at

DRAM & SCRAM

The ordinary memory chip, or Dynamic RAM, does not in fact remember data very well. Instead its memory has to be refreshed many millions of times a second, which means that the processor has to wait one or more clock cycles before reading data – hence the term 'wait states'.

More expensive is Static RAM, or Static Column RAM, which does not need its memory refreshed. RAM caches and fast 386 machines must use SRAM or SCRAM for efficiency.

GOING FOR OS/2

OS/2 is the new operating system conceived jointly by IBM and Microsoft for the PS/2 range of micros, and for the future of micro computing. Despite this, OS/2 is an operating system designed for the 80286, and not the 80386 although it is compatible. It runs in the Protected Address Mode.

It is a far more complex system than MS-DOS, partly because it is fully multi-tasking and partly because it includes a graphic interface very similar to *Windows* called *Presentation Manager*. More significant in the long run, at least as far as IBM is concerned, is that it implements IBM's Systems Application Architecture (SAA), which IBM intends to become the standard environment for applications, whether they run on micros or mainframes.

OS/2 Extended Edition version 1.1 also includes Database Manager and Communications Manager. Database Manager uses SQL (Structured Query Language), IBM's answer to *dBase*; while the communications side implements SNA

(Systems Network Architecture) which IBM sees as being the standard environment for linking computers together, again whether micro or mainframe. OS/2 could be seen as IBM's bid to rule the world.

Nevertheless it has several pitfalls (although that has never stopped IBM in the past). Although it would appear to multi-task applications written for OS/2 rather neatly, it is not MS-DOS compatible. Applications written for MS-DOS can be run in a special 'MS-DOS compatibility box', but many less well-behaved packages may have problems. OS/2, like MCA, is not intended to be downwardly-compatible, to MS-DOS.

There are many alternatives to OS/2, many of which have the advantage of using the 386 to full capacity, and of being fully MS-DOS compatible. There are also established multi-user operating systems like Unix, Xenix or Pick; but doubtless IBM will have its way in the end, and indeed several major packages are already being implemented under OS/2.

8086-BASED MODELS:

NB – in line with business practice, all prices on this table exclude VAT.

Make & Model	Base Price	Processor	Speed	Hard disk	floppy format	display adaptor	RAM	Colour EGA	Colour VGA	Overall Price	Comments
IBM Model 30	£1711	8086	8MHz	20M 80ms	3.5" 720K	MCGA	640K	+£235 (MCGA)	–	£1946	
Amstrad PC1640 HD20	£799	8086	8MHz	20M	5.25" 360K	Herc.	640K	+£200	–	£999	Comes with GEM and MS-DOS 3.2
Amstrad PC2086	£999	8086	8MHz	30M 80ms	3.5" 720K	VGA	640K	–	+£150	£1149	Comes with Windows 2.03 and MS-DOS 3.3
CompuAdd Turbo/10	£759	8088	10MHz	20M 65ms	5.25" 360K	Herc.	640K	+£300	+£450	£1059	
Opus PCIV Turbo	£995	8088	10MHz	20M 68ms	5.25" 360K	EGA	768K	●	–	£995	

● The Base Price quoted here is for the minimal monochrome graphic system with a hard disk. This usually means a Hercules adaptor, although some models, such as the Amstrad PC2086 and the Opus PCIV, come with EGA or VGA ready fitted. This is reflected in the upgrade price. The Overall Price is for a EGA or VGA system with colour display and 640K RAM. Note the £1000 premium for big blue respectability – but then the only 100 percent IBM compatible is made by IBM.

CACHEING UP

The cache, whether used for disk or for memory, is a technique borrowed from the mini computer world used to speed access to or from a slower device.

The cost of memory chips is fairly directly related to their access time. Rather than use 4 Mbyte of expensive fast chips, the idea is to use fairly slow DRAM chips for the main memory, but to have a special 'cache' of 32 or 64K of extremely fast SRAM chips placed between the processor and the DRAM. A memory manager chip then tries to predict what area the processor is likely to want to read next, and load it into the cache beforehand. An efficient cache system can be accurate over 90 percent of the time.

A disk cache uses the same sort of technique on a hard disk.

AT rate – the processor would spend most of its time hanging round waiting.

Although new to the micro world, mini and mainframe computers have had to cope with these problems for some time and so solutions were readily available – especially to a company with a finger in each of these pies.

IBM effectively responded to the 80386 with its PS/2 range, which boasted a host of features designed to speed things up. The most controversial proved to be MCA (Micro Channel Architecture), the new 32-bit expansion bus architecture designed to provide an interface befitting IBM's minis and mainframes as well as its micros. Unfortunately it is not compatible with the 16-bit AT design, and many hitherto faithful manufacturers rebelled with EISA (Extended Industry Standard Architecture) – a similar standard that is downwardly compatible. EISA is only an idea at the moment though, while IBM claim that 624 MCA products are available now.

As the power of the micro increases, and now threatens to encroach on the mini, IBM has been anxious to tie the PC design into its grand plan. MCA is part of that plan, but need only bother corporate buyers anxious to maintain links with the corporate mainframe. What MCA boards are available appear to be rather more expensive than AT compatible equivalents, although of course they are effectively faster.

One area that could not wait for a 32-bit standard was memory expansion. Whether or not you intend to take up OS/2, the 640K limit of MS-DOS really looks a bit absurd on a 386 machine. Most 386 come with at least 1 Mbyte of RAM, and can take 2 or even 4 Mbytes straight on the motherboard, but the huge capacity of the 386 means that expansion slots eventually have to be used. Many 386 machines therefore have proprietary 32-bit slot designed solely to take a proprietary memory card. Many also use the plug-in SIMM standard introduced by IBM on the PS/2 range, where the chips are held in banks on miniature sideways-mounted cards.

The 80386 processor is compatible with the 80286 in that it offers both Real and Protected address modes – and like the 286 is limited to just 640K of memory under MS-DOS. In Protected mode it can make use of its 32-bit address bus, giving access to a potential 4 Gigabytes; but it also offers a third mode – the Virtual mode. This effectively splits the power of the 386 into a myriad of virtual 8086 chips, each with its own memory space and running its own task, and able to communicate with the other.

This has wonderful implications for multi-tasking and multi-user operation, as each partition is potentially fully MS-DOS compatible. The irony is that *OS/2 Extended Edition 1.1*, the most imminent version of OS/2, cannot use this mode so we will have to wait for a rumoured *OS/2-386* before the 'official' operating system can

80286-BASED MODELS:

NB – in line with business practice, all prices in this table exclude VAT.

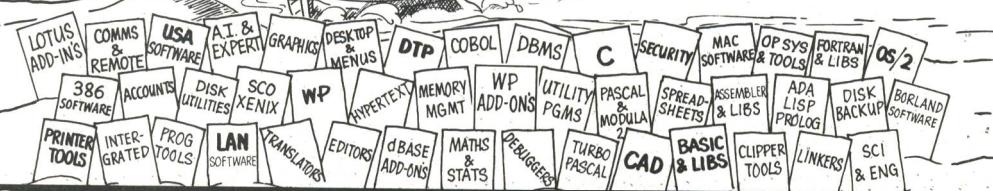
Make & Model	Base Price	Speed	Wait States	Hard disk	floppy format	display adaptor	RAM	Colour EGA	Colour VGA	Price to 4M RAM	Overall Price	Comments
IBM Model 30 286	£2155	10MHz	1	20M 80ms	3.5" 1.44M	VGA	1M	–	+£235	+£1338 120ns	£3728	
IBM Model 50Z	£3069	10MHz	0 1.44M	60M 27ms	3.5"	VGA	1M	– 85ns	+£235	+£1663	£4967	Very fast hard expansion disk MCA expansion only
Amstrad PC2286	£1349	12MHz	1 or 2	40M	3.5" 1.44M	VGA	1M	–	+£150	+£1338 120ns	£2837	Comes with Windows 286, MS-DOS and LIM EMS 4
CompuAdd 286/12	£1149	12MHz	0	20M 65ms	5.25" 1.2M	Herc.	1M	+£300	+£450	+£1066	£2665	Uses piggy-back board for memory expansion
CompuAdd 286/20	£1499	20MHz	0	20M 65ms	5.25" 1.2M	Herc.	1M	+£300	+£450	+£975 100ns	£2924	memory expansion on motherboard
Opus PCVI	£1699	12MHz	0	60M	5.25" or 3.5"	Herc.	1M	–	+£300	+£600 100ns	£2599	memory expansion all on motherboard
Dell System 200	£1249	12MHz	1	20M 65ms	5.25" 1.2M	Herc.	640K	+£350	+£450	+£1800 100ns	£3499	
Dell System 220	£2099	20MHz	0	40M 29ms	3.5"	VGA 1.44M	1M	–	+£200	+£1480 100ns	£3779	2M on motherboard 2M Intel Aboveboard

● The Overall price here is an attempt to compare like with like: it is the price of a system including colour VGA display, hard disk drive, and enough RAM to comfortably run OS/2 (4 Mbytes). These figures do have to be taken carefully though, as these machines operate at a range of different clock speeds and with a wide variation in hard disk capacity. The hardest area to cover, though, is memory expansion. Some of these machines can take a full 4 Mbyte on the motherboard, others use the popular SIMM format introduced by IBM, while others require additional expansion boards with further boards mounted 'piggy-back' fashion on top.

Notice also that the price of adding a colour VGA display depends very much on the type of adaptor fitted. Many 286 models come with VGA as standard these days, so the price is just that for the monitor. Others require a new graphics card as well.

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PC-MOS/386 (5 USER)	455.00
SOFTBYTES/386	79.95

C LIBRARIES

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ESSENTIAL COMMUNICATIONS	110.00
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METAWINDOWS/PLUS	150.00
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ORACLE DEVELOPER	295.00
PARADOX 2.0	295.00
PC-FILE DB	75.00
PROFESSIONAL FILE 2.0	125.00
Q&A 3.0	199.00
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TIMELINE 3.0	295.00

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JAVELIN PLUS	135.00
LOTUS 1-2-3	259.00
LUCID-3D	79.00
MS EXCEL	255.00
NUMBERS-UP	65.00
QUATTRO	110.00
SILK	135.00
SUPERCALC 5	199.00
VP.PLANNER PLUS	105.00

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GRAMMATIK III	85.00
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XENIX/UNIX SOFTWARE	
MICROPORT V/286	399.00
MICROPORT V/386	799.00
XENIX/286 (COMPLETE)	850.00
XENIX/386 (COMPLETE)	975.00



make full use of these machines.

Meanwhile there are other possibilities. Microsoft's *Windows 386* can make good use of the processor, as can *Concurrent DOS 386* from Digital Research. Quarterdeck had *DESQview 386* up its sleeve too, and any of these systems make for a very fast, truly multi-

ON THE SCREEN

The various display adaptors available for the IBM PC range have been covered before, and our January issue *FactSheet* gives full details of all modes.

IBM introduced the VGA adaptor with its PS/2 range, which proved to be the least controversial innovation largely because it is fully compatible with all previous IBM adaptors. The non-IBM Hercules adaptor remains the budget alternative for high resolution monochrome displays though, with EGA and VGA the standard for colour.

Hercules may be perfectly adequate for

all your needs, as its resolution still matches even VGA – but games players should remember that it cannot display CGA or EGA displays. Of the two, VGA is to be preferred to EGA as it is far more versatile and only costs around £150 more.

DTP, CAD or art packages may require higher resolutions and more colours, with most dedicated graphic workstations supplying around 1280 x 1024 pixel displays. Dedicated drivers and monitors are available – at a price.

tasking environment for your existing applications.

But do you need all this power? The 386 machine is really the equivalent of a Porsche; or, with a 300 or even 600 Mbyte hard disk attached, a 20-ton turbo-charged lorry. If you want to use a state-of-the-art DTP pack with font editors and drawing packages available at the touch of a key, or a 3D CAD package with shading and light source generation, then you do.

If you are building a large multi-user system that uses dumb workstations rather than a network with shared computing power, then a large 386 machine is a must. However, you pay for the privilege: although basic hard disk 386 machines can be had for £2000, and 4 Mbyte model with colour VGA display is going to cost around £4000 – although the exceptional Amstrad PC2386 is well under £3000.

Given that OS/2 has yet to have its day, which it inevitably will, an 80286 machine with sufficient memory and a fast hard disk is likely to be adequate for most single users for at least two or three years. Nevertheless the future undoubtedly belongs to the 80386; it is an altogether more satisfactory design, and future Intel developments – the 80486 and 80586 – will build it rather than older processors. As always, you get what you pay for but you don't always need the very best. ●

80386-BASED MODELS:

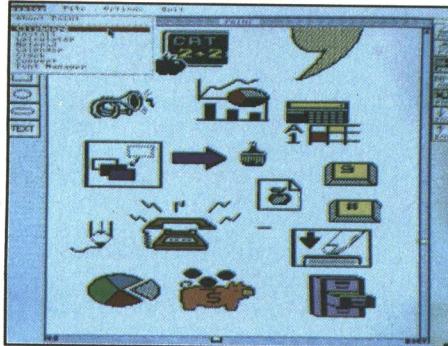
NB – in line with business practise, all prices on this table exclude VAT.

Make & Model	Base Price	Speed	Wait States	Hard disk	floppy format	display adaptor	RAM	Colour EGA	Colour VGA	Price to 4M RAM	Overall Price	Comments
IBM Model 70	£4212	16MHz	0	60M 27ms	3.5" 1.44M	VGA	2M	–	+£235	+£615 85ns	£5062	Memory expansion is all on motherboard
IBM Model 70-A21	£6258	25MHz	0	120M	3.5" 1.44M	VGA	2M	–	+£235	+£622 80ns	£7115	64K RAM cache
Amstrad PC2386	£2649	20MHz	0	65M 40ms	3.5" 1.44M	VGA	4M	–	+£150	●	£2799	Comes with Windows 386, and LIM EMS 4
CompuAdd 386/16	£1999	16MHz	0	44M 25ms	5.25" 1.2M	Herc.	1M	+£300	+£450	+£1339 100ns	£3788	Uses piggy-back board for SCRAM memory
CompuAdd 386/25	£2799	25MHz	0	44M 25ms	5.25" 1.2M	Herc.	1M	+£300	+£450	+£1275 70ns	£4524	Up to 16M expansion all on motherboard
Opus PCVII	£3999	20MHz	0	70M 22ms	5.25" or 3.5"	VGA	4M	–	●	●	£3999	64K RAM cache 1:1 disk interleave
Dell System 310	£2599	20MHz	0	40M 28ms	5.25" or 3.5"	Herc.	1M	+£300	+£400	+£1150 100ns	£4149	
Dell System 325	£4299	25MHz	0	90M	5" or 3.5"	VGA	1M	–	+£200	+£1150 100n	£5649	Uses RAM cache

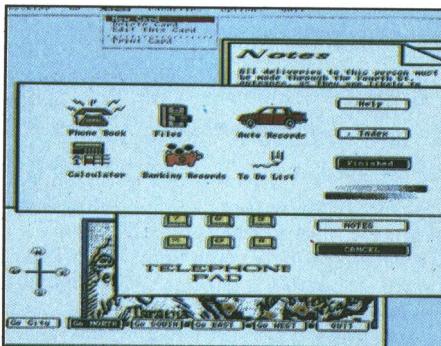
● The same warnings apply when comparing 386 machines as do with 286 models, so see the caption for the 80286 table too. Notice that 386 machines come with rather more RAM than 286 models, which is why memory expansion is rather cheaper. Frequently the RAM chips can simply be plugged straight into the motherboard without having to buy expensive expansion boards first.

Although the Amstrad appears to have a very slow hard disk for a 386 model, with an access time of 40ms, it uses a 16K disk cache to give 1:1 interleave and a respectable performance. As with the PC2286, the PC2386 comes with LIM EMS 4.0~ It also has a 64K RAM cache, as do most 386 machines – the exception being the CompuAdd which uses fast static RAM for the full 4Mbytes

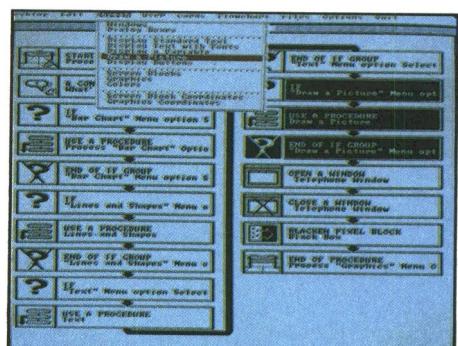
Matrix Announces Desktop Programming.



Use Matrix Layout to create your own objects — 'live' icons, buttons, and windows — to run your application.



Combine your objects, text, and graphics to create cards with hypertext links to any file. You've created a useful program!



Or keep going. Design in complex functions using our CASE flowchart. Layout will deliver a beautiful, stand-alone program.

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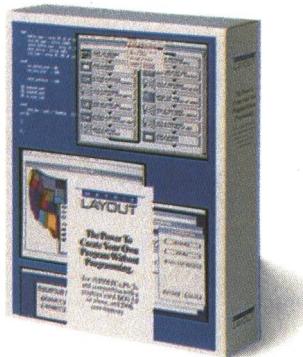
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SPREADSHEETS MADE EASY

Joe's Sandwiches branches out as Matt Nicholson looks at more of the powerful tools that a spreadsheet can provide. Our tutorial is run in conjunction with *As-Easy-As*, a powerful Lotus-compatible shareware package given away free with our September 1988 *SuperDisk*, issue 24. This month sees the spreadsheet coping with business expansion and getting some figures down on paper, so let's get down to work!

EASY TO GET

If you haven't got the September *SuperDisk* you can get hold of a pre-registered copy of *As Easy As*, complete with full manual and telephone support for £34.50 from Shareware Marketing on (0732) 771344.

Evaluation copies of *As-Easy-As* can be acquired free from bulletin boards, or from shareware distributors and user groups.

In our last issue we used *As-Easy-As* to build up a basic cash flow projection for a typical small business, and by way of example set up Joe's Sandwiches – starting small with just one type of sandwich distributed on foot to local offices. The spreadsheet simply lists for each month the income from the cheese and pickle sandwiches against the direct costs – cheese, pickle, butter and bread – and the indirect costs such as rent, rates, living expenses and so forth. From this data simple formulae automatically generate the profit made and the bank balance at the end of each month.

This could of course have been done with pencil and paper, but the joy of the spreadsheet is that once this basic template has been created – the column and row headings and associated formulae – you can start to experiment. Our example had Joe producing 1500 sandwiches a month, but what happens if output is increased to 2000 a month? What happens if the price of pickle doubles overnight? Playing around with the figures in this way makes the flexibility of the spreadsheet obvious. It is also easy to cope with expansion, so let's add ham and tomato to Joe's repertoire.

Load up *As-Easy-As* in the usual way, but this time, to carry on where we left off last month, load the existing file JOE.WKS. enter the command /FR to be presented with a window listing all files on the work disk with the

extension .WKS. Either use the cursor keys to move to the file, or ignore the window and type **joe.wks**. When you press [Enter] the file is loaded where you left off.

HAM AND TOMATO

As before, we need some basic prices for the direct costs of making this new line, and also the sale price. This would normally require research, but for the sake of argument let's assume a price of 90p for the new line (we can always experiment later), that cooked ham is £2 per pound and tomatoes 40p. And let's say we use 1lb of ham per 30 sandwiches, and 1lb of tomatoes per 15.

The first thing to do is insert some new rows into the spreadsheet, and as before we use the command /WIR, remembering that the new row is inserted above the present cursor position.

Insert four rows: one at cell A4, one at A7, and two at A14. The last two can be inserted in one operation when the line **Insert at cell(s) :A14..A14** appears in the top window. Instead of immediately pressing [Enter], move the cursor down one so that both cells A14 and A15 are highlighted. Press [Enter] and two rows are inserted here. As always the existing formulae automatically take account of these changes and alter cell references to suit.

Now we need appropriate row headings and new formulae to derive direct costs from the number of ham and tomato sandwiches made. Enter the following into the spreadsheet where indicated, remembering to copy the formulae from column B through to column M:

A4: Ham & Tomato	0.9*B4
A7: Ham & Tomato	2*B4/30
A14: Cooked Ham	0.4*B4/15
A15: Tomatoes	0.4*B4/15

We also need to allow for the new line in the formulae for bread and butter, so edit cells B10 and B11 and copy through to column M:

B10: 2*(0.44*(B3+B4)/25
B11: 2*(B3+B4)/100

Note the use of brackets here. The convention is that multiplication and division takes precedence over addition and subtraction. In formula B11, for example, we want the total number of sandwiches made to be multiplied by two and divided by 100; without the brackets B3 would be doubled, B4 divided by 100 and the two results added together.

Although *As-Easy-As* will try and follow the effect of changes on existing formulae, it cannot read your mind. Go through the spreadsheet at this point, checking the formula in each cell. In this case we find that cell B24, Total Income, contains the formula **@SUM(B6)**. It was entered in this fashion, rather than simply **+B6**, to remind us that it represents the sum-total income; and so should now read **@SUM(B6..B7)**. *As-Easy-As* knew that a new row had been inserted here, but had no way of knowing that it represented a new source of income. Alter the formula and again copy through to column M.

GLOBAL PROBLEMS

Let's test our new sheet by inserting some figures for production of our new line. See what happens when Joe makes 1000 ham and tomato in January: the associated costs and income are not neatly displayed to two decimal places, but instead use as many decimal places as they need – cells B14 and B15 looking particularly messy.

But didn't we fix this last month, using the command /RFF to fix the format for the range **B5..M23** to two decimal places? Move the cursor from cell B10 down to B15, keeping an eye on the formulae as shown in the top window. All are preceded by **[F2]**, indicating that the format is **Fixed to 2 decimal places**, with the exception of the errant B14 and B15. We have not specified a format for the new rows so they use the default.

PRINTER PROBLEMS

• LINES WRAPPING ROUND

Usually because the margins set incorrectly on the /PPO menu. Make sure Left Margin is set to zero, and Right Margin to the number of characters that can fit across the page in the required typeface. You can find this either by multiplying the specified character pitch by the width of the page in inches, or by simply counting characters.

• INCORRECT PAGE LENGTH

1. The number of lines on a page is specified on the /PPO menu under PgLines. Default is 66, which is suitable for a line pitch of 6 on standard 11-inch paper. You can find out the line pitch either from your printer manual or by measuring off an inch and counting.
2. If the printer has a DIP switch controlling 'Skip perforation', make sure this is set OFF. Set ON it automatically advances four lines at

the end of each page.

3. Make sure any DIP switch on the printer controlling 'Page length' is set correctly.

• SUPERFLUOUS LINES

As-Easy-As sends a carriage return command with line feeds. Make sure any DIP switch on the printer controlling 'Automatic line feed' is set OFF.

• INCORRECT TYPEFACE

Again, check your manual and the DIP switches at the back of the printer. Make sure it is set in Draft mode and not NLQ. Re-check the control codes required to select a condensed typeface.

We could go through specifying a new format every time we insert new rows or columns, but as most of the data concerns money it would be better to change the default itself. Start by cancelling the format set earlier using **/RFR** (Range Format Reset) – but remembering that the range is now **B6..M27** thanks to our new product line. Then enter **/WGFF** and specify two fixed decimal places as before. The command **/WG** takes you to the Worksheet General command menu, allowing you to make changes that affect the worksheet as a whole.

There are however two rows which require a different format: rows 3 and 4 which specify the number of sandwiches made. Use **/RFF** to format appropriately.

The sheet is getting quite large now, and the column or row headings are frequently not on screen, making it difficult to remember where you are. Fortunately you can have the headings permanently fixed to the top and left of the worksheet display by placing the cursor in cell **B2** and entering **/WBB** (Wsheet Borders Both) to lock the rows above the cursor and the columns to the left. Once the headings have been set, test them by hitting **[Tab]** and **[PgDn]**. Headings can be unlocked with the command **/WBC** when you need to work in that area.

Save the spreadsheet with the command **/FS**, choosing to Backup rather than Replace. This preserves the previous incarnation as **JOE.WKB** before updating.

HARD COPY

Unless your Bank Manager is willing to come round and view your handiwork on screen, at some point you'll have to get **JOE.WKS** down on paper. This of course requires a printer, loaded with paper, powered up and switched on-line to your PC. We will assume that you have an Epson FX or compatible, although *As-Easy-As* can cope with most models. Whichever model you own, resign yourself to a little experimentation before you get usable results – getting any peripheral to work with your PC always requires preliminary spade-work.

1. It is best to start by just having a go and see what you get. Enter **/PPO** to summon the Printer Options menu. This is where you control much of the appearance on the page, but for now simply press **[H]** for Header and enter **Cash flow projection for Joe's Sandwiches**.
2. Press **[Esc]** to move up to the previous menu, and press **[R]** to define the range. **Range to Print [Wide 0:Pages 0]: B2** appears in the top window.
3. The range you wish to print is **A1..M27**. Unfortunately you cannot define this with the cursor as **A1** is within the locked border region. Enter the range from the keyboard.
4. Select Range again, and now **Range to Print [Wide 124:Pages 1]: A1..M27** appears. You see the chosen range is 124 columns wide and one page deep.
5. Press **[Enter]** to accept, and select Go from the PrintTo Printer menu.

What you get depends on the printer. With a reasonably Epson compatible model you should get a fair result, but with January to July's figures on one sheet and the rest on a second. Go back to the PrintTo Printer Options menu and note that the Left and Right Margins are set to zero and 80, while Pglines (the number of lines on a page) is set to 66. *As-Easy-As* is quite intelligent when it comes to printers, and is able to work out that it will never get 124 columns on a sheet with margins set at 80, so it prints the last 44 on a separate sheet.

It would be nice to get the whole thing on one page, possible if we set the printer to condensed type. This is done by sending the printer the right ASCII codes: these should be detailed in your printer manual. On the Epson FX it is code 15 or code 27 (ESC) followed by 15. *As-Easy-As* allows for Setup codes, so proceed as follows:

1. Enter **/PPO** to get to the printer options menu, and

F1:Help 2>Edit 3:Macro 4:A		
B10 [F2]: 2*0.44*(B3+B4)/25		
1		Jan
2	OUTPUT:	
3	Cheese & Pickle	80
4	Ham & Tomato	100
5	INCOME:	

● The status window shows both the contents of the current cell and its present format – in this case Fixed with two decimal places displayed

F1:Help 2>Edit 3:Macro 4:Abs Refer 5:Goto		
M27: +M26+L27		
Range to Print [Wide 124:Pages 1]: A1..M27		
1	July	August Sept
18	Rent/rates	80.00 80.00 80.00
19	Living expenses	700.00 700.00 700.00
20	Petrol	50.00 50.00 50.00
21	Telephone	50.00

press **[S]** for Setup.

2. Enter **\027\015** as the setup code (the slash indicates an ASCII code).
3. This puts the printer into condensed mode. We still have the right margin set at 80 characters so this would still split the sheet across two pages. On an Epson printer normal character pitch is 10/inch while condensed is 17/inch. This gives 136 characters across the page – quite enough for our spreadsheet. So press **[M]** to select Margins, **[R]** to select Right, and enter **136**.
4. Press **[Esc]**, check the range and **[G]** to try again!

If you're lucky, and your printer is pretty Epson-compatible, you'll get something quite usable. If not, have a look at our Printer Problems panel, consult your printer's manual, and experiment. A ruler is handy for measuring line and character pitch. Once you've found the correct settings, save the file **JOE.WKS** as the settings are saved along with the worksheet.

Next month we'll do more with printers, and see other ways *As-Easy-As* can help those in business. ●

● Selecting the range to be printed – note the details displayed in the status window as to the width of the selected range and the number of pages required

QUICK GUIDE

KEYSTROKES

- /FR** Retrieves a file, displaying a menu of all WKS in the default directory.
/RFR (Range Format Reset) Returns format of range to the default.
/WGF (WSheet General Format) Menu for specifying global or default cell formats.
/WBB (WSheet Borders Both) Locks rows above and columns to the left of the cursor position to the display area borders.
/WBC (WSheet Borders Clear) Unlocks any previously set borders.
/PPS (Setup) Prompts for initial ASCII codes to be sent to printer. Format is **** followed by three digit code in decimal, as in **\027\015**.
/PPR (PrintTo Printer Range) Sets the range to be printed – also saved along with the worksheet file.
/PPG (PrintTo Printer Go) Starts printing!

PRINTING

- /PPO** (PrintTo Printer Options) Menu for

MASTERFILE PC

The Complete Information Filing and Retrieval System for all PC-compatibles including the Amstrad PC and PPC range.

MASTERFILE has earned the respect of tens of thousands of Z80-based computer users – many of whom mourned its absence when converting to the more powerful PC. But now **MASTERFILE PC** has arrived, with many more features to make best use of your PC. We are told the price (£59.95 ex VAT) is too low for a full relational database of such speed, capacity and flexibility; glance at the feature list and see if you agree.

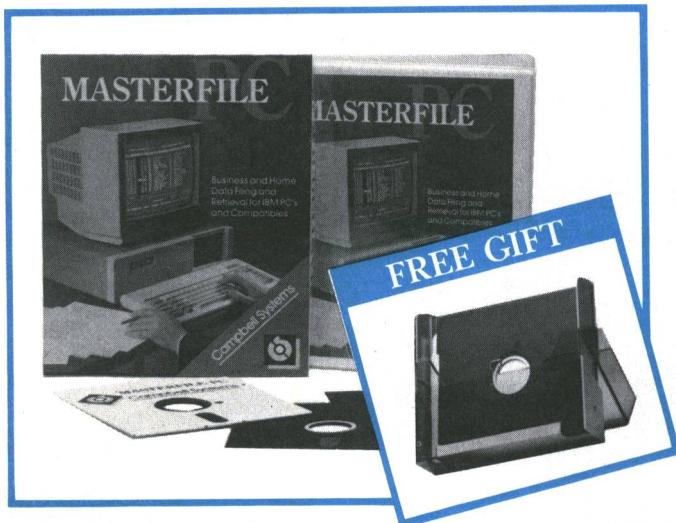
Our first **MASTERFILE PC** was limited to memory-resident file size, but now we have extended it to handle files up to 16MB without losing the flexibility of variable-length data. Yet the same program can be used with just a single floppy disc drive, file size being limited only by disc capacity.

What seems to most impress **MASTERFILE PC** users is that there is no need to set field lengths, and it is so easy to change file structures and screen formats without having to re-enter the data. We quote some early reviews:

“Surprisingly good performances, easy to set up and use.” (PC User)

“A cinch to find data ... very flexible ... how little it takes to get started. At £68.94 it's something of a bargain.” (Personal Computing with the Amstrad)

Those quotes are from reviews of our earlier PC version, with RAM-limited file capacity. **MASTERFILE PC** is now even more powerful, and still growing – except for the price. If you want to know more, call us; our experts will be happy to discuss your filing needs.



APPLICATIONS

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- Stock Control
- Patient Files
- Job Progress
- Price Lists
- Bibliographic Index
- Bank Statement
- Shares Portfolio
- Photographic Index
- Catalogues
- Property details
- Engineering data
- Hobbies

FEATURES

ENVIRONMENT	MS-DOS ver 2.00 or later, 80-column screen colour/mono, minimum RAM = 256K, minimum disc = 1 floppy drive. Install in seconds
POWER	Machine-coded throughout for speed and efficiency
CAPACITY	Up to 16MB/32768 records per file
DATA FIELDS	Up to 80, can extend at any time
VARIABLE-LENGTH	Data, 0-254 characters per field, 2000 per record
KEY	Automatic file sequence option
RELATIONAL	Connect up to 4 relational files, each up to 16MB
LOOK-UP TABLE	Each file can use its own built-in reference table
EASY TO USE	Menu-driven throughout, foolproof
MACRO KEYS	Up to 40 expansion keys, each up to 140 characters
CALCULATIONS	Field-to-field, record-to-record, date-arithmetic
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SPLIT	Save any sub-set as a separate file
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SCREEN DESIGNS	Created graphically, 1-60 lines per record, alter at any time
EMBELLISH	With boxes, colour panels, headings, column totals
PRIVACY/SECURITY	Data encryption option, three levels of password
WIDE-SCREEN	Screen/print formats can be up to 240 columns wide
PRINTING	Huge range of options, including divert to disc
SEARCH	By multiple criteria, including embedded texts
BROWSE	Back/Forward, Direct GOTO/FIND
IMPORT	Build file from external ASCII source
EXPORT	Send ASCII data to other systems
SORT	Breathtakingly rapid sort by any field for display/print
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REPORT GENERATOR	Provides data aggregation summaries (optional extra)

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Campbell Systems

(Dept. PCP)

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CM16 4HA Tel: 0378 77762

There's no doubt about it, my trusty PC1512 is starting to look a bit tired. Not that Amy (well what's yours called?) is performing less than at her best; it's just that things have moved on a bit since her purchase a couple of years ago. The Amstrad PC1512 was then the cheapest and best equipped PC you could buy, and there was little reason to search out the opposition. I didn't even mind too much that my 'first born' Amstrad PCW8512's rise to fame had been so prematurely cut short (mostly due to the release of the poor man's IBM!) – but then came the launch of the PC1640. We all know things do move quickly in this industry, but by this time the 'end user' in me was a little peeved. The PC1640 is a graphically more capable machine, but there is no possibility of an upgrade except by forking out for a completely new computer.

TRAITOR!

Having been caught twice then by Mr. Sugar's enthusiasm for occupying new territory, I am now a little older and a little wiser. So when contemplating a move into 80286 computing, my purchase of the impending Amstrad release was not a forgone conclusion! After all, what we all expected from Amstrad was a sub £1,000 AT compatible, to knock the socks off those Taiwanese imports snapping at Brentwood's corporate heels. In the event what we have is an entire range, starting with a replacement for the PC1640 (he's done it again!), followed by a mid range AT clone, and topped by an excellent value 80386 offering.

Again we have the thirst for making a foothold in a new market, this time the corporate sector, seemingly overriding any loyalty to existing users and perhaps the 'budget' market in general.

Studying the Amstrad PC2286 there are a number of reasons for looking elsewhere. The £1,699 plus VAT being asked for the hard disk colour model is not especially cheap for instance, and surely 'bargains' are what Amstrad are renowned for. Also, what would I do with all those 5.25-inch floppy disks made redundant by the non optional 3.5-inch drive? Purchase of another floppy drive makes the price look even more uncompetitive. The take it or leave VGA is also typical Amstrad forced innovation, and the one or two wait states required (depending on RAM configuration) undermine the 12.5MHz processor speed. I do fancy the 1:1 interleaved hard disk controller however, but that particular innovation can be purchased separately if and when they become more popular.

THE OPPPOSITION

It was time then to make a few phone calls – just to see what the opposition could manage. Running through my shopping list Viglen's Vigil HD40V weighed in at £1,799 plus VAT – sadly £100 dearer than the PC2286; Vanilla also have a very tasty (no pun intended!) machine, but at over £2,000 perhaps the Amstrad was not such a bad buy after all; NTS (Northern Technology Systems) market 'the 286 that Amstrad never launched' at £1599 plus VAT, but second thoughts about the heritage of this own badged Taiwanese clone prevented a quick sale there and then. After a good many enquiries however, I was coming to the inevitable conclusion: to beat the Amstrad price I would indeed have to choose an unknown Far Eastern import, badged by a reputable dealer, and hope for the best.

Last in the alphabet, and last on my list were Zellarch Systems, offering what looked like a nice small footprint AT compatible, at a very nice price – but again with no brand name. I was told the advert was incomplete, and the product should have clearly identified the Samsung range, Zellarch having made a conscious decision not to badge a Taiwanese clone. I had already dismissed

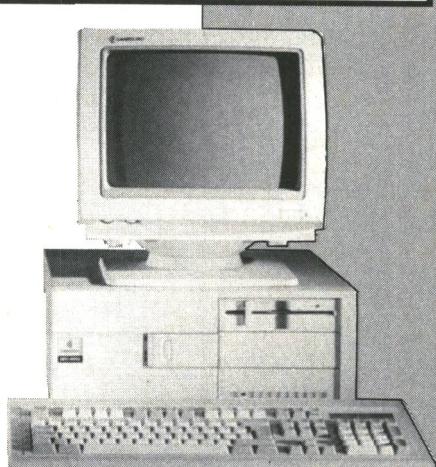
LIFE AFTER AMSTRAD?

As a third time buyer Tim Woodward wonders whether he still feels that initial brand loyalty purchased with his first computer, the Amstrad PCW8512, or is it now time to glance at Alan Sugar's hitherto more expensive competitors?

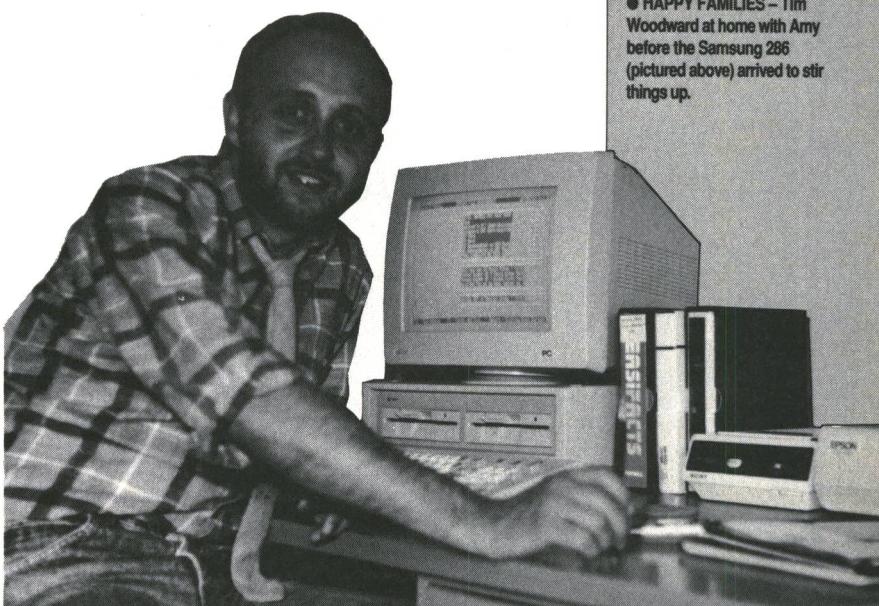
Samsung because of their more expensive price structure, but after an informative pre-purchase discussion Dave Skinner at Zellarch came to the bottom line. I was offered a Samsung 80286 AT with VGA card and monitor, and my favourite Western Digital 32 Mbyte hard card, for just £1,520 plus VAT and including 12 months on site warranty – SOLD!

IN THE BOX

After the severe distress of sending off the cheque I was pleased to receive, eventually, two large boxes – and these contained the Samsung metal clad system unit and VGA analogue monitor. Being inquisitive I found the removal of four screws soon allowed access to the inner parts (no Amstrad sliding flap for the replacement of expansion cards, I'm afraid). Inside is a mass of chips and circuit boards, in stark contrast to the efficient Amstrad minimalist motherboard design. Most of the back



● HAPPY FAMILIES – Tim Woodward at home with Amy before the Samsung 286 (pictured above) arrived to stir things up.



IN SCOTLAND
Zellarch Systems:
9 Rosebery Crescent,
Edinburgh,
EH12 5JP.
phone:
(031-313) 2121

panel is also taken up by a massive power supply and fan, with six internal expansion slots available for use.

Three of these slots were already filled with the combination of facilities I had ordered, and it is this 'open plan' architecture I was particularly looking for in my first non-Amstrad purchase. When VGA is on the demise I can at least recuperate some of the cost of the monitor and card by selling them both on – not possible if your graphics card is part of the motherboard! The familiar Western Digital 32 Mbyte hard disk (my choice as its quiet operation doesn't disturb the rush of creative thought while writing – HAH!) was taking up one and a half slots, but the otherwise wasted half space had been neatly filled by the slim profile of the Logitech mouse bus. This extravagance cost me another few pounds on the basic price, but you can't be without a rodent in these days of IBM Presentation Manager, can you? The

final expansion slot held the Vega VGA graphics card, but more of this later (see panel **THE VEGANS HAVE LANDED!**).

BOEING 747 IMPRESSIONS

On power up my small office now hums like a mainframe computer room – the fan on the Samsung aptly earning the machine its new title of 'The Boeing'! First impressions are extremely favourable, increased swiftness being measurable in seconds as program loads and data sorts are processed at 80286 rate. In comparison with my trusty Amstrad PC1512 the **PC TOOLS** speed test benchmarked a processor rate of 565 per cent (based on an original IBM PC of 100 per cent) against the Amstrad's 220 per cent – a noticeable difference in everyday use. Samsung make a point of delivering zero wait states throughout and the machine is renowned for a quickness that belies its 10MHz clock. 1 MByte of RAM comes as standard, but there is very little you can do with the 384K above the DOS 640K limit. Disk cache's and RAM drives are the usual option – until OS/2 is commonplace and then you will need another 4 MByte or so!

PRETTY COLOURS

On the graphics front VGA display modes are simply breathtaking, the demo software supplied by Zellarch showing the 256 colour mode off a treat. Getting screenshots of VGA software for publication is a problem, however, as my usual screen dump utility throws a wobbly when asked to capture graphic displays of any description. Software supplied with the Logitech mouse is temporarily bridging this gap, although I hope to look at a VGA compatible screen capture utility soon (watch this space!). The keyboard is the usual enhanced AT version supplied with virtually every clone on the market, and although it is firmer than Amstrad's design there's little to choose between the two. I was told the manuals supplied were something of a joke and they are, but I understand Samsung are updating these to their own design – the DOS documentation at present being a straight copy of the Microsoft text. Zellarch supplied the machine with the hard disk already formatted and the system on it, so there was little to do but housekeeping in that department.

UP TO DATE?

Well, my software has been transferred to the new machine, and reconfigured for the enhanced features where applicable. For the time being at least this computer journalist (not to mention small businessman) is up to date, with VGA graphics and OS/2 capability (given enough RAM!): I think I can safely face the next 12 months. There have been virtually no problems to report, apart from my software not being able to read the Samsung clock properly and a complete refusal of all programs to recognise the extra function keys F11/F12 – but these are simply a matter for later consideration when I have the time to delve a bit deeper.

I feel happy with my choice of hardware, even if it isn't an Amstrad, and Zellarch have proved invaluable with their unbiased advice and candid comments. This is one of the few companies I have found with no particular axe to grind; I was given enough 'inside' information to fill an encyclopaedia and then left to make up my own mind. Alan Sugar brought PC computing to the masses, including me, so I won't write him off in the budget sector just yet! As for Amy, well she has a brand new office next door and is proving extremely useful when work loads are heavy or complete compatibility is required (the PC1512 is still the most compatible compatible I've yet to find). I'm keeping a close watch on Schneider too – I like the look of their Tower-AT.....●

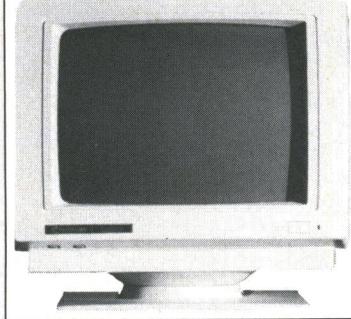
TECHNICAL SPECS.

CM4531 (CD1453M1)

14" Dual Frequency High Resolution (CGA/EGA) Colour Monitor

- CM4531: 0.31 mm dot Pitch.
- IBM™ EGA compatible.
- Separate TTL R.G.B. and Secondary R.G.B. inputs.
- In Enhanced mode allow 64 colours.
- Separate TTL R.G.B. and Intensity inputs in normal mode allow 16 colours.
- Text mode switch (Green colour).

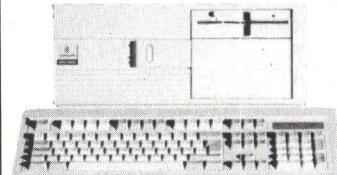
CRT	Size & Deflection	14 inch, 90°
	Mask Pitch	0.31 mm Dot Pitch
Sync	Face	Non-Gated
	H.Scan Frequency	15.75 KHz (normal mode) 21.85 KHz (enhanced mode)
	V.Scan Frequency	50 Hz
Signal Input	Mode 1 Normal mode	TTL level R.G.B. and Intensity
	Mode 2 Enhanced mode	TTL level R.G.B. and R/G/B'
Resolution	Mode 1	Horizontal 640 dots Vertical 400 lines
	Mode 2	Horizontal 640 dots Vertical 350 lines
Display	Mode 1	16 colours
	Mode 2	64 colours
Video Bandwidth		20 MHz
Actual Display Size (H x V)		250 x 170 mm
Controls	Front	Power on LED, Contrast, Brightness
	Rear	V-size, 1, 2 Sub-Brightness Sub-contrast, Green Function (Text)
Power Input		AC 220/240V 50 Hz
Power Consumption		90 Watts
Dimensions (W x H x D)	With Stand	400 x 372 x 381 mm
	Without Stand	400 x 328 x 381 mm
Weight	With Stand	15 kg
	Without Stand	14 kg



MFC 6000/1

AT Compatible Performance in a Compact Design

- 80286 microcomputer
- 80287 maths chip socket
- No wait states
- 6/10 MHz clock speed
- 1MByte RAM expandable to 5MBytes
- 3 slots for disk drives/tape streamer
- 1.2MByte floppy disk drive
- Battery backed real time clock
- 160 Watt switched power supply
- Video card IBM™ Monochrome, Hercules™ Monochrome Graphics, CGA, Plantronics™ Colourplus compatible
- 102 key AT extended style keyboard
- M-S-DOS 3.2, GW – Basic
- RS232 and printer ports
- 6 expansion slots
- 220/240V 50Hz power input
- EGA or VGA driver optional
- 12 months on-site warranty



THE VEGANS HAVE LANDED

The standard IBM VGA 640x480 resolution in 16 colours (mode 12), plus the impressive 256 colours at 320x200 (mode 13) is just great, but most third party manufacturers offer extended modes above and beyond that. The AST card I originally ordered, for example, is built around the Paradise chip set (in common with the new Amstrad 2000 range) and consequently offers an extra 640x400 mode in an amazing 256 colours. Special drivers are required to work with your favourite programs – AutoCAD, Windows and Lotus 123 are usually well supported in this department. You can't have the full quota of

colours and the 480 vertical pitch unfortunately, as this would require more than the 256K video RAM available (half Megabyte options are offered but do not come cheap at present chip prices).

The AST/Paradise combination did unfortunately display some fuzziness in text mode, mostly with bright characters, so I eventually plumped for the Video Seven Vega VGA. This doesn't offer 640x400 with 256 colours, but had crisper text definition. Both cards offer graphics options up to 800x600 in 16 colours – don't forget higher resolutions like these require a 'multisynch' monitor.

SELLING SECOND-HAND

Sell your computer and it is likely to go for a song and if you're buying second-hand there are problems, too. Marcus Rowland and Robin Lloyd investigate



SELL TO MIDDLE EAST?

'Try to sell the office Amstrad', said Editor Paul Stephens; so with mixed feelings I hawked around the virtues of the 1512 DD with colour monitor which had cost £699 when new 18 months earlier.

Mindful that Amstrad had recently cut their prices and that potential purchasers were 'buying' the 1512 'blind', the firm £270 offered by one of Aziz Bayat's Bristol shops seemed reasonable. Others stated prices around this mark but with preconditions.

I mentioned £270 to Multi-Word Trade in London, 'an Arabian exporting company' offering to pay 'top cash'. After a short pause during which I must have summoned up that trading quality for which Arabs are renowned, the foreign lady at the other end of the phone (01-360 8095) came back with a firm £300. She explained that there was great demand for business machines in the Middle East.

This left me with a confused picture of rich gentlemen in flowing robes haggling over my humble 1512, and then its being humped on a camel to a sunbleached house by an oasis.

The best advice is still to shop around. You could try Andy Dewhurst at DMR Electronics in Bradford (0274-817889) or Tim Drew of LG Computer Services in Southampton (0703-552662), two small companies. Computer Exchange of Leeds (0532 435583) offers all types of computer

equipment, to buy or sell. They also produce a used computer magazine for £1.

One proprietor, hearing I was from PC PLUS gave me a rule of thumb formula. 'If selling, stick out for at least half the purchase price; buying, expect to pay anything up to half purchase price plus 25 per cent.'



● Demand for used PC equipment is particularly strong in the Middle East.

Six months ago you bought your sparkling new computer and watched your family gasp as the stripey tiger pictures came out of the printer. Since then, unfortunately, you've found you need cash and it looks as if you will have to sell the computer.

So you take it back to the shop, and the manager offers you about a fifth of the original price. Shattered? Many computer owners think their machines retain most of their original value for years but there are at least four factors working against you: capitalism, VAT, computer manufacturers, and the public's perception of value. There are also four common ways to sell: sale or part-exchange to a dealer; commission sale by broker or through a shop; by auction; or private sale by advertisement.

'The second-hand price of Amstrad PC 1512s dropped by about 20 per cent when the 1640 was introduced.'

Perceived value dominates the resale price of computers. There are always suspicions about the reliability of second-hand machines, and they are rarely covered by the manufacturers' guarantees or service arrangements. Second-hand status reduces the sale price of a computer by at least a third. Also, every time manufacturers reduce prices, bundle accessories with their machines, and release new models the resale value of the original machine plummets. The second-hand price of Amstrad PC 1512s dropped by about 20 per cent when the 1640 was introduced, and again when the 2000-series models hit the market. So the £1,000 machine dropped by a third to £650 has gone down further - and this is being optimistic - to, let's say, £500.

SPOT CASH

Now, if selling to a dealer you are likely to be paid on the spot and your responsibility for the goods ceases. Let's assume that the dealer hopes to sell your computer for £500. In such a situation, you'll obviously be offered much less. One reason is VAT, which you pay even if you buy second hand (but it is not chargeable on private sales). Out of what's left, the dealer will deduct a fairly substantial amount to cover expenses and anticipate depreciation. Another chunk goes towards profits, and a small margin is left for haggling. At the end you'll probably be offered about £200-£250, or possibly more if you want to part exchange your old computer for a new model.

Commission sales work in two main ways. In one, a broker contacts interested clients. You keep the goods until they are sold, then pay the broker commission. Brokers prefer to deal with large professional systems, and you should read their contracts carefully. Often you will have to pay commission if you sell the machine without the broker's help. Note that you may also find the broker is acting only as an intermediary, leaving you

liable for maintenance if the equipment breaks down.

The other method of commission selling is simpler. A shop displays your machine and sells it, usually without any guarantee, charging 15-25 per cent commission. But most commission dealers refuse liability for the goods they hold – it's your loss if the goods are broken or stolen. The shop may also reserve the right to reduce prices at will.

There usually isn't any VAT charged on sales by commission but if you are a VAT-registered company you'll have to pay VAT on the money you get. There may also be problems if you claimed a tax rebate when you bought the equipment. The commission agent's fee will always be VAT-rated. Some agents lump this fee in with the commission, but others add it to the basic commission.

GOING, GOING FOR LESS

Sale by auction may bring in less than you expect. You can always put a high reserve on goods, but the auctioneer gets a commission (liable for VAT), and sometimes charges for unsold lots. If you are a company, you will also have to pay VAT etc. If you sell at auction, you can't usually be sued if the goods go wrong.

Private sales can net the most money, but they do have some disadvantages. Don't take a cheque for more than £50: it's easy for the customer to cancel a cheque that isn't covered by a bankers card, and very difficult to get your computer back.

Finally, though you may not be legally liable, the buyer may still phone at 2 a.m. when the monitor blows a fuse. Most computer magazines will run small advertisements. Computer user groups can be a good market for unusual items. The first rule in getting a good price is that the equipment must be clean, complete, and in perfect working order. Modifications can lower the price you get. Holes cut in the casing and other non-standard changes won't impress dealers. Anything that compromises electrical safety could make you criminally liable.

Co-processors and other 'orthodox' upgrades are more valuable; an 8087/80287/80387 adds a lot to the price you'll get for your machine, as do hard disks, tape streamers, etc.

If you are offered an acceptable price be ready with some proof that you own the computer. A driving licence or passport and the original receipt are ideal. In a private sale, it's a good idea to insist on cash, a banker's draft, or three days for a cheque to clear.

Finally, if you are self employed, or are selling your machine for a company, and the offers that you get are unacceptable, you could give it to a charity or school. They will usually sign receipts to say that they have accepted them as gifts, at a value agreed by an independent appraiser. These donations may be tax-deductible. But talk to your tax consultant first. ●

THE DEALERS

Buying or selling a second-hand personal computer is harder than trying to 'do a trade' with a used car: a snap check on Bristol and Bath dealers showed very little movement in what could develop into a booming industry in the 1990s.

The Avon Yellow Pages directory lists hundreds of companies and individuals advertising Computer Services. A phone-around left me feeling furtive and dodgy. Most of the representatives sounded rather superior. No, they didn't deal in second-hand goods. 'Don't waste our time, Arthur Daley!'

However, ACE of Bristol (tel: 0272-637981) and Starcol of Bath (0225-31126), have plenty of time for the nearly-new market. Mr Aziz Bayat in his ACE Cannon Street shop said most of his sales of PCs are to small businesses. After many of these first-time buyers have upgraded their machines they return for more powerful models. Mr Bayat, who has over five

years in the business, foresees a big upsurge in the second-hand trade – which currently accounts for five per cent of his turnover.

To meet this challenge he is increasing his five-shop empire to 20 branches, ranging from Cardiff to Swindon, by the end of 1989.

Verity Kingston of Starcol, who has had 17 years in the computer business, had several second-hand PCs in stock, all of which had been reconditioned. She said that the makes in greatest demand were IBM, Commodore and Opus – because they have totally compatible parts whereas Amstrad spares can be a problem.

The biggest problem is availability of machines the company can recondition. 'I need more stock,' Verity told PC-PLUS. 'I have a waiting-list of people who want to buy second-hand. It's a market where demand exceeds supply at the moment.'



● Verity Kingston of Starcol: 'I have a waiting-list of people who want to buy second-hand'.

OH! ONE OF THOSE!

There are a few stock phrases, used time and again. Here are a few examples from each side of the counter and what they could mean.

We don't get much call for those... 1: We will if we put it in the window. 2: What the hell is it?

It was working yesterday... 1: It was working yesterday 2: It short-circuited yesterday.

Oh! It's one of those! 1: A nice little earner if I play my cards right. 2: Good grief! I'll take it to the antiques roadshow.

I'm really sorry to part with it... 1: I need the money. 2: The police are going to come back with a search warrant.

It's a bit grubby... 1: You've touched the keyboard. 2: There's a computer under there somewhere.

It's fully PC compatible... 1: 256k, and as slow as an original IBM PC. 2: ...apart from crashing when you try to run Lotus 123

It's well used... 1: You've taken it out of the box. 2: Why is there a six-inch burn hole in the monitor casing?

I've barely used it... 1: I couldn't make sense of the manual. 2: 'Barely' 50 hours a week.

There's a new model... 1: It came out six months ago, so we can knock the price down by 30 per cent. 2: Wow! A 1K ZX81 For that money I'd sooner throw it away! 1: I'm a rich masochist. 2: They offered me more up the road.

It's rather old... 1: See 'There's a new model'. 2: Can you still get the valves?

GUARANTEED

Second-hand computers usually come with a three-month guarantee. For an extra ten percent of purchase price most dealers will extend the guarantee to one year.

WHAT THE PAPERS SAY

Advertisements in newspapers and trade journals can get you better bargains. Newspapers are not targeted at your specialist market. The day is yet to come when there are as many computer ads as there are those for second-hand cars.

Conversely, the few computer small ads that do appear stand out for those seeking those wares. But don't be unrealistic about prices: at the time of writing, the Bath and Wilts Chronicle have been running for three months a personal ad for the sale of an Amstrad and accessories for £750 which cost about £1,000 when new.

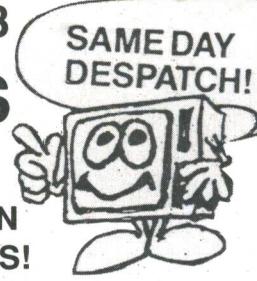
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despatch by 4pm
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OFF ALL PRICES SHOWN
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SOFTWARE PC1512/1640

Integrated Packages		Spreadsheets	
Ability	£77.05	Supercalc 3.21	£69.00
PFS First Choice	£126.50	VP Planner	£74.75
Open Access	£99.00	Multiplan Jr	£59.00
Psion PC-4	£63.96	Sage PC Planner	£82.80
Accounts		Cracker III	£55.20
Sage Bookkeeper	£79.00	Kuma K Spread II	£69.00
Sage Accountant	£120.75	VP Planner Plus	£113.85
Sage Accountant Plus	£169.00		
Sage Payroll II	£126.00	Wordstar Express	£69.05
Map Integrated Accounts	£124.00	GEM Write	£77.96
Sage Financial Controller	£270.00	Wordperfect Jr	£79.20
Camsoft Fin. Manager	£105.00	New Word II	£77.00
Graphics		PC Write	£77.00
GEM Draw Plus	£79.99	Word Junior	£55.96
GEM Graph	£79.99	GEM First Word Plus	£65.00
GEM Wordchart	£79.99		
GEM Fonts & Drivers	£31.96		
GEM Diary	£31.96		
GEM Font Editor	£79.99		
Delta Graphic	£59.80		
Database			
Sage Retrieve	£79.00		
VP Info	£77.00		
PC Promise	£51.75		
Condor Jr	£79.96		
Cardbox	£47.96		
Dbase II (1512 Ver)	£79.90		
Superbase Personal	£79.35		
Camsoft Cambase	£37.95		
Amsoft Infomaster	£69.00		



FINESSE BY AMS

Finesse Ver 1.1 (inc GEM/3 & Fontware)	£79.35
AMS Mouse inc Driver Software	£63.25
AMS Microscan inc scanner software	£228.85
DTP Solution 1 inc Finesse & AMS Mouse	£136.85
DTP Solution 2 inc Finesse & AMS Microscan	£304.75
DTP Solution 3 inc Finesse, AMS Mouse & Microscan	£343.85

HANDY SCANNER

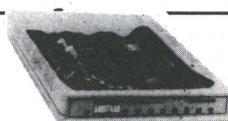
Used to transfer patterns to the screen or into the computer memory. • Software also included

Special Price — £280.00

Handy Scanner + Fleet St Editor - £345.00
(Now with text recognition software)

COMMUNICATION

Amstrad PC Card Modem V21/23	
Free membership to Microlink	£115.00
GEM Comm	£44.85
Sage Chit Chat Software	£79.35
Sage Chit Chat Pack	£79.35
(Software + Linnet Modem)	£209.30
Dialup Personal Software	£75.00



AMSTRAD MODEM SM2400

New external modem. Quad standard. High speed data transfer, fits snugly under your telephone.

- V21, V22, V22BIS, V23.
- Bellinkle repression
- ACI progress monitoring
- Auto pulse & tone dialling & baud rate selection.
- Full duplex with V23. ● RS232 (v2) host interface.

£258.75

DESKTOP PUBLISHING

Fleet Street Editor	£79.00
Fontasy	£55.00
Fonts 1,2,3	£40.00
Fontasy Toolkit	£27.60
GEM (DR)	£230.00
Page Ability	£155.00
PFS First Publisher	£90.99

MC2400 Card Modem

** New **

• V21, V22, V22BIS, V23 • Hayes compatible • Auto answer/dial • 5.25" & 3.5" media • amazingly small

Only £206 from KCS

BOOKS

Introducing the Amstrad PC	£7.95
Amstrad Basic 2 Manual	£9.50
Using DOS Plus on Amstrad	£9.95
Business Graphics on Ams. PC	£12.95
PC1512/1640 Technical Ref. Manual	£19.50
Using Amst. PC1512-1640 Step by Step	£8.50
Using Wordstar 1512-1640	£9.50
Amst. PC Prog. Ref. Guide	£15.99
How to get other 90% from Amst PC1512-1640	£8.95

DATA SWITCHES

High quality in steel cases. Share the printers or computers and save money by using the T-Switches	
SDS-P2 (Parallel) 2 Device-3 female connectors	£39.00
SDS-D2 (Serial) 2 Device - 3 female connectors	£34.00
SDS-D4 (Serial) 4 Device - 5 female connectors	£50.00
SDS-P4 (Parallel) 4 Device - 5 female connectors	£59.00
SDS-DX (Serial) 4 Device X switch - 4 female connectors	
SDS-PX (Parallel) 4 Device X switch - 4 female connectors	£59.00

DISK STORAGE

LOCKABLE DISK BOXES

Model	Size	Capacity	Price
DD40L	3"3/5"	40	£7.50
CS100L	3.5"	100	£13.90
DD50L	5.25"	50	£7.90
DD100L	5.25"	100	£11.70

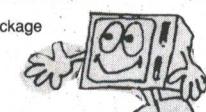
FLOPPY DISCS

3M GUARANTEED

Price per box	Qty	Price per box	Qty
SS/DD	10	£12.00	20+
DS/DD	12.50	£12.00	
SS/DD	16.00	£15.50	
DS/DD	16.50	£16.00	

CLASSIC RANGE SOFTWARE

Lotus 1-2-3 Ver 2.1	£304.75
Lotus Symphony (Version 2)	£430.00
dBase III Plus	£370.00
Supercalc 4	£204.50
Wordstar 2000 Ver 3	£309.00
Framework II	£380.00
Wordstar Professional V4	£270.00
Word Perfect V4.2	£309.00
Microsoft Word V4	£304.75
Smart System	£454.25
Ansa database paradox II	£430.00
Lotus Manuscript	£316.00
Microsoft Excel	£368.00



COPY HOLDER Adjustable Desk Clamping ONLY £14.95	
Low Prices	
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SUPER CALC 4 £149.00	

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DATABASE • WORDPROCESSOR • COMMS • SPREADSHEET • SPELLCHECK

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2000 sheets 11" x 14.5" 1pt 60gsm	£15.50
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2000 sheets 11" x 9.5" 1pt 60gms	£13.49
1000 sheets 11" x 9.5" 2pt NCR	£22.16
2000 sheets A4 1pt 70gsm Micro Perf	£16.95
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LABELS	
1 across	2 across
2000 3 1/2" X 1 7/16"	£8.45*
2000 3 1/2" X 1 15/16"	£11.34
2000 4" X 1 7/16"	£9.53
2000 4" X 1 15/16"	£13.00
	£12.72

* available in Blue, Yellow, Pink, Green, (£1 extra)

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Star

Dot Matrix

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Daisywheel

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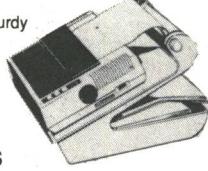
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Printer handling - Unique front feed allows insertion without removing already installed continuous paper

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FOUR GANG SURGE PROTECTOR

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Amstrad LQ5000 ..	£6.50	£5.99	£5.75
Brother EM200 ..	£4.26	£4.14	£3.83
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It's

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Twin floppy drive model
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32 Meg hard disc model
40 Meg hard disc model
64 Meg hard disc model
5.25" & 3.5" floppies
plus 32 meg hard disc

1512

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£489	£589
-----	-----
£619	£699
£679	£759
-----	-----
£719	£799

1640

Mono	Colour	ECD
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-----	-----	-----
£759	£849	£949
£719	£819	£899
£769	£869	£959
-----	-----	-----
£849	£949	£1049
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£819	£999	£1049
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£919	£999	£1049

PC 2086

Mono	14" colour	12" HR colour	14" HR colour
£699	£849	£949	£1049
-----	-----	-----	-----
£819	£959	£1049	£1149
£879	£1019	£1119	£1219
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£918	£1058	£1148	£1248

New
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£1059	£1238	£1378	£1458	
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Ring (0254) 682 343

PLCs & Govt Dept. FAX your official orders through Fax (0254) 664 053

EXTERNAL OPTIONS FOR PC2086

5.25" External floppy drive £99 with PC2086. (£129 alone)
40 meg Tape streamer. £249 with PC2086. (£299 alone)

FREE SOFTWARE

All PC2086 models come with Microsoft Windows Windows-write wordprocessor & Windows paint installed. 1640/1512 computers come with some of the best public domain programs and utilities. 1512s also come with Might Ability and US Gold games. All hard disc models come formatted and ready to use.

BUY WITH CONFIDENCE

Our extra low cost 1 year Onsite Maintenance option is excellent value for money at £39. Normally this costs £100 to £150. This option will ensure that your computer will be attended to at your home/office within 12 working hours should any fault arise within the first year. Even without this option, all computers are fully guaranteed for 12 months.



PRINTERS



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Epson FX1050	9pin 132col	£419
Epson LQ500	24pin 80col	£279
Epson LQ850	24pin 80col	£459
Epson LQ1050	24pin 132col	£599

Epson EX800	9pin 80col	£439
Epson LQ2250	24pin 132col	£899
Epson GQ3500	laser	£1149
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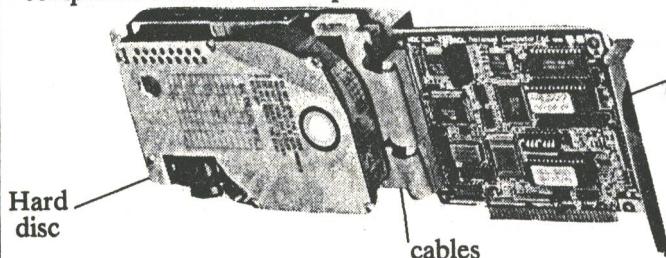
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HARDCARDS

The best way to add a hard disc system to your PC.

A hard card is identical to a hard disc system but fits in one of the expansion slots at the back of the PC. It is very easy to fit and remove and allows the use of twin floppies. 32 meg or lower capacity hardcards can be configured as drive C: or drive D:. Higher capacity hardcards are supplied partitioned into two drives (C: and D:). We can also supply the corresponding front mounting hard disc kits but these are more difficult to install, & can not be used in twin floppy models. Our hard cards are compatible with all IBM & Amstrad PC compatible computers with standard expansion slots.



We are the UK's leading hardcard suppliers.

We provide:

- *Impartial advice about different hardcards
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- *Technical support on hardcards (0254) 63414
- *Hardcards installed with automatic menu system & many free public domain programs & utilities

In terms of advice, support, software & utilities provided, and price, you won't find a better hardcard package.

Miniscribe 32 £229

Miniscribe high quality 32 megabyte hardcards configured as drive c: or d: Best sellers for 2 years running. 65ms access time. Unbeatable for reliability.

Miniscribe 40 £269

Fast 40 ms access speed. Configured as drive C: & D: Same high-reliability as 32 meg card above but higher capacity (40 meg) & faster. 28 ms in each DOS partition

HARDCARD PRICES

21 Meg

Miniscribe	65 ms	£209
Seagate 125	40 ms	£215
Tandon	80 ms	£199
WD filecard	80 ms	£199

32 Meg

Miniscribe	65 ms	£229
Seagate 138	35 ms	£259
WD filecard	80 ms	£219

40 Meg

configured as drives c: & d:
Miniscribe 40 ms £269
Tandon 80 ms £349
western digital 80ms £259
Hi-Q 80 ms £249

High Capacity hardcards
49 Meg Seagate 35ms £379
64 Meg Rodime 28ms £415

ADVANTAGES

- Easy to install. Does not void PC warranty
- can be used in twin floppy PCs
- can be easily transferred to another PC

DISADVANTAGES

Uses 1.5 slots at back compared with 1 for front mounting hard disc but this is unimportant as there are plenty of slots.

ACCESS TIMES: The speed of a hard disc is determined by the access time [milliseconds(ms)]. Fast hard discs have lower access times & are more expensive. Access times may be shortened by partitioning the drive.

controller card
cables

A hard disc provides instant access to all your programs. It will transform your PC. A hard card is the best way of adding a hard disc system to your PC.

BEST SELLERS

- | | | | |
|--------------------|--------|-------|------|
| 1. Seagate 138 | 32 Meg | 35 ms | £259 |
| 2. Miniscribe | 40 Meg | 40 ms | £269 |
| 3. Miniscribe | 32 Meg | 65 ms | £229 |
| 4. Western Digital | 32 Meg | 80 ms | £219 |

Ring (0254) 682 343
and ask for Hardcard Sales.

Seagate 138 £259

New extra fast 35ms hardcard.
32 megabytes. configured as c: or d:
New seagate 138 mechanism. Beware of imitations
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The Best hardcard on the market.

Western Digital Filecards

Popular & cheap with reasonable performance (80ms)
but come with Xtree and Speedread software FREE
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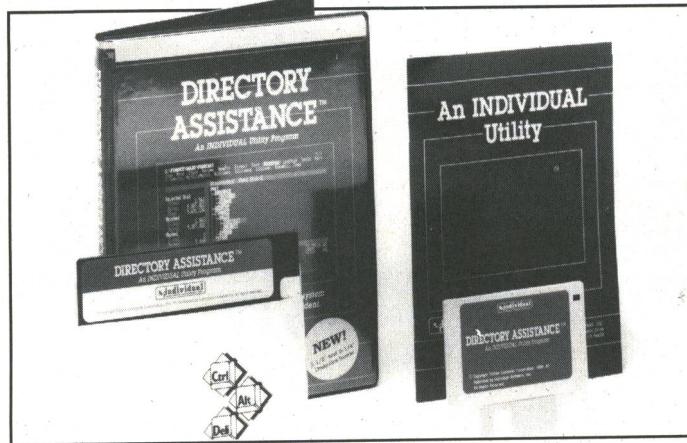
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TIME computers

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Time House, 207 Preston New Rd.
Blackburn. Lancs. BB2 6BS

COMPETITION!



```

C:\GRABIT          MAIN
Copy Move Erase Rename NewDir Format Sort Display LogDisk Tools Quit
Move files or directories

Directories:
Current Disk
  Files: 1,327
  Bytes: 22,256,393
  Free: 8,788,896
Matched
  Files: 1,327
  Bytes: 22,256,393
Marked
  Files: 0
  Bytes: 0
Current Directory
  Files: 53
  Bytes: 1,403,142
Files Sorted By
  Descending
  Name
  Bunch3 .COM C-ED-2 .TIF DEMO .BAT DMSAVE .COM
  BATCH3 .COM C-RPED-1 .TIF DM .COM DMSETUP .COM
  BUNCH3 .COM C-RPED-2 .TIF DMINSTAL .EXE DMSTD .INI
  C-ED-1 .TIF CRC .DAT DMLOAD .COM DMWIDE .INI
  NUM F1, F2 = HELP Directory Assistance 1.1B
  31-Feb-89 10:43:36

```

- Directory Assistance shows your hard disk's subdirectory tree in graphical form. You can navigate around the tree, copy and rename files, and perform non-standard DOS operations such as moving files and renaming directories.

```

C:\TN          MAIN
Copy Move Erase Rename NewDir Format Sort Display LogDisk Tools Quit
View, Initialize, Compare, Export, List, Find, Mark, Secure, Remember
Directory Assistance Help          (Press ESC to return to DA)

The Tools command contains an assortment of utilities for working in DA:
  • View lets you look at your text files, or review the results of a
    Compare, List, or Find operation.
  • Initialize can set file dates and times, change your volume label,
    and control printer operation and saving of results.
  • Export lets you copy and compare files on different disk drives.
  • Mark is used for marking files according to their dates or
    attributes. The Secure utility lets you encrypt and decrypt files,
    and also change your files' attributes.
  • Remember lets you save a path name or a path and file name, and
    recall it in DA or DOS by pressing the right shift key twice.

```

31-Feb-89 10:40:34 NUM F1, F2 = HELP Directory Assistance 1.1B

- The program's built-in help screens tell you what's on offer.

DIRECTORY ENQUIRIES?

This month we have teamed up with software distributors Ctrl Alt Deli to give 50 lucky readers the chance to win a copy of *Directory Assistance*, a full-function, menu-driven file-handler which can run in memory-resident mode and removes the need to use the dreaded DOS prompt. For more details, see our hands-on review on page 9.



To win your copy of *Directory Assistance*, all you have to do is to look at the table below, and then list in order the five reasons why a file-manager like *Directory Assistance* would be useful to you.

A. Saves Time on DOS operations

B. Total Data Security

C. Free Tutorial Included

D. Enhanced Computer Performance

E. Can be Made Memory Resident

So, if you think that C. Free Tutorial Included is the most important reason, write that at the top of your list – and so on until you have written all five.

Answers on a postcard please, to:

PC PLUS
Directory Assistance Competition
4 Queen Street
Bath

CLOSING DATE OF COMPETITION: MARCH 17TH 1989

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--	-------	-------	-------	-------

3 1/2 3M Discs

	24.55	47.90	116.75	227.65
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3 1/2 MICROMEDIA Brand Discs

	14.90	28.60	68.25	130.50
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All discs supplied are with labels 5 1/4" write protects, envelopes & hub rings. 100% certified error free lifetime guarantee.



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Price each Ribbon

Amstrad

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8256 8512 LQ3500 MS

R BL GR BR

DMP 2000 3000/3160

DMP 4000

Amstrad 9512 MS

Canon 1080 1156

R BL GR, BR, Y

Centronics GLP

R BL, GR, BR, Y

Citizen 120D

Epson MXF1RX80FX800

R BL, GR, BR

Epson LX80 86GX80

R BL, GR, BR, Y

Epson EX800

KAGA KP810/910

R BL, GR, BR, Y

NEC P2200

Panasonic KXP

R BL, GR, BR, Y

Star LC10

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89X36 3 1/2x17 1/2

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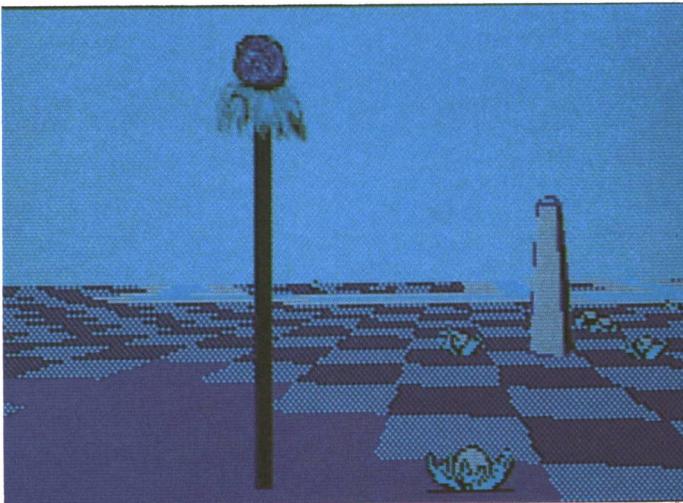
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NEW RELEASES

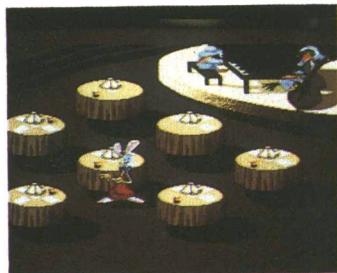


Logotron reckons its latest title could be the company's big success for 1989, and has given PC PLUS an exclusive preview copy. According to Logotron's Herbert Wright Archipelagos 'defies the usual genre of computer games', and we would certainly agree.

The game is set in a landscape of shifting islands in which you must connect stones to a central obelisk by building bridges, but must battle against a variety of strange creatures that poison the land, eat it away or kill on contact. Parallels with international politics are doubtless unintentional.

Conquer one level and you move on to the next – the preview disk came with literally hundreds of playable levels. There was obviously a considerable amount of work still to be done, but the final result should be interesting and will of course be reviewed in this August journal. The CGA version is due out as you read this, with an EGA version in March.

Logotron has adopted an unusual pricing policy, making its first appearance on StarRay (reviewed later). After initial loading problems thanks to over-zealous copy protection, StarRay is being relaunched in two separate versions with VGA displays costing £5 more than CGA. Usually a game caters for all graphics options in the one pack, so we wait to see what transpires. Incidentally, Logotron didn't say whether it had increased the cost of the VGA version or decreased the cost for CGA...Find out on 01-381 8745.



Big film news this winter has of course been 'Who Framed Roger Rabbit', and these days that means a computer game is sure to follow. Cashing in this time round is Activision, which has signed with Walt Disney for the official version and produced a three-in-one package that is already drawing acclaim on the Amiga.

'Who Framed Roger Rabbit' is on the PC at £24.99 and is 'so easy even a Toon can do it'. Ask Activision on (0734) 311666 about the game, and whether the book, teeshirt or pie are available yet.

The big film from George Lucas this winter is the fantasy epic 'Willow', and back in our August '88 issue we brought you screen shots of the computer game as released in the States by Mindscape. UK distributor Mirrorsoft told us at the time that it did not intend to launch the game here until the film had been a hit –

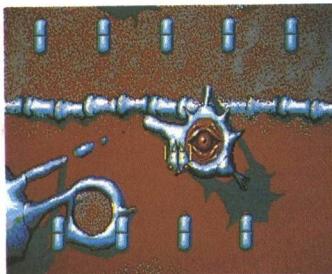
however we now understand that Willow is to be the launch title from Mindscape's new UK office. Watch this space for more news of the company that brought you *Balance of Power*.



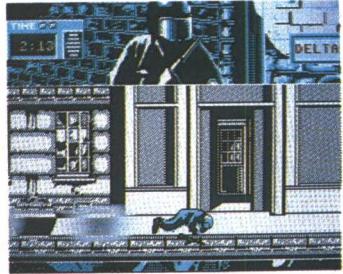
GAMES PLUS

Christmas is over and we're well into the new year – games must be drying up a bit now as we all get back to business...

Don't you believe it! New titles are coming thick and fast as games houses take the PC more seriously – particularly when it comes to EGA or VGA graphics. Over the page we look at five in depth. But first, here's Matt Nicholson with the news



High-speed arcade action with Martech's *Phantom Fighter*. Blast the Echelon Destroyers with your ghostly fighter in full CGA, EGA or VGA glory – Martech claim that the graphics were too much for the Atari ST so have released only Amiga and PC versions. Phone (0323) 768456 to find out why.



Escapism or Realism? Hostages from French label Infogrames puts you in the position of Captain Cavendish, faced with an Embassy overrun by terrorists, four hostages and a government that is not going to give in to their demands.

You have six men and a helicopter to get the hostages out alive in a game that 'allows six figures to be controlled simultaneously on screen'. Hostages is £24.95. If you would like to know more Infogrames is on 01-364 0123.



Fed up with the violence? then why not try a trip to the circus with *Ringling Bros. and Barnum & Bailey – The Greatest Show on Earth*. The official game, no less, complete with High Wire, Tiger Training, Trapeze and Trick Horse Riding. So roll up, roll up and phone Tynesoft on 091-414 4611

FOOTBALL CRAZY

Fans of Addictive Games' Football Manager 2 can kick off to a new season with the Football Manager 2 Expansion Kit. This new version allows the player to become involved in Scottish, French, Italian and world leagues in addition to the ability to save modified games. Price is £12.99 and details from 01-804 8100

ON THE LIGHTER SIDE

Matt Nicholson looks at the latest games releases with a little help from some friends, Graeme Kidd and Andy Smith

WAR IN MIDDLE EARTH

£19.99 • Mastertronic
01-727 8070

Anyone who is familiar with Tolkien's Lord of the Rings trilogy will immediately understand what's going on in *War in Middle Earth*. For those who have so far missed out on the Tolkien experience, here's a potted history of the plot: Frodo Baggins has acquired The One Ring, a magical artefact that is incredibly evil. Sauron wants the Ring because with it he can establish a permanent reign over the land of Middle Earth. The only way to stop Sauron's plans is to cast the Ring into a volcano located in the heart of Sauron's stronghold.

Three levels of control are offered in *War in Middle Earth* – Full Map, an overview of the entire country; Campaign Level, calls up a more detailed, scrolling map of the terrain, and Character Level, where events unfold location-by-location against backdrops created from digitised images. At Campaign Level, you can sit back and watch events unfold without interacting with the character, but such indolence leads to an early victory for Sauron. To play the game you need to combine the skills of an adventurer with those of a master strategist, hopping between game levels to make sure you keep control of events.

Play starts with Frodo in possession of the Ring, wandering around the North West of the land. Mount Doom, the volcano where the Ring may be destroyed, is in the South East corner of Middle Earth. Immediately Frodo is surrounded by a group of Nazguls

JOYFUL WORDS

As Amstrad owners are only too well aware, the Amstrad PC's joystick is not compatible with that of IBM. Thankfully both *War in Middle Earth* and *Fire-Brigade* work best from the keyboard, while *Star Trek* is best with a mouse and works fine with the Amstrad rodent.

Skate or Die! is definitely easier with a joystick, but unfortunately only accepts a genuine IBM compatible. *StarRay* is the other way round – it can't be used with the IBM stick, but does let you configure the keyboard. Plug in the Amstrad joystick, move it in the appropriate direction when asked to press the required key on the keyboard, and Bob's your Uncle (or at least Amstrad's your joystick).

(Sauron's SAS), and has to evade them. Survive this first encounter and it's time to send Frodo in search of items to give to the leaders of the elves and men. Human and elven armies scattered around the countryside refuse to accept orders until their leaders have been given talismans, and without their support the game is almost certainly lost.

All the armies and principal locations in Middle Earth appear as icons, clicking on them brings up status information, and if an army will accept movement orders, it can be sent off to defend a strategic location or do battle with Sauron's forces. You get the chance to issue orders during a clash between forces, but only on a very simplistic level: Charge, Engage, Withdraw and Retreat are all that's available to a field commander.

The game follows the topography of Tolkien's books very closely, and while familiarity with his stories is an advantage, it is by no means a prerequisite to enjoyment of this entertainment. Elements of strategy, wargaming, adventuring and role-playing have been combined in an excellent and absorbing game that is entirely driven by icons. *War in Middle Earth* can be played over and over again as you try different tactics. A truly adult game, that marks the direction for worthwhile PC entertainment software. GK

GRAPHICS
INSTANT APPEAL
LASTING APPEAL
VALUE VERDICT



Below, a view of Mount Doom at character level. The eye and Map icon allow status information and the campaign level to be accessed, respectively. The third icon allows objects to be manipulated.



Above, the scrolling campaign level map. Information on places and forces may be called up, and movement orders issued to forces. Clicking on Mount Doom reveals that 2,000 Orcs are lurking there...

Below, the full map of Middle Earth - the four icons on the right of the screen allow status information to be called up, game positions to be saved to or loaded from disk, the campaign level accessed and the progress of time to be altered.



SKATE OR DIE!

**£24.95 • Electronic Arts
(0753) 49442**

Way back in the early 70's the skateboarding craze swept the land. Every kid who didn't want to be ridiculed by his peers had to have a board, and most parents eventually succumbed and splashed out extortionate amounts of money on the most expensive equipment – after all, not just any board would do, would it? Then two weeks later the inevitable happened: the craze died.

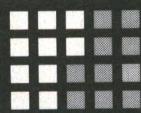
But old skateboarders never die (they just end up in hospital?) and again in the late 80's the craze re-emerged, but this time it was different. The kids were much older, and to be a member of the in-crowd you had to be a skate punk: dress outrageously, do dangerous tricks and pretend you didn't care if you smashed your front teeth out on a cold concrete pavement.

Cashing in on the trend last year was Electronic Arts who released *Skate or Die!* on the Commodore 64, and now bring us the PC version. The two disk game (you have to swap disks during the game because it doesn't recognise twin disk systems) contains five events which you can practise individually or compete in against up to seven friends.

The Freestyle event takes place on a large half-pipe. For this you make 10 passes (crosses from one side to the other) and have to score as many points as possible by doing complex tricks at the top of either side. Also on the half-pipe is the High Jump event where you simply have to waggle the joystick (or bash the keypad furiously) while you're in the pipe to gain speed and send you soaring up the other side. Then there is the Pool Joust in which you pick a computer controlled opponent and skate around inside an empty outdoor pool trying to knock your opponent off his board with a big stick. Then follows the two downhill events: the first is a simple race – make it to the bottom as quickly as possible whilst avoiding drains, gravel and grass banks. The final event the Jam is where you grow an instant Mohican haircut and compete against your friends to reach the bottom of an alleyway first, doing tricks, squashing tin cans and smashing into dustbins and each other for extra points on the way.

Skate or Die! is well presented and very playable (it's easier with a joystick) but it's simple stuff. Take away the jargon and fancy hair cuts and you're left with a simple five event sporting simulator that you may enjoy playing occasionally (especially if you're a younger PC owner or are into the whole skateboarding thing), but it won't keep you hooked and playing into the wee small hours of every night. **AS**

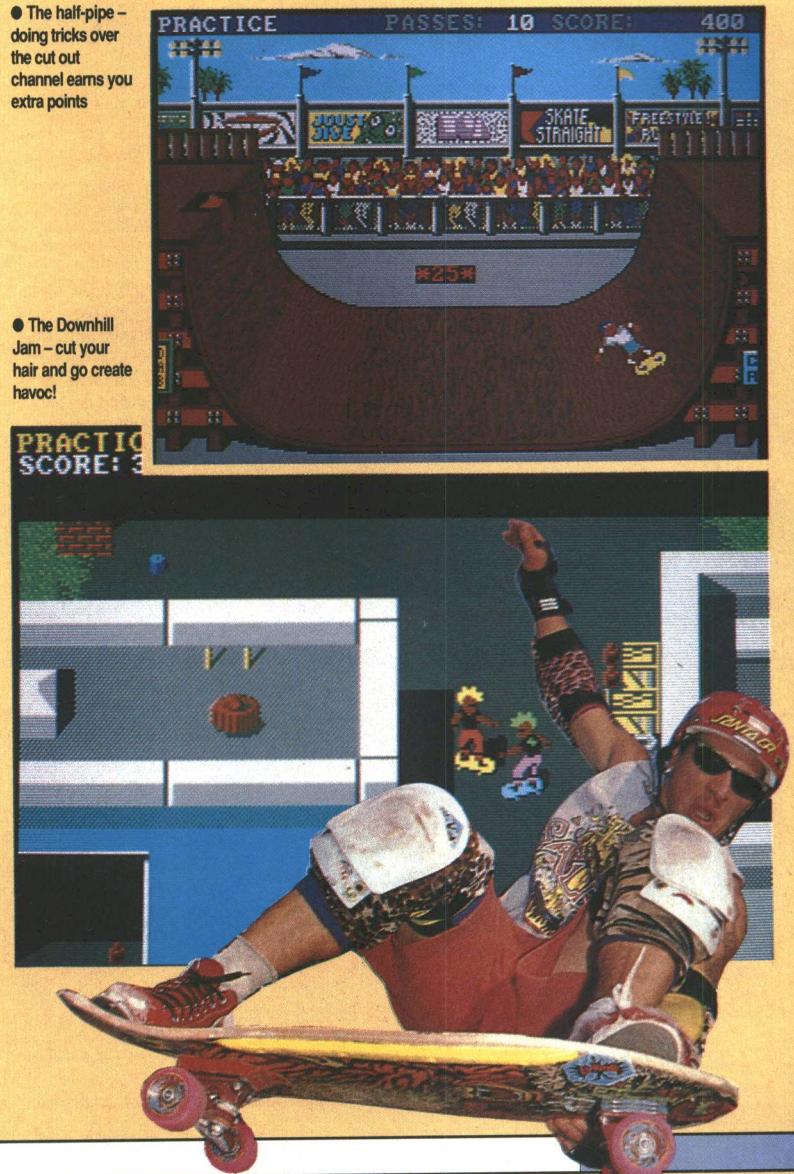
GRAPHICS
INSTANT APPEAL
LASTING APPEAL
VALUE VERDICT



FIRE-BRIGADE
T.B.A. • Panther
010-61 62 815150

November 1943, and the Russian army continue to push the Germans back towards the Dneiper river. It's at the Dneiper that the Germans hope to pull themselves together in preparation for the inevitable Russian winter and Russian offensive.

That's the state of play at the start of this wargame from Australian software house Panther, which comes on two 5.25-inch disks and one 3.5-inch disk. The first thing that needs doing is deciding whether to play the



SIDEWALK SURFERSPEAK

AERIAL – any move that causes all four wheels of the board to be off the ground simultaneously. Usually applies to moves made at the top of a ramp or half-pipe.

RAIL SLIDE – a move that involves sliding the middle of the board horizontally across a surface (like a kerb) whilst keeping all four

wheels off the ground.

DROP-IN – to enter a pool, ramp or half-pipe from the top from a standing start.

RADICAL (or RAD) – any well executed move (the more dangerous a move, the more Rad it is).

computer or a fellow human being. Play the computer and you can alter the skill level to suit, play a human and you may not be able to alter the skill level but you can play remote via a modem or cable. Once you've decided who commands which army and have selected the basic or advanced game (there are even more options and control over your forces in the advanced game) it's time to choose the scenario.

Each scenario lasts a set number of turns – one turn representing one day – the first being the full campaign lasting 50 turns from 3rd November 1943 until 23rd December. For this scenario the Russians are in a much stronger position (initially) and the Germans are

DOWN UNDER

Fire-Brigade is currently only available from Panther Games direct, at following address: Panther Games Pty Limited, P O Box 8, Hughes ACT 2065, Australia.

The game costs \$70 Australian, which includes Air Mail shipment. Panther are currently looking for a UK distributor, and it should retail here for something like £29.95.

Game Windows Reports Staff Time Out

Time 6:00
3 Nov 1943
Temp warm
Air clear
Ground good

13TH KORPS
Gen Hilpert
Command excellent
Orders delay
Object Druzhyna
Effect good
Supply excellent
Fatigue fresh
Ave low AT low
Flt low Hvy med
Inf low Inf low
Enginers low

● Issuing orders to your units on a CGA PC.

FIRE-BRIGADE

● In EGA mode. The Victory Points map shows which areas each army controls. The burning tanks show where battle occurred the day before and the outcome.

Game Windows Reports Staff Time Out

Time 6:00
4 Nov 1943
Temp warm
Air clear
Ground good

Curr Victory Level minor defeat

Victory Points
Current 180
Historical 179
Net Last Turn -4

Step Losses
Last Turn 41
Since Start 41

Step Loss Ratio
Last Turn 2.2
Since Start 2.2
Historical 1.5

struggling to retain their positions. The second scenario lasts 38 turns, starting on the 15th November with the Germans in a better position to counter-attack thanks to the arrival of reinforcements. The final scenario lasts just 18 turns from the 5th December, with the Germans ready to launch yet another counter-attack, this time with the help of the newly arrived 48 Panzer Korps.

For all the scenarios the game structure is the same. Using menus and icons selected using either the mouse or keypad, orders are issued to HQ units who then pass them onto their subordinate units. Once objectives have been issued, supplies and air support are designated and replacements assigned. When satisfied that units have not been sent to certain death, the player hits a key and the movement phase starts. Combat between enemy units is resolved instantly as the day progresses hour by hour until the next morning, when the orders phase starts again.

Before updating a unit's orders it's a good idea to check how well it fared in combat the previous day. Several map overlays are available including a map to show where combat occurred and what the outcome was, and one showing which army controls which towns and so forth. There's even a small scale strategic map that can be called up to give a general view of the overall situation.

Victory at the end of the scenario is awarded to the player with the most victory points, which are acquired by capturing various strategic or tactical objectives such as towns, railway junctions or cities and the like.

Fire-Brigade has a very user friendly game structure and the helpful manual means even a complete novice can easily get into the game but, like most things in life, if you want to do well and get the most from it you'll have to put some effort in. If you like wargaming though, you'll find the effort well worth it. **AS**

GRAPHICS
INSTANT APPEAL
LASTING APPEAL
VALUE VERDICT



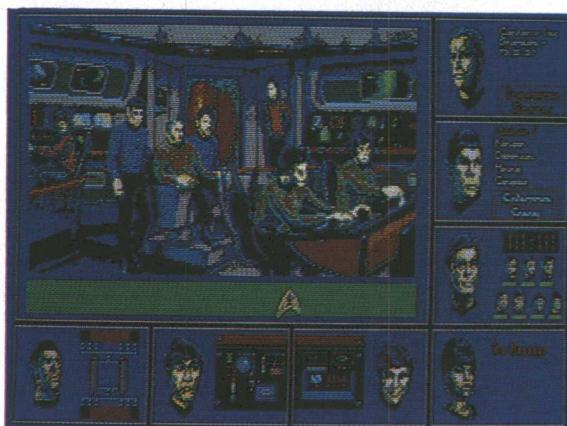
STAR TREK

£24.95 • Firebird Software
01-240 8838

Subtitled 'The Rebel Universe', this official version comes with a plot every bit as ridiculous as the TV series. In a special transmission to Captain Kirk on board the USS Enterprise, Starfleet Command outlines the reason why an area of space within the Sagittarius Arm has been put out of bounds and designated 'The Quarantine Zone'. Apparently every Federation starship that has entered the area over the past few months has turned renegade and switched allegiance to the Klingon's (remember them?).

Needless to say, Captain Kirk and his merry men have been delegated to find out why. The whole area has been enclosed in one of those wonderfully convenient devices that crop up in the scripts of Star Trek with frightening regularity. This time it is the turn of the Klein Sphere, through which no matter may pass. Kirk has five years to find out what is happening and put an end to it – otherwise ship and crew will be sealed within the Quarantine Zone forever.

Such a scenario is very reminiscent of the Electronic Arts classic *Starflight*, which has remained in our Good Software Guide virtually since the first issue of *PC PLUS*. *Star Trek* indeed operates in much the same



● The bridge of the Enterprise, undergoing some sort of vision distortion induced by the dastardly Klingons perhaps?

way, with you travelling about the known universe, collecting objects and information that will enable you to solve the mystery.

Unfortunately Mike Singleton, who wrote the superb *Lords of Midnight* trilogy for Beyond Software several years ago, has rather blown it here by giving the whole game away from the start. The manual details the Klingon's dastardly plot in full (it involves a peculiar

isotope of dilithium that acts as a telepathic amplifier), eight ways of foiling it, and a list of virtually everything you are likely to find on the way. Takes all the fun out of it, really.

Star Trek uses an interesting screen format comprising a main screen called up from an ever-changing series of sub-screens round the edge. It is intended for use with a mouse, and while the EGA version did not seem impressed with the serial rodent of a 386 clone, the Amstrad PC1512 mouse was quite happy with the CGA version.

Unlike *Starflight* the whole user interface is incredibly graphic – you select your destination from a 3D rotating star chart, for example. But it is certainly not easy to use, with the mouse positively flying over the table top as you pull up screens here, click on targets there, and so on.

The programmers have also chosen to use a rather strange blurred image for much of the graphics. This may be the result of some conversion from another machine; the game is already available on the Atari ST and the manual annoyingly refers to digitised speech messages which of course are completely absent on the PC version.

It all looks very impressive at first, but after seeing Dr Spock say 'I will never understand humans – Catastrophe Pods have exploded and consumed the ship' a couple of times it begins to pale. A shame, but *Star Trek* just doesn't have the scope or the mystery of *Starflight*. MN

GRAPHICS
INSTANT APPEAL
LASTING APPEAL
VALUE VERDICT



STARRAY

£24.95/£29.95 • Logotron
01-381 8745

There's nothing like a good old blast-up, where you just sit there in some futuristic scenario, through screen after lurid screen, blasting everything that moves and daring yourself to take a peak at the ever-mounting score. Will you make it through the next wave? You stare in horror as some new alien monstrosity flashes across the screen, dripping death in its tracks. Your firing finger melts the top of the joystick as you try and blast it from the skies, but no – this one's got you and its back to the high-score table and just one more go. You stare in horror as your watch informs you it's four in the morning...

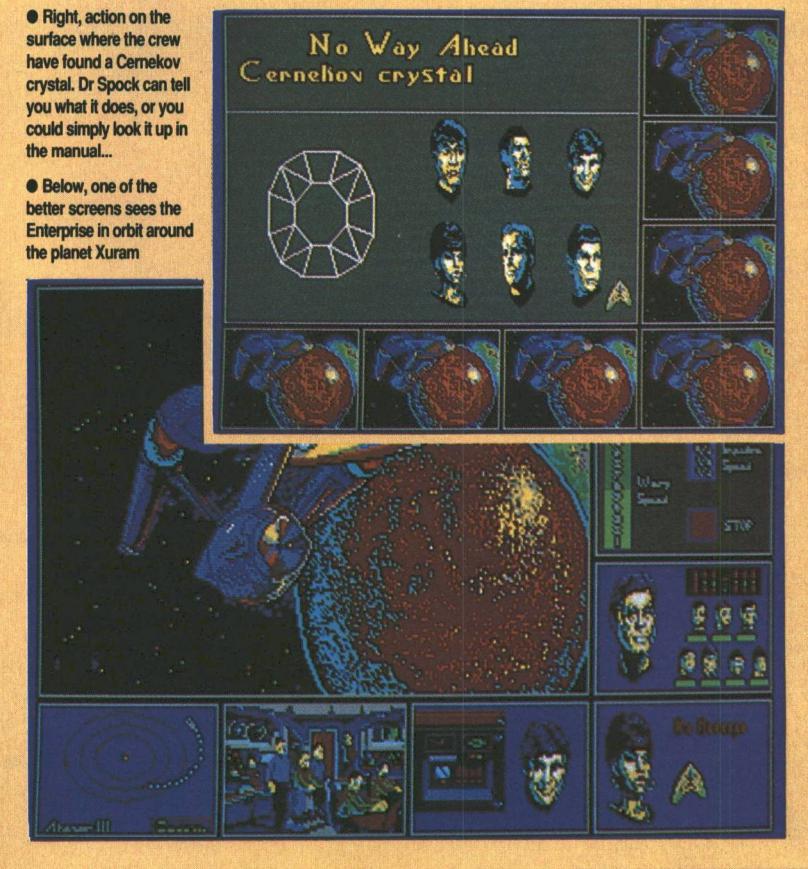
There are indeed plenty of games that are nothing like a



• Battling with the aliens well into the night thanks to *StarRay*

• Right, action on the surface where the crew have found a Cernekov crystal. Dr Spock can tell you what it does, or you could simply look it up in the manual...

• Below, one of the better screens sees the Enterprise in orbit around the planet Xuram



good old blast-em-up, which is perhaps not surprising on a machine that is rather more used to the sedate click clack of data entry than the zap of lasers. However *StarRay* is not half bad, and has most of the necessary ingredients. You get 21 waves of aliens on seven highly colourful backgrounds, which look pretty good on a VGA screen. The aliens include Landers, Blue Hunters, Dragonflies, Wasps and Pterodactyls, each behaving in its own sweet way. It scrolls very smoothly horizontally in either direction, you get a separate sound track on cassette tape for that little bit extra atmosphere, and you even get a high score table that is automatically saved to disk so that it is there whenever you fancy a quick blast. What more could you ask? It would be nice if it supported the IBM joystick and was a little cheaper, but you can't have everything. MN

GRAPHICS
INSTANT APPEAL
LASTING APPEAL
VALUE VERDICT



HIGHER PRICE

Logotron has adopted an unusual pricing policy with *StarRay*, in that it will be available in two different versions. The CGA-only version is available now at £24.95, while an EGA/VGA version will be available soon at £29.95.

War in Middle Earth runs OK on a CGA screen, but obviously looks better on EGA or VGA (these are VGA screens taken from an Amstrad PC2086). *Skate or Die!* is enjoyable in the short term, especially if you invite a few friends round to join in.

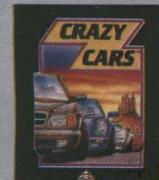
Fire-Brigade runs in glorious living colour on EGA and VGA machines, but CGA owners will have to be content with mono. However this does little to detract from the game – who

THE CGA VIEW

needs colour when there's a battle to win?

Star Trek is unusual on CGA, as it almost becomes easier to play. The EGA displays are so blurred you hardly loose out on detail, and it uses the rather more tasteful red, cyan, black and white colour scheme.

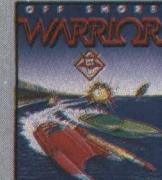
StarRay certainly looks better on a VGA screen, but there is an advantage playing it on a PC1512 in that the Amstrad joystick can be used. It's cheaper, too.



CRAZY CARS



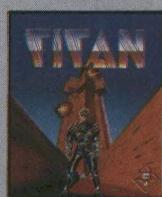
FIREFORGET



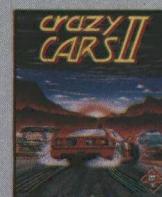
OFF SHORE WARRIOR



GALACTIC conqueror



TITAN



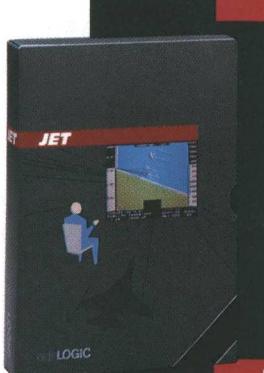
crazy CARS II



TITUS

AMIGA — ATARI ST — PC AND COMPATIBLES — AMSTRAD CPC — C 64, 128 — SPECTRUM

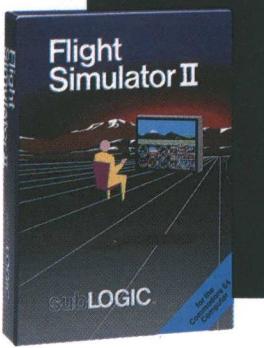
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Telephone: 01-439 8985

Remember *Valhalla*? This early home computer game combined the text entry of the adventure/fantasy program with the animated action of an arcade game. 'Programmed in stunning Cinemavision' (or words to that effect), it claimed to be the first of a long line of releases destined to culminate in the first 'computer movie'.

Valhalla, although very difficult to solve, was a remarkably sophisticated game for its time. Played in real time, you could actually sit back and watch the awkward monochrome stick figures act out their destiny.

Furthermore, the characters involved had a sense of personal 'history', in that they recalled actions carried out by the player and adjusted their goals accordingly. Loki, for example, began the game as a hostile character but could be 'brainwashed' into permanent alliance if you continually took his side in battle.

Valhalla sold over 150,000 copies and was one of the first in a long line of aspiring 'computer movies'. The most notable successors have been Mindscape's *Cinemaware* and Sierra-on-Line's 'Quest' series: *Space Quest*, *King's Quest*, and other associated titles including, recently, *Leisure Suit Larry*. These latter titles have become very popular amongst PC owners and Sierra have just come up with two more: *King's Quest 4* and *Leisure Suit Larry Goes Looking For Love*. Let's take a look at them and see how they rate as games...and as movies.

CURTAINS UP!

The format in both games features a full screen graphic display that looks pretty good on EGA but leaves a lot to be desired on CGA – especially if you own an Amstrad 1512. The display shows the location of the principle character – Princess Rosella in *KQ4* and Larry Laffer in *LSL*. You can use a joystick, mouse, or keyboard to move the character in any direction, whereupon they shuffle across the screen, bumping into objects, climbing stairs and falling over edges where appropriate.

At this point you immediately realise that computer movies all need one thing: bags of processing power. Playing these games on anything less than an AT is a trial of patience that no cinemagoer is likely to relish. *Kings Quest IV*, for example, boasts a ten-minute animated movie at the beginning of the game. That's ten minutes of real time on a slow machine to present information that the average nine year old would assimilate in around 40 seconds.

The agonisingly slow pace continues throughout both games. Every time your character reaches the edge of the screen a new display is loaded from disk, a process that can take ages even with a hard disk. Even worse, throughout both programs there are animated sequences which you have to endure as various story-lines are unfolded. The storylines are fine, but the time taken to present them is unbearably long. An AT is therefore more or less essential, as is an EGA display, since the CGA version is unimpressive and occasionally misleading in its lack of detail.

SCREENPLAY

Each adventure develops its plot in two ways. First, you have the prime objective of the game which, of course, involves ultimate evil and ultimate good in unequal and varying doses. Evil starts with the upper hand, either by striking down King Malcolm and the good fairy Genesta in *KQ4* or by assaulting universal peace and harmony in *LSL*.

Our protagonists respond in different ways and very different styles. Princess Rosella explores the fantasy land of Tamir and encounters the Seven Dwarves (who take almost seven minutes to eat lunch), ogres, witches, unicorns, and suchlike. Leisure Suit Larry, as befits his status as a satirical comment on the art of nerdishness,

INTERACTION

Steve Cooke looks at two new packages from Sierra Online that offer animated storylines...

tries to pick up every girl in sight, appears on a TV dating game, and has unlikely encounters with the KGB.

In addition, as befits the parallel nature of a computer game as opposed to the serial nature of the cinema, you get additional challenges thrown at you in no particular order during the game. Rosella may just have to knuckle down and clean up after those pesky dwarves (part of a generally sexist trend that runs throughout the program) and Larry, of course, just has to make out wherever possible.

WHAT NEXT

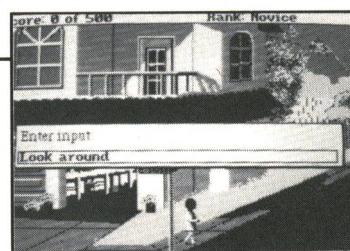
Bearing in mind the game complexity of the original *Valhalla* and the fact that it was programmed over four years ago leads one to question seriously the current state of the art in 'computer movies'. Surely it can't be long before someone starts applying state-of-the-art animation techniques to fantasy material, combined with a reasonable parser?

It's all the more galling because both these games show, despite their shortcomings, evidence of careful plot development along traditional screenplay lines. As a result, the subject matter almost triumphs over the poor technical presentation. Other adventure/fantasy software (particularly some of the Infocom titles) boasts similar strength in the scenario department, making the lack of a good animated interface all the more regrettable.

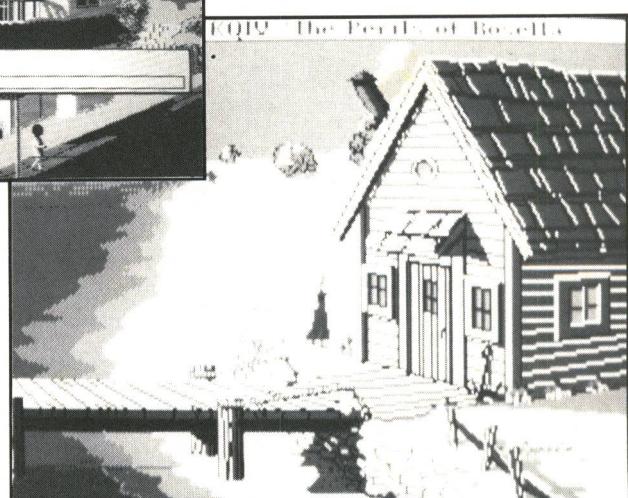
Even if you discount the serious problem of speed, these games remain disappointing. *Kings Quest III* was, as a matter of personal opinion, a better game than its successor and the original *Leisure Suit Larry* product was every bit as good as the newer offering. If you're dead set on a moving experience, however, then either one will do. Romantics will obviously fare better with the fair Rosella, despite the cloying sweetness of much of the scenario. Nerds should stick with *Larry*, a game with much good humour but, ultimately, very little substance. ●

TOONTUNES

Sierra have really gone to town on the soundtrack for these 'movies'. Each program has MIDI output to drive either a Roland MT32, an IBM Music Feature card, or Sierra's own music add-ons. With a standard IBM internal speaker, however, all you get is the usual beep squeak.



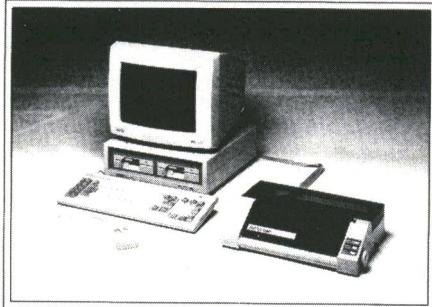
● Above, CGA murders Larry in *LSL*... always provided the KGB don't get him first.



● Right, EGA does wonders for the Tamirian landscape in *KQ4*

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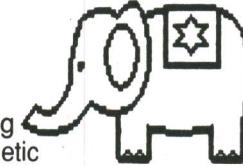
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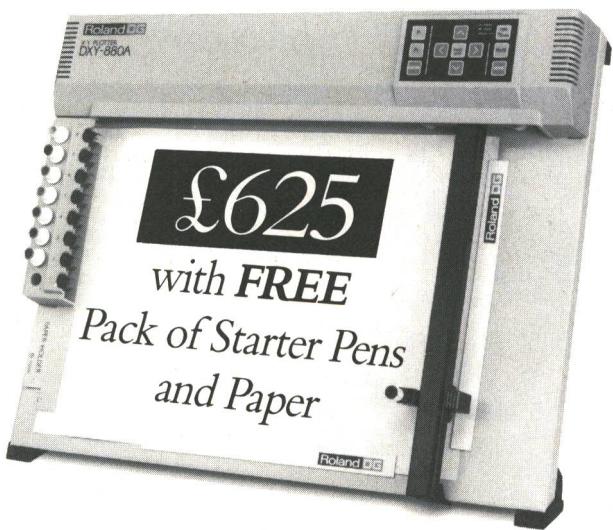
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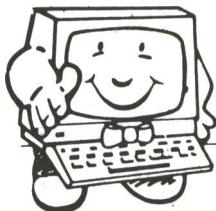
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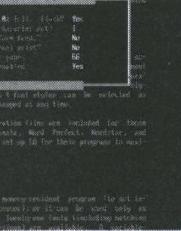
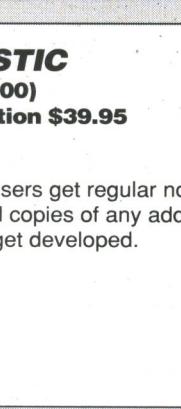
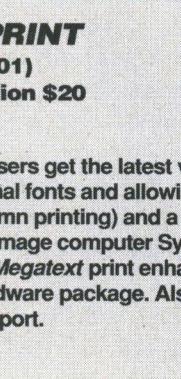
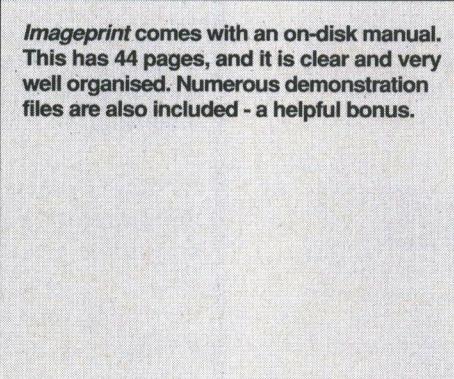
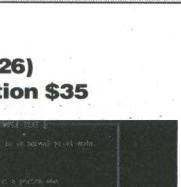
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In this month's dip into the shareware library Roman Iwaschkin looks at four

PRODUCT NAME	DOCUMENTATION	INSTALLATION
BRADFORD (Version 2.03) ● Registration \$39.95  <p>Special hints and/or configuration files are included for Epson, PC-Write, Multimate, Word Perfect, Wordstar, and Microsoft Word, enabling them to set up (or these programs to work) automatically. These can be easily changed if you like.</p> <p>Special hints and/or configuration files are included for Epson, PC-Write, Multimate, Word Perfect, Wordstar, and Microsoft Word, enabling them to set up (or these programs to work) automatically. These can be easily changed if you like.</p> <p>What You Get:</p> <p>You receive either a memory-resident program (for all the memory-resident programs) or it can be used safely as part of Microsoft's Print Queue (one extra cartridge required).</p>	Registered users get a 50-page printed manual offering more detailed explanations of the commands, plus others not mentioned in the shareware version, plus technical support. The shareware disk contains just a 5 page document which is inadequate for serious use.	Comes ready to use, with configuration files for Epson MX & FX ranges, and Star Gemini 10X and 15X models. These will also work with compatible printers.
FONTASTIC (Version 2.00) ● Registration \$39.95  <p>Fontastic comes with a memory-resident program (for all the memory-resident programs) or it can be used safely as part of Microsoft's Print Queue (one extra cartridge required).</p> <p>What You Get:</p> <p>You receive either a memory-resident program (for all the memory-resident programs) or it can be used safely as part of Microsoft's Print Queue (one extra cartridge required).</p>	Comes with an extremely detailed 122-page on-disk manual, which explains and demonstrates the program's capabilities. The effects are spectacular, but it takes an extremely long time to print: allow an entire evening for this task. In addition, some of the files mentioned are missing from the package.	The disks include an installation program which configures <i>Fontastic</i> to your system. Virtually all popular printers are supported.
IMAGEPRINT (Version 1.01) ● Registration \$20  <p>Imageprint comes with an on-disk manual. This has 44 pages, and it is clear and very well organised. Numerous demonstration files are also included - a helpful bonus.</p>		Works with all Epson or IBM-compatible printers. No special installation is required.
LQ (Version 2.26) ● Registration \$35 	Comes with 55 pages of well-organised and superbly clear on-disk documentation, plus several demonstration files which can be printed out with the program.	The program supports most Epson-compatible printers, though you may need to create a configuration file (full instructions are given) if your printer differs significantly from the Epson.
	Registered users get the latest version, a printed manual, and a \$10 bonus whenever anyone else registers from one of their copies of <i>LQ</i> .	

ENHANCERS

programs to improve the quality of your printouts

WHAT YOU GET	IN USE
<p>Bradford offers two modes of operation:</p> <ul style="list-style-type: none"> (a) batch printing of a plain ASCII file in a variety of fonts, (b) batch printing of an ASCII file containing imbedded codings. <p>Files can be printed in any of 41 fonts in 15 styles, including a special provision for the printing of <i>Wordstar</i> files. Also included are two further programs, <i>Unfont</i> (to enable a font file to be edited); and <i>Bradfont</i>, to create your own fonts.</p>	<p>Bradford's commands can be used from the command line to print an entire file in a particular font, or to mark particular sections inside a document, embedded within text lines. It's reasonably fast for a print enhancer, and capable of very good output, particularly when printing files as a batch. However, few users will want to bother with the cumbersome process of imbedding its commands in their files.</p>
<p>Fontastic consists of the menu-driven <i>lspprint</i> program (used for actually printing your text); <i>lspfont</i> (for the creation of any special character not otherwise available, such as symbols); and <i>lsputil</i> (for enhancing existing fonts. The shareware version includes 18 fonts, in a range of sizes. These can be adapted or enhanced with <i>lsputil</i>.</p>	<p>Requires plain ASCII files into which have been imbedded the program's control words. Effects include alter-nate fonts, underlining, enlarged and proportional print. Considerable time will have to be invested in learning the codes if <i>Fontastic's</i> power is to be used to anything near its potential.</p>
<p>The shareware version comes with only one letter-quality font, though a demonstration file gives examples of 4 others.</p>	<p>Text can be either straight ASCII or contain embedded control characters; input can be either from a file or directly from the keyboard. Three print densities are available: medium-quality 3-pass printing, high-quality 3-pass (half-speed) and high-quality 6-pass printing (half-speed, unidirectional). Output quality in all modes is excellent.</p>
<p>Operates either as a memory-resident program or from the command line for individual files. Twenty-one fonts (including matching regular/italic/different-size versions) are available. A variable-size print spooler is included, as well as <i>Bigprint</i> (for enormous, poster-size banner printing in any of <i>LQ</i>'s fonts). Also included is a program for designing your own characters, letterheads, or graphics images.</p>	<p><i>LQ</i> works makes your word processor think it's talking to an Epson MX-80 or IBM Graphics Printer. Fonts can be freely mixed within the document, and output quality is very high indeed. Like all print enhancers, <i>LQ</i> is slow, but its spooler allows you to carry on with other work while your text is being printed. Output quality is in all fonts excellent, and <i>LQ</i>'s general ease of use and versatility makes it a pleasure to use.</p>

● BEEFING UP YOUR PRINTER

A dot matrix printer is theoretically capable of producing just about any character shape, and even the cheapest 9-pin models can also produce passable 'Near Letter Quality' (NLQ) output with a bit of clever multiple-pass printing. However, most word-processing programs stick to the printer's much more limited standard character sets and output quality.

The shareware print enhancers featured here give you extra fonts, effects and print quality, making the best possible use of your printer's capabilities. *LQ* is actually a memory-resident program which intercepts your program's printer output, while the others require you to create text files with special control commands embedded in them. Either way, they could be a good deal cheaper than upgrading to a 24-pin or laser!

● SUPPLIERS

This month's disks were supplied by The Public Domain (& Shareware) Library, Winscombe House, Beacon Road, Crowborough, Sussex TN6 1UL. Tel. (0892) 663298 (voice), (0892) 661149 (Bulletin Board for software download). PDSL can arrange registration in sterling based on the current value of the US dollar) for you for a small fee.

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PRTECFX

Memory resident, it allows graphics screen-prints to Epson or compatible printers.

IBMGRAPH

(PC PLUS Superdisk for May 1988). Memory-resident again, this one provides Epson support for the full IBM extended character set. This means you can have italics and graphics at the same time!

VPS

(Versatility Printer Setup) - Registration \$20. Provides menus to set up your printer for any of 13 print styles (including double-width, proportional, and the genuinely minuscule *TINY*). Designed for Epsons, but works on (or can be adapted for) a large variety of other printers.

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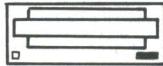
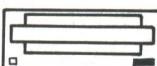
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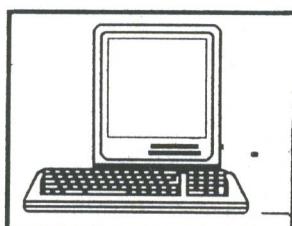
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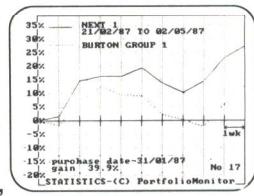
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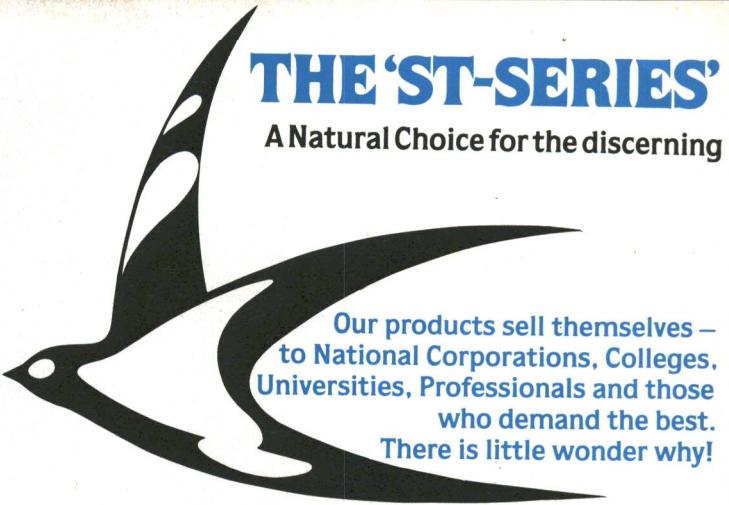
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CLOSE, BUT NO CIGAR

 I have a problem with BASIC2 that may defy explanation! My program asks the user to INPUT a value, and then PRINTs the value elsewhere on screen (ie LOCATE 6,10). If I INPUT a value ending in .66 - 23.66, say - the value printed at (6,10) becomes 23.66001. Why is it that the .66 becomes .66001?

Terry Braverman
Cambridge

This one doesn't defy explanation, but it can get a little complicated. The simple answer is that BASIC2 doesn't store **real** (that is, fractional or partly fractional) numbers exactly as you type them in. Instead it uses a 'rounded-off' form that makes for rapid calculation and takes up very little memory space, but isn't always entirely accurate.

In practice, the inaccuracy is never very large. When BASIC2 displays a real number, the first six digits are always correct - which explains why it got the 23.6600 part of your number right. Where it displays a seventh digit however - the final 1 in this case - it can be a little wide of the mark.

What you do about the error depends on what sort of program you're writing. If you're writing a scientific or engineering program that deals with measurements, the discrepancies will probably be well within your margin of error, so you can simply ignore them. If you're working with money on the other hand, you'll have to take more positive action.

Assuming for a moment that the 23.66 figure is actually meant to be £23.66, a value of 23.66001 is



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obviously unacceptable. One way round it is to use something of the form:

```
INPUT number
LOCATE x, y
PRINT ROUND (number, 2)

...but this will leave you with other problems. In particular, it will display 23.50 as "23.5" because of the way BASIC2 ignores trailing (ie final) zeroes. Also you'll find you start getting errors in the pence column when you go above £10,000: this is the seventh-digit problem rearing its head again. The best solution for finance is to treat the money as a whole number of pence rather than a fractional number of pounds. This can be a bit tricky, especially when dealing with INPUT, but the problems are surmountable. Try something like:
```

```
INPUT "How much
money?"; number$
```

```
a=INSTR(number$, ".")
```

```
pounds$=number$(TO a-
1):pence$=number$(a+1 TO)
```

```
money=100*VAL(pounds$)+VAL(p
ence$)
```

```
LOCATE x, y
PRINT
```

```
money\100; ".": (money\10)
```

```
MOD 10; money MOD 10
```

You'll find this produces output with unwanted extra spaces, but it shouldn't be too hard to get rid of these. (Note the backslash '\' used for integer division: this is not the same thing as the real number division sign '/').

MORE FUN WITH .EXE AND .COM FILES

Here's a little curiosity for you to waste your time on. Take a .COM file - PROGRAM.COM say - and rename it PROGRAM.EXE. Now run it as normal, by typing PROGRAM at the DOS prompt, and it works fine. The same goes if you rename an .EXE program as PROGRAM.COM. How come? An .EXE file is nothing like a .COM file internally (as you'll already know if you read the reply to E J Waite's letter above) and needs completely different treatment to load it properly.

Presumably this is a rare example of DOS being idiot-proof. What I don't yet know is how DOS can tell that it's looking at a .COM file despite the .EXE extension (or vice versa). The obvious way would be to check the first two bytes of the file. All .EXE files start with the characters **MZ** - hex 4D 5A - which serve no apparent purpose. These translate into a pair of machine code instructions **nobody** would dream of starting a .COM file with, (DEC BP, POP DX in case you're interested), so that looks like a promising method.

Needless to say, things are a



Packed pages of problems and programs

In the *Help Screen* pages readers pass on hints and tips on using the Amstrad PC, or ask for help in the hope that we at *PC PLUS*, or another reader higher up the learning curve, can provide the answer to their problem. It is intended for readers at all stages, whether they've never seen a computer before in their lives or have discovered an interesting machine code hack.

To avoid confusion, we use a system of icons to indicate the type of letter that follows:



For the beginner, this indicates a letter from someone just starting out with computers, or perhaps moving up from a home machine such as a Spectrum or BBC.



This icon indicates correspondence about programs on our cover-mounted *SuperDisk*.

 Nothing is too technical for this section; if you don't understand it, don't read it (and don't worry, either!).

This is where you will find useful tips and routines in BASIC, C, Pascal, assembler and on occasion perhaps even dBase!

 When people have found their feet on PCs, they don't stop turning up problems: look under this heading for hints on batch files, pop-up programs and the finer points of DOS utilities.

 Danger! Anything with this logo is potentially hazardous to your machine or data, so proceed with caution. If you wreck your PC or reformat your hard disk, *PC PLUS* cannot be held responsible. You have been warned!

good deal more complex than that. Simply starting a program **MZ** is not enough to convince DOS it's looking at an .EXE file. Presumably the program has to have a correct .EXE header as a whole. Since the header contains a checksum and file length information (which DOS can check independently), the chances of accidentally producing an .EXE file are effectively nil.

I should add that I've only tested the above on DOS 3.2, so it's possible that earlier versions did actually use the .COM/.EXE extension. Who knows?

DIY PSU

 We hear a lot from disenchanted Amstrad PC1640 owners stuck with mono displays, which can't reproduce CGA or EGA graphics, and the standard reply is to keep the existing monitor for its PSU (Power Supply Unit - Tech Ed) while adding

another (colour) one along side. A more elegant solution would be to buy a PSU as well as a monitor - I spotted one in the electronics press that would do, for £35.

To put my money where my mouth is, I thought I'd better try this for myself. I only had a 5V PSU to hand, so I linked that up and ignored the +/-12V supplies (-5V only goes to the expansion slots, and is unlikely to be needed at all). The Amstrad monitor was used, but only connected by its video lead. Sure enough the ROM boot worked fine, until the machine found it could not access the disk drive (because of the missing +/-12V supplies) and reported a failure. Add the full complement of supplies and everything should be fine.

If you are thinking of trying this, the supply requirements are listed in Appendix 6 of the

Technical Reference Manual, and the power connector pin-out is shown in section 1.21. Beware - the diagram is a mirror image of what you actually see looking at the power socket, and the connections in the table are listed with pins 7 and 9 swapped. Unfortunately I know of no source for the mating plug, so the connection will have to be bogged, or the plug cannibalised from the existing monitor.

While on the subject of hardware projects, I've substantially reduced the noise

output of my ECD monitor fan by fitting a layer of foam between it and the case where it's mounted. The foam is cut so as not to obstruct the air flow, and the mounting screws are grommetted to the fans so that there are no pathways left for vibration to be transmitted to the case.

Ken Wood
Newport

I'm surprised we haven't seen any third-party power supplies specially built for Amstrads. After all, if the number of letters we get is anything to go by, there's certainly the

demand for one.

ERROR CORRECTIONS

Listings are notoriously difficult things to typeset properly, as last month's Help Screens ably demonstrated. A couple of infuriating little errors crept in, neither one of which will have been obvious at first glance. First of all there was that GW-BASIC listing in **INPUT TROUBLE** (p117-8), whose line 2080 should have read:

2080 WHILE b\$>CHR\$(13)

(The loop that followed was actually a bit of a cheat: it executed either zero or one times, effectively making it a multi-line **IF...THEN** statement without the need for a **GOTO**.) There was also a semicolon missing from the end of line 2110, without which you'll get a lot of unwanted carriage returns!

More seriously, there's a misplaced carriage return in the DEBUG listing of ESCOUT.COM in **NOT JUST ANSI** (pp114-7) which would cause you severe problems if you didn't spot it. The listing in full should have been:

a 100

BATCH BITS

 I have been examining your PCPLUS.BAT file to see how the menu facility works. I note it operates on the basis of, for example, IF ERRORLEVEL 188 GOTO F2MENU etc

:F2MENU
CD MENU
etc

I know the extended ASCII for F2 is 0;60 and the ERRORLEVEL of 188 looks like 128 + 60. I would appreciate an explanation of the connection between F2 (0;60) and 188 and why the value of 188 is used.

I have also been using the MENU program from the December Superdisk. It's a super little program, but I would like to be able to do more than just call up programs with it. For example, I would like to be able to do something like F5 DIR A:/W or F6 FORMAT A:. Is this possible with the program as it stands, and if so how? My attempts so far have been unsuccessful.

Rev Ivan Hull
Belfast

To understand the workings of the PCPLUS.BAT menu system, you have to look rather earlier on in the file. The IF ERRORLEVEL... GOTO structure in a batch file acts on the **return code** left behind by the last program executed. The return code is a number passed back to DOS by a program when it terminates, and is normally used to indicate whether or not the program was successful. However, since the return code can actually be any number between 0 and 255, it can clearly be used to pass on a good deal more information than this.

In the case of PCPLUS.BAT, the return code is actually set by SCRNDISP.COM according to the key pressed by the user. Actually finding the bit of SCRNDISP.COM that does this would be no easy matter, but it looks like you were on the right track with your 128 + 60 sum. SCRNDISP sets the return code equal either to the ASCII character that the pressed key would normally generate, or to the key's **auxiliary byte value** plus 128. (The auxiliary byte value is a code used to distinguish between the many different keys that generate the ASCII code 0. When you

say that a key's extended ASCII code is 0;60, that's the same as saying that its ASCII code is zero and its auxiliary byte value is 60).

Adding the 128 lets you tell the difference between, say, [<] (ASCII value 60) and F2 (auxiliary byte value 60). By and large this is a good scheme, because ASCII values of keys are always less than 128 so higher return codes are obviously auxiliary byte values. Unfortunately some key-combinations generate auxiliary byte values over 128, so when the distinguishing 128 is added on, the result is over 256 and thus too big to be a return code.

In practice the value 'wraps round' (that is, comes back on at the zero end of the scale) so that the return code looks like an ASCII value. For example, both [Alt][=] and [Ctrl][C] produce a return code of 3 even though the former is an auxiliary byte value (131) and the latter is a true ASCII code. (In particular, if you have a fancy AT-style keyboard with 12 function keys, you'll have problems detecting F11 and F12 accurately.)

Ignoring this minor set-back, SCRNDISP is clearly quite a handy thing to have around. Its main purpose is to display text screens however, so it'd be nice to have a dedicated keycode-returning program. Here's a DEBUG script to create a 16-byte program that does just that:

```
a100
mov ah, 00
int 16
cmp al, 00
jnz 010C
mov al, ah
add al, 80
mov ah, 4C
int 21
[ Blank line ]
rcx
0010
ngetkey.com
w
q
[ Blank line ]
```

As ever, you can use this script two ways. Interactively you type DEBUG and then enter the lines of the script, hitting [Return] where it reads [Blank Line]. Alternatively you can type the whole thing into a text file called GETKEY.ASM (don't forget to leave the blank lines!) and run DEBUG by typing:

DEBUG <GETKEY.ASM

Either way you should end up with a tiny program called GETKEY.COM, which waits for a key and then returns a code based on it. Thus you'd use the lines:

GETKEY
IF ERRORLEVEL x **GOTO** label

...to detect a key with ASCII value x or auxiliary byte value x - 128. To see GETKEY in action, you could try a batch file like this one:

```
ECHO OFF
ECHO Hit any key
GETKEY
IF ERRORLEVEL 188 GOTO L1
ECHO That was NOT
GOTO L2
:L1
ECHO That was
:L2
ECHO function key F2
```

This is horribly unstructured, and about as useful as a "Hello World" program, but it does show the general idea. Incidentally, when using **ERRORLEVEL** in this way, always remember that the statement **IF** **ERRORLEVEL** x actually means 'If the ERRORLEVEL is x or greater', so if you have a series of possible keypresses in a menu, you must put the **IF** statements in descending order, e.g.

IF ERRORLEVEL 64 **GOTO** L1
IF ERRORLEVEL 63 **GOTO** L2

and so on, otherwise the first **IF** would trap all the possible keypresses.

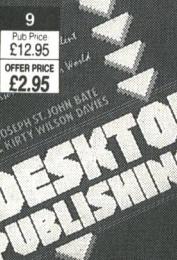
You should also find that batch files fix your MENU problems. If you want to set F1 to perform a **DIR** for example, just create a batch file called F1DIR.BAT which reads as follows:

```
CLS
DIR
PAUSE
```

If F1DIR.BAT is in C:\MENU, just set F1's execution option to C:\MENU\1DIR and you should find it works fine. (The **CLS** stops things from getting in an awful mess, while the **PAUSE** gives you a chance to see the results before it falls back into MENU).

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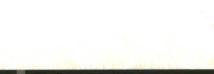
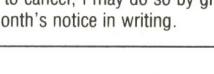
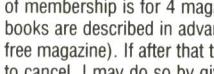
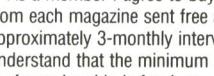
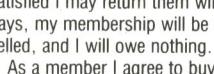
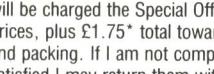
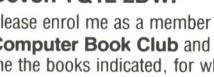
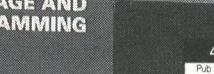
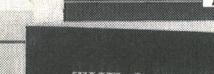
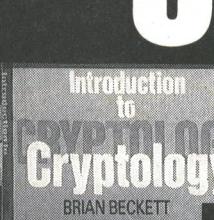
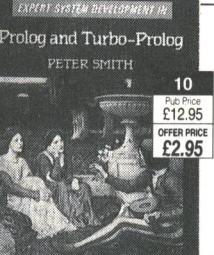
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TJ PCP L2

```

mov bx, 0080
mov cl, [bx]
mov ch, 0
inc cx
inc bx
mov byte ptr [bx], 1B
mov dx, bx
mov bx, 1
mov ah, 40
int 21
mov ah, 4C
int 21
[Blank line]
rcx
0019
nescout.com
w
q

```

{ Blank line }
Apologies for any problems either of these glitches may have caused.

A SORT OF DATE

 The Director of the Society of Genealogists, A J Camp said recently that a person would have to be a fool to express any date wholly in numbers. 'You can say 10 September 1988 or 1988 September 10 but any person who says 10.9.1988 is a fool asking for confusion, who proves immediately that he does not know what he is doing.' He was referring to the danger of accidental transposition.

His statement caused me more than a glow of embarrassment. As a constant user of SORT I have been in the habit of recording the month and day in just such a manner. I do not care for the result of using SORT on the three letter abbreviations for the months of the year, Apr for April, Jan for January etc: the routine places August before February and September as Christmas. (April did more or less begin the year once upon a time with help from the tail end of March before 1752, but for the rest SORT is no good at all.)

I would dearly love to have the approval of A J Camp, so is there any chance of putting a SORT-type routine on your Superdisk which would be able to produce the highly desirable mode where the days are numerical and the months occur as three-letter codes falling in the correct annual sequence?

The three letter code for the months does have a disadvantage when used for annotating a family tree. With space at a premium on an 80-column screen the numerical method takes one less space per date entry. For those of us whose trees are much wider than high, recording numerically has a distinct advantage even

though apparently it's not genealogically acceptable.

Terry Burns
Leicestershire

It's when problems like this crop up that you realise just how unhelpful computer systems can be. Accidental transposition is only one of the dangers involved when you've got an all-numeric date - there's the difference between UK (DD-MM-YY) and American (MM-DD-YY) formats

to worry about too - yet it's still the standard way of entering and processing the things.

Infuriatingly enough, you could almost solve this particular problem yourself using Roman numerals for months. All the numbers up to twelve SORT properly with the exception of nine (IX) which insists on squeezing in between four (IV) and five (V). Alternatives like VIV or VIII would get round this, but they're ugly and can't be read easily.

Besides, with space at a premium August (VIII) is going to cause problems of its own - and maybe A J Camp wouldn't approve anyway.

Otherwise, unless some kind programmer sends us a date-sorting filter, you'll just have to incur A J Camp's contempt or change your working style a bit. The latter would mean looking at database solutions rather than using a word-processor to prepare your trees. As PC PLUS Editor Paul

CHANGING CONFIGS

 I have Lotus 1-2-3 on the hard disk of my PC1512-HD20, and to enable me to handle very large worksheets I have also installed an EMS (Expanded Memory Specification) memory simulator called Softbytes, which uses a hard disk file instead of an expensive EMS RAM card. At present this is activated by an extra line in the CONFIG.SYS file and hence loads up automatically every time I power up. I don't always need the EMS and it does take a long time to set up the EMS pages, so I tried the following (without success):

- 1) delete the line from CONFIG.SYS which loads up the EMS;
- 2) set up a new file called CONFIG2.SYS which only contains the instruction to set up the EMS pages;
- 3) and programmed one of the MENU keys to run this CONFIG2.SYS file.

The problem is that when I press the appropriate function key from MENU, I get Bad command or file name. How can I selectively invoke the setting up of the EMS?

Richard Delahoy
Southend on Sea

Your approach won't work I'm afraid, because CONFIG.SYS isn't a program. It's just a file examined by DOS during the boot-up process, and can't be run. If you want to alter the configuration of your machine, you have to alter CONFIG.SYS accordingly and then reboot.

Automating this approach isn't too hard, but it does take a little preparation. To start with, here's what must be our shortest DEBUG script yet, turning out a .COM file that's a whacking two bytes long:

```

a100
out 66, a1
[Blank line]
rcx
0002
nresetter.com
w
q

```

Type or redirect this into DEBUG as usual, and the resulting program RESETTER.COM will be ready for action. If you run it you'll find your 1512 reboots. This isn't a bug: it's precisely what RESETTER's supposed to do.

Next you'll have to create two copies of your CONFIG.SYS file, one with the EMS driver line and one without it: let's call them CONFEMS.SYS and CONFNORM.SYS for the sake of argument. Lastly

you'll need to create two batch files, EMSON.BAT -

```

ECHO OFF
CLS
ECHO Switching EMS simulation on...
CD \
DEL CONFIG.SYS >NUL
COPY CONFEMS.SYS CONFIG.SYS >NUL
RESETTER

```

- and EMSOFF.BAT -

```

ECHO OFF
CLS
ECHO Switching EMS simulation off...
CD \
DEL CONFIG.SYS >NUL
COPY CONFNORM.SYS CONFIG.SYS >NUL
RESETTER

```

- to actually perform the switch. If all is well, the system will work as follows:

- 1) You run EMSON from MENU;
- 2) EMSON deletes the old CONFIG.SYS file and creates a copy of CONFEMS.SYS as the new one. In other words, you now have a CONFIG.SYS file which includes the EMS driver line;
- 3) EMSON runs RESETTER, which reboots the machine;
- 4) the bootstrap procedure reads the CONFIG.SYS file and installs the EMS driver accordingly.

Personally I'd be a bit uneasy about having my machine just one keypress away from rebooting. At the very least I'd be inclined to build in a PAUSE to let you abort.

Incidentally, the listing for RESETTER.COM only works on Amstrad machines. If you want to use the above technique on any other sort of machine, you'll need to use this script instead:

```

a100
mov ax, 0000
push ax
popf
mov es, ax
mov ds, ax
mov ss, ax
jmp FFFF:0000
[Blank Line]
rcx
0010
nreset2.com
w
q

```

This creates RESET2.COM, a program that should work on all 8088, 8086 and 80286 machines at the

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Stephens was keen to point out, you'd have no trouble at all if you learned to program in dBase!

CLOCK PROBLEM

Recently we installed MS-DOS 3.3 one of our PC1512s (upgraded with a V30 processor). We were after the extended DOS partition facility, but there was a price to pay. When you boot with DOS 3.3 the system clock is reset to 12.00 AM, as is evident when you check the clock with TIME. The real time clock is

unaffected, so when you reboot you get the usual signon with a correct 'last used' time. Try again and TIME returns 12 AM. Entering a new corrected time resets the clock, and stays in effect until the next reboot.

Has anyone else encountered this 'bug', and more importantly does anyone have a fix?

Brian Bell
Newcastle Upon Tyne Polytechnic

We've covered this one before, but as more people turn to DOS 3.3 it's

bound to keep cropping up. The split-personality behaviour of the 1512 here is caused by its two clocks disagreeing.

In a 1512, there are two separate sources of the current time. There's the **system clock**, which runs only when the PC is switched on, and the **real-time clock**, which keeps running on battery power even when the PC is turned off. For most purposes, you'll only be aware of the system clock: that's what TIME displays, and it's where the file time-stamps come from too.

In contrast, the real-time clock keeps a low profile. It only really earns its keep at power-up time, when it (a) provides the 'last used' time for the sign-on message and (b) sets the system clock with the right time. It's this latter 'pilot light' function that's going wrong on your machine.

The Amstrad-modified version of DOS 3.2 supplied with the 1512 reads the battery-backed clock each time the machine is turned on, and automatically sets the MS-DOS system clock to its value. If you install a different version of DOS however, you'll have to perform the update yourself. Amstrad thoughtfully provided the utility RTC.COM to help you do this. RTC.COM was supposed to set your system clock from your real-time clock, so the line **RTC** in your AUTOEXEC.BAT file should have solved all your problems.

Unfortunately RTC.COM was bugged, and couldn't do the job. What DOS-upgraders need then is the PC Independent User Group's alternative version, RTC33.COM. You can get this by sending a formatted disk and SAE to:

PCIUG
PO Box 55
Sevenoaks
Kent
TN13 1AQ

NOTELET SOLUTION

 I own an Amstrad DMP3160 printer which is excellent in all respects but one: it can't print to the bottom of single-sheet paper, because of the relative positions of print head and friction feed mechanism. I normally use continuous stationery but occasionally want to use headed or high-quality single sheet paper, and often find it very annoying that I can't print on the bottom few lines.

My solution is to use two sheets of those yellow self-adhesive notelets from 3M you can 'stick' two or more single sheets together, and then print right to the bottom of the first sheet. When the notelets are removed there is no trace of adhesive left on the sheets and the notelets can be re-used a number of times.

Robert Hynes
Birmingham

Not the first time I've heard this tip, but it is a good 'un. (Shame about that 're-using' suggestion though: a hefty campaign contribution from 3M would have come in very handy.)

FROM THE HELPLINE

Paul Mullen of the PC Independent User Group reports on problems answered by the group's telephone helpline service.

I've been alarmed by the number of members suffering from errors on their hard disks. The newer RLL (Run Length Limited) drive controllers, which pack 32Mbytes of data onto the same size of disk as an ordinary MFM (Modified Frequency Modulation) 20Mbyte drive, seem particularly prone to faults. While using an RLL controller is a very cheap way of increasing a disk's capacity, the higher data density (i.e. the number of bytes per square millimetre of the disk's surface) makes the quality of disk used crucial. Because of this, disk manufacturers warn that an RLL controller must only be used with disks approved for RLL use.

Unfortunately many dealers seem to be either ignorant or indifferent about the goods they supply. We've seen quite a number of cases where an RLL controller has been supplied with an unsuitable drive. Just as you can format a single density floppy disk as double density and get away with it for a while, so an RLL controller used with a non-RLL disk may appear to work satisfactorily for a few months. But later, after perhaps 6 months use, errors start to occur, particularly on booting up – by which time of course your guarantee may have run out!

Various mail order firms and local dealers have been supplying unsuitable drives with RLL controllers. In one case we found a widely distributed batch of 'Seagate 32Mb' hard cards had in fact been made up in the UK using the ST 125 drive – a drive which

Seagate themselves say must not be used with RLL controllers. Similarly, one major distributor was adamant that the Miniscribe 8425 drive he had supplied with an RLL controller was suitable for such use. He only backed down when his customer produced a transatlantic fax from Miniscribe themselves, confirming that it wasn't.

It's a ridiculous state of affairs really: the proper RLL approved drives only cost £8 or £9 more – but then mail-order pricing is very competitive, profit margins are small, and old stocks have to be dispensed with. If you are having trouble with a 32Mb RLL drive which is listed in our panel as not suitable for RLL use please write to us at the user group. We would like to gather all the evidence that we can about this matter.

The use of the wrong drive is by no means the only or even the most common cause of hard disk problems. Another major source of disk drive problems on Amstrad PCs has been traced to RF (Radio Frequency) interference coming from the monitor. This can easily be diagnosed by lifting the monitor off the top of the PC and placing it on the desk to one side. If that cures the problem, RF is the culprit. Amstrad's plastic case does make it more sensitive to RF problems than metal cased PCs. Although later PC1512s and all PC1640s have an earthed metal shield fitted to the expansion slots lid, this does not cover the ventilation slots – and they are directly above the place where a hard card disk sits.

One dealer told us how a client business was having disk problems that only affected one particular user. It turned out that she was a rather tall woman who tilted the monitor back on its swivel base while her shorter colleagues all tilted it forward! Many members have found that just moving the monitor slightly

(even placing a telephone directory under it) can cure the trouble. If you are choosing a hard card try to get one where the metal chassis curves round to shield the sides of the disk drive itself.

The Seagate ST225 and ST238R models (probably the world's best selling disk drive) also seem to cause problems on some Amstrad PC1512s. Several dealers have suggested that this is because its power supply is not powerful enough and in some cases can not cope with the start-up current taken by the drive. Others suggest overheating as a possible cause (although it is hard to see how this can cause boot-up errors).

Brian Gregory, who runs International Hard Disks in Oxford, has another theory to offer: see if the problems disappear when the PCs front panel is removed. He explains that the holes in an Amstrad front panel are slightly too small for a Seagate's front panel and need the bevelled edge filing away. He discovered by chance that if the hole is too tight, pressure on the front panel of an ST225 can cause disk read errors. Either way, the more modern 3.5 inch drives use less current and allow more space for air to circulate, so they're clearly preferable for use in a PC1512.

If you are thinking of buying a hard disk, don't let all this put you off. Hard disks are very worth while: once you have used one you will never want to go back to floppy disks. Just be sure to check the above points and you're unlikely to have problems.

The PC Independent User Group Helpline can be contacted on 0732 63157. If you need help in an emergency but are not already a member, you can get instant membership using an Access card.

TOO FAST INDEED

 February's Help Screen only gave half an answer about why a PC fitted with a NEC V30 chip gave silly figures. Firstly it is not quite true to say that the Amstrad mouse driver makes the clock run slow: it actually makes the DOS timer chip run three times as fast but then only passes one third of the ticks on to DOS. The trouble is that some games programs also speed up the clock and so speed test programs often reprogram the PCs timer to its proper rate. Then because the mouse driver is still only passing on one third of the 'ticks' to DOS the clock runs slow.

Old versions of Norton's SI program gave silly speeds on V30 processors: because the V30 is a clone of the 8086 chip and is completely different internally, some instructions are very much faster on the V30 than on an 8086 and some slower. Peter Norton happened to devise a speed test that contained a very high proportion of instructions that were much faster on the NEC chip than on an 8086. On average users replacing their 8086 with a V30 can expect to see a 10 to 15% speed increase in performing real tasks.

Paul Mullen
PC Independent User Group

Thanks for setting the record straight: as you say, the mouse driver only causes problems if some other program adjusts the clock rate. I suppose a smart speed test program would intercept the clock interrupt as well, rather than relying on the ticks getting through to the system clock properly.

ARCH VILLAIN?

 I own an Acorn Archimedes with a PC emulator. I received a copy of First Choice from a friend who owns an Amstrad PC1512. I copied First Choice onto a 3.5" disk and tried to run the program by typing FIRST. After a few seconds the following message appeared:

Insufficient Memory

I ran CHDKISK and it displayed that I had 480K free, so why does a 332K program not load? I am a complete novice as far as MS-DOS is concerned so any assistance would be most appreciated.

Michael Prudhoe
Durham

If by First Choice you mean the

integrated software package from PFS, rather than some PD or shareware package of the same name, you shouldn't have taken a copy from your friend. Like all software houses, PFS fund their efforts by selling people software. If you pirate that software, you're getting the benefit of their efforts without contributing anything. That's unfair to PFS, and to everyone else who does pay for the package.

As far as the technical point's concerned, this brings us back to the differences between .COM and .EXE program files. Under DOS, an .EXE program file can specify how much working space it absolutely must have. If DOS finds that there isn't that much memory free, it doesn't waste its time loading the program, but just reports back to you instead: that's what the Insufficient Memory message meant. A .COM program will always load if there's the memory to fit it in, and has to check for itself to see if there's enough working space left over.

Where does the .EXE space information live? Why, in the file header of course. It's turning into a real theme issue this month, isn't it.

SPIRITED AWAY

 Here is some help for Spirit, from the February '89 issue Superdisk. First copy SPIRIT.EXE and DEBUG.EXE onto a fresh disk. Then enter:

```
DEBUG SPIRIT.EXE
...followed by...
E DS:02A3 90 90 90 90
...for infinite lives, or...
E DS:01CF NN
...where NN is a number
between 31 and FF hex (30 hex
+ number of lives). Now enter G
to run the game, and finally Q to
quit from DEBUG.
```

Readers may like to note that I am able to supply a program which will allow Spirit, Biorhythm, Impact, Xmas Game and Rimtrix to run on a Hercules type of display. Just send me £1.50 or £2.50 (cheque or postal order) for a 5.25" or 3.5" disk respectively.

C J Smith
10 Penwood Close
Westbury
Wiltshire
BA13 3LW

We can't vouch for the Hercules-compatibility program, for the simple reason that we haven't seen it, but it certainly sounds handy. If a few more programmers turned their hands to this kind of thing, 1640 MD owners would have a considerably better time of it.



"NOT EXACTLY USER-FRIENDLY, IS IT?"

READING THE LABEL

 Apart from doing the usual hard disk back-up, I regularly back-up just the data files of the various programs that I use like a spreadsheet, bank account records, customer files etc. Although with the menu program I use I am prompted to insert a specific back-up disk in drive A, I have on occasion put the wrong disk in. This, as you can imagine, can be disastrous.

Is there any way that I can get the computer to recognise a specific disk and warn if it is not the correct disk?

Clive Charles
Wolverhampton

one or more floppies.

As you can see from a DIR display, disks (hard and floppy) do in fact have 'volume labels' – a series of characters stored on the disk which you can set with the LABEL command (see your MS-DOS manual for details). What's more, if you're writing your own programs you can read a disk's label without too much difficulty, and therefore check that the right disk is in the drive. However the MS-DOS BACKUP utility has no facility for checking the labels of the disks it's writing to.

You could, however, use a separate program which checked the volume label before you called the MS-DOS BACKUP program, returning an ERRORLEVEL of, say, 0 or 1 depending on whether the volume label matched the one you'd supplied. You could call this from your batch file, and simply refuse to run the BACKUP until the right disk was present. Note though that this would only work with MS-DOS

DO YOU HAVE THE RIGHT DRIVE?

Look for the model number, which should be prominently marked on the drive itself. Several manufacturers, including Seagate and Miniscribe, denote the drive's unformatted capacity by the last 2 digits of the serial number. Unformatted capacity is about 20% higher than the MSDOS capacity of the drive thus a 20Mb non-RLL drive may have a serial number ending with 25 whilst the 32Mb RLL version has a number ending in 38. Seagate also put an 'R' on the end of model numbers suitable for RLL use.

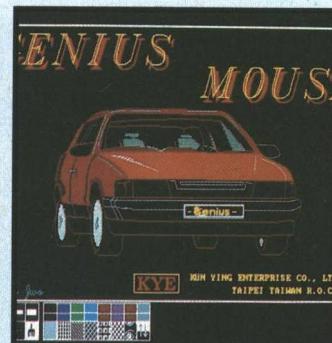
This system however does not apply to some older Rodime drives nor to WD drives – but then I believe that all WD drives are designed for RLL use. If you don't know whether you have an RLL controller, the chances are that a disk with a capacity of 30 or 32 Mb is, whereas one of about 20 Mb usually isn't.

The most common RLL controllers are the WD1002-27X and the Seagate ST11R.

Some Common Hard Disks

	Not for RLL use.	Suitable for RLL.
Miniscribe	8425 3650	8438 3675
Seagate	ST225 ST125 ST251	ST238R ST138R ST277R

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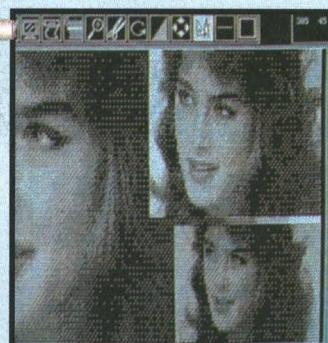
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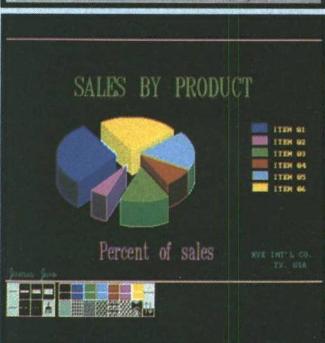
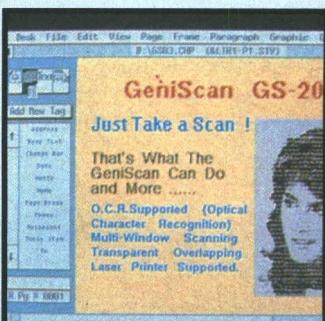
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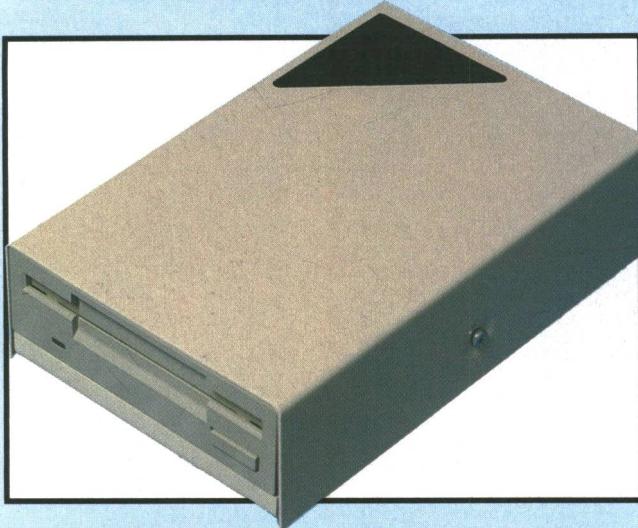
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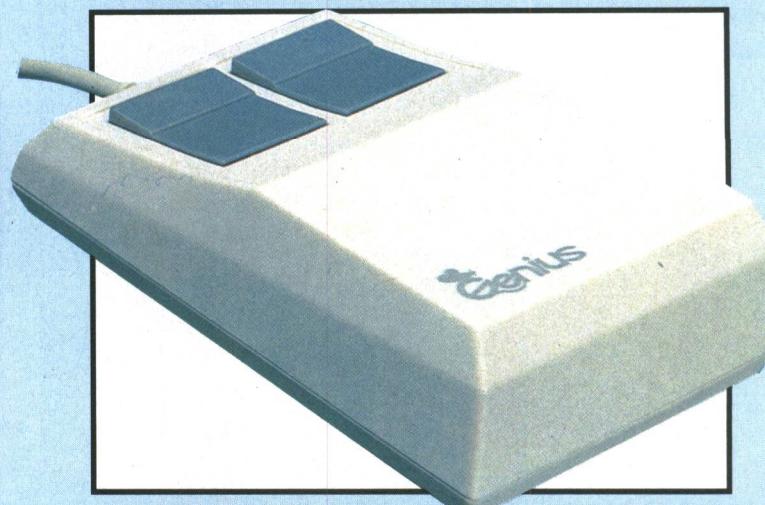


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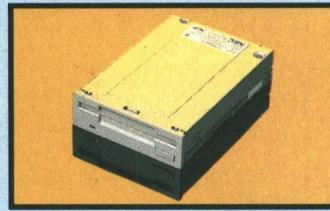
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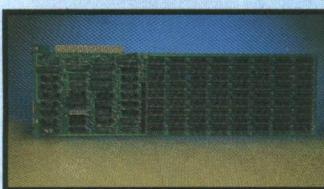
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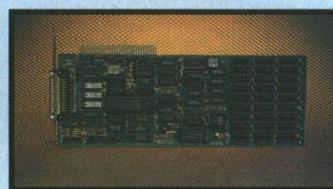
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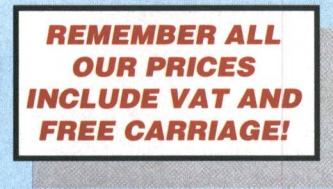
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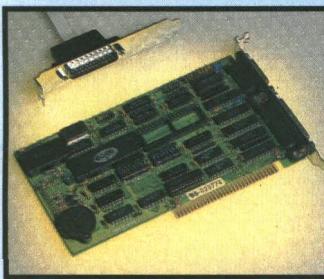
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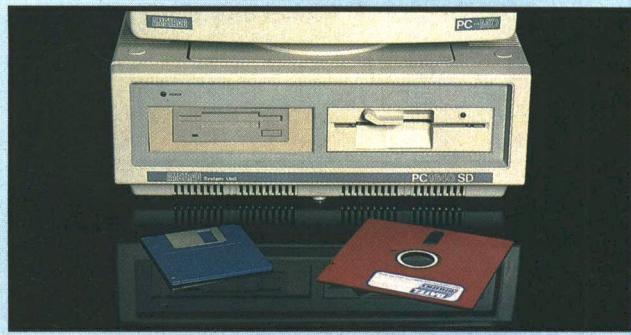


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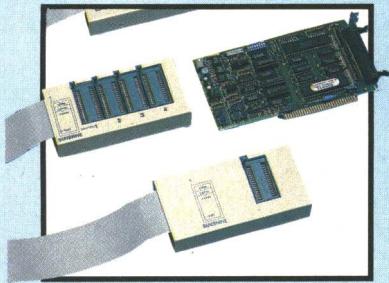
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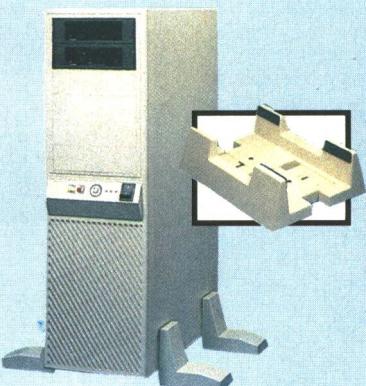
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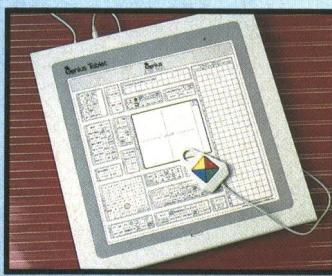
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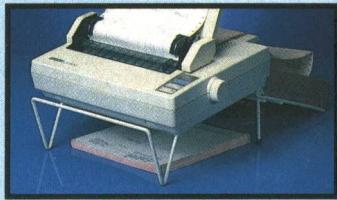
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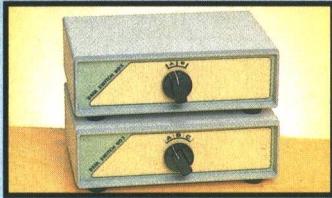
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version 3.2 or earlier, since in 3.3 the BACKUP program rather unhelpfully relabels the disk to BACKUP-001 when it writes to it, although we do have some ideas on that too. If, for example, the program was called CHKLABEL, then your batch file might read something like this:

```
:L1
ECHO Place disk SPREADS in
drive A: now
PAUSE
CHKLBL A:SPREADS
IF ERRORLEVEL 1 GOTO
NOTFOUND
GOTO FOUND
:NOTFOUND
ECHO ERROR - Wrong Disk!
GOTO L1
:FOUND
ECHO OK - BACKUP proceeding
BACKUP C:\SPREADS\*.WKS A:
Note that this will only check the
first disk in your BACKUP disk set –
there's still no way to make BACKUP
check the second and subsequent
disks' labels before overwriting
them. However if you keep your
backup sets neatly filed together,
that shouldn't be a problem. A tip
here; the plastic bags containing PC
PLUS SuperDisks can hold around
```

six disks each, so are ideal for this purpose – we use them all the time!

The only thing still missing, of course, is the program **CHKLBL** – but help is at hand. Here's a DEBUG script that produces a suitable CHKLBL.COM:

```
a100
mov bx, 0080
mov cl, [bx]
add bl, cl
inc bx
mov byte ptr [bx], 00
mov ah, 4E
mov cx, 0008
mov dx, 0082
int 21
mov ax, 4C00
adc al, 00
int 21
[ Blank Line ]
rcx
001C
nchklbl.com
w
q
[ Blank Line ]
```

As you almost certainly know by now, you can either type this into DEBUG a line at a time, or type it all into a text file called CHKLBL.ASM and then redirect it into DEBUG using the line:

DEBUG <CHKLBL.ASM

All being well, you now have a volume label checker much as described above. It does have a few quirks – for example, on volume labels longer than eight characters you'll need to use a full stop after the eighth character, as if the volume label was actually a filename:

```
ECHO Place disk LONGISHNAME
in drive A:
PAUSE
```

CHKLBL A:LONGISHN.AME

On the plus side however, CHKLBL.COM takes wildcards so that a batch file modified as follows:

```
ECHO Place any backup disk
in drive A:
PAUSE
```

CHKLBL A:BKP*.

will accept any volume with a label that starts BKP. This suggests all sorts of intricate naming systems, if you've got the patience to set them up properly.

ALL CLEAR?

 I have just read the letter from Dr P J Frazer in the November issue of PC PLUS (page 121), concerning

the **Lotus 1-2-3** graphs which remain on screen even after unloading the program. I had a similar problem with AutoCAD release 2.03, and I wrote to the 1512 Independent User Group (as it then was). Paul Mullen replied, saying that the problem was connected with the non-standard colour/intensity planes of the Amstrad PC1512, and that some programs seem to clear the screen in a way which does not write to all the planes. He sent me a copy of **AMSLOTUS.COM** which apparently cures the problem for **LOTUS 123** release 1A, though I have not confirmed this. It did not work for AutoCAD, so I wrote a program of my own (CLR1512) which does a one-off clear of all planes of the screen buffer of the 1512. I hope that it will be of some use to Dr Frazer.

P A Fox
Maidenhead

The PC1512 is a strange beast, graphically speaking. In most of its screen modes, it's a perfectly

INTO ASSEMBLER

 I have been a computer user for about 6 years but have only recently begun to use a PC. Could you please explain to me the difference between an .EXE file and a .COM file? Why, for instance, when I use **Prospero PC Fortran** does the program compile and link to produce an .EXE file while **Turbo Pascal** compiles in one operation to form a .COM file?

Secondly, I have done a fair amount of machine code programming on a 6809 processor but would like to try my hand at the 8086 in my Amstrad 1640. Could you suggest a reasonably priced book which would outline the machine code instruction set and explain the inner workings of the Amstrad? Also, could you recommend an assembler for this machine?

If I purchased an assembler with a disassembler, could I use this to produce machine code listings of my .EXE and .COM programs?

E J Waite
St Annes-on-Sea

A .COM file is simply a block of code and data assembled to run at memory address 0100h. There is no header information of any kind: the first byte of the file is the start of the program itself. In other words, it is a straight binary image of memory as it should be when the program runs.

Because of the way the PC's 8086 central processor is designed, programs less than 64K can be written so that they're relocatable – so that they can load and run anywhere in memory, that is – whereas programs over 64K in length can't be. Now an MS-DOS program

has to be capable of running anywhere in memory, because there's no knowing where DOS will want to load it. The upshot is that any program over 64K long has to be relocated by MS-DOS – altered to run properly in its new location, in other words – before it can be run.

Unfortunately, to relocate a program an operating system needs more information than just the code of the program itself. In fact, it really needs a complete list of every byte it'll have to alter. Since a .COM file doesn't come with such a list, it can't be relocated. That in turn means that it has to be less than 64K long.

An .EXE file, on the other hand, does come with a list of bytes that need to be altered. This information is contained in the 512 or more bytes that make up its .EXE header, and enables MS-DOS to do the necessary relocation work. As a consequence, .EXE files can be as large as available memory or disk space will allow. There's other information in the .EXE header that makes .EXE files a desirable thing to produce for future-proofing ("forward compatibility") reasons, but in practice this is of little concern to programmers at the moment.

On the minus side an .EXE file is a complex thing to put together, because of that all-important header. That's why compilers, assemblers and the like often can't produce .EXE files in one go, but have to settle for .OBJ ("object") files instead. You then feed the .OBJ file through a linker program, such as the LINK.EXE utility provided with most MS-DOS systems, and this produces your finished .EXE file. As well as creating the .EXE file header, the linker can also 'link in' (hence its name) other .OBJ routines which have been pre-compiled and stored in library files. (There are exceptions: QuickBasic produces .EXE files directly.)

As far as assembly language books go, I'm afraid it'll take more than one book to get you started. First of all you'll want an assembly language reference. I use **The 8086 Book** by Rector & Alexy (Osborne/McGraw-Hill): it's not ideal and has the odd error in it, but it gets the job done.

After that you've got a choice. You can go for separate high-level and low-level books – I'd recommend the trusty **Advanced MS-DOS** by Ray Duncan (Microsoft Press) and Amstrad's **1640 Technical Reference Manual** respectively – but this does work out rather expensive. You could settle for **Advanced MS-DOS** alone if you don't think you're going to need those low-level details. Alternatively you could do a lot worse than **The New Peter Norton Programmer's Guide** by Peter Norton and Richard Wilton, as reviewed in this issue (see p83).

For small assembly tasks you can get by with the copy of DEBUG on your system disks – it's a very handy little utility – but beyond that your best bet is the shareware assembler A86. Like **Advanced MS-DOS**, A86 is a product I always seem to be plugging – simply because it's the best of its kind that I've yet come across. It's fast, flexible and the manual makes an awful lot of sense.

For disassembling .COM and .EXE files, you'll probably find DEBUG more than adequate. It's hard to find good DEBUG documentation: the **1640 Technical Reference Manual** has the best I've seen, but you might also like to consult the **FactSheet** in **PC PLUS** Issue 19, April 1988, if your collection goes back that far.

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standard CGA (Colour Graphics Adaptor) machine. Its 640x200 graphics screen, variously known as Mode 6 or Graphics Mode 2, is a little bit different. Although it mimics a standard CGA 640x200 monochrome screen for most purposes, this mode can actually display up to 16 colours in the same resolution, with the right software. The extra capability is good news as far as GEM users are concerned – they'd be stuck in mono otherwise – but it can cause problems with a few software packages.

The problem Dr Frazer reported

having with *Lotus 1-2-3* release 1A was that, though the program could draw graphs perfectly well in 640x200 mode, it couldn't clear the screen off properly afterwards. The upshot was that, as successive graphs were drawn, the new curves simply overlaid each other to produce a scrambled mess onscreen. Quitting and re-running *Lotus* didn't get rid of the built-up curves, and neither did rebooting the machine. In fact, Dr Frazer could find no way of wiping the slate clean short of powering off completely.

We don't have the appropriate

version of *Lotus* here so I can't be certain, but it looks like the program draws a graph as follows:

- 1) *Lotus* clears the screen memory it expects the 640x200 mode to use;
- 2) *Lotus* selects 640x200 mode;
- 3) *Lotus* draws the graph;
- 4) ...and finally *Lotus* switches back to its normal 80-column text mode. Sounds a reasonable way of doing things? Well, on a standard CGA machine it would be, but for a 1512 steps (1) and (2) are the wrong way round. In order to allow you that special 16 colour display, the

1512's 640x200 mode has to use a great deal more display memory than other modes do: a whacking 64K in fact, compared to the 16K needed for the same resolution of display in mono. The extra 48K can only be accessed once the machine is in 640x200 mode, so it won't get cleared in step (1). It will get altered by step (3) however, because of the way the 1512's innards are designed.

In other words, every time a graph gets drawn, more bits of curve are added to the 48K of extra display memory, without any of it ever getting wiped off again. Simply exiting isn't enough to do the trick, because that doesn't wipe the memory.

Now for the odd bit: as far as I can tell, rebooting either of PC PLUS's colour 1512s clears out the entire 64K of screen memory. (So, for that matter, does the DOS internal command CLS.) Why didn't rebooting do the trick for Dr Frazer? And why did Mr Fox go to all that trouble with the CLR1512 program if CLS would do the trick just as well? I can only assume that there are different versions of the 1512 ROM BIOS, and that we're blessed here with two machines that do things thoroughly. If anyone has more information on the subject, do drop us a line, won't you?

Anyway, here's the DEBUG script for CLR1512.COM: enter as usual, and don't forget the blank line or carriage return just before `rcx!` In either case, you'll need to use CLS to get a usable screen afterwards. Of course, if you've got a 1512 like the ones we've got, you can use CLS on its own and forget about DEBUG.

DEBUG SCRIPT

```

mov al,1a
mov dx,03D8
out dx,al
mov ax,0000
mov cx,B800
mov es,cx
mov di,0000
mov cx,2000
rep
stosw
mov al,09
mov dx,03D8
out dx,al
mov ax,4C00
int 21

rcx
0022
nclr1512.com
w
q

```

PRINT PROBLEMS

 My machine is an early Amstrad 1512 DDCM that I bought in December 1986, and my problem concerns printing hard copy. Basically, of the programs that I have used, my good old LC-10 responds perfectly to *Tasword* and *Wordstar 4*, but if I try printing with any other program under MS-DOS (version 3.2 Feb 87) I just get error messages.

The PCIUG, of which I am a member, have tried very hard to help – but so far to no avail. With their assistance I have found that all programs tested print perfectly under DOS PLUS and that my printer, boot disks and software all work without any problem on other members' machines, so that the fault must lie with the computer itself.

PCIUG advised me that the machine probably has a faulty ROM BIOS and suggested trying a printer cable with pin number 15 disconnected as a possible "fix". I had such a cable made up but still no joy, and PCIUG appear to have given up now.

When trying to print out using PD or Superdisk programs, all I get is the error message Write fault error writing device PRN. Abort, Retry, Ignore? Using DEBUG to test the printer connection I get `WWrrriittee ffaauulltt eerrrrroorr etc instead of a print-out of the code. With PC Type+ the message is Cannot send character to printer. Fix problem or press escape to abort.`

The original suppliers of my Amstrad have been unable to obtain a suitable replacement ROM BIOS (the new one will not work on my machine) and tell me that Amstrad deny all

knowledge of such a fault. I can't even sell the wretched machine, because it won't be much use to anyone else.

Tony East
Dunstable

If your boot disks, software and printer work together on other people's machines, that seems to rule out obvious candidates like your copy of MS-DOS. On the other hand, the fact that DOS Plus and a couple of applications can drive the printer okay with your machine suggests that there's nothing major wrong with the printer port hardware, and that the PRN errors returned by MS-DOS are caused by a glitch somewhere in between.

What's confusing is the way that some programs work okay under MS-DOS and some don't. I think the explanation is, as PCIUG thought, that the ROM BIOS is misbehaving. Specifically, I think it's returning some kind of error after sending characters to the printer correctly. This would account for the mixed bag of symptoms as follows:

1) Where a program prints via a high-level MS-DOS 'send character to device PRN' call, MS-DOS in turn makes a low-level BIOS printer call. The BIOS call wrongly returns an error code, MS-DOS reads this and decides that device PRN isn't working properly, hence the error message.

2) Where a program makes a similar high-level call under DOS Plus, this also gets turned into a low-level BIOS call. If DOS Plus isn't so scrupulous about checking for error returns however – I'm speculating here – it might not notice the error code and would then carry on unperturbed.

3) Where a program makes its own BIOS calls directly and bypasses MS-DOS/DOS Plus, it

may or may not notice the spurious error code depending on how thorough its programmer was. Thus PC Type+ spots the 'error' and displays its homebrew **Cannot send character** message, while *Tasword* and *WordStar* ignore the false alarm and carry on regardless. The way to check this, I think, is to run PC Type+ under DOS Plus. If I'm right, the program will still fail to print because the BIOS return will be unaffected by the switch of operating system.

Having said all this, I'm surprised that any ROM error could have escaped the power-up ROM BIOS checking procedure. The odds are 255-1 against this procedure failing to spot an error, so it seems a little strange. (Of course if it was a bug rather than a fault, it would escape detection – but you'd expect a lot of other people to have the same problem). Perhaps the ROM is okay and is shying away from a tiny, non-fatal hardware fault elsewhere in the machine.

Be that as it may, this much is certain: (a) the fault is at BIOS level or lower, and (b) it doesn't prevent some software from driving the printer okay. In that case a really hot assembly-language programmer should be able to write a replacement driver as a TSR, hook it into the relevant BIOS interrupt (INT 17h) and bypass the problem altogether. It's such a specialised thing to write that you'd more or less have to do the job yourself, but it's the only cheap solution I can see.

Of course, hardware fixes may be possible. Depending on just where the fault is, there's a good chance that either an external (ie expansion card) parallel port or a serial interface for the LC-10 would get round the problem, albeit at a price. Definitely a case for trying before you buy, I'm afraid.

THE GOOD SOFTWARE GUIDE

This is by no means a comprehensive guide to software on PC compatibles, since such a thing would be the size of a telephone directory. Instead it is a guide to the software that PC PLUS has reviewed in the past and thought powerful, easy to use and good value. Please note that software reviewed in this issue is not included, but will appear in next month's Guide.

Remember too that, although our reviewers test software thoroughly, we cannot guarantee to uncover every feature or bug. Do ensure before you buy that software will do what you want it to do – or get the dealer to agree to a refund if it doesn't.

ACCOUNTING

MICROSYSTEMS

£454 • Multisoft

(0420) 85572 • Reviewed August 88

A powerful 'budget' system that does virtually everything you could want, produced by a major name in accounting software. Good help screens, profuse use of menus, and on-screen representation of real documents make it a joy to use.

A-B-C

£172 • A-B-C Systems

01-661 0488 • July 87

Unusual but powerful and easy to use accounting system, combined with word processor, database and mini-spreadsheet. Excellent features, good after sales, and suitable for single-drive machines.

SAGESOFT RANGE

£114 to £344 • Sagesoft PLC

091-284 7077 • Feb 88

From Bookkeeper through Accountant and Accountant Plus to Financial Controller, Sage offers a coherent upgrade path however large your business, including multi-user versions and its own network system. User interface is attractive and logical throughout the range too.

CASH TRADER

£100 • IT Marketing

(08045) 6566 • June 87

Easy to use and packed full of features; caters for most cash traders' needs and comes with an excellent manual. Can be combined with the Analyser module for an extra £50 to give a powerful report generator.

PENNYWISE

£50 • Buzzz Software

(0865) 56063 • Jan 88

A very simple analysis tool suitable for personal or very small business use. Easy to use, though an autosave option on exit would be welcome.

EASIFACTS PAYROLL

£115 • Facts Software

(0234) 218191 • Aug 87

'Well designed, comprehensive, simple to use, and costing about a quarter the price it's worth', to quote the reviewer.

PROFITMAKER

£286 • Cambrian Software

(0766) 831878 • Nov 87

Centres on a powerful stock control system to provide a comprehensive package that is easy to use and provides parts explosion to boot.

RETAILER

£199 • Ob-serve

(0533) 813545 • Dec 87

Excellent vertical market package for the retailer that copes admirably with the Retail VAT scheme. Largely menu-driven and providing comprehensive reports.

DATABASES

VP-INFO

£1150 • NewStar Software

(0245) 265017 • Jan 87

Compatible with dBase II, but cheaper and with built-in compiler. Fast but like dBase II needs programming skills if you are to make the most of it; still, if you have the know-how the sky is the limit.

G-BASE

£100 • SPI

(07357) 4081 • Oct 86

Fully relational GEM database with powerful query language. Derived from Open Access. A little slow.

TAS PLUS

£114 • Megatech

01-874 6511 • Jan 87

A powerful programmable database, but friendly as well. Capable of handling multi-file databases: uses pull down menus. Also available is Tas Professional, for £499, a vast, and vastly powerful product (Feb 89).

FILER 1295

£12.95 • Logotron Limited

(0223) 323656 • Oct 87

Only 10 fields per record and no sort facility, but at this price who's arguing? Good search facilities and easy to use. Integrates with Writer and Planner to form the 1295 range (available Three in One for £29.95).

PC PROMISE

£70 • Duncan Databases

01-942 2538 • June 87

A menu-driven database, but packed full of powerful features. Poorly documented and a bit rough around the edges. Well worth considering at this price, though.

DBXL 1.20 (DIAMOND RELEASE)

£148 • In Touch Ltd.

(0222) 882334 • May 88

All the power of dBase III Plus together with variable arrays, user-defined functions and much improved text editor (but still no screen painter). A major update of what was already unchallenged value for money.

WORD PROCESSORS

TOPCOPY PLUS

£110 • Innova Software

(0453) 835379 • Mar 88, Feb 89

Full featured big brother to Topcopy, also memory resident but with the ability to import text from defined areas of the underlying screen. Foreign characters, three files on screen, calculator, spelling checker and mail merge; and all at high speed.

WORDSTAR EXPRESS

£79 • Amstrad PLC

(0277) 230222 • Jun 88, Feb 89

Following on from WordStar 1512, this version includes a pop-up Sidekick style desk utility, well integrated mailing list facilities and an intelligent spell checker. A little slow at times, though, and still comes on six disks.

MULTIWRITER 2

£100 • NewStar Software

(0245) 265017 • Jun 88, Feb 89

A very powerful package that includes many features only found on word processors costing considerably more. Good spelling checker, macro facility, multiple formatting rulers, twin file editing, word counter, file conversion and encryption, DOS shell, a comprehensive pop-up calculator, plenty of help screens and even a built-in Space Invaders game!

PC OUTLINE

£59 • Brown Bag Software

01-831 1106 • May 87

A 'pop-up' word processor-cum-ideas organiser. A little limited as a word processor perhaps, but with many other powerful features that soon become indispensable. £62 is for full registration – PC Outline is shareware, so evaluation copies can be had for around a fiver.

PROTEXT V4

£100 • **Amor Limited**
(0733) 68909 • Feb 89, Nov 87

Features a particularly powerful Execute language for macros and the like, plus good mail merge facilities: will be familiar to many 'home' computer users.

TASWORD PC

£30 • **Tasman Software**
(0532) 438301 • Apr 87

Superb value, and very fast too. Has a number of silly limitations, but will process words with the minimum of fuss. *Tas-Spell PC* available as separate program.

WRITER 1295

£12.95 • **Logotron Limited**
(0223) 323656 • Oct 87

Includes a dictionary, but altogether very basic. Easy to use though and part of the £29.95 *Three in One* pack.

COMMUNICATION

DATATALK

£171 • **Amstrad PLC**
(0277) 230222 • June 87

Hayes protocols plus viewdata and virtually every feature you could wish for. Expensive when bought alone, but price quoted includes Amstrad PC Series internal modem.

MIRROR II

£83 • **MDP Limited**
(0225) 60491 • Mar 88

Powerful package with its own programming language and the ability to run in the background. Supports viewdata and comes bundled with Amstrad's PPC range of portable and the M2400 modem.

PROCOMM

Shareware • June/Sept 87

General-purpose comms program including Hayes dialling commands and seven file transfer protocols. *Procomm* version 2.4.2 is shareware, while *Procomm Plus* is available at £80 from Shareware Marketing on (0732) 771344.

CALLBOX

£149 • **Callbox Ltd.**
(0600) 4478 • July 88

An ingenious system that puts a memory resident PC program in charge of your telephone to provide complete control - expensive but more powerful than most luxury phones around. Comes with expansion board and miniature loudspeaker.

LINK MASTER

£19.95 • **Amsrad software**
(0277) 230222 • Jan 89

Complete kit for file transfer between two PCs. Cheap, effective, and includes a bonus program for using an Amsrad PPC as an 'external' modem.

INTEGRATED SUITES

INTEGRATED 7

£114 • **Neric Automation**
(053) 756326 • Aug 87

Integrates well between word processor, spreadsheet, database, graphics and comms. Good use of macros, and a particularly powerful spreadsheet module in a full version of the 1-2-3 clone *The Twin*.

ABILITY

£99 • **Migent**
01-493 2655 • Mar 87

Good integration between word processing, spreadsheet, database, graphics and comms; and including a slide show module called *Presentation!* A little sluggish, but allows full merging of text and graphics on screen. Now bundled with the 1512.

PC FOUR

£79 • **Psion**
01-723 9408 • Feb 87

The old *Xchange* suite as found on the QL. Featuring word processor, database, spreadsheet and business graphics this is not as integrated as some, but cheaper.

EIGHT-IN-ONE

£50 • **Logotron Limited**
(0223) 323656 • April 88

Word processor, spelling checker, spreadsheet, database, business graphics, outliner, comms and desktop utilities all in one package. Supports EGA and offers a consistent user interface.

MINI OFFICE PERSONAL

£30 • **Database Software**
(0625) 878888 • Nov 88

A complete package including Word processor, Database, Spreadsheet, Communications, Label Print and Utilities in one neat package. Worth the price for the comms software by itself. Scored five out of five in the review.

PUBLISHING

VIDEO DIGITISER

£150 • **Electric Studio**
(0462) 420222 • Mar 88

Unusual package that captures pictures from video camera or recorder and stores them in GEM image or *GW Basic* format with the aid of *Screenmaster*, an integral paint package. Comes with a half-length expansion card.

FONTASY

£70 • **ProSoft/Ctrl Alt Deli**
(0908) 662759 • Apr 87

Not the friendliest of Desktop Publishers, but full of features with a huge range of fonts and clip-art. Once mastered, capable of generating a relatively professional document. Has drivers for Hewlett-Packard laser printer.

TIMEWORKS DTP

£129 • **Electric Distribution**
(0954) 61258 • Jun 88

Very powerful package that bears a resemblance to the far more expensive *Ventura*. Capable of really professional results with PostScript typesetters, but quite happy with a dot matrix printer. Comes complete with GEM/3, which now has a £10 driver available for the Amstrad PC1512 16-colour mode.

FINESSE

£115 • **AMS Ltd.**
(0925) 413501 • Sept 88

Like *Timeworks*, a GEM-based package (GEM/3 included), also with resemblance to *Ventura*. Very easy to use, excellent performance, superb graphics import, scaling and cropping features. Strangely, text flow round graphics is not provided, otherwise a really superb product.

VP GRAPHICS

£115 • **Paperback Software**
(0245) 265017 • May 88

GEM-like graphics package that draws faster than GEM *Draw Plus*. Features a 12 page drawing area, file-merge facility and the ability to generate 'business graphics' from tables of numbers and labels.

DELUXE PAINT II

£100 • **Electronic Arts**
(0753) 49442 • July 88

Superb paint package that is both easy to use and offers a stunning range of features, it brings out the best in every type of graphics adaptor. A bit squeezed in an ordinary PC, requiring at least 640K and preferably an EMS board.

GEM SYSTEM

Various • **Digital Research**
(0635) 35304 • Various

Digital Research's GEM *Desktop* provides a friendly graphic environment for a number of packages aimed primarily at presentation/ desktop publishing applications.

It is large and cumbersome on a floppy based machine though, but really comes into its own on a hard disk 1640.

NEWSMASTER

£69 • **MGA Microsystems**
(0233) 83571 • Oct 87

Very easy to use 'desktop publishing' package with few pretensions but realistic outlook on what users want. Can't drive laser printers or import graphics, but has got a great library of 'clip art'.

VALUETIME RANGE

£9.99 each • **Electric Distribution**
(0954) 61258 • Jan 88

Comprising three packages - *Signs & Banners*, *Greeting Cards* and *Calendars and Stationery* - these are easy to use and capable of excellent results on a standard dot-matrix printer. *Art Library 1 & 2* are compatible with *Newsmaster* too.

LANGUAGES

PROSPERO PASCAL/ FORTRAN FOR GEM

£100/£130 • **Prospero Software**
01-741 8531 • Feb 88/Jan 89

Excellent compilers providing full access to the GEM environment. Well documented but not for the beginner.

QUICKBASIC

£98 • **Microsoft**
(0734) 500741 • Feb 87

Easy to use powerful compiled Basic from the people who wrote the original PC Basic. High degree of compatibility with *GWBasic*, but low compatibility with *Locomotive's Basic II*. Vital if you want to sell your Basic programs.

DBFAST

£86 • **Megatech**
01-874 6511 • May 88

A *dBase* compiler that enables you to produce stand-alone applications at a *Turbo Pascal* price, and all on one floppy. Not suitable for beginners on its own, and first release does contain some small bugs - but nevertheless superb value.

TURBO C

£60 • **Borland International**
01-258 3797 • Nov 87

Professional product for the professional developer as well as the beginner. Lacks library and trace facilities but has excellent documentation.

C-PROBE

£36 • **Murray Communications**
(0476) 74108 • Feb 89

High quality, low-cost debugger for use with *Turbo C*. Also available for *Zorland C*. A small outlay will save hours of your time.

NEW ENTRY

TURBO PASCAL VERSION 4.0

£69 • **Borland UK**
(0734) 320022 • Sept 88

Probably the best known Pascal compiler, with over 500,000 sold worldwide. Now with the latest Borland integrated compiler/editor (as used in *Turbo C* and *Turbo Prolog*), a new 500-page manual and many language enhancements. Biggest change though is the removal of the 64K limit on compiled program size. Easy to use and suitable for even a single disk machine.

POWER C-WORKS

£59.95 • **Analytical Engines**
(0703) 262099 • Dec 88

Addresses all the criticisms of *Mix C*, plus further improvements. Smaller .EXE files, bigger function library with complete source code, faster executions and the wonderful *Power C trace*. Really excellent value.

ZORTECH C

£29.95 • **Zortech**
01-316 7777 • Dec 86

Very cheap for a full-feature C compiler. It comes with a comprehensive standard library and many low-cost additions are available. Fast, but needs separate linker program

SPREADSHEETS

VP PLANNER PLUS

£172 • **Paperback Software**
(0245) 265017 • Feb 88

The ultimate spreadsheet, offering everything you could possibly want and much more, plus full *Lotus 1-2-3* compatibility. Even reads *dBase III* files directly, and offers 'multidimensional' financial modelling, although the specialist *Javelin* is easier to use for this purpose.

Also *VP Planner* at £115, substantially the same product, but minus the multidimensional modelling and a few other features - check with Paperback for details.

LOGISTIX

£114 • Grafox
01-922 8807 • Aug 87

Good spreadsheet package that offers rather better graphics than 1-2-3, although harder to use. Also offers basic critical path analysis for time planning and scheduling.

THE TWIN

£81 • Mosaic Software
(0604) 830496 • Aug 87

The one that Lotus got upset about because of its resemblance to 1-2-3. Powerful graphics and spreadsheet, but not so wonderful manual. Also *Twin Special Edition* at £35, the same product but with 'only' 1000 rows x 256 columns (against 8196 x 256) - more than enough for most people and a real bargain to boot.

LUCID 3-D

£114 • PCSG Inc/In Touch Ltd
(0222) 882334 • Feb 89

No graphics, but otherwise it's the spreadsheet that does (just about) everything. Includes a '3-D' facility which allows a cell in one spreadsheet to be linked with any cell of any other spreadsheet.

NEW ENTRY

PC-CALC

£45 • Shareware Marketing
(0732) 771344 • May 87

Good basic spreadsheet, available through User Groups with a cut-down manual for around a fiver. Full documentation requires registration with Buttonware's UK representatives Shareware Marketing, which costs £40.

PLANNER 1295

£12.95 • Logotron Limited
(0733) 323656 • Oct 87

Very basic, but easy to use and works well on single disk machines. Part of the 1295 range, and available with word processor and database for £29.95.

MISCELLANEOUS**INSTAPLAN**

£115 • Deepak Sareen Associates
01-904 0811 • Feb 88

Easy to use project planner ideal for the beginner. Provides impressive printed reports and instant analysis of data as it is entered. Really needs 640K of memory.

DESQVIEW

£114 • In Touch
(0222) 882334 • June 87

If you need to run several programs at the same time this is probably the best way of doing it. A tight fit in 512K though, and really needs an EMS board.

MICRODRAFT

£100 • Timatic Software
(0329) 236727 • Dec 87

Powerful yet easy to use low-cost Computer Aided Design package. Gives good results on a plotter but needs EGA screen for best results.

PC TOOLS DELUXE

£50 • Evesham Micros
(0386) 765500 • April 88

Powerful file recovery tools combined with a disk cache, hard disk backup, a friendly DOS shell and a word processor. Can be loaded in pop-up form too.

FILE RESCUE PLUS

£25 • Mirrorsoft
01-377 4837 • April 88

Extremely powerful file recovery package that is easy to use too. Originally copy-protected, but now Mirrorsoft has removed the protection it is a good buy.

HOMEBASE

£59 • Brown Bag Software
01-874 1106 • July 87

Large 'pop-up' shareware package offering full database facilities in addition to text editor, calendar, calculator and comms software. Slow - best suited to a hard disk system.

IN CONTROL!

£50 • Abtex Software
(0274) 734638 • May 87

Project Management software offering most of the features of *Pertmaster*. Not easy to use, but flexible and generates attractive printed reports. Exceptionally cheap.

JOT!

£46 • Beacon Software/Paperlogic

01-968 1117 • Dec 87

Powerful memory resident 'macro' generator that can substitute whole words and phrases for a short code.

COMPLETE INTRODUCTION

To the Amstrad PC

£34 • Reeltime/Dixons

(0432) 271598 • Jan 87

For the real beginner, this is an excellent tape and disk interactive tutorial specifically for 1512 and 1640 owners.

PC-DESKMATE

\$25 • Shareware/User groups

July 87

Conventional pop-up package offering calculator, calendar, typewriter and a rather limited notepad. Also has a DOS shell - useful when used with those packages that lack one. \$25 is the registration fee requested by the authors Alternative Decision in the States, but evaluation copies can be had for a few pounds.

EDUCATION**ANSWER BACK**

£19.95 • Kosmos

(05255) 3942 • June 88

An entertaining and educational quiz program available in both a Senior version and a Junior version for six to 11 year olds. Each provides 750 questions, and there are 16 further Factfiles available at £9.95 each.

SPACE M+A+X

£41.95 • Micro Disc Duplications Ltd

(0451) 60770 • Jan 87

A full-blown simulation of the planning and construction of a space station written by an expert. More a management training tool than a game - but great fun too.

YES CHANCELLOR!

£9.95 • Topologika

(0733) 244682 • Mar 88

Amusing and educational, if necessarily limited, simulation of the British economy. Can you do better than him at Number 11?

GAMES**FLIGHT SIMULATOR 3**

£52 • Microsoft

(0734) 500741 • Sept 88

Latest version of this classic offers spectacular graphics (particularly on VGA), spectacular realism and a multitude of extra options. Buy it and fly it.

CORRUPTION

£24.99 • Magnetic Scrolls/Rainbird

01-240 8838 • August 88

An interactive adventure featuring superb graphics and competent, computer-controlled characters that you can question and bully as you try to avoid taking the rap for stockbrokers Roger & Roger's dirty insider dealings.

GUNSHIP

£34.95 • MicroProse

(0666) 54326 • Dec 87 & Oct 88

Heavy duty simulation of AH-64 Apache helicopter gunship in operation in battlefields from Vietnam to Western Europe. As near as you'll get to the real thing on a PC.

FALCON AT

£34.99 • Mirrorsoft

01-377 4644 • Nov 88

The military flight simulator based around the USAF F-16. This is to aerial combat what Flight Simulator is to leisure flying. Running on EGA the program is a joy and it's even better on a 286 machine.

BALANCE OF POWER

£29.95 • Mindscape/Mirrsoft

01-377 4645 • June 87

Dice with Armageddon in this frighteningly accurate simulation of world politics. Runs under Windows and is all the better for it.

INFOCOM ADVENTURES

£24.99 to £34.99 • Infocom/Medienagic

(0734) 311666 • Various

All Infocom adventures are superb, and aimed at a variety of users. In particular, *Wishbringer* is an ideal introduction to the art; while *Lurking Horror* and *Beyond Zork* are the best of recent releases.

CYRUS II CHESS

£19.95 • Amstrad Gold

(0277) 230222 • Mar 87

Powerful chess simulation featuring 3D graphic display from any angle. Plays a tough game too.

STARFLIGHT

£24.95 • Electronic Arts

(0753) 49442 • Mar 87/May 88

Very involved space game comprising exploration, trading, combat and even communication with alien races.

BORODINO

£29.99 • Atari Battlescapes

(0753) 33344 • Feb 89

Serious wargaming outside a village called Borodino, 70 miles from Moscow, set in the Napoleonic period. Good graphics, not to be missed if you are into strategy games.

NEW ENTRY

ELITE

£24.95 • Firebird Software

01-240 8838 • Dec 87

Pretty faithful copy of the BBC classic, but featuring high-speed solid 3D graphics. Superb combination of space trading game and shoot-'em-up.

F-19 STEALTH FIGHTER

£39.99 • MicroProse

(0666) 54326 • Feb 89

Simulation of an F-19 Stealth Fighter (surprisingly enough). Excellent graphics with support (at different resolutions) for everything from CGA to VGA. Expensive but one of the best.

NEW ENTRY

DRILLER & DARK SIDE

£19.95 • Incentive Software

(07356) 77288 • May 88 & Oct 88

Two games set in the same scenario and using 'Freescapes', a revolutionary 3D graphics system, to generate a fast-scrolling, believable landscape. PD demo of *Driller* available for £1.

GUILD OF THIEVES

£24.95 • Magnetic Scrolls/Rainbird

01-240 8838 • Dec 87

Highly challenging adventure with superb colour graphics for EGA monitors. Described in review as 'an essential purchase'.

UNIVERSAL MILITARY SIMULATOR

£24.95 • Rainbird

01-240 8838 • April 88

Whether you are into the battle of Waterloo or the student riots of '68, this is the package all war gamers must have.

TETRIS

£19.95 • Mirrorsoft

01-377 4645 • April 88

A totally new type of game that needs fast reactions and quick thinking. Beautifully implemented, suitable for all models, and what's more it comes from Russia.

IMPOSSIBLE MISSION

£19.95 • U.S. Gold

021-356 3388 • July 88

Excellent action-packed platform game that introduces an element of puzzle and strategy as well as stunning animation. Comb the fortress of the Evil Atombender for clues to thwart his evil plan to destroy the world.

ULTIMA V

£29.95 • Microprose

(0666) 54326 • Sept 88

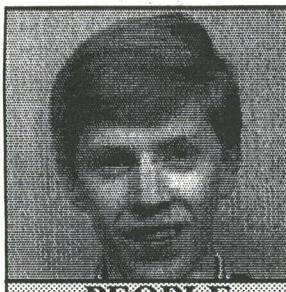
The ultimate role playing game, offering 200 characters, 30 towns and eight dungeons over four disks. Packed with action, adventure and magic.

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Ventura Publisher v2.0 (UK)	795.95
Page Ability	179.95
Timeworks (inc Gem III)	99.95
Timeworks Lite	39.95
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AMS Solution 1	139.95
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AMS Solution 3	369.95
Fleet Street Editor	89.95
FSE Fonts & Graphics (each)	19.95
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Sage Retrieve III	149.95
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dBase IV	564.95
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Timeworks	
Data Manager PC	24.95
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Many others - please ask!!!	

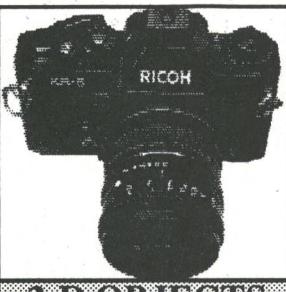
PC SOFTWARE	
SPREADSHEET	EDUCATIONAL
Lotus 1-2-3	359.95
Amsoft Supercalc 4 (LAN)	199.95
Amsoft Supercalc 3.21	69.95
Sage PC Planner	69.95
Sage PC Planner Rel 2	99.95
VP Planner	79.95
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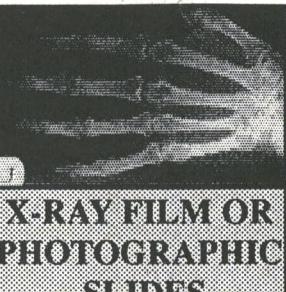
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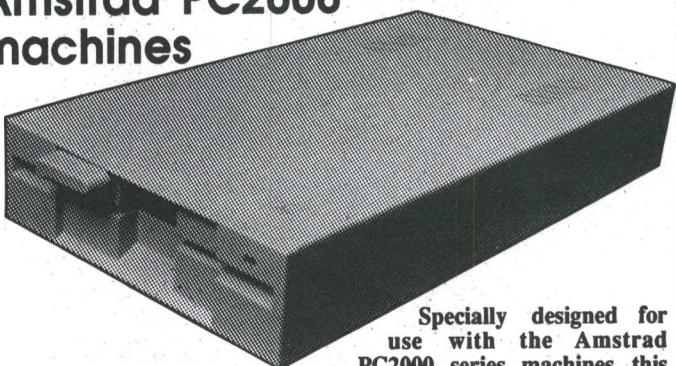
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MIX C COMPILER

Using the *Mix C Compiler* and *Linker* on this month's *Superdisk* to produce stand-alone program files from your C source code

There are two stages to generating an executable program file from the source code (the ASCII text file containing your program code) in any compiled language such as *Mix C*. The first stage involves using the *Mix C Compiler* to generate an intermediate 'object' code. This object code is then fed to a 'linker' program which combines it with a number of other 'library' files from which appropriate machine code routines are extracted to create a stand-alone COMmand file.

By convention source code is saved in files with the extension .C, object files with the extension .MIX and the executable file has the standard extension .COM. The *Mix C compiler* can either produce stand-alone programs or executable files that require the presence of RUNTIME.OVY at runtime. The latter tend to be smaller, but remember that RUNTIME.OVY is copyright MIX Software.

COMPILER

The compiler is contained in the file CC.COM and can be used with a number of command line options. Any or none of the options can be specified, but these should be in the order -1 followed by -o with stacksize last, and a space between each:

CC source.c

Compiles the source code file, in this case SOURCE.C, line by line into the object code file SOURCE.MIX. As each line is compiled it is displayed on screen together with an error code if errors are detected. The meaning of the error codes is displayed after the program listing.

CC source.c -1PRN:

As above, but the source code listing and any error messages are re-directed to the printer.

CC source.c -1\path\filespec

The listing is re-directed to the specified file.

CC source.c -1

Compilation takes place without a listing at all. This is faster, but also dangerous unless you are very sure of the source code!

CC source.c -o\path\object.mix

The object code is saved to the file specified.

CC source.c -o

No object code is generated. This speeds up compilation and is useful when debugging the source code.

CC source.c [4K]

Sets the compiler's stack size as specified, in this case to 4K or 4096 bytes. If stack size is not specified available memory is split equally between stack and heap.

When a C program is run a certain area of available memory is allocated for storing data. This is divided into space for the variables declared within the program, called the 'stack', and the 'heap' which is used to hold information about files that are open. If these areas overflow an error message is generated indicating how much memory was allocated and how much was actually used for each area. This information can be used to optimise the size of the stack before re-compiling.

LINKER

The linker is contained in the file LINKER.COM and requires the presence of RUNTIME.OVY, which contains the low-level runtime routines, and CLIB.MIX, which contains the object code library for the C functions.

The linker can be executed with a single line command followed by options. If the options are omitted altogether then simply entering **linker** produces a menu of commands.

SET LIBRARY=drive:\path

PC PLUS 16

FACTSHEET

Sets the environment variable LIBRARY defining the path for LINKER to find required library files. LINKER will also search the current directory and any specified by a PATH command.

COMMAND LINE OPTIONS

Curly brackets are used to indicate optional parameters:

LINKER{/i}{/m} object{,object..}{;library..}{[stack]}
Creates OBJECT.COM from the specified object files, searching specified library files where necessary, and allocating stack space as specified in the same manner as with the compiler. CLIB.MIX does not have to be specified as a library as it is always searched when running LINKER. Switches are as follows:

/i creates a stand-alone COMmand file. If it is omitted then a much smaller .COM file is created that requires the presence of RUNTIME.OVY at runtime.

/m produces an extra file called OBJECT.MAP which lists the name of each function used, its starting address and size in both hex and decimal. This is called a 'link map'.

LINKER MENU OPTIONS

Commands are implemented by entering one or two letters and pressing [return]:

Help – Summons help.

Load – Prompts for the name(s) of object files to be loaded into memory. Multiple file names should be separated by commas. Each function is displayed on screen as it is loaded.

Find – Prompts for the name(s) of library files and searches through once for functions that have been referenced.

Find All – As above, but performs multiple searches automatically until all the required functions have been extracted.

Symbols – Displays the symbol table, with each function in the object file followed by a D if the function has been loaded into memory, or an R if it has been referenced but not yet defined. This is followed by the function's address.

Run – Executes the program from within LINKER once the object files have been linked to the library functions, prompting for the amount of stack space. Press [Return] if the default is acceptable, otherwise enter value on bytes or using K as a multiplier.

Build – As above, but creates a .COM file on disk. Prompts for whether RUNTIME.OVY should be included: press [Y] if yes, [N] or [Return] for no. Also prompts for the name of the resulting file.

Change runtime – Allows a runtime file other than the default RUNTIME.OVY to be used. If required it must be selected before any other menu commands are selected.

Initialise – Clears the symbol table and displays the command menu ready to start afresh.

Exit – Terminates LINKER and returns to operating system.

Map – Prompts for the name of a file to hold the link map.

The following error messages can occur during linking:

*****CANNOT OPEN FILE** Linker cannot find a specified object code or library file. Check spelling and path.

*****UNRESOLVED REFERENCES** Functions have been called but have not yet been loaded. Run the Symbol command to list them, and check library files have all been specified.

*****INVALID OBJECT TAG** The file being loaded is not a valid object file – check you haven't specified the source code.

ILLEGAL REFERENCE Object file has probably been damaged – recompile.

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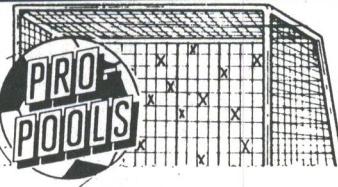
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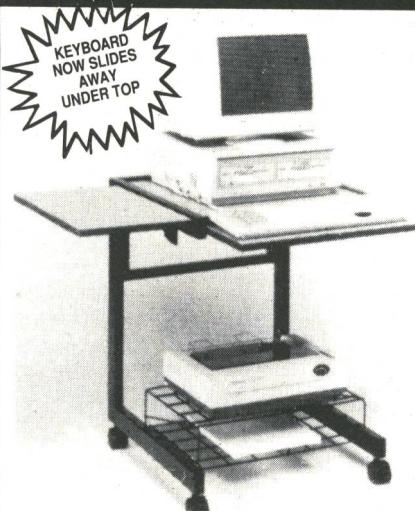
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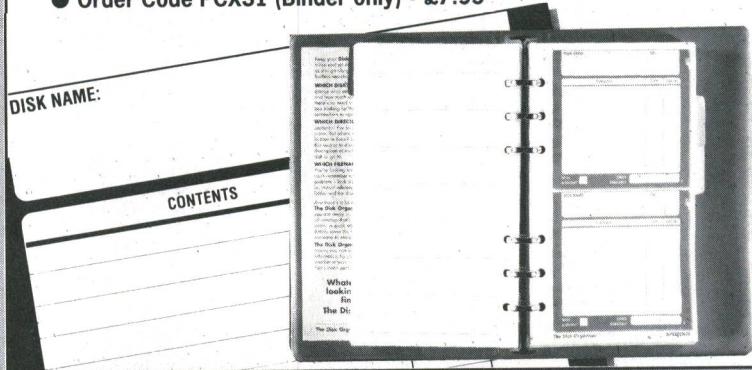
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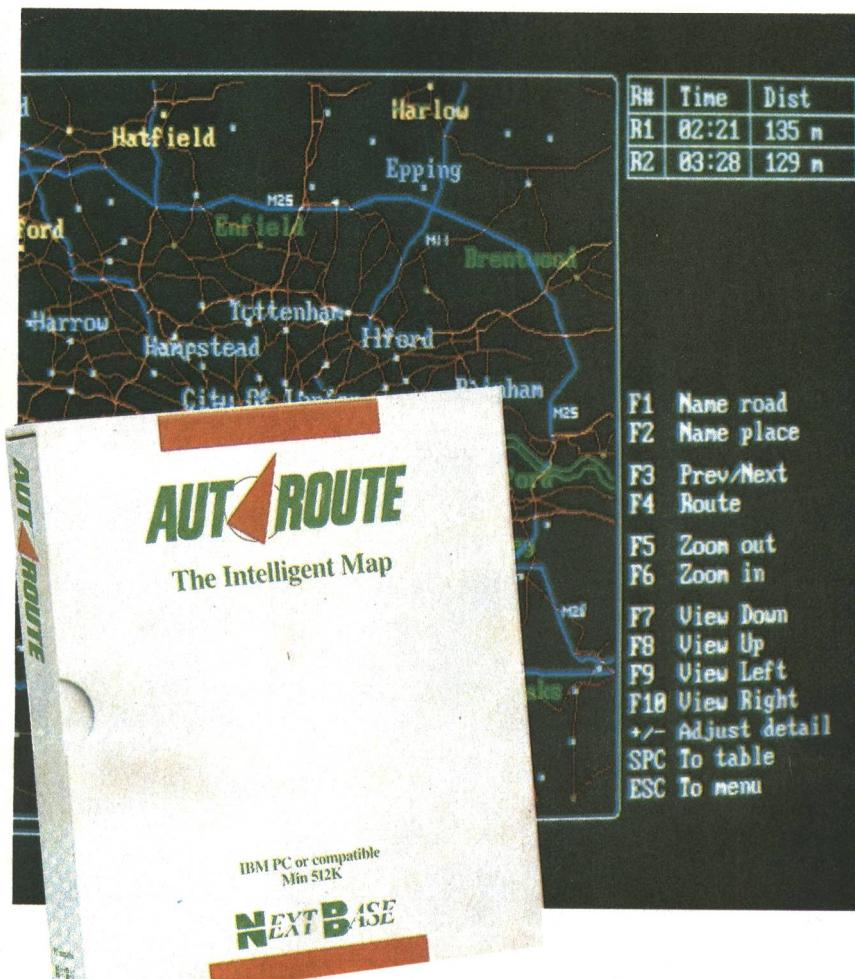
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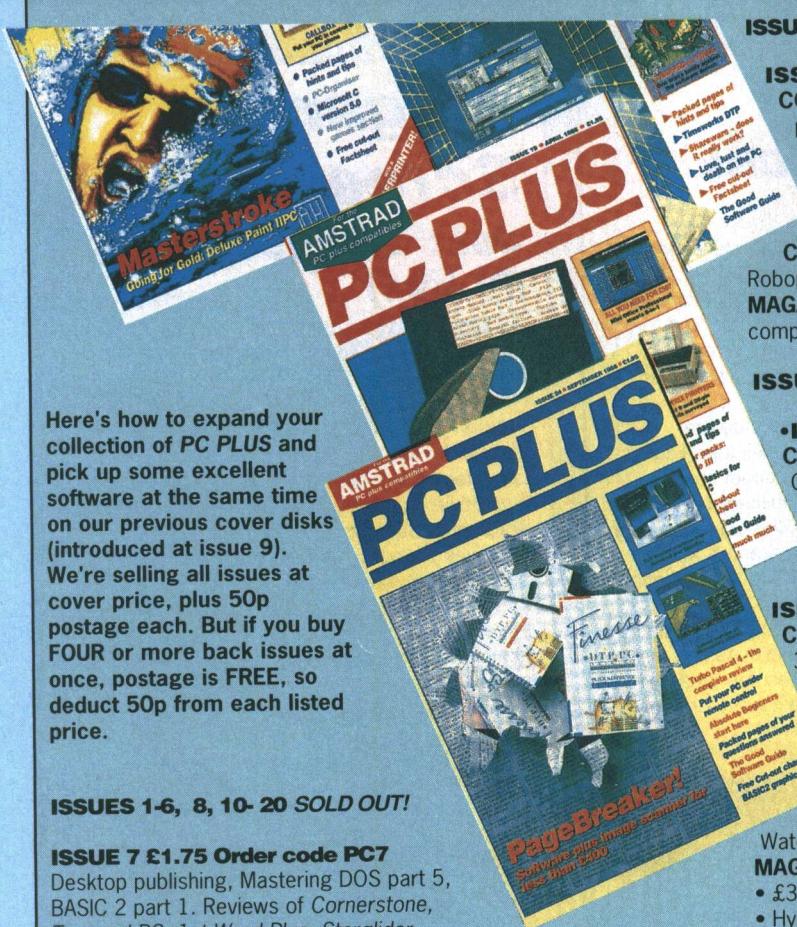
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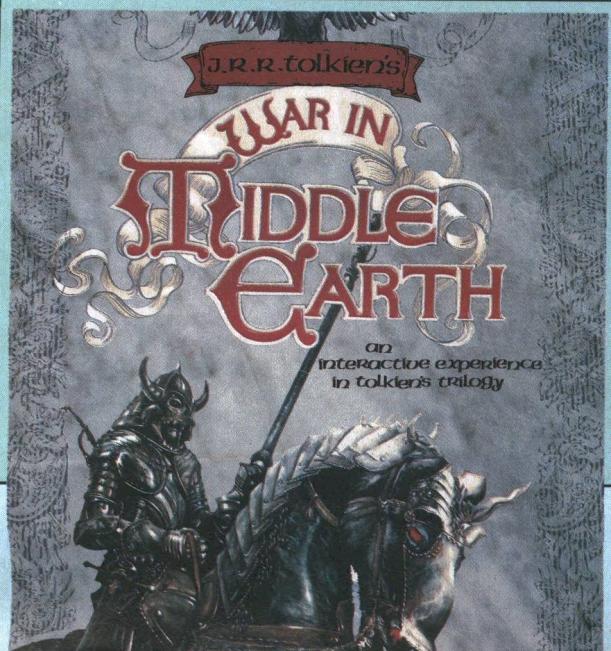
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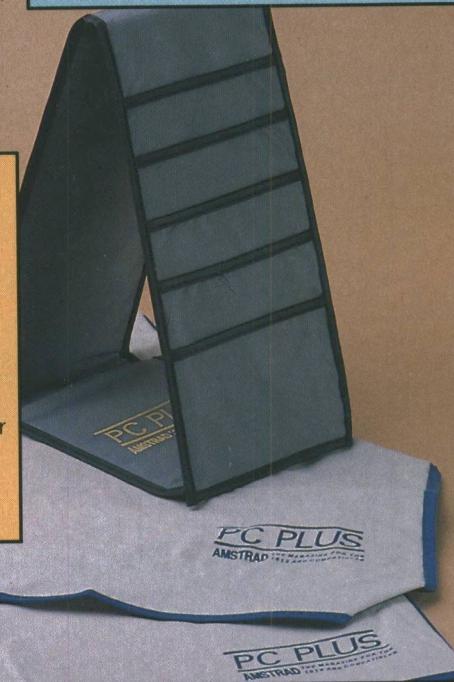
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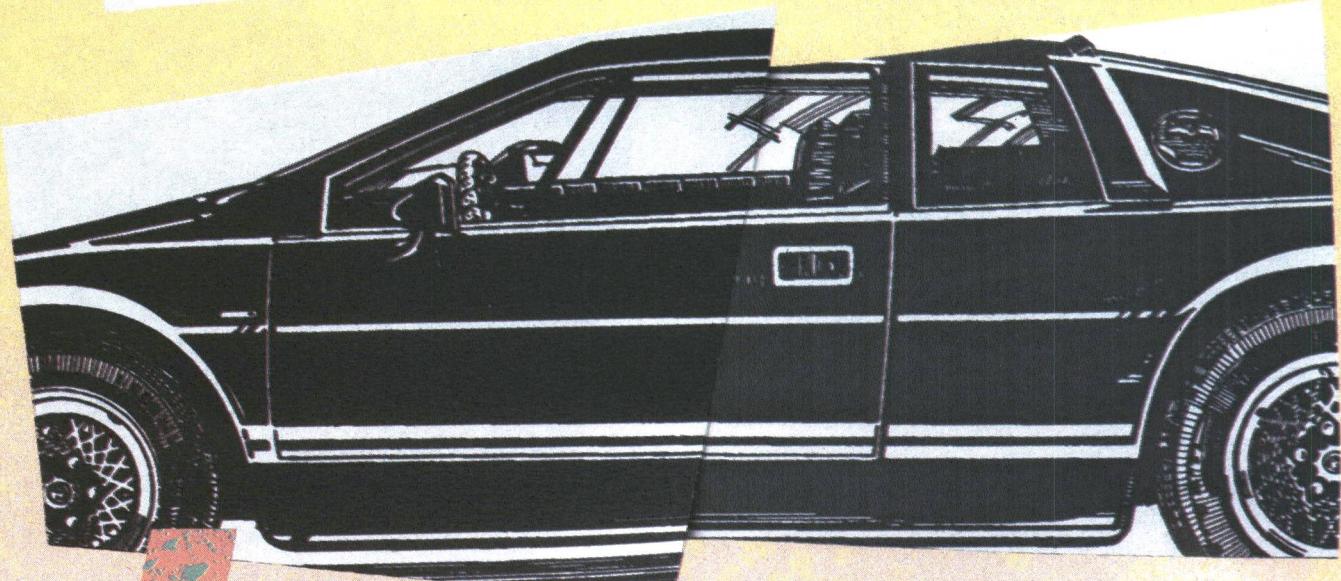
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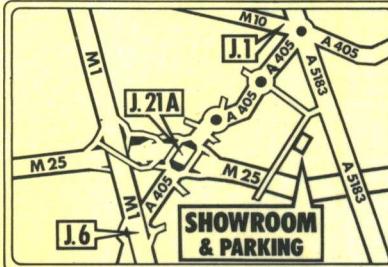
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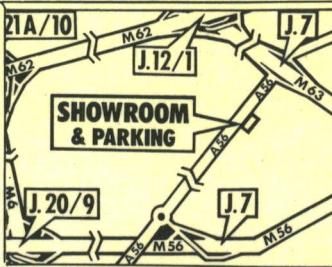
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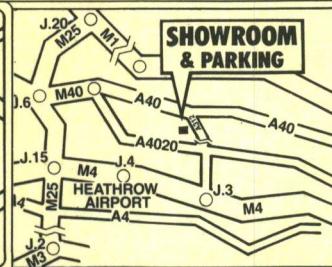
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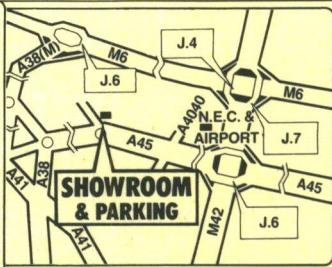
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