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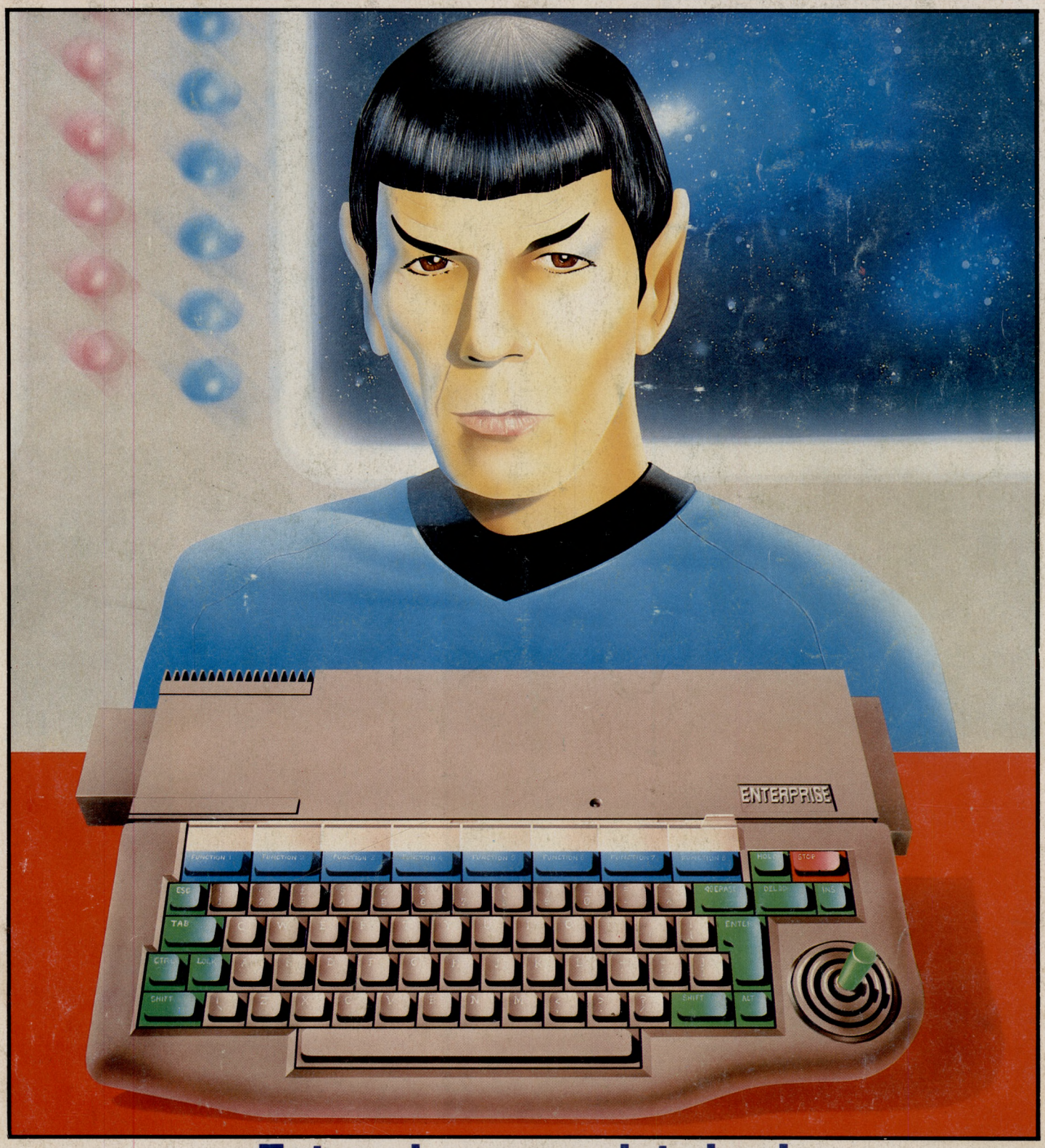

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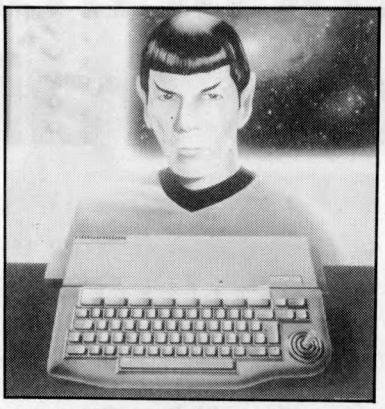

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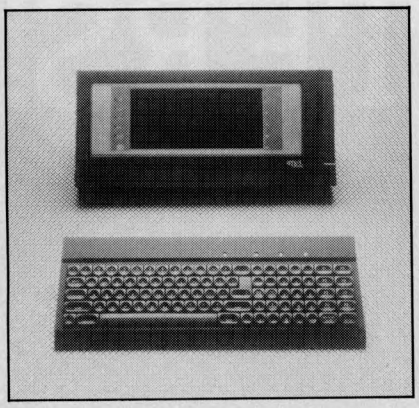

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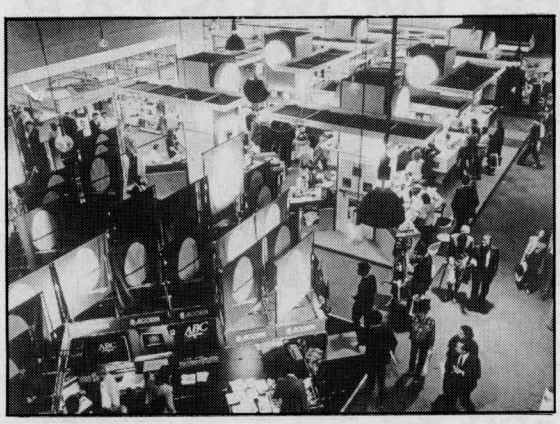

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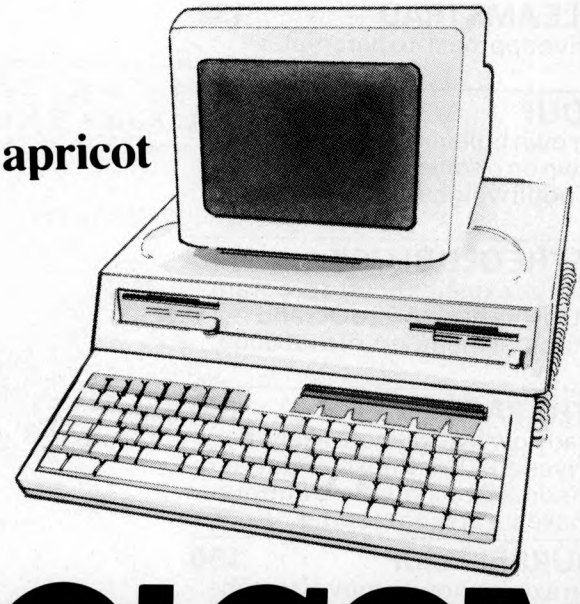

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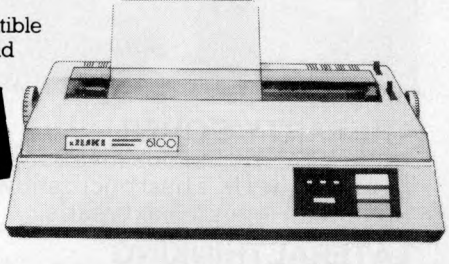

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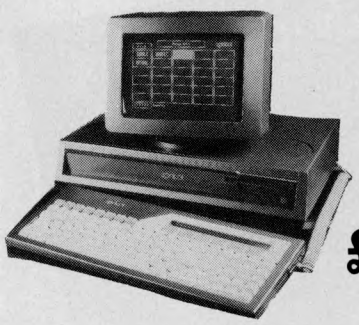

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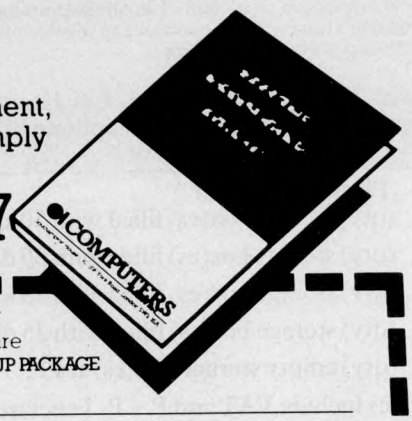

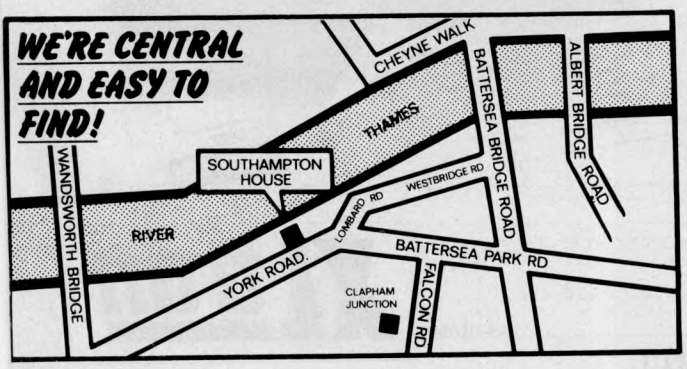

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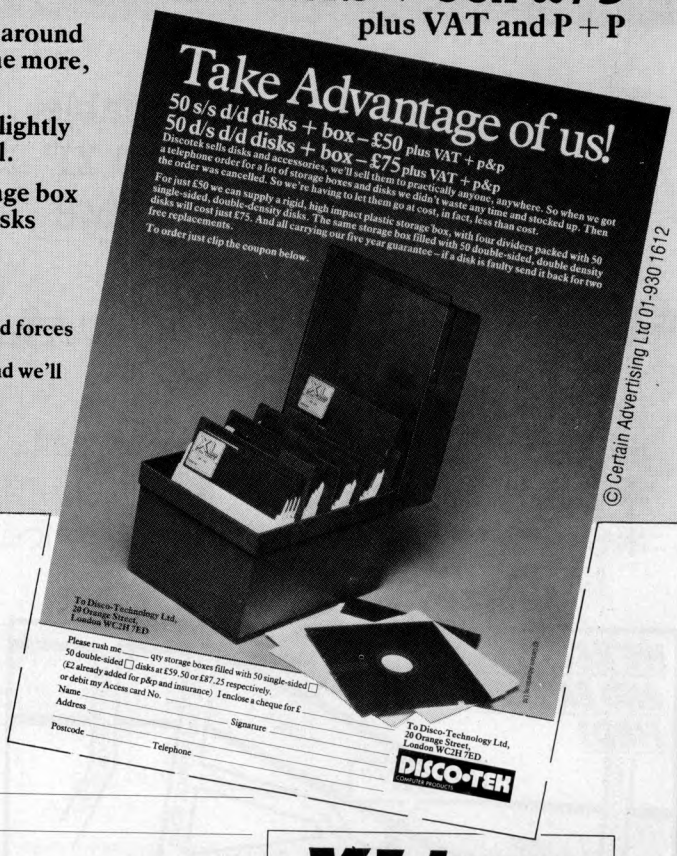

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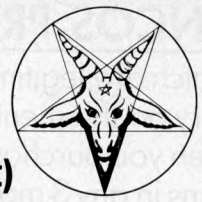

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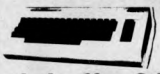

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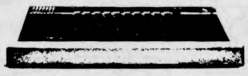

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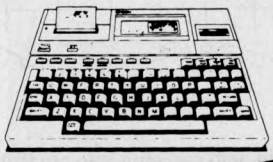

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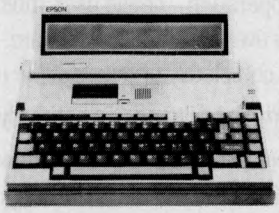

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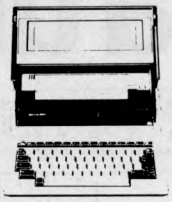

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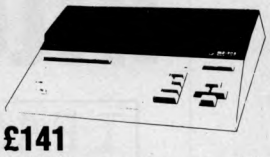

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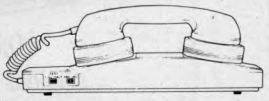

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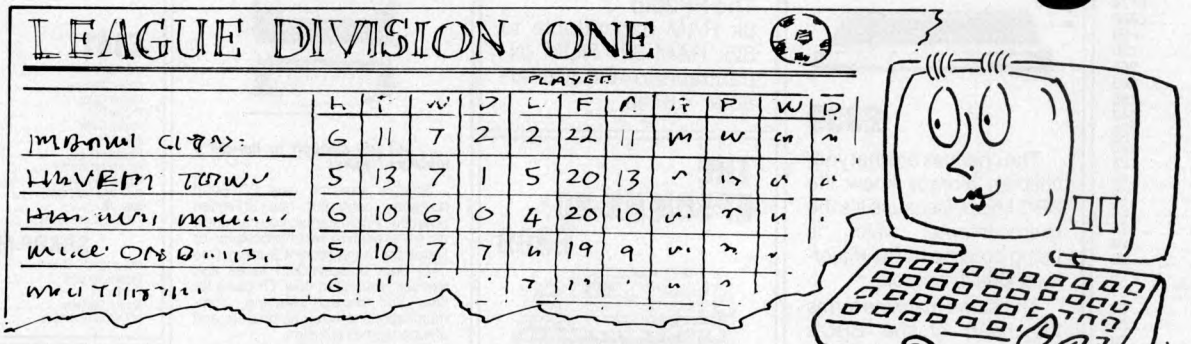

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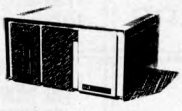

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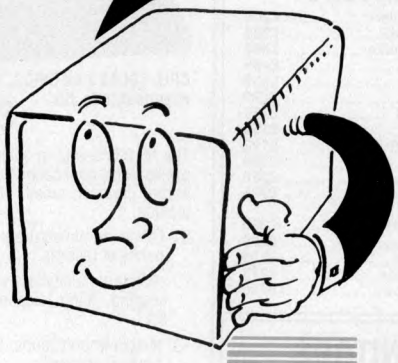

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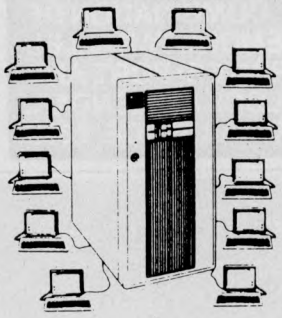

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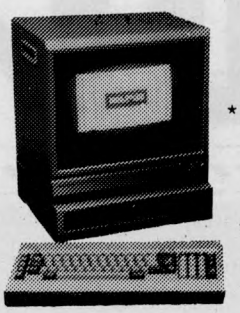

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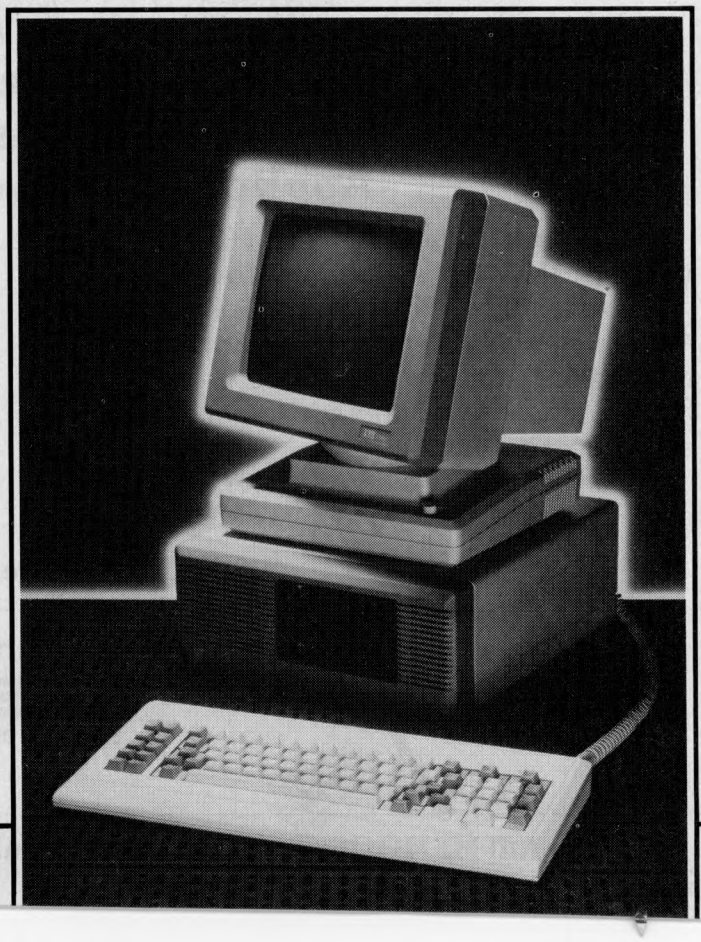

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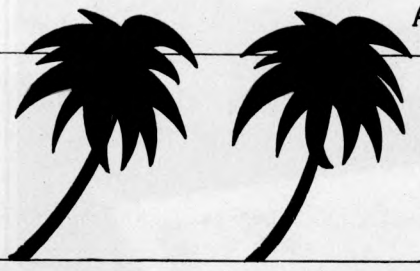

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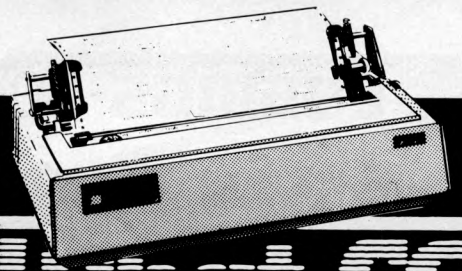

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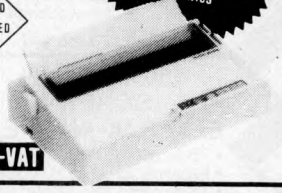

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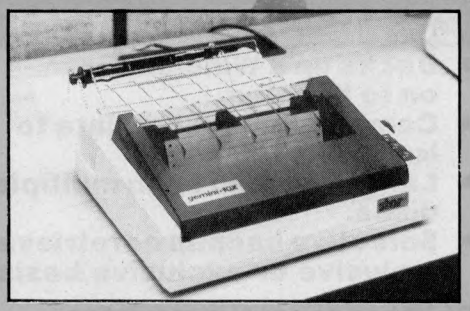

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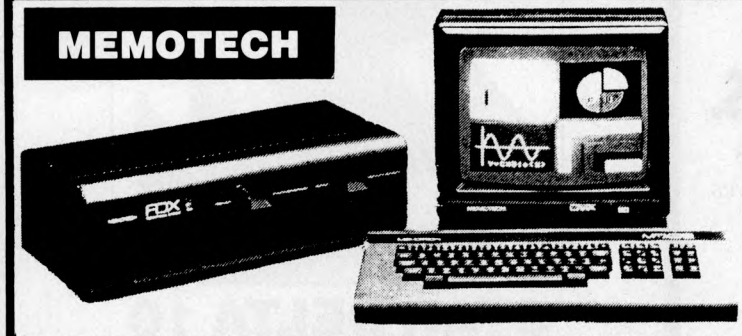

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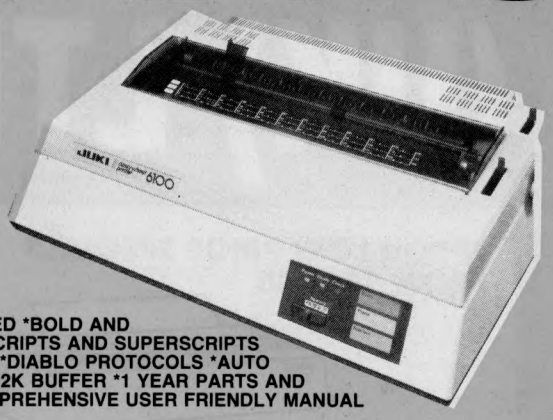

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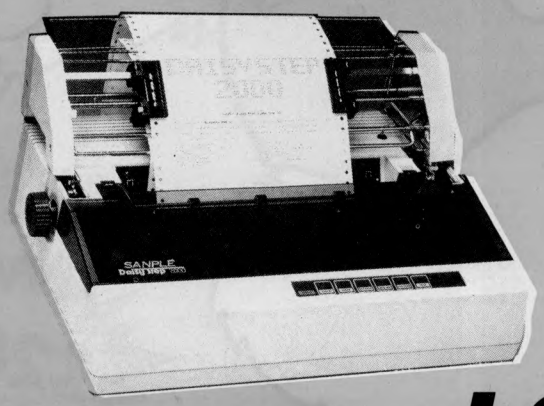

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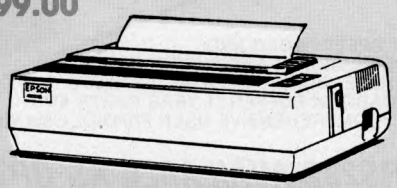

EPSON RX 80	100 cps	~~£249~~	**£199.00**
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20 CPS: Bidirectional & Logic 10, 12, 15 & Proportional Spacing: Wordstar compatable: 2K Buffer; 13 inch Platen: Underline; backspace & lots more: Centronics Interface Standard. Optional RS232, Tractor and Sheet Feeder

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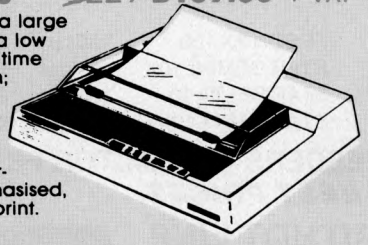
Friction and tractor feed as standard. 80cps. Bi-directional logic seeking 13 × 9 dot matrix giving true descenders, sub and superscripts. Italic printing and auto underlining. Condensed, emphasised, expanded and double strike (can be mixed in a line). Parallel interface fitted as standard.

ADMATE DP80 — ~~£229~~ £169.00 + VAT



The Admate DP-80 has a large range of features and a low price. Ideal for the first time user. 80 cps; 80 column; Bi-directional logic seeking; block and dot addressable graphics; sub/superscript, auto underline, condensed, emphasised, expanded and italic print.

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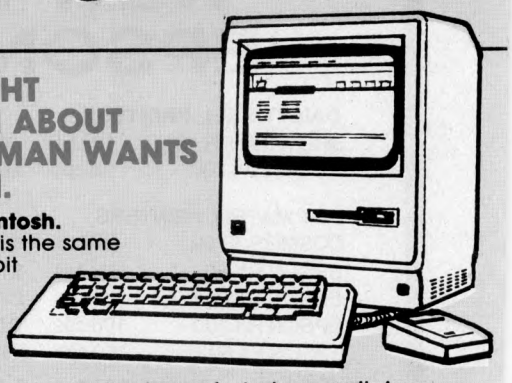

Introducing Macintosh.
Macintosh's brain is the same blindingly-fast 32 bit MC68000 microprocessor that powers the Lisa personal computer.
Its heart is the same Lisa technology of windows, pull-down menus, mouse commands 32-bit power more useful by making Macintosh far easier to use.

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If the problem won't come to Macintosh, you can always take Macintosh to the problem — it weighs 9 pounds less than the most popular portable computer.
Just pick Macintosh up by its built-in handle, and carry it.
A micracle of miniaturisation is Machintosh's built-in 3½" drive. Its discs store 400K — more than conventional 5¼" floppies.

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There's more software on the way from developers like Microsoft, Lotus and Software Publishing to mention a few. And with Macintosh BASIC, Macintosh PASCAL and our own Macintosh Toolbox for writing your own mouse driven programs, you could turn a few bob in your spare time.

All the right connections

On the back of the machine, you'll find built-in RS232 and RS422 Applebus serial communication ports for connecting printers, modems, and other peripherals without adding expensive cards. If you wish to double Macintosh's storage with an external disc drive, you don't have to pay for a disc controller card — that's built in too.

Talking of extras

Macintosh has a built-in polyphonic sound generator capable of producing high-quality speech and music.



Machintosh automatically makes room for illustrations in text.

MacPaint — virtually any image the human hand can create.

Microsoft's Multiplan for Macintosh.

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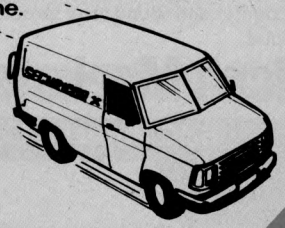

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Toshiba HX-10 Computer including starter Pack Software £279.95

A powerful home computer designed to satisfy the first time user, enthusiast and businessman alike. Featuring MSX Basic operating language, a powerful 64K memory and 73 Key fullstroke keyboard, the HX-10 will produce high resolution graphics including graphs and charts in up to 16 colours and full 8 octave music generation. The HX-10 is totally expandable and like the software, MSX hardware is also standardised enabling users to add a wide range of peripherals. Comes complete with starter pack of software.

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A selection from our extensive range of MSX software

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		Hot Shoe	£5.95
		Oh Mummy	£5.95
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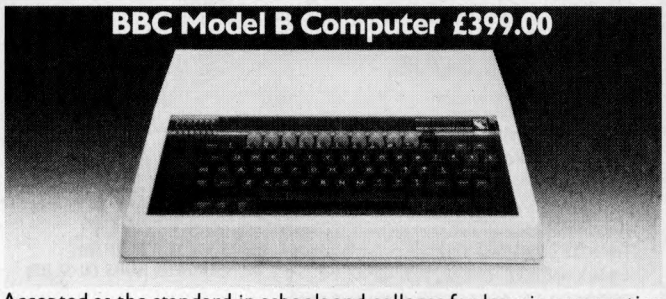
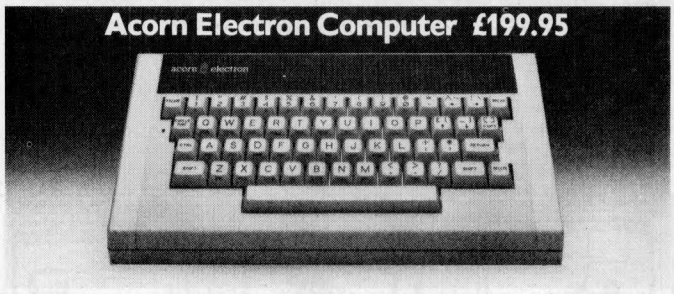
BBC Model B Computer £399.00



Accepted as the standard in schools and colleges for learning computing. The BBC Model B features the powerful BBC Basic programming language, 32K memory, 73 key full stroke keyboard, 16 colour high resolution graphics and sound synthesizer. It has several interface parts for easy connection to many peripherals and there is a large range of business, home and games software available.

Acorn Electron Computer £199.95



Built by the same company as the BBC computer and therefore uses the same widely used programming language. The ideal machine for learning about computers, the Electron features full stroke keyboard, 32K memory, full colour graphics and sound generation. It comes complete with 2 manuals: 'The User Guide' and 'Start Programming with the Electron'.

MICRO MARKETS

Amstrad CPC 464

The complete system at an amazing price from Micro Markets

Amstrad's long awaited entry into the micro computer market is a low cost computer that provides the user with everything to just plug-in and get going, with applications ranging from arcade games to business and accounting. Its impressive features include: integral RGB colour monitor or Green Tube VDU, built-in 'speed load' data recorder, 64K memory, 74 key full stroke keyboard, high resolution graphics, 7 octave sound generation and a comprehensive range of software for business, educational and games from Amsoft.

With Green Screen Monitor £239.00

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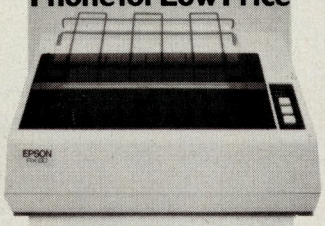
Oric Atmos Computer — Phone for latest Low Price

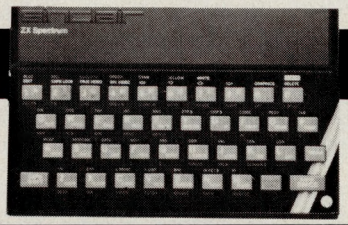
Unlike other micros, the Atmos has a powerful ROM memory which leaves most of the valuable RAM memory for user programming. There are full colour high resolution graphics and special sound effects for games programmers which can be heard through the powerful built-in speaker. Other features include full featured keyboard with sculptured keys and a range of exciting software.

Epson RX80FT Dot Matrix Printer Phone for Low Price

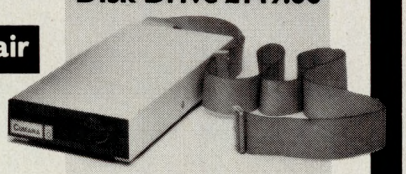


Sinclair Spectrum 48K £129.95 With FREE Software 6 pack (worth £56.70)

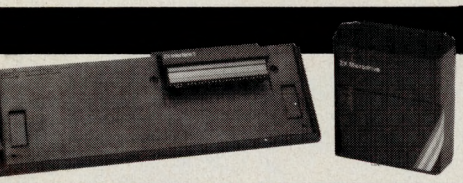
This very popular 48K colour computer offers excellent value for money. Featuring full colour high resolution graphics, 10 octave sound range and 44 key keyboard. There is a full range of peripherals and a massive selection of software.



Cumana CSX100 Disk Drive £149.00



Interface 1 and ZX Microdrive. £99.95 per pair



For fast access to large amounts of data each microdrive is capable of holding up to 100K of memory on a single microfloppy disk. The Interface 1 will control up to 8 microdrives and also adds file handling and communication facilities to the Spectrum.

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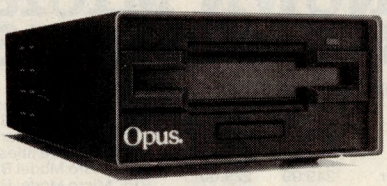

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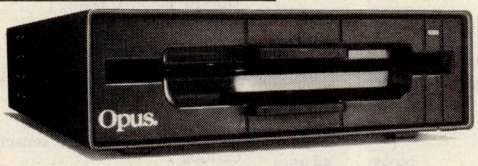

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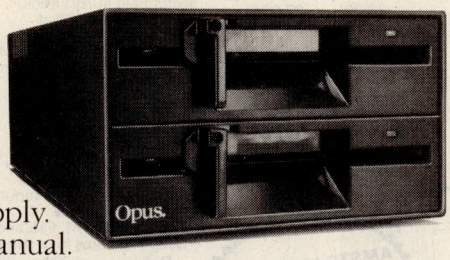

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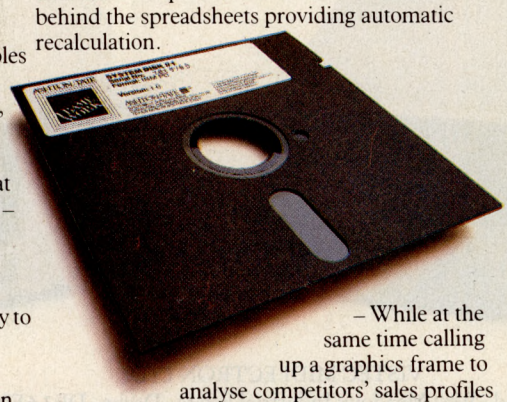

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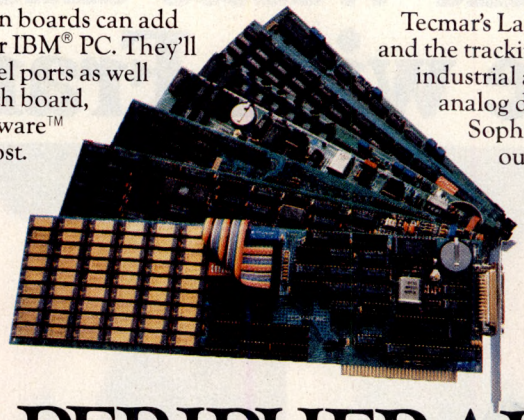

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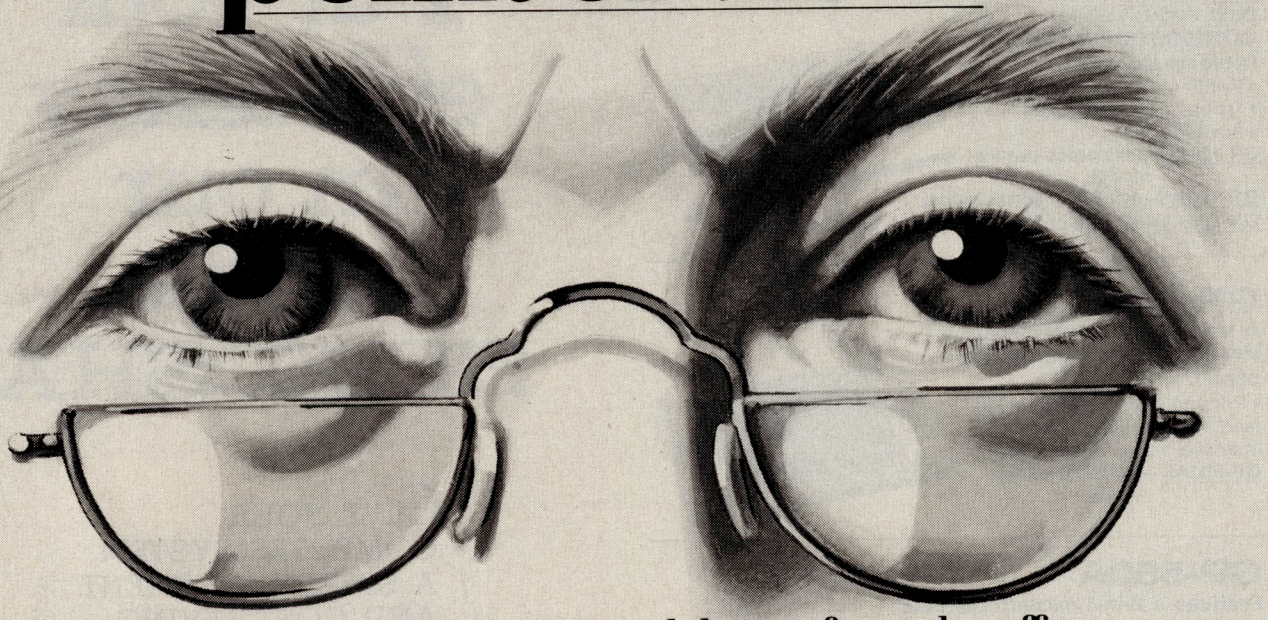

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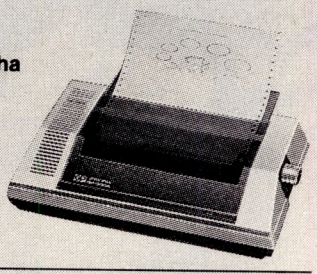

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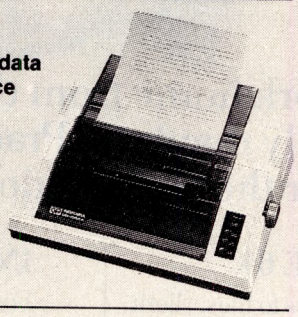

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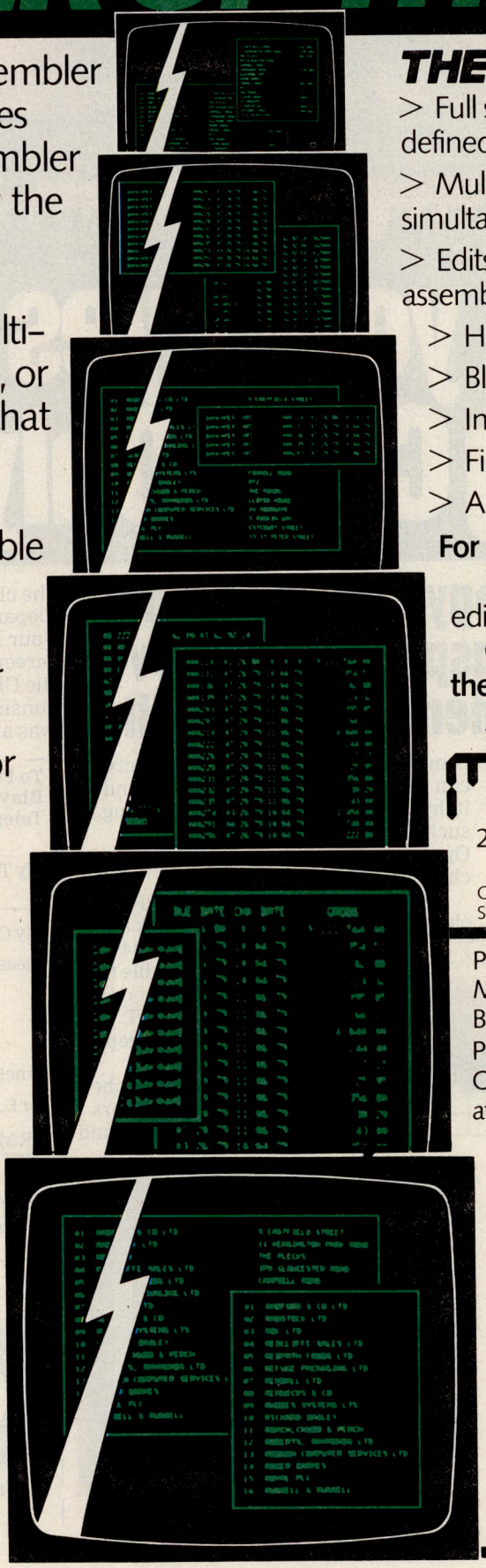

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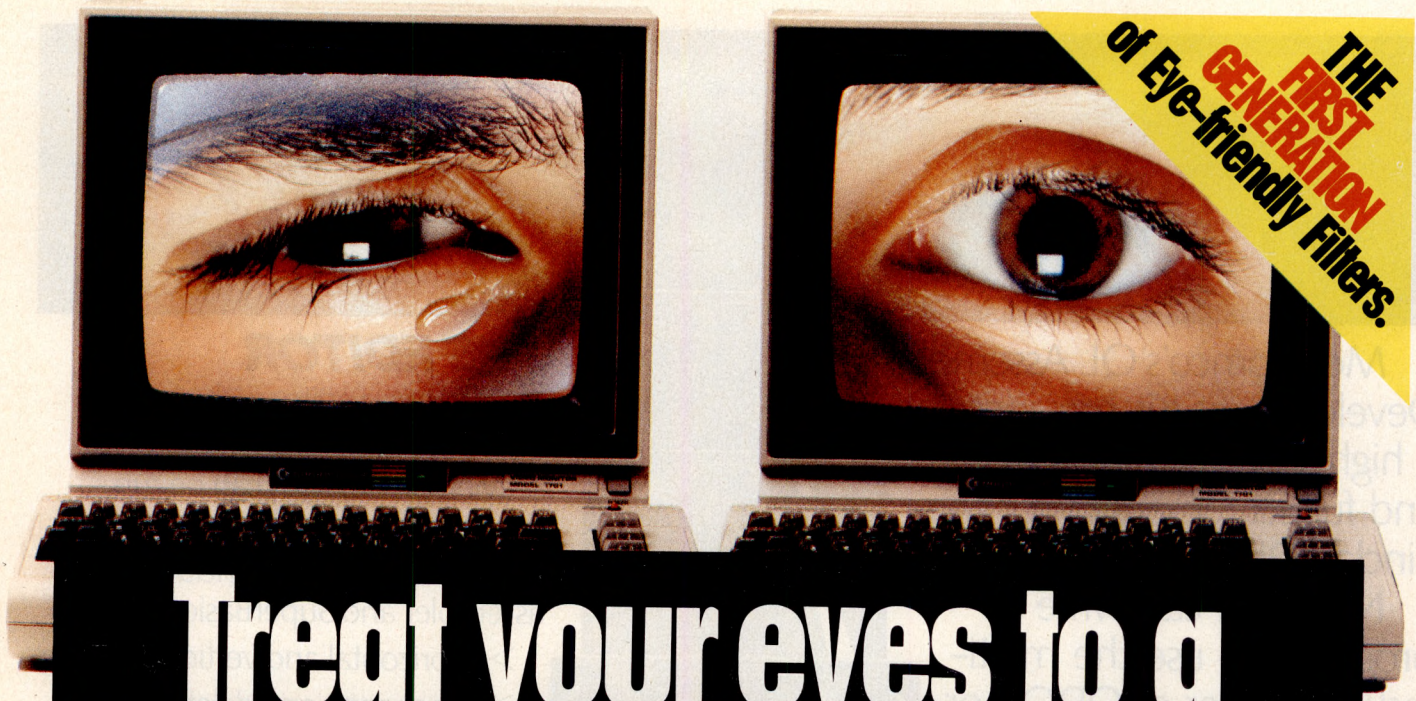

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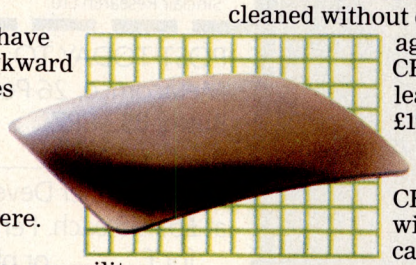

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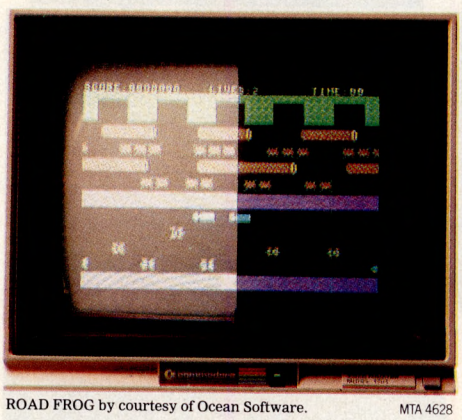

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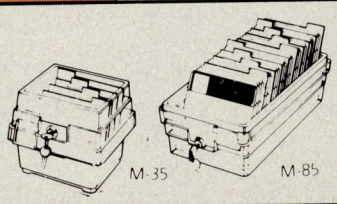

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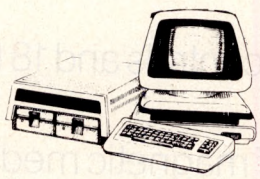

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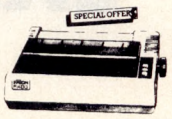

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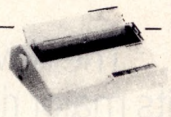

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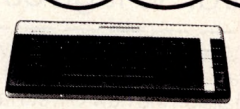

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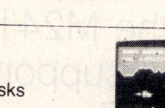

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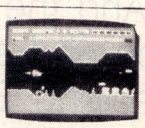





The Graduate. The first IBM PC compatible upgrade for the BBC model B micro.

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Introduction to MS™-DOS

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TECHNICAL SPECIFICATION

- 8088 16-bit processor running at 5 Mhz
- 128K or 256K RAM
- MS™-DOS operating system customised to IBM compatibility
- Model G400 – Single, double sided, high density disc drive (320K formatted)
- Model G800 – Twin, double sided, high density disc drives (640K formatted)
- Integral stabilised power supply
- 2 IBM PC compatible hardware expansion buses
- Software compatibility allows Lotus 1-2-3 and all popular IBM PC business programs to run without modification, subject to the constraints of the BBC keyboard and display
- Disc interface is not required

Keyboard text and graphics supplied by BBC Model B

• THE GRADUATE •

More data storage

A step up from the G400 is the G800 which offers twin, double sided 320K disc drives for extra data storage. Both the G400 and the G800 provide the possibility of further expansion for networking, modems, etc., via the IBM compatible hardware slots provided by the Graduate models. Each model comes complete with a well written user/technical manual and connecting leads.

Just plug it in

Unlike other add-ons there is no need to open the BBC to make the connection. The compact and tidy Graduate models simply plug in to the 1MgHz bus on the Model B. Within minutes you can be up and running with an IBM PC compatible system that really means business.

The range

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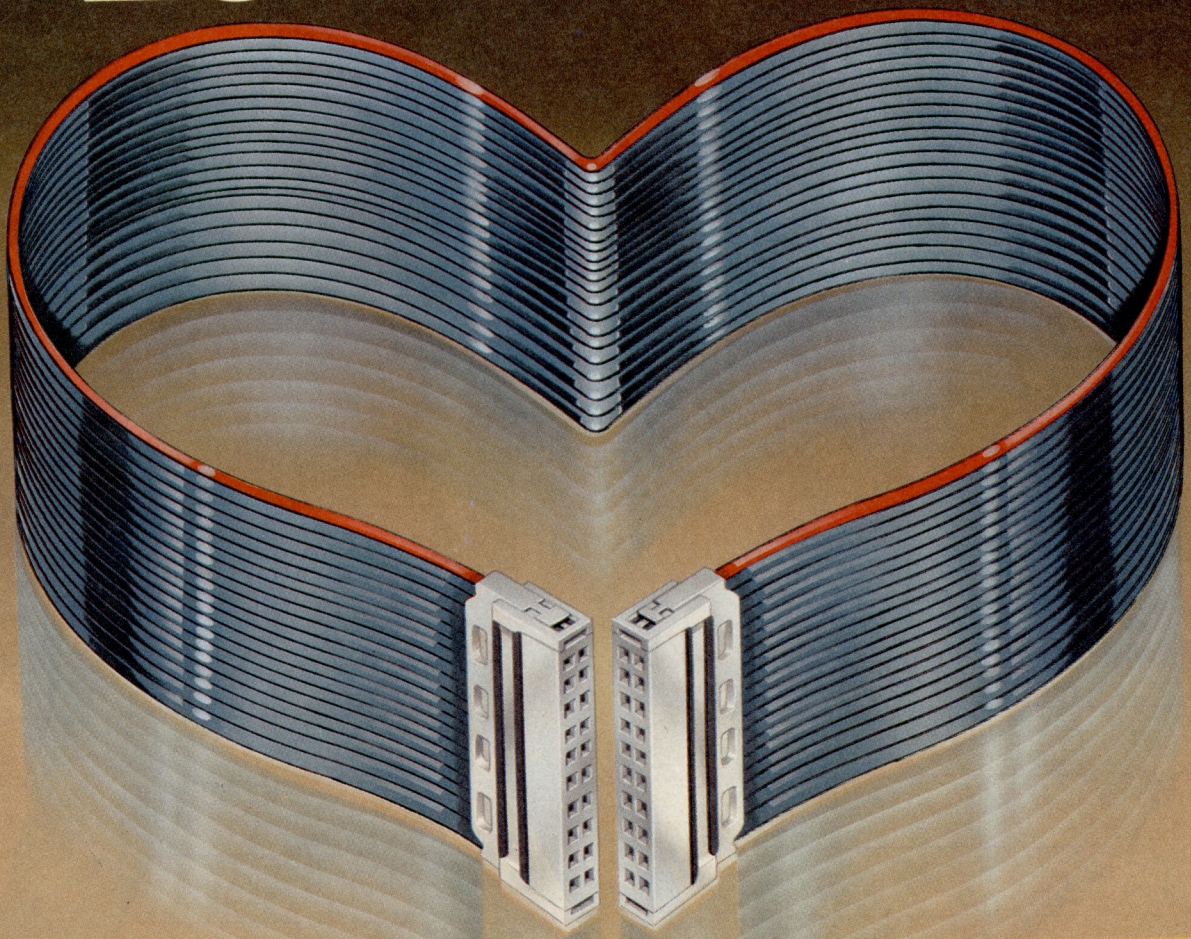

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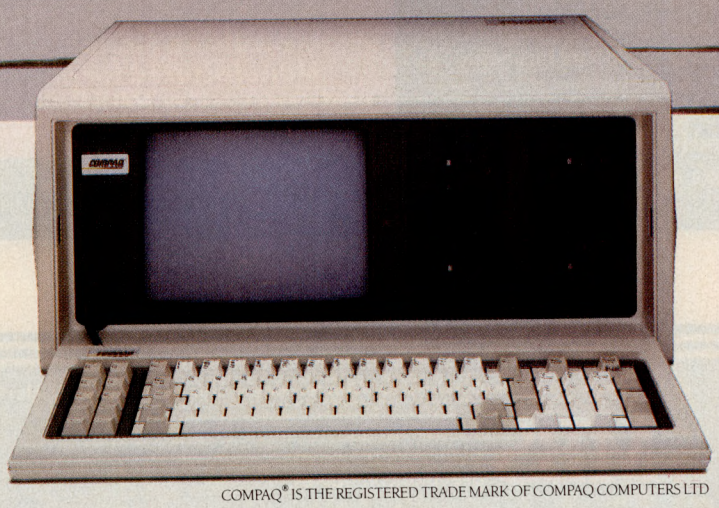

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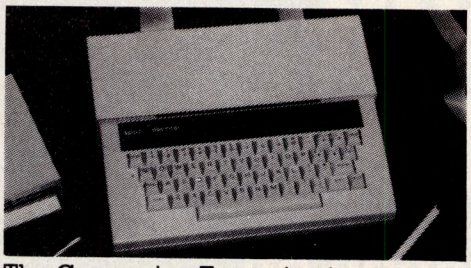

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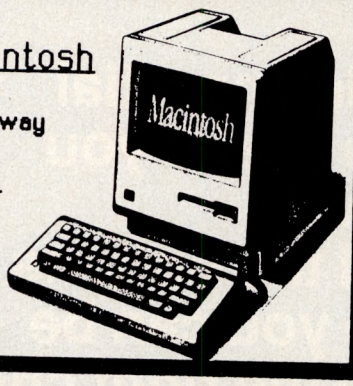

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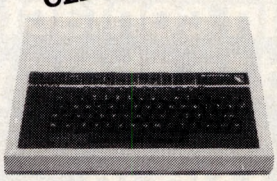

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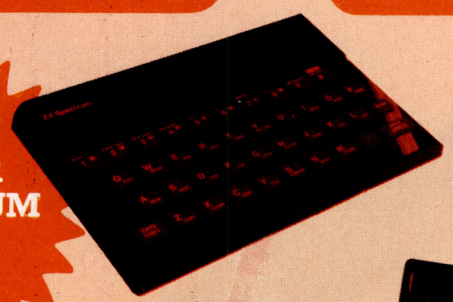

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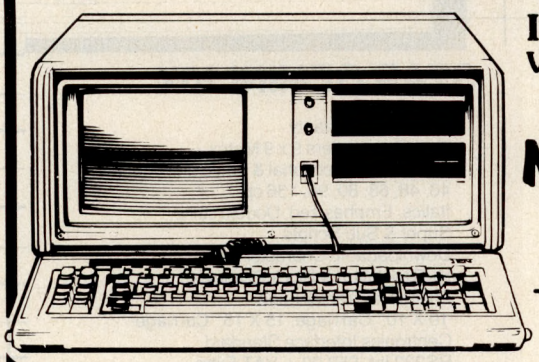

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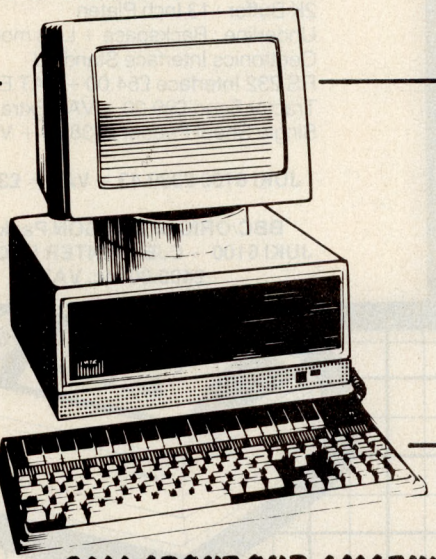

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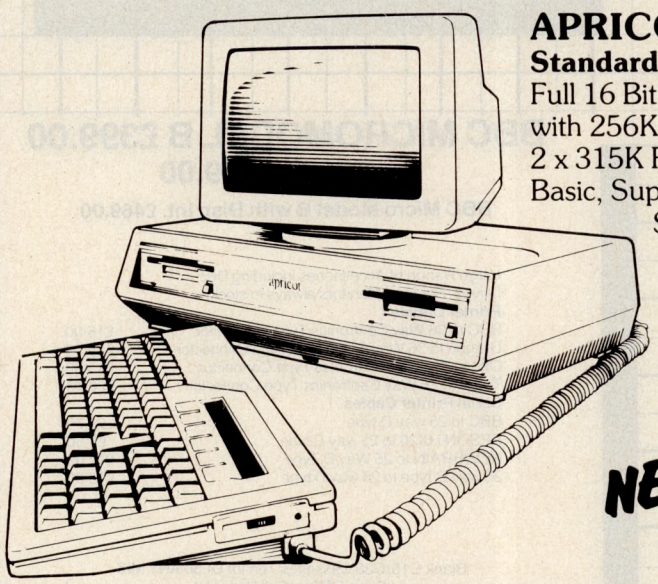

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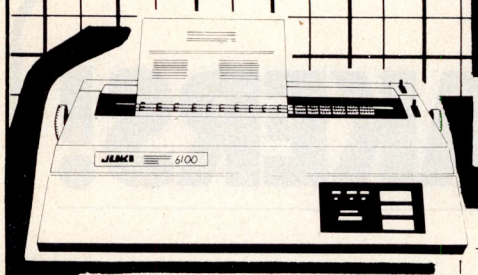

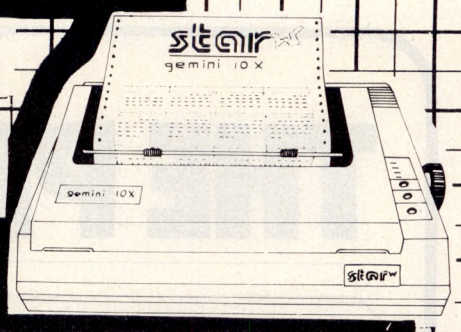

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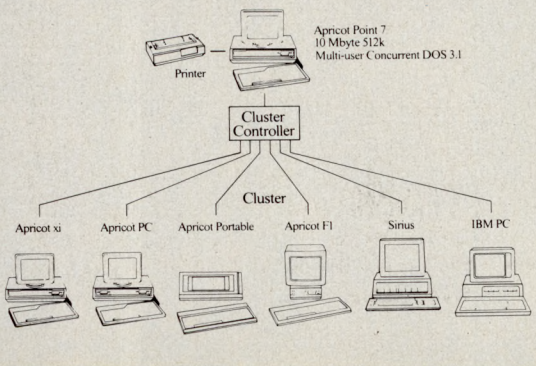

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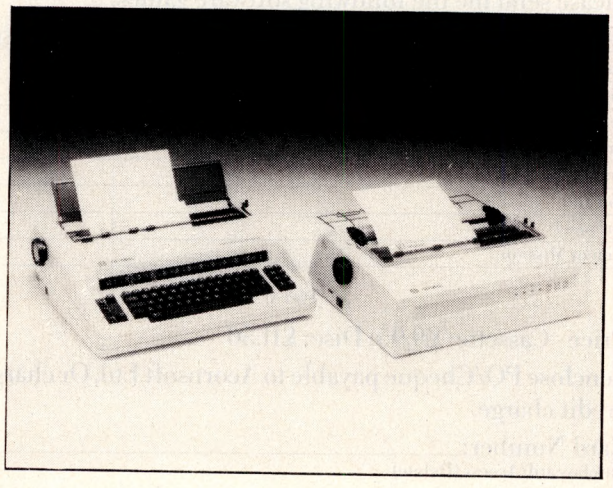
Method of printing: Automatic bi-directional printing with shortest path seeking logic. Automatically skips over blank fields.
Paper feed: Variable, 96 positions/inch, bi-directional.
Buffer: 4 K Buffer. Keyboard option. Qume/Diablo. Code option.
Function control led: ON/OFF-Line. Paper out. Ribbon out. Cover open. Error.
Printing mode: Bold printing (1/120″). Expanded printing. Double strike.
Interface: RS232 IEEE, Centronics.

OLYMPIA 103 SERIES

Method of printing: Daisywheel, exchangeable, 96 characters
Print speed: 17 characters per second, Bidirectional.
Form width: 17″ (431.8mm)
Width of printline: 14.2″ (360.6mm)
Tabulation: Variable, 60 positions/inch, Bidirectional
Pitch: 10, 12, 15 characters/inch proportional spacing
Line length:
141 characters with 10 pitch
169 characters with 12 pitch
212 characters with 15 pitch
Paper feed: Variable, 96 positions/inch, Bidirectional, indexing one half space up/down.
Printing: Automatic bold, (1/120″), expand and double print. Automatic bidirectional printing with shortest path seeking. Automatically skips over blank fields.
Buffer: 4 k byte. Keyboard option. Qume control code. Option for Wordstar.
Function controls led:
102 ON/OFF-Line. Error.
103 ON/OFF-Line. Error.
Bold print.
Expand print. Double print.
Interfaces: RS232, Centronics IEEE.





OLYMPIA COMPACT SERIES

Method of Printing: Daisywheel 100 characters. Interchangeable.
Print Speed: 14 cps
From Width: 14.3″ **Width of Printing:** 11.5″
Pitch: 10, 12, 15 characters per inch.
Line length: 10 pitch – 115 char. 12 pitch – 138 char. 15 pitch – 172 char.
Instruction code: Diablo compatable (compact R0)
Built in Tractorfeed – Compact R0
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RS232 or Centronics Interface (Compact 2)
Both interfaces as standard (Compact R0)

ACCESSORIES

Olympia Single Bin Sheet Feed £398. Double Bin Sheetfeed £598.
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A full range of Daisywheels and ribbon types are available.

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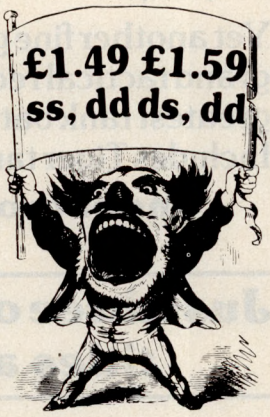

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Also included in **MicroCache** is a printer buffer. This enables printing to apparently occur immediately by 'printing to RAM'. Actual output to the printer occurs in background mode without delaying the user. The RAM used by the disk cache is dynamically shared with the printer buffer; whichever is causing you most delay automatically gets the most RAM. This is a much more cost-effective way of saving time than purchasing expensive add-on printer buffer boxes.

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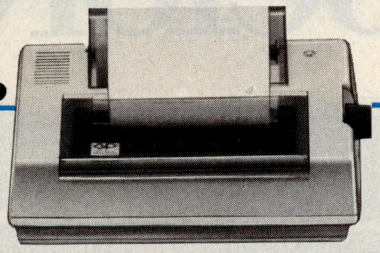

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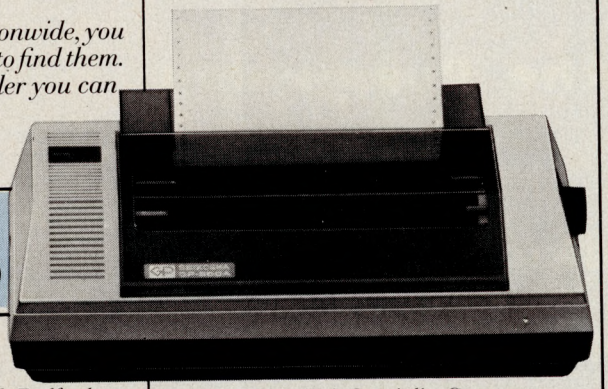

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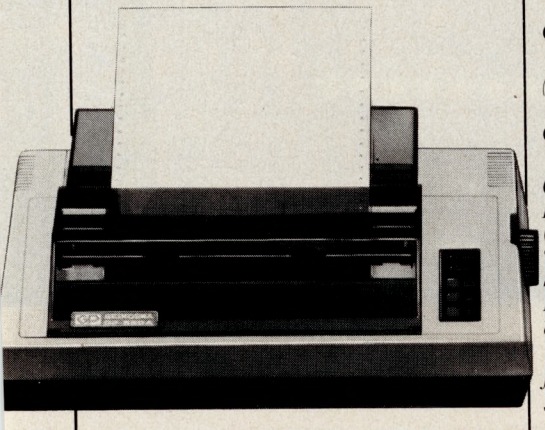

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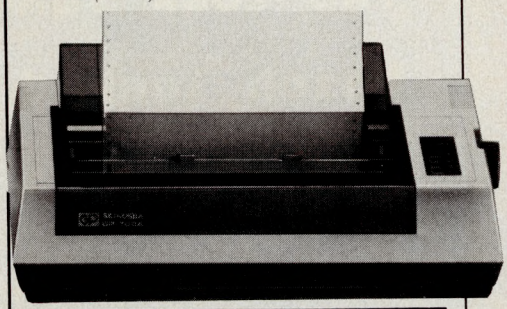

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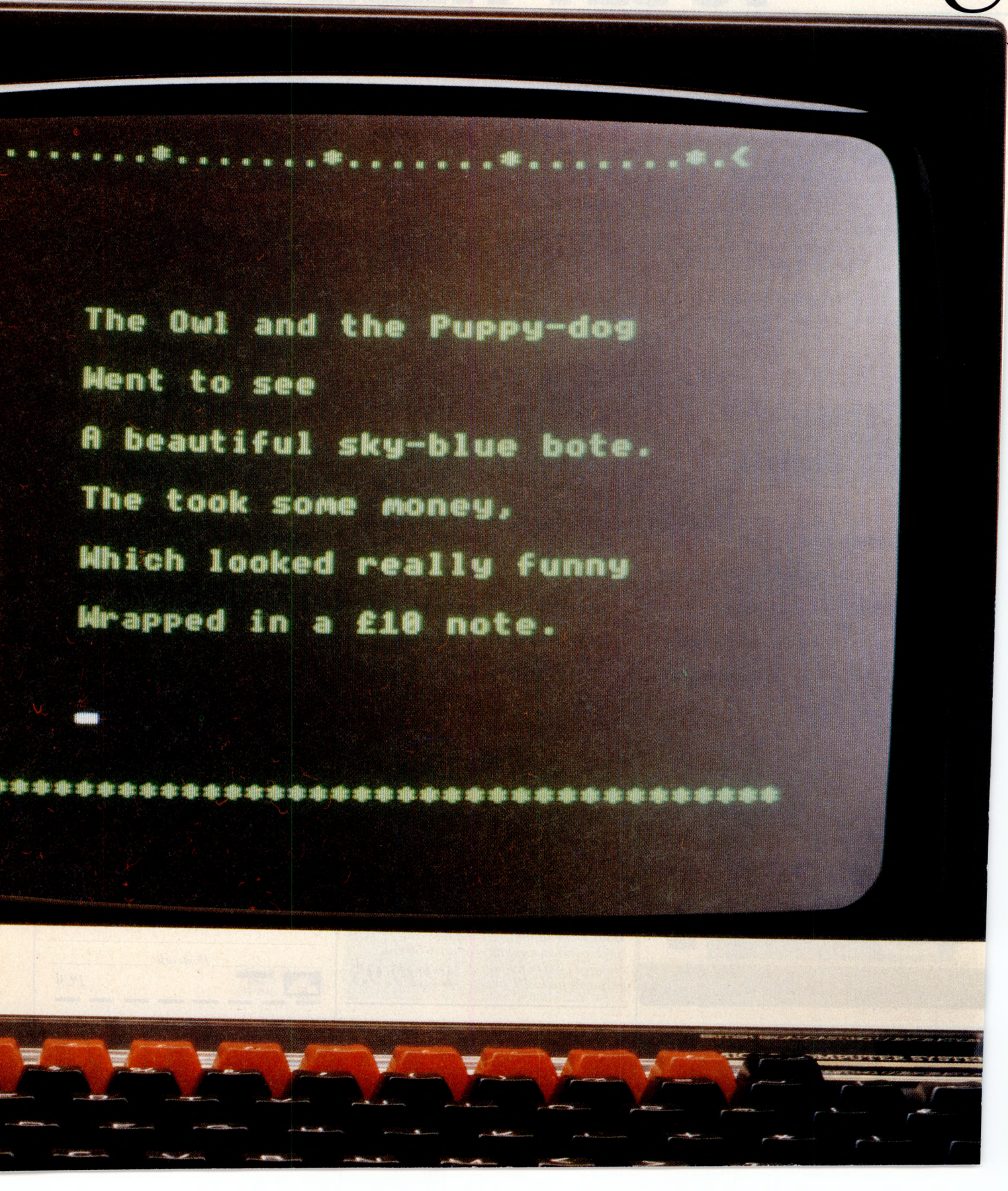

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VIEW is a professional system, yet it's surprisingly straightforward to use.

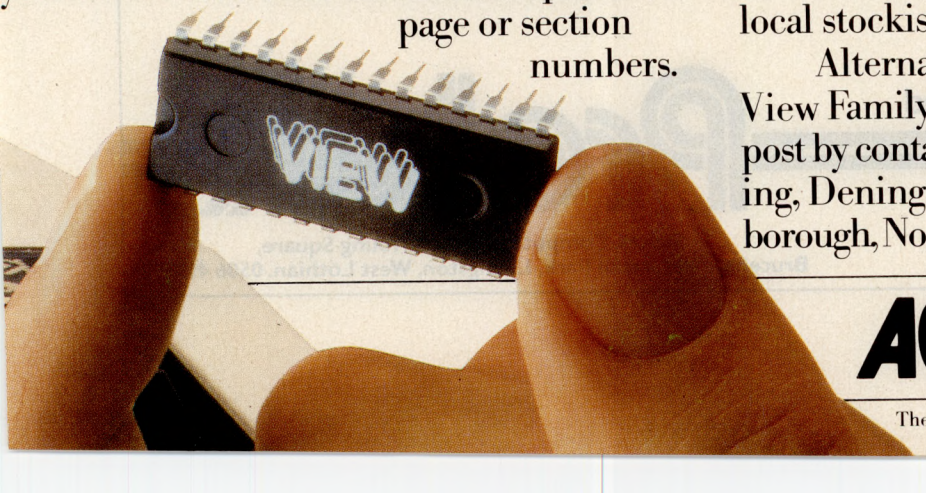
And it's so outstanding it's won the 1984 British Microcomputing Award for Home Software.

All you do is type out your text on the keyboard, and view it on the screen.

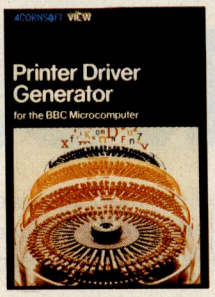
VIEW can search, change and replace particular words whenever they occur in your text. It can swap paragraphs. Automatically alter page numbers. Even count words.

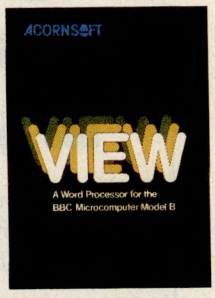
The possibilities are endless, because you can check, edit and change as much or as little as you like until you're satisfied. Then, with a single command, your final version will appear on the screen.

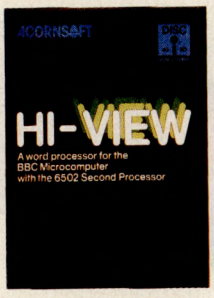
If you want to go even further, the simple addition of ViewIndex, just £14.95, means you can select and index words, complete with page or section numbers.

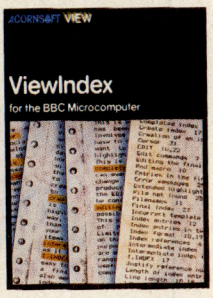


And of course, when you're ready, any printer that will operate with your BBC Micro will operate with VIEW. But if you want to use the printer's special facilities, such as bold printing or underlining, Acornsoft's Printer Driver Generator (£9.95 on cassette, £11.50 on disc) enables you to do so.









For the more specialised user who wants to take advantage of the extra power offered by the 6502 Second Processor, Hi-VIEW (£59.80) provides 47K of text space in any of the BBC Micro's screen modes.

So whether you're composing a 300 page business document, a letter to the gas board, or a bit of Victorian nonsense, you can polish it to your heart's content, wasting precious little time. And even less paper.

You can get VIEW products from your Acorn dealer. Just phone 01-200 0200 for your local stockist.

Alternatively, you can send off for the View Family brochure and order through the post by contacting Acornsoft, c/o Vector Marketing, Denington Industrial Estate, Wellingborough, Northants NN8 2RL. Tel: 0933 79300.

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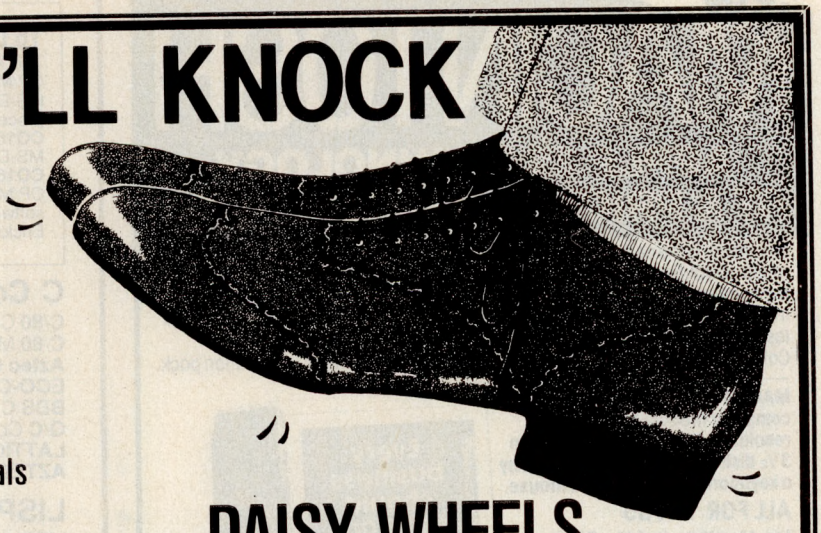

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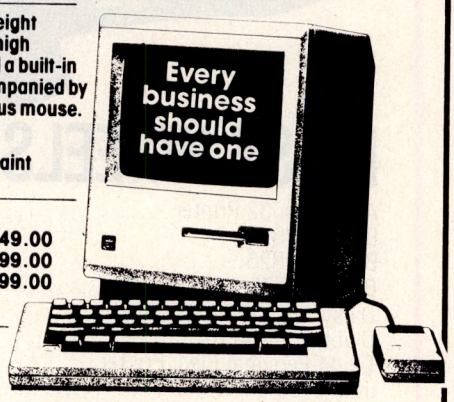

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Specification

CPU Type	True 16-bit 8086 running at 4.77 MHz.
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Languages Included	Basic
Type of Keyboard	Full 84 keys tactile
Keyboard Facilities	10 programmable keys
Character Set	256 in ROM
Method of Display	TV, RGB, Comp/Sync colour or monochrome monitor
Display Facilities	Full screen handling, 4 screen paged
Text	80 x 25 or 40 x 25
Graphics Resolution	320 x 200 or 640 x 200
Colours Available	16
Graphics Facilities	Scroll, reverse image
Cassette Recorder	Audio
Interfaces Included	Cassette port, light pen, joystick, Centronics
Sound	Built-in speaker
Operating System	Built-in ROM
Printers	Any using Centronics parallel interface
Comments	Hardware and software compatible with IBM PC Upgradeable to Model B Provision for 8087 Arithmetic Processor
Warranty	12 months

Benchmarks

The standard Benchmarks were run using Advance Basic, which is the equivalent of Microsoft GWBasic and Basica on the IBM PC.

Machine	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Advance 86 — 8086	0.8	3.3	7.3	7.4	8.1	14.6	23.9	26.0	11.4
ACT Apricot — 8086	1.6	5.2	10.6	11.0	12.4	22.9	35.4	34.4	16.7
IBM PC — 8088	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30.0	16.8



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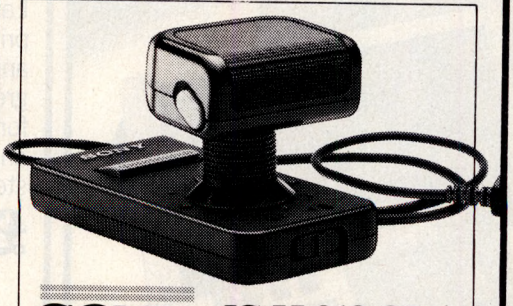

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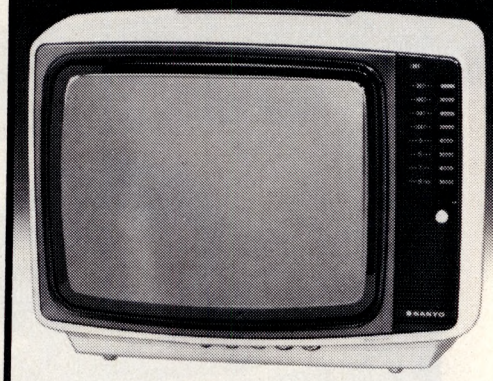

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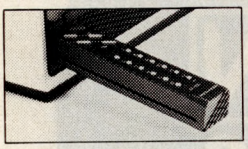

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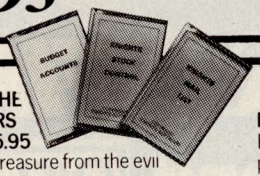

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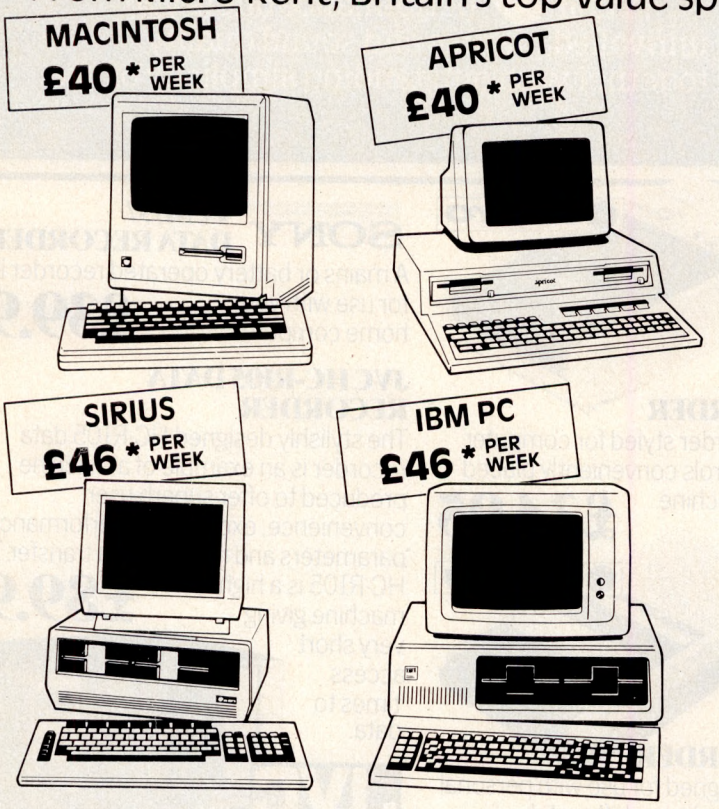

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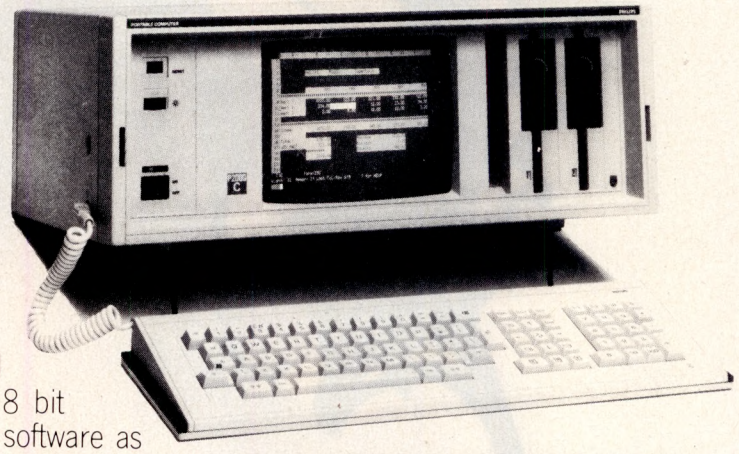

It's just plain common sense.

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NEWSPRINT



Food for thought! Guy Kewney takes a bite out of Apple's 'Big Mac' and, what's this, Currys is really serious about those micro chips. Plus, news of one company which is helping software companies (and hatching golden eggs in the process) while across the Atlantic the sas fate of one coast to coast software chain.

Oric quashed in price war

It is possible that Oric got snarled up in the warm summer, which you may remember was very good. That is the one sensible answer to the question 'What on earth has happened to Oric?'

It seems like only yesterday that the word on the streets was: 'Oric is making it.' And today, the brief spurt of optimism is evaporating, and people are once more asking: 'Can Oric make it?'

As usual, apart from the fact that sales dropped this summer, nobody agrees quite what happened.

It is certain that British micro buyers suddenly stopped buying Oric Atmos micros. Sales overseas remained 'reasonably constant' in the words of one responsible Oric executive, but UK sales dropped, from a point in February where they made up half of Oric's total output, to a fifth of the total by September.

But where Oric itself claims that it was just a bad summer, and it was caught out by the idiocy of distributors, the distributors tell a different story.

They say that there was a shortage of ZX Spectrums. 'Most people had taken on the Oric in the belief that it was a substitute for the Sinclair,' commented Bob Denton at Prism. Prism was one of these, having announced in May that Oric Atmos was a potential winner, and would be distributed by Prism.

What happened then isn't too easy to pin down. It isn't true, for example, that supplies of Spectrum micros suddenly improved. It isn't even true that the Spectrums shipped suddenly improved in quality so that people didn't send them back.

What most likely happened was sunshine. Summer was just too good for people who weren't already hooked to contemplate staying indoors, debugging programs.

Sales of most micros dried to a trickle. Supplies didn't, however, and the things started piling up on shelves in the shops.

The shopkeepers reacted promptly and predictably; they announced sales price reductions. And before anybody knew what was happening, there was a price war.

The price war is a fact of history. The Atmos's recommended retail price was £169, and Dixons, followed by Greens, cut the price to £139. Then Rumbelows and Greens both went to £129, and finally Greens upset everybody by dropping to £99. Then the company changed its mind, but too late to avoid a sinking feeling in everybody's heart which said 'Drop the Oric.'

Since the machine was currently leaving Oric at a price of £115 or so (volume discounts included), the panic that followed was very real. Oric's response was to put the official price up to £179, which was meant to convince everyone that the company would support retail margins. Instead, everybody decided they were giving up on the UK market.

Oric claims that the real villain of the piece was its advertising agency. If the judge had let them, Oric executives would have sued their agency for £200,000 on the ground of 'wrongful advice', a phrase which wasn't explained.

My sources say that what Oric actually meant was that the agency took TV time on Channel 4, in March, when nobody was watching. It's one theory, I suppose.

Terry Shurwood, Oric's sales and marketing director, agrees that sales dropped after the allegedly useless TV ad campaign. Meanwhile, however, he'd sold the Atmos into all the High Street chains on the back of the advertising, leaving retailers with far higher stocks than they wanted for the time of year. Money tied up in stock, be it Atmos micros or chocolate bars, is bad news, so the High Street discounting began.

One result was that UK Atmoses started to appear in the German and French markets, as astute middlemen bought up discounted stock in Tottenham Court Road and smuggled it into the European free trade area. If there's one thing Shurwood likes less than an advertising agency, it's a smuggler ruining his otherwise lucrative European market.

Anyway, for those who have an Oric-1 or Atmos, the news at press time was that the company was hoping to arrange to 'reschedule' its debts (around £3.5 million, said one director of Oric) with its 15 biggest suppliers, on the grounds that even if UK sales didn't improve, French and German-speaking countries were buying the things like madmen.

What the chances of success were, I can't even guess, but it might be worth reminding readers that the NewBrain, despite piffling UK sales, was saved because of Dutch success on a very much smaller scale than Oric's in France. It is still the number one micro there, selling around five times as much as Sinclair and Commodore together.



This is a 'desk-top robot' which means it is £550 worth of mechanical kit plus control electronics, without any industrial purpose. You use it for training, and you marvel at the ingenuity of Cybernetic Applications in producing it and its bigger brother, the Neptune I and II, with water hydraulics rather than oil hydraulics. Fascinated, you phone Andover 50093 for details of connection to BBC, Commodore VIC-20 or ZX Spectrum micros.

One Big Mac, please

Much earlier than expected, the big version of the Apple Macintosh has been announced. And it looks as if machines will be in the UK in October.

The buying public in Britain, by comparison with punters in the US, seems to be taking Apple's Macintosh very seriously.

By that I mean that they aren't rushing out and buying it as a toy — they are taking it seriously enough to be holding off buying the currently-available mini version with only 128k and one diskette, and waiting for the 512k version.

Price, whatever Apple thinks, looks like being the biggest problem. To upgrade from the mini Mac to the big one you have to spend £800, which is quite a lot of money for less than 400k of memory.

And the new machine costs £800 more than the old one, at £2600.

Disappointingly, the Mark II

version is otherwise identical to the original Mac.

Rumours from the US raised hopes, just before the launch, that some of that £800 (in the US, $1000) would be put towards the cost of including a second disk drive. But no.

In approximate terms, this implies that a working system, with only Macwrite and MacPaint as software, two disks and a printer as peripherals, and the 512k of memory, will cost £3500.

Possibly one could argue that this is far better value than the starting price of just under £3000 announced for IBM's PC/AT (have you found a way of pronouncing that which doesn't sound like the PC80?). After all, the amount of equipment missing from a 'basic price' IBM can nearly double the price.

But anybody prepared to carp should start off by acknowledging one thing: Mac is now an established top five best-seller. It will succeed, where the Apple II could not.

The question is: will it ever make the Number One slot?

American figures show that Macintosh got 11 per cent of the market there, in July. However, nobody is going to release figures for the Mac here, because they haven't been big enough to record by anybody except Apple, where they are secret, because they aren't very exciting so far.

From Apple's point of view, the reason that sales are slow is the lack of software. But they do report that there is a 'whole new flood of software out,' and with the announcement of the bigger Mac, they included a list of a few dozen packages available. A dozen or so, including Filevision, PFS: File, Microsoft Chart, and so on, emerging now. Irritatingly, many of these titles have been pre-announced so often that the surprise is really not that they are available, but to discover that they weren't, before. I thought the 'new titles' were something *really* new.

What is really and truly holding up software houses is the fact that writing a big program for Mac is *hard*. There isn't enough memory, especially compared with what you get on an IBM, and there are lots of new ways of doing things which have to be learned, and fed into the design of the program.

The crucial thing about the launch of the 'Big Mac', however, is that it will release software producers from the need to squeeze programs into 128k. Provided, that is, that the Big Mac can answer one important question.

It is this: 'will Big Mac be cheap enough for people to buy?'

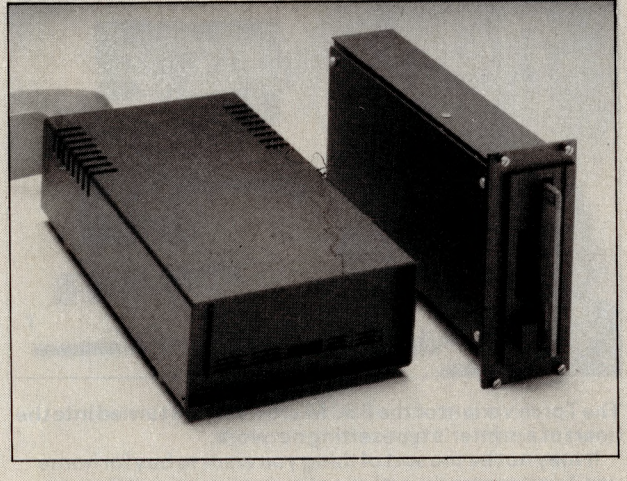
I think the answer is: 'not in the UK.' Certainly for universities, the price is ridiculous and for schools, even more so. Even Apricot's F1 looks a bit pricey to many schools at well under £1000 for a 128k system, including screen.

What else does Mac offer you? A nicer system? *That* much nicer? It doesn't matter, anyway, I haven't got the cash, remarked the professor.

The sensible thing for Apple to do would be to reduce the ordinary Mac to around $1600 including printer and software, and sell the Big Mac at the same price, more or less, as the current machine.



Up to nine separate programs, or jobs, can be run simultaneously on the IBM PC or XT with Multi-job. But if you do run nine jobs, they will each take nine times longer to run. Also, you have to be careful that none of them tries to use the printer when another is already busy doing so. On the other hand, at £129 from Pete and Pam, through P&P Micro Distributors, on (0902) 43913, it's worth phoning for details.



Smaller microfloppy drives are not cheap yet, but they're on the way down, with this add-on unit from Sarel in Luton fetching £236.79. The matching 3.5in hard disk unit seems a better bargain at £852. On top of these reasonable-sounding prices, however, you have to add the cost of a disk controller (a couple of hundred pounds for some) and the hard work of interfacing them to your system. For details of the ones shown here, contact Sarel on (0582) 20121.

Initially, this wouldn't make the machine terribly profitable — but it would sell them like mad.

And in a year, of course, the costs would have reduced, the profitability would have climbed, and there would be so many machines and so much software out in the world, that nothing could stop it.

But Apple is not going to do that, which is a pity, because the longer Apple takes to get its act moving, the bigger the lead IBM can build up, and the less choice there is for everybody.

Curry and chips

First off the mark with an MSX machine for British buyers was Currys, the retail chain with 530 stores and a slightly red face.

Currys got the red face from having to close down its Micro-C mini-chain, with some hilarious excuses for failure.

In a pathetic little note, after four years' struggle, the company's managing director (one of the Curry brothers) referred sadly to the difficulties of trading in 'an immature, price-sensitive market, beset by ever reducing prices and margins.'

And, he hinted, the company might try again one day, 'when patterns of distribution have become more firmly established.'

While enjoying a public laugh at Currys' expense, the group's rivals will actually be sitting up and starting to worry — because what has actually happened is that they now have a very major competitor, whereas before they had a half-hearted, split effort by just a few stores.

Micro-C, as the group's marketing operations director, Simon Williams, told me when the announcement was made, 'is just one of several experiments which we make from time to time, to test out new markets, learn about new products, and see if there is an opportunity.'

Instead of stocking a few, also-ran brands of expensive business micros in the half-dozen specialist Micro-C shops, the group now stocks a half-dozen, best-selling micros, ranging from the Spectrum to the BBC Micro, in most of its standard retail stores.

This news would normally be of interest mainly to the computer retail trade: what makes it interesting to those of us who have to wander in off the streets and buy the things, is the fact that Currys will not only be expanding this range into the smaller business systems (in a year or so) but will be selling software.

The problem of selling software at the moment is simple — nobody knows how many copies of any program are going to sell, but nobody wants to be caught short of a popular game.

Most groups have huge warehouses, full of tapes, so that they can ship out a 'hit' program as soon as the buyers start asking for it, and before the counterfeiters can get ready with half-price fakes.

Currys, however, is going to get the software distributor to manage the racks of tapes, so that whatever appears to be selling is brought in quickly, and whatever is not selling is returned to the producer, and doesn't clutter up the display as old trash. Old trash keeps customers away.

The range sold doesn't leave out much that you might expect, but it does puzzle me with one or two inclusions.

The first puzzle is the Commodore C16, the excuse for which is that the VIC-20 is



I think I can resist the temptation to go overboard about the news that there has been 'highly favourable feedback from customers of dedicated multi-user local area networks.'

The information comes from AM Stearns itself, mixed in with equally vague suggestions of an 'impressive half-year performance'.

It also includes the information that 'our Micronetwork runs under Concurrent CP/M-86, which is widely acknowledged as the finest 16-bit multi-user operating system available.'

Since it isn't a multi-user operating system at all, one finds oneself wondering just what might be 'remarkable success' for the £4600 'aggressively priced' office system pictured here.

being withdrawn, and this goes into the same price area.

True, but nobody would buy a VIC-20 without software, and the C16 is dangerously close to that. And similarly, the bigger Plus/4 is not noticeably nicer than a Commodore 64 without software, and, in my view, only blind faith in the power of advertising is going to see it transformed into a best-seller.

The other puzzle is the Acorn Electron. Currys admits that Electrons haven't been other than 'disappointing' in its stores so far — but since the company makes more profit on that than on the BBC Micro, it must be hoping to fool some people into thinking they will save money and get a similar machine.

The MSX machine is the Toshiba HX-10, at £280. Currys will sell a few — but then, it's only ordered 2000 odd a month from September, which spread over 530 stores suggests it expects to sell four per store per month. One a week per store is worth taking seriously, but not getting steamed up about, not yet. Not until they're actually sold, at least.

Government brainwash

Two versions of reality: one from a politician, the other from a computer industry analyst.

The politician, Nicholas Edwards (secretary of state for Wales) started digging the new factory for Britain's chip-building start-up, Inmos, with the following words:

'This is significant... for the consolidation it represents of Inmos's and the UK's position in a strategically important sector of advanced technology.'

Translated carelessly, you might think that meant: we are doing well, and this new factory will make us unstoppable.

The industry analyst is Professor John Ashworth, chairman of the National Computing Centre, and the man who has just produced a report on the UK information technology industry.

He said: 'The UK industry has been growing, but its competitors have been growing much faster, and it may not be able to survive as an independent industry.'

And he points out, for example, that employment in information technology has dropped from 152,000 in 1970, to 123,000 last year.

Ashworth reckons that the UK's computer industry will be nothing but an arm of American and Japanese enterprises — within a year, unless action is taken.

The only detectable Government response was to reduce the number of people in Government with any knowledge of IT, by putting Ken Baker in a different ministry.

Goodness knows, Baker is no crusading saviour. He is more famous for his failures than his triumphs, and what little he did get credit for turned out to be, mainly, things which were going to happen anyway under different industry aid policies.

But it's hard to see how putting him in charge of Local Government matters is going to solve the problem. And if people like the Right Hon Nicholas Edwards can talk about 'consolidation' just a week after Ashworth's report, it's very easy to fall into the trap of thinking that, perhaps, the Government doesn't think there is one.

It is a trap, isn't it? Hello? Is anybody there? Hello?

Fact or fiction?

If a survey from market research company Romtec is to be believed, business microcomputing is not at all a High Street operation — not yet, anyway.

According to a directory and analysis of business micro dealers which the company is now offering for sale, only just over 10 per cent of business micro dealers are 'retailers' — and by far the biggest number of them are 'systems houses'.

'One would expect the proportion of retailers to increase with the expansion of such chains as First Computer, and Computerland, and with the entry of such firms as WH Smith into this market,' comments the launch announcement from Romtec. 'However, the WH Smith outlets have not developed sufficiently yet as business micro dealers to be included in this issue of the directory,' it concludes.

The directory isn't casual reading for users, at £595 plus a £95 per quarter update service. And at that price, Romtec faces a considerable scepticism barrier, arising from a colossal bloomer last year.

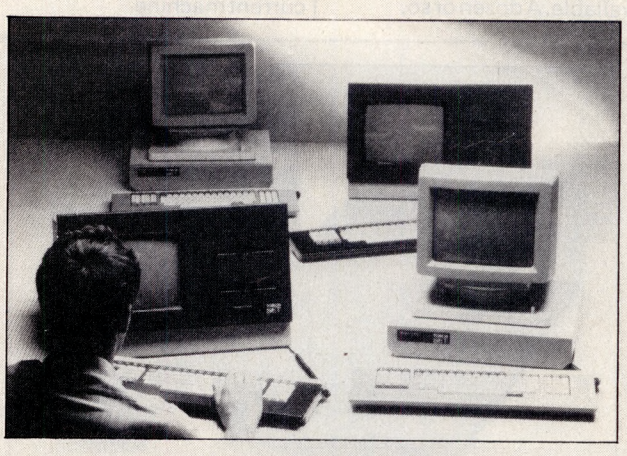
What happened was that the report went out claiming that one particular chain of business micro shops was the largest in the land — much to the surprise of most of us, who had never heard of it.

Two weeks later, when that chain went bust, it turned out that the company had invented most of the statistics which it had fed to Romtec, which, at the time, had no way of knowing they were entirely spurious.

This year, Romtec has acquired credibility in the form of a new research analyst, Ruth Stopford, from the Micro Industry Planning Service at IDC.

Stopford assured me that the job of checking facts was now in safe hands. 'Eighty per cent of my job is checking and updating, continually calling people to cross-reference information,' she said.

Also, Stopford said, Romtec had had 'a lot of feedback, from clients who have pointed out



The Torch variant of the BBC Micro has been turned into the heart of a printer's typesetting network.

It may not be the sort of thing you want to buy for home use, but it seemed worth mentioning because of the way Torchset Systems (the company which designed the typesetting equipment) decided to link the Torch systems, terminals, phototypesetting machines and so on — the company used a local area network. It includes telephone modems, telephone diallers, voice message links, and the normal features of data storage and shared peripherals.

The networking system chosen is the Cambridge Ring. More details on (061) 834 8564.

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There's never been a business software system like it before.



If you're in the market for business software, we think you ought to read our brochure about Xchange before you reach a decision.

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Each of the four programs, in the expanding Xchange system individually competes with the very best in its field.

And the programs also link together to form an integrated software system that allows you to transfer information between programs with remarkable ease and speed.

The Xchange programs can either be purchased as a complete suite or separately to build a system that's exactly right for you – and to add to later as you require.

This modular approach to integration puts Xchange in a different league to ordinary "all-purpose" programs. It's the difference between a team of specialists working together and a jack-of-all-trades trying to do everything.

Rapid switching between tasks boosts the productivity of you and your micro.

Xchange enables you to switch between as many as eight completely different tasks and transfer information freely between them.

For the first time, you can have a micro that really works the way you do – moving from job to job and working with different people throughout the day. With Xchange, it's like having eight micros on your desk at the same time.

Xchange will be available shortly for the IBM PC, IBM XT, Apricot, Apricot xi and Sirius 1. The complete suite costs £495, individually the Word Processor, Spreadsheet and Business Graphics programs £175 each, the Database £250 (all excluding VAT). Versions for the Apple Macintosh, and other leading makes of 16-bit micro are under development.

Xchange – a software dream come true.

To give you the complete picture of how Xchange can transform the way you use your micro, we've written a brochure giving full details of each of the four programs, and the way they link together. It tells you everything you need to know. Complete the coupon or call us on 01-200 0200 and we'll send you a brochure by return post.

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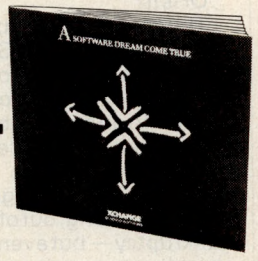

'Xchange' is a trade mark of Psion Systems Ltd., and is sold subject to standard terms and conditions of use, copies of which are available direct from Psion.

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PCW 93



This is not a Bering: that's the name of the American manufacturer—this is actually a Sponge. It 'soaks up' data off a hard disk HP 120 micro, onto its 15 Mbyte tape. What makes it different from other systems for making safety tapes of the contents of hard disks is the fact that it can actually pretend to *be* the hard disk, if that disk goes down—with a 64k 'cache' to speed it up. Transfer of the full 15Mbytes takes just over six minutes, which is not slow. But then £2500 isn't cheap.
Details on (01) 245 6844.

any odd figures, which we have then been able to go back and check.'

The other information of real interest in the directory is the list of 2000 dealers, which Romtec reckons is the longest such list in the country. So scarce is hard information about the micro world, that this may even be true.

Details of the report on (0628) 74242.

Better 'green' than soft!

Software shops are likely to go into shock as the news crosses the Atlantic of the collapse of Softwaire Centre, a massive franchise-store operation which had some 60 outlets in the US.

That group sold only software, and was the first of its type when it opened up in California nearly two years ago. Now, it is one of six such software-only chains, and the first major casualty of the software flop.

Or is it?

The group has now been taken over by Wayne Green, a man with fingers in more pies than there are crusts to cover them, and an old-established, if not leading, software publisher.

Admittedly, Green got the group for a song, out of bankruptcy—but even so, he sounds very convinced that he will make money from day to day, selling software in the US.

Observers blame Softwaire Centre's collapse on too rapid growth, which seems likely.

In this country, however, people like Kelvin Robertson, head of Pilot Software (the UK's closest approach to a software chain) are feeling very nervous about it, all the same.

'Nit-picking?'

There is no gratitude in this business: Commodore, by including three software packages with the 8096D micro, could reasonably expect praise for giving away £865 worth in the £1690 price of the system.

The packages are Superscript, a word processor which includes a spelling checker; The Manager, a database and file manager; and Calc Result, a financial planning spreadsheet.

The system itself has 128k (these days, a drip, of course) and a two megabyte dual floppy which is still pretty impressive, even these days, plus integral monitor and keyboard.

It is sheer nit-picking on my part to grumble that the software package is only worth £865 because Commodore put the price of Superscript up, from its original £35, to a few hundred.

Hatching golden eggs

John Hatch must be a brave man—he has earmarked £5m for the purpose of investing in young, start-up software companies.

His company is called Venture Link, and its chairman is Duncan Fitzwilliams, who tells me he founded the well-known computer comms company, CASE.

Over the past five years, Venture Link says, it has raised over £20m for 'other young companies with the same ambitions as CASE,' and Fitzwilliams says that a special feature of his operation is that 'we like start-ups and very new companies, based on a good proven management team.'

The 'good proven management team' would rule out most of the software companies I know—many young people with the spending habits of millionaires have struck me as the sort of tycoons who would have trouble making money out of any organisation more demanding than an independent television company.

Still, Venture Link has a long list of wealthy institutions from Royal Life, through Guardian Royal Exchange to the Water Authority's Superannuation Fund; so put together your management proposals, decide which of you will be chairman, *stick to it*, and call John Hatch on (01) 236 6891.

Acorn's expensive mistake?

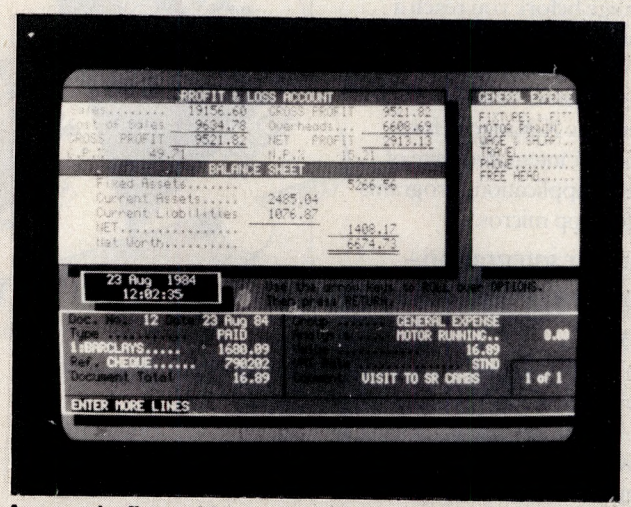
Acorn has been changing the prices of BBC Micro add-ons like disks and second processors.

The single disk drive, 100k of storage, is officially £199, down £50. The Z80 second processor, however, is up by £100 to £400.

When everybody else is cutting prices, this rise is bound to take eyebrows with it.

The excuse given by Acorn's Tom Hohenberg is that his 'dealers need a larger margin to enable them to expand and improve their customer support services.'

It is certainly true that dealers hate selling BBC Micros, because they make so little money on it (the BBC does quite well out of it, and so does the factory subcontractor), and need a spoonful of something sweet to encourage them to



Among the first evidence of the thousands of software houses which (Nigel Searle tells me) are all beavering away on software for the QL is an accounting package.

How you order it in a shop, beats me. You have to go up to the counter and say 'Can I have a copy of' and clear your throat before coming to the title 'iT! CASH TRADER.' Pronounced small-eye-big-tee-pling, I suppose.

It costs £75, and versions will be available shortly for Apple, IBM, Apricot, BBC, Amstrad, and 'other business micros' it says in the press release.

It is entirely a defect of my own mentality which prevents me taking a package called small-eye-big-tee-pling (or shriek) seriously. Accounting Software of Torquay, however, is very proud of it, and includes a review of the package with the announcement, which it will send to anybody who contacts it on (0803) 313454.

The company itself describes the name as 'somewhat gimmicky,' which I won't waste time arguing about.

A COMPLETE COLOUR MICRO WITH NO HIDDEN EXTRAS FOR AROUND £499.



The title of 'genius' is not bestowed ghtly on man or machine: those extra- rdinary qualities and powers of intellect re rare.

Einstein had them in full measure. And so now does the new micro omputer from Tatung, designed and uilt in Britain and appropriately amed – Einstein.

Einstein was created by Tatung, one f the world's leading electronic companies, nd given the capacity and the remarkable apabilities to compete with computers costing far more.

Its simplicity of operation will appeal to the first time buyer nd to businessmen who don't want to lose staff to expensive and ime-consuming training courses. At the same time its operating ystem is both powerful and sophisticated to satisfy the most dvanced requirements.

For those who have outgrown their existing primitive machine, the speed and capacity of the 500K built-in disc drive will make all the difference. And for the small businessman, the ability o store and retrieve all information in seconds will be as important as Einstein's built-in flexibility, which allows the system to grow as the business develops.

BUILT-IN 80K MEMORY

Total memory capacity 80K RAM divided into 64K 'user' memory and 16K for colour graphics production.



BUILT-IN DISC DRIVE 500K 3" compact floppy disc drive. Potential for massive extra storage with a second 500K disc drive internally.

BUILT-IN 16 COLOUR GRAPHICS High resolution graphic animation from 32 sprites (definable shapes), 16 vivid colours.

BUILT-IN EXPANSION PORTS

Connection to both TV and optional colour monitor, most printers and other computers via RS232C interface. Also twin joystick ports, 8 bit user port, exclusive Tatung Pipe.

BUILT-IN FLEXIBILITY

Powerful Crystal BASIC. Multi-lingual plus ability to run CP/M.†

BUILT-IN VERSATILE SOUND

Sound synthesiser facility includes chromatic music with three voices. Substantial speaker with volume control. Provision for speech synthesiser.

Einstein has them all. Feature for feature, it meets the needs of the novice and the experienced operator, both at home and in the office.

Einstein, designed and built in Britain, is a complete colour micro computer with no hidden extras.

And for under £500 is sheer genius.

TATUNG

Einstein

SHEER GENIUS: AT WORK, AT HOME.

DIAL 100 AND ASK FOR FREEFONE EINSTEIN FOR YOUR NEAREST STOCKIST.

†CP/M is a trade mark of Digital Research Inc.

THE PSION

THE WORLD'S FIRST PRAC

THE PSION ORGANISER WILL CHANGE THE WAY YOU WORK

Imagine how much more convenient and simple your life could be with a full-feature microcomputer – including screen, keyboard, mass storage and software – in your pocket.

That's what THE PSION ORGANISER gives you – a uniquely versatile and innovative computing resource incorporating hybrid microprocessor technology more advanced and powerful than that found in micro computers twenty times the price!

A UNIQUE NEW INVENTION

Thanks to a Psion-pioneered breakthrough in solid-state drive technology, the ORGANISER's data and program packs offer open-ended, failsafe storage and ultra-fast operation.

- **Built-in data-base facility allows instant access to programs and information.**
- **Simple operating procedures for ease of use.**
- **Off-the-shelf software library provides a mass of powerful programs and information designed to solve problems at work and home.**
- **The purpose-designed POPL programming language enables you to write and save your own programs.**
- **Communicate with office computers, printers and other peripherals through a standard RS232 interface.**

PACKED WITH EXCLUSIVE FEATURES

- Solid-state drives access information in milliseconds.
- Information stored on datapaks is totally secure. Datapaks may be removed from the Organiser and still retain their information. Datapaks are re-usable through formatting.
- Solid-state drives allow the open-ended use of software and data. There's no limit to the amount of information or variety of programs which can be slotted into the drives.
- Auto-switch off after 5 minutes and low power-consumption CMOS components give six months' life in typical use with standard PP3 battery.
- 16 character alpha-numeric display with full scrolling over a 200 character record with adjustable contrast.
- Includes an editable calculator. Lets you carry out complex calculations involving up to 200 characters and two levels of brackets. Using the editing facility you can amend your calculation during entry. Moreover, you can go back and edit both data and formulae after a calculation has been carried out allowing you to carry out "what if" analyses.
- The special UTILITY PACK extends the power of the calculator even further with an extensive range of additional mathematical and scientific functions.



ONLY £99.95 (+P&P)

Includes FREE
– 8K Datapak
– Utility Pack

- Includes time and date clock function.
- Tough, protective sliding case.
- British designed and built with the highest quality engineering including gold-plated contact points and connectors for rugged, reliable use.

THE PSION ORGANISER: THREE WAYS TO PRACTICAL POCKET-COMPUTING

Use THE PSION ORGANISER in any of three ways:

AS YOUR OWN PRIVATE DATABASE TO STORE PERSONAL INFORMATION AND RETRIEVE IT INSTANTLY

You can use the Organiser to store all the vital day-to-day information you need –

Names and addresses	**Expense details**	**Survey information**
Meeting notes	**Restaurants**	**Statistics**
Schedules	**Timetables**	**Exchange rates**
Important dates	**Customer and supplier records**	**Experimental data**
		Personal Reminders

ORGANISER

TICAL POCKET COMPUTER

THE PSION ORGANISER: IT'S LIKE HAVING A FILING SYSTEM IN YOUR POCKET

Forget about diaries, notebooks and the backs of old envelopes. THE PSION ORGANISER allows you to type in information as you want and file it away at the touch of a key for instant future reference.

Retrieving information is every bit as simple. Just type in a keyword, a few characters, or even a date or number. THE PSION ORGANISER will search out the appropriate records and display them on the LCD screen. The simple scrolling facility allows you to view an entire entry up to 200 characters long.

Entries can be easily amended and edited and, since all data is permanently stored, there is no danger of it being lost – even if the battery is disconnected. A choice of 8k or 16k datapaks is available for you to build up an infinitely large information base.

WITH READY-TO-RUN SOFTWARE FOR IMMEDIATE PROBLEM SOLVING

A comprehensive range of ready-written software programs is already available for THE PSION ORGANISER and more are on their way.

FINANCE

Mortgage – monthly repayments
Cash Flow – net present value
internal rate of return
Investment – bond redemption
yield, equity price to earnings ratio estimates
Compound Interest – payments
present value
capital appreciation
savings
Depreciation – straight line
reducing balance
lifetime estimate
depreciation charge schedule
book value schedule

SCIENCE

Physical Constants – Planck, electron mass, electron charge, Rydberg, Gravitation, Avogadro, speed of light, sound. Gas constant, permeability, permittivity, earth radius, Bohr radius, Astronomic unit, etc.
Conversion Factors – UK to MKS etc.
Formulae – LC circuit, Lenses, Bohr energy levels, Larmor, plasma, etc.
Integration Under a Curve
Least Square Fit
Solution of Polynomial Equations

UTILITY

LOG, ALOG, LN, SQRT, EXP, SIN, COS, TAN, ATN, ABS, INT, DEG, RAD, MOD, MIN, MAX, FAC, SGN, ROUND, MEAN, STDEV, PI, RND, RAND, ENG, FIX, POWER FUNCTION AND COPY.

MATHEMATICS

Bessel – functions
Polynomials – solutions of equations
Matrices – solution of matrix equations
Eigenvalues
Integration – under a curve
Curve-fitting – least squares
Statistics – mean
standard deviation
Chi-squared

LINK-UP COMMUNICATIONS

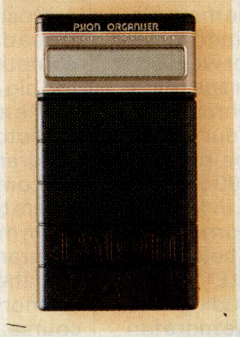
– Industry standard RS232 with ribbon cable plugs into a solid-state drive.
– Configuration module sets the Organiser to transmit and receive programs and data. Options are selected using the cursor keys including:
BAUD RATE : 150-9600
PARITY : ODD, EVEN, MARK, SPACE, NONE
PROTOCOL : NONE, RTS/CTS, XON/XOFF

AS A PERSONAL COMPUTER TO RUN YOUR OWN PROGRAMS

THE PSION ORGANISER has its own programming language – POPL – contained in the Finance, Maths and Science packs.

POPL is built around a set of straightforward commands such as IN, OUT and GOTO. It enables you to write your own programs which can be as simple or as sophisticated as you choose. By storing and saving programs in a datapak, you can run them whenever you need.

SLIDE OFF CASE GIVES FULL PROTECTION



EASY TO USE, POSITIVE TOUCH KEYBOARD



DATA & PROGRAM PACKS SLOT INTO SOLID-STATE DRIVES



INTERFACE LINKS ORGANISER TO OTHER COMPUTERS & PERIPHERALS



DEVELOPED BY ONE OF EUROPE'S LEADING MICROCOMPUTER SOFTWARE COMPANIES, THE PSION ORGANISER IS THE WORLD'S FIRST PRACTICAL POCKET COMPUTER. FILL IN AND RETURN THE "FREEPOST" COUPON TODAY AND GET THE POWER OF A DESK-TOP MICRO IN YOUR POCKET – OR CALL US ANYTIME ON 01-200 0200 TO PLACE YOUR ORDER

PCW 2

TO: PSION LTD., Freepost, 22 Dorset Square, London NW1 1YP.

Please send me by registered mail:	Quantity	Price	P+P	Total
Psion Organiser with 8K datapak and free Utility Pack		£99.95	+£2.50	
Science Program Pack		£29.95	+£1.50	
Maths Program Pack		£29.95	+£1.50	
Finance Program Pack		£29.95	+£1.50	
Link-Up Communications Pack		£39.95	+£1.50	
16K datapak		£19.95	+£1.50	
8K datapak		£12.95	+£1.50	

I enclose my cheque/Postal order made payable to Psion Ltd. for _____

or Please debit my credit card: (please tick appropriate Box)

Access ☐ Barclaycard/Visa ☐ American Express ☐ Diners Club ☐

Card No: _____

Signature: _____

Name (Mr/Mrs/Miss/Ms) _____

(Please print)

Address _____

_____

_____

Postcode _____

☐ Tick for further information.

To place an order over the telephone, ring 01-200 0200.
Psion Ltd., Reg. No. 1520131 England.
Orders can only be accepted for delivery within the UK. Please allow 28 days for delivery.
If for any reason you are not completely satisfied with your Psion Organiser, return it in good condition within seven days and we'll return your money in full and without question.

PSION

get enthusiastic about any other Acorn products.

But it is also true that once you add up the cost of a BBC Micro, the Z80 processor, a pair of diskettes, even without a monitor, the system that results fetches a total of £1400. The diskettes cost £700 odd all by themselves.

Well, you can make allowances. You can point out that the machine includes a list (Memoplan, Fileplan, Graphplan, Accountant, and Nucleus plus, for programmers, CIS Cobol, Professional Basic, and BBC Basic) of software that would fetch quite a sum.

But the fact of the matter is that nobody thinking of buying their first computer would seriously consider spending £1500 on a monochrome CP/M system taking up four separate, big boxes (plus monitor) — or £1700 on a colour equivalent, in 1984.

Even an old Osborne 1 at £700 sounds like a better bet, and the Kaypro 2 at £1100 or the Wren at £1000 including modem sounds like more fun — all of which are portable.

Unless, of course, you already have a BBC Micro and an expensive colour monitor, in which case another £100 on the cost of the add-on Z80 must seem neither here nor there.

Thanks for the memory

The Wren has now joined the list of machines which possess the inestimably wonderful luxury of a memory disk.

The Executive can have its 64k upgraded at a cost of £400, to 256k, as a 'post-sales option,' says the company. It takes three days to do (you send the machine back to Wren) and it ought to make all the difference.

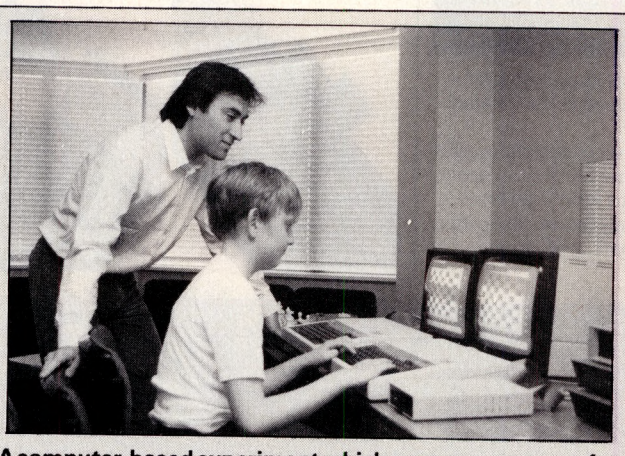
Most business software these days doesn't fit into the computer's memory. It's just too big and complex.

The most usual way around this is to keep parts of the program on the disk, and when the computer reaches the point where the next instruction is not in memory, the rest of the program can be read off disk, over the code that was in memory before. And, of course, when the main section is needed again, it has to be read back in.

The result can be delays of up to six seconds, before the computer works out how to respond to a command given by the operator. You can hear it happening — a grinding noise as the disk head walks across the surface, looking for the right track, then another as it goes back to the directory track to work out where the next information lies.

On a RAM disk system, the whole grinding operation happens in milliseconds. On my own Osborne, the computer can't normally read the keyboard while it's looking at the disk, and so as soon as the disk starts working, the keyboard goes dead. But with the RAM disk it all happens so fast that you never miss a keystroke.

Readers may recall that apart from the Hyperion, the new, upgraded IBM PC Junior can have this facility, so it's obviously getting fashionable. I hope to be able to report on how well the Wren system works in the December issue.



A computer-based experiment which even non-owners of computers can share will be the primary school chess competition organised by Acorn.

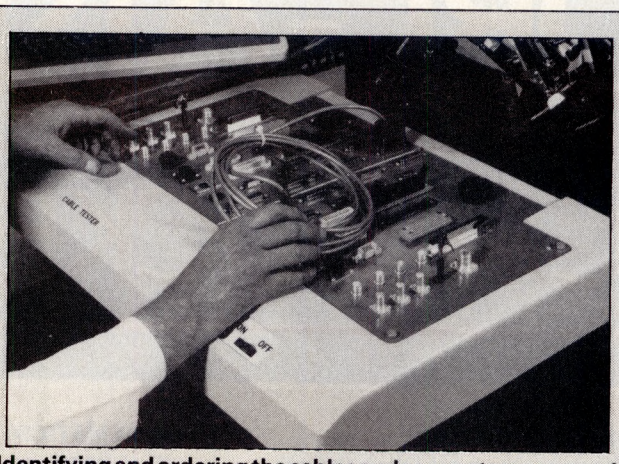
In the final stages, the competition will be played on computers (BBC Micros) linked by direct phone lines to the BBC's Ceefax teletext centre.

As a player enters a move on a keyboard, it will be transmitted to the Ceefax centre, where it will automatically be transferred to Ceefax pages.

The competition starts with regional heats in over 20,000 schools in October. Only when it gets down to the last eight finalists in round three, will the Ceefax commentary start, in January.

Meantime, why not try Oracle, Channel 4, page 557? It's me, giving advance snippets of Newsprint.

Acorn's picture shows Simon Huth from Patcham Middle School in Brighton, playing under the supervision of William Hartston. Acorn describes him as 'the international master in chess,' which makes him sound like a colleague of the local master in athletics but is actually meant to be recognition of his chess-playing ranking.



Identifying and ordering the cables and connectors you need can be a problem. Indeed, as computer services company DNCS more graphically puts it, it 'can be a nightmare.'

But DNCS has some ideas to help users sleep more easily. If you know the manufacturer's equivalent part number, then ordering from DNCS is straightforward. If not, you can check through the company's catalogue and identify what you want from the photographs. For the more adventurous there's a do-it-yourself service, for the less an on-site service.

DNCS checks that you've actually chosen the correct photograph and the cable testing system shown above also checks the cables to make sure they perform properly.

More details on (0706) 67567.

Research shows its bigger and safer...

Education specialist Research Machines has enlarged the capacity of its ROM pack to 64k, giving users more instantly-available programs for the 480Z.

The system is, the company observes, very helpful in schools where accidents can happen to floppy disks, but where ROM chips cannot be 'inadvertently' erased by an exuberant student.

And in primary schools, where children might normally wait for minutes to load software off cassette tape, a great deal of time can be saved, especially now that there can be four different programs on one ROM pack.

Details on (01) 235 7040 from RML's publicity agent.

Statistical guide

Who sells more micros, Apple, or IBM?

The answer, by quite a margin (according to an American survey done in August) is Apple.

In the US, Apple claimed a total of 45 per cent of micro sales, spread across its three main ranges of IIe, IIc and Macintosh.

IBM, with both PC and XT to sell, sold 25 per cent of the units.

The surprise isn't quite as huge as it seems, however, for two reasons.

The figures are compiled by Infocorp, and they show sales through retailers — and IBM sells a very great many micros direct to its big corporate customers. So, of course, does Apple, but by common consent, not to the same extent.

And secondly, Infocorp

emphasises, the actual value of sales is quite remarkably different, with IBM very nearly getting the same. In dollar shares, IBM gets 14 per cent of the total amount spent for selling the XT, it gets 19 per cent for selling the PC, (a total of 31 per cent) and Apple only gets 35 per cent if you include the four per cent of the dollars which are spent on the Lisa.

Actually, careful students of the US market wouldn't have been quite so surprised by those figures, as they doubtless were to discover that Kaypro sold the same number of machines as Compaq in the period noted (July). Each got five per cent of the market. In dollar terms, however, Kaypro only got four per cent, and Compaq seven per cent, because Compaq charges a great deal more per machine.

Commodore, too, topped one poll in this survey. It was 'mentioned far more than any other company, as having reliability problems,' says the report.

Scoring points for action

There is 'a lack of suitable multi-user software for the Apricot range,' according to Software Ltd, business software distributor—which lack the company now hopes to reduce.

The announcement by Software Ltd falls some way short of actually solving the problem, since the only concrete action it can reveal at this time is that it is going to do something about it.

'Over the coming months, we will be encouraging all the software houses and authors we deal with,' said Aidan Shackleton of Software Ltd, 'to come up with multi-user versions of their existing products.'

There is more to this than a kindly smile at his enthusiasm, however, because what has attracted his attention is not just the Apricot, but the very significant announcement that was made when the new Portable and F1 models were announced. That referred to two networks.

Shackleton, probably quite correctly, apparently feels that many people will have missed the fact that multi-processor networks require a totally different approach to multi-user software from multi-terminal systems on a single processor.

And, equally correctly, he has identified the Point 7 and Point 32 networking systems as significant developments in the market for networks—if the software can be found.

'We want to have a substantial number of multi-user packages fully tested and ready for release by early next year,' Shackleton announced, adding that arrangements had already been made with ACT to obtain equipment to test the new software as it appeared.

'We will also be promoting the packages through the ACT dealer network,' he added.

Anyone care to waltz?

One company which got very excited by IBM's announcement of the PC/AT was a rival which has just launched a very similar system—Northern Telecom, with its Vienna family.

Bravely suppressing any impulse to panic at the discovery of the world's biggest computer company suddenly sitting bang in a patch it thought it had cornered for itself, Northern Telecom has pronounced the Vienna 'endorsed' by IBM's AT.

The similarity is the use of the Xenix operating system on a box with the Intel 80286 chip.

'The IBM announcement meant that the 286 Xenix route will now become an industry standard,' commented Barry Eames, vice president (Europe) of NT Data Systems.

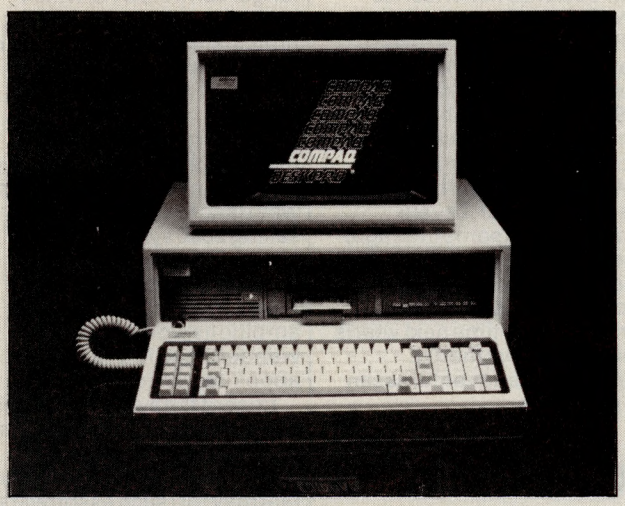
Think positive, that's what I say. And with the appointment as distributor for the Vienna family of the Fraser Williams Group, tremendous success must be a foregone conclusion.

The distributorship agreement was signed in September, and anybody wanting details can contact Northern Telecom in Harpenden on (05827) 63161.

Amstrad takes the lead

Amstrad is winning the race to attract games conversions if Level 9 is anything to go by.

Level 9's five text adventures are available for the CPC464 now, plus a new graphics adventure called Return to Eden, the second part in the



Talk about caution. Interface Network PLC took no chances when it declared its Holborn store open. The official launch took place three months *after* trading began from the new premises. Just to make sure there were no Sinclair-style foul ups.

The new store is a franchise operated by 25-year-old graduates from Jesus & Pembroke Colleges (Cambridge) and a relatively ancient 36-year old (Queen's, Oxford). The rest of the 19 staff weren't educated anywhere worth mentioning, so the handouts don't. But then Interface Holborn is targetting the Square Mile, London's old-boy network of bankers and brokers, so not being educated at Oxbridge is a serious blot on a computer retailer's credibility.

Nestling in the surrounds of Interface Holborn, machines from Compaq and Hewlett Packard were on show for the first time. The Compaq Deskpro top of the range model has half-height, 10Mbyte winchester twin half-height disk drives (capacity unspecified) and a 10Mbyte tape backup cartridge which takes 18 minutes to save the entire contents of the winchester.

Instead of the IBM PC's 8088 8-bit data bus processor, the Deskpro has an 8086 with a 16-bit bus. This, according to Compaq, is why the machine runs IBM software two to three times faster than the PC. Executives whose time is valued by the second should note that recalculating 8320 Lotus 123 cells takes the IBM PC 52 seconds but only 26 on the Deskpro.

Pricing for the Deskpro range was thrown off balance by IBM's announcement of an 18 per cent price cut in XT prices. This led to a scrum at Compaq (UK) headquarters as the debate on how much to undercut raged and no decision had been reached by press time.

Hewlett Packard's desk-top laser printer comes in at £2975 (ex VAT). It, together with the HP110 lap-held (Benchtested July 1984), and the 9114A single double-sided 710k disk drive for the same, will all be available in the UK from 1 November.

The laser printer is small. I measured it with my arm at 20in × 20in × 14in high. Like the Think Jet printer the HP2686A is the result of cooperation between HP and Canon, and if you didn't know what you were looking at, you'd think the laser printer was a diminutive photocopier. But here's the bad news, it doesn't make photocopies.

If that doesn't bother you, you may be impressed by a printer that measures its speed in pages per minute (eight of them) rather than characters per second (but as you're dying to know you get 300 and all letter quality). The only clue that it isn't a photocopier is the font-cartridge slot at the front and the RS232C interface at the side.

For once HP has made the first issue of a new product compatible with PCs other than its own. Even so, £3450 (inc VAT) is more than most PCs cost, and HP may find that the real laser printer market is with mini installations, where *that* sort of money for *that* sort of printer is peanuts.

firm's science fiction series which started with Snowball.

But MSX users will have to wait. Level 9 hopes to work on converting its games for the MSX machines so that versions will be available 'possibly before Christmas.'

And QL users will have to wait even longer. Level 9 ordered its QL some time ago, decided that it had waited long enough and cancelled the order. Then the machine arrived. Some time next year is now the earliest that QL versions of its adventures can be expected.

Arrow with a poisonous tip

Another entertaining chapter in the Hyperion/Gulfstream story was opened by the announcement by Arrow that it was going to market the ITT 3030 micro.

Arrow was the bit of Gulfstream which was sold off, when Bytec took over the Hyperion side (which ended, of course, when Bytec gave distribution rights to Anderson Jacobson after all, and closed Gulfstream down, but that's another story) and it is now out to make its own mark on history.

Quite what sort of mark it will be is another question.

The machine itself has failed to thrill me for nearly three years now. It is an 8085-based CP/M system, developed by a German company. ITT no longer controls STC, which had the marketing rights, but nonetheless STC has taken on ITT's imitation IBM, the Xtra. And it has dropped the 3030 dead.

Plans are to emulate the machine's remarkable success in Germany, says Arrow. Just what is so remarkable about selling 2000 systems wasn't explained in the announcement, but if that is the limit of the company's ambitions, you can't help wondering why it has appointed 33 dealers.

Price of the system has been cut, by the simple expedient of 'unbundling' some of the things you were obliged to buy (and pay for) such as software. Without most of the software, the thing still costs well over £2000—in a market where a Wren, with colour, modem, portability, more memory and full software complement is going for around £1000.

And the 3030's 8085 chip won't run the quite substantial amount of ordinary CP/M software which has been written for the Zilog Z80, either.

Bad practice at school

It would be honest to start an enthusiastic sermon by SFIA—that multi-user machines are bad for schools—by explaining that the old School Fees Insurance Agency sells single-user micros for schools.

The company sells packaged systems on machines like the Olivetti M20, and has become irritated to discover a 'fashion' for buying bigger, multi-terminal systems, in some schools. This is a waste of money, says SFIA.

'Many schools believe, falsely, that they need to share access to data. In fact the different departments in most schools will generally use entirely separate sets of information—for instance, the headmaster's secretary would have no reason to be interested in data held by the bursar, and the bursar doesn't require access to information held by the secretary of the Old Boys' Association,' remarks the company in a recent press announcement.

By using discrete units instead of a fully integrated system, adds SFIA, 'the situation is avoided, where one erroneous piece of data, once input, is automatically multiplied.'

And anyway, since micros are very cheap, why buy the more expensive micro-mini? 'Schools, unlike small businesses, can predict their future administration needs very precisely, and therefore do not need to invest for growth.'



The UK distributor of one of the fastest machines *PCW* has Benchtested, the Sage, has helped to develop an even faster micro.

The TDI Pinnacle is the machine's full title—TDI is the UK end of the operation while Pinnacle Systems hails from Dallas. The machine's speed stems from its 68000 CPU running at 12MHz with no wait states.

A system with 256k of RAM, a 10Mbyte hard disk and one 800k floppy disk drive costs nearly £5000. This supports up to seven users via RS232 serial ports. Giving each of these users a terminal and keyboard costs about £700. So, the cost per user comes in at about £1400.



Televideo, which makes an imitation IBM micro, has now released a portable version through UK distributor, Thorn EMI Computeraid.

This box weighs 28lb, costs £1895, and includes only one diskette, but also packs in a parallel printer port and a serial comms port. Software included is Telesolutions stuff to do word processing, spreadsheet and data file management. Colour output is included, too.

Details from dealers or on (0908) 668778.

Books to improve your typing

Tandy has come up with an interesting solution to the problems associated with keyboard entry—its Electronic Books consist of a nine-key membrane keyboard mounted inside an ordinary plastic ringbinder.

The product is aimed at the educational market. To ensure acceptance in UK schools, Tandy has taken the unprecedented step of including BBC-compatible software as well as the Tandy version in every package.

The hardware is completed with a single cable from the ringbinder which plugs into the micro's joystick port. To use the system you insert a 'book' into the binder rings so that each right-hand page lies on top of the keypad. Pressure on these pages at labelled points is converted to an integer which a Basic program can use in an IF . . . THEN condition.

The keypad is sensitive enough to respond accurately

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MICRO DISCOUNT LTD OFFERS THE BEST PRICES AROUND

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COMMODORE SX 64	£585.00
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EPSON PX 8 (PORTABLE + software)	£625.00
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APPLE MACINTOSH	£1600.00
APPLE 11C	£800.00
APPLE 11E	£450.00
APPLE PERIPHERALS	POA
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COMMODORE 1541 Disk Drive	£154.00
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FIDELITY CM 14 Colour Monitor	£165.00
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ANADEX DP 9000B 180CPS	£786.00
ANADEX DP 9620B 240CPS	£910.00
ANADEX DP 9725B COLOUR	£1086.00
ANADEX DP 6500B 500CPS	£1999.00
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EPSON P40 PX8 MODEL	£70.00
EPSON P80	£135.00
EPSON JX 80 COLOUR	£450.00
EPSON RX 80 T	£185.00
EPSON RX 80 F/T	£212.00
EPSON RX 100 F/T	£338.00
EPSON FX 80	£318.00
EPSON FX 100	£420.00
EPSON LQ 1500	£867.00
Sheet feeder for EPSON's	£179.00
OKI MICROLINE 82A	£229.00
OKI MICROLINE 83A	£369.00
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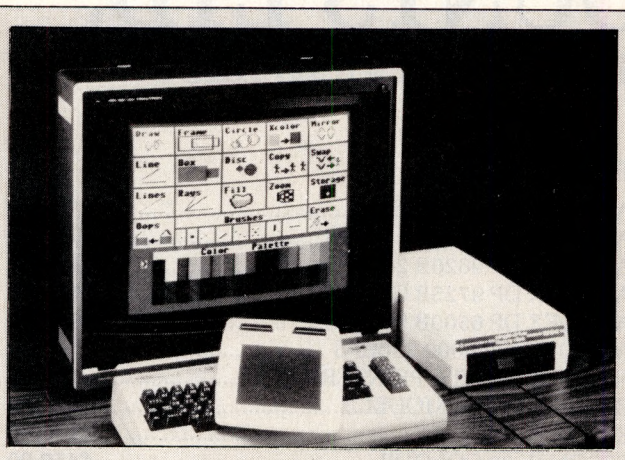


Audiogenic has got the rights to sell Koala touch pads—very popular in American schools—in the UK.

The pads and other 'direct entry' devices like light pens are available for Apple Commodore 64 and IBM micros, but Koala plans to have BBC Micro versions available before Christmas.

'Each product bypasses the keyboard to simplify creating and editing graphics, and to speed commands,' says the company. Software comes with the pads—the 64 package shown here is a drawing program called KoalaPainter.

to pressure through the thickness of a phone book.

Tandy UK picked up the idea from independent programmer Danny Phillips, and Tandy's interest has enabled him to set up a software house, Spectrarts, which has developed the first range of educational software for the Electronic Book.

Tandy is on (01) 836 1527.

Ready for blast-off!

You can now get Fortran as a programming language, on the new lap-held portable Epson PX-8 CP/M micro.

The software is provided by Transam, which has also released a program to let the machine communicate with the IBM PC, or other MS-DOS (or CP/M) micros.

The transfer program is called BLAST (for Blocked Asynch Transmission) and works in block mode, so it isn't suitable for attaching to time-sharing services as a dumb terminal. But then the PX-8 includes suitable software for that anyway.

In passing, it's nice to spot another WordStar user, who accidently hit control-Y, the command which deletes whole lines.

According to Transam's announcement, Fortran is the 'fourth language that the company has transported onto Basic, Pascal and Lisp and C.' We've all done it, Simon, and people will ring you on (01) 631 3434 to commiserate.

Back in orbit

Browns Computer Systems has found a neat way of getting publicity for its Apple dealership in Oxford, by praising Peachtree Software to its face.

Peachtree took over the marketing of Orbit accounting software, and, (says Peachtree) vastly impressed Browns by re-writing it.

Quoting from Peachtree's own pronouncement, Browns managing director Roger Jarman points out: 'We liked the Orbit package very much, but we were also aware of its shortcomings. Peachtree has eliminated those faults and produced a comprehensive product with greater quality.'

Reading between the lines, another interpretation might be that Browns was about to throw Orbit into the bin, when Peachtree took it over, but decided that in its improved form, it was worth keeping.

The dealer uses the product, now called PAAS (Peachtree Apple Accounting System) as the financial end of a restaurant management system which lets waiters and waitresses use a touch-screen to enter orders into the Apple.

On the road to recovery

Big Dec, the minicomputer company, says it's struggling a bit with the micro market, and plans to add to the number of dealers carrying its machines.

Encouraging news, then, from one distributor—Hoskyns, which sold a million pounds worth of DEC micros to British Road Services.

Not only is it a big order, but it is part of a deliberate plan by BRS to get rid of its mainframe computers, says Hoskyns.

The plan is to replace the old giants with a network of personal micros, and powerful Vax minis.

The company is starting out with 126 micros and six Vax machines. The network will handle accounting data, electronic mail, and telex.

Eventually, the plan is to extend the network outside BRS, so that its customers can link in direct with orders.

Tune into Compunet

Commodore has finally announced the Prestel-style user net which so many industry watchers had predicted and had come to doubt would ever appear—Compunet.

For the cost of the modem, £100, you get a year's subscription to Compunet, which is officially described as a database service.

Prestel's microcomputing service, Micronet, responded to the announcement by producing a service for Commodore 64 users.

Theoretically, the Compunet modem will work perfectly well on Micronet, because they use the same Prestel standard.

However, the Micronet service includes the downloading of software, some free, some best-seller stuff at reduced prices. And the software to do this is supplied by Micronet in the form of a plug-in cartridge.

Whether the Compunet software will download Prestel software remains to be seen, and until I've had a chance to test both systems, I don't feel confident enough in the information available to pass on an opinion.

Micronet is on (01) 278 3143.

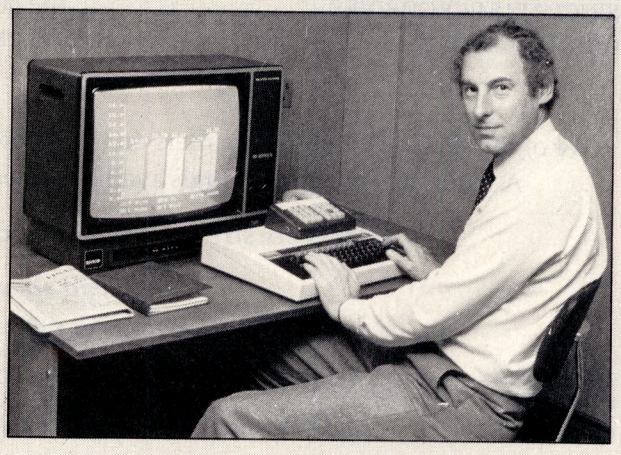
Details of the Compunet service, which was demonstrated at the *PCW*'s Show, are available from Commodore. But don't make the mistake of trying to call Slough, because Commodore isn't there.

It has moved into its new Corby factory, where the phone number is (0536) 205555.

British Telecom playing with fire?

British Telecom's entry into the micro software market with Firebird Software has particular claim to interest *PCW* readers.

Faithful readers of the magazine will recall that in our February '84 issue we told the story of Tony Rainbird who planned to challenge the big software houses with his



It may look like a BBC Micro; what it is actually doing is running a special plug-in ROM chip developed by stockbroker Scrimgeour Kemp-Gee (SKG), which turns it into a terminal to a central Digital Equipment Vax mini.

It also communicates with the stock exchange's TOPIC viewdata system, which shows share prices. What makes it interesting is that SKG has already sold over 100 systems to its clients, as a way of keeping in touch with their portfolios.

Home computers.

The report you've been waiting for: simple, factual, honest, comprehensive and 100% biased.

ALL you need to know about computers can be summed up in one word: Commodore. (Well, we did tell you this would be biased).

We make everything you'll ever need to get the most out of home computing: all the *hardware* and all the *software*. (And if you don't understand what that means, simply look under "H").

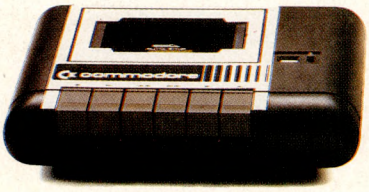
That's what these three pages are all about: explaining what computers are (without the scientific jargon), how they work (without any technical mumbo-jumbo), and how you can get more enjoyment out of them (without much difficulty).

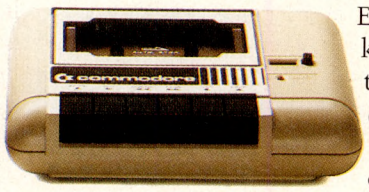
BASIC. Most home computers speak the same language. It's called BASIC. This is a friendly way of saying "Beginners All-Purpose Symbolic Instruction Code".

There are different kinds of BASIC and, like languages, some are a little easier to understand than others. Like, for instance, BASIC 3.5 in the *Commodore plus/4* and *Commodore 16* computers. BOOKS you can read: "Teach Yourself Computer Programming With The Commodore 64" and "Programmers Reference Guide".

CASSETTE. Just as you keep your favourite TV programmes on video cassette, and your favourite music on audio cassette, you can keep your favourite computer programs on cassette too. You can buy pre-recorded programs in a shop, or you can write them yourself. Cassettes are just one form of program storage and playback – see also *Cartridges* and *Disk Drive*.

The Commodore 1530 and 1531 cassette units have been specifically designed to get the very best out of our computers, and provide consistently reliable results.





CARTRIDGES. These are programs that plug directly into the back of the computer itself.

CPU stands for Central Processing Unit. This is the computer's "brain", and basically it's what does all the hard work.

CHIP: micro. A very complex electrical circuit that has been miniaturised in silicon. Unlike other home computer companies, Commodore manufacture their own chips, so first class quality can be maintained.

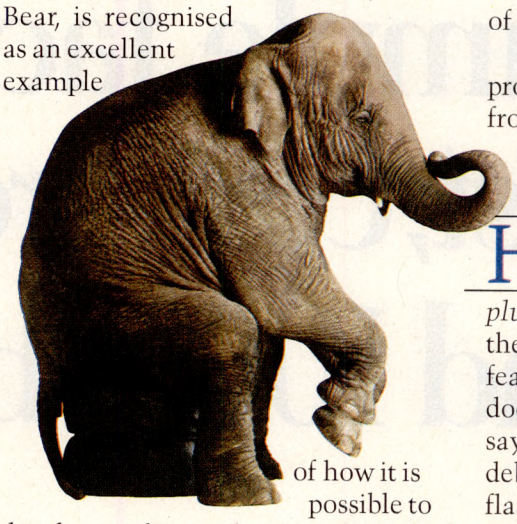
DISK drive. A program storage system, like *cassettes*, but much faster. You can find the program you're looking for in seconds instead of minutes. Disks, which can be used again and again for recording or re-recording programs, are placed in the disk drive which then transfers the information or instructions to the *CPU*.

EDUCATION software from Commodore. We are continually working with educationalists, improving our range of programs for the pre-school to "O" level age groups and beyond.

Many claim computers are an essential educational aid.

We tend to agree!

Our "Get Ready to Read" series, with a lovable character called B.J. The Bear, is recognised as an excellent example



of how it is possible to develop reading and writing skills in pre-school children.

ELEPHANT: well-known symbol of the *Commodore 64's* enormous 64K memory. And don't you forget it!

FOUR is for Commodore plus/4, our very latest home computer with four, very popular built-in programs: wordprocessing, spread-sheet (financial planning), database (filing), and graphics.



It has an extensive 64K memory, with an exceptionally large 60K available for use. The plus/4 comes equipped with the Commodore BASIC 3.5 with over 75 programming commands.

Other features include comprehensive graphics, 121 colours and sound facilities.

GORTEK and the Microchips is a unique programming course, for children of all ages, that links learning exercises with a space adventure story.

GRAPHICS.

The pictures and diagrams on a *monitor* or TV screen, either high or low resolution.

All Commodore home computers have 66 graphic symbols to create low resolution pictures and diagrams, or high resolution modes that allow you to specify each pixel (or dot) on the screen.

(There can be up to 64,000 of these).

GAMES: Commodore produce them all, from shoot 'em up games, to games of adventure and complex strategy.

HELP! On the Commodore *plus/4* computers there is a very special feature: a HELP key. It does exactly what it says: it helps you to debug (which is a flash way of saying, "identify and correct errors") when you're programming.

It highlights errors right down to individual instructions.

HARDWARE. The computer itself – you can touch it. Whereas software's a program you can only see or hear (on the monitor) when it's running in the computer.

INTEGRAL software is software that's actually built into the computer, as on the Commodore *plus/4*, the very latest in home computing.

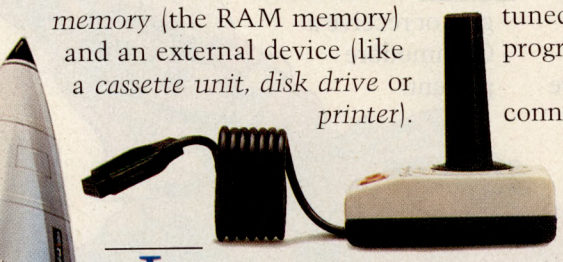
INTRODUCTION to BASIC. Just as you don't need to understand how a car works to be able to drive it, you don't have to understand how a computer works to be able to use one.

But you will definitely get more enjoyment out of it if you do have a basic knowledge of programming.

Which is why "Introduction to BASIC" has become the most popular software tutorial.

It comprises 2 cassettes and an easy-to-follow, step-by-step booklet.

INPUT/output: the part of the computer that allows data to be transferred between its own internal *memory* (the RAM memory) and an external device (like a *cassette unit, disk drive* or *printer*).



JOYSTICK and paddles. As well as improving speed and accuracy, these make games more real by putting the control of whatever it is on the screen directly into your hands.

KILOBYTE is 1,024 bytes. So "K" stands for a unit of 1,024 or 2^{10}. A 64K byte memory unit contains 64 x 2^{10} or 65,536 bytes of memory. And if you don't understand all that, don't worry.

All that's important is knowing you can run more complex programs through a computer with a large memory, than one with a small memory.

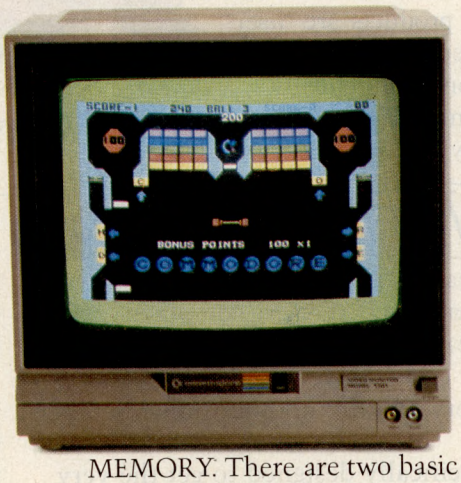
LANGUAGE. This is a system of coding that can be understood by a computer. It allows you to "speak" to the computer, and for the computer to "speak" to you. Most home computers speak *BASIC*, but there are also other languages available for Commodore computers that have been designed for specific uses. For example, LOGO and PILOT in *education*.

MONITOR: this is the screen on which you can see what you've typed into the computer, and also what the computer is saying back to you. You can use an ordinary TV screen, but more preferable is a colour video monitor, like the Commodore 1701.

This is a special device that produces much higher resolution than a TV, and so offers superb reproduction and clarity.

On top of which it allows the rest of the family to stay tuned-in to their favourite TV programme while you're tuned-in to your favourite computer program.

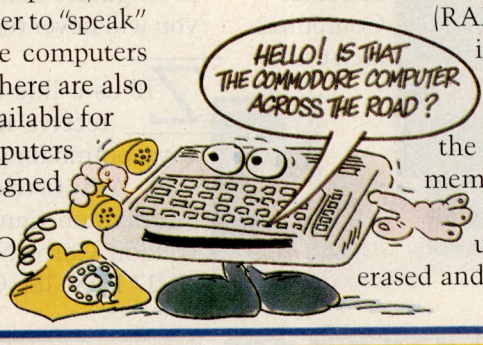
MODEMS allow computers to connect via a telephone line to other computer systems. Commodore 64 modem owners can communicate with other owners, join systems like Prestel/Micronet and an exciting new system called Compunet, where quality software is available cheaply or even free.



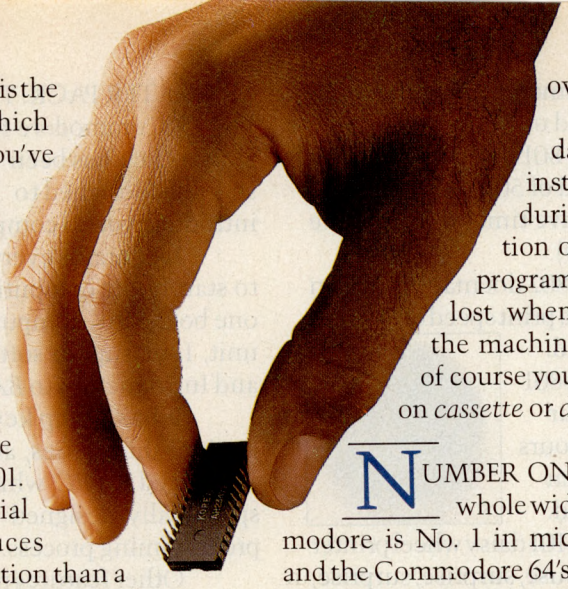
MEMORY. There are two basic types of memory: ROM and RAM.

Read Only Memory (ROM) is the computer's permanent built-in memory which tells the computer what to do. It doesn't disappear when the computer's switched off.

Random Access Memory (RAM), however, is for temporary storage. It's the part of the computer's memory that's free for you to use. It can be erased and used over and over again.



It stores data and instructions during the execution of a computer program. These are lost when you switch the machine off – unless, of course you store them on *cassette* or *disk*.



NUMBER ONE. In the whole wide world, Commodore is No. 1 in microcomputers, and the Commodore 64's the No. 1 best seller.



ORIGIN of the computer. In the 19th Century an Englishman, Charles Babbage, invented the first true computer. But his "Analytical Engine," was so ahead of its time, it turned out to be impossible to build!

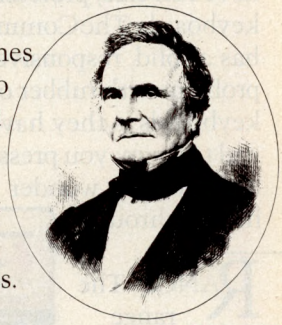
The modern computer first appeared around the time of World War II. Britain's "Colossus" was vast, consumed vast amounts of electricity, required its own air-conditioned room, was unreliable and difficult to operate.

It had its limitations.

Then came the amazing transistor... integrated circuits... and microcomputer.

The first desk top microcomputer in the world was the Commodore PET (a friendly name for Personal Electronic Transactor), in 1977.

In effect Commodore had taken hitherto huge, mysterious machines accessable only to eggheads, reduced the size and price, and put them into the hands of ordinary mortals in ordinary offices.



PERIPHERALS. These are outside the main body of the computer, but are connected to it.

They perform a definite function, which is usually *input* or output.

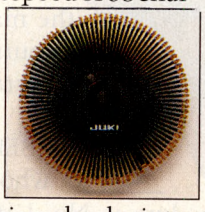
PRINTER: One of the ways a computer can "speak" to us.

It means you can actually keep, on paper, the fruits of all your labour.

The Commodore range includes four printers and one printer plotter.

The MPS 801 dot matrix printer has a print speed of 50 characters per second (about five times as fast as the fastest secretary).

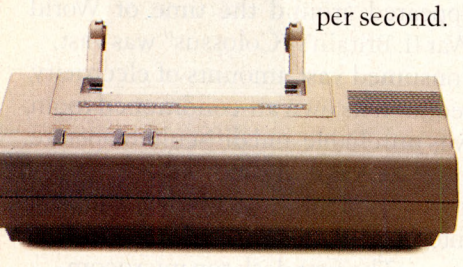
The MPS802 dot matrix friction feed printer has a print speed of 60 characters per second.



The MCS801 dot matrix colour printer has 7 colours and prints 38 characters per second.

The DPS1101 daisy wheel printer (called that because, surprise, surprise, the print wheel looks a bit like a daisy), produces superb quality print on all letters, reports and documents (the kind of quality one desperately requires on a letter to the bank manager). There's a range of alternative type faces available on additional print wheels. Speed: 18 characters per second.

And the 1520 printer plotter, (illustrated). This has 4 colours, and opens up a whole new world of graphic print-out ability. You can draw pictures, create graphic designs, plot graphs or construct bar and pie charts. Speed: 14 characters per second.



QWERTY – the top 6 letters on a typewriter. Unlike lesser machines, all Commodore computers have full-size, professional typewriter keyboards. The Commodore keyboard has a solid, responsive feel to it. (The problem with rubber or membrane keyboards is they have a soft, spongy feel to them: you press a key and immediately wonder if the message has got through).

RANGE. The range of Commodore software is enormous. There is something as they say, for everyone: educational, business, home and games.



STARTER PACK. The Commodore 16 Starter Pack has been specially designed to introduce you to computing.

It contains everything you need to start home computing, complete in one box: a 16K computer, cassette unit, four superb software programs, and Introduction to *BASIC* Part 1.

It has a *Help* key in case you get into difficulties, and incorporates Advanced *BASIC*, which has been specifically designed to simplify the programming process.

Other features include: 4 cursor keys, 2 joystick ports, an astonishing 121 colours, plus excellent sound and *graphics* capabilities.

TUNES. Commodore make software to help you compose your very own music.

All our home computers have great sound and music capabilities.

USER friendly. This is a program that explains itself as it goes along, or a computer that people can easily operate.

Every computer manufacturer now claims its products are "user friendly," but only Commodore really demonstrates it. For example, our *Help* key and use of Advanced *BASIC*.

VERTICAL integration is not as complicated as it sounds. All it means is that Commodore make everything to do with computers, from the *micro-chip* to the computer casing.

So we have complete control over everything, from design to distribution.

Also, everything has been specifically designed to get the very best out of your Commodore computer system.

WOMEN also are discovering computers – and not just in offices, but at home. Computers aren't sexist.



They were invented for everyone, and the fact that they're fun, exciting, educational, practical and time-saving are benefits that apply to women just as much as to men.

XMAS. There's no better time to give or receive a Commodore present.



YIPPEE! Yes, now you know (or should do) that computers are really interesting. They're not just about space games with horrendous monsters. Nor are they horrendously complicated machines that you need a maths degree to understand.

Computers are the future, and it's important that you and, even more so, your children don't get left behind in the past.

With a Commodore computer and a *peripheral* or two (and we now know what those are, don't we?) whole new leisure and business opportunities will immediately be opened to you.

Make the choice now and (just so long as it's Commodore) we promise you will never regret it.

ZIP us a line if you would like to receive more information on any Commodore products.

Write or telephone: Commodore Information Centre, 1 Hunters Road, Weldon, Corby, Northampton NN17 1QX. Tel: Corby (0536) 205252.

commodore

BY APPOINTMENT TO HER MAJESTY THE QUEEN, MANUFACTURERS OF COMPUTER BUSINESS SYSTEMS, COMMODORE BUSINESS MACHINES (UK) LIMITED, CORBY

home-brewed machine code games for the Spectrum, under the brand name MicroGold.

Tony submitted some MicroGold software to BT's New Information Services boss Ederyn Williams, with the result that Tony is now operations manager for Firebird.

Firebird Software will have a first portfolio of twenty games in the shops by 1 October and, following MicroGold's philosophy, they'll be cheaper than the average game, at not more than £2.50 per cassette.

Lap-helds down in price!

NEC's £100 price cut on its PC8012A lap-held micro came at a bad time for Tandy.

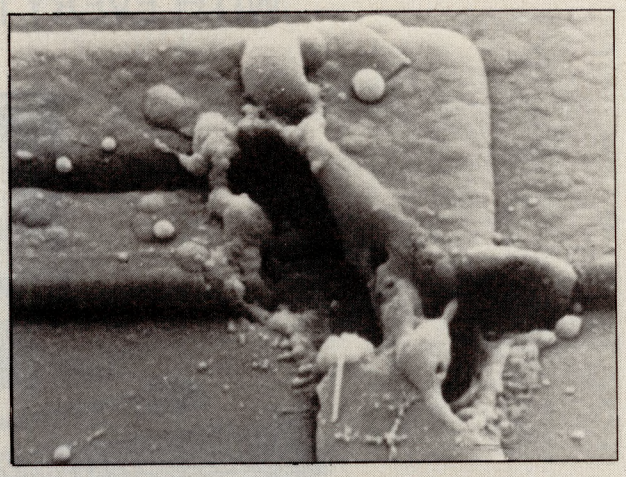
Why? Well, at the end of its annual convention, the Tandy (UK) marketing executives decided to bring down the price of the Model 100 (which at that moment was £60 cheaper than the NEC PC8201A) to a new low of £449 including VAT. Tandy, the company whose attitude seems to be 'we pretend never to know how much our competitors charge,' has two Kyocera-born lap-helds to fight off — the NEC 8201A and the Olivetti M-10.

On the day of the Tandy announcement, NEC announced that following a year of successful low-profile selling into vertical markets, the PC8012A was to get a marketing boost with a price cut. The new price? Just a fiver more than the Tandy model 100 at £454.95 including VAT.

At NEC, marketing manager Bill Barham not only knows what the competition is doing, but what it had for breakfast. And if you're in the market for a lap-held it might be wise to hold on — Barham is thinking about a further NEC price cut.

Mini entry

Well-known mini-computer maker Data General has released an impressive but expensive portable micro.



Perhaps you have wondered exactly what damage you can do to a silicon chip. Here is a bit of silicon, part of which used to be an Intel 8085 microprocessor, after being zapped with static electricity. The camera was a scanning electronic microscope. It was sent to us by a company called Hartley Measurements, to encourage us to test the chips we make for static sensitivity, with the Autozap device it makes. If I ever make a chip, I will certainly buy one.

More details on (0256) 56695.

To be known as the Data General One, the machine features a 25-line × 80 column liquid crystal display and battery-powered CMOS electronics in a 13.7 × 11.7 × 2.8in package weighing just over 9lb. The price varies according to specification from a basic £2490 to over £4000.

Two systems are available — the basic model and an enhanced version. Both systems come with a CMOS 8088 processor, MS-DOS, two RS232 ports and a ROM-based terminal emulator. However, whereas the basic unit is supplied with 128k of RAM and one 720k 3.5in disk drive, the enhanced model has 256k of RAM and two 3.5in disk drives. The enhanced model is also supplied with a rechargeable battery pack to allow the unit to be used away from mains electricity.

A major selling point of the machine is that it is claimed to be software and hardware compatible with the IBM PC. This could seem strange when you consider that it uses an LCD display and 3.5in disk drives — and that there isn't enough room inside the box for any IBM expansion cards.

The LCD gets around the compatibility problem by looking exactly like a standard monochrome display to programs written for the IBM. The other two problems are overcome by using an optional extra expansion box/5¼in disk drive unit which will happily take IBM expansion cards and read IBM disks. It doesn't do much for portability though.

Data General has arranged for a range of popular IBM programs to be available directly on its 3.5in format disks. These include products like WordStar, Lotus 1-2-3, Symphony and Word. If you don't want to buy the expansion box, but you do have access to an IBM, Data General says it is possible to download software directly from the IBM into the One. END



This is an infra-red joystick, with the Cheetah logo on it. Unfortunately, embossed in plastic, it doesn't look like the cheetah with black dots that the company prints on its letterhead.

So Cheetah bowed to the inevitable, and called it a rat. The company said it was a 'Remote Action Transmitter', which was almost convincing, then gave the game away when it asked for people to enter a competition, sending in their idea as to what RAT stood for.

The competition is closed. The Rat costs £30, and details are available for Spectrum users on (01) 8334909.

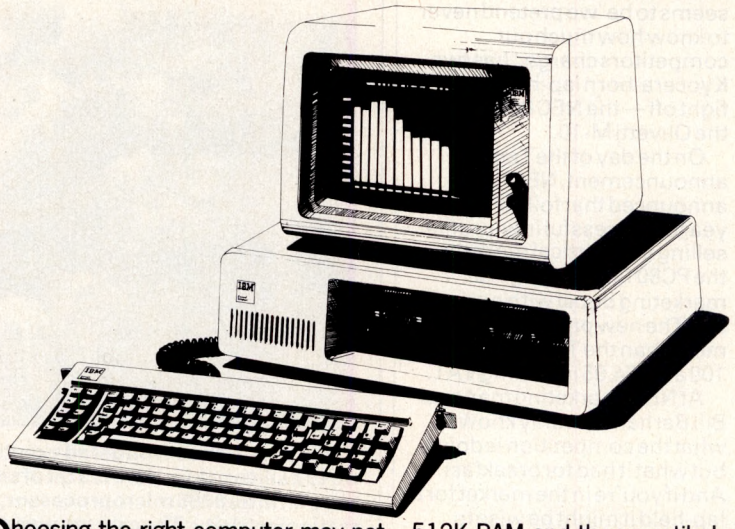
Second chance to get the Basic Converter Chart

Now's your chance if you missed the Basic Converter Chart in our September issue, or are looking for extra copies. Each chart costs £1 and can be obtained by writing to Robert Buggs, VNU Business Publications, Evelyn House, 62 Oxford St, London W1A 2HG. Enclose a cheque made payable to *Personal Computer World* along with a note of your name and address, and the number of copies of the chart you want.

If you're after 25 or more copies, write to the same address for details of prices.

COMPLETE SYSTEMS AT MORSE

MORSE COMPUTERS SUPPLY A **FREE** PRINTER WITH EVERY IBM PC PACKAGE



Choosing the right computer may not be difficult with the IBM PC around, but choosing the *right system* can be.

As the best-selling personal computer, the IBM PC has more software and options than any other machine, so many in fact it's difficult to know precisely which combination will best suit you.

To make that decision easier, Morse Computers have put together four complete IBM PC packages. At Morse there's no expensive hidden costs for adaptors or extra memory. Everything down to a box of disks and a plug is included in the price.

Each package is supplied with a printer and software **at no added cost.** Our "Full House" XT system even has 512K RAM and the versatile Lotus 123!

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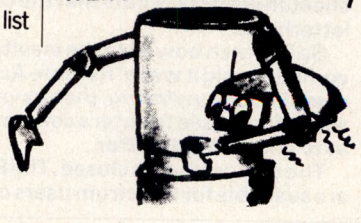

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YANKEE DOODLES



David Ahl reports from the States on a multi-user Unix/MS-DOS rival for the IBM PC/AT, strong competition to provide an IBM PC-compatible windowing facility, a touch screen add-on for the IBM PC and Apple, and a new lease of life for computer games.

It's all in the stars

A multi-user Unix/MS-DOS machine to rival IBM's PC/AT looks set to emerge following negotiations between Fortune Systems and North Star Computer.

Arising out of talks concerning the reselling of North Star MS-DOS systems by Fortune Systems are much broader negotiations for the acquisition of the entire company by Fortune.

So far, Fortune has provided $3.75 million in debt financing to North Star, equivalent to 19 per cent ownership.

More interesting are the products that are likely to come out of such a merger. In the early days North Star was strong in CP/M systems, but more recently the company has moved into MS-DOS systems, particularly multi-user configurations.

On the other hand, Fortune has specialised in Unix machines. Fortune's president, Jim Campbell, conceded that a hybrid multi-user Unix/MS-DOS machine is the most attractive aspect of the merger.

'Some development work has already been done,' says Campbell, 'and I'm sure we'll be able to come out with it before the IBM PC/AT with Xenix is ready.' (IBM has announced its system for the first quarter of 1985.)

The system is said to use an 80186 MPU as a file server for multiple 8088 CPU cards (North Star) combined with a 68000-based CPU card for Unix users (Fortune). Sounds interesting; although at the moment, both manufacturers have been criticised for the slowness of their machines. Perhaps the combination will help.

And then there were four...

With IBM's announcement of Top View, there are now four incompatible, competing windowing products for the IBM PC: Microsoft Windows, Digital Research Concurrent PC-DOS, Sorcim/IUS Easy Plus, and Top View. The existence of these four products raises complicated technical and strategic choices for both users and software vendors. One must consider questions of graphics-based vs character-based shells, memory management, classes of compatibility, and the nuances of concurrency.

Windows is probably the broadest approach as it creates an entirely new standard for both software and hardware (screens, keyboards, printers, and other I/O devices). Indeed, it would erase issues of PC-DOS and MS-DOS compatibility: everything would simply be windows-compatible. Software and most hardware vendors love it because it means all packages run on all machines. However, there's one important holdout: IBM.

Now, IBM comes along with its own multi-tasking windowing system, Top View. Like older time-sharing systems, Top View uses a non-optimised equal time-slice approach to concurrency. Compatibility poses problems too: programs that directly access the screen, such as Lotus 1-2-3 and Multiplan, will not run under Top View since all I/O calls must go through PC-DOS. But it only costs $149 and all IBM-distributed programs will run on it.

Concurrent PC-DOS from Digital Research is closer to Top View in conception, but seems to have better optimisation and more capabilities. On the other hand, EasyPlus takes a much narrower approach as it's designed to integrate only the productivity and accounting packages from Sorcim/Information Unlimited Software.

As none of these packages is being delivered to users yet, you can delay your decision making.

Unfortunately, software houses are in the unenviable position of having to bet now on one (or more) of these competing systems.

Soft touch

Hewlett Packard has attracted a loyal core of followers with its touch screen on the Model 150. Now, BFANM Corp has announced Soft-Touch, a device that allows IBM PC and Apple II owners to add a touch screen to an existing monitor.

The Soft-Touch device uses an infra-red scanning beam housed in a bezel which mounts over the front of a monochrome or colour monitor. It also includes an interface card and cable — but no software; apparently that's up to the user.

More details from BFANM Corp, 1704 Moon NE, Albuquerque, NM 87112.

Hide and seek

After a disastrous year for computer game makers in the US, several companies — now considerably slimmed down — are again beginning to announce new offerings.

Also, new companies are beginning to creep into the market-place. Motivated Software has announced a role-playing game, Competition Karate, in which players create teams of individual fighters, and Arctec Systems has announced several voice-controlled games for use with its Micro-Ear voice recognition system.

Random bits

IBM has been rumoured to be working on 5¼in winchester drives with capacities in the 30-50Mbyte range, which seemed low as it had already announced a 40Mbyte drive on the PC/AT. It seems that IBM engineers are now aiming for capacities in excess of 100Mbytes . . . Earlier this year, Apple won its first criminal convictions against six Taiwan makers of fake Apples. The company's latest attack against fakes is against Hong Kong-based Video Technology, maker of the Laser 3000 . . . In addition, Apple has started legal proceedings against 19 Singapore companies accused of assembling, selling, and distributing bogus Apple equipment . . . Hewlett Packard and Apple have both delayed the introduction of 25-line × 80-column LCD displays for their portable machines. Both blamed difficulties in getting reliable displays in quantity from the Japanese manufacturers . . . Tandy has dropped the Micro-Color Computer less than one year after its introduction; it has also dropped prices by as much as 29 per cent on the three full-size Color Computers . . . In 1949, only 3000 people worldwide had direct access to a computer; today the number is about 50 million . . . A man and woman were arrested in a Sperry Corp plant in Minnesota for smashing prototype defence computers with hammers. The two were protesting against Sperry's involvement in weapons manufacturing . . . Before the Olympics, everyone was bragging about how their computers were to be used in the games, but now, no one will say whose computers fouled up and delayed the scoring on the swimming and gymnastics events . . . Weeks after Lotus Symphony went on sale it soared to No 2 on the Softsel charts. Now the reviews show it to have some serious problems. I bet there are lots of unhappy customers who are too proud to admit it. . . . Vertex Systems has announced a board for the IBM PC that lets it read Apple disks directly . . . Quark, maker of Catalyst and Word Juggler for the Apple, has launched its first piece of hardware, a 10Mbyte hard disk which can connect with the Apple IIc, IIe, III, or Macintosh. END

The party's over

That's all for this year, folks! We're still clearing up after the PCW Show, but for those who missed out, here's a brief summary of what went on.



Step right in! The 1984 PCW Show gets underway

Freed from the constraints of the Barbican car park, this year's *PCW* Show took up three whole floors of London's Olympia 2 exhibition centre. The exhibits were roughly divided according to their appeal, with most of the business activity occurring on the first floor and the serious alien-zapping on the second.

The home computer big guns were lined up on the ground floor with Acorn, Amstrad, Atari, Commodore and Sinclair blocking hapless visitors' bids for food and freedom.

Acorn showed its new range of business machines for the very first time in public. Although they won't be officially launched until January (which makes you wonder when they'll be in the shops), these machines represent a concerted effort by Acorn to broaden its product range.

The new ABC range consists of no less than eight different variations on the theme ranging from the Personal Assistant, a single-disk, single-processor machine at about £1000, to an Intel 80286 megaprocessor with a hard disk and colour display running the brand new, not-quite-released-yet 80286 version of Concurrent CP/M. Called the 310, this model is expected to come in at under £4000.

Interestingly, this top of the range machine will be released with an ikon-based work environment that looks just like the Apple Lisa/Mac. Acorn claims that it is the first micro in the world to offer ikons *and* multi-tasking. Someone obviously forgot to tell them that the Lisa was multi-tasking ages ago . . .

Staying on the ground floor, Amstrad launched the disk system for its CPC464 micro. For £199, you get a Hitachi 3in disk drive, CP/M 2.2 and the Logo programming language. This caused a great deal of interest until people realised that only 38k of RAM is available for the CP/M Transient Program Area!

In one fell swoop this means that the Amstrad won't run a large proportion of popular CP/M software. Even WordStar, which doesn't usually need the full 64k TPA, won't run. Amstrad was lamely saying that it was hoping that people would write CP/M software specially for the machine . . .

Upstairs on the first floor, ACT fought DEC to see who had the bigger stand. Even if it lost in terms of size, ACT won on interest as DEC didn't have anything of much notice to show. The ACT staff were busy exhibiting the entire range of new and revamped products ranging from the new Apricot F1 through the Portable to the new multi-user and networked version of the 'Old' Apricot PC. The company also got good mileage out of the videos it made for the launch of the new models back at the Albert Hall (waste not, want not).

Apricot owners got a shock at the Show, a shocking pink one as it happens, from an IRGB (Intensified Red Green Blue) card for the Apricot standard and XI machines. The card will be retailing by the time you read this at £295 (ex VAT), and an ACT brand monitor to match will set you back a further £395 (ex VAT).

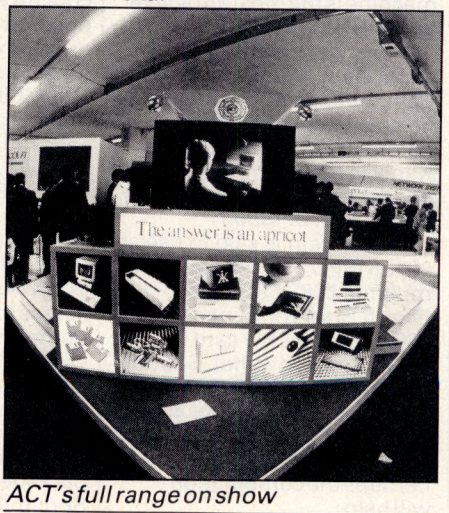
On the same floor, Lotus and Ashton-Tate demonstrated their integrated business systems on the IBM PC and various lookalikes including the Olivetti M24 and Columbia.

Next to the Lotus stand, I/O Research gave an impressive demonstration of its Pluto high-res graphics board. Lotus also displayed a very high resolution, high speed TV-digitising system which came near to producing credible digitised moving pictures.

The Apple stand was given over to the Apple IIc and the Mac, with the Lisa lurking in the bowels of the stand. A great deal of emphasis was given to new software for the Mac, with rightful prominence given to the Filevision Graphical database (to be reviewed in our next issue).

One flight of stairs up and the aliens took over, with the major software houses exhibiting their new releases supported by Spiderman, The Incredible Hulk, American footballers, cheerleaders and a cycling policeman. And Melbourne House offered the chance to be the world's greatest detective through Sherlock or a social climber through Hampstead.

An executive case containing £25,000 attracted a lot of attention as it was offered as a prize to the first person who solved Domark's 250k adventure game called Eureka.



ACT's full range on show



Barry Norman presents Brian Hands with his prize, a Hantarex monitor

New Generation had two intriguing releases on show, which were Travel with Trashman for the Spectrum and Cliffhanger for the Commodore 64.

Adventure International previewed the follow up to The Incredible Hulk game which is to be Spiderman. There were also numerous releases from Quicksilva, Beyond, Softek, Ocean, Mirrorsoft and from a newcomer to the Show, Japan's biggest software house, Hudson Soft.

But not all the games activity was upstairs. Acorn, not content with launching the ABCs, also released one of the best games at the Show. Called the Elite, it is a space adventure game in the true sense of the word. You have to trade and fight your way through the galaxy as you attempt to become one of the fighting Elite. But it's an unfriendly universe inhabited by pirates, bounty-hunters and even the police who are after both you and your cargo.

On the hardware side home users could buy almost anything from a printer interface to a microdrive cartridge. Wafadrives were on offer to Spectrum owners from Rotronics which also promised one for the Commodore 64. However, that will have to compete with the one previewed by Audiogenic, which also showed its Koala graphics tablet now available for the Apple II and IBM PC.

Protek Computing offered a cheap entry into networks through its 1200 modem for under £60. However, Spectrum, BBC and Commodore 64 owners will also require an interface kit which includes the hardware and software required for their particular type of machine. The Commodore version will provide an interesting alternative to Commodore's own modem which was on show with its new machines, the Plus/4 and C16, on the Commodore stand.

The new Tramiel-controlled Atari announced a further price reduction of the Atari 800XL which now undercuts the Commodore 64 at £169.95.

Sinclair sold QLs on its stand, as well as the Spectrum expansion kit which includes an Interface 1 and microdrive — wonders will never cease.

The BBC's Chip Shop also had a stand on the second floor, recording programs for later broadcasting. One crowd-puller there was the 'micro-magnates' panel featuring the top two UK home computer manufacturers side by side, with Hermann Hauser flying Acorn's flag and Nigel Searle Sinclair's. Roger Foster from ACT represented the business end of the market, while Digital Research's Paul Bailey put the software point of view. The panel fielded questions from the audience with very few hiccups, showing in this instance at least that the team does think.

The Japanese threat, as represented by the MSX machines, was dismissed as being 'far too little, far too late'. Instead, the real threat was several years away and might well prompt some pooling of European ideas. Internationally-agreed levels of standards, covering areas such as Open Systems' Interconnection, were firmly supported by Hermann Hauser. Roger Foster was even more firm in his opposition to the proposed joint venture between British Telecom and IBM. He regards this as 'potentially a major disaster'.

Opinions were more divided on systems programming languages. Paul Bailey backed 'C' while Hermann Hauser supported Modula II. Nigel Searle hedged his bets and promised both for the QL.

One predictable talking point was the ABCs. Roger Foster took great delight in arguing that Acorn would have as hard a time breaking into the business market with these machines as ACT faced in education. Nigel Searle added that he wished Acorn luck — but, as he also pointed out, he didn't specify what *kind* of luck.

Hermann Hauser also took a bumpy ride over Acorn's six-months-only warranty, with Roger and Nigel being delighted to point to their own companies' one-year guarantees. Before the panelists departed to their respective stands downstairs, Hermann fought back with the promise of the launch of a 'number of new computers in the home market over the next few years.'

Back on the ground floor the winning entries in our Micro Animation Competition were on display. Alexander King of Bristol took first prize of a Fujitsu FM16S micro for his image-manipulation program. Runner-up in this particular section was Chris Rust of Birmingham with his 3-Design program, which won him an Oric Atmos, while Mike Jackson of Knossington was commended for his Transforma and won £100 worth of books from Century Communications.

Another Atmos went to Steven Temple of Cambridge for his cartoon entry in the animator program section, with runner-up WJ Kennedy of Coventry receiving another £100 worth of Century books. The winning VDU animation sequence came from CM Wong of London for his Octagons program, and he received the third Atmos. William



Animation winner Alex King (left)

McLean of Paisley was commended in this section for Gymnast and received an Atari 600XL. The film sequence section was won by Brian Hands of Cumbria for his Supercube entry — his prize was a Hantarex high resolution colour monitor. Winner of the special category section was Paul Carruthers of Nottingham.

When we put together the Micro Animation Competition it was expected that the Fujitsu FM7 would have been launched in the UK by September. However, due to Fujitsu corporate policy changes, the UK arrival of the machine has now been delayed and the actual launch date is still uncertain. We have, therefore, decided to offer Paul an alternative prize of a Commodore 64. In the schools category, The Scottish College of Textiles won a Sinclair Spectrum plus Microvitec monitor for its Alien II video, and a Sheffield special school for the handicapped received a similar award.

Our thanks to all the readers who sent in entries and to all the manufacturers who provided prizes. That's all for this year, see you next year when, maybe, Acorn will steal the show again — but this time with a home computer. END

Photographs by Martin Shallcross

Before you compare our new computer system with any other, double the price.



£249
Computer complete with green screen VDU (GT64)

£359
Computer complete with colour monitor (CTM640)

CPC 464 complete with monitor and datacorder

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Which other home computer, gives ou a built-in cassette data recorder, ypewriter style keyboard, numeric eypad and a very fast extended ASIC?

And which other home computer ffers it all for £359 with colour monitor £249 with green screen VDU?

What's more, the CPC464 comes omplete and ready-to-go. Just plug it in.

64K RAM.

Pound for pound, other micros can't atch the CPC464's memory. Over 2K is available to users, thanks to the nplementation of ROM overlay tech-ques.

So there's plenty of room for soph-ticated and complex programs.

High resolution graphics. Stereo sound.

The monitor drives each colour on the creen directly from the computer. here's no unnecessary circuitry to istort your view. No tuning problems. nd no arguments about who's using e computer and who's watching TV.

Sounds good, doesn't it?

So does the CPC464 with its 3-voice, octave stereo output fed through hi-fi amplifier and speakers.

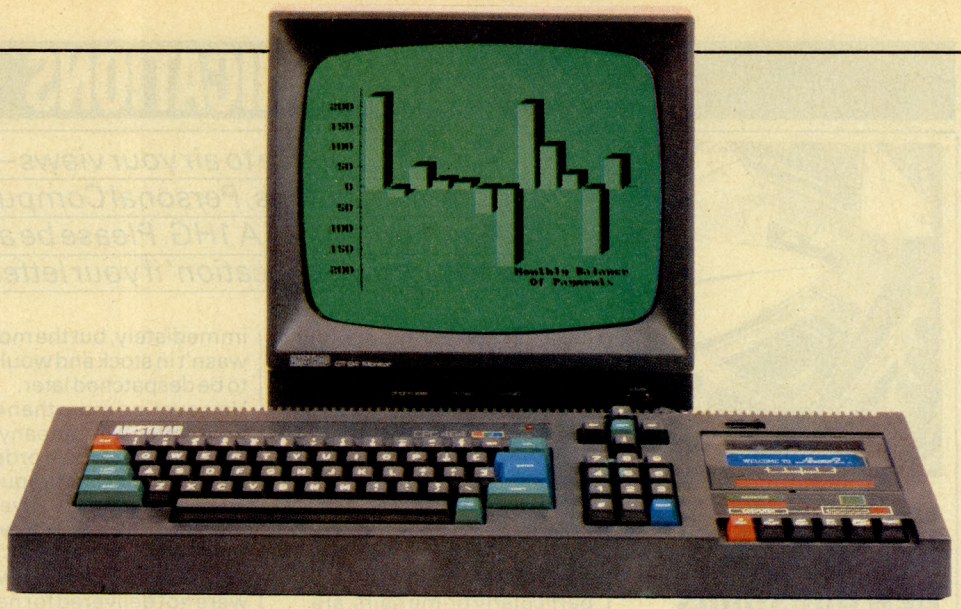
Amsoft. High quality software.

A rapidly expanding range of pro-rams is already available. High quality ftware that takes full advantage of the PC464's high specification and speed-ading capability.

Which means even complex pro-rams can be loaded quickly.

Arcade games, educational pro-rams and business applications are l designed to utilise the CPC464's npressive graphics, sound and pro-ssing abilities.





CPC464 green screen VDU (GT64)

Green screen VDU.

Text and numerical data are bright, sharp and easily read at a glance. Which is invaluable for word processing, accounting, budgeting and developing programs. And this purpose designed visual display system has an 80 column text display.

Green screen versions of the CPC464 can be used with a colour TV by connecting the optional power supply and modulator MP-1.

Amstrad. User Club.

The CPC464 User Club is run by Amsoft, our software division, which provides software, peripherals and publications for members.

As a member, you'll enjoy immediate benefits like the privilege card, Club binder, regular magazine, competitions for valuable prizes and contact with other Amstrad users.

Whether you're interested in commercial applications or you're a games fanatic, you'll want to join the Club.



CPC464. Unlimited scope for expansion.

At Amstrad, we try to anticipate your future requirements. That's why there's a built-in parallel printer interface. A low cost optional disk drive system including CP/M* and LOGO. A joystick port. And the virtually unlimited potential of the Z80 data bus with sideways ROM support.



Optional disk drive DDI-1 including interface CP/M* and LOGO £199.95



Optional 80 column dot matrix printer DMP-1. Offers high performance computerised text processing for only £199.95.

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PCW3

COMMUNICATIONS



This is the chance to air your views—send your letters to Communications, Personal Computer World, 62 Oxford Street, London W1A 1HG. Please be as brief as possible and add 'not for publication' if your letter is to be kept private.

New trends, new questions

Sinclair Research has been much criticised in the past for launching products before they're available, but I'm pleased to note that this trend now seems to have been reversed. I have found a product which is readily available *before* Sinclair has launched it—extra microdrives for the QL!

On the right-hand edge of the QL, near the reset button, is the slot designated for microdrvies to augment the two already built-in. Page two of the introduction to my *QL Users' Guide* states: 'ZX microdrives are not suitable for use with the QL', but recently I read a letter in the computing press stating that Spectrum microdrives could be used as read-only devices with the QL. Filled with trepidation, I was not only able to confirm this, but was able to FORMAT and SAVE files on cartridges in these extra drives. Such files are LOADable in the two original drives, and I have now been using the QL with two extra ZX microdrives for a week with no apparent snags. I'm glad I made provision for eight microdrives in my QL utilities package!

To connect them, I unplugged the ribbon cable from the Spectrum's Interface 1 and plugged this into the microdrive expansion port of the QL. The microdrives therefore end up with the *slots facing away from you*. Perhaps this is why Sinclair says they are not suitable! Is this compatibility exclusive to QLs fitted with 'dongles' (I still have QDOS version PM)?

CC Wilton-Davis, Jersey, CI

Calculating the prize

I have written a program which calculates prime numbers by additions and occasional multiplication, that is, without dividing. It's much faster than the method of testing by division and saves unnecessary testing of non primes.

Furthermore, the formulae used in this program prove that prime numbers, and particularly prime pairs, are not random. It proves many other things besides, and I forwarded some of this work to two masters of science in mathematics. They have agreed it's very interesting and certainly accept the proof of some of the formulae, while they are checking others. These formulae, when combined, indicate that there are an infinite number of twin primes.

As you state in 'Brun's Constant' on page 198 of the July issue, there is a $25,000 prize for this part of my work. I would be grateful for information so that I can claim same.

GD Wright, Doncaster

(Kenneth Carter of Hereford is just one of PCW's readers now coding up the best way to spend their $25,000. To qualify for the prize, the winning proof must be published in either Proceedings of the American Mathematical Society *or* Transactions of the American Mathematical Society. *A copy of the article in published form, identified as the twin prime proof or disproof, must be delivered by certified mail to Twin Primes, Worldwide Computer Services Inc, 7 Doig Road, Wayne NJ 07470, USA. The proof must stand unrefuted for one year following the date of delivery of the publication to WCS. The prize offer expires on 31 March 1987—Ed)*

Service at last

I must congratulate Technomatic on its excellent service. When asked about delivery time for an urgent BBC computer with monitor, the company did not lie—like so many companies—but said that the BBC was no problem and would be despatched immediately, but the monitor wasn't in stock and would have to be despatched later. However, no more than 48 hours after the company received the written order and cheque, both the computer and monitor were delivered!

In sharp contrast, however, UCC quoted seven days' delivery for disk drives which were not delivered for nearly eight weeks (after seven phone calls and one written complaint). When the drives finally turned up there was no invoice, manual or even an apology, and it seems that the UCC disk 'manual' is a very poor and incomplete program on the Utilities disk.

I can only agree with your correspondent HG Lee (Communications, July) when he says try to order from a company of repute. I'm glad to say that it's mainly through letters in magazines such as *PCW* that the good can be distinguished from bad.

Paul Skirrow, Derby

Computer evolution: a battle against time?

If one examines the progress of biological evolution, it can be seen that the overall level of organisation and complexity in living organisms has increased as the degree of specialisation of, and division of labour between, the subunits (for example, cells) of the organisms has increased. For example, the single cell which is known as an amoeba is far more complex than, say, a cell from the human mouth, but the latter is found in an infinitely more complex organism.

It seems possible that computer evolution will follow a similar path. Will the super-powerful computers of tomorrow be derived from today's mainframes, or will processor array machines make the traditional mainframe an extinct species? What sort of power will a computer that has advanced as far past a Cray-1 as a human has passed the amoeba possess? More importantly, perhaps, what will it think of us?

D Roberts, Barnsley, South Yorkshire

(The exponential curve that maps computer evolution suggests that before such a computer has had time to think at all, it will be obsolete—Ed)

Acceptable limitations

I'm sure that A Bretherton's letter, 'Unfair and inaccurate', in the September issue of *PCW* has done much to help restore credibility to the Advance 86B's claim to be a leader among the growing range of IBM compatibles.

My own experience with an Advance suggests that there are some limitations to this computer and the bundled software, but that these are unlikely to pose a major threat to its viability. These may be summarised:

The quality of the keyboard seems to be variable. The first one supplied to me failed to register certain characters, but the replacement immediately supplied by WH Smith compares favourably with most fitted to other computers in the same price bracket;

I have been unable to use the computer in conjunction with a normal colour TV (although the display on my green-screen monitor is excellent). I gather that this is a common problem with the Advance. Another irritation has been the generation of spurious characters, due to interference from the washing machine. Neither of these problems has been experienced with other computers which I have used at home. However, the serious business user is unlikely to be affected by such considerations, unless he's in the laundry business!

The Perfect software supplied with the computer is not as versatile for mailing list management as WordStar with Mailmerge. However, for my own purposes, the manuscript preparation facilities offered in the Advance version of Perfect Writer, together with the

Perfect-Calc spreadsheet, are in general more powerful than the principal bundled alternatives.

Ultimately, the success of the total package will depend on WH Smith's ability to convince the businessman that the organisation has the know-how to provide continuing guidance on the computer, available software and its operation. The kind of support enjoyed by Mr Bretherton from the Croydon branch may not be sustainable throughout the country, but the onus is on WH Smith to ensure that its resources are sufficiently developed to exploit the potential of an extremely competitive product. As we have seen, companies cannot always depend on the computing press to do their selling for them!

John Bridge, Cyncoed, Cardiff

(Hear hear! — Ed)

Discount? What discount?

With reference to your recent 'Discount Offer' on Lisp packages, why should anyone want to pay out £300 on a Z80 board as well as the cost of Lisp, when they could get a perfectly reasonable interpreter from Acornsoft for £15?

Acornsoft Lisp is an adaptation of Owl Lisp which runs on the Apple II and (I think) the Commodore PET, from: Owl Computers, 41 Stortford Hall Park, Bishops Stortford, Herts CM23 5AJ.

Robert Swindells, Birkenhead, Merseyside

Slow, slow, Quill Quill slow

As your reviewer points out ('StraightXchange, October'), the QL's word processor (Quill) is almost unusable because it is incredibly slow. It's possible to type whole sentences ahead of what appear on the screen. What is the point of electronic correction of text if you can't see what you've typed? The slowness of Quill is Psion's fault — it wrote the thing in the 'C' language. This language is hopeless at dealing with text: in order to do anything with a text string, one has to know its length.

Most text languages store the length of strings in the first one or two bytes. The 'C' language has to count every letter before it knows the length! Imagine: to move a paragraph, Quill must first count every letter before it knows the size! No wonder it's so slow. Unfortunately, most reviewers have fastened onto Quill as representative of all the other packages, because they know word processers best . . . after all, they probably use one regularly.

But the other packages are really very good. Even the Basic is quite usable, and has only crashed once. I have even managed to transfer a payroll program I wrote for my RML 380Z to the QL with little trouble.

I can recommend the QL for any small business, with one reservation: don't expect too much. If you intend to operate a QL all day, then it's not for you; the fragile microdrives will just not stand up to continuous use, and will fail. My QL *ate* a microdrive cassette, and it wasn't even breakfast (can I afford to keep feeding it at this rate, I ask myself?). If, on the other hand, you only have a limited need for a microcomputer, then the QL is fantastic value for money.

Dr PH Jowett, Winterslow, Wiltshire

Epson HX20 on location

In your July issue, Alan F Reekie complained of the insularity of keyboards ('The case for a European keyboard').

I would just like to point out that the Epson HX20 has a selection of 'typefaces' which are hardware or software selectable. I have successfully used the software switching to provide the accents needed in a French vocabulary program which I wrote recently.

My work takes me to developing countries, and I find that my Epson HX20 (with the expansion) and a Brother EP22 portable typewriter/printer allows me to function adequately during prolonged periods without electricity, or on my bush trips 'up-country'.

Elizabeth White, Newcastle upon Tyne

When in doubt — cheat!

```
RUN
110   Dear Ed, GOTO 130
120   BRAINDUMP, return
125   August issue of PCW, return
130   With regard to the, GOSUB 120, article in the, GOSUB 125, which, GOSUB 150, was a very valid argument, GOTO 230
135   'RETURN without GOSUB in line 15', see the, GOSUB 125, GOTO 220
140   It's an, GOSUB 170, that, GOSUB 150, often interrupts the smooth running of a program when using, GOSUB 190, this, GOSUB 170, is, GOTO 135
150   In my opinion, GOSUB 200, return
160   'RUN' return
170   'ERROR!', return
180   If you are reading this line you have crashed this program
190   'GOSUB', return
200   For what it's worth, return
210   But I have found an, GOSUB 170. This, GOSUB 170, occurs when the program is, GOSUB 160. GOTO 140
220   END
230   A time & a place for everything, GOTO 210
```

John C Brown, Rayleigh, Essex

(1000 If you read this you're cheating — Ed)

Go to it

```
LOADGO"GOTO THOU SLUGGARD":
REM PCW AUGUST 84
RETURN without GOTO at line 15
Ready
EDIT 10
10 It seems . . . my point. END
```

David Bradnack, Haddenham, Bucks

That certain feeling

After reading the September issue of your magazine, I can understand Robert MacLaren's feelings about Oric ('Patience and promises').

Before Christmas last year I thought about buying an Oric-1, but was put off by the rumours of a 'new ROM'. Looking for reassurance, I phoned Oric International and was told that there were no plans for a new ROM or a new



'Left-right — look out! — mind that supernova — left — watch that Klingon battlecruiser!'

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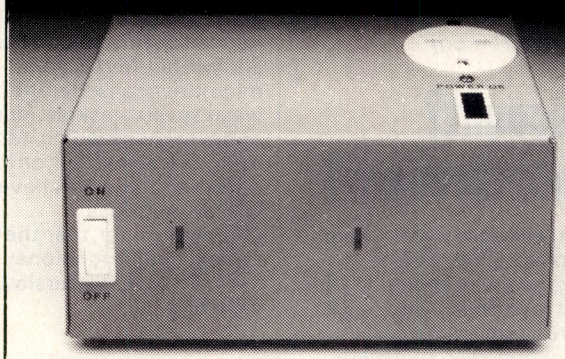

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.....Signature.....

*delete as appropriate

machine, and it was safe to buy the present Oric-1.

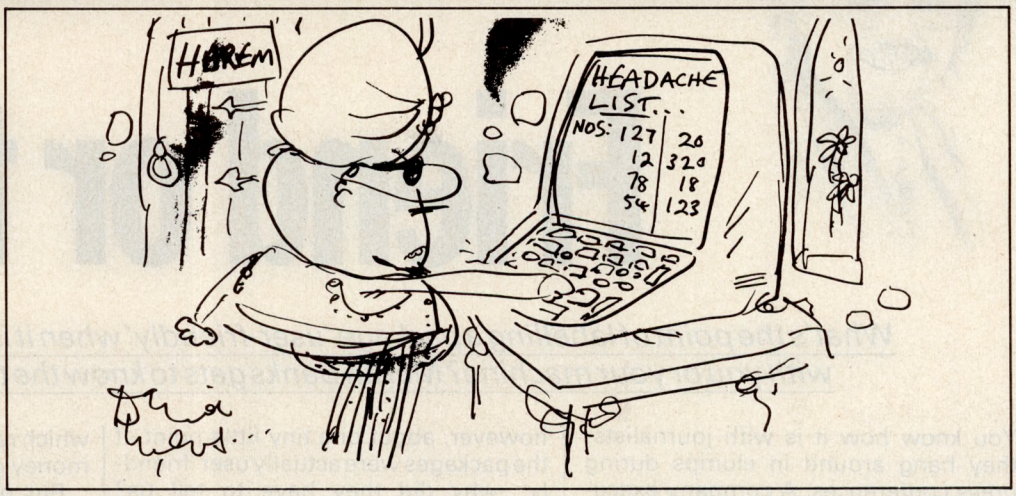
This I did, only to find about one month later that the new ROM appeared inside a new machine.

Oric's reply to this was a compliment slip—'Your letter filed'. After a Telex I received the standard Oric to Atmos update request form at a price of £60.

My machine cost £135 plus the cost of mods (£60 total), making a price of £195. A local discount electrical shop in Newcastle is selling the Atmos 48k at £135 and the local computer shop sells it at £139.

Ever had the feeling you have just been conned?

E Bradford, Newcastle Upon Tyne



Spectrum assessment

You may be interested in my assessment of the Spectrum disk interface which I have used in conjuction with a Cumana double 80-track drive, and with a single 40-track Shugart drive.

The interface works unfalteringly with either drive, and I have been able to transpose a large library of 'serious' software to disk with little difficulty. The Campbell Masterfile and Tasword, for example, are easily modified to download files to a second drive. Unlike other Spectrum disk interfaces, this one does not use crucial areas of memory.

As an educational user I am also pleased to note that the disk interface coexists with the Sinclair Interface 1, promising maximum use of the network.

Of the printer interfaces used with this disk interface, I find the Euroelectronics ZX Lprint III to be the most straightforward—a simple one-line command being sufficient to give both lprint and screendump facilities.

Disk formatting and copying utilities work extremely well, and the documentation is adequate. For a modest outlay, the Spectrum user can now be equipped with a thorough-going system, and take full advantage of the very good (and cheap!) business software now available for this machine.

SF Tyler, senior lecturer, Department of Business Studies, Telford College

QL bugs abound

When Clive Sinclair released his new (. . . now perhaps old . . .) computer, the QL, back in January, most people took a step back and read the eight-page glossy advertising booklet wondering if this specification could be achieved on a £400 machine.

Over the months we have heard of many bugs creeping into the QL ROM and Psion's 'bundled' software, but surely someone would have noticed that A1+10*B2 does not equal 110 when A1=100 and B2=10, but equals 200 ('Painting by Numbers', Sept 1984, page 146).

Is Sinclair or Psion introducing a new way to produce random numbers?

The original 28-day delivery date must have been calculated on a QL (ref ChipChat, August 1984).

Should we warn owners of IBM PCs and ACT's two computers that Abacus is suspected of only having 10 fingers and gets muddled counting any higher?

Or did Mike Liardet slip an extra zero in just to see who would spot it? (If A1 contained 10 not 100, the equation would be correct.) Hopefully this is the case, and we won't have to wait another nine months for the arithmetic ROM routines to be rewritten.

Colin J Wood, Edinburgh, Scotland

(It's a fair cop—Ed)

Software for the handicapped

We are in the process of establishing a database of software for the handicapped called Bardsoft. Briefly, each entry to the database will contain a description of the programs, the handicaps they are suitable for, the type of computer system required, name and address of supplier/developer and price. This information will be made available through printouts in answer to specific enquiries.

The aim of Bardsoft will be to facilitate the exchange of information on software relevant to any aspect of the lives of handicapped people. One major addition will be the concerted effort to promote the database, and therefore the software, abroad. This is what we have been doing successfully for non-software products in the field.

As we are currently collecting and processing information, we would be pleased to hear from any of your readers who may wish to contribute to Bardsoft. For further information please contact me.

Peter Curran, Handicapped Persons Research Unit, Newcastle upon Tyne Polytechnic, No 1 Coach Lane, Coach Lane Campus, Newcastle upon Tyne NE7 7TW.

Immortality taped

According to a leading tape manufacturer all tapes, even C15s, should last indefinitely as long as the tape is rewound at least every six months to eliminate print-through problems. Although software houses cannot be unaware of this fact, I find that no information on this subject has been given in advertisements or with any program I have purchased on cassette. The implication is, therefore, that the program will last for ever.

If a program on a tape deteriorates to such an extent that it's no longer loadable, a reliable software house will replace it upon its return. However, the possibility of the software house ceasing to trade cannot be eliminated, which leaves the tape owner with no absolute guarantee of the program's immortality.

I suggest that all programs sold on tapes which have no free listing supplied, or which have an anti-copying device, may have been sold under false pretences (that is, no warning given that the tape will not last forever unless rewound regularly), and that the owners of such tapes could be legally entitled to a listing of their program under the Sale of Goods Act.

Nick Davidson, Leicester END

BLUDNERS

Acknowledgement: Screenshots of BBC and Spectrum games reviewed in *PCW's* Screenplay are photographed from Cub monitors supplied by Microvitec plc.

We wrongly stated (Newsprint, September '84) that Framentec's M1 expert system was written in G-Lisp. M1 is written in Expert Systems International's Prolog. Expert Systems International is also the company that produces ES/P Advisor (review, September '84), having changed its name from Expert Systems Ltd between sending us the program for review and our review appearing.



BANKS' STATEMENT

Friend or foe?

What's the point of labelling a package 'user-friendly' when it isn't compatible with you or your machine? Martin Banks gets to know the term better.

You know how it is with journalists: they hang around in clumps during press conferences. A company executive is desperately trying to extol the virtues of a product in which no-one is interested; and the assembled hacks huddle together for protection and pray for the verbiage to stop.

To help ward off the evil spirits, the journalists talk among themselves, saying such things as ' 'ere, 'ave yew tried this new fully-integrated, all-singing-all-dancing-does-every-function-you-ever-thought-of package called "X"?' Being of a solicitous nature, I'm curious as to why the question is asked. The reason, I am informed, is that package X is reckoned to be the most complicated piece of high functionality the journalist has ever seen.

Now this might not seem to be a particularly significant event. After all, journalists are by repute totally unable to cope with anything more complicated than a four-function calculator on which to work out their expenses. When, however, the same basic complaint is made casually to me by a user of said program, it makes me wonder. After all, if the users find it difficult to make their selected packages run, there's likely to be something amiss with either one or the other.

There was a time when the package was always wrong, certainly in the field of personal computing, if only because the business was so new and inexperienced.

But as the industry grew up, so did the software writing. Packages became easier to use and, with a little training and guidance, the simple things of computer life were easily accomplished. It was during these days that the phrase 'user-friendly' was first coined. It was meant to depict how the software industry had come out of those dark, early days of applications programming and realised that if the user couldn't make a program run, then there wouldn't be much of a market for the product in the long run.

For a time it seemed like a valid descriptor for a software package: 'This is user-friendly,' they would say, and sometimes it looked as though it might be true. I have always wondered, however, about one tiny little point. If the packages were actually user 'friendly', why did they have to tell us? Couldn't we guess?

Now this pigeon has come home to roost. There are available today new ranges of applications software that are claimed to be user-friendly, but which are, in practice, rather choosy about whom they befriend. If the user has the time to really get to know and love an application, then it will eventually respond with much friendliness, help and comfort.

Unfortunately, most users rarely have the time to develop more than a passing acquaintanceship. They just want the damned thing to work.

There's little point in having an applications package that gives PhD-standard problem-solving capabilities if you need a PhD in computer science to drive the beast. If the new packages are only advantageous in the former area, they are still of little value to the user; it would be easier to stick with VisiCalc, a piece of paper and a pencil than to try and work the newer, more complicated, hyper-powered programs.

One reason that such a situation has developed at a time when it appeared that user-friendliness might come to mean something really tangible, is the ironic fact that software technology is now outstripping hardware technology on a cost-benefit basis. For a good, intuitive programming team, the amount of time taken (and investment made) in developing a new integrated applications suite for the business community is not going to take much longer than developing each of the original individual applications programs. The lessons learnt on these still exist and are automatically integrated into the new packages.

This means that there are now program suites which offer the user the potential of highly integrated operations, with powerful, flexible packages that are the theoretical equivalent of any fancy product available for a mainframe or large minicomputer. In some ways they are, theoretically, much better products. Their price is also attractive: many of them have an end-user price tag of around £500, which represents outstanding value for money on a bangs-per-buck basis.

But getting all the bangs to work properly on the available hardware is the problem.

It seems that we're enthusiastically trying to get the quart of potentially high-quality software poured into the pint pot of the current crop of computers. It can be made to fit, but with some compromises along the way. The current pint pot in demand is the IBM PC which is OK in so far as it goes, but arguably does not go far enough for the tasks being asked of it by these packages.

The necessary compromises needed to make the packages run on the PC also make them difficult to use. For example, the IBM PC has function keys, a control key, a shift key and the ALT key. Each of these plays an individual and unique part in getting a package to run properly: press one in conjunction with another key and a useful function results. This is all very well for the expert user, but for the average person it's rather complicated. It's bad enough having to remember the relevant keys that accompany the CTRL key in something like WordStar; multiply that by three or four and the combinations of possible functions get to be quite big — too big to remember.

In two years' time, when we can all buy a desk-top computer with the power equivalent to a medium-sized DEC VAX and costing less than £5000, applications packages like these will make sense, and will run better than they do now. There will be the power available in the system to make all the user-friendly bits genuinely friendly. It would be nice to think that the software companies will spend some time talking to end users (and, more importantly, potential end users) to find out what the friendly bits ought to be like. This is somewhat different from the current situation: experts trying to give the end users what they think the end users hope they need.

Users sit like someone with a can of beans and no can opener. Somewhere in there is goodness and usefulness... if only they can find it.

END



Illustration by Tony Healey

Enterprise

Plagued by production delays and a serious identity crisis, the Enterprise finally comes a year late to launch. But what was once an impressive specification now looks only 'par for the course'. Nick Walker assesses to what extent the machine's viability has been jeopardised by its slow start.



When the Enterprise was first announced to the world, there was no denying that it had an impressive specification: a built-in word processor, 64k of RAM, high resolution graphics, 256 colours, stereo sound, and an 80-column display. It shone out above anything else on the market in its price range.

Since that first showing Enterprise has kept a low profile, the only news being various changes of name and a declaration of the obvious — that it was late. During this time Sinclair released its QL with its 68008 processor, multitasking and not only a word processor but also spreadsheet and business graphics packages. Amstrad released a home machine which included a colour monitor, high resolution graphics, and stereo sound, all in a very nice looking integrated package. And the Japanese introduced the MSX range. So how does the Enterprise fare against these recent arrivals?

Hardware

The model tested was the 64k Enterprise housed in a low profile black ABS casing. To the front of the unit is the keyboard which slopes slightly towards the user. Above the keyboard is a perspex strip under which can be inserted a strip of cardboard stating the current function definitions. There is also a small green joystick in the lower right-hand corner, a fairly central red LED and to the left an external finned heat sink.

With its black, green, blue and red colour scheme, joystick and external heat sink, the machine looks rather futuristic and toy-like at a time when the trend in the home is towards more professional units. An earlier demonstration model used the same design and looked much more purposeful with its shades of grey as the colour scheme. Overall I'd say the unit looks like a cross between a Tonka toy, a panel of the USS Enterprise and a rubber typing mat.

The Enterprise has ports on three of its four sides. On the left is the ROM bay or cartridge socket. This has sufficient address lines to accommodate up to 64k cartridges and is where the Basic cartridge is inserted.

Included with the Enterprise is a Basic cartridge, a TV cable, cassette leads, a power supply, a demonstration cassette and two manuals (the *Setting Up Guide* and the *Programming Guide*).

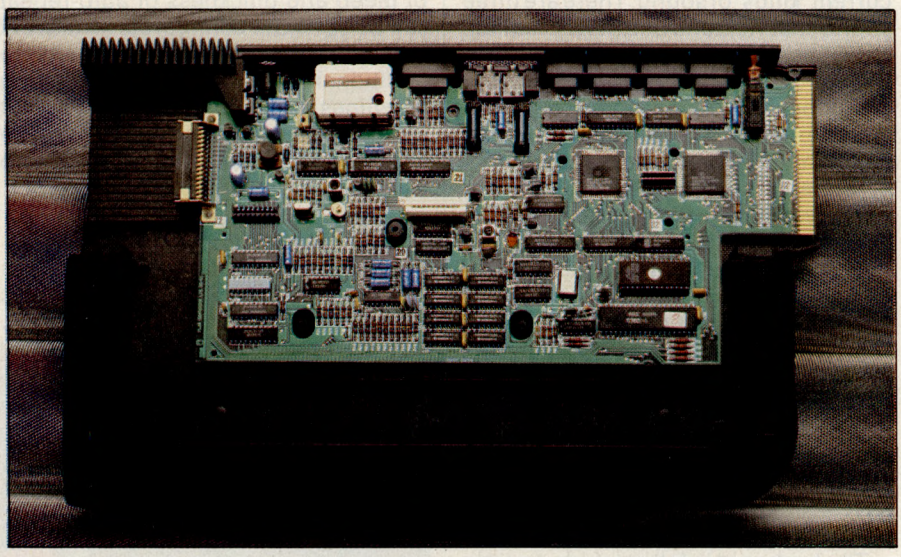
Along the back is a power socket, television output, sufficient holes to drive two cassette recorders and a large red reset button. Also on the back are monitor output to drive, an RGB colour monitor or composite video monochrome monitor, a serial and networking RS432 port, a centronics-type parallel port and two joystick ports. These are of a non-standard 'clip-on-the-PCB' type and thus prohibit the use of standard leads and joysticks. Enterprise will manufacture suitable leads. There is no power switch but to compensate for this, warm and cold resets are available with one and two presses of the reset switch respectively.

On the right-hand side, covered by a plastic casing, is the expansion port. This not only contains an extension of the main processor bus but also video in and audio in lines, allowing all sorts of possibilities — such as relaying a video track through the computer. To use this expansion port a *base unit* has to be bought, onto which can be stacked the disk drive, extra RAM, and so on. Unfortunately this makes buying your first major peripheral that much more expensive.

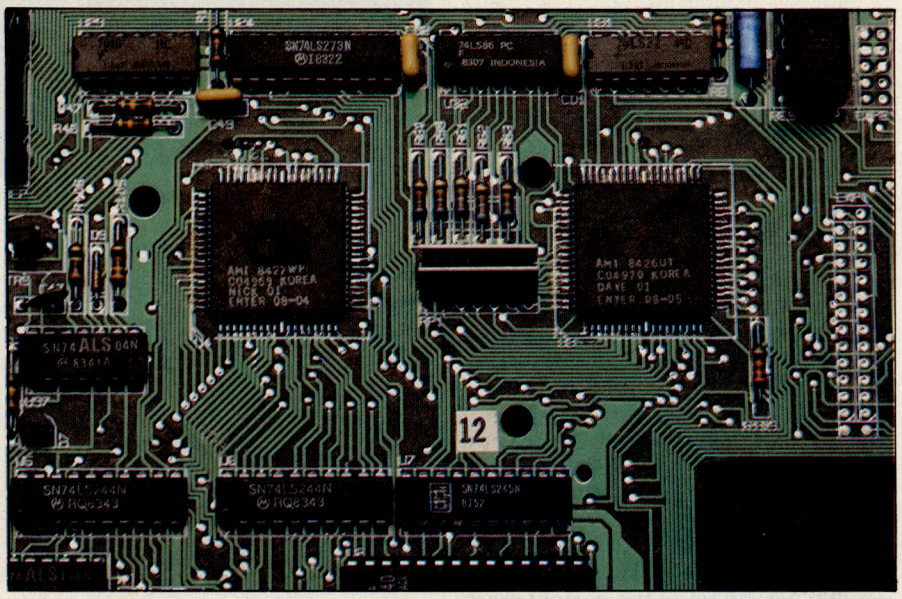
Opening up the unit requires no fewer than fourteen screws to be removed. Once inside you are greeted with a single, somewhat cramped looking, PCB; from the middle of which run two ribbon cables up to the keyboard. Its most striking feature is not the Z80 processor but the two custom-built chips 'Nick' and 'Dave'. These are square with connections on all four sides — 18 lines per side giving a total of 72 possible lines from each chip. Below these is the Z80A processor which runs at 4MHz and the operating system and word processor ROM. Sixty-four kbytes of dynamic RAM is organised in a bank of 8 × 8k RAM chips. Other than this there is the usual collection of timing and decoding logic chips. Overall the board looks as though it could be produced cheaply and quickly in the right volumes.

'Nick' is the custom video chip. On the pre-production model reviewed the chip wouldn't support some of the higher graphic modes, but it was still possible to appreciate some of its versatility. The 'Nick' chip organises the display into a list of mode lines. Each mode line can have its own particular area of video RAM and consists of a number of television scan lines of independent width and height.

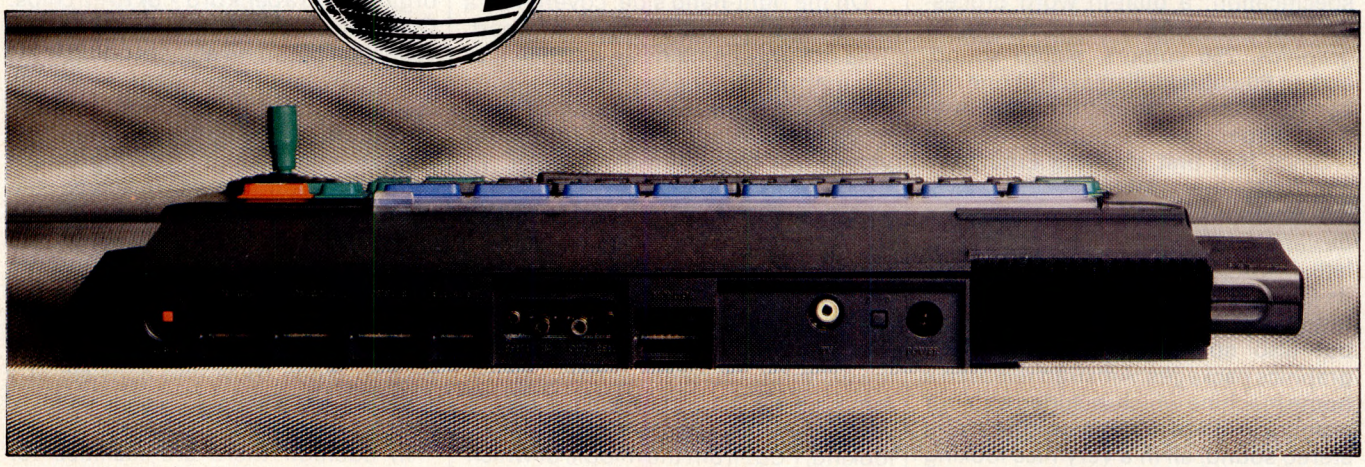
In addition there are facilities for changing screen parameters while the screen is being drawn. This gives exceptional versatility to the machine code programmer, and with the links Enterprise has provided to Basic, offers a very wide range of displays for the Basic programmer. As an example of its power, it would be relatively easy to



A compact PCB with the two custom chips overshadowing the Z80 processor



The custom video and audio chips, 'Nick' and 'Dave' — named after the designers



From left to right: reset switch, joystick, serial and parallel ports, cassette sockets, monitor and UHF output, power socket

design screens for the current multi-screen adventures, so that each screen occupies, say, 40 bytes.

The 'Dave' chip handles the audio, and, in my opinion, is certainly on a par with the BBC or Commodore 64, the current 'kings' of sound. There are three sound channels and one noise channel, covering eight octaves each, and facilities for filtering and ring modulation, envelope control of both pitch and volume — all in stereo. Sound output is through a built-in speaker, external amplifier or headphones.

There are two text screens: 40×24 and 80×24 pixels; but the latter requires a monitor. Graphic screens can be up to 672×256 pixels with up to 256 colours on the screen at the same time. Unusually there is no trade-off between screen resolution and number of colours available and an imaginative machine code programmer would be able to produce some very colourful high resolution displays. Curiously, for such a high video specification there is no sprite facility.

The keyboard is full-stroke but a little 'slushy'. I found I needed the confirmation bleep from the in-built speaker. The keys are of the contoured injection-moulded type like the QL, and not in the same class as, say, the BBC or Amstrad. Having said that I think most touch-typists would find them acceptable.

At the top of the qwerty keyboard are eight blue rectangular function keys. Used alone and in conjunction with SHIFT, CTRL and ALT these give a total of 32 different functions. They can be configured and read from within a progam using Basic. All control and editing keys are coloured green (including the joystick) and provide a comprehensive set of editing functions including LOCK, INSERT, DELETE, and ERASE. The joystick is used instead of cursor control keys and after a little use seems an extremely natural way to edit text. But it doesn't look as though it could take much heavy use and wouldn't stand up to the current craze for decathlon Olympic-type games. It is of the switch not analogue type, so we shall probably be seeing converters for Atari-type joysticks in the near future.

Each key depression generates a bleep from the in-built speaker and auto-repeat is provided. The loudness of bleep and quickness of auto-repeat can be software configured. A network of 32 machines can be created with no additional hardware by connecting machines through the serial/net port. It is, however, necessary to load in appropriate communication software as none is supplied with the machine.

System software

The Basic is supplied on cartridge and is a version of ANSI Standard Basic extended with structured features, graphics, sound and links to the operating system. Typing in a small Microsoft Basic program required very little modification suggesting that the Basic is compatible with Minimal Basic, as Enterprise claims. I will, therefore, concentrate on the more interesting aspects of Enterprise Basic.

A quick glance through the *Programming Manual* makes Enterprise Basic seem a little daunting because of the sheer number of commands available.

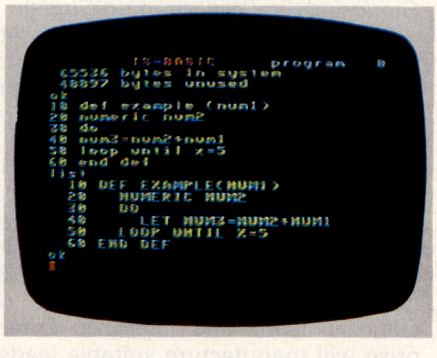
Basic programs are entered via a full screen editor. This uses the built-in word processor as its base and practically all the word processor commands are available to edit Basic programs. This arrangement works very well, though it is a little easy to forget to



The expansion port with no fewer than 62 lines for peripheral connection



The word processor in action



The Basic will interest programmers



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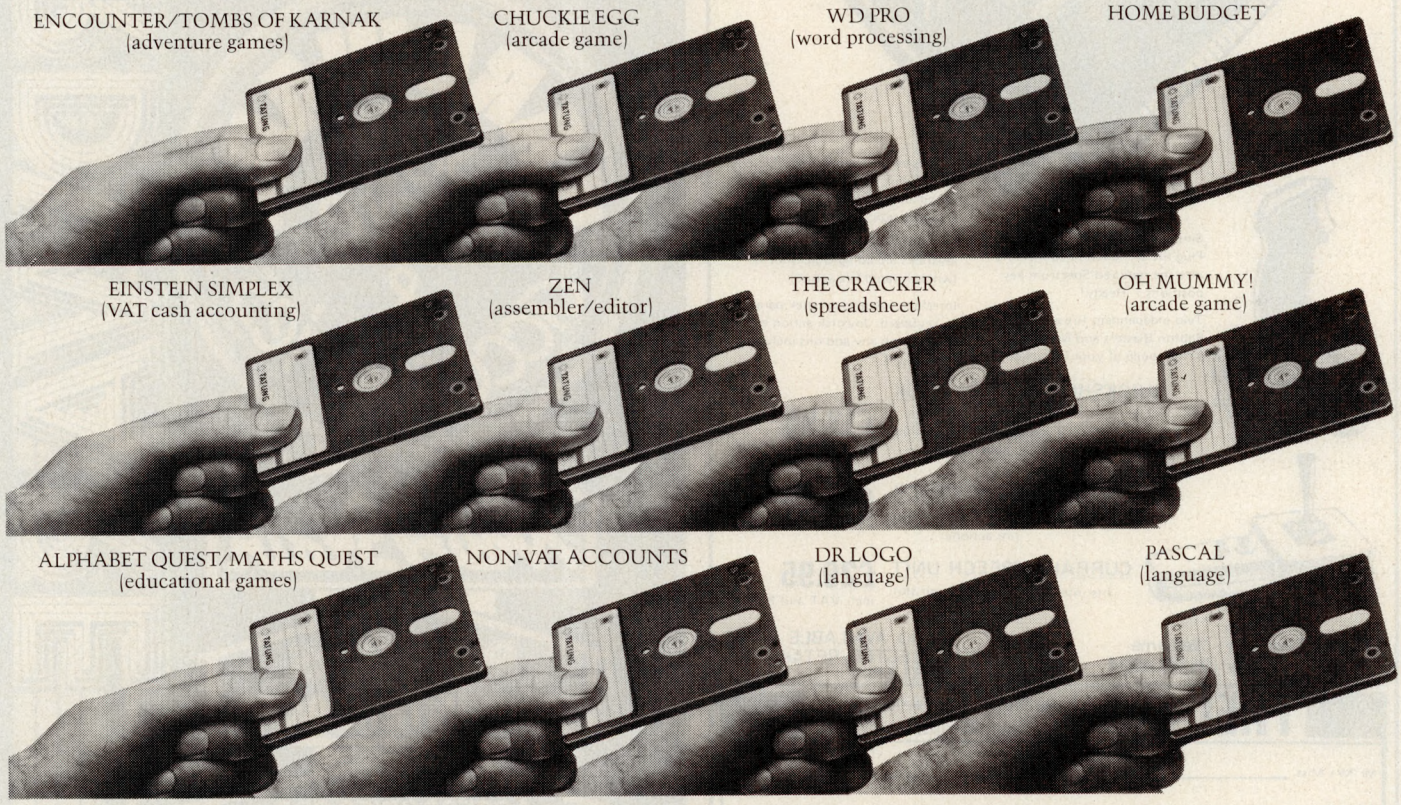

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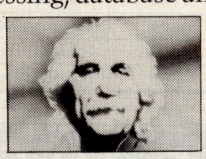

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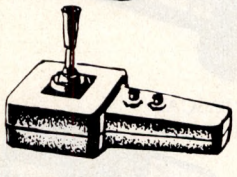

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ENTER your newly edited line. In addition to the word processor functions (described below) there is AUTO for automatic line numbering, DELETE for block line deletion and RENUMBER.

The power-up settings of the function keys are shown on a strip of paper under the perspex strip. These are set up with commonly used Basic commands such as LIST, START, AUTO, and CONTINUE.

Noteworthy features of Enterprise Basic include 'Procedures' and 'Functions' with both value and reference parameter passing, DO LOOPS with both WHILE and UNTIL condition testing, multi-line IF . . . THEN . . . ELSE . . . ENDIF blocks, CASE statements, and numerous links to the operating system, sound and graphics.

Procedures and functions are defined with the DEF command. This can be single-lined or a multi-line block ending with END DEF. Local variables can be used within a procedure. The procedure can be turned into a function by using the procedure name as a variable name within the procedure as in Pascal. Parameter passing normally creates local parameters, but the addition of REF before the parameter creates a reference to the parameter and allows operation on the passed global variable. Overall this is a very complete procedure capability — even my attempt at a recursive factorial worked perfectly.

DO LOOPs are provided with both WHILE and UNTIL the controlling condition. Enterprise has provided a simple and elegant solution to the problem of whether the condition is a leading or trailing condition on the loop. If you want a leading decision, place the condition at the start of the loop. If you want a trailing condition, place the condition at the end of the loop. Also provided is a structured IF . . . THEN . . . ELSE . . . ENDIF and case statement. The case statement, actually call SELECT on the Enterprise, gets over the problem of what happens when none of the conditions are satisfied by the provision of an ELSE placed at the end of the SELECT.

Another striking feature of the Basic is the number of configurable system parameters. For example, using the 'SET' statement it is possible to configure a very wide range of machine, video and sound options such as the size of the editor buffer or redefinition of the character set.

It is possible to have a number of programs in memory simultaneously, each with its own local variables and line numbers. Limited communication is available between the programs by chaining; parameters can be passed from one program to another.

Although most graphics modes were unsupported on the review machine it was possible to experiment with the graphics using a mode called GRAPHICS ATTRIBUTE. This mode divides the screen into a number of squares, each of which can accommodate up to two independent colours — Spectrum-style, although each square has much better resolution than the Spectrum.

Enterprise says there will also be GRAPHIC Hi-Res and GRAPHIC Lo-Res modes. Within each of these you can select GRAPHICS 2, GRAPHICS 4, GRAPHICS 16 and GRAPHICS 256 (the parameter refers to the number of colours available.

A wide variety of resolutions are available, though a high resolution screen with 256 pixels would consume vast amounts of memory. Maximum resolution is 672 × 256 with various others available down to 80 × 256 (in theory it is possible to double vertical resolution by 'interlacing').

Despite the difference in resolution, all graphics modes use the same system of coordinates. This means the screen references for a coordinate are constant irrespective of graphics modes.

The BBC does the same thing but other users may find this approach unusual, although it has the advantage that a change of graphic mode doesn't necessitate a change of all coordinates. One other difference from other computer graphics systems is that the coordinate 0,0 is in the lower left-hand corner of the screen, instead of the normal upper right-hand position.

The fundamental drawing command for a graphics screen is 'PLOT x,y'. This can be followed by more coordinates, a semi-colon between successive coordinates indicating a drawn line between the points.

A number of alternatives are available to the basic PLOT command; for example, 'PLOT ELLIPSE x,y' will plot an ellipse, or a circle if x equals y, PLOT PAINT will fill a shape with colour. Also available using PLOT are a number of relative drawing commands — Logo style. These are PLOT FORWARD, PLOT BACK, PLOT LEFT and PLOT RIGHT.

With all graphics modes, except 256 colour mode, it is necessary to select the required colour from what Enterprise calls a palette. To change the palette from its default setting, the command SET PALETTE is used followed by sixteen colours. Even in two-colour mode it is necessary to specify sixteen colours, the first two being the ones available.

Colours on the Enterprise are divided into 32 groups, with eight shades in each colour group. Colour can be specified in three ways, an integer between 0 and 255, the primary teletext colours can be specified by name such as BLACK, RED, WHITE, and, most interestingly, as a fraction of the luminance created by the three red, green and blue colour guns within a colour TV or monitor using the command COLOUR(r,g,b). For example, COLOUR(0,0,0) would be black, COLOUR(1,1,1) would be brilliant white, and COLOUR(0.6,0.6,0) is an off yellow. Mixing colours in this manner does not follow the same rules as mixing paint because you are, in fact, mixing sources of light.

The last eight colours in a palette have to be of one colour with eight different shades. Having set up your palette you can then extract your required colour by SET INK, SET BORDER and SET PAPER.

Sound follows in the trend of the BBC Micro — complex sounds can be generated and then sound envelopes can be applied to these sounds. It is initiated with the SOUND command — logical enough. Optional parameters are pitch, left and right volume, duration, voice number, style, which envelope to apply, synchronisation with other sounds and interruption of other sounds. Envelopes are created with the ENVELOPE command and are user-numbered to be applied to any sound. One single envelope can consist of a number of phases, each phase specifying the change in pitch, left and right volume and duration.

Synthesis of very complex sounds is possible with these two commands, the in-built loudspeaker doesn't really do justice to the sound creation facilities. It is well worth investing in a special socket to feed sound through to headphones or an external amplifier.

There were only a couple of minor grumbles about the Basic. Even given that the review machine was running at half speed due to the pre-production video chip, it was still a slow Basic and I don't expect it to break any records in terms of Benchmarks (Benchmarks will be published as soon as a full speed machine is available). Also because of the wide format of Basic lines which can be entered, the syntax checking is not very thorough.

The operating system reminded me of the flexible operating systems found on some 1960's mainframes; but the limitation on memory is the addressing capability of the processor, *not* the price of RAM.

To give the Enterprise its four Mbytes of addressing space, Enterprise has divided the Z80A's, 64k addressing space into four 16k pages. A further function of the Dave chip is the decoding of 22-bit addresses rather than the normal 16-bit addresses. The 22-bit address is converted into page number and the address within a page. The appropriate page is then used.

All devices are accessed via channels providing considerable flexibility with input/output instructions. For example, it is possible to set up a custom graphic display with different graphic modes on one screen and eliminate the text window by using a different channel from Basic. Animation could be simply achieved by flicking the video screen between channels with a different frame of the cartoon on each channel. Channel-based architecture also makes the connection of any kind of peripherals much simpler than usual.

Application software

If you don't insert the Basic cartridge described above the machine will boot up into the built-in word processor. Two bands at the top and bottom of the screen give the meaning of various function key depressions.

Text is entered on a full screen editor, 40- or 80-columns wide; words that don't fit on the end of one line automatically wrap-around to the next line. Paragraphs are delineated by ENTER key depressions. The joystick is, of course, used to position the cursor anywhere on the screen. It is possible to toggle between insert and over-write mode. This change is shown by the cursor changing between a solid block and backwards arrow.

The word processor allows you to set margins, right and left justification and a limited form of paragraph movement, and is very much of the current home word processor type. It is noticeably lacking in some features, such as SEARCH and REPLACE, block deletions, block moves and duplications. By itself the word processor is not sufficient to justify the purchase of an Enterprise — but it is extremely easy to use.

Probably the most important aspect of a new machine's success is software support. (An excellent specification alone is no guarantee of sales.) At the time of writing there are a number of software houses writing or interested in writing programs for the Enterprise. Intelligent Software, Enterprise's software affiliate, will of course be supporting the machine and will have a number of programming languages and programming aids available at the public launch. Also under development are two converter tapes which will allow the Enterprise to understand BBC and Spectrum Basic. Enterprise hopes that this versatility of design will inspire software houses to design programs of a calibre that isn't possible on older designs.

Documentation

Two manuals were supplied with the machine: a *Setting Up Guide* and a *Programming Guide*. These were not in final form but gave a taste of the style.

The *Setting Up Guide* is a slim volume which straightforwardly explains how to get the system up and running, and execute operations such as cartridge insertion and trouble-shooting. In this it is effective.

The second manual is the 200-page *Programming Guide*. This is divided into three sections: Getting Acquainted; the Tutorial; and the Reference section. It is generally well-written and contains numerous examples. The Tutorial section is more suited to converting existing Basic programs to the structured Enterprise Basic than teaching novices. The Reference section is both comprehensive and well-written and provides a most valuable insight into the operation of the Enterprise. However, in my opinion, more technical documentation will be needed if machine code programmers are to make the most of the machine.

Prices

The 64k Enterprise costs £249 and is being launched in mid-November. The 128k version will be launched next year at approximately £350.

A number of peripherals are in various stages of development. These include disk drives, a touch tablet and RAM expansion.

Conclusion

The Enterprise is still ahead of the field in terms of technical specification, although the competition is obviously a lot stronger now than a year ago. The time it has taken to deliver the machine has hindered its chance of success and the going will now be much more difficult with Sinclair's QL, the Amstrad CPC 464 and the MSX machines to fight against. The machine's idiosyncratic styling and non-standard ports are also drawbacks.

Currently the Enterprise will only really appeal to programmers attracted to its structured Basic, nicely designed operating system and technical specification. But if software houses support the machine, its appeal will obviously be wider.

However, the Enterprise seems to have got over its identity crisis, even though the PCB still bears the stamp of one of the earlier titles, Flan. END

Technical specifications

Processor:	Z80A running at 4MHz
ROM:	32k operating system and word processor, 16k Basic cartridge
RAM:	64k dynamic RAM
Keyboard:	68-key full-stroke keyboard including eight function keys and joystick for cursor control
Display:	Text modes: 40×24 and 80×24. Graphics up to 672×256 — up to 256 colours
Sound:	Three sound channels, one noise channel, stereo, eight octaves
Interfaces:	64-way expansion port, cartridge slot, cassette sockets for up to two cassette recorders, serial/net, parallel (centronics-type), two joysticks
Video Outputs:	RF Television, RGB, composite video and audio
Dimensions:	1½in×15½in×10in
Weight:	3lb 6oz

In perspective

The Enterprise is aimed at the top end of the home market. With the Sinclair Spectrum dominating the cheap home micro sales, this is probably the most contested area of micro sales.

The Enterprise offers the best Basic and internal architecture in its class with its only rival being the Sinclair QL. This alone is no guarantee of success. To make inroads into the micro sales charts it is necessary to make a machine appeal to non-technical people. Enterprise intends to mount an extensive marketing campaign aimed at doing this.

A number of other machines have different attractions that may lure potential purchasers away from the Enterprise. The Commodore 64 and Atari 800XL have vast software libraries, Amstrad includes a colour monitor and cassette built into a single integrated unit, Sinclair's QL offers fast secondary storage and a suite of business programs, and the MSX range offers a sort of software compatibility unknown to home users.

Comparing prices, the Atari 800XL and Commodore 64 come in at just under £200. The Enterprise is more expensive at £249 but costs less than the MSX machines, which start at £275. An Amstrad with colour monitor costs £329, while the BBC B and QL are nearer the £400 mark. Enterprise obviously thinks it has found the right price niche for its machine but, equally obviously, it faces a struggle establishing itself against such close competition.

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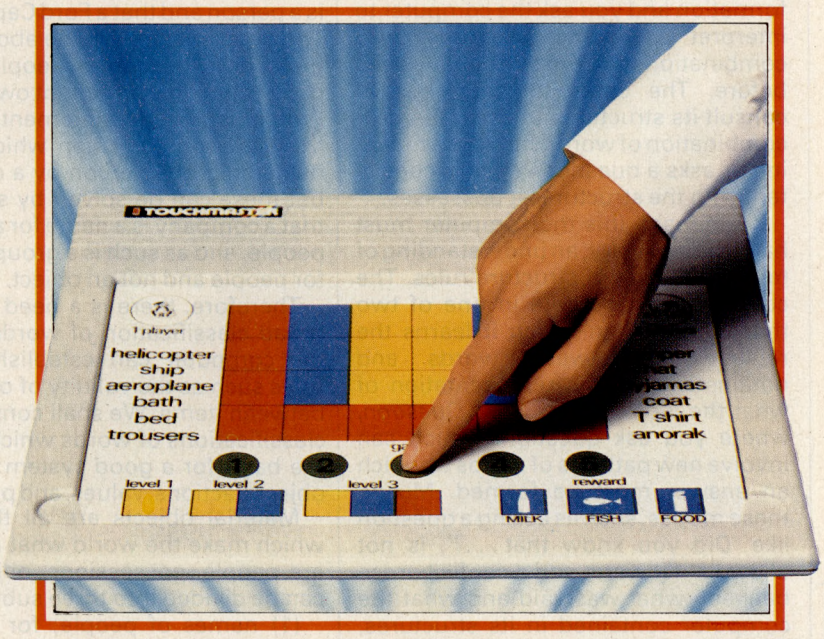

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Lateral thinking

A structured approach to programming the English language can lead to some interesting results. Andrew Couch gets to grips with natural language processing.

Providing artificial intelligence on a computer is undeniably difficult. But it's not too hard to make a computer a *little* more intelligent, even if not quite up to the standard of an expert system. As one example, this article explains how to program a computer to form an intelligent reply to a question it has never been asked before.

Structured language

Putting it simply, this can be done by identifying structures in the way words are used. The clever part comes when you have already structured this information and you ask the computer to interpret a pattern of words in a combination that it may not have seen before. The computer then has to consult its structures to see if the new combination of words conveys a meaning or asks a question which is consistent with the structures it possesses.

To manage this the computer must have a vocabulary, an understanding of tense and a set of structure rules. The computer will operate in one of two modes: *Learn*, in which it learns the relationship between words and obtains a symbolic representation of what the word means; and *Question*, where you ask questions which can involve new patterns of words to which an answer must be formed. Mixing these modes, such as asking a question like 'Did you know that . . .?', is not allowed. If it were, and a conflict arose between what was said and what the computer contained in its structures, how would the computer know who was correct?

Word classification

But before the programming problems are solved, we first have to identify the word structures. As we know (but do not often recognise), the English language is very complex, with an average adult having a vocabulary of over 100,000 words. Because of this, writing a program to deal with every possible question is very difficult, so some simplification is required. Consider the following: we have informed the computer that people can own cars but cars cannot own people. We then ask two questions concerning John and his Ford Capri.

'Can John own a Ford Capri?'

'Can a Ford Capri own John?'

Before the computer can answer either of these questions it requires more information. It needs to know that John is a person and that a Ford Capri is a car. The generalisation of the above example leads to the rule that people can own objects but objects cannot own people. Problems arise in statements such as 'He was a company man' which implies ownership of a person by a company, but these can be solved by specifying that a company is a name for a group of people, and as such is a grouping word for people and not an object.

Therefore, there is a need for some broad classification of words, so that the computer can establish general rules such as the validity of ownership between items. We shall consider four classifications of words which provide the basis for a good system: material objects, actions, values, and properties.

Material objects are all the things which make the world what it is. They are people, possessions, objects, and can be divided into three sub-classes.

(1) names of people; for example, John;

(2) objects which people can see, own, touch; for example, car; and

(3) parts of the objects in class (2); for example, wheel.

This type of sub-classification is relative. We could equally have defined our classes as:

(1) names of cities;

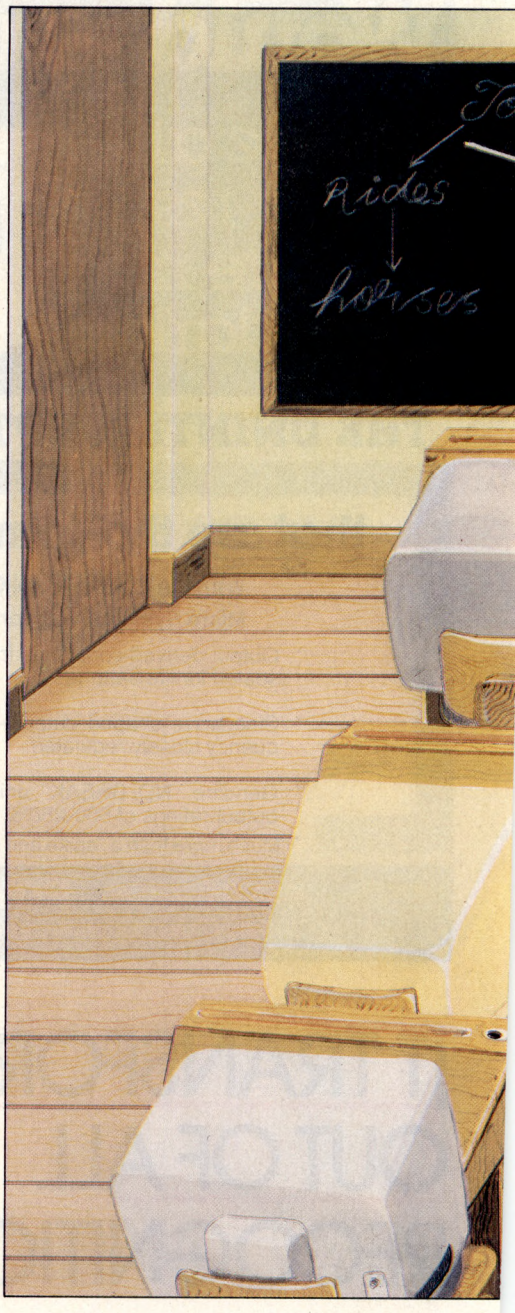


Illustration by Martin Aubrey

(2) famous buildings in cities; and

(3) objects found in the famous buildings.

The actual choice of what is to be classified is to some extent arbitrary. Only the relative importance, that class (1) is more important than class (2) which is more important than class (3), must be maintained.

The sub-classification of material objects sets up a type of hierarchy among the objects.

Actions are words which reflect that something is being carried out, such as running, dancing and swimming; for example, 'The tree was *falling* over.' Values are of a purely personal nature. They express feelings, such as hatred and love. Properties are physical attributes of objects, such as colour, shape and size. They also reflect the current 'state' of something or someone; for example, 'John had flu.'

The 'state' here is that of illness.

Will any word fit into one of our categories? The answer, unfortunately,

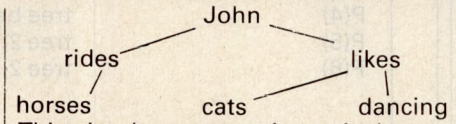


is 'not always'. But there are many cases where the classification works.

Word structures

Having classified words, we need to put them into a structure, and the one I've adopted is the familiar tree structure. The tree hierarchy starts from the base, that is the key word, and spreads out to various branches which represent words associated with the key word. From the branches hang the buds, that is the words related to the key word via the branch words.

If the analogy isn't clear, a practical example should help to straighten things out. In a sentence such as 'John likes cats', 'John' is a base word (and a grade 1 material object in our classification), 'likes' is a branch (and an action), and 'cats' represents a bud (and a lower-level material object). If another branch were added, for example 'rides', and further buds, for example 'dancing' and 'horses', the tree structure would be:



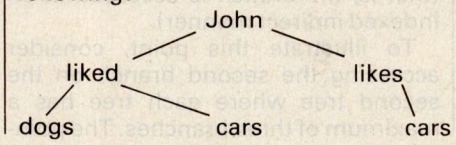
This simple structure is equivalent to storing the three statements:

'John rides horses',
'John likes cats',
'John likes dancing'.

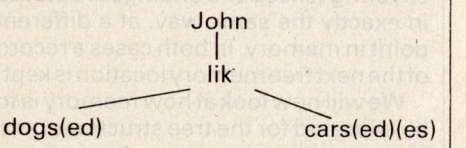
We've said that the computer requires the capacity to handle tenses. The way in which this is incorporated can be seen from the following example. Consider the three statements:

'John liked dogs',
'John likes cars',
'John liked cars'.

There is a definite distinction between *having* liked something and *still* liking it! We would normally construct the following:



However, the structure becomes more complex as we add on branches for tenses, so it is much easier to store the tense of a branch with its associated bud:



For cars we have the connecting branches 'liked' and 'likes' indicating that John both likes and *has* liked cars.

Programming

Now onto the programming. Each material object, action, value and property is stored as an ASCII string, closed by a delimiting symbol to indicate where the word ends. The delimiter is followed by three pointers. Material objects require a pointer to a possible plural ending, values and actions pointers to tenses, and properties pointers to endings. Using three poin-

ters is sufficient to cover a range of possibilities, including the past, present and future tenses of regular verbs.

After the pointers comes a flag indicating the word's classification: flag 1 for a material object, 2 for an action, 3 for a value, and 4 for a property. Material objects are further divided into the three previously mentioned sub-classifications. Any inapplicable flag or pointer is given a value of zero.

Thus the word 'cars' would be stored as the ASCII code for 'car', followed by the delimiter, a pointer representing 's', two zero pointers, flag 1 (indicating that a cat is a material object), and finally its sub-classification (in this case, 2). A value such as 'like' would be stored as 'lik', followed by three pointers providing a range of suffixes such as '-e', '-es' and '-ed', and then ended by flag 2 indicating its classification (3).

There are two approaches to setting up a vocabulary of the words themselves. The first is to set up an array of strings and search various elements in the array. The other method, and the one adopted here, is to set aside areas of memory for the various parts of the program and use machine code search routines. This utilises the available memory best and also provides a very fast searching method.

We'll now describe in algorithmic form the technique to store a word in the vocabulary. For those who have a 6502-based machine the following is implemented using the facility of post-indexed indirect addressing (see also Fig 1).

STVADD start vocabulary memory pointer

WORDP pointer to beginning of vocabulary word, where the vocabulary word is (string)(del)(P1)(P2)(P3)(C)(Sub-C) as described earlier.

WLEN Word length, that is, string length+6

The values assigned to the pointers covering tenses and endings are stored in exactly the same way, at a different point in memory. In both cases a record of the next free memory location is kept.

We will now look at how memory is to be allocated for the tree structures, and how these structures are formed, updated and searched.

The trees are laid out in memory as shown in Fig 2, where 'fp' indicates a fixed pointer to the beginning of a tree structure and 'vp' indicates the point in memory to which the tree has grown.

The arrows indicate how the memory is all sequentially laid out. Having trees of a fixed length with a fixed maximum number of buds in a tree does impose some limitations. However, this does simplify many other aspects of the program, and we trade off memory for speed of searches. Typically a useful tree system may have about five trees each with five branches, and each branch containing about 10 buds. The fixed and variable pointers associated with the tree structures are stored in tables, so to access any given bud a simple offset can be constructed from the tree number and branch number.

At this point in the pointer table the fixed pointer for the given branch will be stored. The memory starting from this fixed pointer can then be sequentially searched to find the desired bud (that is, the branch is accessed in an indexed indirect manner).

To illustrate this point, consider accessing the second branch on the second tree where each tree has a maximum of three branches. The pointer table would be as in Fig 3.

The index to the pointer table is calculated as follows:

(TREE−1)*3+(BRANCH+1),

that is,

(2−1)*3+(2+1)=6

So, pointer(6) contains 260, that is, the desired branch starts at memory location 260.

We'll now consider the 'Learn' mode of operation to explain how the tree structures are constructed. The Learn mode consists of three parts, two of which, 'add to vocabulary' and 'add to tense table' are straightforward applications of the algorithm described earlier to set up these tables. The third part of the Learn mode is constructing a

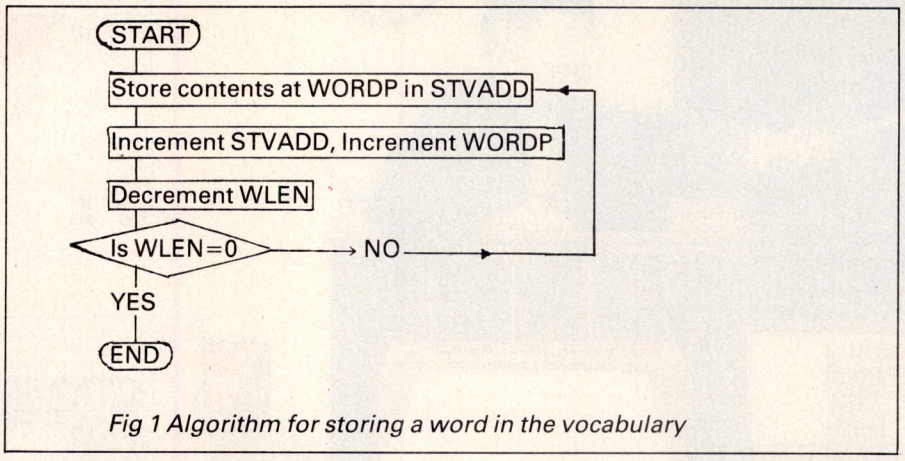


Fig 1 Algorithm for storing a word in the vocabulary

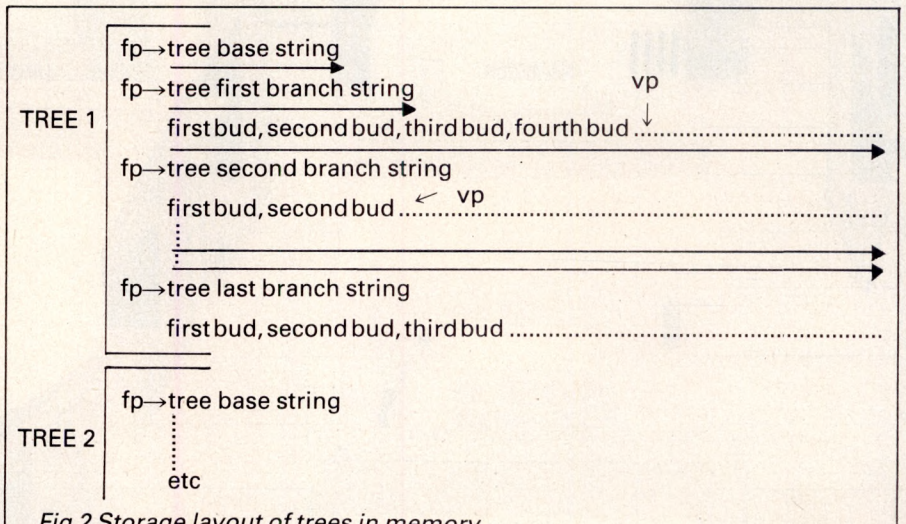


Fig 2 Storage layout of trees in memory

Pointer Table or Array	Pointer	Contents
P(0)	tree base 1	200
P(1)	tree 1, branch 1	210
P(2)	tree 1, branch 2	220
P(3)	tree 1, branch 3	230
P(4)	tree base 2	240
P(5)	tree 2, branch 1	250
P(6)	tree 2, branch 2	260
.	.	.
.	.	.
.	.	.

Fig 3 Pointer table

tree structure or updating an existing structure.

Most of the time we are interested mainly with first class material objects and their relationship with other objects, so we'll only construct trees for first class objects. To aid explanation consider constructing a tree to contain the relation between John and his car. From the point of view of operating this part of the program all that need be entered is the statement: 'John likes cars.' This is the 'Learn string'. This statement would be read into a string variable.

The next stage is to split up all the words in the string and store each in a separate string. This can be done by performing searches for the space characters between words and using some simple string manipulations. Having performed this we next have to determine the classifications of each word, by searching in the vocabulary for each word, then checking for the ending or tense, and then retrieving from the vocabulary the flags which tell us the type of word we are examining.

The algorithm for this searching process is shown in Fig 4 and performed for each word in the Learn string.

Having established the word classification and found all words to exist in the vocabulary, we now want to search the existing trees to see if this information already exists, and if not, add the information to an existing tree or create a new tree. This can be illustrated in the form of Fig 5.

The search is referred to as a 'cascade search': if a test results in a word being found then the search cascades to the next level of search. The buds on the end of the branches are stored in the following format: (string)(Pointer value for tense/ending used)(delimiter)(Pointer value for tense/ending used) and so on. If we had both 'liked' and 'likes' used in conjunction with the same branch, then the bud is constructed as (LIK-)(Pointer to ED)(Pointer to ES).

Note that when adding another tense/ending pointer to an existing bud, some shifting along in memory will be needed for other buds after the one in question to make room for the new addition.

The string from which all this stemmed was very simple, containing only three words. It is left to the reader to consider some of the more complex situations that could arise, such as two first class material objects in the same statement; for example, 'John loaned June his pencil.' Here indeed more tiers may be required in the tree structure.

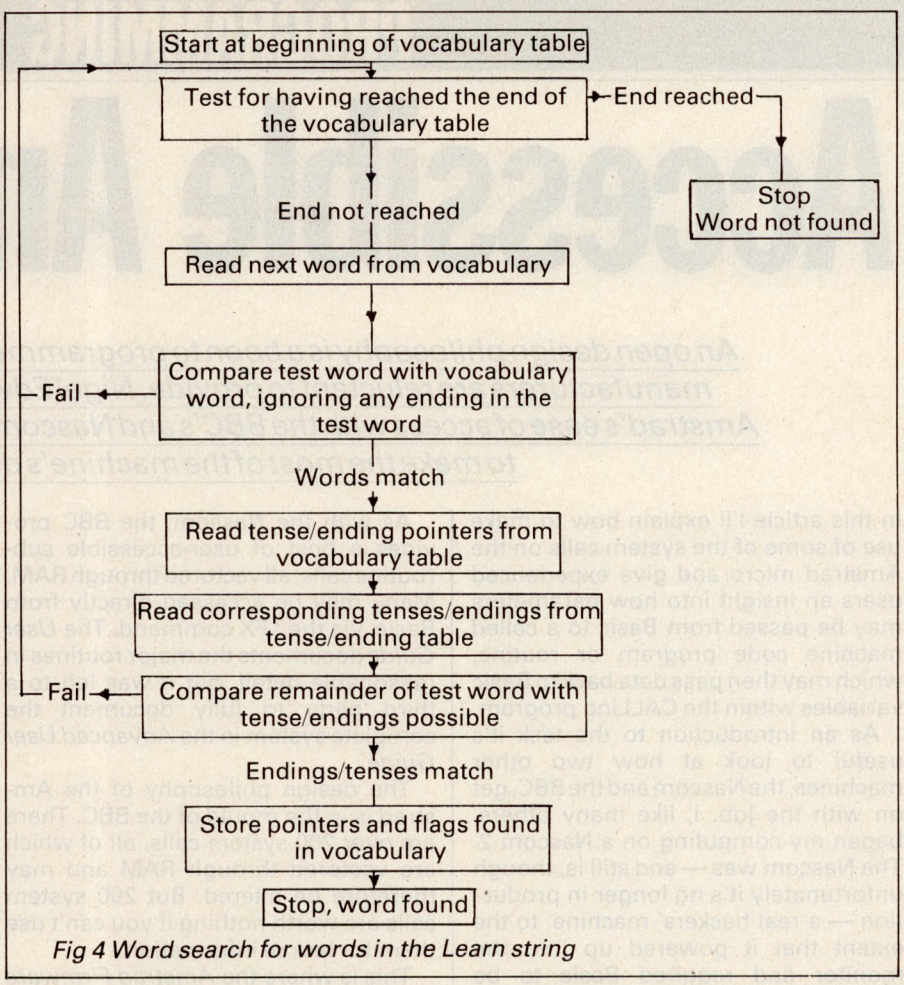


Fig 4 Word search for words in the Learn string

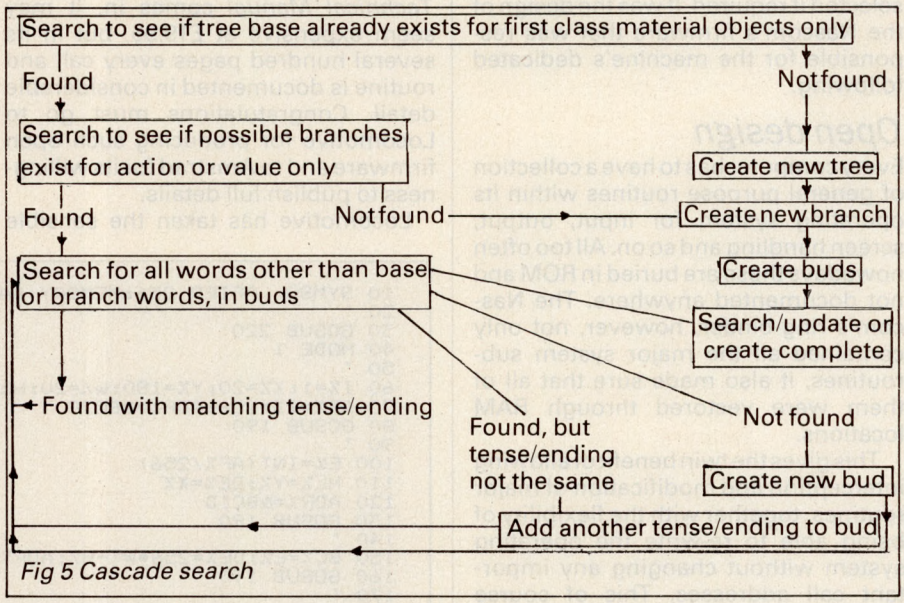


Fig 5 Cascade search

Intelligence level

To return to our opening paragraph, the intelligence rating of this program depends on how well it can form replies to questions presented in a form new to the computer. In its simplest form the question mode is not too difficult and yields satisfactory results. Consider asking the question:

'Does John like cars?'

Here we would look for a tree called 'John' after establishing that 'John' is a first class material object, then search for a branch called 'lik','li','like' or 'l'. Having found such a branch, we then search for a bud 'cars' and a bud tense/ending pointer which completes the branch word. For example, we could find a branch 'lik' and a bud 'cars' with a pointer to 'e', so completing the branch word 'like'. In this case a simple answer of 'yes' or 'no' would suffice.

Questions of the form 'What does John like?', are also easy to handle. In this case we simply search the branch 'lik' and then list all the associated buds. The reply could be 'John likes cars . . .'. Things start to get more complex as we permit more complex questions:

'Is it possible that John likes cars?'

Another more advanced feature would be to construct searches so that if the question 'Did John like cars?' is asked and the structure only contains the information that John likes cars, the reply is:

'No, but John does like cars.'

However, constructing a program which could handle this level of reply would indeed be a huge task. END

Accessible Amstrad

An open design philosophy is a boon to programmers, though one many manufacturers are reluctant to provide. Nigel Edwards compares the Amstrad's ease of access with the BBC's and Nascom's — and explains how to make the most of the machine's design.

In this article I'll explain how to make use of some of the system calls on the Amstrad micro and give experienced users an insight into how parameters may be passed from Basic to a called machine code program or routine, which may then pass data back to Basic variables within the CALLing program.

As an introduction to the task it's useful to look at how two other machines, the Nascom and the BBC, get on with the job. I, like many others, began my computing on a Nascom 2. The Nascom was — and still is, though unfortunately it's no longer in production — a real hackers' machine, to the extent that it powered up into the monitor and required Basic to be selected if required. It was the design of the Nascom's firmware that was responsible for the machine's dedicated following.

Open design

Every computer has to have a collection of general purpose routines within its operating system for input, output, screen handling and so on. All too often nowadays these are buried in ROM and not documented anywhere. The Nascom's ring-binder, however, not only contained all the major system subroutines, it also made sure that all of them were vectored through RAM locations.

This gives the twin benefit of allowing interception and modification of major routines, together with the flexibility of being able to re-write the operating system without changing any important call addresses. This of course meant that third party software which used only the official RAM vectors would work with any version of the operating system.

Some home microcomputers followed the Nascom, but the majority ignored this open design philosophy until Acorn resurrected it for the BBC Micro. The BBC actually takes this idea further by allowing a considerable amount of low-level access to the machine system directly from Basic. In fact Acorn's approach is such that it is even possible to construct a new disk filing system without ever really leaving Basic.

As with the Nascom, the BBC provides a host of user-accessible subroutine calls, all vectored through RAM. Many may be accessed directly from Basic, via the *FX command. The *User Guide* documents the major routines in reasonable detail, but it was left to a third party to fully document the complete system in the *Advanced User Guide*.

The design philosophy of the Amstrad is in the mould of the BBC. There are over 200 system calls, all of which are vectored through RAM and may therefore be altered. But 200 system calls are worth nothing if you can't use them for lack of information.

This is where the *Amstrad Firmware Technical Manual* comes in. It may seem expensive at £19.95, but in its several hundred pages every call and routine is documented in considerable detail. Congratulations must go to Locomotive for producing such open firmware and to Amstrad for its willingness to publish full details.

Locomotive has taken the sensible step of assigning actual Basic keywords to the more common system control functions. This compares favourably with the system employed on the BBC. It's far easier to remember the Amstrad's 'SPEED INK a,b' than the BBC's '*FX 9,a' and '*FX 10,b' when all you want to do is change the display flash rate.

On the BBC there is a simple method for passing a limited amount of data from a Basic program to a machine code routine as the Accumulator, Flag, X and Y registers of the 6502 are loaded with the contents of Basic variables A%, C%, X% and Y% respectively when the CALL instruction is executed. This is an easy method to use but only allows the passing of four bytes of data and does not provide any method of returning data to Basic variables. This facility does not exist on the Amstrad, but Listing 1 provides a very similar facility which actually goes further, as it directly allows the user to pass eight bytes of data. More importantly, it will pass data back into Basic variables from

```
10 SYMBOL AFTER 256:MEMORY &AB7F:SYMBOL AFTER 240
20 '
30 GOSUB 220
40 MODE 1
50 '
60 I%=1:X%=20:Y%=180:W%=20:H%=100
70 AF%=I%*256:ADR%=&BC2C
80 GOSUB 190
90 '
100 E%=INT(AF%/256)
110 HL%=Y%:DE%=X%
120 ADR%=&BC1D
130 GOSUB 190
140 '
150 BC%=E%:DE%=256*W%+H%:ADR%=&BC47
160 GOSUB 190
170 '
180 STOP
190 CALL &AB80,ADR%,@AF%,@BC%,@DE%,@HL%:RETURN
200 '
210 '
220 RESTORE 250
230 FOR A=&AB80 TO &ABF0:READ B$:POKE A,VAL("&"+B$):NEXT
235 AF%=0:BC%=0:DE%=0:HL%=0
240 RETURN
250 DATA F3,DD,22,f1,Ab,ED,73,F3,AB,FD,21,F5,AB
260 DATA 06,04,DD,6E,00,DD,66,01,7E,FD,77,00,23
270 DATA FD,23,7E,FD,77,00,FD,23,DD,23,DD,23,10
280 DATA E7,DD,6E,00,DD,66,01,22,BE,AB,31,F5,AB
290 DATA E1,D1,C1,F1,ED,7B,F3,AB,FB,CD,0D,BD,F3
300 DATA 31,FD,AB,F5,C5,D5,E5,ED,7B,F3,AB,DD,2A
310 DATA F1,AB,FD,21,F5,AB,06,04,DD,6E,00,DD,66
320 DATA 01,FD,7E,00,77,23,FD,23,FD,7E,00,77,FD
330 DATA 23,DD,23,DD,23,10,E7,FB,C9
```

Listing 1

the machine code.

In fact both the Amstrad and the BBC provide a more complex system for passing parameters between Basic and machine code and it is this feature which is used in Listing 1. The program has, however, been written so that it may be used without the need to understand how it works; it is effectively a simple-to-use, general purpose interface between Basic and machine code. Hopefully the implementation of this routine and the discussion of its operation will be enlightening to the more experienced user.

The Z80 microprocessor has four main register pairs, AF, BC, DE and HL, which may each be treated as a single 16-bit register or as a pair of independent 8-bit registers. Before executing a section of machine code you may need to load some or all of these registers with data values. The program given in Listing 1 will load these registers with the values held in the Basic variables AF%, BC%, DE% and HL%. It will then execute a subroutine call to the machine code at the address held in Basic variable ADR%. After execution of the machine code routine, the new values of the main registers will be transferred to the Basic variables AF%, BC%, DE% and HL%, before the final return to Basic.

Therefore, you only need to load the appropriate Basic variables with the required data values and routine address, then execute line 190 of Listing 1. Of course, you will have to assemble the machine code before calling the routine for the first time.

To illustrate the technique, let us look in detail at Listing 1 — a program which will rapidly fill a rectangular area of the display screen with a given colour.

In line 10 HIMEM is reset to reserve an area of memory starting at &AB80, which will hold the machine code. Line 30 calls the subroutine at line 220 which assembles the machine code into the reserved area. This subroutine also declares the essential variables. The CALL statement will report an error if any of the parameter variables are undefined, even though the called subroutine may require no parameters to be passed to it.

The variables which define the rectangle are defined in line 60. I% is the ink colour number, X% is the left-hand edge of the rectangle and Y% is its top edge. The width of the rectangle is given by W%, and H% is its height.

It should be noted that these coordinates have not been expressed in the standard Basic form but as follows: the variables X%, Y%, and H% are coordinates in terms of pixels. This means that Y% and H% range between 0 and 199 and the range for X% will vary with the selected display mode: 0–639 in Mode 2, 0–319 in Mode 1, 0–159 in Mode 0. The other coordinate variable, W%, expresses the width of the rectangle in number of bytes — there are 80 bytes per display line in all modes.

Many system routines use 'encoded inks' rather than the absolute ink numbers used by Basic. Fortunately, a routine at &BC2C will convert an ink number given in the A register to an encoded ink value returned in the A register.

Line 70 sets AF% to pass the ink number. The '*256' is necessary because the A register is the high byte of the AF register pair. This line also sets ADR% with the address of the required machine code subroutine.

Line 80 calls the Basic subroutine at line 190 which does all the work. On returning the high byte of AF% it will hold the value of the encoded ink. Line 100 extracts the encoded ink value from AF% and stores it as E%, while lines 110-130 set the appropriate parameters and call the system routine at &BC1D. This routine converts a pixel location passed in DE (X coordinate) and HL (Y coordinate) to an absolute address within the display memory area. The address is returned in HL.

Finally, lines 150 and 160 set parameters and call the system routine at &BC47. (Note that HL% has already been set on returning from the previous call.) This routine fills a rectangular area of the display with a given colour.

The parameters needed on entry at &BC47 are as follows:

The C register must hold the encoded ink value.

The HL register pair must hold the memory address of the top left corner of the rectangle.

The D register must hold the width of the rectangle in bytes.

The E register must hold the height of the rectangle in terms of pixel lines.

This short program shows how easy it can be to pass parameters to machine code routines and how values may be returned from the machine code to Basic for later use.

I mentioned above that Amstrad Basic has many extra keywords which allow you to set various system functions — SPEED INK, SPEED KEY, etc. However, it lacks any way of interrogating the sytem to determine the current state of these system functions. The described technique provides an easy solution to this problem, and I offer here a few further examples.

Delete lines 50 to 170 from Listing 1, then try adding the lines shown in Listings 2, 3, 4, 5, 6 or 7.

Listing 2 interrogates the state of the CAPS LOCK and SHIFT LOCK. After the call the high byte of HL% will represent the state of the CAPS LOCK, the low byte of HL% will represent the state of the SHIFT LOCK. A value of 0 means that the lock is off, &FF means the lock is on.

Listing 3 is a useful routine for games programming, as it will examine the character at the current cursor position and return its ASCII code in the high byte of AF% assuming it's a recognisable character.

If the character at the cursor isn't recognised, the routine resets the carry flag and sets A to zero.

Listings 4 to 7 return the current state

```
 70 ADR%=&BB21
 80 GOSUB 190
 90 IF HL% AND &FF00 THEN PRINT
    "CAPS LOCK ON" ELSE PRINT"CAPS LOCK OFF"
100 IF HL% AND &FF THEN PRINT
    "SHIFT LOCK ON" ELSE PRINT"SHIFT LOCK OFF"
```

Listing 2

```
60 LOCATE 1,1:PRINT"A":LOCATE 1,1
70 ADR%=&BB60
80 GOSUB 190
90 PRINT:IF  (AF% AND 1) THEN PRINT
   "CODE OF CHARACTER AT CURSOR IS ";AF%\256
```

Listing 3

```
60 ADR%=&BB93
80 GOSUB 190
90 PRINT"INK OF TEXT PEN IS ";AF%\256
```

Listing 4

```
70 ADR%=&BB99
80 GOSUB 190
90 PRINT"INK OF TEXT PAPER IS ";AF%\256
```

Listing 5

```
70 ADR%=&BBE1
80 GOSUB 190
90 PRINT"INK OF GRAPHICS PEN IS ";AF%\256
```

Listing 6

```
70 ADR%=&BBE7
80 GOSUB 190
90 PRINT"INK OF GRAPHICS PAPER IS ";AF%\256
```

Listing 7

of the text or graphics, paper or pen selection. You only need to use the correct routine address for ADR% and extract the high byte of AF%. The listings should make this quite clear.

Amstrad CALL statement

The Amstrad's keyword CALL followed by just an address will cause a subroutine call to a machine code routine located at the given address. The routine may be a system call or a user-supplied machine code program. If you want to return to Basic, the routine must end with a Z80 RET instruction (&C9). This simple form of CALL has its uses (try CALL &BB18, which waits for a key press) but it is not suitable when you want to exchange variable data between the Basic and machine code parts of your program. Fortunately, there is an extended form of CALL statement where a series of parameters, separated by commas, may follow the address in the CALL statement. This form of CALL is shown in the user manual, but the method of parameter passing is only documented in the full Basic technical manual (available from Amsoft at £19.95).

The parameters in a CALL statement may be of four types: numeric variable names, actual numeric values, numeric variable names preceded by an '@' character, or string variable names preceded by an '@' character. If a parameter is a numeric value then the actual value will be passed to the machine code. Floating point values are first converted to two-byte integers. A numeric variable name as a parameter will cause the value of the variable to be passed. Again floating point values are converted to two-byte integers. If the parameter is a string variable preceded by an '@' character, the value passed is the address of a string descriptor block associated with the string. A string descriptor is a three-byte block of data: the first byte holds the length of the string and the other two bytes hold the address of the first character of the string. The final parameter class is when a numeric variable name is preceded by the '@' character. In this case the value passed is the address in memory of the given variable rather than its value. It is this class of parameter that is of particular use here, as it not only allows us to pass values to the machine code but also to pass data back to the Basic variables.

When the CALL statement is executed, all the parameters are passed in a parameter block as a succession of two-byte values. The IX register points to the first (lowest) byte of this parameter block. The parameters are passed in reverse order, the first two bytes in the parameter block corresponding to the last parameter in the CALL statement.

The action of the machine code in the program is as follows (see Listing 8):

Line 10: this saves the IX register which points to the parameter block, as it will be needed later to pass data back to the Basic variables.

Line 20: this saves the current stack pointer, as a temporary stack will be set up to transfer data to the registers.

Line 30: this points IY at a temporary data area.

Lines 40 to 160: this loop takes each of the four variable addresses, as passed in the parameter block, finds the value of the variable stored at that address, and transfers it to the data area.

Lines 170 to 190: these find the routine address as passed by the variable ADR% and copy this address to locations L2+1 and L2+2, so that when the call in line 250 is reached it will execute the required subroutine as given by ADR%.

Lines 200 to 245: these set a temporary stack in the data area, POP the values from the data area into the registers and then restore the stack pointer.

Line 250: this actually executes the specified routine, now that the register contents have been set.

Lines 260 to 310: again, a temporary stack is set up within the data area, but this time the register contents are PUSHed into the data area, then the stack pointer is restored.

Line 320: this points register IX at the parameter block.

Line 330: this points register IY at the data area (which now holds the register contents ready for returning to the Basic variables).

Lines 340 to 460: these form a loop which take the values from the data area and transfer them to the appropriate variable addresses as found in the parameter block.

Line 490: this reserves memory for a temporary data store.

Note the DI and EI instructions. They ensure there are no interrupts while the stack is within the data area. Interrupts at this time would be likely to corrupt the code and cause a crash. END

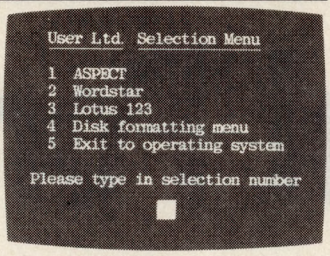
```
Pass 1 errors: 00

AB80                    1          ORG   £AB80
AB80  F3                9          DI
AB81  DD22F1AB         10          LD    (STORE),IX
AB85  ED73F3AB         20          LD    (STORE+2),SP
AB89  FD21F5AB         30          LD    IY,STORE+4
AB8D  0604             40          LD    B,4
AB8F  DD6E00           50 L1       LD    L,(IX+0)
AB92  DD6601           60          LD    H,(IX+1)
AB95  7E               70          LD    A,(HL)
AB96  FD7700           80          LD    (IY+0),A
AB99  23               90          INC   HL
AB9A  FD23            100          INC   IY
AB9C  7E              110          LD    A,(HL)
AB9D  FD7700          120          LD    (IY+0),A
ABA0  FD23            130          INC   IY
ABA2  DD23            140          INC   IX
ABA4  DD23            150          INC   IX
ABA6  10E7            160          DJNZ  L1
ABA8  DD6E00          170          LD    L,(IX+0)
ABAB  DD6601          175          LD    H,(IX+1)
ABAE  22BEAB          180          LD    (L2+1),HL
ABB1  31F5AB          190          LD    SP,STORE+4
ABB4  E1              200          POP   HL
ABB5  D1              210          POP   DE
ABB6  C1              220          POP   BC
ABB7  F1              230          POP   AF
ABB8  ED7BF3AB        240          LD    SP,(STORE+2)
ABBC  FB              245          EI
ABBD  CD0000          250 L2       CALL  0000
ABC0  F3              255          DI
ABC1  31FDAB          260          LD    SP,STORE+12
ABC4  F5              270          PUSH  AF
ABC5  C5              280          PUSH  BC
ABC6  D5              290          PUSH  DE
ABC7  E5              300          PUSH  HL
ABC8  ED7BF3AB        310          LD    SP,(STORE+2)
ABCC  DD2AF1AB        320          LD    IX,(STORE)
ABD0  FD21F5AB        330          LD    IY,STORE+4
ABD4  0604            340          LD    B,4
ABD6  DD6E00          350 L3       LD    L,(IX+0)
ABD9  DD6601          360          LD    H,(IX+1)
ABDC  FD7E00          370          LD    A,(IY+0)
ABDF  77              380          LD    (HL),A
ABE0  23              390          INC   HL
ABE1  FD23            400          INC   IY
ABE3  FD7E00          410          LD    A,(IY+0)
ABE6  77              420          LD    (HL),A
ABE7  FD23            430          INC   IY
ABE9  DD23            440          INC   IX
ABEB  DD23            450          INC   IX
ABED  10E7            460          DJNZ  L3
ABEF  FB              470          EI
ABF0  C9              480          RET
ABF1                  490 STORE    DEFS  £10

Pass 2 errors: 00
```

Listing 8

The 'Classic' Menu Generator.



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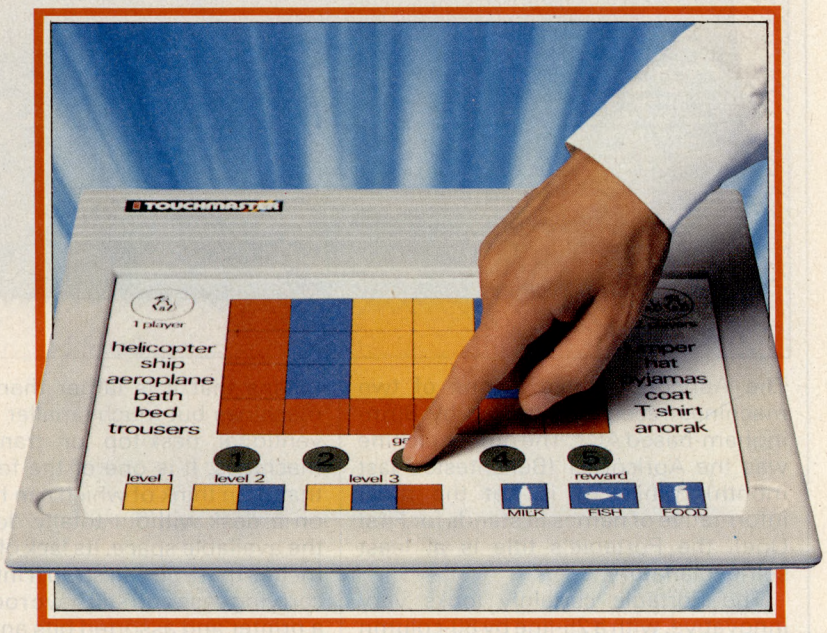

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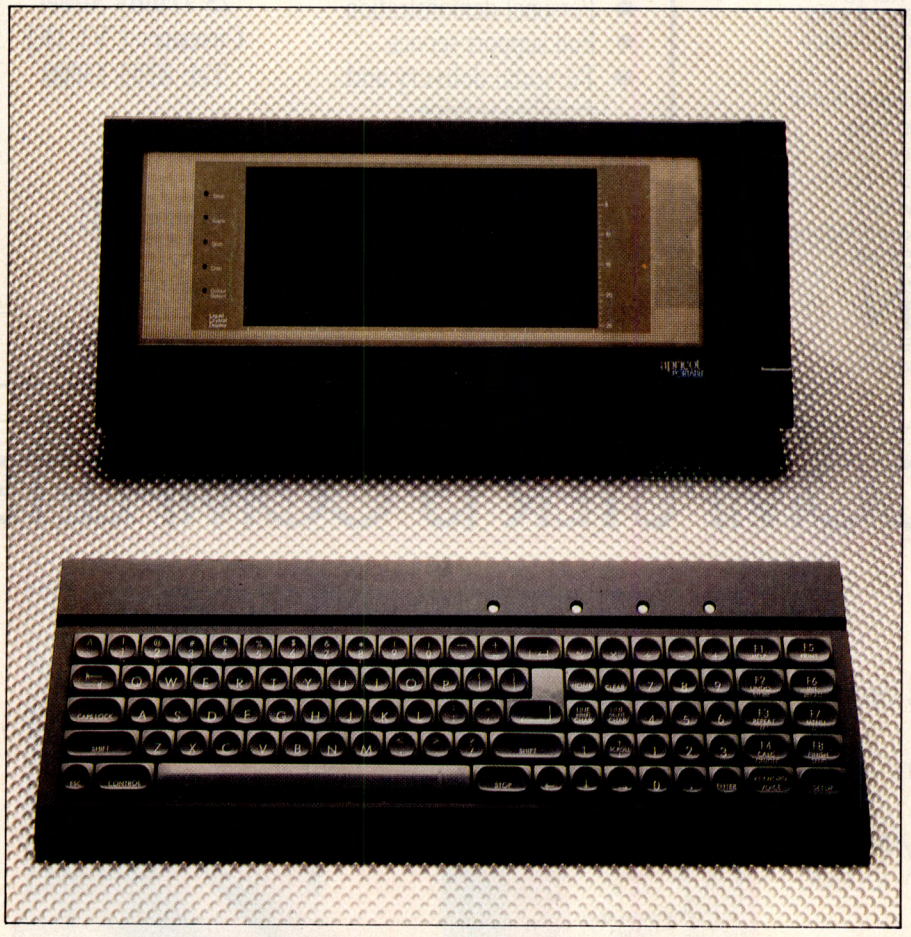
ACT Apricot Portable

Providing a lower entry level into the ACT range the Apricot Portable has some novel features to be proud of—one of which is a speech recognition facility as 'standard'. Unprecedented on a micro, Peter Bright wonders how useful this, as well as the machine's other innovative features, will be.



The Apricot Portable is one of two machines recently launched by Birmingham-based ACT. The other machine was the Apricot F1 (Benchtested last month). While F1 is not the most informative of names (it stands for First One), the Portable's title is at least self-explanatory.

The Portable certainly looks very innovative, with a 25-line by 80-column liquid crystal screen, built-in voice recognition, an infra-red keyboard and 16-bit computing power all for £1695.

Hardware

The brochure lists the Portable's dimensions as 450mm long × 172mm wide × 200mm high. In real terms this means that it is larger than lap-held machines but much smaller than conventional desk-top or transportable machines. It is one of the few micros that I can think of which can happily sit on a desk without totally dominating the available space. Its lack of bulk also means that you can strap it into its hard carrying case and still have room left for a printer and assorted bits and pieces.

A look at the photograph will show that the Portable looks very unusual. The 25-line LCD display dominates the front of the unit with the single disk drive hiding away along the right-hand side. The microphone for the speech recognition unit is clipped to the front of the unit and can either be used there or unclipped and held in the hand.

Along the back there is nothing to be seen apart from the power socket and a massive great heat sink. I/O ports are conspicuous by their 'apparent' absence. In fact they are just hiding and can be accessed by removing a large cover which runs halfway along the back.

The Portable is not exactly overrun with I/O ports, just one centronics parallel, one RS232 serial, one for the RGB monitor and one Apricot-compatible expansion slot. The most likely card for the expansion slot is either ACT's modem card which allows access to remote dial-up services or one of its RAM expansion cards.

Getting inside the Portable is easy — just undo two screws and pull the front panel off. The first thing you notice is how closely packed the PCBs are — the review machine, a pre-production model, had an old Sirius guarantee card slipped in between to stop two boards shorting together!

The second noticeable thing is that there isn't a CMOS chip in sight. Absolutely no attempt has been made to allow this machine to run off batteries — it's strictly mains only. ACT thinks that CMOS technology is still too expensive to be viable in the portable price range and volume. A pity.

The PCB on the back of the LCD display is covered with 20 'flat pack' decode chips. These are square and unlike conventional DIL chips have pins on all four sides — much like the new Intel iAPX 186 & 286 CPU chips.

There are two main PCBs inside the Portable. The first fills the front of the unit and houses the main processor, RAM, ROM, display circuitry and the expansion bus. The board was well-made with little patching in evidence.

The board on the review machine used 32 Texas Instruments 64k × 1 RAM chips to give a total of 256k onboard. However, it is wired for 128k × chips, so you could have 512k if required. Unfortunately this is only available as a factory option, it isn't a field upgrade job. The board also contains 32k of

operating system ROM.

The processor is an Intel 8086 clocked at a fairly sedate 5MHz rather than the decidedly odd 4.77MHz of the F1.

The second board handles the RS232 and centronics ports, takes the output from the infra-red keyboard link and also takes the input from the microphone for the speech recognition. All in all the electronics are well up to ACT's usual high standards in terms of construction and ease of servicing.

The disk is located in the right-hand side panel. It follows standard ACT practice — Sony 3.5in, double-sided 720k. It worked fine in use (as have all the Sonys I've used). If you are going to be handling large quantities of data, ACT can supply a nifty little external 10Mbyte Rodime 3.5in hard disk called an MSD (Mass Storage Device).

The display is one of the major features of the Portable. As far as I know, it's the first production machine to use a full 25-line liquid crystal display. The display unit is made in Japan by Hitachi, but ACT wasn't happy with the controller, so it designed its own (very fast) display controller chip.

LCD resolution is the best I've ever come across. In text mode it can display 80 characters × 25 lines, while in graphics mode 640 × 200 pixels. Thanks to the dedicated controller, the LCD is also very fast.

LCD displays have two major advantages for portable machines. Firstly, they use very little power and so lend themselves to battery power. Secondly, they are virtually flat and, therefore, use much less space than a conventional cathode ray tube. ACT didn't go for LCD for its low power consumption (the rest of the system eats power), but because of the space advantages. Using the LCD it has managed to pack the display and the two main PCBs into a unit little thicker than an average paperback book. Impressive. The trouble with LCDs is that they aren't always easy to read. Whereas CRTs actually give off light, an LCD display can only reflect light shining onto its surface. This has two effects: firstly, if there isn't much light around, you won't be able to see the display; and secondly, even if there is enough light, you risk getting all sorts of nasty reflections back from the display.

Most micros which use LCDs try to get around these problems by allowing you to alter the tilt of the display and by providing for alterations in the contrast of the display. Although the Portable allows you to alter the contrast by holding down the SHIFT and UP-ARROW or DOWN-ARROW together, the angle of the display is fixed and there isn't anything you can do about it.

The upshot of all this is that display quality on the Portable can be appalling or acceptable — depending on how careful you are when you position the unit.

ACT rationalises this problem by saying that the LCD display was intended to be used away from base. Back at base you would plug into the optional colour monitor and use that instead of the LCD.



'File' allows normal 'housekeeping'



Create ikons and save them to disk!

The colour display is, in fact, very good. Its resolution of 640 × 256 pixels is higher than the LCD and it can also display up to eight colours simultaneously out of a palette of 16 on the screen. If you have the colour option, an extra 128k of dedicated video RAM is added to the system.

As with the F1, the Portable makes heavy use of Digital Research's GSX graphics extension to ensure that applications programs are compatible across the range. This means that so long as your applications software uses GSX you can run it up on either the LCD or the colour display, even though they have different resolutions and the LCD can only display black and white. All you need to do is install the appropriate GSX driver. (For more details see last month's F1 Benchtest.)

In addition it is also possible to display data on both displays at the same time. For example, if you are using Supercalc 3 you can display the spreadsheet model on the LCD at the same time as displaying graphs or pie charts on the monitor.

The keyboard is exactly the same as the one used on the Apricot F1: that is to say, it's a 92-key membrane unit with 10 function keys and a numeric keypad.

Anyone who read last month's F1 Benchtest will know that I'm not too keen on this type of keyboard. I don't like membrane keyboards, and even though this is a good one, it still doesn't have the feel of a good 'traditional' unit. Also the space-bar doesn't register until it's below the level of the keyboard casing. This gives your thumb a very hard time when you are touch-typing.

The keyboard's main claim to fame is not its keys but its infra-red link with the main unit. This does away with the traditional cable and uses a light beam to send each 32-bit keycode.

As with the F1, I found that this link either worked or it didn't — it never got the key wrong. The trouble is that I'm still trying to think of the advantages of infra-red as opposed to good old cable.

The Portable is also available with ACT's infra-red mouse. This is a very large mouse/trackball arrangement which is very useful when used in conjunction with ACT's new user-friendly applications packages.

Unfortunately, the pre-production infra-red mouse supplied with the machine wasn't feeling well and refused to work. I had the same trouble with the F1 last month — I only hope the production units are better. Anyway, it had to go to the vet, so I ended up using a Microsoft mouse plugged into the RS232 port. Apparently all the necessary driving software is buried somewhere in the GSX driver, so this could be a good alternative to ACT's offering. The Microsoft mouse worked faultlessly.

System software

As with the rest of the Apricot range, the Portable is available with MS-DOS Version 2 and/or Concurrent CP/M Version 3. The review machine was supplied with MS-DOS 2.11. Nothing strange to report.

What is much more interesting is that the Portable is also shipped with the 'Activity' front-end to the operating system. Those of you who have used an Apricot before may remember the 'Manager' front-end which ACT used to ship. I am happy to report that Activity is much better than that and it's a very useful alternative to the MS-DOS command line.

I looked at Activity in some depth in the F1 Benchtest last month. However, the pre-production version supplied with the Portable is much more complete than that supplied with the F1, so I'll have another quick look at it.

Activity is ikon-based and very heavily influenced by the Apple Mac. Most of the screen is taken up by a list of files on the current disk. As soon as you change a disk, the list is updated. Applications programs can be called from here. If an application is run, it overwrites Activity and it is recalled when you exit from the application. It is perfectly possible to run Activity within Activity, within Activity, within . . .

Along the bottom of the screen are six ikons which allow you to play around with files, create new keyboards and characters, create new ikons and format and copy disks. In fact all your normal housekeeping can be done within Activity.

Three new features which weren't there last month are 'Help', 'Files' and the 'Ikon Editor'.

The 'Help' ikon is a large question

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mark at the top of the screen. Selecting Help attaches a little box to the end of the cursor arrow which you then move to the area with which you are having trouble and an appropriate Help message appears. This is very impressive.

If the Help isn't enough, press the button twice over the Help ikon and you will be taken to a self-teach tutorial! Help is available wherever you go, but I found that after 10 minutes using the system it was so straightforward that it became unnecessary.

The 'Files' ikon wasn't implemented on the old version of Activity. It allows you to copy, rename and delete files and to move around, create and delete sub-directories.

The central part of the screen shows a list of the files on the current disk. To its left are a number of named filing cabinet drawers. These represent sub-directories. Below the file list are ikons for rename and copy, a dustbin for delete, and ikons for creating and deleting sub-directories.

To select the file you want to work on, you can either type its name or you can highlight it in the list of files. To perform the operation, drag the file to the desired ikon.

All in all this area of Activity has been well-executed. The only times I had to descend into MS-DOS were to TYPE a file and to copy a file to a sub-directory. Although the Files option allows you to play with sub-directories, my version wouldn't let me copy files to or from a sub-directory.

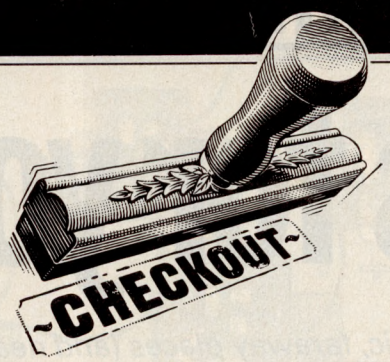
The third new feature is the Ikon Editor, which again wasn't operative on the last version. This is a fairly basic painting program which allows you to create ikons which can subsequently be attached to application programs for display on the main Activity screen.

On the colour screen, the Ikon Editor allows you to choose from six different brush shapes, six different fill patterns and eight different colours. Like all painting programs you can have hours of endless fun playing with different pictures.

Applications software

The Portable is supplied with a great deal of bundled software — SuperWriter, SuperCalc, SuperPlanner, ACT Diary, ACT Sketch and an interactive tutorial. ACT says the majority of standard Apricot software will run provided it doesn't make direct calls to the hardware.

The last main claim to fame of the Apricot Portable is that it boasts built-in speech recognition. Most speech recognition systems rely on highly expensive, complicated hardware to sample and process the signal from the microphone. The Portable's speech system relies instead on highly complex algorithms built into the software. This



makes it economical to build speech into a budget product.

The recognition system can work in two ways: simple and complicated. In its simplest form the output from the recognition is just dumped into the keyboard buffer. This can be used with most applications programs because the program just thinks you've typed the command in. The second method is to write the applications program with voice recognition specifically in mind. This obviously allows you to do more, but the software is likely to be quite specialised.

The voice system on the Portable allows you to have a vocabulary file of up to 4096 words. However, only 64 words can be held in RAM at any one time, so a fair amount of shuffling is necessary with large vocabularies.

Before the system can understand your commands, it is necessary to create a vocabulary file and train the system to understand your voice. The Portable is supplied with a program which allows this to be done.

The first thing to do is to create a vocabulary disk file. You can have as many of these as you like. The training program prompts for a name and then opens a disk file under that name with a .VOC extension.

Next you enter the words you want to use, along with an optional command which you want the machine to respond to. Once you have entered all the words, you can go into training mode. To do this you speak the words into the microphone and the program records the voice patterns. The more times you repeat each word the better the result.

After you have trained all the words you can go on to see how well the machine understands you. I found that the majority of words worked straightaway but some needed more effort.

By way of a test I had a go at teaching the Portable *Mary had a little lamb.* It did pretty well but had problems with the difference between 'had' and 'and'. I think many of the problems I encountered were associated with the microphone — it's a cheap electret type and I had to virtually swallow it to get the machine to register my voice. This in turn induced stress in my voice which didn't do much for accuracy.

Overall, I reckon the review machine was 80-90 per cent accurate. The problem is that you never remember the times it got it right, just the times it made a terrible mistake. ACT reckons it is going for 99 per cent accuracy in production versions. I'll be interested to see if the company makes it.

One of the applications programs bundled with the Portable is an electronic diary program which was written specifically for use with voice recognition. The program makes good use of graphics — it even has a picture of a open diary onto which it displays its information.

Unfortunately, the review version of the Diary program was not compatible with my version of the voice training program. This meant that the results using voice were not good. The production versions of the programs will be compatible.

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Final versions of the documentation were not available with the review model, except for an applications manual covering Superwriter, SuperCalc and SuperPlanner, and a Microsoft manual covering MS-DOS and GW-Basic. Both are attractive presentations of fairly standard information.

Prices

A basic machine with 256k of RAM costs £1695. A colour display with an extra 128k of video RAM and a mouse will add £300.

Conclusion

When I looked at the F1 last month it was easy to write the conclusion — the machine was cheap and offered exceptional value for money as a small desk-top machine which was also transportable.

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The 25-line LCD display represents a first, yet the machine requires mains power. This isn't necessarily a bad thing as most users will no doubt carry out their 'heavy computing' back at base with lots of power and a colour monitor for easy readability. The LCD will probably only be used on occasional forays out of the office to impress clients. I think the LCD is also a statement of intent from ACT. Maybe the next machine will be a CMOS machine with a colour LCD?

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It's for you!

Make new friends in exotic, faraway places (and nearer home) — start your own computer bulletin board system. Peter Tootill, master of the Liverpool Mailbox, advises on the rewards and pitfalls of such a venture.

What are the reasons for running a BBS? I'm often asked this question by people who use my bulletin board system, who are also curious to know what is involved: what hardware and software are needed, and so on. BBS operators can be divided into two groups — hobbyists and businesses. The reasons for running a BBS as a hobby are difficult to define. If you're interested in microcommunications, it can help to keep your phone bill down: people will call you from all over the world and they will foot the bill. It's rather like ham radio — it's the contact and interaction with other people that makes it interesting.

There's also a certain fascination in seeing your micro respond to commands typed by someone you can't see — who may be just across the road or thousands of miles away.

What's involved?

One of the first things to realise is that running a BBS takes time and dedication. It's not something to be undertaken on the spur of the moment, whether as a hobby or for business purposes. The operator needs to do 'housekeeping' every day: clearing out messages that have been read, or are no longer relevant; keeping an eye on whether there's any bad language (it does happen); backing-up disks regularly; and rescuing much-used files that have become damaged. The time it takes depends on how much the system is used, but it will probably take around half an hour a day, every day.

Most full-time public BBSs can expect around 40 daily calls — more if they're very popular, or have a large local call catchment area, less if there are a few systems around to share the load. Many callers will leave messages, so you can see how quickly disks fill up. The more storage space you have, the longer you'll be able to go before being forced into action because a disk is full.

Another consideration is whether to install a separate phone line for the BBS. If you're going to use it for business purposes, then there's no question about it. However, for the hobbyist it's more difficult; but if you can afford it, get a separate line.

But the main decision to make is whether you intend to run a part-time BBS or a 24-hours a day system. A part-time system (evenings only, perhaps) can be run using your own home phone line, as long as you can educate your friends not to hang up and report a fault each time they hear the modem tone. The 'ring-back' method can be used to avoid this problem; some clever modems will even answer the phone, and if they don't get a carrier within a certain time they'll assume it's a voice call and ring, just like an ordinary telephone.

If you want to run a 24-hour system, you really *do* need a separate phone line. Even for a part-time system a separate line is preferable, as you'll find that no matter how carefully you specify system times, people will call outside them. Whatever the reason, it can be aggravating and has been the reason for many BBSs closing down.

Hardware

To set up your own BBS the minimum hardware requirements are a microcomputer, an RS2332 interface, an auto-answer modem, a floppy disk, a real time clock and a printer. The last two items are not always necessary, but would normally be found in a reasonably capable system.

Let's look briefly at the items in turn. Almost any micro will do. BBSs run on everything from Spectrums to IBM PCs, and minicomputers and mainframes can also be used.

Many computers have built-in RS2323 interfaces. In addition to the two data lines, the interface must have at least one control line that can be used to keep an eye on the carrier detect circuit. This is required so that if the caller hangs up or the line is poor and the modem loses the carrier tone, the software can be informed and reset itself to standby mode to await the next call.

Some modems will automatically answer the phone when it starts ringing; others just tell the computer that there's a call coming in and need to be told to answer it. The latter will need an extra control line (usually the RI signal on pin 22 of the 25-way plug).

One other control signal may be needed on the RS232 interface if you intend to run the system at more than one speed. This is very common in the States, where systems offering Bell 103 (300/300) and Bell 212 (1200/1200) are popular. The modem answers the call and if it's of a high speed, lets the computer know. Modems which can detect the speed of an incoming call are rare in the UK as yet, but if you get the chance to use one, make sure that it's compatible with your software and RS232 interface.

An auto-answer modem is essential. The modem needs to be able to answer the phone by itself and to hang up again at the end of the call, or when the carrier drops for any reason. Answering and releasing the line may be done automatically or on instructions from the computer. There are two methods of auto-answering: in one, the modem does the work, answering the phone when it rings, checking for the carrier and hanging up at the end of a call; in the other, it keeps the computer informed of what's happening and waits for instructions (that is, it tells the computer the phone is ringing, answers it when instructed to do so, and so on). A 'ring-back' system is easier to implement with the latter method.

Your main consideration is to ensure that the modem is compatible with your software. It's no good the modem waiting for instructions if the software is waiting for the modem to answer the phone! Indeed, the matter of compatibility can be critical as some software is designed specifically for a particular make of modem. This is particularly true of BBS software for the Apple II, which has a number of plug-in modem cards available in the US. The US is the prime source of BBS software, which is not surprising as the idea was formed there, and other parts of the world are still several years behind.

The interaction between software and hardware is even more important when you want to run a two-speed BBS. The way in which the modem recognises the high speed call and notifies the software must be compatible with the BBS program.

Another way of running a multi-speed BBS is for the software to do the work; for this to happen, the baud rate of the modem must be controlled by the computer in some way. There's more

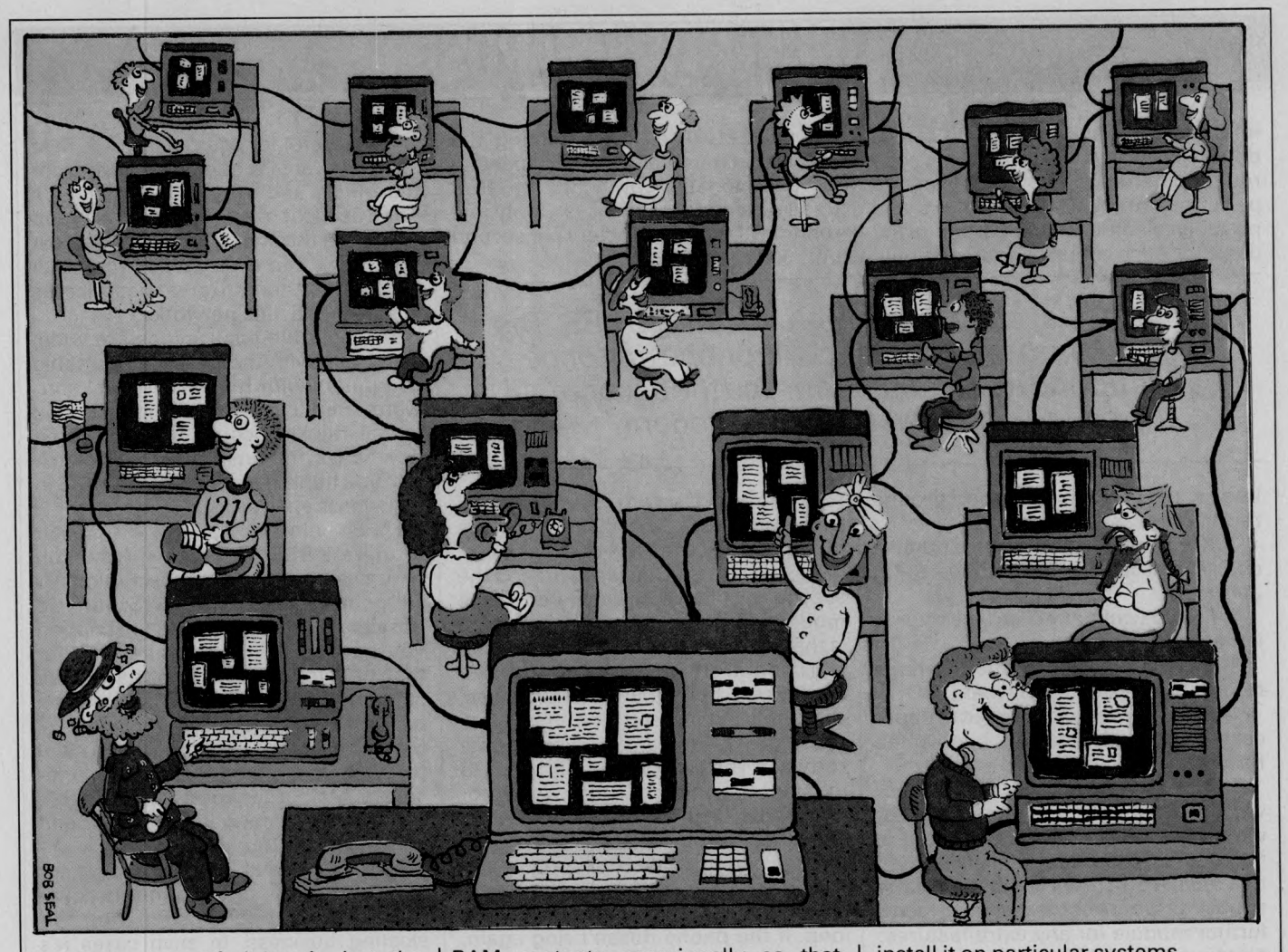


Illustration by Bob Seal

than one way of doing it, but the obvious method of setting the modem to a particular baud rate and then checking to see if carrier detect is on is not reliable. It's quite possible for the carriers of two different modes to be close enough for the modem to think it has a correct carrier when in fact it hasn't. One simple method is to send a message such as 'press return if you can read this' at each different mode and wait for a recognisable carriage return to be received. If it doesn't come in a reasonable period of time, the computer could change the baud rate and send the message again. This is somewhat crude, but effective.

A number of US dual-speed modems work in a similar way. The caller sends a few carriage returns and the modem, knowing what to expect, analyses the incoming signal to see at what speed it's travelling. These dual-speed auto-answer modems have a lot of processing power built in, and this will often extend to auto-dial as well as auto-answer features. They are often termed 'intelligent' modems.

Disks are also essential. It's possible to build a fairly basic BBS system that keeps all its information in memory, but it would be severely limited as to the facilities it could offer and the number of messages it could store. If there's a power failure, all the information in RAM would be lost. It isn't practical to use cassettes for running the system, although they could be used to save the RAM contents occasionally so that something could be recovered in the event of a power failure. Floppy tape/microdrive storage can be used, but its viability depends on the access time and the amount of data to be stored.

Software

There are a few general points to consider here:

- ★ Will it suit your needs?
- ★ Will it run on your micro?
- ★ Is it flexible enough to be tailored to suit your future needs?

However, the most important consideration for the hobbyist is 'How much is it?' BBS software can cost you nothing for a public domain package such as Remote CP/M or the C language Citadel system (which comes from the CP/M and C users' groups respectively). On the other hand, it can cost several hundred pounds for one of the sophisticated commercially published packages. Be warned, however — price is not always a good guide to the features and flexibility of the software.

Because of the variation in the way that 'compatible' micros are set up when it comes to such things as RS232 ports, you'll probably find that any BBS package will require a certain amount of installation before it will run on your system, unless it was specifically written for that make and model. CBBS, for example, is for CP/M systems but you need to be familiar with assembly language programming to be able to install it on particular systems.

You should approach the problem of choosing BBS software from two directions. Firstly, write down your requirements, as far as you can define them. Secondly, ring as many BBS systems as possible and see what features they have that you like, and those that you dislike. Take note of how different BBSs using the same software vary: this will provide some indication of the package's flexibility. If they all look the same, it may be that the operators cannot personalise the system to suit their own requirements. If they vary widely, then the software must have a reasonable amount of flexibility. BBS software is an area where you can try out a lot of different packages and talk to the people using them without ever leaving your desk or your own front room!

This research will provide a reasonable idea of what to look for in terms of software, and as most BBSs will give you details of the hardware they use, it will help with that aspect too.

Writing your own BBS software is not as difficult as you might imagine. Apart from a small machine code driver, the main programming can be done in Basic. In a 300-bit/sec system, the software has only to keep up with the system operating at 30 characters a second, and even slow Basics can manage that. The main BBS program will consist of some file-handling routines to: save and retrieve messages; maintain a user log; and display

information files. Downloading can be done in this way too. The machine code routine referred to above is needed to perform a few background tasks and possibly to handle the RS232 input and output, if such commands are not built into your system. The background routines are as follows:

1) Keep an eye on the carrier detect circuit, and tell the BBS software if it gets low.

2) Provide nulls after carriage returns if the caller needs them.

3) Provide line feeds after carriage returns if the caller needs them.

4) Convert lower case output to upper case if the caller cannot handle the former.

The other features that can be provided are many and varied, and the best way to proceed is to write the software in modules. These can then be chained to a main 'core' program that does the major work, but has the facility to load a further module for any extra features; quite successful BBS software has been written in this way.

At least two disks are desirable for ease of back-up, which should be done frequently as disks are heavily used in most BBS applications. Disk errors are not uncommon; if you don't have a recent back-up, information can be lost.

It's difficult to generalise about the capacity you need. I have heard of BBSs running with as little as 200k; I started my system with about 500k, but that didn't last long. It depends on the space your disk operating system and the BBS software need, plus a fairly generous allowance for message and information files.

Software for downloading is another disk-eater. One megabyte is approximately the right amount to think about, but a hard disk is ideal. It not only gives you plenty of space, but radically speeds up the system operation.

'Real time clock' is computer jargon for something that enables the computer to tell the time. It's normally used by the BBS software to mark the entry time of messages, and to perform certain standard operations at set intervals. It's not essential unless the software you use needs it, but many modern micros have a built-in clock fitted as standard. Battery back-up is useful, so that the time is not lost if there's a power failure.

A printer is very useful for keeping track of calls and for general listings of files, userlogs, and so on, but there's no special need for a sophisticated one. As the printer will only be printing the occasional message, it doesn't need to be able to keep up with the BBS transmissions (which will only be running at thirty characters per second on a 300bps system).

'A ring-back system is one way of running a BBS. The caller dials the number, lets the phone ring once, hangs up and then calls again; and the second call should be answered by the modem.'

A ring-back system is one way of running a BBS. The caller dials the number, lets the phone ring once, hangs up and then calls again; and the second call should be answered by the modem. The advantage of this system is that ordinary callers don't get a loud whistling in their ears when they are expecting a human voice. The easiest way to implement the ring-back method is by means of appropriate software. The program simply needs to monitor the modem's ring indicator circuit (pin 22 on the RS232 connecter), and when the phone rings it counts the number of rings. If there are only one or two, it starts a timing loop and answers the phone if it rings again inside this loop. If the phone doesn't ring again, the software resets itself to standby mode.

It's possible to do the same thing in hardware, using a ring detector and timer circuits. Indeed, this might be the only way to do it if the software can't be made to support the ring-back system.

Applications

There are many areas in which businesses can and do use bulletin board systems. Some of the more obvious ones are electronic mail ordering, cataloguing, and stock level information. The BBS can be private (for employees only), for employees and customers, or public. In the latter case it could form, for example, a natural extension to the mail order side of the business.

Another common application is customer support: a 24-hour two-way telephone answering system. Other applications are legion: a publisher uses one for uploading author's copy while another system forms a collecting point for information for a bibliographic database. The message facilities can be useful for companies with field staff who are frequently absent from the office, and in such situations it's often used for passing orders back, and for telling the staff member of his next task. BBSs can even be tied to packet switching systems to give cheap access via the worldwide networks.

The possible applications are wide, especially with the advent of portable computers with built-in terminal software. Here's an area where a little lateral thinking could produce some new ideas for business applications. Can you think of a novel use for a BBS in a business environment?

I must point out that it's very difficult to make a BBS pay its own way. You may charge callers a subscription, or sell goods by mail using a BBS. Both are possible, but to charge a subscription you have to have something to offer that other *free* systems don't have. Why should someone pay you a sub when they can call other BBSs for nothing? Mail order can work, but again you need to have something special to offer callers. Mail order goods are available from a wide range of places and competition is tough.

Few BBSs make money for their operators (none of them in this country), unless it's in conjunction with their existing business. In such cases it's usually in advertising and publicity, or as part of their existing mail order business that it becomes financially viable, not in terms of direct income generated.

Conclusion

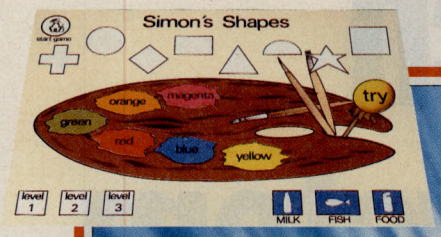
Don't be easily discouraged from running a BBS by the above dos and don'ts. If you're serious you'll find it's a very rewarding hobby, and will make you many friends in the UK; indeed, all over the world.

'There are many areas in which businesses can and do use bulletin board systems. Some of the more obvious ones are electronic mail ordering, cataloguing, and stock level information. The BBS can be private, for employees and customers, or public.'

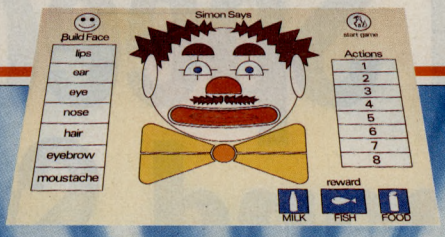
However, commitment is essential in terms of time and effort to keep the system ticking over, and to keep it interesting for regular callers. It takes over your micro: sometimes the only way you can get to use it is to take the phone off the hook, and then feel guilty about all the people who are trying to get through and can't! Is it worth it? Well, I think so.

If you're interested in micro communications, look out for Peter Tootill's book, The Communicating Micro, *just published by Sunshine Books.* END

FORGET SOFTWARE THINK TOUCHWARE



Simon's Shapes



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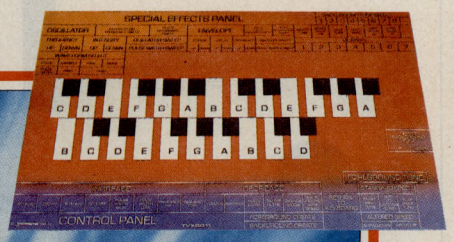

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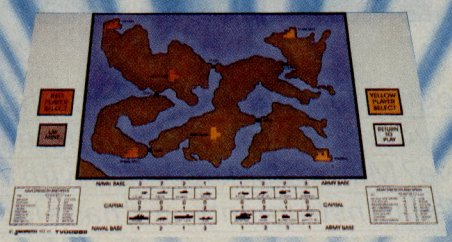
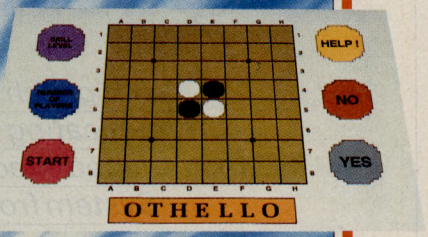
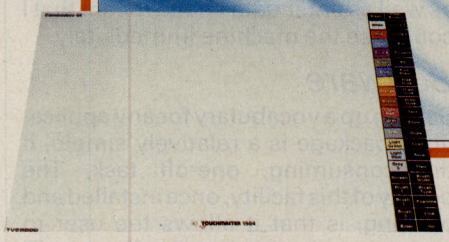


Strategic Command



Othello



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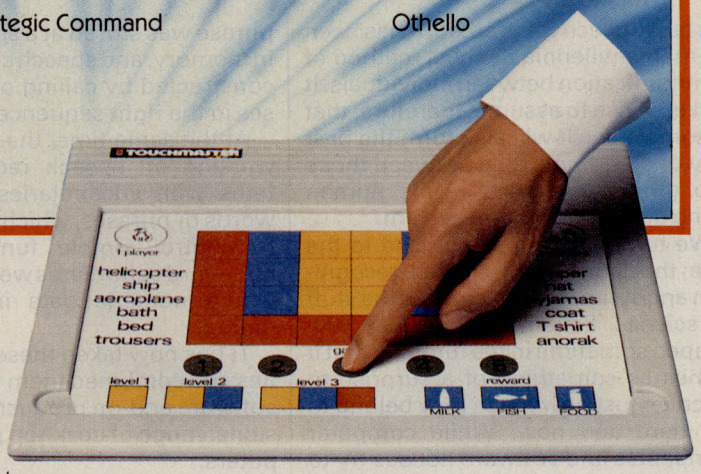

Simply Simon

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TI Speech Command System

Will speech recognition/synthesis become the accepted way of communicating with your micro, or will it remain an expensive plaything for the jaded executive? Martin Banks confers with the Speech Command System from Texas Instruments, and has a lot to shout about.

We take speech for granted. It has been for many millennia the best method of communication between individuals. It makes sense to assume, therefore, that at some stage it will also form the best way of communicating between those two other individuals — the human being and the computer system.

We have all become so used to the idea that competent speech recognition and synthesis systems are the stuff of science fiction — that they will happen sometime in the future — that it comes as something of a surprise to discover just how much they belong to the here and now. While computer companies and software houses try to promote mice and touch-screens as sensible alternative input devices to the keyboard, the natural alternative — speech — has been creeping up on us unawares.

Several companies now offer speech-based systems for personal computers, not least of which is Texas Instruments (TI). This company can arguably claim to have played the most significant role of all in developing speech systems, having long ago introduced such wonders as the educational toy, Speak'n'Spell. This utilised a speech synthesis technique called Linear Predictive Coding, which allowed the company to make systems with tolerably 'human-like' speech in a simple and inexpensive form.

Real speech was recorded as discrete words and phrases in a digitised form. The predictive coding technique meant that each second of speech could be stored in a much reduced capacity — 12k rather than the 30k normally required at the time. Each word or phrase was stored at a specific address in memory, and speech could be simply constructed by calling out the addresses in the right sequence.

At the same time, the company was working on speech recognition systems with vocabularies of up to 50 words or phrases, which could be used to control simple functions where one-word commands were sufficient or where numeric data input was required.

TI has now taken these two capabilities and combined them in a hardware/software add-on product for its Professional range of desk-top personal computers.

Called the Speech Command System, the product has been available for several months. TI did not shout about it from the roof-tops: the company's conservatism, a natural state of mind for Texans, precluded making too much ballyhoo about the speech system, even though there's a great deal to be said in its favour.

Hardware

For £1300 the user gets the add-on circuit board containing the speech synthesis and recognition systems, a microphone, a headset (giving the option of machine responses that can only be heard by the user — useful in open-plan offices), and system software.

On the test machine, these items came pre-installed by TI on a hard disk Professional system. The company had also performed some pre-installation of voice commands for Lotus 1-2-3 which had been created at a previous demonstration at the company's Bedford headquarters. These allowed me to control the operation of the package, as well as enter data — and meant that I could use the machine immediately.

Software

Setting up a vocabulary for any applications package is a relatively simple, if time-consuming, one-off task. The beauty of this facility, once installed and working, is that it allows the user to operate in a largely hands-off mode: TI calls it the 'Transparent Keyboard'.

For many applications it won't be relevant: it's not the Orwellian 'Speak-write' machine that all frustrated keyboard drivers pray for. With others, however, and Lotus 1-2-3 is a good example, it works well.

Imagine the harassed executive telling the computer to enter data, speaking numbers to it and getting printed results, all while scribbling something else by hand.

When the software has been installed on the hard disk, setting up the system is quite simple. The Speech Command System is called from the Professional's MS-DOS operating system by keying in SCS. This offers the user the choice of four applications — Telephone Manager, Calendar/Tickler Manager, Dictation File Utility and Transparent Keyboard — plus an exit back to the OS. Each application is called by function keys, and three have distinct capabilities based on the system's speech synthesis and/or recognition facilities.

The Telephone Manager, as yet unapproved by British Telecom, offers a variety of telephone answering and control capabilities. The Calendar/Tick-



The TI Speech Command System is an easy to use but expensive add-on for the TI Professional range of computers

ler Manager is a non-speech application, being just a nice, if standard diary and calendar, facility; the Tickler part is a facility enabling specific events to be brought to the user's attention at a stated time. In other words, you can get the machine to flash a reminder message onscreen.

The Dictation facility and the Transparent Keyboard are of most interest. The latter is called by function key F4. Once loaded, it asks you for a vocabulary file name which can be any descriptor you like; for example, the pre-installed Lotus filename was E:123.VOC, E: defining the drive location and .VOC defining it as a vocabulary file (it isn't necessary for the user to key in the .VOC extension). The system will also ask for a description of the file for easy clarification by the user. Each vocabulary is stored as two separate files: one being the words used in the vocabulary together with their equivalent keystrokes; the other the digitised recording of the spoken words.

The system requests the phrases to be used, together with the equivalent keystrokes. The phrases obviously depend on the application, but will be predominantly of the 'right', 'left', 'mark block', and 'create a graph' type. They can also be numbers or letters of the alphabet. Each vocabulary, of which there can be nine, holds fifty words or phrases, and can be used for different applications of the same voice, different voices for the same application, or continuations of single application vocabulary. When each phrase has been keyed in, the system asks for the equivalent keystrokes. In some cases (for example 1, 2, 3, 4, and so on) the keystroke is obvious; for others, it requires checking the applications program manual to see which control keys are used (for example, 'centre text' in WordStar is CTRL OC), and then checking the Speech Control System documentation appendix for the equivalent key codes. (Although this may sound rather tortuous, it is quite straightforward.)

Once the phrases have been entered into their file, the next stage is to enrol the voiceprint for each one for which the system provides easy, explicit, onscreen instructions on what to do and how to do it.

When the enrolling process is selected, you are asked to speak each word or phrase as it's highlighted on the screen. You start the recording process by pressing the relevant function keys; as each phrase is highlighted you say it. Should the system not register it, it stays on that word and you repeat it; otherwise it highlights the next phrase, and so on, through the vocabulary.

A chip off the old block

Nick Ryman-Tubb explains how to program the 68008 CPU at the heart of the QL and introduces the other members of the 68000 family.

At a press conference recently Sir Clive Sinclair stuck his neck out and claimed that the 68000 will be *the* chip for the next decade. He's probably not far out in his prediction. The 68000 family is fast becoming the processor every one wants to use, and already features in machines like the Fortune, Wicat, Sage II, Corvus Concept and TRS 80 model 16, not to mention Sir Clive's own QL.

Three good reasons why the micro makers are clamouring for this chip are its elegant instruction set, fast instruction cycle and the availability of CP/M-68K and the multi-user Unix operating systems. National Semiconductor is fighting back with its NS16000 family but it isn't getting the same level of support.

Acorn is said to be interested in the NS16032 as a second processor for the BBC Micro. This chip has the advantage of supporting virtual memory operations directly. But the youngest Motorola relation, the MC68010 Virtual Memory Processor, has just arrived on the scene and is object code upward compatible with the MC68000. What's more, its virtual memory system is unique in physically detecting a bus error and then acting upon this condition through a relocatable exception vector.

The 68000 family

Each member of the 68000 family is upward compatible with its relations at the machine code level, and all share the same basic features as follows: 32-bit address and data registers; 56 powerful instruction types; memory mapped I/O; 14 addressing modes; and five main data types. Fig 1 shows the 68000 family tree.

Considerable confusion about whether the 68000 is a 16-bit or 32-bit processor has been caused because, while most internal registers and data paths are 32 bits wide, the 68000 can only communicate with the outside world 16 bits at a time. It's best described as 32:16-bit CPU, the numbers referring to maximum register size and external data bus size respectively. In the same way, the Intel 8088 used in the Sirius and IBM micros could be termed a 16:8-bit CPU. Result? The MC68000 can process twice as much data in a cycle as the 8088 can.

The MC68008

The MC68008 (Fig 2) is fully software compatible with the 68000 CPU, but has an 8-bit data bus instead of 16 bits (32:8-bit CPU). This means that for every instruction op-code needed, the MPU must make two fetches from memory.

While this might slow down the operation of the processor when compared with its 16-bit father, it is still very fast compared with the Z80. This is due to the pipelining technique used within the CPU. While most 8-bit CPUs fetch and execute instructions in series, the MC68008 can fetch the next instruction while executing another. This greatly speeds up the fetch/execute cycle, which reduces the speed difference between the 16-bit and the 8-bit external data bus versions.

The 68008 has 20 external address lines which means that it can address up to 1024k of memory. Its father, the MC68000, has 24 address lines and so can address 17.7Mbytes of memory.

The MC68008 has 56 basic instruction types with six basic types of addressing modes: register direct, register indirect, absolute, program counter relative, implied and immediate.

The instruction set is 'regular', which means that you can use all of the 14 addressing modes with nearly all of the instructions. The instruction set has been thoughtfully put together, and is especially good for compilers (such as C or Pascal), where the LINK and UNLK instructions can be used for holding local variables within a procedure. Other instructions include data movement, logical operators, integer arithmetic, rotate and shift operations, BCD operators, bit manipulation and control instructions.

Five data types are supported: bits (single binary digits), BCD digits (four bits = a nibble), bytes (eight bits), words (16 bits = two bytes) and long words (32

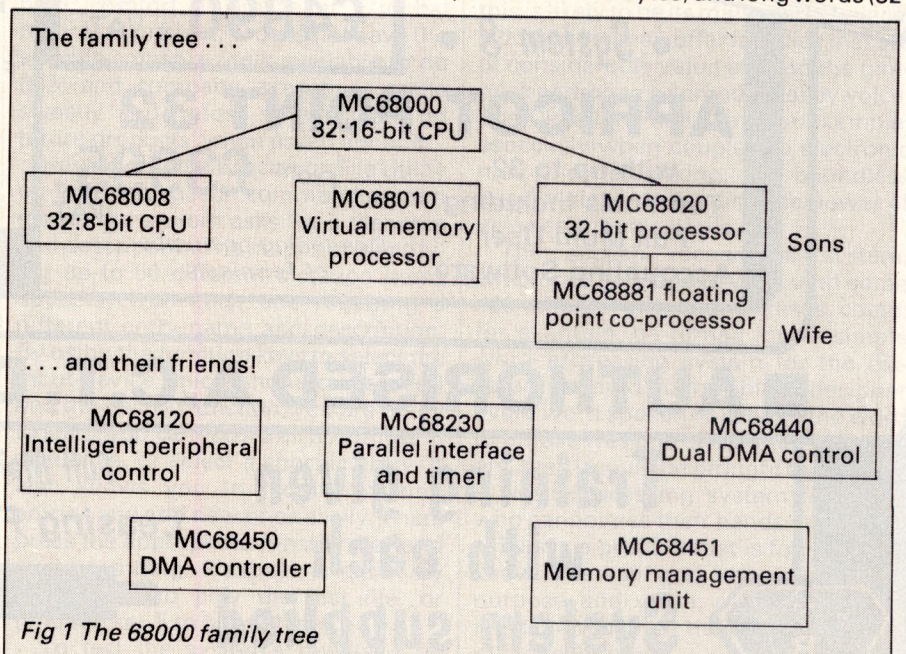

Fig 1 The 68000 family tree

bits = four bytes).

All the instructions are words and can have up to a further four extension words (these hold the data for the instruction). All the instructions on the MC68008 must start on an even byte address, and data must be padded out so that it, too, starts on an even boundary.

The standard format of the mnemonics, in 68000 assembly language programming, is:

MNEMONIC.size source,destination

The size can be B(=Byte), W(=Word) assembler defaults to word, or L(=Long word)

Both the source and destination values could be any of the 14 addressing modes. Some instruction mnemonics only allow one or two of the addressing modes to be used, such as the move quick instruction (MOVEQ #0,D1). The addressing modes available are shown in Fig 3 with an example mnemonic.

Registers

The MC68008 has eight 32-bit data registers, seven 32-bit address registers, two stack pointers, a 16-bit status register and a 32-bit program counter. The eight data registers can be used with bytes, words or long words. Numbers can be put into any of these data registers to represent counters, indexes or anything.

For example, if we wanted to put the number 12 into a data register as a byte then we would use the example shown in Fig 4.

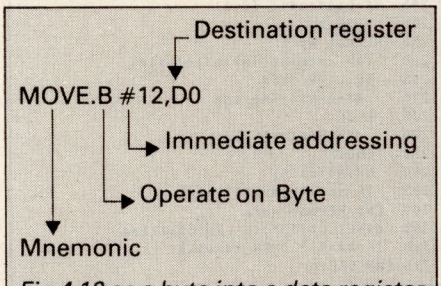

Fig 4 12 as a byte into a data register

This is like LET A=12 in Basic, only much faster!

There are seven address registers which can handle words or long words. Address registers are normally used to point to memory. Each memory cell has a unique number: data can be stored within this cell and then accessed by using the address registers.

For example, let's assume that we have a list of numbers stored in memory as words. We can point an address register to the start of the list by the instruction:

MOVEA.L #124,A2

This will fill all 32 bits of the A2 register with 124. Other instructions can now be used to get at the list of numbers pointed to by A2:

MOVE.W (A2),D4

This instruction will put the contents of memory pointed to by A2 into the data register, D4. So D4 will be equal to 76.

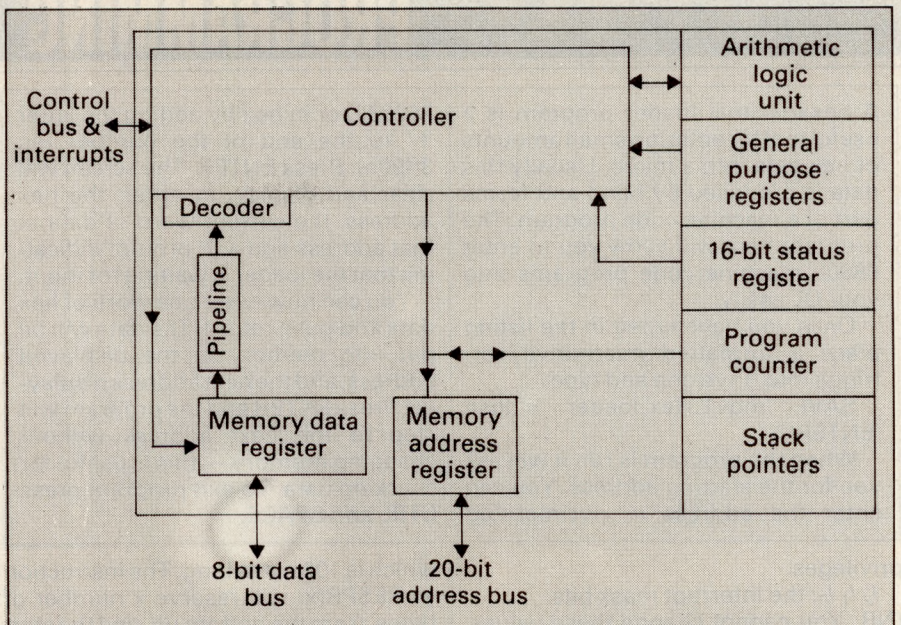

Fig 2 The MC68008

Data Register Direct:	MOVE	D0,D3
Address Register Direct:	ADD	A1,A4
Immediate:	MULU	#$22,D2
Absolute Short:	JMP	$1200
Absolute Long:	JSR	$123456
Address Register Indirect:	SUB	(A0),D4
Address Register Indirect with postinc:	AND	(A2)+,D4
Address Register Indirect with predec:	MOVE.L	−(A7),D0
Address Register Indirect with index:	ROL	$20(A3),D3
Address Register Indirect with index & disp:	BCLR	$12(A1,A2),D5
Program counter relative with disp:	JSR	$8(PC)
PC relative with index and disp:	JMP	$55(PC,A1),D3
Quick Immediate:	ADDQ.B	#2,D1
Implied Register:	MOVE	SR,D0

Fig 3 Addressing modes

Address register seven (A7) can act as a stack pointer as well as a normal address register. So, if we want to put three numbers onto the stack, say, 19, 20 and 30, first set up the stack pointer:

MOVEA.L #5002,A7,

and then put 10 onto the stack:

MOVE.W #10,−(A7).

This mnemonic will decrement the contents of A7 by two (5002 − 2 = 5000). It will then use this address to store the data (that is 10). For the other two numbers we write:

MOVE.W #20,−(A7), and

MOVE.W #30,−(A7).

If we now wish to remove these values, we must do so in the order 30,20,10. The first number put in is the last out, that is:

MOVE.W	(A7)+,D0	D0=30
MOVE.W	(A7)+,D1	D1=20
MOVE.W	(A7)+,D2	D2=10

There are in fact two stack pointers — one for the operating system, and one for the user (which you can use). The CPU will sort out which one you are using. Some assemblers allow you to use 'SP' instead of 'A7' in the mnemonic. This makes the code easier to understand.

The program counter is 32 bits long and is used by the processor to hold the address of the next instruction to be executed. However, since there are only 20 external address lines on the MC68008, only the first 20 bits in the PC are valid. The status register consists of two bytes, one for the system (the QL ROM) and one for the user (yourself). The function of each is as follows:

User Status:

C=carry: this is used to hold the most significant bit from a logical or arithmetic operation.

Z=zero: this bit will be set to 1 if the previous operation yielded a zero result.

V=overflow: this bit will be set if a result greater than that specified is produced.

N=negative: this bit will take on the same value of the most significant bit of a result (it is usually set to 1 if the result is negative).

X=extend: this is always the same as the carry flag!

The System Status:

T=trace mode: this generates an exception interrupt after each instruction (like single-stepping).

S=supervisor mode: when this is set to 1, then the system operates in supervisor mode which has special

A hexadecimal loader program is a useful tool for entering small amounts of hex data into a micro. Usually this data is produced by hand and forms part of a machine code program. The program here will allow you to enter 68000 machine code programs into your QL easily.

Once you have typed in the listing place a formatted microdrive cartridge into drive one and type:

SAVE mdv1_Hex_loader <push 'ENTER'>

When the program is run it will ask you for the starting address. You can enter the address in decimal (eg 262032) or in hex by adding the letter 'h' to the end of the number (eg 3ff90h). Press ENTER. The screen will clear and display, in order, the hex address, the current word of data at that address and a '?' prompt indicating that the loader is waiting for input.

You can now enter one word of hex data and push return. The data will be put into memory at the displayed address, and the next address displayed. Press ENTER and the program will step to the next address without changing memory — this is useful for checking data. To exit program press CTRL and SPACE.

```
10  REMark QL hex loader program
15  REMark (c)Tubb Research,1984 for PCW
20  REMark
25  CLS
30  BORDER 5,0,6
35  PRINT "Type in hex starting"
40  INPUT ("address ");a$
41  IF a$(LEN(a$) TO LEN(a$))="h" THEN
42   a$=a$(1 TO (LEN(a$)-1))
45   hex_dec a$
46  ELSE
47   t=a$
48  ENDIF
50  add=t
55  REPeat loader
60   CLS
65   FOR col=0 TO 18
70    AT col,0
75    dec_hex add,6
80    PRINT d$;"       ";
85    FOR q=0 TO 1
90     dec_hex PEEK(add+q),2
95     PRINT d$;
100   NEXT q
105   AT col,18
110   INPUT ("?");b$
115   IF b$="" THEN GO TO 145
120   hex_dec b$
125   POKE_W(add),t
130   AT col,18
135   dec_hex t,4
140   UNDER 1:PRINT d$;:UNDER 0:PRINT "   ";
145   add=add+2
150  NEXT col
155 END REPeat loader
160 DEFine PROCedure hex_dec(h$)
165  LOCAL L,a$,v
170  v=0:t=0
175  FOR L=0 TO LEN(h$)-1
180   a$=h$(LEN(h$)-L TO LEN(h$)-L)
185   IF CODE(a$)>57 THEN
190    v=(CODE(a$)-87)
195   ELSE
200    v=a$
205   END IF
210   t=t+((16^L)*v)
215  NEXT L
220 END DEFine
225 DEFine PROCedure dec_hex(v,L)
230  LOCAL c,a$,b
235  b=v:d$=""
245  a$=b:a$=a$(1 TO 1)
250  b=ABS(b)
255  REPeat work
260   LET c=(b/16-INT(b/16))*16
265   IF C<=9 THEN
270    d$=CHR$(c+48)&d$
275   ELSE
280    d$=CHR$(c+55)&d$
285   ENDIF
290   b=INT(b/16)
295   IF b=0 THEN EXIT work
300  END REPeat work
305  d$=FILL$("0",(L-LEN(d$)))&d$
310  IF a$="-" THEN d$=a$&d$
315 END DEFine
```

privileges.

I_2 I_1 I_0: the interrupt mask bits.

(NB: You cannot change these values unless you are in the supervisor mode — that is, within the operating system, QDOS.)

QDOS

The QL operating system, which includes QDOS and the Basic command interpreter, will not be the operating system of the future until Sinclair Research has rid the system of bugs and written a few extra features into the Basic interpreter. The system is partly multi-tasking, but it still manages to 'hang' the machine on the printer! The small 68008 test program (Fig 5) demonstrates QDOS traps (special systems routines).

The code is ready for typing into the QL using the hex loader program (see box). The program is fully relocatable, so to find the start address into which it can be loaded and run, type:

```
CLS
op=RESPR(100)
PRINT op
```

The number displayed on the screen is the start address of free memory which is 100 bytes long. The instruction y=RESPR(x) will reserve x number of bytes, from the bottom up, and the start address is y. You can now load and run the hex loader, typing the start address as that shown on the screen. Now type in the hex words, from the listing, pressing ENTER after each word. When finished (29 words) press CTRL and SPACE. Put a formatted microdrive cartridge into drive one and type:

SBYTES MDV1_mcode,op,58

This will save the machine code onto the microdrive. You can now run the code by typing:

```
CLS
CALL op
```

If you have a book on the 68000, then you can try out further programs yourself. Note that when you end any routine with RTS, register D0 will contain an error number. You must set this to zero if no errors are to occur: for example,

```
7000 MOVEQ #0,D0 ;Set no errors
4E75 RTS ;Return to Superbasic
```

Watch out for further issues of PCW *with more QL programs.*

```
4281            CLR.L   D1              ;D1=0=Job ID
4283            CLR.L   D3              ;D3=0=device code
7001            MOVEQ   £1,D0           ;D0=1=routine IO.OPEN
41FA 0012       LEA     $14(PC),A0      ;A0=Address of channel name
4E42            TRAP    £2              ;Open a cannel (default SCR)
343C 001A       MOVE    £26,D2          ;D2=Length of message
43FA 000E       LEA     $0F(PC),A1      ;A1=Address of message
7007            MOVEQ   £7,D0           ;D0=7=routine IO.SSTRG
4E43            TRAP    £3              ;Print the message (to channel)
4E75            RTS                     ;Return to SUPERBASIC
0004            DC.W    4               ;Length of channel name
5343 525F       DC.B    'SCR_'          ;Channel name
0A0A            DC.B    $0A,$0A         ;The message
5448 4953       DC.B    ????            ;You will have to try the
2049 5320       DC.B    ????            ;program to see what
494E 204D       DC.B    ????            ;this message
4143 4849       DC.B    ????            ;reveals to you
4E45 2043       DC.B    ????            ;on the QL!
4F44 4521       DC.B    ????
```

Fig 5 68008 test program



Choosing a printer is a lot easier than choosing a computer.

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Sharp MZ-5600

Sharp has taken a brave step in launching a 16-bit business machine which is not IBM compatible. Whether it be a question of Japanese pride or unfamiliarity with the European market, Bob Piper still feels that the company's reliable track record and competitive pricing will guarantee the machine a decent future.



Photographs by Crispin Thomas



'The keyboard is a real gem — hard to fault either in terms of layout, build quality or key response'

The fiendishly cunning Japanese are trying to smuggle in business computers disguised as video recorders. Suspicions were aroused by the low profile angular lines and matt silver finish of the Sanyo 500 series. Their latest attempt, however, the Sharp MZ-5600, confirms the UK's worst fears. Not only does it share the same 'living room' looks as the Sanyo, but it also sports an audio output socket and slider volume control on its front panel.

Beneath the facade, however, lurks a serious business machine boasting an Intel 8086-2 CPU running at 8MHz, 256k RAM, a 640k floppy and a 10Mbyte winchester disk. This is most definitely not the kind of specification associated with 'domestic quality' computers. Prices are competitive, and the machine includes some thoughtful features, although the thinking behind the choice of outdated CP/M-86 and a non-IBM PC compatible implementation of MS-DOS, is more puzzling.

Hardware

The first thing that attracts attention is the MZ-5600's enormous size. The review machine was supplied with a 15in colour monitor standing on a pedestal base, which no doubt did a lot to contribute to the overall impression of enormity. The processor footprint measures 17ins wide × 16ins deep and is larger than average, but with the monitor on top, the height of the combo is 21 inches. This height coupled with the large 15in screen makes it possible, some may say advisable, to sit a fair distance from the screen.

Finished in greyish white, the Sharp is an impressive looking machine but, be warned, it does consume an awful lot of desk-top. The front of the processor unit houses along the top row, an audio output speaker, a hard disk and floppy disk both fitted with green 'busy' lights. The bottom row from left to right comprises a power on indicator, audio output socket for connecting the sound generator straight into the hi-fi, reset button, audio volume control, and front keyboard connector. The front reset button is a handy idea but would be safer if it were further recessed or subject to a time delay before initiating its drastic action. The unusual keyboard connector looks like a mini DIN plug, but it is more difficult to assess the correct orientation and not impossible to distort the pins in the attempt.

The upper level of the rear panel houses four blanking plates where expansion boards can be fitted into the separate chassis without the need to remove the main casing. To the right of this is the mains input socket with a grounding terminal alongside it, another hangover from the hi-fi trade, which is intended to cut down interference on adjacent electrical appliances.

Along the lower level from left to right are a second keyboard socket, a connector for an additional external floppy disk drive, a centronics compatible parallel port, two RS232C ports and conventional DIN connectors for both monochrome and colour (RGB) monitors.

The on/off rocker switch is conveniently located on the left-hand side of the machine, and well-recessed.

Turning the machine upside down reveals a removable panel (more of which below), and a hole on the casing permitting access to a single dip switch. The settings on this switch may have to be changed when hardware options are changed or added and the panel saves having to remove the main casing. The MZ-5600 does not carry out auto-diagnostics each time it is switched on. If the user suspects all is not well he can change positions on the dip switch to initiate a lengthy diagnostic procedure. This is a welcome idea as the time some machines take to go through their diagnostics, which 999 times out of 1000 are OK, is becoming increasingly unacceptable.

The dip switch can also be used to detune the MZ-5600's 8086 processor from 8MHz to 5MHz as some applications software cannot handle the extra speed.

Removing the main cover involves taking out no less than eight screws. Inside the machine seems much more crowded than we have become accustomed to. The power supply is shielded on three sides and occupies three inches of the entire left-hand side except for an extremely lo-fi audio speaker. The fan, which draws air out of the interior, passing it through the power supply before venting it through the side, is inexcusably noisy. Maybe the cramped interior has dictated that a really powerful unit has to be used but other machines seem to use quieter units without overheating.

The motherboard occupies all the remaining space at the lowest level. Above it are screwed the disk drives to the front and the expansion chassis to the rear.

The DSDD floppy unit is manufactured by TEAC and has a capacity of 640k, while the hard disk unit comes from yet another competitor, Hitachi, and has a capacity of 10Mbytes. Both units are noisy, especially the TEAC unit, which makes such loud banging noises that you expect the disk to come out dissected into several parts.

The motherboard contains the Intel 8086 coupled to 256k RAM and 92k dedicated video RAM. This can be expanded to 192k by the addition of extra chips, but it is necessary to remove the drives to do this.

The advantages of doing this will be greater resolution and a larger palette of colours. For instance, with 92k VRAM and 640 × 400 resoluton with a monochrome monitor, only three

shades of green are possible. With 192k VRAM this figure increases to six. Basically the MZ-5600's display is bit-mapped, one dot on the screen corresponding to one bit in VRAM. Graphics are displayed horizontally across the screen in 16-bit words. On the standard machine with 92k VRAM, three screens of 600 × 400 resolution displays can be stored. Screens cannot be transmitted to the CRT directly but must be directed through windows. The windows can be any rectangular shape up to the same size as the CRT screen, and up to four can be displayed at any time. Windows have to be allocated a display priority within the range 0-3 and no window can have the same priority level as another.

The MZ-5600 has eight basic colours in its palette, and all window functions are controlled by a dedicated LSI controller. The whole idea seems to work well but at the moment can only be accessed through Sharp Basic. The demo program supplied with the machine, written in Basic, demonstrated the four graphics windows moving around the screen overlapping splitting and changing priorities to great effect.

While on the subject of special effects the sound generator is worthy of mention, although quite how it is intended to be used in a business machine I cannot hazard a guess. There is an 8330 sound chip with three polyphonic channels covering eight octaves from 20Hz to 20KHz. It is, therefore, possible to produce three note chords over the whole range. Degradation through the integral loudspeaker is very noticeable but greatly improves when played through a hi-fi system.

The MZ-5600 has a real-time clock with battery back-up using an RP5C01 chip and 32.768KHz crystal. This automatically provides the date and time to the operating system which can be changed or corrected using the appropriate system commands. The preliminary version of MS-DOS provided for review, however, had not been adapted and still requested date and time from the operator on start up.

Expanding the MZ-5600 is intended to be child's play. Apart from the extra VRAM described earlier which requires the disk drives to be removed, all the other expansion options can be fitted without removing the case. The Intel 8087 arithmetic co-processor can be fitted by removing a small hatch on the underside and simply plugging it into the vacant socket provided and resetting the dip switch. The expansion chassis plugs into the motherboard and is screwed onto the main chassis. This provides four horizontal expansion slots, although our hard disk review machine had the top two filled by the hard disk controller. Strangely, maximum memory is only 512k as opposed to the more normal 640k found on 8088/8086-based micros but should be enough for most users' needs.



The front of the processor houses audio output, hard and floppy disks



At the rear, four blanking plates will accommodate expansion boards

The keyboard is a real gem. Designed to ISO standards it really is hard to fault the unit either in terms of layout, build quality or key response.

To indicate status the keyboard has a second power on LED and further LEDs on the 'CAPS' lock and 'GRAPH' lock keys. The keys are divided into four main groups.

Notable features of the qwerty keypad are a large RETURN key and a combined £/hash key. The GRAPH key to the left of the space-bar is designed to input predefined graphics characters as found on previous Sharps but, not surprisingly, does precisely nothing when working under CP/M-86. They do produce some pretty weird looking symbols when in Sharp Basic.

The next keypad contains the cursor control and word processing keys. The up and down keys are double size for some reason and situated either side of the horizontal movement keys.

The numeric keypad is conventional with the exception of the CL key in the top left-hand corner. This is an extension to the word processing keys and is used to delete whole lines.

'Expanding the MZ-5600 is intended to be child's play. Apart from the extra VRAM which requires the disk drives to be removed, all the other expansion options can be fitted without removing the case.'

The final group extends across the top of the other three and comprises 17 function keys. Starting at the extreme left is the conventional BREAK which is followed by 10 user-definable function keys. Next there is HELP, which is intended to provide useful information whenever it is pressed, but as it only produces a HELP string followed by a carriage return it is very dependent on the package accepting such an instruction. It works well, however, with CP/M-86's HELP facility.

The COPY key is used to dump the contents of the screen to the printer and is equivalent to the PRINT SCREEN key found on other computers. The remaining four keys are something of a mystery as they do not appear to be user-programmable in the same way as the others. Further investigation reveals they are for use in Sharp Basic programs in debugging and window management. As the machine is probably going to be used more for running applications software than Basic programming it seems a waste to dedicate four keys in this way.

Each group of user-definable function keys has a clear perspex cover above them where suitable cards can be placed describing the keys' action. As supplied for review the keys produced a very comprehensive set of CP/M-86 commands strings and certainly saved a lot of time when working at system level. Actual user defining of function keys is covered in more details under the 'System software' section.

The keyboard is controlled by an 80C49 chip and has a 63-character buffer. This means that although it is theoretically possible to type ahead of the computer by up to 63 characters, in practice it is difficult as none of them will actually appear on the screen until the processor is freed from its original priority task.

The keyboard has a two-key rollover facility and auto-repeats on most non-function and non-system keys.

It also has a rear edge tilt facility and a mouse port. Key action seemed just about right with the correct blend of tactile feedback and robustness. In short it is the sort of keyboard that grows on you; the more you use it, the more you like it.

The 15in colour monitor is a large unit. It is in fact quite good looking with a very attractive flat screen but its overall size tends to detract from final impression. The tilt swivel base is fixed onto the base of the monitor with four large screws and, although allowing precise adjustment of the screen angle, it does seem to add an inordinate amount to the overall height of the combined unit.

Brightness, vertical size, vertical hold, horizontal centre and horizontal hold commands are located behind a flimsy side panel. The combined on/off push button and pilot are placed on the front of the unit.

A separate mains supply is required but the RGB connection is a flying lead fixed at the monitor end.

The 80 × 25 character and graphic colour displays were top quality with excellent resolution and stability, especially when the extra large screen size was considered. However, when operating at system level in black and white the screen produced a weird green ghosting when scrolling.

System software

The Basic interpreter included with the MZ-5600 series is written by Sharp and is not a modified Microsoft version. It is a very comprehensive and powerful language occupying no less than 104k of memory.

The core of Sharp Basic differs a little from others. For instance, to print to the screen one does not use PRINT but DISP. The more complex commands concern graphics and windows manipulation which are very much tied up with the use of the video RAM.

A typical example is as follows: SEL C,G,W will display text and graphics together on the same screen. 'C' represents the screen number in VRAM assigned to text, 'G' is the screen number assigned in VRAM to graphics and 'W' is the screen number used as a background.

There can be little doubt that Sharp Basic has some very powerful graphics commands but reference to the Benchmarks reveals how slow it is as a general purpose Basic.

Sharp Basic in fact operates under FDOS, Sharp's own operating system, which in turn works under CP/M-86. Consequently, when disk access is frequent, things could slow down even more.

Although Sharp has no intention of bundling it with MS-DOS, Microsoft's GW-Basic will probably be available through one of the software distributors at a moderate price. Microsoft Basic Benchmarks supplied by Sharp show the machine running much faster.

The MZ-5600 series is being launched with both Digital Research CP/M-86 and Microsoft MS-DOS operating systems. At the time of writing the MS-DOS implementation was not quite complete and Sharp could only supply a preliminary system disk for review. But the company's overall philosophy with both systems is to extend them with various utilities which not only help realise the machine's full potential but make it much easier for users to configure the system to suit their own needs.

The review machine was supplied with CP/M-86 on the hard disk, so on powering up the MZ-5600 first looks for a floppy disk. If there is none present it boots up from the hard disk and, after displaying the status of the memory map and hard disks, produces a system prompt.

As supplied, the hard disk is partitioned into two sectors of 5Mbytes each, and Sharp tells me this cannot be changed by the user.

The function and HELP keys are fully configured to produce a wide variety of system commands. Press the 'HELP' key and the standard CP/M Plus type list of available topics appear on the screen with the addition of Sharp's extra utilities.

Function keys 1 to 10 are programmed to produce some quite complex strings. F10, for instance, initiates "PIP B:=A:*.*(V). and F7 STAT A:*.*. The commands which display status incorporate a carriage return but those which actually write to disk require the operator to confirm initiation by supplying his own return. The function keys are set up using the 'KEY' utility. This displays a list of the current assignments for each key plus their shift modes. Pressing the required function key displays the current string in an entry line which can be changed by over-typing. All keys on the cursor control keypad can also be reprogrammed using this utility. When finished

'The Basic interpreter included with the MZ-5600 series is written by Sharp and is not a modified Microsoft version. It is a very comprehensive and powerful language occupying no less than 104k of memory.'

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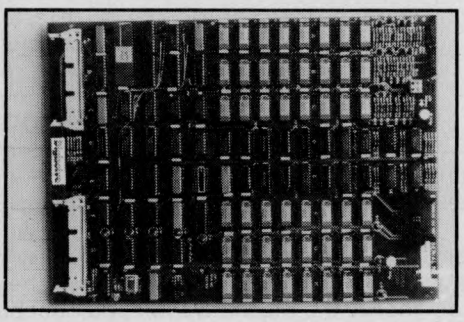

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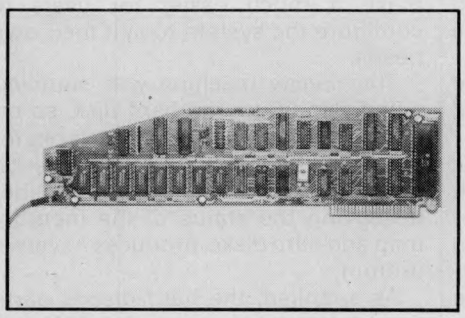

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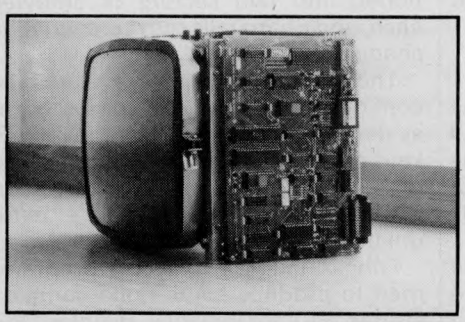

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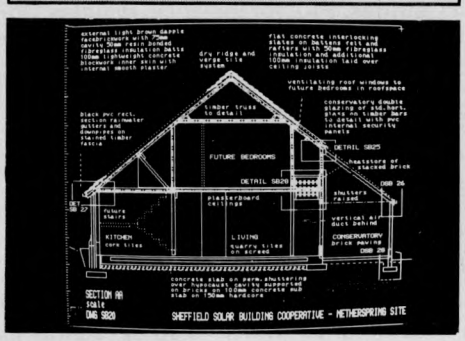

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the changes can be saved with a CTRL C or abandoned with a CTRL Q.

The INSTALL utility is used to set up the parallel printer driver. Unfortunately the only printer driver supplied was for a Sharp printer, so the machine would not drive an Epson RX80 from the parallel port. Sharp informed me that by the time the machines reach the dealers more drivers will be available.

The DSKMAINT utility is used, as the abbreviated initials imply, for general disk maintenance purposes. It is probably slower than using CP/M commands directly but it is easier to follow and less prone to silly mistakes. Floppies can be copied, formatted or verified and it is also possible to copy over just the system tracks onto a formatted floppy. In default mode the Sharp automatically verifies after writing to disk but this feature can be disabled if speed rather than accuracy is important.

The ASSIGN command enables physical to logical device assignments to be reviewed and altered. It can also be used to change the physical labels given to the disk drives. For instance, on the review machine the two partitions of the hard disk were labelled A & B and the floppy I. This could easily be changed to the hard disk with I & J and the floppy, A. Basically the ASSIGN utility is a more specific implementation of the STAT CP/M utility but much easier to use.

RSPARM enables the parameters of both serial ports to be configured. The parameter menu displayed is very comprehensive including, among others, word length, parity, stop bit, X on/X off and of course baud rate which has a maximum setting of 9600. All the above utilities will, of course, modify the operating parameters during the current session but on switching off they will all be lost. However, by using the BIOS item on the IOCNF utility menu they can all be saved onto the boot tracks of the operating system.

IOCNF is a really powerful tool boasting some other useful features as well. It can be used to define a command string to be executed on start up in much the same way as the CP/M SUBMIT command. The difference with the Sharp utility is that there is no need to get involved with the awkward CP/M utility ED, just type in the required string and the machine sets up the necessary file.

The MZ-5600 has a somewhat crude RAM disk facility which can be set up through IOCNF. It is possible to allocate blocks of memory, 32k at a time, to the RAM disk which is assigned the physical label 'M'. The machine then uses this in place of disk storage. The snag is that there is no auto-save facility, so when the memory area gets full the user must remember to perform a PIP M: = A:*.* command before switching off.

BKUP and BRST are two utilities used to back up the hard disk. The former copies data from the hard disk to floppies in compressed format, while the latter copies back from the floppies to the hard disk, expanding the data in the process. DSKCNV is a disk format conversion utility which enables the MZ-5600 to read other disk formats. Those covered include the Sharp MX-3500/5500 and IBM PC single or double-sided but all in CP/M-80 or -86 format.

The MS-DOS preliminary operating system supplied did not have DSKCNV utilities, but would accept and read the directories straight from IBM PC disks.

By the time the machine reaches the dealers the MS-DOS system disk should have the same utilities as the CP/M-86 version. Sharp has obviously gone to a lot of trouble to make the operating systems easier to use and to adapt to suit specific needs. There are many other machines around that would benefit from the Sharp treatment.

'Sharp has already prepared a preliminary catalogue of CP/M-86 software . . . Major applications packages include the full Micropro range, dBasell, SuperCalc 2 and SuperWriter.'

'. . . the MZ-5600 series has some outstanding aspects but the Japanese designers seem somehow out of touch with the basic requirements of the European market.'

Application software

Sharp does not intend to market the MZ-5600 series with any applications.

Benchmarks

BM1	1.5
BM2	7.2
BM3	19.8
BM4	20.2
BM5	21.6
BM6	32.8
BM7	53.8
BM8	115.2
Average	34.0

All timings in seconds. For a full listing of the Benchmark programs, see 'Direct Access'.

Although the range is not IBM PC compatible Sharp seems fully aware of the potentially disastrous results that can occur when a machine is launched without sufficient software. It has already prepared a preliminary catalogue of CP/M-86 software which will be available from the WH Smiths Softteam and MPI distributors. Major applications packages include the full Micropro range, dBasell, SuperCalc 2, and SuperWriter. Vertical markets and programming languages also appear well catered for, but it is hard not to question Sharp's adoption of CP/M-86 as the operating system for all this software.

It is unlikely that any exciting new packages are being developed for use under this system, as MS-DOS has swept the board in the past few months as far as single-user operating systems are concerned. With the introduction of the multi-tasking Concurrent CP/M, which boasts in PC Mode an MS-DOS emulator allowing MS-DOS programs to run, it is even less likely that the software houses will launch packages designed to operate under straight CP/M-86.

The picture with MS-DOS is more optimistic. At the time of writing the catalogue of MS-DOS software had not been released but it should make interesting reading. Sharp had just agreed with SPI to port Open Access onto the MZ-5600 series and other major IBM style applications packages should follow. Although not an IBM PC compatible in the accepted sense of the word the hardware specification can be detuned sufficiently to emulate the IBM PC very closely. Consequently, software modifications are likely to be of a minor nature. The Tandy 2000 finds itself in a similar position regarding PC compatibility and it has already demonstrated that software houses will produce special versions if the demand is sufficient. Make no mistake, however, off-the-shelf IBM software does not stand a hope in hell of running in standard form.

For review purposes Sharp supplied WordStar, SuperCalc 2 and dBasell, all of which seemed to work well but not noticeably quicker than they would or a conventional speed 8088-based machine. Function keys were not configured, but this presents no problems on the Sharp as customising their functions to suit individual tastes using the KEY utility is very simple.

Packages written for the earlier MZ-

3500 series can also be patched to run on the new model. Data files prepared on the 3500 series can be converted to the new format by selecting one of the options in the disk conversion menu. This facility provides a well-thought out upgrade path for loyal Sharp users.

Documentation

As supplied the documentation was all contained in one massive, boxed A5 binder comprising six separate soft-bound manuals. Unfortunately the binder is so tightly packed that the individual manuals have to be removed for reading. Furthermore, as they are conventional paper backs and not ring-bound they refuse to stay open at the required page.

CP/M-86 was covered by reprints of the three heavyweight Digital Research manuals entitled *User's Guide, System's Guide* and *Programmer's Guide.* Although they have long set the standard for user hostility they are comprehensive, but users will need considerable determination to find the particular piece of information they're looking for.

Fortunately, Sharp has covered its extensions to CP/M-86 with an excellent supplement, which uses screen displays and examples to great effect. To some extent, however, the set-up utilities covered in the manual are so well-prompted from the screen that the write-ups become almost superfluous.

The Owner's Guide looks rather inadequate when compared with the complexity of the machine but in practice works rather well. The first section covers setting the machine up and explains the basics of operation. Subsequent sections each increase in complexity, until eventually it is more like a very abridged technical reference document packed with useful information for those who wish to explore beyond the straightforward use of applications software.

The Basic reference manual is excellent. The first quarter is dedicated to the explanation of Sharp Basic's more advanced commands. The remainder details commands individually, each one explained fully and illustrated by examples. Two reference booklets are also included in the standard package, one covering CP/M-86 and the other covering Sharp Basic. Although the former is basically a reprint of the equivalent Digital Research document it does, however, cover details on the Sharp extensions.

At the time of writing documentation covering MS-DOS was not available but it will most likely adopt a similar format to that covering CP/M-86, that is the basic Microsoft manual plus a Sharp supplement covering the extended facilities.

Prices

The Sharp 5645 hard disk model with 256k RAM, 92k VRAM, 640k floppy, a 10Mbyte hard disk and a monochrome monitor as opposed to the colour on the review machine costs £3495.

The 5641, identical except for the substitution of the hard disk by another 640k floppy, costs £1995. The 5631 is a single 640k floppy machine costing £1595.

The 15in colour monitor as reviewed retails at £595. List price for the Sharp mouse is £95. Prices for additional RAM and VRAM had not been fixed at the time of going to press.

Conclusion

As with Sharp business computers in the past, the MZ-5600 series has some outstanding aspects but the Japanese designers seem somehow out of touch with the basic requirements of the European market.

The graphics potential, higher than average mass storage and the user-friendly set-up utilities all bode well for the machine, but to waste so much effort on the implementation of the almost defunct CP/M-86 and sound generation system, is misguided.

Sharp nearly saved the day with an excellent implementation of MS-DOS but, unfortunately, stopped just short of offering full IBM PC compatibility. A question of pride, maybe?

It would be hard for anyone to deny that the machine would sell far better, in the short term at least, if it were able to run 'off-the-shelf' IBM software.

However, Sharp machines are reliable and have a loyal following as a result. The MZ-5600 series will, therefore, no doubt appeal to users of the MZ-3500 series wishing to upgrade to a full 16-bit machine. Sharp will also be integrating it with products emanating from its other divisions to provide a comprehensive range of office automation products. There are already plans afoot to use the MZ-5600 as the hub of a 'point of sale' system using Sharp cash registers.

As a stand-alone micro the MZ-5600 is competent, but not outstanding enough in any one particular area to get itself noticed in the already confused non-IBM PC compatible market-place. As far as value for money is concerned the machine is very competitive, especially considering the fact that one year's on-site maintenance agreement with CGS is included. END

Technical specifications

Processor:	Intel 8086 running at 8MHz
ROM:	16k
RAM:	256k standard, max 512k
Video RAM:	96k standard, max 192k
Mass storage:	640k DSDD 5.25in floppy disk, 10Mbyte 5.25in hard disk
Keyboard:	ISO standard, 103 keys
Size:	Processor 17in(W) × 16in(D) × 4.8in(H), 15in monitor 16in(W) × 16in(D) × 16in(H)
I/O:	Parallel (centronics) RS232C, two floppy disks, composite video and RGB monitor
DOS:	Extended CP/M-86 Extended MS-DOS Version 2
Bundled Software:	None
Options:	Extra RAM (up to 512k), extra VRAM (up to 192k), mouse, monochrome monitor, 14in colour monitor, 15in Colour monitor

In perspective

With the business computer market in its present state, two groups of machines are notching up most of the sales. On the one hand we have the IBM PC and its clones, while on the other we have machines offering innovative features usually associated with user-friendliness, like Apple's Macintosh and Hewlett Packard's Touch-Screen.

Unfortunately by opting out of both these groups Sharp automatically places the MZ-5600 among the also-rans. The new Tandy 2000 finds itself in a similar position offering a better hardware specification than the IBM but sacrificing PC compatibility in the process.

One machine that manages to combine the best of both worlds is the Olivetti M24 which uses a full 16-bit chip, offers improved mass storage and graphics capabilities but will still run practically any IBM software you care to feed it. The M24 is not expensive either.

However, it's not too late to save the day. If Sharp is prepared to swallow its pride and make the necessary modifications to, at least, offer software compatibility (even if hardware plug compatibility is impossible), then the MZ-5600 may stand a better chance of success.

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Triperfect numbers

Mathematical mind-benders from Mike Mudge

A positive number N is called a 'triperfect' number if and only if s(N)=3N, where s(N) denotes the sum of the positive divisors of N.

For example: $T_1=2^3.3.5=120$ is triperfect because 1+2+3+5+4+6+10+15+8+12+20+30+24+40+60+120 =3.120 =360.

And: $T_2=2^5.3.7=672$ is triperfect because 1+2+3+7+4+6+14+21+8+12+28+42+16+24+56+84+168+112+48+32+336+96+224+672=3.672=2016.

We need not search for odd triperfect numbers since it has been shown that such numbers (if they exist) are:
(i) greater than 10^{50}, WE Beck & RM Najar, *Math Comp, vol 38, 1982, pp249-251.*
(ii) mutiples of at least 10 distinct prime factors, M Kishore *Math Comp, vol 42, 1984, pp231-233.*

However, six even triperfect numbers are known (including T_1 & T_2 above)

Readers are invited to design and implement an algorithm for the determination of some or all of these numbers.

Submissions should include program listings, hardware description, run times and output; these will be judged for accuracy, originality and efficiency (not necessarily in that order) and a prize of £10 will be awarded to the 'best' entry received by 1 February 1985.

Please address entries to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Nr Wolverhampton, Staffs WV4 5NF. Tel: (0902) 892141.

Diophantine equations

The response to this three-part problem displayed the considerable interest in the solution of equations in integers, both by computational and algebraic methods.

The wording of (1) was unfortunately somewhat misleading and prompted numerous telephone calls and letters; copies of the Barnes paper are available on request so that the detailed nature of the 'trivial' solutions may be seen.

The fourth non-trivial solution to (2) $x=74$, $y=260$ together with a further solution $x=767$, $y=8672$ hitherto unknown to the writer have been found. Are there any others?

In (3) the value $x=3344161$ was incorrectly printed but this did not deter extensive algebraic and computational analysis.

The May prize-winner is AS Tickner of 14 Grimsdyke Road, Pinner, Middlesex HA5 4PH.

The criteria used to justify the award for work on an HP-98020 A calculator are those listed together with a commendable tenacity of purpose. It is hoped that other contributors and those interested in Diophantine problems will contact Mr Tickner in an attempt to complete the analysis of problem (2) and to investigate further unsolved problems in this area.

Quotients of Wilson and Fermat

This proved to be a very popular competition, probably due to the simplicity of its formulation. A ZX81 ran for 32 days, a U2200 (Apple-compatible) in Pascal used 36-digit LONGINT to display explicit values of some F_p and W_p, while an Apple II in 14 days 3 hours and 22 minutes made a major contribution. However, several programmers were in difficulty with unrecognised integer overflow leading to incorrect solutions of $w_p=0(p)$.

Nonetheless, we can now list all the solutions of $a^{p-1}\equiv 1 \pmod{p^2}$ for $2\leq a\leq 31$ and $3\leq p\leq 1040069$.

a	p
2	1093,3511
3	11,1006003
5	20771,40487
6	66161,534851
7	5,491531
10	3,487
11	71
a	p
12	2693,123653
13	863
14	29,353
15	29131
17	3,46021,48947
18	5,7,37,331,33923
19	3,7,13,43,137
a	p
20	281,46457
22	13,673
23	13
24	5,25633
26	3,5,71
28	3,19,23
30	7,160541
31	7,79,6451

(i) No solutions were found for a=21 or a=29.
(ii) There are no further solutions for a=2 with p less than 3×10^7.

Considering $(p-1)!\equiv -1 \pmod{p^2}$. EH Pearson, *Mathematics of Computation, vol 17, 1963, p194* has tested all p less than or equal to 200183 and only p=5,13 and 563 satisfy the congruence . . .

The June prize-winner is Don Hunter of The Old Vicarage, Elmdon, Nr Saffron Walden, Essex CB11 4LT; whose ALGOL 60 programming of a 16k Elliott 903 using library procedures for multi-precision arithmetic ran for a total of 53½ hours.

The last such computer that the writer heard of had been refurbished following its removal from a tank.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided. END

LEISURE LINES

Brain-teasers courtesy of J J Clessa

Quickie

What temperature is the same in Centigrade (Celsius) as it is in Fahrenheit?

Prize Puzzle

A certain 7-digit number contains no zeros and is not palindromic (that is, it does not read the same from right to left), but it does have the property that if its digits are reversed, the resulting 7-digit number is a factor of the original number. What is the original number?

Answers, on postcards only, to: *PCW* Prize Puzzle, November 1984, Leisure Lines, 62 Oxford Street, London, W1. Entries to arrive not later than 30 November 1984. END

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SOFTWARE

Workwriter – friendlier letters

Workwriter is claimed by its originators to fill a vacancy for a user-friendly word processing package, allowing a mix of text and graphics, aimed at the 'busy executive'. Peter Jones finds out whether these claims are justified.

Workwriter is a word processing package from a recently established company, Micro Business Products, based in Brussels, Belgium. According to managing director Peter Vekinis there is a need for a word processor designed for the busy management executive. It should be extremely . . . wait for it . . . user-friendly, and the average company director should be able to produce good output virtually from boot-up. It would be used principally for memos and short letters of one or two pages, but should be able to cope with longer documents. It should also have graphics for bar graphs, organisational charts, and so on. Vekinis claims his package fits that description.

Workwriter will run at the moment only on the IBM PC and compatible machines, and the Apricot (with the IBM emulator), but it is currently being prepared for other well-known systems. This could be done quickly since the program is written in the highly portable 'C' language.

The program resides completely in memory, which provides an extremely fast response and maximises the amount of disk storage available for text files. It does mean, however, that a minimum of 128k RAM is needed to run the program.

Like some dedicated word processing machines (the Philips 5020, for example), Workwriter is page-based. That is to say, you effectively have one piece of paper in front of you and when that is filled up you must save it to disk before you can carry on with the next page. As a page-based word processing system, it contains features absent from normal document-based word processing programs.

These features include: text with illustrative graphs and charts; columns, numeric data entry and a mixture of all three; and full attribute support as well as colours.

Micro Business Products seems to have gone out of its way to ensure that the much-abused term 'user-friendly' does have a meaning when applied to its software and its approach could usefully be imitated by the best-selling WordStar.

Screen display

On booting-up the program, you are greeted with the title page and then the injunction:

Enjoy it!
Press space-bar to continue

Friendliness, indeed!

After the space-bar is pressed, the work screen is displayed. The top line consists of dots, the width of the 80-column screen, along which a reverse video square cursor moves to indicate column position. The left and right margin settings (defaulted to 10 and 70) are shown on this line, indicated by an 'L' and 'R' respectively. If required, a paragraph indent (I) and a bell (B) are also placed here.

The next 20 lines are reserved for text, and form a window which scrolls up and down a page which can be up to 80 lines long, at your choice. (In fact, a bug in the software prevents a figure higher than 79 from being fixed.) The cursor is a flashing underline character.

Immediately below the window is the command/status line, a series of 39 dots followed by:

C 1: 1 P10L1...TYPING

This indicates that the (C)ursor is on line 1, column 1; the (P)itch setting is 10 characters per inch; the (L)ine spacing is single; and you are now ready to enter text (TYPING).

Next is the prompt line. At first it is composed of a series of dots, but when you press a function key, the command associated with it is shown at the start of the command/status line and information to help the user appears on the prompt line.

The following line, also dotted, is reserved for the helpful, plain English, error messages which come up highlighted and accompanied by a beep if you do something silly.

The last line on the screen, displayed in reverse video, shows the commands assigned to the 10 function keys (Fig 1).

Function key	Assignment
1	VIDEO (Screen commands)
2	DISK
3	SET (Formatting parameters)
4	PRINT
5	DELETE
6	INSERT
7	SYSTEM (Access to DOS commands)
8	S/S (stop and start printer)
9	Not used
10	RESET (Cancels partially completed commands)

Fig 1 Functions and commands

When text is entered, the normal wrap-around takes place at the end of each line, the RETURN key only being struck at the end of a paragraph, which is indicated on the screen by a non-printing, filled, triangular character.



Illustration by Cathy Balme

If the DELETE key (F5) is used, then the line being modified will be shifted left to close up the gap. No other line is affected. The delete command available under VIDEO (F1) is used when paragraph re-formatting is required.

Since the page is held in memory as an 80 × 80 grid — each character position corresponding to a memory location — there is absolute freedom to roam about with the cursor controls, placing characters wherever you wish. This is unlike the majority of WP packages, where the text is held as a continuous ribbon. With Workwriter, even with the margins set, it is possible to move outside them and place words. This is a very useful feature for adding comments to existing text.

One annoying feature is the need to position the cursor where you wish to carry out a particular function before you call it. Too often I tried to delete a few words only to find that when trying to highlight the words to be deleted, I was restricted to moving the cursor to the right and down only, and unfortunately the cursor was at the end of the text.

With regular use of the program this would be less of a problem, but I feel that it would have been more logical to design this procedure the other way round, so you could call the function and then position the curser easily at any point in the text.

Commands

The operations are divided into four main areas, each of which is assigned to a function key. These are VIDEO for the screen, DISK for disk operations, SET for changing parameters and PRINT for all printing operations. When you press one of these four function keys a whole series of subsidiary commands appears on the prompt line, and there is even a third level of commands beneath some of these.

Pressing function key 1 (VIDEO) produces the following choices: ERASE; UPPER; LOWER; CENTER; DEL; INS-LINE; FILL; PUT; GET; TYPE; ATTRIBUTE; JUSTIFY; and TAB. Typing the first letter of any of them is sufficient, except for the last, which is the TAB key.

DISK operations are fast and easy to use. Because of the space limitations of a page-based program, it was not possible to use *PCW*'s standard 3000-word text to establish Benchmarks, but a full page of characters, 6320 of them, took 9.5 seconds to save to disk and about half that to load back into memory.

File names follow the rules of MS-DOS: up to eight characters plus a three-character extension. Single page documents have a .DOC extension automatically added when they are saved, but the first page of a multi-page document must have a page number for its extension (for example, fname.001). This number is incremented for subsequent pages. It is possible to insert pages in a multi-page document and have the following pages re-numbered.

Asking for a directory of files on disk can cause problems to the unwary. If you have text on the screen, and then call for a directory listing, this will be written over the text and the text will be lost, unless previously saved. If you *have* saved the text however, the file can be called back to the screen simply by placing the cursor over its name in the directory listing and using the F2 key (DISK) to ask for a disk read.

A useful disk command is TRANSLATE. This takes a Workwriter file and converts it to an MS-DOS-compatible file. This enables word processing files to be used by other applications.

A feature which should have been included is the automatic backing-up of a file when it is saved to disk. If a filename already exists, Workwriter merely asks you whether you want to overwrite it or not.

The keyboard can be reconfigured to any layout using the keyboard tables provided on the distribution disk (the Dvorak keyboard is also on this disk).

Graphics

You can mix graphics and text on the

same page, which is a nice idea. For example, you can use the right-hand margin indicator to limit the main body of text to the left-hand of the page, and use the control key together with the keypad keys and certain others to draw on the right-hand side of the page. Graphic characters giving vertical and horizontal lines and corners make it simple to construct boxes, bar charts, and so on. Words can, of course, be freely mixed within the graphic area. The outline graphics can be shaded in by using the VIDEO FILL command. You can also select different shades (Fig 2).

Columns and decimals

You can print in columns using the left and right margin indicators. For example, by setting the left margin at five and the right margin at 25, you get a column 20 characters wide. Once this has been filled with text, you can move the margins to, say, 30 and 50 and type in a second column. Each column can be right justified individually and graphics can be included on the same page.

There is also a facility for entering columns of numbers aligned on the decimal point (or decimal comma, at your choice). You move the shadow cursor on the format (top) line of the screen to the place you wish to have the decimal point, hit 'N' for NUMERIC TAB and then the ENTER key. The letter 'N' will be shown on the format line to indicate the position of the decimal point. Striking the TAB key will move the main cursor to the column marked by the N, and then any figures (or text) you type will move backwards from right to left until you press the decimal point key. Subsequent figures you key in then move as normal left to right, to the right of the decimal point you have keyed in already. This is a boon to those working for accountants and similar professions.

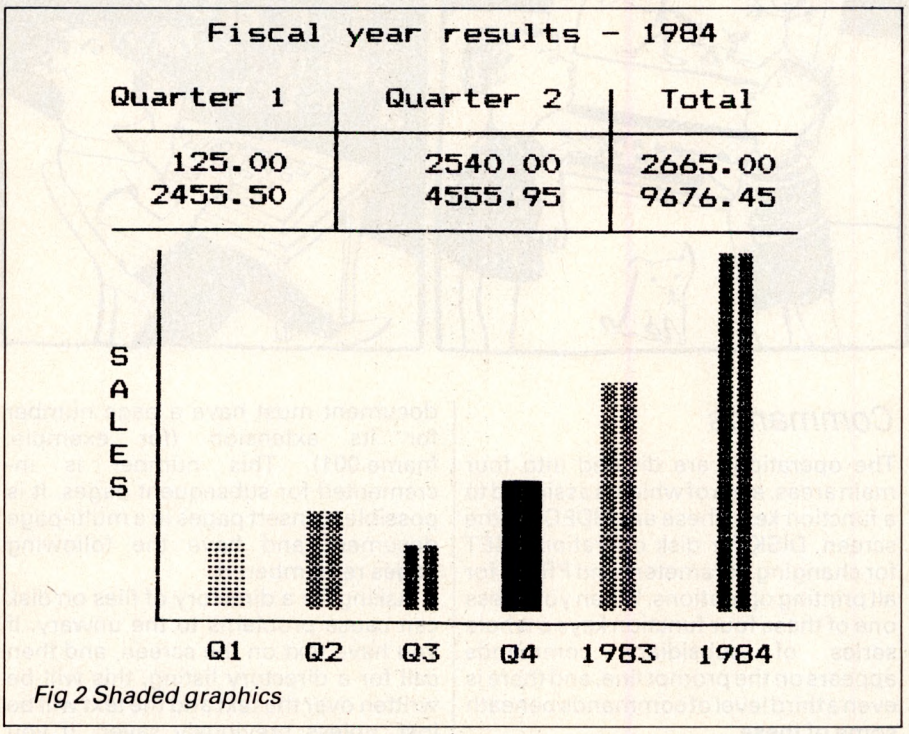


Fig 2 Shaded graphics

Limitations

There is no global search and replace facility; the argument being that since Workwriter would be used mainly for quite short documents, it would not be used much.

To read consecutive pages of a multi-page document you must load each page from the disk as you need it. (I was using Version 1.7, but I was told that Version 2, currently under development, would permit the user to scroll through a document, pages being automatically read in as required.)

Documentation

Documentation is provided in a sturdy, boxed A5 loose-leaf manual. The style is very readable, if lacking in literary elegance — much as if the author had been standing behind an operator explaining to them how the program works, and a third person had taken down his words *verbatim*.

The copy of the manual provided with the review program was provisional, but fairly complete, lacking only the index. It starts with a summary of the capabilities of the package, and instructions for installing it in your particular machine. You are then led through an easy-to-follow guided tour, taking up about 50 pages. This section is packed with examples of what you should see on the screen if you follow the instructions.

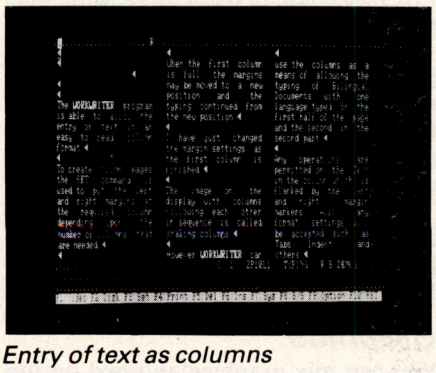
The last part of the manual is a reference section. Each command, and its variations, has a page of explanation in a very clear format which is split into four vertical sections containing command sequence, command options, command description and remarks.

Conclusion

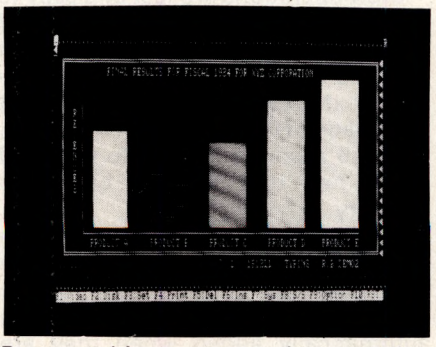
Workwriter is a well-thought out, well-implemented and fast word processing program. I disliked one or two features, but a newcomer to word processing tackling this package might well feel that these objections are not so important.

If the 'busy executive' at whom the package is primarily aimed really exists, then Workwriter should sell well. A companion spreadsheet program, Workmat, is also in the pipeline.

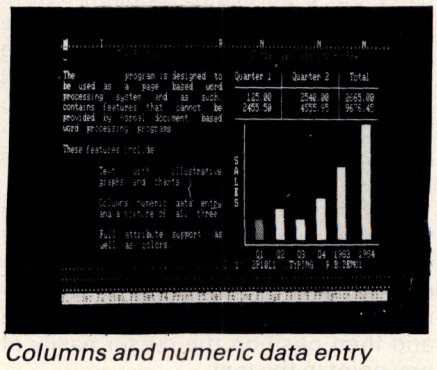
Workwriter is available from Data Applications of Cirencester, price £185 plus VAT. END



Entry of text as columns



Pure graphic screens can be created



Columns and numeric data entry

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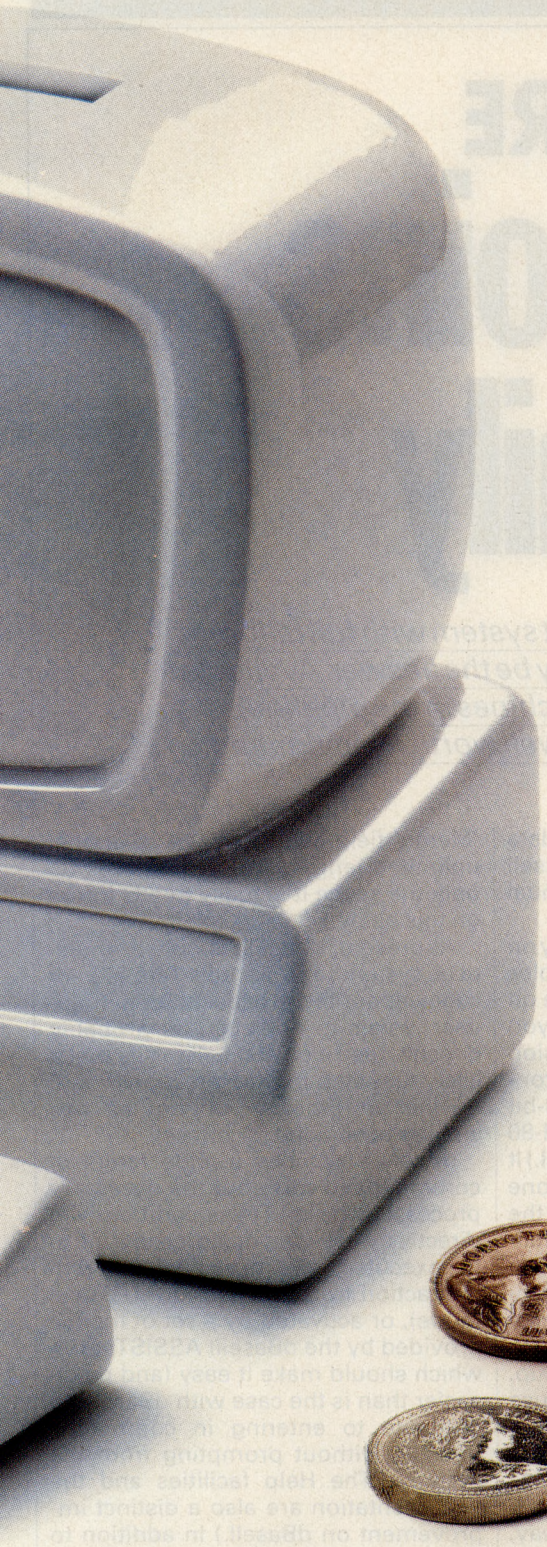





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SOFTWARE

dBaseIII joins the family

If you are looking for a powerful data management system with full tailoring features and multi-file handling, then dBaseIII may be the answer. Available for the IBM PC and compatibles (with other machines in the pipeline), Kathy Lang believes this single-user package is well worth investigating.

Ashton-Tate has long been among the market leaders with its data management system dBaseII. It is regarded by many as being very difficult to learn, but even its detractors acknowledge that, until recently, it has been one of the most powerful packages on the market. In recent months, however, two major groups of competitors have emerged: on the one hand there are powerful systems — such as Sensible Solution and Aspect (reviewed in September and October *PCW*, respectively) aimed largely at the professional systems developer which concentrate on providing full database facilities; and on the other the so-called 'integrated packages', which aim to provide spreadsheet, graphics and word processing closely integrated with data management. Indeed, Ashton-Tate has a horse in the latter race called Framework — reviewed in August alongside its arch rival, Lotus's Symphony — which, like most of its competitors, requires the whole of the database to be in the computer system memory while being processed.

How and where does dBaseIII, which has already been dubbed 'son of dBaseII' fit into this highly competitive market, both by comparison with the other Ashton-Tate products, and against those of the other major suppliers?

I've tried as far as possible in this review to look at the product as though it were a newcomer to the market, but where appropriate I've added brief comments about extensions from dBaseII. Certainly Ashton-Tate expects a good many people to upgrade to the new package, since it comes complete with conversion programs to copy data files across and to help convert dBaseII program files, as well as a short manual aimed at existing dBaseII users.

dBaseIII is presently available only on the IBM PC and on close compatibles (although it is to be made available on other MS-DOS-based systems — you can expect to see the Apricot version among the earliest of these. Ashton-Tate has explicitly stated that an 8-bit version will not be supplied, so CP/M-80 users will not have access to dBaseIII.) It is distributed on two floppy disks, one containing the basic system, and the other various example files and utilities, including the separate screen formatting program. dBaseIII is protected by the PROLOK system, which obliges you to have the system disk present in drive A when it is started up, though you can then remove it and use the drive for other files. Two copies of the system disk are provided, but you cannot produce further back-up copies of your own. You can, of course, back-up data disks in the normal way, and the system disk need not contain any files which are changed during runs of the package.

The basic format of dBaseIII is a set of records all having the same format, stored in a single file, with the ability to link up to 10 data files together at any one time. Such linkages must be made explicitly by the user; although dBaseIII does provide powerful commands to help in this, there is no equivalent of the 'data dictionary' approach taken, for instance, by Sensible Solution. Most data is stored in fixed-length fields; however, the package also allows you to create a special type of field called a 'Memo' field, which can be of almost unlimited length, and which takes up only the space it actually needs (more on this below).

At present, dBaseIII is only a single-user system, and Ashton-Tate is very cagey about the prospects for a multi-user version; however, it probably doesn't need a crystal ball to see that a likely first step in that direction would be via an Ethernet option, as has already been done for dBaseII.

dBaseIII provides a wide range of commands to carry out the necessary processing tasks. These can be given directly by the user, or stored in a file to be executed as a group (either with interaction from the user or in 'batch' mode), or activated by a set of menus provided by the dBaseIII ASSISTant — which should make it easy (and much easier than is the case with dBaseII) to graduate to entering in commands directly, without prompting from the system. (The Help facilities and the documentation are also a distinct improvement on dBaseII.) In addition to commands which may be given either from the keyboard or from a file, there is a group of commands which control the execution of command files; these provide facilities comparable with many programming languages (and more powerful than those in many forms of Basic).

Constraints

The major constraints on use of dBaseIII are shown in Fig 1. All the limitations should now be sufficiently permissive to be acceptable to even the most demanding user, although some professional developers may run out of

Maximum file size	OS Limit
Max record size	400/512,000
Max no fields	128
Max field size	254/4096(UL)
Max digits	19
Max prime key length	100 characters
Special disk format?	No
File size fixed?	No
Link to ASCII files?	Yes, various
Data types	Numeric, Char, Logic, Date, Memo
Fixed record structure?	Yes
Fixed record length stored?	No for Memo fields Yes for others
Amend record structure?	By copying
Link data files?	Yes
Number data files open	10 (fewer if using memo fields)
Number sort fields	Not stated
Number keys	7
Max key length	100 chars, UL fields
Subsidiary indexes kept up-to-date?	Yes
Data validation	Average
Screen formatting	Default or 'Paint-a-screen' or Col and row pos
Unique keys	No on entry, yes on retrieval
Report formatting	Default or Col and row
Save calculated data	Input, update
Totals & Statistics	Yes
Save selection criteria	Permitted
Combining criteria	And, Or, Not
>1 criterion/field?	Yes
Wild code selection?	String Within
Browsing methods	Any Field
Interaction methods	Menu, commands, full tailoring
Reference Manual†	****
Tutorial Guide†	****
Reference Card†	****
On Line Help†	****
Hot-line?	Dealer support

Fig 1 Features and constraints

files, especially if memo fields are in use. (Although you may have up to 10 data files open, you may only have 15 files open altogether at any one time, and these include format and index files as well as data files.)

The provision for varying length items is generous, and should provide a reasonable compromise between flexibility and speed. Numeric, ordinary character, date and logical fields use the maximum amount of space whatever their actual length, but memo fields are treated rather differently. Each occupies a 10-character field in the main record; this field acts as a pointer to a record in another related file, which contains one record for each memo field actually used in the parent file. These records take up exactly the amount of space needed to store the text entered, up to a maximum of 4000 characters. This related file counts towards your maximum of 10, but otherwise can be regarded as part of the main file.

You *may* edit and print memo fields using a conventional word processor rather than dBaseIII's own editor, and in that case memo fields may be of virtually unlimited length. Even without that provision, any or all fields may be memo fields, so that with 128 fields available (a welcome improvement on dBaseII), you can have a record of 512,000 characters in length. That would, however, be of distinctly limited utility, since memo fields may not be indexed, and there are some limitations on their processing. But in conjunction with conventional fields, the dBaseIII approach could provide an appropriate solution to many problems where the data is of mixed type.

dBaseII *aficionados* will notice the introduction of a Date format. This normally displays in the standard American format MM/DD/YY, but a battery of functions is provided to make it easy to display the date in any way you wish, including the ability to access the day of the week from the (numeric) date.

File creation and indexing

Initial creation of a data file involves issuing the CREATE command, either directly or through ASSIST, and specifying for each item its name, type, and length (for ordinary character and numeric fields).

The process of specifying this information has been well thought out; some basic information is always displayed, such as the number of characters used in the record so far, with help on how to enter the information available either all the time or by pressing the Help key, as you choose. The file is then ready for information to be entered. You can copy and then modify this structure to make it easier to set up a file with similar characteristics. You can also modify the structure at any time, just by amending the screen representation of the structure, and the data will be preserved. To do this, you must have enough disk space available to allow dBaseIII to make a complete copy of the data file on the same disk. (If you haven't, then you must use the combination of Modify and Copy which is necessary in dBaseII.)

Any file may be indexed automatically by using up to seven keys. A key may consist of a combination of fields, totalling up to 100 characters. These indexes may be used both to control the order in which information is displayed when editing and reporting on files, and also for fast access to individual records. To ensure that indexes are kept up-to-date as records are added and changed, you must remember to tell dBaseIII the names of the indexes when you begin to use the file — this doesn't happen unless you request it. (Since each index increases the time taken to make changes, dBaseIII doesn't want to keep up-to-date indexes that you have created for a specific non-recurring need. Remembering to activate the indexes can, however, be a bit of a pain unless you put the necessary USE command in a procedure to reduce the typing and memory strain.)

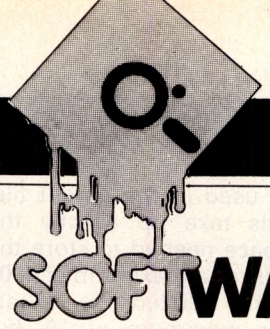
Data input and updating

dBaseIII provides one command for adding records, three ways of changing them from the keyboard, and two more for making batches of alterations automatically, as well as the full control available if you program your own input and editing procedures through the tailoring commands (on which more later). Simple addition of records is provided through the APPEND command, which just adds records to the bottom of the file. To change records, you can use EDIT to display an individual record retrieved either by scrolling through the file, or by selecting a record with a particular key value, or by specifying the record number. Or you can amend a set of records, one at a time, using the CHANGE command to specify which set you want (all those whose accounts are overdue, or all the children in a particular class. Finally, the BROWSE command allows you to show several records on the screen at the same time so that you can make changes to one while still seeing others. All these commands give you full screen editing facilities.

Amending batches of records may be done with REPLACE, which simply replaces a field or fields in all or a group of records with the results of a calculation. Where several files are related to one another, one file may be UPDATEd with information from another. This updating may involve replacement, or a calculation such as addition or subtraction. For example, where one file holds stock information and another holds orders, the stock file can have its levels reduced to reflect the sales represented by the orders. UPDATE allows you to specify the fields to be used to relate the files; these must be indexed files. (This is an improvement on the equivalent dBaseII features, which permit only replacement or addition, not subtraction or other calculation.) The UPDATE command gives similar facilities to those provided by 'Posting' in some other packages.

Screen display

When you define the structure of a file, dBaseIII automatically sets up a display format, which will be used to show individual records on the screen unless you specify an alternative format. Such a format may be specified in a Format



file, set up directly using the dBaseIII editor and defining field positions, prompts and messages by row and column positions.

If you think that sounds like hard work, the alternative is to use dBaseIII's separate formatting program, dFORMAT, which allows you to use simple 'paint-a-screen' techniques to define the layout, and then builds the appropriate Format file for you from that specification. dFORMAT can be used from within dBaseIII if you have enough memory, or you can use it direct from PC-DOS. (What 'enough' is, depends on what else you are using, but it ran quite happily on our 384k system.) Whichever way the Format file is constructed, once you have issued a SET FORMAT TO command, that format is used for all commands which display one record on the screen at a time (such as APPEND, CHANGE and EDIT).

Other commands, such as DISPLAY (which shows specified fields from selected records without permitting editing) and BROWSE (which displays selected fields from all records starting at the current position in the file, and allow you to edit these records) have a fixed display format of one line per record. DISPLAY 'wraps round' lines which are too long to fit, while BROWSE keeps to one line but allows you to 'pan' across each record with the cursor keys — and you can 'freeze' specified fields so that these are kept displayed at the left of the screen while those to the right change.

Memo fields are treated slightly differently. While amending or editing records using the 'one record per screen' display mode, you can edit a particular memo field; dBaseIII will then present the field on an otherwise blank screen, giving you simple editing commands for the purpose. These are, like all dBaseIII editing commands, based on the WordStar conventions.

In addition to the specific screen display formats, any report may be displayed on the screen instead of being printed.

Printed reports

As with screen display, dBaseIII provides both simple 'default' facilities and more powerful 'DIY' features through the ability to store sequences of commands.

The REPORT command allows you to set up a tabular format with headings for the report and for each field; column widths may be specified, or you may let dBaseIII use the defined maximum field size. Two levels of sub-totals can be produced, provided the file is already sorted or indexed appropriately. Totals can be printed, and any field may contain the result of an expression if desired.

Once set up, a report format can be modified, or copied and modified to provide the basis for another similar report. (This is another improvement on dBaseII, in which report formats could not be edited.) Fields from several related files may be included in a single report, provided the appropriate commands to define their relationship are issued first.

Once a report format has been defined, you can show the report on the screen to check it, and then print it just by adding the TO PRINT parameter to the REPORT command.

For most people, REPORT should provide sufficient flexibility for all printed reports.

One irritating feature has carried over from dBaseII: both packages use the semi-colon to indicate that a command is continued on the next physical line of the screen or a command file. This character should logically have no such effect in data items, but in fact when REPORT encounters a semi-colon in a field value it starts a new line, without of course printing the semi-colon.

Several applications I have come across use semi-colons for delimiters in fields such as titles, so this practice can be a real nuisance. The problem could be avoided by allowing the user to redefine the 'continue' symbol where necessary.

Where you need greater flexibility than REPORT can provide, you can write dBaseIII command files to produce completely tailored reports. This can be done directly using column and row coordinates in the '@' SAY command. No paint-a-screen features are provided directly for producing formatted reports in dBaseIII, though you could use dFORMAT with some adaptations.

Selection & sorting

Most dBaseIII commands operate on the whole file if you don't specify otherwise. If you want to be selective, you can specify a scope (a range of record numbers) and/or a FOR parameter which sets conditions for the inclusion of a record in the processing. For example, you can ask the package to display all records which meet the condition

```
FOR MARSTAT="SINGLE" .AND.
 (EYE_CLR="BL" .OR. EYE_CLR="BR")
```

You will then see only those records where the person is single and has blue or brown eyes. As you can see, brackets may be used to make sure that, where several conditions are needed, they operate correctly together.

Conditional expressions may include the usual range of comparison operators such as less than, greater than, and so on, and a 'string containing' operator to provide for conditions such as 'does this field contain the characters *tennis*' which would find values such as tennis, table-tennis, tennis racquet. Conditions may be linked with And, Or and Not.

Selection conditions may be placed on most commands; for example, modifying the CHANGE command in this way can give a very precise method of finding a particular subset of records to amend using the screen editor. BROWSE cannot be used selectively in this way, though you could use the FILTER command first. This provides a global filter, which applies to all subsequent commands until countermanded. Such an approach can be especially useful if you are processing several separate sub-groups within a group; you could set a FILTER on the whole file, and then use the FOR parameter to select sub-groups within that selection when issuing individual commands.

As with any dBaseIII command, a sequence of commands used to display or edit selectively may be acted upon immediately, or stored for future reuse.

In addition to the indexing facilities, dBaseIII also provides a SORT command which allows you to sort the records into a particular physical order. Initial indications are that this command is much faster than its equivalent in dBaseII.

Calculation

dBaseIII's facilities for calculations are very good. You can use the system as a desk calculator, you can set up batch calculations to replace existing fields, and by using the command file facilities you can arrange for calculations to take place on input data. (By popular request, dBaseIII includes an extra function not available in dBaseII, Square Root.)

By using memory variables (up to 256 are allowed), it is possible to do most calculations not requiring more than limited use of arrays, which need to be simulated in a rather tedious fashion if they must be used.

Multiple files

Up to 10 data files may be open at any one time, though not all could be using indexes, since the overall file limit is 15. Each file is opened in a separate area, indicated by a number or letter according to your choice. Only one file may be active at a time—that is, several may be available for reading but only one for writing. Fields in non-active files may be referred to by prefacing their names with the file name or by the letter or number of the area in which they were opened.

Tailoring

dBaseIII provides a powerful tool for the system developer, in the shape of a set of commands which can be used to tailor a system for a particular application. All commands which can be issued from the keyboard can also be stored in a file. In addition, there are commands for controlling the execution of these command files, including DO WHILE, IF...ELSE...ENDIF and DO CASE. Command files may be called with parameters, making it possible to build up suites of procedures which can be used in different aspects of applications without duplicating effort.

Using the facilities for formatting the screen, you can build menus for novice users. Calculations and tests may use memory variables, which may be global or local to particular procedures and stored for future re-use. (Up to 256 memory variables are allowed; there is no provision for contiguous lists of variables.)

Security & housekeeping

Security provisions are limited to some self-help procedures aimed at preventing accidental deletion of records. Any record deleted is not actually expunged and lost until an explicit PACK command is issued. The only exception to this is the ZAP command, which allows you to empty an entire file — it does require confirmation, though!

dBaseIII provides facilities for copying and deleting any file, and for directory information. The package gives almost the full path facilities provided by DOS. You can run any legal DOS program from within dBaseIII, provided there is enough memory. (This improves upon the rather clumsy dBaseII feature of QUITting to a .BAT file which included a dBase command for return.)

Links with outside

dBaseIII can read any ASCII text file in fixed length or comma-delimited format. I used the fixed length format successfully, but couldn't persuade the package to read beyond the first field of each record of my comma-delimited file. The package can also write files in these formats, allowing you to prepare files for word processors such as WordStar's Mail-Merge.

User image

dBaseIII is a command-based package, which can be more difficult for novices than menus. A special command called ASSIST is provided to help out here: all the commands you are likely to need initially are available through menus. These use the proper command names, and allow you to short-cut much of the prompting as you become more practised. Once into the main part of the package, there is still quite a lot of help available if you need it, always through the F1 function key. This is the only function key which cannot be reset; dBaseIII provides facilities to allow you to set the others, and to dictate the colour of the screen and areas of enhancement if you have a colour monitor.

Documentation

dBaseIII comes with a single manual slightly larger than the standard IBM format. It is divided into separate sections for tutorial, reference and glossary, and has one index for the whole manual (quite a promising index too). In addition, separate booklets provide a good reference summary, and a 'bridge' for dBaseII users describing the automatic conversion programs and the small number of situations they cannot cater for, plus a list of new and changed features.

The tutorial manual is written around a set of example files, which make up a simple accounting suite; the example files needed are supplied on the second disk, and you are encouraged to go through the lessons with them, up to and including setting up inter-related files. Although this should make a good introduction for a beginner, someone with a little experience of computing will undoubtedly get on a lot more easily than someone without.

The reference manual consists of an introduction to the main ideas of dBaseIII, plus a list of the commands and their functions followed by a detailed explanation of every command, with short examples. I thought it quite well done, and I guess most people who criticised the dBaseII documentation will be satisfied with the new versions.

The only part of dBaseIII not covered in the manuals is dFORMAT, which comes complete with its own 'online' manual.

Having done quite a lot of research into what people do and don't like about manuals, I am deeply sceptical about putting large manuals online, but the size of the subject in this case is just about small enough to make the idea feasible. The most obvious lack is a thorough explanation of the concepts involved — it may be there, but I couldn't find it despite the online index. However, I did manage quite easily to find out how to set up a simple screen form, and I enjoyed using the program, so on the whole I would regard the exercise as a success.

Conclusion

dBaseIII is well worth investigating. It has ironed out most of the wrinkles in dBaseII, and should give its competitors in the specialised data management systems market a good run for their money.

As for the 'integrated' packages, clearly dBaseIII is superior in terms of the amount of information it can handle, and it is very fast: times for the Benchmark using a hard disk are shown in Fig 2, and they don't look wildly inferior to those for in-memory systems, for data sets up to the size that such systems can handle.

I look forward to a further opportunity to use the package in conjunction with Symphony or Framework, to see just how 'integrated' one could get using a large database with a multi-function memory-based package. END

BM1	Time to add 1 new record	Inst
BM2	Time to select record by primary key	Inst
BM3	Time to select record by secondary key	Inst
BM4	Time to access 20 records from 1000 sequentially on 3-character field	50secs inc scroll
BM5	Time to access record using wild code	Inst
BM6	Time to index 1000 records on 3-character field	1min 50secs
BM7	Time to sort 1000 records on 5-character field	1min 55secs
BM8	Time to calculate on 1 field per record and store result in record	3min 25secs
BM9	Time to total 3 fields over 1000 records	1min 25secs
BM10	Time to add 1 new field to each of 1000 records	1min 58secs

Time to import a file of 1000 records: 1min 55secs

Fig 2 Benchmarks using IBM-PC/XT (hard disk)

Summary

Package Type	Powerful and sophisticated data management facilities with full tailoring. Menu-driven for novices if necessary
Strong points	Powerful and flexible data entry, display and selection facilities; good multi-file features; unusually good calculation features; very good documentation and onscreen help in relation to the complexity of the package
Drawbacks	Single user only; limited security provisions; no explicit letter-writing features
Ease of Use	Very good for a complex package
Error messages	Adequate
Documentation	Very good
Costs (ex VAT)	£495
Supplier	Ashton-Tate, Cofferidge Close, Stony Stratford, Milton Keynes MK11 1BY. Tel: (0908) 568866

SOFTWARE

As easy as a b'C'

The Sinclair Spectrum now has the C programming language, and Adam Denning conducts a basic lesson.

One of the most controversial modern languages is C, and one of the least likely candidates for an implementation is the ZX Spectrum. This machine is now one of the first home computers to support a real compiler.

The compiler comes from Hisoft, the company responsible for an excellent Pascal compiler for a number of Z80 machines, and this version of C is just one of many it has planned.

C is currently in vogue because of its close association with the Unix operating system. It's the archetypal compiler-writing language, having the block constructs of languages like Pascal and ADA plus the clarity of BCPL.

History

C's history neatly shows the difference between theory and practice.

In the early 1960s, London and Cambridge universities were cooperating in the development of a new language. This was to be block structured but easy to write, and was called CPL (Combined Programming Language).

Various stories exist but essentially, rivalry and excess ambition caused the project to end prematurely with no finished product. But one of the contributors, Dr Martin Richards at Cambridge, did not let things die so easily: he resurrected the language in a much scaled-down form and called it BCPL — basic CPL.

BCPL had block structure and numerous control statements: WHILE, UNTIL, REPEAT, DO, FOR, and so on. It was quickly adopted as an ideal compiler — writing language, but its distinct personality meant that it had to be taken a stage further. So B was born, but this only existed for a very short time during which Kernighan and Ritchie developed it into C. The ancestry is easily visible in C programs — the section brackets of BCPL were replaced with braces ({}) and the syntax was changed, but the step from BCPL to C programming is an easy one.

At the same time AT&T was developing Unix, and C's potential for this application was quickly realised. C was the flavour of the month.

```
#define  high 2000
#define  TRUE 1
#define  FALSE 0

main()
{

     int  prime[high];
     int  i,next,divis;

     divis=2;
     for (i=0;i<high;++i)
          prime[i]=TRUE;
prime[0]=FALSE;
prime[1]=FALSE;

while (divis*divis<=high)
{
    next=divis*divis;
    while (next<=high)
    {
        prime[next]=FALSE;
        next += divis;
    }

    do
        ++divis;
    while (prime[divis] == FALSE);
}

printf("\nPrimes up to %d\n\n",high);
for (i=0;i<high;++i)
{
```

Listing 1 The Sieve Of Erastothenes in C

Implementation

C comes on cassette with a large and useful manual, but a lack of Kernighan and Ritchie's *The C Programming Language* (Prentiss & Hall, £16.95) is a severe handicap. A short Basic loader installs the machine code, allows a backup copy to be made onto microdrive, and then invokes the compiler. At this stage you have three choices: you can directly enter a program into the compiler by typing it in; you can invoke the editor and develop source code in a more friendly environment; or you can enter direct mode and execute C from the keyboard. This last possibility is unique, as it's very unusual to find a compiler that accepts direct statements in the same way that Basic does. Normally, you would invoke a function using this facility, be it built-in or user-defined. For example, finding the hexadecimal equivalent of a number couldn't be simpler:

printf("%x",12345);

The printf function is called to convert its second parameter into a digit string defined by its first parameter. The same facility could be used to test a user-written function, or even to execute a whole program.

The built-in editor is a version of the standard Hisoft line editor similar to that used by the company's other source-orientated products, Pascal and GENS (an assembler). Although C is not dependent on line numbers, the editor is, so seasoned C hackers will have to get used to seeing them. In fact, the line numbers are only notional, as they are not saved with the source and are not used during compilation.

C is highly portable. The language is well defined, and a compiler on one machine will accept source compiled by another compiler on a different machine. This is true of the Hisoft product too, but the Spectrum's RAM size means that there are a number of implementation restrictions. Noteworthy ones are the lack of the float type, so floating point calculations can't be carried out, and the lack of initialisers, which means that variables can't be preset when they're declared. The former is a minor problem and the latter

makes for more readable programs; neither vastly devalues the compiler.

The scanf function for formatted input is also missing, which means that programs using this function must be re-written to use less general routines, such as 'atoi', to read data from the keyboard.

Standards

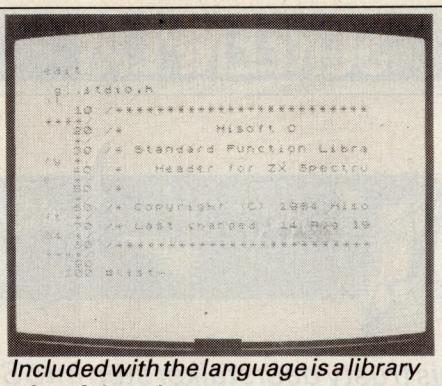
There are functions to read and write characters, and strings to and from previously opened channels. Cassette, microdrive, screen, keyboard and printer channel openings can be implemented from within C by use of the fopen function, but channels to other devices, such as the RS232 or the network, need a more complicated procedure. You must open the channel in Basic, and take the stream number used in Basic's OPEN# statement as the FILE pointer for all file reads and writes involving that channel. This is rather tedious, but having discovered that it's possible to leave C and then re-enter it from Basic with RANDOMIZE USR 25200, the process becomes less onerous.

There's also no way of saving compiled object code, so programs must always run with the compiler resident in the machine.

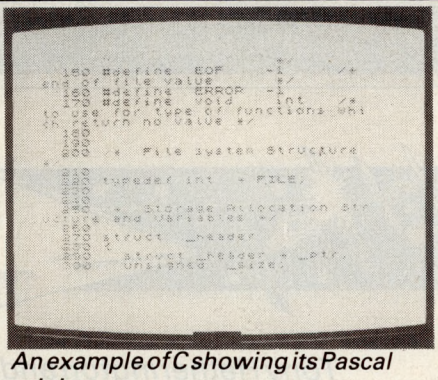
The compiler is flawed, but Hisoft's policy is refreshing in this respect. As it did with Pascal and Devpac, it will issue regular updates, including all the faults and omissions so far described, and early purchasers will be able to buy later versions at a much reduced price. The first update will, in fact, be free. If any C programmer encounters problems with the compiler, Hisoft is happy to answer enquiries.

Program build-up

A C program always consists of function definitions and a (usually) small function somewhere in the program called 'main'. This is comparable to the BCPL START procedure, and simply defines where the program will begin execution on invocation. Small programs may consist of a main definition only, but it's bad style to do everything in one function in programs larger than 10 lines.



Included with the language is a library of useful routines



An example of C showing its Pascal origins

A simple program to demonstrate C is The Sieve of Erastothenes, which calculates all the prime numbers up to a specified limit. To show the differences between C and ZX Basic, the program is shown in both languages (Listings 1 and 2). The C program does the whole calculation in one function.

Each program does exactly the same thing, but while C version does it in about six seconds, the Basic program takes approximately 108 seconds.

The algorithm used in each is to fill an array with 1s (TRUEs). Each element of the array represents the number of that element rather than its value. We then go through the array striking out each multiple of 2, 3, 4, and so on, until we reach the square root of the highest number in the array. Every remaining element still holding TRUE now represents a prime number, so the final loop prints out the number of each true element — all the primes up to the specified number.

The program introduces some interesting aspects of C syntax. First, the for loop — it follows the general form of

```
FOR number = value TO limit DO
something
```

which equates to

```
number = value
WHILE number < limit DO
{       something
        number = number + 1
}
```

and, in fact, this is all a C for loop does. The initialisation (number = value) can be any arbitrary assignment, and the expression with which the end of the loop is determined (number < limit) can be any expression that evaluates to a Boolean result. We could, for instance, check a different variable. The final part of the loop, number = number + 1, need not be a simple increment: we could divide our number by two each time, or decrement the value of another variable.

All three elements of the for loop are contained within the for statement, and there is complete interchangeability between for and while loops.

The other interesting parts are the ++i, ++divis, and so on. This is C's way of saying 'increment the variable by 1', and the operator can be prefixed, as shown here, or postfixed, i++. In most cases they have exactly the same effect, but in array handling, the ability to use the value before or after alteration can be useful. The same syntax applies to decrementing.

We also have a line, next += divis;, which seems rather strange. It's common in all languages to have to write something equivalent to variable = variable + something, and this is how C implements that. It goes further, as we can generalise this statement to variable = variable <operation> something, and C will allow us to put any valid operator in the place of <operation> into the statement, so *=, /=, <<=, and so on, are all valid.

C will accept the longer and more usual versions of these operations, but programmers generally choose the latter form.

```
10 LET high=2000
20 LET divis=2

30 DIM p(high)

40 FOR i=2 TO high:LET p(i)=1:NEXT i

50 LET p(1)=0

60 LET next=divis*divis

70 LET p(next)=0

80 LET next=next+divis

90 IF next<=high THEN GO TO 70

100 LET divis=divis+1:IF NOT p(divis) THEN GO TO 100

110 IF divis*divis<=high THEN GO TO 60

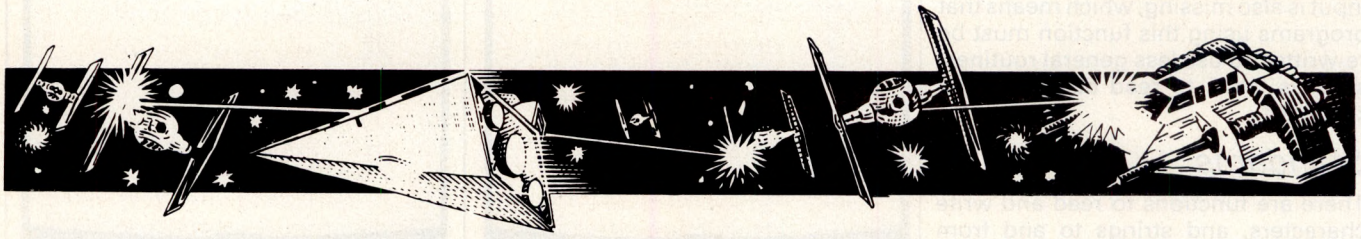
120 PRINT "Primes up to ";high''

130 FOR i=1 TO high:IF p(i) THEN PRINT i;" ";
140 NEXT i
```

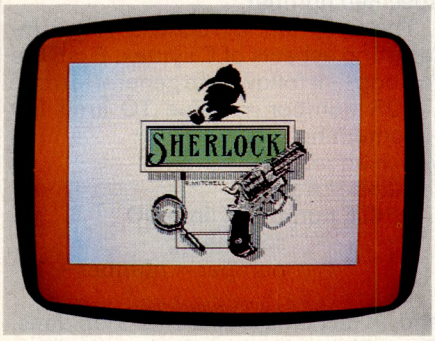
Listing 2 The Sieve Of Erastothenes in Spectrum Basic

Hisoft C costs £25, and is available from Hisoft, 180 High St North, Dunstable, Beds. Tel: (0582) 696421. END

SCREENPLAY



Tony Hetherington and his trusty deerstalker step into Sherlock Holmes' shoes, re-enact the Battle of Midway and become the motorist's worst enemy in just some of this month's best games for the Commodore 64, Spectrum and BBC B.







Elementary, my dear micro

Title: Sherlock
Computer: 48k Spectrum
Supplied: Melbourne House
Format: Cassette
Price: £14.95

This is your chance to be the world's greatest detective as you attempt to solve a crime that has Scotland Yard baffled. The game starts in your lodgings at 221b Baker Street with your faithful companion, Dr Watson. The time is 8am and the next move is yours.

The time is important as the characters move in real time: in other words, if you don't get to the scene of the crime in time to do some detecting, Inspector Lestrade will arrest the wrong man and the game will be over.

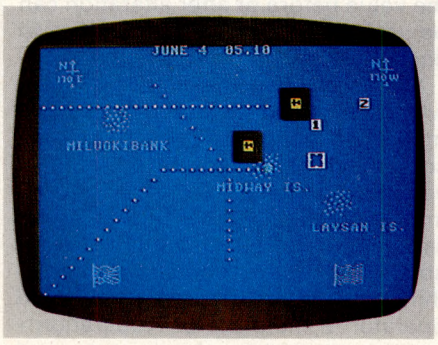
Hobbit-style graphics are present, but only fill one third of the screen and may not be enough to satisfy graphic adventure freaks.

The game's most impressive feature is the ability to talk to the characters, and discuss and argue the case with Watson and Inspector Lestrade. I tried to delay the good Inspector by confidently announcing the identity of the murderer, only to hear that he didn't believe me. To make matters worse, the inspector then demanded the required evidence and finally ignored me.

Sherlock is an intriguing game to play, and captures well the atmosphere of Victorian England and the character of Holmes. He doesn't like walking, so you have to use cabs and trains; the cabbies call you 'Guv'nor' and only know street names, so if you want to go to Kings Cross station you have to ask for Kings Cross Road. The need to know street names can be a little frustrating as no map is provided, but with a little detective work you should get to the scene before the fun starts.

Once you're there, question the suspects about their alibis and anything else that requires investigation. The command sequence 'TELL ME ABOUT . . .' is particularly useful here.

Sherlock doesn't have the dramatic quality of The Hobbit, but it will keep a lot of potential Sherlocks cramped over their Spectrums late into the winter nights.





Land of the rising enemy

Title: Midway
Computer: Commodore 64
Supplier: PSS
Format: Cassette/disk
Price: £9.95/£12.95

Based on the famous battle for Midway Island which was fought between the American and Japanese forces at the end of World War II, it's time to don your stars and stripes in an attempt to defend all that stands between the Japanese fleet and the American coastline. At your disposal are two fleets which include three aircraft carriers and the Midway Island defence force.

Your tactics are simply defined — to defend your carriers while continually attacking the Japanese fleets with your air squadrons. You have to find the Japanese before you can attack them, so you need to launch two reconnaissance squadrons and prepare your forces for battle while your planes locate the enemy. This is a skilful process: you have to juggle your squadrons, as each carrier can handle only one squadron at a time. Later you'll have to manage squadrons that are returning for refuelling and rearming.

Your fleets and aircraft are moved around a map display via a joystick-controlled cursor. You specify the position you want the unit to go to; the time it takes is dependent on the unit type. This cursor is also used to receive reports on the unit's strength and

status: for example, whether a squadron has dropped its bombs, and the amount of fuel it has left. Naturally such detail is not available to the Japanese fleets, but you can look at a fleet that your search aircraft is tracking — a cloud-covered view of the enemy fleet. You can peer through the clouds in an attempt to identify the types of remaining ships. If you find their carriers and destroy them, they'll call off the attack and you'll be the victor.

When aircraft attack a fleet or Midway Island, the screen displays the ships with the attacking aircraft screaming overhead; a cursor will also appear, which you use to shoot down the attacking planes. You can even shoot at your own planes, which is a feature included for 'the arcade players who can't resist shooting at anything that moves on the screen.'

The game can be played at a number of different speeds and levels, which affect the real time that elapses for each game minute and the ease with which you find the Japanese fleets. The game minutes refer to a clock that ticks away at the top of the screen, showing the passage of time in the game. Watch this carefully as it will warn you of the oncoming night, during which all your aircraft are grounded; but the Japanese will continue to move, so you'll have to find them quickly in the morning or they'll catch you unawares.

You'll need a keen sense of strategy and good joystick reactions to fend off attacking aircraft in this game.



Night moves

Title: Flight from the Dark
Computer: 48k Spectrum
Supplier: Five Ways Software
Format: Cassette
Price: £6.95

Flight from the Dark is the first in a series of Lone Wolf adventure scenarios in which you are the lone survivor of the monastery of the Kai Lords. Your people were wiped out while you were out collecting wood, so you haven't had time to complete your training; and you must start your adventures still unsure of your skills.

The game begins with your last training fight with your instructor in which you must chop, thrust and parry yourself to victory. Your success determines your initial skill factor, displayed as a bar to the left of the main screen display.

Through this main display you can watch your progress via an impressive series of graphics, aided by Valhalla-style animated characters. Particularly impressive are the fight sequences in which you have total control of your character. Single key presses carry out the attacking and defensive moves at your disposal, which you'll have to learn quickly if you're to progress.

Throughout the game you're presented wth a series of options which you again choose with a single key press: the groping around for the correct phrase — so often a problem in adventure games — is nicely sidestepped by this system.

Each location is described in beautifully scrolling text, which is then illustrated by the graphics: for example, if the text describes refugees ambling across a road, then you'll see exactly that.

You'll be able to buy this game by Christmas in a pack along with a book of the same name. The book is of the fighting fantasy style in which you're presented with options which direct you to the relevant pages, and so on. The book and the game follow the same plot, so why should you buy them both when the book only costs £1.50? However, the excellent graphics and vividly realistic fight sequences make the computer version a must for Spectrum owners.

The second in the 'Lone Wolf' series is Fire on the Water; you can transfer your character and his acquired skills from this adventure to the next, and so on, throughout the series.



Spellbound

Title: Avalon
Computer: 48k Spectrum
Supplier: Hewson Consultants
Format: Cassette
Price: £7.95

Avalon takes place as the Roman Empire is crumbling and the forces of evil are set to take over. It's your job to stop them as Maroc the Mage, the loreseeker. You have a rod to aid you in your quest, which projects a vision of yourself into the lair of Avelach, the Lord of Chaos.

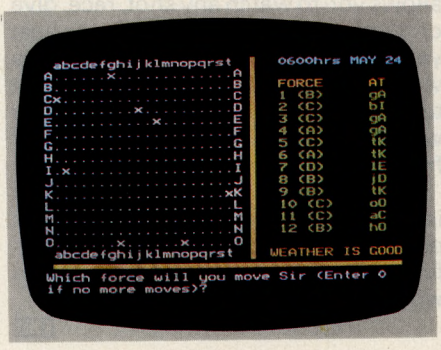
The rooms of the lair are displayed on screen in 3D grapics which smudge quite badly, but then mine was a pre-production version. Fingers crossed, the final version should be better.

Most of the game's interest is in the spells that you have at your disposal: for example, MOVE will allow you to move around the rooms or fling fire balls — just to mention some of its abilities. MOVE is the only spell that you possess at the beginning of the game — you must find the others on your travels.

Each spell has only a limited life, so you should take heed of signs that you're about to lose it. If not, one of the many nasties in the lair will drain you of energy and you'll lose a life.

A particularly interesting group of spells are the cursor spells: the SERVANT gives you control of a sprite that can be used to open doors and collect objects. This is a skill you should practise, but it's difficult finding room away from the evil goblins, guardians, wraiths and wizards which inhabit the lair.

Avalon is an enjoyable game, and it will take the average player some time to explore all 223 rooms.



Plain sailing

Title: Bismark
Computer: BBC B
Supplier: ASP Software
Format: Cassette
Price: £7.95

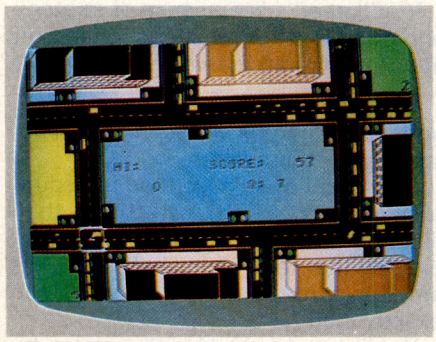
The search is on for the world's most powerful warship, the Bismark. You are the commander of the British forces who must find and destroy her, but she is faster and more powerful than any of your ships.

You are, therefore, caught between the need to spread out your forces to increase your chances of finding her, and having the necessary stationary power to destroy her.

The search is conducted on a battleship-style grid in which you move your ships. In each of the 13 turns you move some or all of your forces, and you'll receive reports on any Bismark sighting.

If the weather is fine you can order your carriers to launch search aircraft which cover a much larger area. However, you are only allowed to do this four times in the game, so you should use these aircraft wisely.

At the end of the game you're awarded a points total up to a maximum of 100. In my first feeble attempt I achieved the princely score of −30 — with the result that the Bismark escaped unscathed. The fun really starts when you sight the Bismark: you must attack in strength without giving it room to escape.



Ready, steady, go

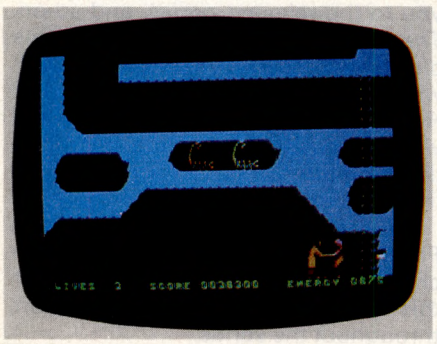
Title: Traffic
Computer: Commodore 64
Supplier: Quicksilva
Format: Cassette
Price: £7.95

Traffic proves the old maxim that simple ideas are often the best: your task is to control sets of traffic lights at city centre junctions. Your reactions must be fast and your planning sound as the traffic quickly builds up. If you cause a jam, you get the sack and the game ends. Success, however, leads on to another part of the city and another set of junctions.

This game was quite a revelation: I've always thought that a traffic controller's job was to cause chaos, not avoid it.

The graphics are smooth and simple, with the cars being little more than blobs moving down the streets. The game instructions are, at best, vague, and only hint at the scoring system and the size of the traffic jams you'll encounter, which must be discovered by trial and error.

I have my doubts about the *lasting* appeal of something so simple, but, nonetheless, I found it a very entertaining game.



Take your partners...

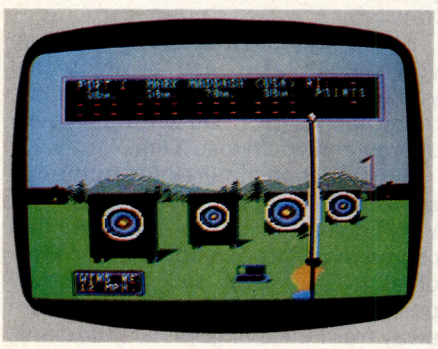
Title: Storm Warrior
Computer: Commodore 64
Supplier: Frontier Software
Format: Cassette/disk
Price: £7.95/£9.95

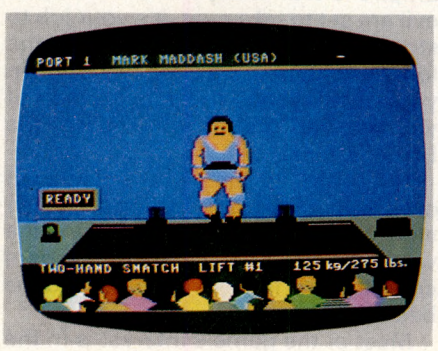
Storm Warrior is another of the increasingly popular multi-screen games in which you must complete one screen before you move onto the next. However, this game's superb sound, graphics and fighting sequences set it well above the others.

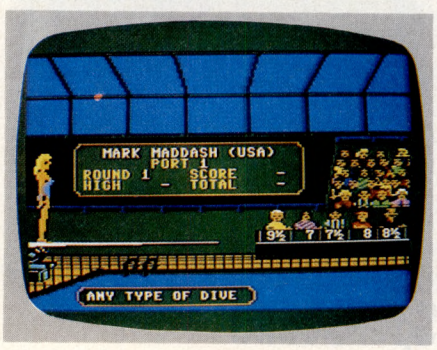
In the first screen, you're involved in a deadly ball game with an evil-looking gremlin who's throwing a fire ball at you. The rules of the contest are simple: he's trying to kill you and you have to deflect the fire ball with your sword. The game ends if you hit the ball past him. Your sword strokes are controlled via logical joystick movements.

If you survive the duel, you progress to the next screen in which you must prevent deadly birds from carrying you away, a duel with equally deadly scorpions and men — with one particularly graphic struggle on a carpet as you travel towards a lightning-lit island.

Storm Warrior was written by a ballroom dancing teacher, but it certainly isn't a waltz.







Move over, Daley

Title: Hesgames
Computer: Commodore 64
Supplier: HesWare/Thorn EMI
Format: Disk
Price: £27.95

Following closely on the heels of Decathlon (reviewed last month) Hesgames is a collection of six world class events in which you compete in Olympic conditions.

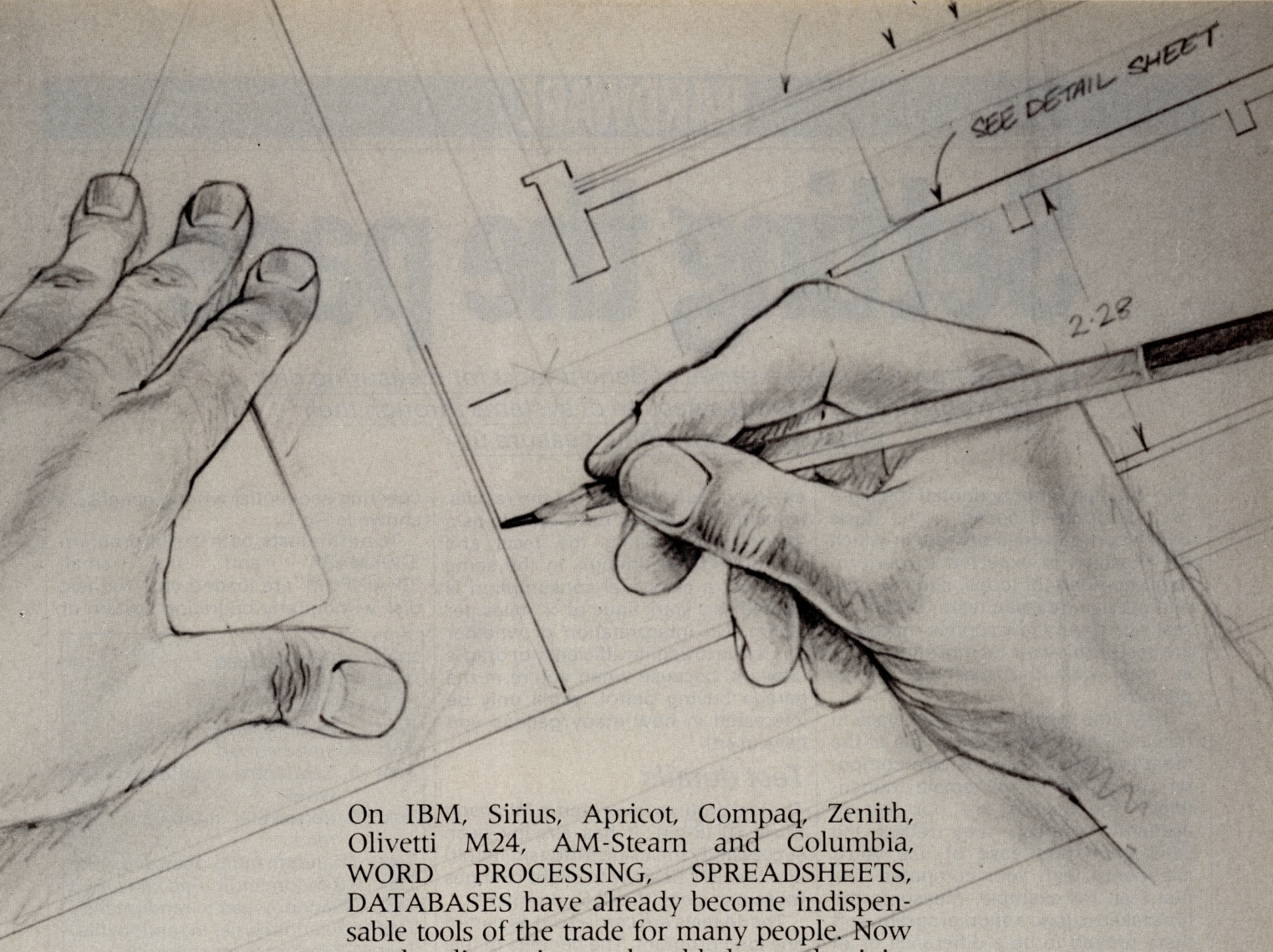
There are six events: the 100m sprint, 110m hurdles, long jump, diving, archery and weight-lifting. Each event must be loaded in separately from a central menu — which doubles as a record of your scores — as each one is steeped in detail (which consumes a lot of memory). For example, in the weight-lifting the crowd are far from passive: they either applaud a good lift, or turn and mutter to each other about a failed attempt. It's this detail that makes Hesgames more of a simulation than a game.

You control your character with simple joystick movements, but if you are to break any world records these movements must be precise and well-timed. My best event was the diving, in which you have to call and execute forward and reverse dives as tidily as possible, landing straight in the water and creating as little splash as possible. Six judges award points and there's a crowd ready to applaud your skills.

An action replay facility at the touch of a button is just one of the features which justifies the games's high price. It allows you to watch any shot, race, dive or lift after the event. Should you beat your personal best, or perhaps even a world record, you can save the attempt to disk as a classic replay to be recalled whenever you want to amaze your friends.

The accompanying instruction book is also a coaching aid, and contains diagrams to help improve your performance until eventually you're a world beater.

END



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DEALER ENQUIRIES WELCOME

Setting the pace

Eric Bagshaw proposes a series of Benchmarks for measuring disk performance, and puts a selection of systems through their paces to see how they measure up.

The most commonly quoted measure of a computer's speed is the Basic Benchmark, a series of tests in which the machine is expected to perform large numbers of loops, square roots and other unrealistic tasks. But in the real world, very few serious machines are used in this way: far more important is how well the machine's disks perform.

Very little testing has taken place in this area, and until it does, one of the most important features of a computer's performance will remain unquantified. The speeds are not just of academic interest; they reflect the satisfaction and ease of use you'll experience with your computer. The first test, for example, measures the time taken to load a short program, and there proved to be a difference of 30 seconds between the worst and best performers. That '30' repeated many times during the day can become tedious and time consuming.

The lack of performance data on the hardware also hampers software testing. It's impossible to compare the sorting and retrieval timings of two packages if they've been reviewed on different machines.

I haven't attempted to be too scientific about the tests, nor to carry out an extensive post-mortem on the results. Instead, I've treated each system as a 'black box' running the tests and monitoring the timings, in the same way that a car's fuel consumption is quoted as a stark figue of 'x' miles per gallon. No interpretation of whether this is due to engine efficiency or drag is relevant, because when you're in the garage buying petrol, you'll only be interested in how many gallons you have used!

Test details

The test program is written in Microsoft Basic 80 (8-bit). It has already been successfully run using MSBasic (16-bit) and the IBM Basic with slight changes for screen clear (the CLS command).

The 14 tests are carried out as part of one long program. The benefits of this approach are that the test runs as a complete unit with automatic timing (on suitable machines), and the program can be used to time the loading speeds. Each test is backed up with a 'Basic dummy': this repeats the loop structure, screen displays and any other actions, but doesn't access the disk. The times for both the test and the dummy are subtracted, therefore the effects of disk alone can be isolated. An example of one of the test programs, covering sequential writing speeds, is shown in Fig 1.

To run the tests, both the full program 'DISKMARK' and the small 'CHAINPGM' are loaded onto the test disk without any operating system or the Basic language. This is to minimise any differences that may be caused by the varying sizes of operating systems and interpreters.

The test programs are numbered from 0 to 13 (Fig 2). The first (test 0) measures the time taken to load the

Test 0 Program load
Test 1 Sequential write
Test 2 Sequential read
Test 3 Random write
Test 4 Random read
Test 5 Sequential multi-open and write
Test 6 Sequential multi-open and read
Test 7 Random multi-open and write
Test 8 Random multi-open and read
Test 9 Random read in random file
Test 10 Random write in random file
Test 11 Random front end swap
Test 12 Close up holed file
Test 13 Multi-kill

Fig 2 Test programs (0-13)

```
1000 REM ************************************
1001 REM          SEQUENTIAL WRITE
1002 REM ************************************
1010 OPEN "O",£1,"DATAFILE"+".SEQ"
1020 FOR I = 1 TO N(0)
1030 D=RND(1)
1040 WRITE£1,D
1050 PRINT I;D
1060 NEXT I
1070 CLOSE£1
1499 RETURN
1500 REM SEQUENTIAL WRITE - BASIC
1510 REM OPEN "O",£1,"DATAFILE"+".SEQ"
1520 FOR I = 1 TO N(0)
1530 D=RND(1)
1540 REM WRITE£1,D
1550 PRINT I;D
1560 NEXT I
1570 REM CLOSE£1
1580 RETURN
```

Computer	Test 4
IBM XT 10Mbyte	3
FTS 20Mbyte	4
Wren 10Mbyte	4
FX 30 3Mbyte	5
Sirius 10Mbyte	6
Apricot XI	7
Apricot 320	10
Clenlo 3.0	10
Rair 3/30	10
Clenlo 2.2	11
IMB PC 320k	20
Epson QX10	20
Wren 200k	21
FX 30 800k	24
Compaq 320k	24
FTS 616k	27
Sirius 600k	28
Xerox 820	84
Rair 3/20	97

Fig 3 Random file read

Computer	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	Total
Apricot 320	18	6	8	19	10	20	2	21	2	7	13	103	46	7	282
Apricot XI	16	6	7	11	7	26	1	27	2	4	9	50	20	6	192
Clenlo 2.2	17	10	11	83	11	17	8	35	12	16	31	717	237	27	1232
Clenlo 3.0	17	6	11	18	10	21	8	32	12	9	14	304	135	30	627
Compaq 320k	24	11	16	24	24	36	8	67	16	7	13	319	125	49	739
Epson QX10	21	8	13	34	20	49	21	62	27	35	70	1762	486	45	2653
FTS 20Mbyte	9	3	3	6	4	17	17	18	18	2	3	23	11	53	187
FTS 616k	12	4	5	21	27	45	15	49	16	8	43	229	35	39	548
FX 30 3Mbyte	11	4	4	6	5	13	6	14	7	13	22	470	82	15	672
FX 30 800k	20	6	6	23	24	35	13	49	20	25	52	1132	311	50	1766
IBM XT 10Mbyte	19	5	19	15	3	22	8	27	8	3	3	76	31	15	254
IMB PC 320k	21	10	21	21	20	30	8	65	17	7	15	311	145	51	742
Rair 3/20	33	9	18	94	97	31	13	39	15	19	33	1009	235	37	1682
Rair 3/30	23	7	14	16	10	50	29	53	32	54	59	1675	31	38	2091
Sirius 10Mbyte	16	4	7	7	6	11	3	12	4	2	3	80	37	11	203
Sirius 600k	27	11	9	57	28	52	18	42	20	32	67	1669	466	39	2537
Wren 10Mbyte	11	4	8	6	4	19	10	22	12	2	3	66	24	19	210
Wren 200k	14	5	9	21	21	38	14	37	16	9	19	385	200	21	809
Xerox 820	39	14	22	83	84	103	53	156	74	55	66	1686	317	165	2917

Fig 4 Disk Benchmark results in seconds (in alphabetical order)

complete test program (about 16k long) by exiting and then re-chaining back. Sequential writing and reading are covered by tests one and two. The former tests the time taken to write 500 records in a sequential file, while the latter tests the time taken to read the 500 records created by the previous test. Test three and four perform similar random functions: test three looks at the time taken to write 500 records in a random file, while test four looks at the time taken to read the 500 records created by the previous test.

The next four tests make life rather more complicated. Test five measures the time taken to open 20 sequential files in turn, write one record and then close (sequential multi-open and write). Test six measures the time taken to open the 20 sequential files already created, read one record and then close (sequential multi-open and read). Test seven measures the time taken to open 20 random access files in turn, write one record and then close (random multi-open and write). Test eight measures the time taken to open the 20 random access files already created, read one record and then close (randon multi-open and read).

Random read in random file is covered by test nine, which looks at the time taken to read 50 records in a random generated sequence in a random access file. Test 10 moves on to random write in random file, measuring the time taken to write a block of stars (**********) in 50 records in a random generated sequence in a random access file.

Test 11, a random front end swap, takes the longest, measuring the time taken to completely invert the file: what was the first record becomes the last, and *vice versa*. Test 12 measures the time taken to close up the file, removing the ********** records.

And finally, test 13, the ferociously-named multi-kill, measures the time taken to kill all the files created in the testing process.

Results processing

The results of the tests on a range of systems, from the Apricot to the Xerox 820, are shown in Fig 4 (alphabetical order).

One of the interesting facts to emerge during the testing process was the difference that the operating system makes. Take particular note of the results achieved for the two Clenlo systems: the hardware is identical, only the operating system differs—CP/M 2.2 changed to CP/M 3.0 (also called 'Plus'). The results are similar, but there are differences: for example, over 413 seconds are saved by 3.0 in test 11.

As the results show, no one system dominated throughout. However, Future Technology Systems' 20Mbyte machine fared the best in terms of overall times, with the 10Mbyte Apricot XI a close second. Top slot for random file read (test four) went to the 10Mbyte IBM XT (Fig 3), while the 10Mbyte Sirius took the honours for sequential multi-

Computer	Test 5
Sirius 10Mbyte	11
FX 30 3Mbyte	13
FTS 20Mbyte	17
Clenlo 2.2	17
Wren 10Mbyte	19
Apricot 320	20
Clenlo 3.0	21
IBM XT 10Mbyte	22
Apricot XI	26
IBM PC 320k	30
Rair 3/20	31
FX-30 800k	35
Compaq 320k	36
Wren 200k	38
FTS 616k	45
Epson QX10	49
Rair 3/30	50
Sirius 600k	52
Xerox 820	103

Fig 5 Sequential multi-open and write

Computer	Test 6
Apricot XI	1
Apricot 320	2
Sirius 10Mbyte	3
FX 30 3Mbyte	6
IBM PC 320k	8
IBM XT 10Mbyte	8
Clenlo 3.0	8
Clenlo 2.2	8
Compaq 320k	8
Wren 10Mbyte	10
FX-30 800k	13
Rair 3/20	13
Wren 200k	14
FTS 616k	15
FTS 20Mbyte	17
Sirius 600k	18
Epson QX10	21
Rair 3/30	29
Xerox 820	53

Fig 6 Sequential multi-open and read

Computer	Test 13
Apricot XI	6
Apricot 320	7
Sirius 10Mbyte	11
IBM XT 10Mbyte	15
FX-30 3Mbyte	15
Wren 10Mbyte	19
Wren 200k	21
Clenlo 2.2	27
Clenlo 3.0	30
Rair 3/20	37
Rair 3/30	38
FTS 616k	39
Sirius 600k	39
Epson QX10	45
Compaq 320k	49
FX 30 800k	50
IMB PC 320k	51
FTS 20Mbyte	53
Xerox 820	165

Fig 7 Multi-file kill

open and write (test five, Fig 5). Of the more popular systems, the 320k IBM PC fared only average, or worse, in all but two of the tests, which just goes to show that having waited to buy a PC, users still have to wait while they use them. In one of the PC's successful tests, sequential multi-open and read (test six), the FTS machine slipped down to 15th place (Fig 6).

On the Apricot vs IBM front, the Apricot 320 defeated the IBM PC in every test bar one, random read in random file (test nine), which was a dead-heat (Fig 8). The 10Mbyte Apricot XI didn't manage the same whitewash over the 20Mbyte PC XT though: the XT won in five of the 14 tests with a dead heat in the sixth (Fig 9).

Apart from the aforementioned machines, the only 16-bit machines which performed consistently above the class average were the 10Mbyte Sirius and the Clenlo running CP/M 3.0. Eight-bit computing, in the shape of the 10Mbyte Wren machine, fared well to come in above both IBM machines on overall score and finish in the top five in all but four of the tests.

At the other end of the table, the 8-bit Xerox 820 chalked up nine last places out of fifteen and a highest placing of thirteenth to finish last overall, just ahead of its 8-bit rival, the Epson QX-10.

Interesting as the tests are, they would be of little value if they didn't bear some resemblance to a machine's performance when running applications packages in a normal office environment. Different packages make different demands on machines, so the actual importance of each test varies.

The first test, however, is widely applicable, due to the loading of programs (and overlays) accounting for a large proportion of the disk access in many packages. The operating system and applications programs must be loaded before you can run. In addition, during a package's operation, and especially in complex systems such as accounts, much program swapping will occur. If the system is slow to load programs, there will be large delays when changing system functions: for example, swapping from sales to purchase ledger. The access speed of help facilities will also be greatly affected as they are often stored on disk.

Tests one and two come into their own for word processing and spreadsheets, due to the major disk-related tasks in these applications being the loading and saving of large blocks of sequential data.

Both database and accounting systems use a wide range of filing techniques in sequential and random modes. This variation is designer, not just application dependent, therefore attention must be paid to tests three to 12. In a database application with much re-indexing, tests 11 and 12 are of particular interest: test 11 simulates a complete file inversion, whereas test 12 closes up a file to remove deleted records — very similar in operation to a dBasell 'pack' command.

The deleting (or killing) of files, covered in test 13, occurs in some but not all systems. It often happens when systems utilise scratch, or temporary, files (Fig 7).

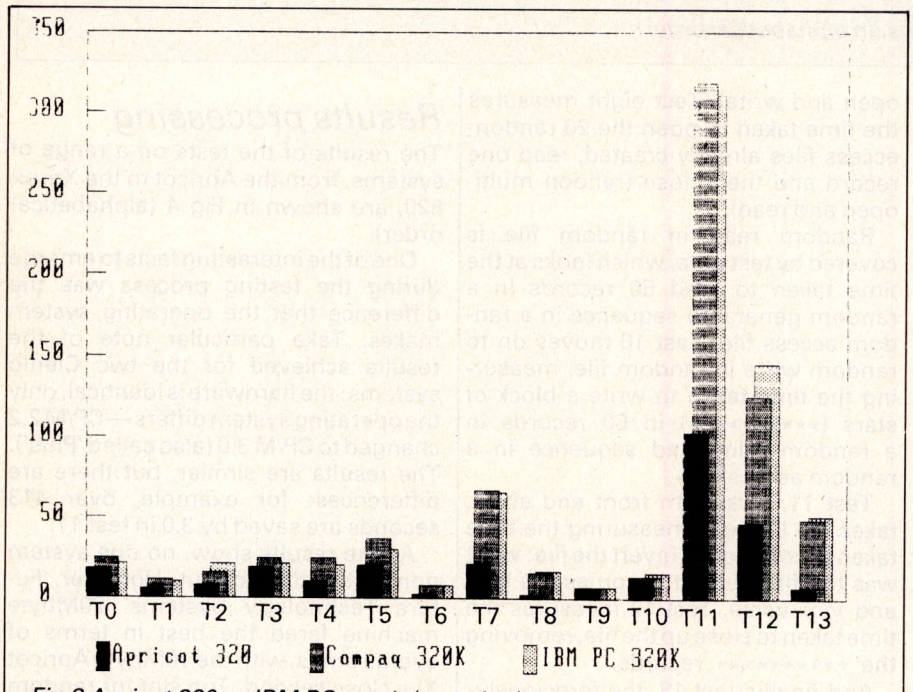

Fig 8 Apricot 320 vs IBM PC result (test nine)

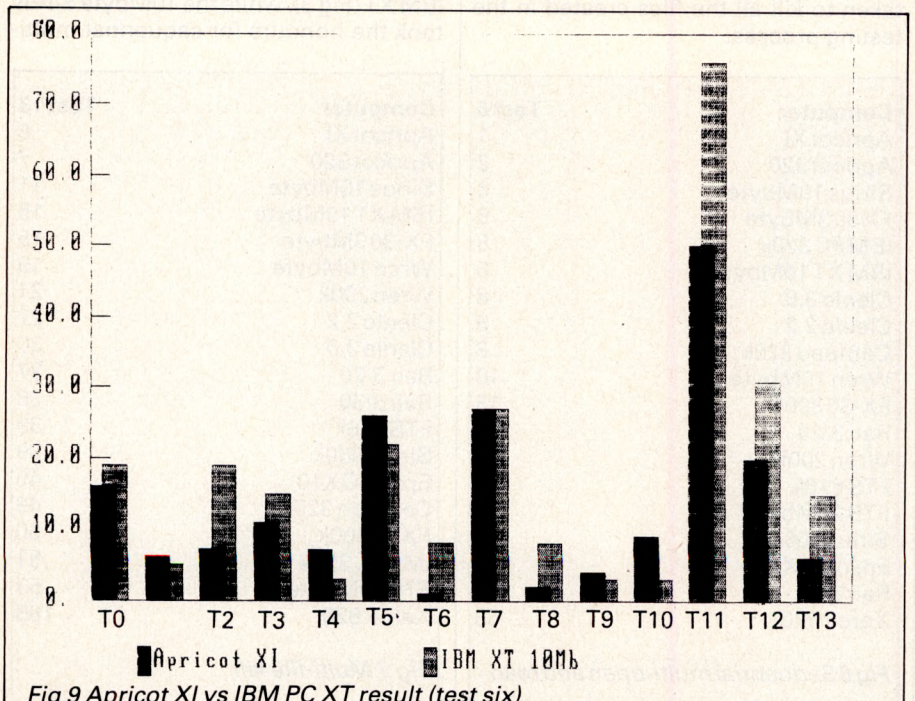

Fig 9 Apricot XI vs IBM PC XT result (test six)

Conclusion

This is a first attempt at Benchmarking disk performance. Five hundred records is not the ideal number to choose: disks slow down with larger and larger files. However, all machines were measured by the same rule.

Only a small range of machines were tested, but the test software is in the public domain and is available to anyone. Copies of the listings can be obtained by sending a large stamped addressed envelope to *PCW*, marked 'Disk Benchmarks'. If unlisted machines are tested, we would be pleased to know the results.

Thanks to the following companies for allowing the use of stock for testing: Digitus, Morse Computers of Holborn and Transam Computers. Thanks also to B Androlia of ACT Pulsar for the loan of an Apricot for testing and the Open Access package for results' compilation and plotting.

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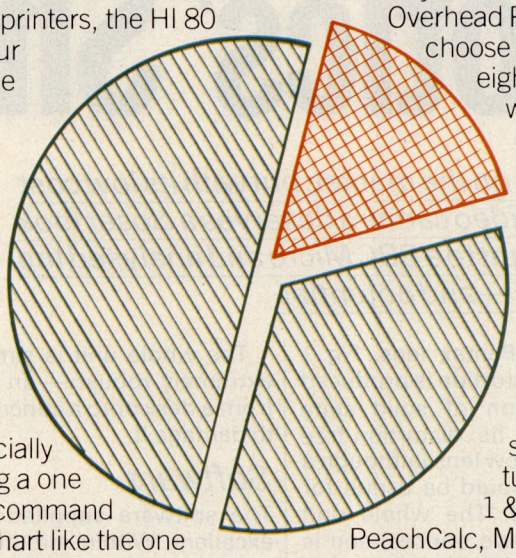

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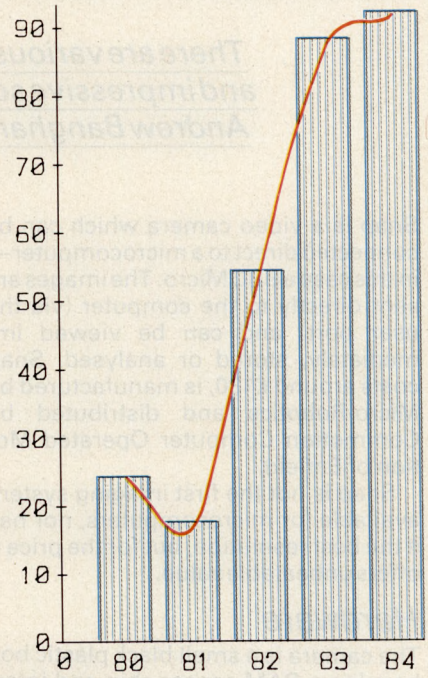

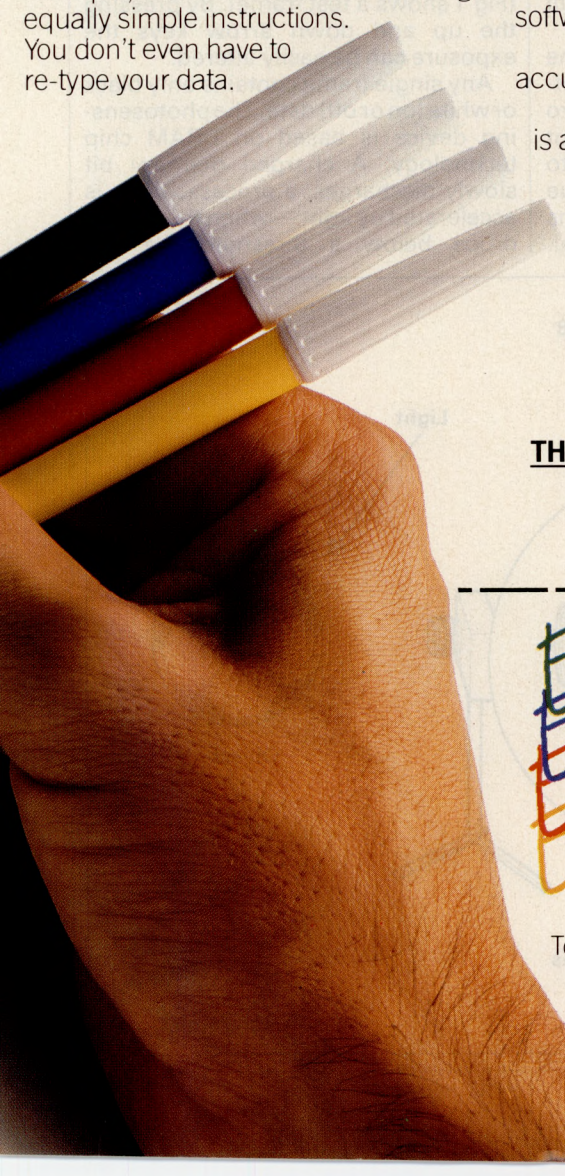



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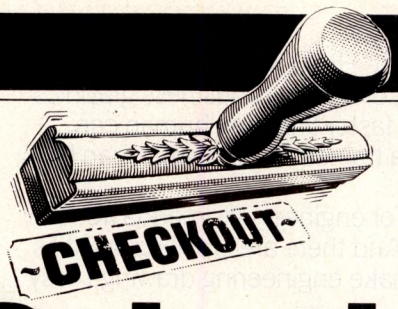


Micro-Robotics' Snap

There are various imaging systems on the market, but with its low cost and impressive software the Snap video camera deserves a closer look. Andrew Bangham used it to give sight to a BBC Micro and analysed the system's abilities—and potential.

Snap is a video camera which can be connected direct to a microcomputer—in this case a BBC Micro. The images are sent directly to the computer (via the user port) and can be viewed immediately, stored or analysed. Snap costs around £130, is manufactured by Micro-Robotics and distributed by Commotion Computer Operated Motion of Enfield.

Snap is not the first imaging system available for microcomputers, nor has it the best resolution, but for the price it offers unbeatable value.

Hardware

The camera is a small black plastic box housing a RAM sensor chip and interface. A simple Pentax 110 size bayonet lens mounting allows standard lenses to be used, and the camera is supplied with a 24mm 2.8 Pentax lens. Fig 1 shows how little distortion is produced by this combination of solid state photosensor, with its distortion-free geometry, and narrow lens (although a wider angle lens would be useful for many applications). The whole unit weighs 65 grams (two ounces) and is easy to mount on a robot by squidging it onto some plasticine or by using small bolts. (Open the case before drilling to avoid destroying the printed circuit board.)

Of course, you can always use the unit's standard camera screw mounting. This is connected to the BBC Micro through an eight-way ribbon cable, but Micro-Robotics expects to be able to provide links to other micros in due course and the relevant specifications are included in the succinct manual.

The whole unit is simple, neat and extremely robust — an accidental fall from a desk onto a concrete floor failed to damage it.

Software

The software supplied with Snap is excellent. Within minutes of connecting the camera to the user port, ghostly images appeared on the screen. Frames were updated every second (Fig 1 shows a test frame). By pressing the up and down arrow keys the exposure can be easily altered.

Any single frame contains only black or white (on or off) data. The photosensing device is based on DRAM chip technology. A charged memory bit slowly discharges, a process which is accelerated by light—when the charge drops below a threshold the cell

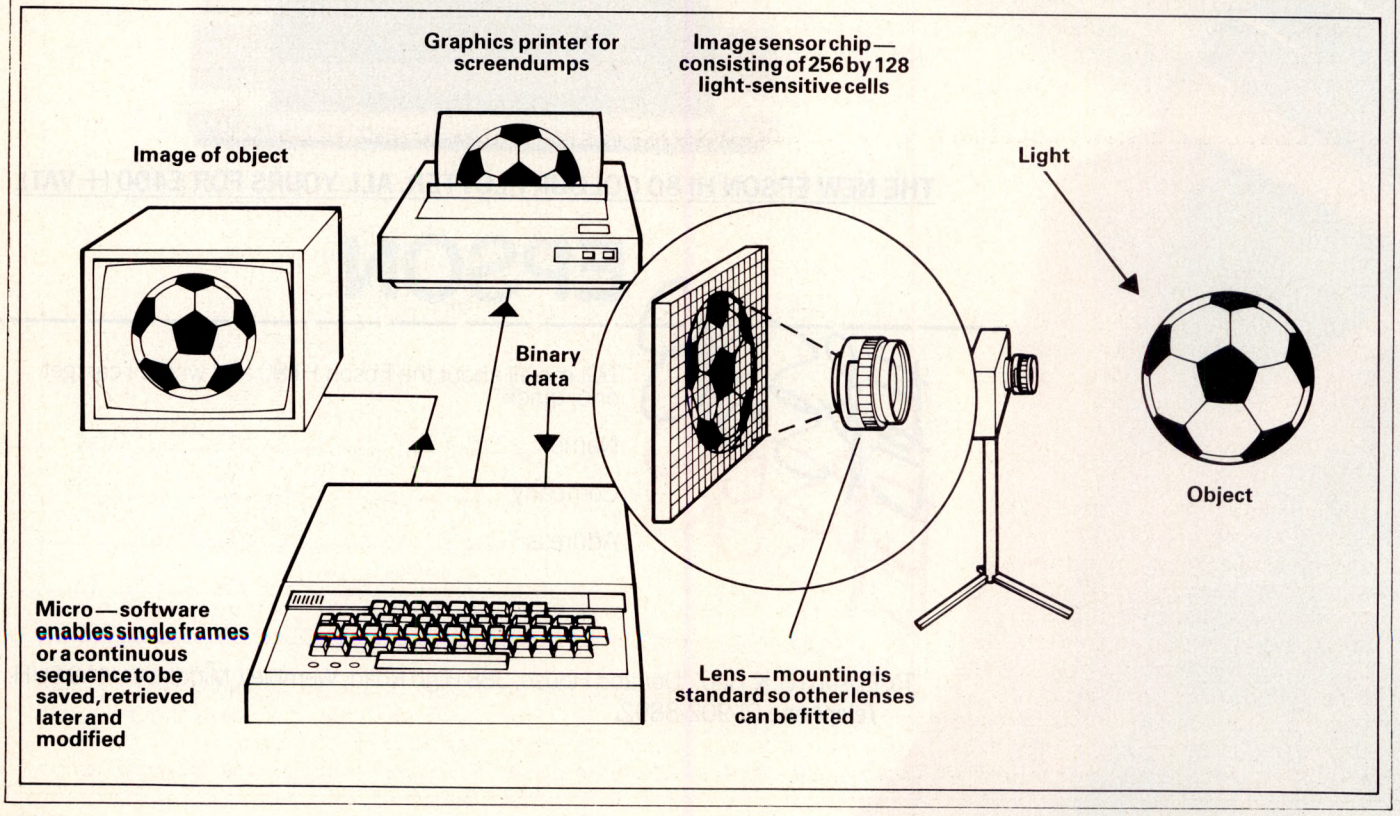


Illustration by Kevin Jones

changes state. By resetting all the bits, and then waiting a fixed time (exposure time) before transferring the bit values (on/off) to the microcomputer, a black and white image can be obtained. It takes 64 milliseconds to transfer an entire frame from Snap to the BBC Micro. Micro-Robotics uses an IS32 optic DRAM chip.

The program (EV1) used to produce Fig 1 is a general purpose routine which, because of its speed, allows the camera to be tested, directed and focused, just like an ordinary camera. It is both fun and instructive.

The machine code program used by EV1, called Wide, transfers images from the camera to a mode 4 screen. A second routine clears the exposed cells in the memory and returns the number that had been set. This value can be used in a software automatic exposure control program.

Wide also includes a further pair of routines. The first compresses an image and the second transfers a compressed image onto the screen. Image compression is sophisticated, but relies on the fact that in any meaningful image there are areas of uniform intensity: rather than memorise every bit in that area, the intensity value and the count (along the line to the next intensity value) are stored instead. Consequently simple silhouettes take less than 1k of memory, whereas the uncompressed counterpart takes 4k.

Image compression is demonstrated by a program called Movie, in which a series of images are stored and then played back as a sequence. A simple, effective demonstration.

A third program (Grey) exploits the possibility of varying the exposure time using software, by using a series of different exposures to compose a single grey scale image (see Fig 2).

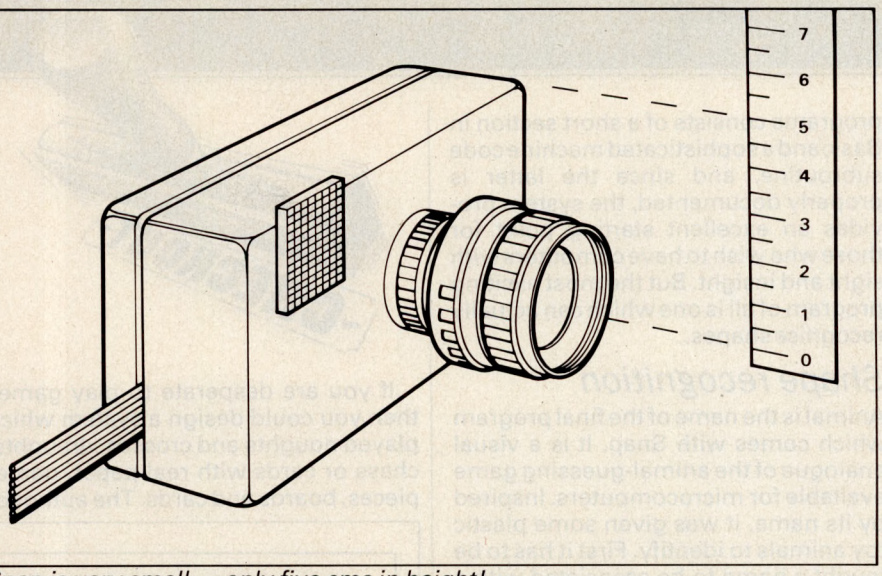
Naturally these images are not nearly as good as those you see with a conventional video camera/recorder. Snap has a maximum resolution of 256 × 128 cells, and it is slower. But that comparison is irrelevant. Once the computer has captured an image the fun really starts, because the computer can analyse what it sees.

Image analysis

It is in image analysis where the software supplied by Micro-Robotics really helps. An experienced computer buff should be able to emulate EV1 and Grey, including the machine code parts (note that the camera handling has to be somewhat more subtle than implied above, as not all the memory cells are reset in the same way), but even a computer expert would probably take a long time learning and producing programs which analyse images.

Secure allows you to turn the BBC Micro/Snap system into an instant visual security system. You point the camera at a scene — the door perhaps — and allow the program to automatically exclude acceptable changes within the scene — for example, the cat coming in or swaying trees. Then you press the space-bar to cock the alarm. Thereafter the amount of activity it sees is continuously displayed on the screen and whenever it exceeds the threshold an alarm is sounded.

Since each of the demonstration



Snap is very small — only five cms in height!



Fig 1 A test frame taken by Snap using the supplied EV1 program. The grid is made from uniform squares, but there is a small gap between the top and bottom halves of the photosensitive surface which is not allowed for in the display software. Apart from this missing slice, there is very little distortion. EV1 includes a mode 4 Epson screendump program

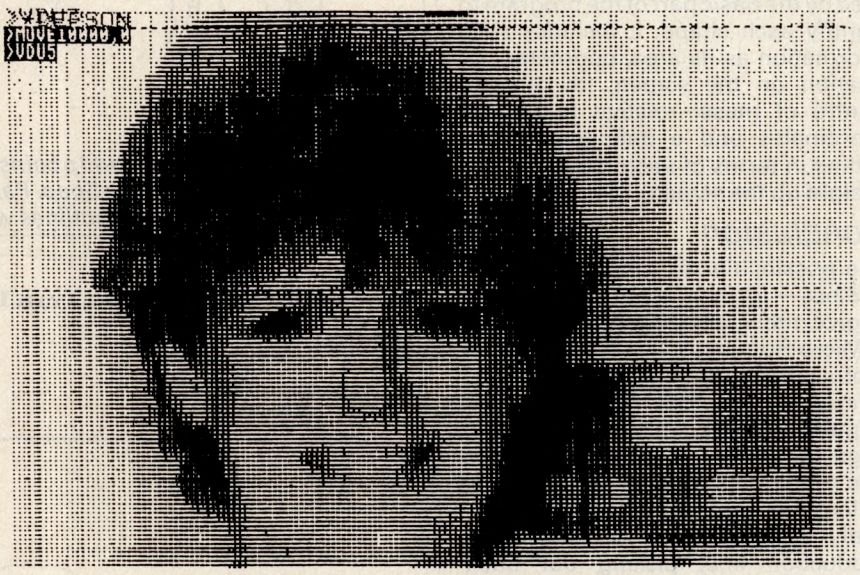


Fig 2 A frame taken by Snap using a program called Grey. A standard Epson screendump utility was used having first changed all blacks to whites and so on, using a single line of Basic: FOR I=&3000 TO &8000: ?I=&FF EOR ?I: NEXT

programs consists of a short section in Basic and a sophisticated machine code subroutine, and since the latter is properly documented, the system provides an excellent starting point for those who wish to have computers with sight and insight. But the most exciting program of all is one which can actually recognise shapes.

Shape recognition

Animal is the name of the final program which comes with Snap. It is a visual analogue of the animal-guessing game available for microcomputers. Inspired by its name, it was given some plastic toy animals to identify. First it has to be taught a name to be associated with a shape. Quite simply, place each object in the field of view, press 'L' and answer the question 'what is it?'. From then on you simply show it a shape, press the space-bar and within a second it usually manages to identify it correctly.

Fig 3 shows some of the objects which were used in the trial. Notice that Part A is a screendump of the image produced by the EV1 program and shows the silhouettes (the objects were illuminated from behind using a light box) but the image recognition program (Part B) displays just the outline. It effectively displays the two dimensional first derivative (by finding where the image intensity *changes*), though this program works by doing a more pragmatic and perhaps faster transformation.

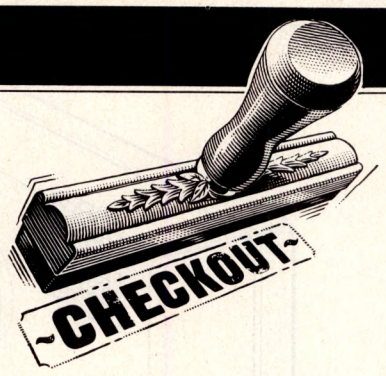
Having transformed the image the machine code routines produce an object description block containing details of each object in turn. This data is used by the Basic part of the program to identify each shape. It includes such information as its area, perimeter, x,y location on the screen, its centroid (centre of mass) relative to the x,y coordinates and a definition of the outline in terms of vectors (such as N, straight up the screen; S; E; and W.

Conclusion

The possibilities for this program are endless — for instance, it could be used to give intelligent sight to a robot.

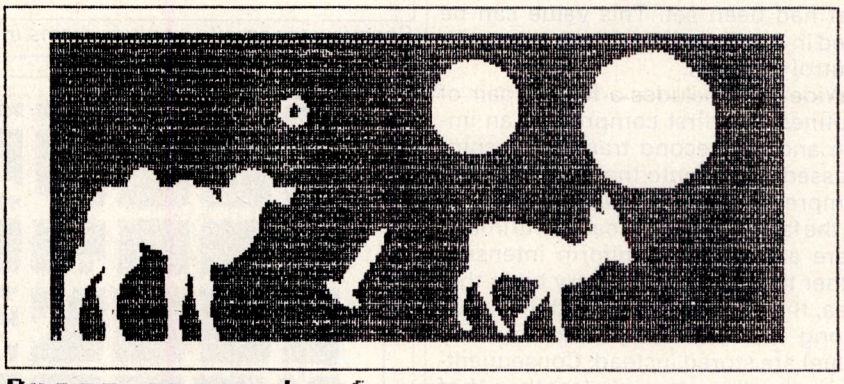
Micro-Robotics sells a range of servo-motors which can either be controlled directly from the BBC Micro (see *PCW*, September 1984, 'To Serve and Obey', page 136), or using a Beasty interface. The robot could then be programmed to look for particular objects. Alternatively it could be used to control a production line, picking out unexpected objects. It was able to correctly identify 50p and 2p coins, so it could be used to count change.

Notice that having learnt the shape of an object, that object can then be identified at any angle and any position on the screen and its orientation and position recorded.

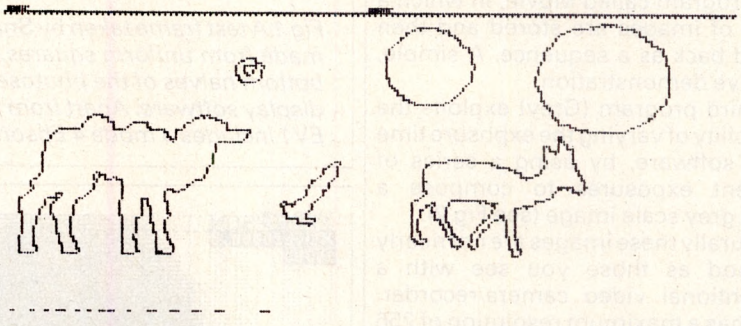


If you are desperate to play games then you could design a system which played noughts and crosses, draughts, chess or cards with real paper, game-pieces, boards and cards. The author of the Snap manual, Alex van Someren, draws readers' attention to a challenge laid down in the wake of the successful annual mouse/maze competition, which was once thought so difficult, but which now has heats before the finals because of the number of entries.

This new challenge appears breath-takingly difficult: to produce a robot able to play (or at least start to play) table tennis. It is a good bet that a group of enthusiasts with a BBC Micro, a speech chip, Snap, some model makers' servo-motors and a few tools, will be in at the kill. END



Part A



Part B

Fig 3 Toy animals, a 50p and 1p coins, a screw from the back of the BBC Micro and a small nut as seen by Snap. Part A shows the silhouettes produced by EV1 and Part B shows the outlines which are generated by OUTL

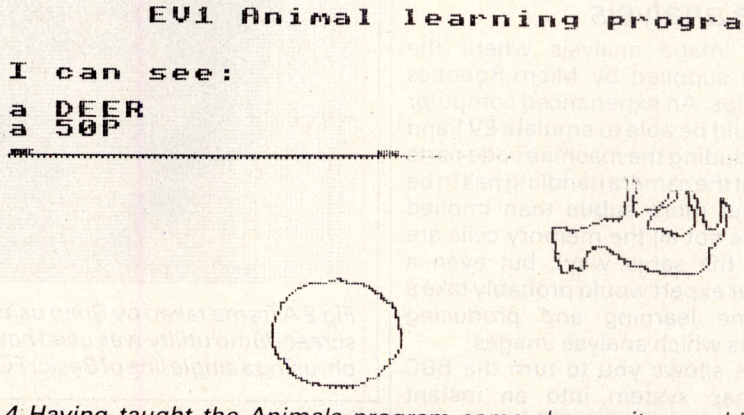


Fig 4 Having taught the Animals program some shapes, it was able to recognise them. In this case it took less than a second to correctly identify these two objects. Notice that the profiles can be at any angle

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TEACH YOURSELF LISP

Dick Pountain continues his 'Teach Yourself' series with a look at some of Lisp's non-applicative features.

Lisp arose from a purely mathematical system of notation for working with functions, and implementing it on a computer was almost a side issue.

In our examples so far, we've treated Lisp as a purely functional (or 'applicative') language. Our programs have been functions, or functions applied to functions, and so on, which were evaluated by Lisp. We've used no special I/O operations at all — when a program printed its result onscreen, this was merely the value of a function which Lisp obligingly puts on the screen for us — when a program needed input from us, we merely supplied it in the shape of parameters to the function.

However, there comes a time when we have to realise that we aren't doing maths but working on a computer, with physical bits like memory, VDU, keyboard, and so on.

Let's start with the non-applicative feature I/O. Input is quite straightforward: the function READ causes a program to pause and wait for input from the keyboard; this input is returned as the value of READ, which requires no arguments. READ will only accept one expression (a number, an atom or a list) as its input, and looks for a carriage return to tell it you've finished. If you type a whole line of words, followed by CR, only the first will be returned to the program by READ. Try it by typing in:

```
* (CONS (READ) ' (A B C))
```

Some dialects (Acornsoft, for instance) have the additional function READLINE which reads in everything you type up to the CR, not merely one expression. MuLisp has READCH which reads only one character, like the Basic INKEY$.

READ is also used to read from files in most Lisp systems, but the methods of redirecting input from keyboard to disk or cassette are extremely machine-dependent; I leave you to the mercy of your manual.

Output is a little more complicated. The most commonly used function is PRINT, which behaves very much like the Basic PRINT. It prints the value of its single argument on the screen, and then performs a newline. One thing that initially confused me is the fact that PRINT, being a function, also returns a value, which is again the value of its argument. If you type:

```
* (PRINT 'HELLO)
HELLO
HELLO
```

you begin to see double. One of the HELLOs is the *side effect* of PRINT (to print on the screen, which is what we use it for) and the other is its value as a function, returned as normal. Inside a program you'll normally discard the returned value, but if your program starts to stammer you'll know why.

Most Lisp dialects provide the function PRIN1, which behaves like PRINT but without the newline. Some dialects will also supply functions with names like PRIN and PRINC, which have a variety of more specialised behaviours. The most common of these is to print output in a form re-readable by Lisp, which entails giving special treatment to any characters illegal in a Lisp name. The utility of such functions arises because PRINT, like READ, can usually be redirected to write to a file instead of the screen, and it's not much use writing files that can't be read back in.

Saving and loading programs is done by the special functions SAVE and LOAD, which are usually very blunt instruments indeed, merely storing the whole of the workspace, definitions and variables. This has the merit of restoring a session exactly as you left off, but makes any kind of library-building rather tiresome. Supersoft Lisp and MuLisp both have more selective ways of saving individual function definitions.

Now that we are deep into the fleshpots of non-applicative functions, we might as well go the whole hog. Any Basic programmer who has been following this series and trying out the examples will probably have experienced, as I once did, a peculiar kind of unease. How exactly in Lisp do you program a sequence of actions of the sort: do this, *then* do this, *then* do this . . .?

This type of sequence is a natural way of expressing programs in Basic (or Pascal, Forth or most other languages). In Basic the very layout of program text dictates this structure, with numbered statements following one another. But most of the Lisp functions we've seen have a nested structure, with function calls inside function calls inside function calls, and once you enter the body of a definition there seems to be no way of controlling sequence at all.

Using only the constructs we've seen so far, it isn't easy. In fact, it would only be possible using the body of a COND clause (in which, if you remember, the expressions are evaluated one after another and the value of the last one is returned). There's another way though. It's a function called PROG, which is rather like COND in that it acts as a control structure. It also provides a way of introducing local variables for use inside a definition, and a method for ordinary looping without using recursion. In other words, PROG allows you to write Basic programs in Lisp! (PROG, sometimes called PROGN, stands for PROGression.)

Like COND, PROG can take any number of non-evaluated arguments: that is, they don't require a quote in front of them. Its first argument is always a list of variables: these are the local variables which are to be used inside the PROG structure. Then comes a series of expressions (you can think of them as statements) which are evaluated *one* after the another. Some of these expressions can be atoms which act as labels, with the function GO<label> acting like a Basic GOTO, causing evaluation to begin again at




```
(DEFINE PRINT-NUMBERS ()
     (PROG (NUM)
           (SETQ NUM 0)
            LOOP
           (SETQ NUM (PLUS NUM 1))
           (PRINT NUM)
           (GO LOOP)
     )
)
```

Fig 1 The function GO label acts like a Basic GOTO

```
(DEFINE PRINT-NUMBERS-NICELY ()
     (PROG (NUM)
           (SETQ NUM 0)
            LOOP
           (SETQ NUM (PLUS NUM 1))
           (COND ((EQUAL NUM 100) (RETURN 'CENTURY!!)) )
           (PRINT NUM)
           (GO LOOP)
     )
)
```

Fig 2 PROG takes its value from the RETURN statement

```
(DEFINE MATCH (PATTERN LIST)
     (COND      ( (AND (NULL PATTERN)(NULL LIST)) T     )
                ( (OR  (NULL PATTERN)(NULL LIST)) NIL   )
                ( (OR  (EQUAL (CAR PATTERN) '? )
                       (EQUAL (CAR PATTERN)(CAR LIST)))
                  (MATCH (CDR PATTERN)(CDR LIST))       )
     )
)
```

Fig 3 MATCH allows the wildcard character '?' to match any expression

<label>. Fig 1 makes this clear.

If you try this function, you'll find that it prints the whole numbers from one upwards without end. It is, in fact, *exactly* equivalent to the Basic program:

```
100 NUM=0
200 NUM=NUM+1
300 PRINT NUM
400 GOTO 200
```

except that NUM is global in Basic while it's local to the PROG in Lisp. In other words, were a variable called NUM already in use in the program, then its value would be saved on entering the PROG and restored upon leaving it.

Incidentally, in most dialects of Lisp, PROG variables are automatically set to NIL on entry, but the (SETQ NUM 0) is still necessary. Why? The atom LOOP (no brackets) is a label which GO uses to cause backward looping.

PROG must, of course, return a value and the normal rule here is that if the last statement is reached and is not a GO (if the PROG runs off the end), then the value returned is NIL. If the value returned by a PROG is important to your program, then it can be controlled more precisely by RETURN. When a RETURN is reached, the PROG finishes immediately and takes its value from the RETURN statement in Fig 2.

By using a judicious combination of PROGs and CONDs, you can create any kind of program structure. Don't overdo it though, or you'll merely succeed in introducing all the bad habits of Basic into your Lisp: tangled webs of GOs are just as hard to decipher as GOTOs or GOSUBs. If you persist with Lisp you'll soon get a feel for which types of problem are best solved by recursion and which by looping with PROG, and the former will tend to predominate.

As PROG is rather frowned upon by Lisp purists, it isn't surprising that it's subject to great variation between dialects. Some squeaky-clean versions don't allow it at all. Serious Software's Spectrum Lisp has PROGN, which uses WHILE <condition> instead of GO and has no RETURN. Acornsoft has a PROGN without looping, but uses a different function—LOOP . . . WHILE or . . . UNTIL — to give Pascal-like structured loops. MuLisp has no PROG but a LOOP, which repeats as long as none of its conditional clauses evaluates to T; rather like a COND biting its own tail.

Let's finish with a rather more meaty program example. The function MATCH performs a crude pattern matching between two lists, allowing the wildcard character ? to match any expression: (FRED IS A ?) will match (FRED IS A PLUMBER). Fig 3 shows the definition.

Reading this in English should tell you how it works: 'If both lists are empty then they match, or if one of them is empty and the other isn't then they can't match, or if their CARs are the same (possibly a wildcard) then see if their CDRs are the same.' Notice the use of the Boolean functions AND and OR

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SIMPLY FILL IN THIS ▶

```
(DEFINE MATCHER ())
    (PROG (PATT LIST RESULT)
          (PRINT 'TARGET-LIST?)
          (SETQ LIST (READ))
          (PRINT 'PATTERN?)
          (SETQ PATT (READ))
          (COND ((MATCH PATT LIST) (SETQ RESULT 'SUCCESS!) )
                ( T                (SETQ RESULT 'FAILED)   ) )
          (RETURN RESULT)
    )
)
```

Fig 4 Interactive program with prompts

```
DEFINE EXAMPLE (ARG1 ARG2 ARG3)
    (PROG (LOCAL1 LOCAL2)
          (RETURN ( Rest of definition.....))
```

Fig 5 PROG is a dummy, its body a return clause

```
(DEFINE MATCH (PATTERN LIST)
    (COND      ( (AND (NULL PATTERN) (NULL LIST))     T      )
               ( (OR  (NULL PATTERN) (NULL LIST))     NIL    )
               ( (OR  (EQUAL (CAR PATTERN) '? )
                      (EQUAL (CAR PATTERN) (CAR LIST)))
                  (MATCH (CDR PATTERN) (CDR LIST))            )
               ( (EQUAL (CAR PATTERN) '*)
                  (COND  ( (MATCH (CDR PATTERN) LIST )   )
                         ( (MATCH  PATTERN (CDR LIST))   )
                   )
    )
)
```

Fig 6 '' as a second wildcard will match any number of expressions*

whose effect is exactly what you'd expect.

Now let's use PROG, PRINT and READ to put this function into a simple interactive program with prompts (Fig 4). The PROG here adds nothing to the functioning of MATCH but is purely cosmetic; instead of evaluating a function you have a 'proper' program. By adding a suitable LOOP, you can have it continue prompting until told to quit. This is probably the best use for PROG, as an outer 'shell' to your program, the inner levels being wholesome recursive Lisp functions (like MATCH).

Another important use is to create local variables in those dialects which don't allow the use of 'spare' formal arguments for this purpose. In this case, the PROG is a dummy, whose body is one large RETURN clause (Fig 5).

The MATCH function is a simple example of an immensely important Lisp technique which is the basis for many of its applications to Artificial Intelligence. Pattern matching is at the root of natural language manipulation (for example, parsing sentences) and database searching.

Let's modify MATCH to accept * as a second wildcard which matches *any number* of expressions (including none). Now we have (FRED *) matching (FRED IS A PLUMBER), (FRED BLOGGS) or (FRED) while (A * D ?) matches (A B C D E) but not (A B C D).

Adding a final clause which tests for * will do the trick (Fig 6). Notice that the clauses of that new embedded COND don't perform any action except to cause a recursion. Don't be downhearted if you can't immediately see how it works; try tracing the recursion on paper using real example lists. The detection of an * in PATTERN causes the recursion to scurry down the successive CDRs of LIST (using the MATCH PATTERN (CDR LIST) expression) until LIST is empty, which ends that branch of the recursion (with T if * was the last item in PATTERN, or with NIL allowing the rest of the lists to be matched). The key to understanding this function is that in MATCH PATTERN (CDR LIST), PATTERN is not 'reduced' by taking its CDR: this means that when an * is encountered it will be kept until LIST is empty. **END**

This is part five of our six-part Teach Yourself Lisp series. Back issues can be obtained from our office at 53 Frith St, London W1A 2HG, tel: (01) 439 4242.

Lisp discount offer

To help you get the best from the Teach Yourself Lisp series, *PCW* has arranged special discounts on several Lisp packages. Identify your machine from the list below and send the offer tab at the corner of this page with a cheque for the full amount to the appropriate address, stating clearly which machine it is for.

Machine	Address	Cheque (includes VAT and p&p)
Spectrum NewBrain	Serious Software 5 Wimbourne Avenue Chislehurst Kent BR7 6RQ	£10.50 (Normal price £15.50)
CP/M-80: QX-10 Televideo Kaypro Sirius SuperBrain Apple II Lynx Laureate Transtec Tatung PC2000 NEC 8000 Pied Piper DRS-20 TAP3 & PC BBC B IBM PC	Software Ltd, for... 2 Alice Owen Centre 251 Goswell Rd London EC1 OR Text 100, for... South Black Lion Lane Hammersmith London W6 Text 100 Address as above	Supersoft Lisp: £75 (Normal price £115) Microsoft MuLisp: £112 (Normal price £170) MuLisp (MicroSoft): £112 (Normal price £170)

LISP DISCOUNT VOUCHER

BIBLIOFILE

David Taylor reads all about QL SuperBasic, Logo and Forth, but loses the fight against operating system esoterica.



A battle through RSTS, RSX, VMS . . .

Title: Operating Systems — A user friendly Guide
Author: Alan Trevennor
Publisher: Sigma Technical Press
Price: £8.50

Alan Trevennor is not by trade a writer; he's a computer engineer. When you battle through his book, this unfortunately shows.

Apparently he'd had a basinful of levering the lids off kaput computers' operating systems, only to find that the one thing he'd never got to hand was a decent, lucid guide to what's what. So, he determined to write up his working notes and produced this impenetrable paperback. Its viewpoint, he tells us, is 'biased towards the non-software oriented computer person' and it is meant as 'an appetite whetter for the reader to use as a springboard.'

Trevennor is a non-software oriented computer person if ever there was one and he is doubtless a dab-hand at OS structures as well as with a soldering iron — and he can't half mix his metaphors, too. A gripping stylist, on the other hand, he's not.

What's worse, this book, despite its catch-all title, is scarcely of much useful concern to personal micro users. Most of it is a highly specialised rummage round the OS innards of Digital Equipment Corporation minicomputers. It might fascinate an engineer's mate, or another fine non-software oriented person, who is about to lay spanners on DEC's RSTS (an acronym for Resource Sharing Time Sharing pronounced 'Ristus'), the more scientific RSX, or the more up-to-date VMS.

For the rest of us, there is at least a bit of general discussion on such posers as why a disk-based OS may have advantages over a ROM-based one, but most of Trevennor's text is stupefyingly esoteric.

It isn't that I mind engineers writing among themselves, say, in specialist journals. It's just that when they turn out books billed for a general readership, I have my doubts that 'a user friendly guide' is likely to result.

Proper programming for lucky QL owners

Title: Good Programming with QL SuperBasic
Author: Roy Atherton
Publisher: Longman
Price: £5.95

The QL's notorious IF, THEN, ELSE statement has taken a bit of getting used to, even for experienced Sinclair users. It goes something like this: IF you place an order for a QL, THEN you must expect to have aged considerably before it arrives ELSE you might go up the wall from head-banging frustration.

A stir, says Roy Atherton, is what the QL has caused, although what he has in

mind isn't the appalling succession of cock-ups surrounding its launch and deliveries, but the fact that it seems to offer unprecedented power for the price, (quantum-)leaping the gaps between business, educational and home users.

Best of all is the QL's SuperBasic, he goes on, as well he might since he had a hand in designing it. He also wrote the introduction to the QL's handbook and, one way and another, we must infer that Atherton belongs to that privileged handful of people who can swear they've been using a living QL, not just the cardboard cut-out, for more than about a fortnight.

Perhaps that is why this book, though not the first on the QL, is at any rate free of disclaimers for 'failure of material to correspond to the operation of the QL'. It's a guide to QL structured programming, and, like the *Sinclair Beginner's Guide*, it is peppered with little tests, from which you score points to show you have grasped the preceding chapter. It's also split into phases — phase one is a sprint through the operating essentials, detail being deliberately limited to maintain your interest; and phase two, an expanded version of the QL manual's instruction on program control, data-handling, graphics, and so on. GOTO statements and flow charts are laid to rest, the absence of UNTIL and WHILE explained, the upstart REPEAT and EXIT introduced, and case studies added.

It's all good stuff and nicely presented. If it's not so very different from the QL's own manual, Atherton insists that a bit of repetition does no harm, not in a book designed both for complete beginners and also to type-convert the seething queue of Sinclair fans, already skilled on the old ZX81 and Spectrum, who are itching to upgrade into semi-professional circles.

If you think you stand a cat in hell's chance of getting a QL this side of Christmas, then I shouldn't hesitate to add this book to your stocking.

Fed up with Basic?

Title: Forth for Micros
Author: Steve Oakey
Publisher: Newnes Technical Books
Price: £6.50

Quite a thirst is developing for Forth, or so says Steve Oakey, who sees it as a kind of Basic GTi. It's a language that appeals to those who, having got the hang of regular Basic, are beginning to get hang-ups about the speed of its program execution.

The first recourse is traditionally to consider a Basic compiler, translating into a machine code that runs much faster than the interpreted program, but is a long-winded process and can drive you nuts to debug. Assembler is another option, often used to do frequent loops within a Basic program at a decent lick, but again there are snags. It is a damn nuisance, for instance, if you want to swap machines (generally you have to re-write your program's code sections) and frankly it's not much fun for any but the most doggedly persevering programmer.

Forth can be seen, Oakey suggests, as high-level assembler: an effective compromise between user-friendliness and speed. It expects you to do some of the work an interpreted language would do for you — like chucking familiar Infix notation (1+2+3) in favour of 'Reverse Polish' notation (12+3+) — and Forth prefers you to manipulate 'stacks' of last-in, first-out (LIFO) data, rather than rely on variables.

Forth, then, can be a bother to begin with, but it not only soon rewards you with a personal best program run, it actually gets easier to use because you build up a useful library of Forth subroutines.

Forth's biggest niggle is that it is still a developing language and at present comes in various forms. What Oakey sensibly does is take as normal the best-established versions (Forth-79 and Fig-Forth) and steer the novice through their common features, teaching by example and by comparison with Basic and Pascal, at least one of which he expects you to know. He does it rather well.

This book, he says, is meant as a conversion course into Forth's fundamentals: it does not have the scope to cover the entire language, nor does it attempt to tackle methods of efficiency within Forth programs. It's enough to gain a general insight. You start with the idiosyncratic arithmetic, progress to a few simple programs, get a nasty turn of the Booleans, then work your way through data types and extended input/output to emerge, dazed, into Forth's style of top-down structured listing.

It's an exercise best recommended for enthusiastic micro-programmers, the hobbyist who'd far rather marvel at a neat multi-dimensional array than zonk incoming aliens. Like the language he favours, Oakey maintains a cracking pace. If you can keep up, it's fun to go Forth.

The gospel according to a Logo disciple

Title: Microchild — Learning through Logo
Author: Serafim Gascoigne
Publisher: Macmillan
Price: £5.50

Logo, like Lego, is primarily for kids. Nevertheless it can be a powerful and adaptable language—much misunderstood, according to its fans — and the philosophy behind it is way too intense to be dismissed as kids' stuff.

Logo was devised in the 1960s by one Seymour Papert, a computer-smart US educationalist at the Massachusetts Institute of Technology (MIT), in association with a distinguished Swiss psychologist called Jean Piaget. Both were fascinated by the nature of intelligence, human and artificial, and both were taken with the idea that pre-school youngsters should be encouraged to do much more than say 'goo' to a micro.

Given appropriate tools and the right incentives, Papert and Piaget maintained, toddlers might demonstrate startling new approaches to conceptual thought. Moreover, as the computer revolution gathered pace, the world would quickly divide between those who could handle high technology and those who would find themselves pushed around by it. Computer training should, therefore, be second only to potty training. Baby hackers (young computer buffs, I mean) couldn't start too soon and Logo was customised for them.

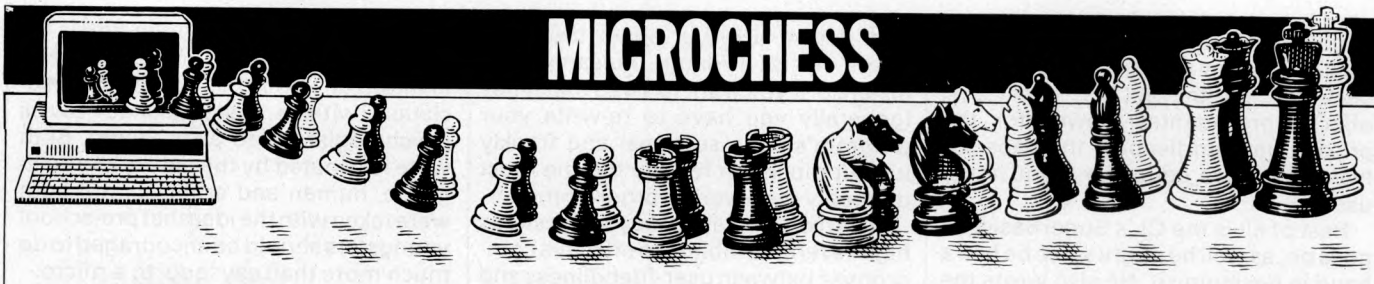
Serafim Gascoigne clearly goes along with this approach, despite the fact that Logo has been slow to catch on in the UK and has been devalued by upstart Logo look-alikes, able to do little more demanding than work a turtle. Gascoigne gives short shrift to Basic for its alleged tendency to make programming an end in itself. His enthusiasm for Logo (and the bulk of this book) stems from his experience of teaching sulky 8-9 year olds in Bradford.

There Logo's top-down method of reducing complex problems to more easily managed bits has apparently worked wonders motivating underachievers. Kids previously dismissed as thick oiks have, under Logo's influence, blossomed into little sharp-as-a-pin proceduralists.

It is acknowledged in passing that any structured version of Basic (BBC Basic being the obvious one) might have had similar effects, but Gascoigne is resolute that Basic will always be a language which at root is friendlier towards the machine than to the operator. Logo is to Basic as the New Maths is to old-fashioned arithmetic, he affirms. It's the future-proof way for kids to go.

Schoolteachers especially are likely to find this book a stimulating introduction to Logo — what it's for and how, in outline, it works — but they should bear in mind that proper Logo (and not just its turtle graphics) tends to work best on pretty pricey machines like the Apple II or IBM PC. The BBC doesn't currently support it, though the Sinclair Spectrum will. The QL, which Sir Clive Sinclair would dearly love to have in every school, presumably supposes that its own (procedural) SuperBasic has the edge.

Perhaps Gascoigne is right and Logo has not been given a proper trial with youngsters. I'm all for it when it's used for thought-provoking fun, but I'd stop short of seeing it as a first step towards some gee-whizz MIT dream of Utopian 2001. END



Of might and men

The recently released Colossus Chess 2.0 for the Commodore 64 claims to be the best home computer chess program on the market. An impressive statement and one which Tony Harrington cannot dispute.

It is good to see that the drive for faster and better chess programs is not just restricted to dedicated chess computer suppliers.

Colossus for the Commodore 64 is the second home computer chess program by Martin Bryant. It's nice to see that Bryant hasn't been resting on his laurels and has gone on to write a program which thrashes White Knight (his first program) by 11.5 to 5.5 over a 16-game match.

Although this result is taken from the manual, where Bryant claims to have played Colossus against just about every home computer program around, I have found no reason to dispute it. Colossus is definitely better and stronger than White Knight.

For a start, the manual consists of 14, clearly and concisely laid-out pages. The board graphics are neat, and the colours of the squares and the background border can be set by the user. This is something of a double-edged benefit. Beginners should note that this feature needs to be used carefully. My first attempt to vary the colours — provoked by the fact that with the default values, with black as the colour of the dark squares, the black pieces didn't show up well — created an illegal chessboard.

As the old adage has it, chessboards should always be set up with 'white in the right' — that is, a white square in the bottom right-hand corner. My attempt to redesign the colour scheme switched the dark and light squares. The result was that the set looked as if I was playing with the black pieces on an incorrectly set up board. For a moment or two I thought Byrant had got so involved with the program that he'd forgotten what a chessboard looked like!

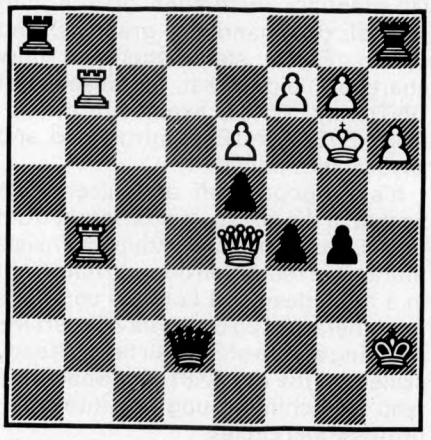
As well as the graphics display, there is an excellent 'status' screen, which has a number of very good features. It shows the time elapsed on both clocks and — an intriguing feature — during Colossus's thinking time, it shows the number of positions currently examined. The two left-most figures on this counter revolve at an amazing rate. More usefully, perhaps, this screen also shows the best line found so far by the program, up to its current look-ahead level (also displayed). You toggle between the board display and the status screen by pressing the space bar.

There are six playing modes, ranging from tournament level to problem mode. In practice, since mode 3 allows any clock setting, from blitz upwards, there is an endless set of playing levels. The program clock can be set independently, so weak players can give the computer a time handicap. Strong players can try handicapping themselves.

One of the good things about the design of this program — aside from its playing strength — is that all the commands are easily input. Compared to the highly complex command sequences we saw in last month's review of the Fidelity Elite, the commands are all of the single-key, capital letter type. All numerical input, even the clock setting, is done by pressing the up-arrow key to increase the default number, and the down-arrow key to decrease it. Position set up is the easiest I have come across yet and takes all the sting out of setting up complex positions.

Like several other home computer programs, it enjoys an advantage over dedicated chess computers in that games can be replayed on the screen at any stage from the beginning. Unlike all other home computers though, the replay is done automatically, with any move interval between one and 20 seconds. There are also backward move and forward move commands for stepping manually in either direction, for as many moves as you like (though there is an upper limit, imposed by the 64's memory, of around 120 moves).

Colossus has an excellent problem-solving mode (mode 6). Its strategy is to search all logical moves, beginning with the King and proceeding down through the pieces until it has found all possible mates. When one mate is found it asks 'Continue?' and goes on to check for others which, of course, there shouldn't be in a good chess problem. The manual claims that it can solve mate-in-seven problems. I tried it on



mate-in-two problems, which it solved almost instantly, and on the above mate-in-three problem, from Donald Bloss's book, *Rate your own Chess*.

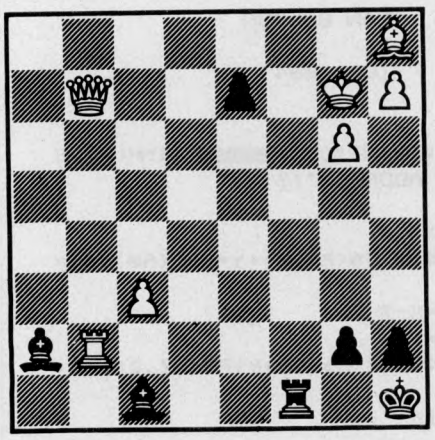
The program took 104 seconds to find the correct solution, which is 1) f4-f5+ e6×f5 2) Qd2×h6+ g7×h6 3) Ra8-g8 mate. In terms of speed, this performed on a par with a US Chess Federation rating of around 1740, according to Bloss's rating chart, but not too much should be made of this since: a) the ratings only begin to mean something over a series of problems; and b) Colossus's cast-iron technique of starting all its problem-solving by looking first at combinations beginning with the King, then the Queen, and so on, slow it down. Once it started looking at combinations beginning with the f-pawn it found the mate almost instantly, despite the five-ply finale.

The seven-move-mate limit cannot be exceeded because the program has a maximum look-ahead of 14 ply. Put into 'infinite mode' (mode 5) it will hunt for the best move, searching all combinations of all moves. It gradually

extends its search, ply by ply, until it either finds a mate or reaches the limit of its search, when it will report the best move available to it, according to its evaluation.

Interestingly, the program recognises self-mate problems as well as the more standard variety (self-mate, as the name implies, is where white has the first move and tries to mate himself in the shortest possible sequence). Bryant claims that this is a first for Colossus — certainly I am not aware of any other program that recognises self-mates. It is not a feature that will excite users unless they happen to be chess problem enthusiasts.

Much to its credit, Colossus, unlike White Knight, and almost all other home computer chess programs, recognises and can use underpromotions. To test this point, I set up the following problem — which, I might add, has nothing to recommend it as a chess problem except for the fact that it proves conclusively whether a program will underpromote when searching for a mate in problem mode.



The only one move mate in the position is the blindingly obvious 1) e7-e8=N checkmate. But for programs that haven't been told that pawns can become anything other than Queens when they reach the eighth rank, this is an impossible problem. They simply report that there is no mate in one — a technical absurdity. Colossus, I am happy to report, found the right move instantly.

It is much harder to tell whether it would underpromote spontaneously in a game, when the situations called for it, but I am prepared to give it the benefit of the doubt. The more sceptically minded may test this for themselves by finding a game where a player underpromotes successfully and keying in the appropriate position.

All in all, Colossus is a very neat, powerful little program.

SPEED CHESS
Game No 1. Player vs Colossus

1	e2-e4	Ng8f6	33	Ng4-e3	Bf5d7
2	e4-e5	Nf6-d5	34	Be5-f6	b6b5
3	c2-c4	Nd5-b6	35	Bc4-b3	Rh1-h5
4	d2-d4	d7-d6	36	g2-g4	Rh1-h2+
5	e5×d6	e7×d6	37	Kf2-e1	Rh2-h3
6	Bf1-d3	Nb8-c6	38	Ke1-e2	Rh3-h2+
7	Ng1-e2	Bc8-g4	39	Ke2-d3	Kb7-b6
8	f2-f3	Bg4-d7	40	Bf6×g5	Kb6-c5
9	Bc1-e3	Qd8-e7	41	Bg5d8	Kc5-d6
10	Be3-f2	d6-d5	42	Ne3-c2	a7-a6
11	c4×d5	Nb6×d5	43	Nc2-d4	a6-a5
12	Qd1-d2	Nc6-b4	44	Kd3-e4	a5-a4
13	Bd3-c4	Bd7-f5	45	Bb3-c2	Rh2-g2
14	0-0	Nb4-c2	46	Bd8-f6	Kd6-c5
15	Bc4×d5	Nc2×a1	47	Bc2-d3	Rg2×a2
16	Nb1-a3	0-0-0	48	Bf6-e7+	Kc5-b6
17	Bd5-c4	Qe7-b4	49	Be7-b4	Ra2-g2
18	Qd2×b4	Bf8×b4	50	Ke4-e5	Bd7-e8
19	Rf1×a1	Bb4×a3	51	Bd3-c4	Be8-d7
20	b2×a3	Rh8-e8	52	Ke5-f6	Rg2-f2
21	d4-d5	Kc8-b8	53	Kf6-e7	Bd7-c8
22	Ne2-f4	g7-g5	54	Nd4-f5	Bc8×f5
23	Nf4-h5	b7-b6	55	g4×f5	f7-f6
24	Nh5-f6	Re8-e7	56	Ke7×f6	Rf2-e2
25	h2-h4	h7-h6	57	Kf6-e7	Re2-e3
26	h4×g5	h6×g5	58	f5-f6	c7-c5
27	Ra1-e1	Re5×e1	59	d5×c6	Re3-e2
28	Bf2×e1	Rd8-d6	60	f6-f7	Re2-g2
29	Be1-c3	Kb8-b7	61	f7-f8=Q	Rg2-e2
30	Bc3-e5	Rd6-d8	62	Qf8-b8+	Kb6-a6
31	Kg1-f2	Rd8-h8	63	Qb8-b7+	mate
32	Nf6-g4	Rh8-h1			

Games section

White: V Korchnoi. Black: Nuchess. Notes by Grandmaster Dr John Nunn.

On 9 April 1984, the Dutch city of Delft witnessed a chess battle between Grandmaster Viktor Korchnoi, currently rated fifth in the world, and Nuchess, designed by David Slate and William Blanchard. The program ran on a Cray-1.

The game wasn't of much sporting interest since Nuchess made some weak moves early on which were more than enough for an opponent of Korchnoi's calibre. The two main errors were both of the same type and, although the game went on for a long time, the crucial phase lasted just five moves.

1	Ng1-f3	d7-d5
2	c2-c4	e7-e6
3	g2-g3	Ng8-f6
4	Bf1-g2	d5×c4
5	Qd1-a4+	Bc8-d7

(5 . . .Nb8-d7 is more common, but although the bishop development is unusual it is quite playable.)

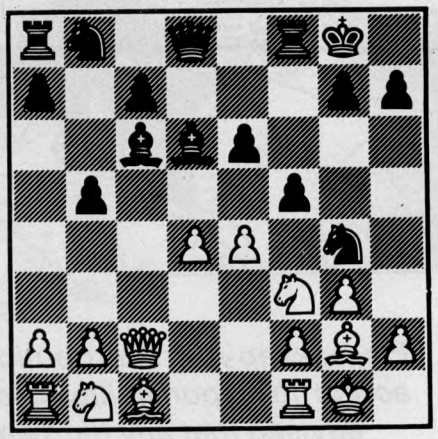
6	Qa4×c4	Bd7-c6
7	0-0	b7-b5?

(A very bad move. The program is tempted by the gain of time inherent in chasing back the white queen, but pays no regard to the long-term weaknesses created by this rash pawn advance. Human players think very carefully before pushing a pawn because such a move is irrevocable; it's no good deciding later that you shouldn't have committed the pawn, because you can't move it back again. 7 . . . b7-b5? means that the b-pawn can never again guard the squares c5 and c6, which is particularly serious here because Black no longer has a d-pawn which might have given alternative protection to these squares. The squares on the c-file become permanent Black weaknesses.)

8	Qc4-c2	Bf8-d6
9	d2-d3	0-0
10	e2-e4	Nf6-g4

(Defending against the threat to win a piece by e4-e5.)

11	d3-d4	f7-f5?



(The same mistake again! Now it is the e6 square which is deprived of protection, but unlike the earlier error, which could only be exploited gradually, this one leads to immediate loss of material.)

12	Nf3-g5	

(Straight away Korchnoi attacks the new weak point.)

12		. . . Qd8-d7
13	Qc2-b3	

(By reinforcing the pressure against e6 White puts Black in an impossible position. 13 . . . Rf8-f6 loses to 14 e4-e5, while after 13 . . . Rf8-e8 14 e4×f5 the pin along the b3-g8 diagonal nets two pawns.)

13		. . . Bc6×e4
14	Ng5×e6	Be4×g2
15	Ne6×f8+	Qd7-f7
16	Qb3×f7+	Kg8×f7
17	Kg1×g2	Kf7×f8

(The series of exchanges has given Korchnoi the advantage of rook for knight. If there is no compensation, this material plus is almost always enough to win.)

18	Nb1-c3	a7-a6
19	a2-a4	b5-b4
20	Nc3-d5	Nb8-c6
21	Bc1-f4	Bd6×f4
22	Nd5×f4	Nc6×d4
23	Ra1-c1	

(Black is finally made to suffer from the c-file problems caused by 7 . . . b7-b5? and must now return the pawn.)

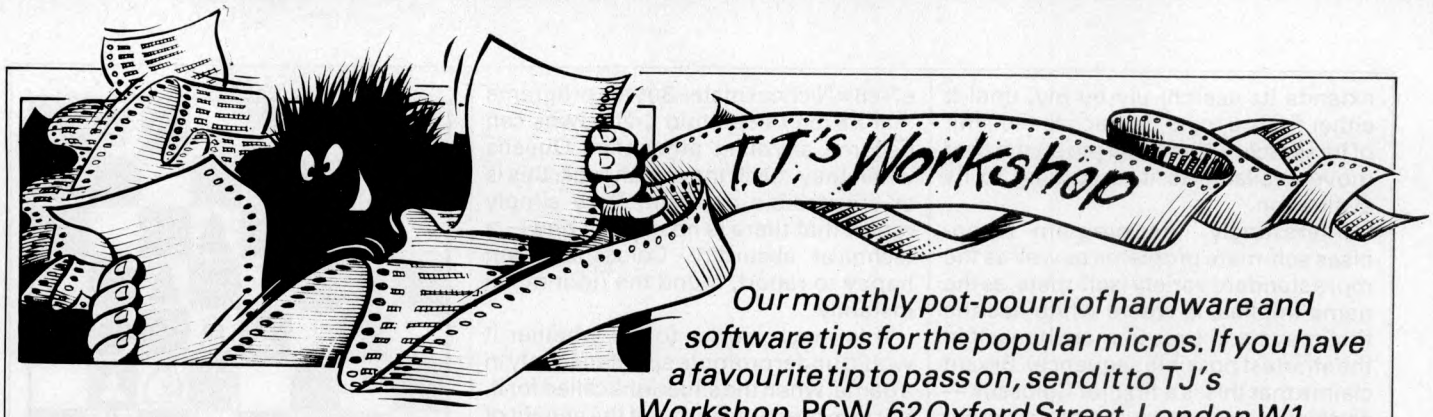
23		. . . Ra8-a7
24	Rc1-c4	Nd4-f3

(This leads to further exchanges leaving Korchnoi a piece up.)

25	Rc4×b4	Kf8-f7
26	Kg2×f3	Ng4×h2+
27	Kf3-g2	Nh2×f1
28	Kg2×f1	Kf7-e7
29	Rb4-b8	c7-c6
30	a4-a5	Ra7-d7
31	Rb8-b6	g7-g5
32	Nf4-h3	g5-g4
33	Nh3-f4	Rd7-d2
34	b2-b4	Ke7-d6
35	Rb6×a6	Rd2-b2
36	Ra6-b6	Rb2-b1+
37	Kf1-e2	Rb1-a1
38	Ke2-e3	Ra1-a3+
39	Ke3-d4	Ra3-a2
40	Nf4-d3	h7-h6

(and Black resigned.)

Colossus is available from CDS Micro Systems. Tel: (0302) 21134. END



Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to TJ's Workshop, PCW, 62 Oxford Street, London W1.

Please keep your contributions concise. We will pay £5-£30 for any tips we publish. PCW can accept no responsibility for damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

SPECTRUM ADVICE

(1) It is often useful to save the Basic variables in order to store a games position or data created by a more serious program. Although there is nothing in the Spectrum ROM to achieve this, the following routine produces the results:
LET peek1=PEEK 23635:LET peek2=PEEK 23636:POKE 23635,PEEK 23627:POKE 23636,PEEK 23628:SAVE "name":POKE 23635, peek1: POKE 23636,peek2

The variables saved can be verified by substituting VERIFY in place of SAVE, and the variables can be reloaded by entering MERGE "name".

The routine works by fooling the Spectrum into treating the variables as a Basic program and then saving in the normal way.

(2) When carrying multiple saves I find it irritating to have to keep pressing a key in between each save. This can be avoided by including POKE 23736,181 between the saves. For example:
SAVE "Basic":POKE 23736,181:SAVE "mcode":POKE 23736,181:SAVE "udg"

If required, a gap can be incorporated between the saves by including a PAUSE command before the POKEs.

(3) The necessity to keep removing the microphone lead when saving programs can be avoided by simply using longer leads—three foot, being the normal length available, works fine.

I am no electrical wizard, but assume the additional resistance in the wires does the same job as some of the relatively expensive add-ons.

John Palmer

COMMODORE SCREEN SCROLL

This program consists of a set of scroll routines. These allow the screen to be scrolled up, down, left or right one character at a time. The program was written containing no jumps, so the code can be located anywhere in memory. When the program loads it asks for the start location for the machine code: I would suggest 49152. The code is then loaded starting at the specified address and the appropriate locations for each scroll are displayed. If the start address is 49152, then the scrolls are called as follows:
SCROLL LEFT...SYS 49152
SCROLL RIGHT...SYS 49255
SCROLL DOWN...SYS 49373
SCROLL UP...SYS 59626

The scroll up is a call to the KERNAL ROM scroll routine and always has the same value.

In games or business programs, often only a portion of the screen is required to scroll while the rest of the display remains fixed. The following POKES will adapt the scrolling routines to maintain fixed 'windows' on the screen while the rest of the display scrolls as normal.
POKE 49199,0: POKE 49171,24—top six lines don't scroll left
POKE 49252,193: POKE 49180,48—bottom six lines don't scroll left
POKE 49324,0: POKE 49356,8—bottom five lines don't scroll right
POKE 49381,207—bottom six lines don't scroll down
POKE 49282,0: POKE 49347,240: POKE 49309,255: POKE 49310,4—top six lines don't scroll right

The program incorporates a checksum feature to make sure the hex data is correct. If you get a 'DATA ERROR' message when you run the program, check the data statements again.

S Bolton

```
1 REM ****     SCREEN  SCROLL     ****
2 REM                 BY
3 REM
4 REM            SEAN BOLTON
5 REM
6 REM ****        (C) 1984        ****
7 REM
8 T=0:W=Z
9 POKE53281,11:PRINT"[redacted]":INPUT" E
NTER THE START ADDRESS";Z:W=Z
10 READA$
20 IFA$="S"THEN100
30 X=ASC(A$):A$=MID$(A$,2):Y=ASC(A$):A$=
MID$(A$,2)
40 IFX>57THENX=X-7
50 IFY>57THENY=Y-7
60 X=X-48:Y=Y-48:Q=(X*16)+Y:POKEZ,Q:Z=Z+
1:T=T+Q
70 IFA$=""THEN10
80 GOTO30
100 IFT<>31580THENPRINT" DATA ERROR.....
.":END
110 PRINT:PRINT" SCROLL LEFT......SYS"W
120 PRINT" SCROLL RIGHT.....SYS"W+103
130 PRINT" SCROLL DOWN......SYS"W+221
140 PRINT" SCROLL UP........SYS 59626"
150 END
510 DATA18D8,AD0005,8DFD02,AD0006,8DFE02
,A200,A920,9D0004,9D1805,9D3006
520 DATA9DF806,188A18,C9F0,F007,18,6928,
AA,18,90E4,A200,BD0104,9D0004
530 DATABD0105,9D0005,BD0106,9D0006,E8,E
0FF,D0E9,18,ADFD02,8DFF04,ADFE02
540 DATA8DFF05,AD0007,8DFF06,18,A200,BD0
107,9D0007,E8,E0E9,D0F5,60
550 DATA18D8,ADFF04,8DFD02,ADFF05,8DFE02
,ADFF06,8DFF02,18,A2FE,BD0004,9D0104
560 DATABD0005,9D0105,BD0006,9D0106,E000
,F004,CA18,90E6,18,ADFD02,8D0005
570 DATAADFE02,8D0006,18,A2E9,BD0007,9D0
107,E000,F004,CA,18,90F2,18,ADFF02
580 DATA8D0007,18,A200,A920,9D0004,9D180
5,9D3006,9DF806,18,8A,18,C9F0,F007
590 DATA18,6928,AA,18,90E4,60
600 DATA18D8,A2F0,BDCF06,9DF706,CA,D0F7,
18,A2F0,BDDF05,9D0706,CA,D0F7,18
610 DATAA2F0,BDEF04,9D1705,CA,D0F7,18,A2
F0,BDFF03,9D2704,CA,D0F7,18,A920
620 DATAA228,9DFF03,CA,D0FA,60
630 DATA5
```

BBC MACHINE CODE RELOCATOR

The following routine will relocate 6502 machine code by physically changing addresses of JMP and JSR instructions.

The user is first prompted to enter the start, end and relocation addresses of the code. The routine will check the code and alter it where necessary.

For example:

Start address? &2000
End address? &2006
Relocation address? &4000

A typical piece of code would be changed as shown below.

The relocated code will not be transferred to address &4000. It must be transferred by the user. The easiest way for BBC and Electron users to achieve this is:

SAVE Example 2000 +6 4000 4000
LOAD Example

As the routine stands it will only run on the BBC and Electron, but it needs little alteration to run on other 6502-based machines. Non-BBC and Electron users should omit line 660 since it checks for operating system calls in the BBC ROM. Commodore 64 users should remember that the 6510 CPU is a version of the 6502 and so the relocator can be run on the 64 with little modification.

RA Lober

Address	Original code	Relocated code
&2000	CLD	CLD
&2001	BCS &2006	BCS &2006
&2003	JMP &2500	JMP &4500
&2006	RTS	RTS

```
10REM 6502 machine code relocater.
20REM By R.A.Lober
30REM 25.7.84.
40REM Do not renumber this program.
50
60REM Written in simple BBC Basic.
70REM & so should easly be
80REM translated to other 6502
90REM based machines :Commodore,
100REM Atari, Orics, Apple II & IIIs
110
120REM This routine DOES NOT move any
130REM code but over writes it
140REM changing address. Therefore
150REM code must be moved by the
160REM user.
170
180REM This routine will not take
190REM account of data tables & text
200REM & so the user must be accurate
210REM when giving start & end
220REM addresses.
230
240CLS
250CX=0: REM Number of JMPs & JSRs.
260
270INPUT"Start address ";A$:S%=EVALA$
280INPUT"End address ";A$:E%=EVALA$
290INPUT"Relocate address ";A$:R%=EVALA$
300IF E%<S% PRINT"Illegal entry ":GOTO270
310IF S%<TOP AND S%>PAGE PRINT"Area used by BASIC":GOTO270
320REM Main loop.
330
340FOR B%=S% TO E%
350I%=?B%
360GOSUB410
370NEXT
380PRINTCX;" JSRs & JMPs found."
390END
400REM Check op code & find len. of data
410
420IF I%=&4C OR I%=&20 GOTO630
430N%=0:F%=-1
440REPEAT
450RESTORE (N%*10)+560
460IF F%=-1 N%=N%+1
470REPEAT
480READ F%
490UNTILF%=I% OR F%=-1
500UNTILF%<>-1 OR N%=4
510B%=B%+(N%-1): REM Skip data bytes.
520IF F%=-1 PRINT"Unknown op code &";~I%;" at byte ";~B%
530RETURN
540
550REM Tables of op codes.1,2 & 3 bytes
560DATA 00,&0A,&4A,&2A,&6A,&18,&D8,&58,&B8,&CA,&88,&E8,&C8,&EA,&48,&8,&68,&28,
&40,&60,&38,&F8,&78,&AA,&A8,&BA,&9A,&8A,&98,-1,-1
570DATA &69,&29,&C9,&E0,&C0,&49,&A9,&A2,&A0,&9,&E9,&65,&25,&6,&24,&C5,&E4,&C4,
&C6,&45,&E6,&A5,&A6,&A4,&46,&5,&26,&66,&E5,&85,&86,&84,&C1,&41,&A1,&1,&E1,&81,&7
1,&31,&D1,&51,&B1,&11,&F1,&91,&75,&35,&16,&D5,&D6,&55,&F6,&B5,&B4,&56,&15,&36
580DATA &76,&F5,&95,&94,&90,&B0,&F0,&30,&10,&D0,&50,&70,&96,&B6,-1,-1
590DATA &6D,&2D,&E,&2C,&CD,&CC,&EC,&CE,&4D,&EE,&20,&AD,&AE,&AC,&4E,&D,&2E,&6E,
&ED,&BD,&BC,&BE,&DD,&DE,&5D,&FE,&BD,&BC,&5E,&1D,&3E,&7E,&FD,&9D,&D9,&59,&B9,&BE,
&19,&F9,&99,&6C,-1,-1
600DATA -1
610REM Change address of JSR & JMPs.
620
630L=B%?1:H=B%?2
640A=(256*H)+L
650IF A>&C000 GOTO690 :REM don't change if it is an OP system address
660A=A+(R%-S%)
670B%?1=A MOD 256
680B%?2=A DIV 256
690B%=B%+2: REM skip address bytes
700CX=CX+1
710RETURN
```

SPECTRUM ON ERROR GOTO

This routine allows any Spectrum owner to make the computer perform certain operations when an error has occurred in a Basic program. Many Basics found on more expensive machines, such as the BBC or Apple, have an instruction such as ON ERROR GOTO 1000, which makes the computer execute from line 1000 in the program when an error has occurred—such as 'Integer out of range' or 'Out of memory'. At line 1000 then, the type of error found in the program could be used to tell the user what has happened, and why.

This routine uses the variable 'error' (if it has been assigned a value) and jumps to the line number that this variable contains. If the variable does not exist, or has the value 0, then there will be no jump and the usual report will appear. If the line number is larger than the largest one in the program, then the 'OK' report will appear—just as GOTO 9999 will produce the 'OK' report if there is no such line number as 9999.

The routine also creates two new variables (or alters them if they already exist) called 'err' and 'erl'. The variable 'err' is assigned the code of the error—0 to 27 (0 = OK, 4 = Out of memory, and so on). All these codes are in appendix B of the manual. The variable 'erl' is assigned the line number at which the error occurred.

If, however, there is an error in a direct command, such as RANDOMIZE 65536, the variable 'erl' will contain the number 65534 which is the line number of any direct command.

As it stands, the routine will not make the computer jump if the error is one of the following:

STOP statement;
BREAK—CONT repeats;
STOP in INPUT;
BREAK into program; and
OK

A jump to the specified line can be made by entering:

FOR f=60125 TO 60144:
POKE f,0: NEXT f (for the 48k).

This will cause a jump to the line number in the variable 'error' every time the computer tries to print a report other than OK.

Now here's the problem: if you do enter the line above, you must be sure that the line you want when an error occurs contains no error itself! If there is one, the computer will keep jumping to that line *ad infinitum*—you will not be able to BREAK into it.

If the line does contain an error, but you haven't entered the line above, you will be able to break into the loop.

James Torjussen

```
 30 REM *    ON ERROR GOTO     *
 50 REM *      Written by      *
 70 REM *   James Torjussen    *
110 REM *       for the        *
130 REM *  48K  ZX Spectrum    *
160 REM
170 CLEAR 59999
180 PRINT  OVER 1;AT 8,13;"PLEA
SE";AT 10,14;"WAIT"
190 PLOT 129,30: DRAW  OVER 1;0
,145,253*PI
200 DATA "33882ab25c363e2bf92b2
b223d5c1807fd363102cd9517cdb0163
e00cd0116fd3600ffcd2c0fcd171bfdc
b007e2013fdcb3066cad5ea2a595ccda
711fd3600ff18d82a595c225d5ccdfb1
978b1c208ecdffe0dca6eeafdcb3046c
4af0dcd6e0d3e19fd964f328c5cfdcb0
1fefd3600fffd"
210 DATA "28e9360a01cd8a1b3a3a5
cfeffca7aebfe08ca7aebfe0cca7aebf
e10ca7aebfe14ca7aeb2168ec225d5cc
db22830132a595c2b010800cd5516233
6a52336722336f2233a3a5c3c3600233
600237723360023600216cec225d5cc
db22830132a595c2b010800cd5516233
6a52336722336"
```




```
  220 DATA "2cefec23ed4b455c36002
336002371237023360021 62ec225d5cc
db228381f23cdb433cda22d78b128143
e0032445c3d323a5ced43425c11d5ead
5c3761b76fdcb01aefdcb304ec4df0e3
a3a5c3cf5210000fd7437fd7426220b5
c21010022165ccdb016fdcb37aecd6e0
dfdcb02eef147"
  230 DATA "2b1ffe0a3802c607cdef1
53e20d778119113cd0a0caf113615cd0
a0ced4b455ccd1b1a3e3ad7fd4e0d060
0cd1b1acd97103a3a5c3c281bfe09280
4fe152003fd340d01030011705c21445
ccb7e280109edb8fd360afffdcb019ec
375eaed43495c2a5d5ceb215aece52a6
15c37ed52e560"
  240 DATA "20bf69cd6e192006cdb81
9cde819c1793db02828c5030303032be
d5b535cd5cd5516e122535cc1c5132a6
15c2b2bedb82a495cebc1702b712b732
b72f1c36eea3e0a010000c38aeb45525
24f520d4552520d45524c0d000000000
0000000000000000000000000000000
0000000000000"
1000 LET a=10: LET b=11: LET c=1
2: LET d=13: LET e=14: LET f=15:
 LET h=60000: LET l=200
1010 FOR g=1 TO 5
1020 READ a$: LET s=VAL a$(1)*40
96+VAL a$(2)*256+VAL a$(3)*16+VA
L a$(4): LET a$=a$(5 TO )
1030 LET t=VAL a$(1)*16+VAL a$(2
): LET s=s-t: POKE h,t: LET h=h+
1: LET a$=a$(3 TO ): IF a$<>"" T
HEN GO TO 1030
1040 IF s<>0 THEN PRINT AT 19,0
;"Error in line ";l: STOP
1050 LET l=l+10
1060 NEXT g
1070 PRINT OVER 1;AT 8,13;"PLEA
SE";AT 10,14;"WAIT"
1080 PRINT OVER 1;AT 9,15;"OK!"
1090 PLOT OVER 1;129,30: DRAW
OVER 1;0,145,253*PI
1100 LET a$="To use, type RANDOM
IZE USR 60000"
1110 FOR f=1 TO LEN a$: PRINT AT
 19,32-f;a$( TO f): BEEP .02,20:
 PAUSE 4: NEXT f
```

LABELLING APRICOT DISKS

The Apricot disk format facility does not support the MS-DOS 2.0 volume label /V switch feature, so you end up with all your disks labelled 'Apricot' — nice for ACT, but annoying because you have to take the disk out of the drive if you've forgotten the label name.

With the help of DEBUG.COM you can change this:

Enter DEBUG DISK.OVL

then write S 0000 L FFFF "Apricot"

You will usually find the /V switch location with no other program in memory at 4C90:

Write E (location) "newlabel" (max. 11 letters inc spaces),

check your entry: D (location),

OK? Write W which will put your "newlabel" into the DISK.OVL file.

Anyone who is new to DEBUG should experiment on a copy of the DISK.OVL file because mistakes can have disastrous results.

John W Lyth

NEC HAND-HELD HINTS

There are several external device names, not all of them explained in the manuals:

RAM: RAM memory

CAS: cassette

COM: RS232 communication link

LCD: screen

LPT: parallel printer

and it is perfectly correct to use

OPEN "LPT:" FOR OUTPUT AS#1

PRINT#1,A$;B$

instead of

LPRINT A$;B$

which can sometimes be useful (see the program in Basic Reference Manual p9-15 for an example; correct "SCRN:" to "LCD:" on line 410).

Contrary to what the Basic Reference Manual states on p4-103, it's possible to use both the data recorder and RS232 circuit simultaneously. I wrote a program which reads a text file from the data recorder and sends it through RS232 to IDS 460 printer. It works well, simply because I didn't notice the remark on p4-103 and didn't realise that such a connection should be impossible.

Finally, here's a memory dump program for the PC-8201A which can be used to find out some interesting things about the machine (for example, locations of file control blocks, undocumented keywords, and so on). The progam works in two modes: ASCII (characters only) or full dump (hex values and characters).

Notes:

(1) Output may be suspended by <CTRL—S> and resumed by <CTRL—Q>.

(2) Output may be interrupted by pressing the space bar (do not use STOP as it does not properly close the file and reclaim the buffer space).

MJ Wiechowski

```
 10 GOTO 35
 11 'Hex -> Dec
 12 D=0:FOR I%=1 TO LEN(H$)
 13 H1$=MID$(H$,I%,1):D%=ASC(H1$)-48
 14 IF D%>9 THEN D%=D%-7
 15 D=16*D+D%:NEXT I%:RETURN
 16 'Dec->hex4
 17 H$="":FOR I%=1 TO 4
 18 D%=D-16*FIX(D/16):D=FIX(D/16)
 19 IF D%<10 THEN H$=CHR$(D%+48)+H$
 20 IF D%>9 THEN H$=CHR$(D%+55)+H$
 21 NEXT I%:RETURN
 22 'Dec->hex2
 23 H$="":FOR I%=1 TO 2
 24 D%=D MOD 16:D=FIX(D/16)
 25 IF D%<10 THEN H$=CHR$(D%+48)+H$
 26 IF D%>9 THEN H$=CHR$(D%+55)+H$
 27 NEXT I%:RETURN
 28 'Outchar
 29 IF V%<32 THEN PRINT#1,".";:RETURN
 30 IF V%>130 THEN PRINT#1,".";:RETURN
 31 PRINT#1,CHR$(V%);:RETURN
 32 'Interrupt?
 33 Z$=INKEY$:IF Z$=" " THEN RETURN 54
 34 RETURN
 35 'Main
 36 MAXFILES=1:CLS
 37 INPUT"From (hex)";H$:GOSUB 11:F=D
 38 INPUT"Output (LCD:,LPT:,COM:)";OF$
 39 OPEN OF$ FOR OUTPUT AS#1
 40 INPUT"Ascii only";Q$:CLS
 41 IF Q$="Y" OR Q$="y" GOTO 49
 42 FOR I=F TO 65535! STEP 8
 43 D=I:GOSUB 16:PRINT#1,H$;" ";
 44 FOR J=I TO I+7:V%=PEEK(J):D=V%
 45 GOSUB 22:PRINT#1,H$;" ";:NEXT J
 46 FOR J=I TO I+7:V%=PEEK(J)
 47 GOSUB 28:NEXT J:PRINT#1,""
 48 GOSUB 32:NEXT I:GOTO 54
 49 FOR I=F TO 65535! STEP 32
 50 D=I:GOSUB 16:PRINT#1,H$;" ";
 51 FOR J=I TO I+31:V%=PEEK(J)
 52 GOSUB 28:NEXT J:PRINT#1,""
 53 GOSUB 32:NEXT I
 54 CLOSE:MAXFILES=0:END
```

T.J.'s Workshop

QL SCREEN EDITOR

One of the most annoying features on the QL is the lack of a proper screen editor. The obvious answer is to use the Quill word processor supplied free with the machine, which gives access to full SEARCH and REPLACE facilities. To transfer programs between Superbasic and Quill, they must be written as ASCII files onto microdrives.

(1) To save a program as an ASCII file:

```
OPEN_NEW#3,
  MDV1_filename_lis
LIST#3
CLOSE#3
```

(2) To save a document as an ASCII file:

Using the INSTALL_bas program, install microdrive as a printer where the end of line character is a linefeed only (no carriage return).

Remove the HEADER and FOOTER from the document.

PRINT the document to MDV2_filename.

The files can now be loaded using MERGE (SuperBasic) and IMPORT (Quill).

For example, to load a program and save it as an ASCII file.

S Biggs

```
32751 choose command$
32752 MERGE command$
32753 command$(4) = "2"
32754 command$ = command$ & "_lis"
32755 OPEN_NEW #5, command$
32756 LIST #5, TO 32750
32757 LIST #1, TO 32750
32758 CLOSE #5
32759 DEFine PROCedure choose (command$)
32760  DIR mdv1_
32761  INPUT 0, "Which file";command$
32762  command$="mdv1_" & command$
32763 END DEFine choose
```

VISICALC TIPS

(1) Printing tips

Have you noticed that the start and end positions of a print are seldom on the screen together? You can waste time running the cursor down to the place you think you used last time without wrap-around on the printer. On the other hand, you could put the bottom print cell coordinate into a cell just left or above the starting cell. Perhaps you already do. If not, try it! See below for an example in cell C1.

There are important restrictions to consider when creating a sheet as to the size of the numbers used and the amount of columns to screen or print. The numbers below form an easy guide to checking and initial design of sheets.

```
Chars/col 5 6 7 8 9 10 11 12 13
  14 15 16
Scr 64 Y 12 10 9 8 7 6 5 5 4 4 4
        N 13 11 10 9 8 7 6 6 5 5
          5
Prt 80 Y 16 13 11 10 8 8 7 6 6 5 5
          5
        N 17 14 12 11 9 9 8 7 7 6 6
          6
```

(2) Error flags

Just suppose you miss a decimal point in your data entry and the results are way out. Can you quickly find the line or even the cell to change it, or perhaps there are more than one? Don't panic, try this. Use the * format for a cell on the far right or bottom of a sheet.

Let's say you are checking a calculation less than 100%. If the sum calculated in a total column has 100 taken from it and the result is a positive number, then the cell will 'flag' the error using asterisks. Errors less than the column width can be found; for example, a column width of 8 will show an error value of 6 as six asterisks.

Or you can temporarily change the cell's format back to no format for the value to appear to help find the culprit. A cross reference grid of a row and a column of error checks will exactly point to the error, though it can waste precious memory if taken too far. I use a column on the right in a split screen of a couple of columns and enter data on the left screen, then call the calculation manually (!) to check for errors. See columns U and V below. The formulas are U4/F*(V) @SUM(E5...H5)-A5. The formula quoted above is U12 /F*(V)+I12−100.

John A Wilkinson

```
A4 (V)  +A2-(A1*A2)                                                    C

  ...A....B....C....D....E....F....G....H....I..    ..U...V..
1     1 1=BH D2T56 MAIN HALL USAGE FOR W/E.....
2    84   78                <----OFF PEAK--   84---->  2.** = ERRO
3 OFFP PEAK   TOT  DAY CASL ADVB UB40 OTHR %USE  3.OFFP PEAK
4    84   78  162  MON                        0  4.
5    84   78  162  TUE                        0  5.
6    84   78  162  WED                        0  6.
7    84   78  162  THU                        0  7.
8    84   78  162  FRI                        0  8.
9        162  162  SATXXXXXXXXXXXXXXXXXXXXXXXXX  9.
10       156  156  SUNXXXXXXXXXXXXXXXXXXXXXXXXX 10.
11 ============================================= 11.==========
12  420  708 1128 %USE    0    0    0    0    0 12.
13 OFFP PEAK  TOT DAY  CASL ADVB UB40 OTHR %USE 13.
```

SPEEDY PROGRAMMING ON THE AMSTRAD

The program

```
1 KEY 128,"LIST":KEY
129,"NEXT":KEY
130,"RETURN"+CHR$(13):
  KEY
131,"EDIT":KEY
132,"GOSUB":KEY
133,"MODE2:INK 1,0:INK
  0,22:BORDER
  22"+CHR$(13):KEY
134,"AUTO":KEY
135,"LOCATE":KEY
136,"GOTO":KEY
137,"THEN":KEY
138,"RUN+CHR$(13):NEW
```

Re-define the keypad as shown in the diagram. Type in the program (then SPEED WRITE 1 & SAVE). Re-set (CTRL + SHIFT + ESC). Load & Run tape (CTRL + ENTER on keypad). The keypad now responds to keywords as in the diagram. The program has NEW'd itself and the keywords marked with an asterisk also produce a carriage return.

This routine is very useful for speedy programming—it only takes seconds to load from tape and run. The 5 key returns a screen which is easy to read in 80-column mode (mode 2). This could also be a second 'escape' key should you find text, paper and pen colours 'lock' and you are typing 'blind'.

Derek R Messenger

7	8	9
4	5	6
1	2	3
0	.	ENTER

LOCATE	GOTO	THEN
GOSUB	see text*	AUTO
NEXT	RETURN*	EDIT
LIST	RUN*	ENTER

END

COMPUTER ANSWERS

Send your queries to Tony Hetherington, PCW, 62 Oxford Street, London W1. Note that Tony cannot answer questions on an individual basis, so please don't send an SAE with your query.

Phone-in question

Please could you tell me which is best: an 'acoustic coupler' or a 'direct connect' modem?

Also is it possible for someone to phone any terminal or computer with either one? By the way, my computer is a CBM 64K.

Cliff Iriri, Cardiff

An acoustic coupler is designed to work in conjunction with a normal domestic telephone set. The coupler has two rubber cups which hold the telephone handset. When you want to link up to another computer you dial its number in the normal way on your telephone, and when you hear the carrier tone you plug the handset into the coupler. It then uses the microphone in the handset to send signals and the speaker in the handset to listen.

As the name suggests, direct connect modems are plugged directly into the phone system. This usually means that you unplug your phone from the wall socket and plug the modem in instead. If your modem doesn't have an 'auto-dial' facility, you will also have to connect your telephone in parallel, so that you can dial the telephone number.

The main advantages of direct connect modems are that they are more reliable than acoustic couplers and they can also operate at higher transmission speeds (acoustic couplers usually run at 300 baud, whereas direct connect modems can work at up to 1200 baud). Direct connect modems also tend to be cheaper.

You can only phone remote computers which have modems compatible with yours and which run on the same settings at the same speed. The most common speeds are 300/300 baud and 1200/75 baud. 300/300 will get into most bulletin boards, Telecom Gold, and so on, whereas 1200/75 will get into Prestel and Compunet. For more information on settings see the 'Networks' section.

Finally, as you have a Commodore 64 your best bet is probably to join Commodore's 'Compunet' dial-up service. This gives you a 1200/75 direct connect modem and access to the Compunet database. Details from:

1 Hunters Way
Weldon
Corby
Northamptonshire NN17 1QX

Learning a new language

In the hope of increasing computer awareness among my employees I run a number of computer classes for my company. I have successfully taught Basic and am now looking at other computer languages and their application.

Can you help?

Ron Bright, Chesterfield

There are a number of alternative languages available for the more popular micros. Having worked with a Basic interpreter, it would probably be interesting to look at a compiler in order to appreciate the increase in speed of programs and the extra stages a compiled program must go through before it can be run.

I will try to cover the most common languages available on micros and the type of application to which they are suited, leaving you to choose the ones you wish to cover.

First up is Logo, an increasingly popular micro language. The greatest attraction of this language for most people is its graphic capability. Logo graphics are generated by an imaginary turtle crawling across the screen with a paint-brush attached to its tail. Simple commands are used to move the turtle, such as FORWARD 100 and RIGHT 45. People who find generating graphic screens difficult in Basic usually find Logo a joy to use because of these 'turtle graphics' commands. Logo's biggest success has been in educational environments with children from the ages of six upwards being taught a structured approach to problem solving.

It is important to realise that Logo is not just turtle graphics but a complete computer language with the ability to define your own commands, list processing and all other computer language features. Logo is, however, an interpreted language and not particularly fast. Of the Logos I've seen on micros, Apple Logo and Terrapin Logo for the Apple, Atari Logo and Sinclair Logo are good implementations. Sinclair Logo was reviewed in October's *PCW*— but watch out for so-called Logos that are only turtle graphics programs.

For a complete contrast from Basic programming try the Lisp language. Lisp stands for LISt Processing. In Lisp everything is represented in list form and all operations are operations upon these lists. Although specifically designed for this purpose it has been adopted by the Artificial Intelligence fraternity and forms a good basis for experimentation in this area.

Lisp is one of the oldest computer languages, being designed to run on an IBM mainframe in the early 1960s. I feel that the transition from Basic to Lisp could be difficult as Lisp contains some idiosyncrasies from that old IBM mainframe. This is especially true for inexperienced Basic programmers. Lisp is available for very many home micros including the Spectrum, BBC, IBM PC and others. For a detailed description of the language and a tutorial, look at *PCW*'s back issues from July 84 onwards for Dick Poutain's 'Teach yourself Lisp' series.

On to Pascal, which was designed for use in teaching students computer programming. The idea behind Pascal was to produce very reliable programs which could be easily understood, modified and reflect the algorithm used to implement your program. Pascal also has a high reputation in terms of portability and transferring a program from one machine to another. It is probably a good choice for a second language as it is compiled.

Pascal is also available for a number of micros. The most popular version is one known as UCSD Pascal — general micro Pascal compiled into a special internal code known as P-code which is then interpreted, but the difference in speed can still be appreciated.

Another language, Forth, has a great following among the 'hacker' type of computer enthusiast. Forth systems give you a very small group of central commands from which you generate your own commands. It has been used to design the software within arcade machines, giving you some idea of its power. Although it is possible to generate readable programs in Forth, a lot of Forth users seem to delight in writing their programs as cryptically as possible.

Other languages you might consider are C, which is like Pascal but gives you a lot more power to deal directly with the machine you're programming; Action, a 'C' and Pascal clone available for Atari micros; and Cobol, a business language that will run on CP/M and other business-like operating systems.

Viva España!

My problem is finding a word processor suitable for our Spanish Department. It must be complete (inc monitor and printer) and cost less than £4000 inclusive of a year's supply of any necessary software (floppy disks, printing ribbons, and so on).

The prospective machine needs to perform two tasks: firstly, store the kind of information that is currently held on cyclostyled sheets in the secretarial office (booklists, and so on) allowing easy and quick revisions to be made; and secondly, enable members of staff to put drafts of articles and books onto disk for subsequent (and usually repeated) text-editing (including re-paragraphing and re-pagination).

To date I have run up against two problems. We need a keyboard that has all the necessary Spanish as well as English characters, that is,

¿ ¡ ñ ´ (and if the accent is on a dead key so much the better). We need a printer with italic font as well as roman if we are to achieve neat, camera-ready copy. The problem here seems to be the mixing of the two typefaces on the same page: if you leave a gap for the later insertion of italic words and titles you can easily foul the line when re-adjusting the paper in the printer.

Is there an answer?
Dr Alex Longhurst, Spanish Dept, Leeds University

There's no need to buy an expensive dedicated WP system nowadays unless it's got to take an eight-hour-a-day pounding in a typing pool. The main difference between dedicated systems and microcomputers used as word processors is that the latter are tank-like in construction.

Your problem wouldn't be a problem if you lived in Spain because you could buy an off-the-shelf system (for example, an IBM PC, WordStar and an Epson FX-80 printer) all ready to run in Spanish and English.

In the UK, however, it's not so easy. There are two main problems: the computer keyboard has to be reconfigured to give foreign character entry and screen display; and the printer has to be able to print the desired characters.

Regarding keyboard and screen, the IBM PC and lookalikes win hands down, since PC-DOS (the IBM PC operating system) includes routines known generally as KEYB command files. Simply type, for example, KEYBSP at the keyboard and it becomes a Spanish one, with a dead key for accenting vowels, and so on.

You don't indicate whether you want daisywheel or matrix output. With today's matrix printers you can often achieve Near Letter Quality (NLQ) printout which should be good enough for your requirements. Furthermore, a matrix printer can swap between fonts itself, whereas unless you spend a few thousand pounds on a two-wheel daisy machine, you have to stand over a single wheel one waiting for the computer to tell you to 'change print wheel now.' That's how it copes with different language character sets — you put a wheel for the language required into the printer every time the text changes language.

So we're down to an IBM PC, a matrix printer (either the IBM graphics printer, which is an Epson MX-80 customised to include extended graphics and font capability) or an Epson FX-80. The last part of the equation is the software. Although you can get word processing packages such as WordStar and Wordcraft in foreign language versions, you'll only get one language pair for your money. That's because the package allows you to write English anyway because (as you know) there are no funny 'squiggles' over or under English letters.

Since you'll have to order a foreign language version anyway, I suggest the best package for you is the Western European version of a word processor called Multilingual, from a company called Economic Insights, 416 Center Street, 365, Washington Grove, Silver Springs, Maryland 20880, tel: (301) 258 5235. For $450 you get a WP package for the IBM PC which can display and print character sets for all West European languages of the Indo-European family.

The total package should come well within your £4000 budget.

Distribution slip-up

Your Benchtest of the Osborne Encore in the August issue failed to mention the machine's distributor. Could you let me know who is handling it in this country?
Anne Norden, London N3

The Osborne range of computers is distributed in the UK by Future Management Corporation Ltd. Any readers interested in the Encore should direct their enquiries to David Uwins, sales manager, at the following address:
Future Management (Portable Computers) Ltd
38 Tanners Drive
Blakelands North
Milton Keynes
Berks
Tel: (0908) 615274

Colour blind

I own a BBC model B which I need to use frequently — at least four hours a day. At the moment I use a black and white 20in TV but am thinking of buying a 14in colour TV. What's the better choice — a colour TV or a monitor.
Mushta Fazid, United Arab Emirates

I assume you are worried about the effect of extensive computer use on your eyesight. According to the Institute of Opthalmology, over use can cause blurred vision, itchy and watery eyes and perhaps even *permanent* changes in eyesight.

The effects can be reduced if the image you are looking at is clear and stable. Consequently you should opt for a monitor as most TV pictures are far from stable. Also you might consider buying a filter (about £20) which will cut down screen reflections and, therefore, sharpen and enhance the screen colour and clarity. One such manufacturer is Romag CEAF, tel: (091) 414 5524.

Mining for onyx

Our company, PT Koba Tin, an Indonesian/Australian joint-venture, tin-mining corporation has installed three units of C8001 since 1983—the Micro-System (256k RAM and 20Mbytes hard disk per system).

We utilise MP/M as our operating system, using four terminals per CPU which give 48k of memory per user.

This limitation is one of our major problems as we run a General Ledger system and COMICS (Computerised Inventory Control System). The latter involves transactions on 8500 catalogue items. We would be grateful if you could provide us with answers to the following queries:
(1) Is it possible to expand user RAM?
(2) Is it possible to speed up the processing time?
(3) Is there a UK Onyx Users' club?
(4) Has *PCW carried out any reviews of Onyx systems* (both hardware and software)?
Bennard Rachman, Jakantag, Indonesia

The Onyx range of micros is distributed in this country by Thame Systems Ltd. A phone call to the company revealed that: it doesn't seem possible to expand the user RAM or easily upgrade the processor to a 16-bit chip. Your best bet would probably be to trade in your existing systems for more advanced hardware. The main problem here is that the more upmarket Onyx machines use Oasis or Unix as their operating systems rather than the rather defunct MP/M. This could well mean that you would have to junk your software as well as your hardware and start again.

Assuming that a 16-bit version of COMICS is available, it would be advisable to go for one of the newer 16-bit, multi-user machines running the multi-user version of Concurrent CP/M 3.1. This is largely compatible with MP/M and could be your only viable upgrade path. I must stress, however, that the process of upgrading hardware and software while trying to keep data intact is always a tricky job and should be handled with care.

Thame does not know of a UK Onyx Users' Club, and I'm afraid, we haven't reviewed any of the Onyx systems.

Enhancing your BBC

Does the extra speed of a second processor for the BBC mean that I will have to be twice as quick in order to win space invaders? How can a Z80 second processor benefit a home programmer like myself? Finally, are programs written with a second processor compatible with an unexpanded BBC?
Mark Brown, Dereham, Norfolk

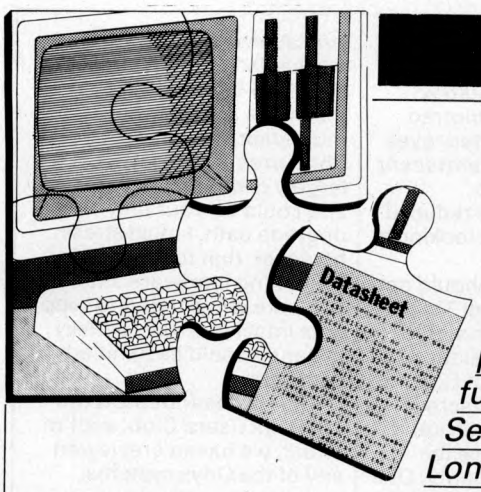
The Z80 second processor will allow you to use the wide variety of CP/M packages as yet unavailable to BBC users, and similarly some powerful programming debugging tools. Unfortunately, any programs you write with such a system can only be used by people with the same equipment.

The games company Legend used such a system to develop its latest game 'The great Space Race' even though the game will be released on the Spectrum and the Commodore 64.

You won't have to speed up your reactions to beat the invaders as the program will have been written for a standard BBC and as such won't use the Z80 processor.

However, a second processor will accelerate your own programs as you can devise programs shared between the processors, therefore speeding up the processing time and, as a result, the program. For example, the Z80 can handle the graphics while the 6502 carries on with the number crunching.

Finally, the second processor offers one final bonus to memory-starved BBC owners — an extra 64k of RAM. However, the bad news is that it will cost nearly as much as your BBC Micro. END



SUBSET

David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to Sub Set, PCW, 62 Oxford Street, London W1A 2HG.

68000 RANDOM

SubSet is making a big leap from 8-bit to 32-bit processing with RNDW (Datasheet 1) from Matthew Rhodes of Bradford. RNDW uses the algorithm R(i+1) = (1509 * R(i) + 41) mod 2**16, thought to produce good 16-bit pseudo-random numbers. Matthew also submitted a 32-bit generator using R(i+1) = (69069 * R(i) + 41) mod 2**32 which will be given in the December issue.

Matthew was unable to test the routines and as I can't decide between the QL and Macintosh, I would be glad to hear if RNDW does work satisfactorily.

Two listings are provided in the RNDW Datasheet. These show the code that ought to be generated by an assembler for a SEED within or outside the range of 'base page' memory. They also demonstrate alternative methods of adding immediate data to a data register.

DATASHEET 1

```
;=================================================================
;= RNDW      16-bit pseudo-random number generator.
;=================================================================
;JOB         To generate a 16-bit random number from the
;           series: Ri+1 = (Ri * 1509 + 41) mod 2**16.
;ACTION      Read previous random number from store.
;           Multiply by 1509 and add 41.
;           Write low order word of product to number store.
;-----------------------------------------------------------------
;CPU         MC68000 series.
;HARDWARE    Two bytes of RAM for random variable (must be
;           located between $FF8000 to $007FFF inclusive for
;           "absolute short" address version, RNDWAS).
;SOFTWARE    None.
;-----------------------------------------------------------------
;INPUT       16-bit seed or previous random number must be in
;           RAM variable SEEDS or SEEDL.
;OUTPUT      New random number in SEEDS or SEEDL.
;           D0 low word = new random number.
;           D0 high word holds multiplication high result.
;           Negative (N) and Zero (Z) flags show the status.
;           Overflow (V) and Carry (C) flags are cleared.
;ERRORS      Re-entrancy could cause numbers in the sequence
;           to be missed, affecting the randomness.
;REG USE     D0 CCR
;STACK USE   None.
;RAM USE     None.
;LENGTH      18 (RNDWAS), 22 (RNDWAL).
;CYCLES      68000: 108 (RNDWAS), 116 (RNDWAL).
;           68008: 160 (RNDWAS), 180 (RNDWAL).
;           68010: Max. 92 (RNDWAS), Max. 100 (RNDWAL).
;-----------------------------------------------------------------
;CLASS 2     -discreet  *interruptable  *promable
;-**-*-      -reentrant  *relocatable  -robust
;=================================================================
;
;...Code generated by assembler when "SEED" is located at
;...an address between $FF8000 and $007FFF (inclusive).
SEEDS  EQU     $a1a0     ;Address of 2-byte random number.
;
RNDWAS MOVE.W  SEEDS,D0 ;Get old number or seed into     3038
                        ;Data register 0, low word.      a1a0
       MULU    #1509,D0 ;Multiply it by 509 with         C0FC
                        ;product in all D0.              05E5
       ADD.W   #41,D0   ;Add 41 to low word only,        D07C
                        ;this is modulo 2**16.           0029
       MOVE.W  D0,SEEDS ;Store new number (in low word   31C0
                        ;D0) back to variable.           a1a0
       RTS              ;Exit, number formed.            4E75
;
;...Code generated by assembler when "SEED" is located at
;...an address between $008000 and $FF7FFF (inclusive).
;...("ADDI" is an alternative to "ADD" for adding immediate
;...data into a Data register.)
SEEDL  EQU     $a2a1a0   ;Address of 2-byte random number.
;
RNDWAL MOVE.W  SEEDL,D0 ;Get old random number or        3039
                        ;seed into lowest word of        00a2
                        ;Data register 0 (D0\3).         a1a0
       MULU    #1509,D0 ;16-bit by 16-bit multiply;      C0FC
                        ;D0\F = D0\3 * $05E5.            05E5
       ADDI.W  #41,D0   ;16-bit addition;                0640
                        ;D0\3 = D0\3 + $0029.            0029
       MOVE.W  D0,SEEDL ;Copy new random number from     33C0
                        ;D0\3 to random variable,        00a2
                        ;affecting N, Z, V and C flags.  a1a0
       RTS              ;Exit, number in SEEDL & D0\3.   4E75
;=================================================================
```

6502 N-BASE CONVERSION

Did only Peter Sewell of Reading notice when 22 bytes of XBIN went missing in December 1982?

XBIN by Dennis May of London, SE1, converts an unsigned (positive or absolute) number of any base from 2 to 36 into a 32-bit binary value.

The input number is a string of ASCII digits and upper-case letters ending with a $0D (carriage return) terminator. The unsigned binary result is output in four consecutive page zero bytes.

For new readers and to prevent confusion, here is the full listing of XBIN (Datasheet 2) documented to the new SubSet standards.

DATASHEET 2

```
;=================================================================
;= XBIN      Unsigned ASCII base 2-36 to 32-bit conversion.
;=================================================================
;JOB         To convert an unsigned number, of any base 2 to
;           36, held in memory as ASCII digits and upper
;           case letters to an 32-bit binary number held in
;           registers or base-page "pseudo-registers".
;ACTION      Clear result.
;           Get first character.
;           ON overflow: [ Set overflow flag & exit. ]
;           WHILE character NOT terminator:
;           [ Convert character to binary coded digit.
;             Result = result * base + digit.
;             Index and get next character. ]
;           Set conversion completed flag.
;-----------------------------------------------------------------
;CPU         6502
;HARDWARE    Memory containing ASCII number string.
;SOFTWARE    None.
;-----------------------------------------------------------------
;INPUT       M4,5 addresses 1st byte of ASCII string which
;           must terminate with $0D (carriage return).
;           M6 contains the number base.
;OUTPUT      Registers changed. M7 to MC changed.
;           M4 to M6 not changed.
;           C = 0: conversion completed.
;             32-bit result in M0 to M3 (M3 is high order).
;           C = 1: overflow during process.
;             M0 to M3 is indeterminate.
;ERRORS      No test is made for non-upper-case alphanumeric
;           characters in ASCII string.
;           No test is made for digits greater than base.
;REG USE     P A X Y
;STACK USE   2
;RAM USE     M0 to MC
;LENGTH      106
;CYCLES      Not given.
;-----------------------------------------------------------------
```

```
;CLASS 2     -discreet  *interruptable  *promable
;-***--      *reentrant  -relocatable  -robust
;=============================================================
;
ASCN    =    M4         ;Stored address of ASCII string.
BASE    =    M6         ;Stored ASCII number base (2 to 36).
BTMP    =    MB         ;Storage for working BASE.
RSLT    =    M0         ;4-byte result location (low byte).
RTMP    =    M7         ;Storage for working RSLT (low byte).
INDX    =    MC         ;Storage for ASCII string pointer.
;
XBIN    LDY  #0         ;Clear for RSLT clear.          A0 00
        LDX  #4         ;Index for RSLT 4 bytes.        A2 04
;
XBIN1   DEX             ;Index RSLT next byte           CA
        STY  RSLT,X     ;and clear it, repeat           94 M0
        BNE  XBIN1      ;until RSLT clear. X = 0.       D0 FB
        STX  INDX       ;Initialise ASCII index to 0.   86 MC
;
XBIN2   LDY  INDX       ;Index current ASCII byte       A4 MC
        LDA  (ASCN),Y   ;and pick it up.                B1 M4
        CMP  #$0D       ;If ASCII "carriage return"     C9 0D
        BEQ  END        ;terminator then completed.     F0 52
;
        SEC             ;Strip ASCII digits high        38
        SBC  #$30       ;nibble and test for if         E9 30
        CMP  #$0A       ;greater than digit 9,          C9 0A
        BCC  ASCY       ;adjusting for gap between      90 02
        SBC  #7         ;"9" and "A" if it is.          E9 07
ASCY    PHA             ;Save new digit.                48
        LDA  #0         ;Clear for RTMP clear.          A9 00
        LDX  #4         ;Index for RTMP 4 bytes.        A2 04
;
XBIN3   DEX             ;Index RTMP next byte           CA
        STA  RTMP,X     ;and clear it, repeat           95 M7
        BNE  XBIN3      ;until RTMP clear.              D0 FB
;
        LDA  BASE       ;Move base to temp byte for     A5 M6
        STA  BTMP       ;use as multiplier.             85 MB
        LDY  #8         ;Count for 8-bit multiplier.    A0 08
;
XBIN4   ASL  BTMP       ;Shift next multiplier bit      06 MB
        PHP             ;into C and save it.            08
        ASL  RTMP       ;Shift left partial product     06 M7
        ROL  RTMP+1     ;for possible addition at       26 MB
        ROL  RTMP+2     ;next bit place.                26 M9
        ROL  RTMP+3     ;                               26 MA
        BCS  OVFW1      ;Skip out if product too big.   B0 2E
        PLP             ;Get multiplier bit to C and    28
        BCC  XBIN6      ;skip if 0, no add this place.  90 0E
        LDX  #-4        ;Else index from low bytes.     A2 FC
        CLC             ;Clear for low bytes add.       18
;
XBIN5   LDA  RSLT+4,X   ;Add multiplicand byte to       B5 M4
        ADC  RTMP+4,X   ;partial product.               75 MB
        STA  RTMP+4,X   ;                               95 MB
        INX             ;Index next and repeat for      E8
        BNE  XBIN5      ;all four bytes.                D0 F7
        BCS  OVFW2      ;Out if product too big.        B0 1E
;
XBIN6   DEY             ;Repeat for all 8 bits of       88
        BNE  XBIN4      ;multiplier (base).             D0 DF
;
        CLC             ;Clear for add.                 18
        PLA             ;Get new digit and add to       68
        ADC  RTMP       ;product low byte, result to    65 M7
        STA  RSLT       ;partial conversion result.     85 M0
        LDX  #-3        ;Index from byte 2.             A2 FD
;
XBIN7   LDA  RTMP+4,X   ;Move other three product       B5 MB
        ADC  #0         ;bytes to conversion result     69 00
        STA  RSLT+4,X   ;adding in any carry from       95 M4
        INX             ;digit add in to low byte and   E8
        BNE  XBIN7      ;subsequent carries.            D0 F7
        BCS  OVFW3      ;Out if result too big.         B0 09
;
        INC  INDX       ;Index next ASCII byte and      E6 MC
        JMP  XBIN2      ;continue conversion.           4C lo hi
;
END     CLC             ;Flag conversion complete       18
        RTS             ;(C = 0) and exit.              60
;
OVFW1   PLA             ;Lose multiplier bit.           68
OVFW2   PLA             ;Lose digit.                    68
OVFW3   RTS             ;Exit (C = 1) on overflow.      60
;=============================================================
```

68000 NOTATION

The symbolic 'lohi' and 'hilo' used for 16-bit absolute addresses in Z80, 6502 and 6809 datasheet listings are inadequate for the 68000 with its 24-bit addresses. Instead, 'a2a1a0' signify the 3-byte addresses with 'a0' as the low order byte. Note that the 68000 requires the unused 'a3' to be in the code.

68000 Data and Address registers, Stack Pointers and Program Counter are all four bytes long. Much processing, particularly that dealing with ASCII characters, will use various combinations of individual bytes within registers and description of what is happening could be very complex.

For descriptive purposes, the position of the bytes within any register can be coded as a sequence of four bits with set bits indicating which register-bytes are currently being referred to. The code can be written as a single hexadecimal digit after the register name. This notation has been used in the comments to RNDWAL where the lowest two bytes of data register 0 are referred to as D0\3.

Here are two other examples of how the notation works: (1) the processor addresses program instructions using PC\7 (lowest three bytes of the Program Counter); (2) 'SWAP D4' can be described as D4\C exchanged with D4\3, but if we are using only the lowest byte of each word then it could be commented as 'exchange D4\4 with D4\1'.

RANDOM BITS VIA THE 6522

Regular readers of SubSet might remember a suggestion made in April 1981 that a 7-bit random value could be read from the Z80 Refresh register. This is incremented after every 'fetch'.

RND16B (Datasheet 3) from TA Browning of Southampton is a 6502 equivalent of that idea with extra processing. It uses the two 16-bit counters of the 6522 VIA to compute 16 'random' bits.

Registers which increment or decrement in synchronisation with the system clock cannot be relied upon to give random values if read inside a loop. However, RND16B is a very fast method of getting a 'non-calculated' value.

DATASHEET 3

```
;=============================================================
;= RND16B   Compute 16 random bits.
;=============================================================
;JOB        To compute 16 random bits using a hardware timer
;           device with two independent 16-bit counters.
;ACTION     Set counters to decrement continuously without
;           interrupt.
;           Read contents of timer 2 into registers.
;           Exclusive-or hi-byte with lo-byte of timer 1.
;           Exclusive-or lo-byte with hi-byte of timer 1.
;           Write contents of registers to timer 2.
;-------------------------------------------------------------
;CPU        6502
;HARDWARE   6522 Versatile Interface Adapter (VIA).
;SOFTWARE   None.
;-------------------------------------------------------------
;INPUT      None.
;OUTPUT     A,Y contains an unknown (random) number.
;           Sign and Zero flags show status of byte in A.
;           VIA counters are free-running.
;           VIA port input latches are disabled.
;ERRORS     The randomness of the result depends entirely on
;           the regularity with which RND16B is called.
;REG USE    A Y P
;STACK USE  None.
;RAM USE    None.
;LENGTH     25
;CYCLES     38
;-------------------------------------------------------------
;CLASS 2     -discreet  *interruptable  *promable
;-****-      *reentrant  *relocatable  -robust
;=============================================================
;
RND16B LDA  #0      ;Clear VIA ACR putting timers   A9 00
       STA  ACR     ;in one-shot mode.              8D lo hi
       LDA  T2C-L   ;Exclusive-or lo-bytes with     AD lo hi
       EOR  T1C-L   ;hi-bytes of other counter      4D lo hi
       TAY          ;with Y as low byte result      A8
       LDA  T2C-H   ;and A as high byte result.     AD lo hi
       EOR  T1C-L   ;                               4D lo hi
       STY  T2C-L   ;Write result into counter of   8C lo hi
       STA  T2C-H   ;timer 2, letting it decrement. 8D lo hi
       RTS          ;Exit, random bits in AY.       60
;=============================================================
```

68000 CHALLENGE

The 68000 has both signed and unsigned 32-bit by 16-bit division with 16-bit quotient and 16-bit remainder. Division by zero and overflow are 'trapped' and the machine goes into Supervisor mode for 'exception processing'.

Worst-case division of a 32-bit number can give either a 32-bit quotient or a 32-bit remainder—the DIVS and DIVU instructions are possibly only worth using for 16-bit division.

Who will be first to submit a Class 1 32-bit division routine that cannot be 'trapped'?

NETWORKS

Peter Tootill passes on some interesting facts about Prestel, and keeps you up-to-date on the bulletin board world.

The number of Prestel users is nowhere near the million that was predicted for 1984 when the system was launched in 1975. It was the world's first public access viewdata system and there was doubt as to how the general public would respond, but the high cost of specially adapted TV sets was enough to dissuade the average consumer. It can be argued that had the TV manufacturers significantly reduced prices, then people would have bought them in sufficient numbers to make the lower prices profitable. But this is 'catch 22': prices won't fall until demand rises, and demand won't rise until prices fall.

Prestel became very much a business-orientated system. Many of the early information providers, or IPs (that is, organisations which take space on the Prestel system to display their own information), especially those aiming at the general public, dropped out, resulting in the system being even less attractive to the domestic user. However, the microcomputer boom has changed the situation. Many micros can be converted to Prestel terminals by the addition of a modem, an RS232 (if not already built-in) and the appropriate software. Micro users also form a readily identifiable target at which to aim a marketing strategy.

In March 1983, a publishing company already linked with Prestel launched Micronet 800. It sold adapter packages to certain groups of micro owners for around £60, plus a subscription of £13 per quarter on top of the normal Prestel subscription. It also provided sufficient items of interest on the Micronet 800 database to entice people to buy. It set out to provide general news and information on the micro scene, software to download, and information about computer clubs (courtesy of the Association of Computer Clubs (ACC)). There were teething problems: delays on adapter delivery (packages for some machines that were promised in the early days still haven't materialised, others have been abandoned). Micronet now has over 9000 subscribers, and should get a further boost with the launch of its Commodore 64 package.

But there's a twist to the Micronet 800 story. There are other IPs on Prestel aimed at the micro user, such as Viewfax 258 and the ACC's ClubSpot, which are available free of charge to any Prestel subscriber, whereas Micronet is only available on payment of the fairly steep sub.

ClubSpot is a thriving area with a great deal of information provided by individuals and computer clubs; it includes an art gallery, local club information and message areas. It's not just for computer clubs, but also those who use computers in their hobbies, and amounted to around 1000 frames in May 1984. In April, Prestel shepherded all the micro IPs into a new section, available only on subscription, called Prestel Microcomputing. Either Micronet subscribers were not renewing their subscriptions, having found so much available free of charge, or Viewfax was jealous of the money and facilities going to Micronet!

The present situation is that if you want to use any part of Prestel aimed at the micro user, excepting a few small areas that are designed to whet your appetite, you have to pay the same sub you previously paid to Micronet, but it now goes to Prestel.

Telex Link

Prestel subscribers can send telexes to subscribers via Telex Link. It's only a one-way system at present (you can't get a reply from a telex subscriber via Prestel), but a two-way service is in the pipeline. At 50p a page (approximately 100 words) plus your normal Prestel charges, it's an economical method of sending urgent messages to people.

Prestel down-under

Telecom Australia has just chosen Prestel for a new public service viewdata system called 'Viatel', which will run on GEC computers in Melbourne. A live service is expected in February 1985.

Australia is apparently the tenth country to buy a national viewdata system from GEC and Prestel, and there are already several private viewdata systems running in Australia using the GEC-Prestel system. Viatel will have several enhancements including keyword search facilities, a feature that would be useful in this country too.

No of terminals	44,000
Business	62%
Home	38%
(Micronet: nearly 60% of home users)	
Information Providers	
Main IPs	161
Total no of IPs	1200
Frame statistics	
Total accessible	317,000
Accesses in month	14.1m
Messages sent	154,000
Response frames	60%
User to user	40%
Gateways to external computers	17
94% of UK telephone subscribers have local call access to Prestel	

Fig 1 Prestel facts and figures

*0#	Main menu
*#	Repeats last page (can be used up to three times)
**	Cancel if you make a mistake
*00	Repeats current page (useful in cases of line noise, for example, free for chargeable pages)
*09	Repeats current page with any updates made during the viewing period (charged at same rate as the first time you saw the page)
*170#	What's new on Prestel
*1909#	Mailbox directory
*199#	Alphabetical index to subjects and IPs
*2#	The Prestel Gazette
*21#	How to use Prestel
*3#	Local information
*5#	Business information
*6#	Response frame guide
*7#	Mailbox—for sending messages to other users
*800#	Prestel microcomputing
*9#	Customer facilities
*90#	Leave Prestel
*92#	Check your current bill (on the current computer only)
*920#	Change your passwords
*930#	Check for messages to you
*931	Retrieve stored messages

Fig 2 Prestel commands

Useful Prestel commands

Many people have a problem finding useful information in the Prestel directory. It's all there, but difficult to pinpoint. Fig 1 is a list of the more common items for quick reference, and Fig 2 shows some useful Prestel commands.

Download your BBS

A US magazine for TRS-80 users is producing a series on writing your own bulletin board software. It refers to an example program and uses it to outline the various stages involved in production. The software has been written for the TRS-80 Model 1/3/4 computers, and the magazine is publishing part of the program each month.

The program can be downloaded from the author's BBS. The number is 0101-606-739-6088, after 6pm Eastern Standard time. It's also available on disk for $15, plus postage, from Saturday Software, PO Box 404, Catlettsburg KY 41129 (TRSDOS 1.3, & LDOS 5.1.4 only).

The bulk of the software is written in TRS-80 Basic which is close to Microsoft MBasic, so it might be of interest to users of other systems too.

80 MICRO, the American magazine for TRS-80 users, has started a bulletin board for readers. It runs 24 hours a day on 0101-603-924-6985.

BULLETIN BOARDS

UK free networks

CBBS South West . . . Tel: (0626) 890014. Hours: 24 hours daily.

Mailbox-80, W Midlands Tel: (0384) 635336*. Hours: 6pm-8am daily (ring-back system).

Forum-80 Hull . . . (Forum-80 HQ) Tel: (0482) 859169. International electronic mail, library for up/down loading. Hours: 5-11.30pm, Mon-Fri; noon-11.30pm, Sat & Sun (CCITT); midnight-8am, daily (Bell 103).

Hamnet . . . Tel: (0482) 497150. Hours: 6pm-8am, daily.

Forum-80 Users Group, PET Users section shopping list system. Hours: Tues/Thurs 7-10pm; Sat/Sun 1-10pm; nights, midnight-8am, US (Bell 103) standards.

Forum-80 London . . . Tel: (01) 902 2546. Electronic mail, library for down-loading. Hours: 7-10pm weekdays; midday-10pm weekends. Ring and ask for Forum-80.

MG-Net CBBS London . . . Tel: (01) 399 2136. Facilities: electronic mail, program downloading. Hours: Sun 5-10pm.

Liverpool Mailbox . . . Tel: (051) 428 8924. Electronic mail, down-loading, TRS-80 information. Hours: 24 hours daily.

TBBS, London . . . Tel: (01) 348 9400. Hours: daily 9am-7am.

BASUG . . . Tel: (0742) 667983. Hours: 24 hours daily.

Computer Answers . . . Tel: (01) 631 3076. Hours: 24 hours daily.

CBBS Surrey . . . Tel: (04862) 25174. Hours: 24 hours daily.

Blandford Board . . . Tel: (0258) 54494. Hours: 24 hours daily.

Southern BBS. Tel: (0243) 511077. Messages, down-loading. Hours: 8pm-2am daily (ring-back system).

NBBBS-North Birmingham . . . Tel: (0827) 288810

TBBS Southampton . . . Tel: (0703) 437 200 (ring-back)

Stoke ITeC (Information Technology Centre) (Remote CP/M) . . . Tel: (0782) 265 078. Hours: 24 hours daily.

TBBS Nottingham . . . Tel: (0602) 289783. Hours: 24 hours daily.

Clinical Notes Online . . . Tel: (0254) 60339. Hours: 24 hours daily.

UK commercial systems which are free in part

DISTEL. Tel: (01) 679 1888. Run by Display Electronics (new and surplus electronic and computer equipment, components, etc). The system provides information about stock lines, credit card sales, and some message facilities. 300 baud only at present. Cost: free. 24 hours.

MAPTEL. Tel: (0702) 552941. Run by Maplin (electronic components and micro-computers). Provides information on stock levels, credit card sales to existing customers only. 300 baud only. Cost: free. 24 hours.

ESTELLE. Tel: (0279) 443511 V21 (Datel 200); (0279) 441188 (Datel 600); (0279) 441222 (Datel 1200). For customers of STC Electronic Services. Office hours only.

Subscriber commercial systems in the UK

PRESTEL. Subscribers only: Prestel consists of a database made up of individual pages provided by many different organisations (not by Prestel itself). 1200/75 baud service at local call rates for a large percentage of potential users. 300 baud service on London telephone number only, at present. Cost: domestic subscribers £5 per quarter and no time charges outside peak periods, 80 per cent of pages are free. 6pm and Saturday mornings, no time charges outside these hours (time charges also apply to domestic users). Information: Dial 100 and ask for Freefone Prestel sales.

MICRONET 800. An organisation providing information within the Prestel database specifically aimed at microcomputer users. Service details as Prestel. Cost: £50-£75 joining fee (covers acoustic coupler and software—for a limited range of machines at present) and £8 per quarter on top of normal Prestel charges. Information: Micronet 800, 8 Herbal Hill, London EC1R 5JB. Tel: (01) 837 3699.

Subscriber business systems in the UK

TELECOM GOLD. Info from: sales admin, 60-68 St Thomas Street, London SE1 3QU. Tel: (01) 403 6777

COMET. Message handling system giving user facilities for leaving and retrieving messages: costs £30 per month. Info from: John Douglas, BL Systems Limited, Grosvenor House, Prospect Hill, Redditch, Worcs. Tel: (0527) 28515. *RING-BACK SYSTEM—dial the number, let phone ring once and then ring back.

END

Modem Operating Frequencies

Modem Type	Speed (Bit/s)	Duplex	Transmit Frequency 0 Hz	Transmit Frequency 1 Hz	Receive Frequency 0 Hz	Receive Frequency 1 Hz	Answer Tone Freq Hz
CCITT V.21 Orig	≤300	Full	1180	980	1850	1650	—
CCITT V.21 Ans	≤300	Full	1850	1650	1180	980	2100
CCITT V.23 Mode 1	600	Half	1700	1300	1700	1300	2100
CCITT V.23 Mode 2	1200	Half	2100	1300	2100	1300	2100
CCITT V.23 Back	75	—	450	390	450	390	—
Bell 103 Orig	≤300	Full	1070	1270	2025	2225	—
Bell 103 Ans	≤300	Full	2025	2225	1070	1270	2225
Bell 202*	1200	Half	2200	1200	2200	1200	2025

Bell 202 has no back channel as such, only a 5 bit/sec on/off signal (387Hz = on, no signal = off) used for handshaking. (CCITT V22 & Bell 212A do not use single frequencies like these and cannot be simply included in such a table.)



TRANSACTION FILE

Your chance to buy, sell or swap equipment

● ITT 2020 48k RAM £250. Integer card + prog AIP #1 £50. 16k Ramcard boxed as new £50. Parallel printer card £25. Disk drive card £25. Lower case adaptor (rev. 0-7) £15. Call "Keir" (0268) 43079 eve.

● APPLE II + 16k/Z80. Disk, monitor, Centronics printer, + interface Pascal, Forth, CPM. 80 column, Serial, Visicalc, database Applewriter II, compiler + lots more + books. £800 ono. Tel: 01-241 3845 eve.

● 48k SPECTRUM. Manuals, Sharp cassette recorder, over £200 software including Pascal, (with manual), VU3D, Maziacs, Manic Miner, Atic Atac, Hobbit, Combat Zone, All leads £185. Tel: 01-947 8111 after 6.30pm.

● TRS-80 Model I, Level II, 48k, Expansion interface, monitor, line printer VII and software. Ideal for hobbyist £250. Will split. Tel: 0225 833794.

● GENIE I 16k. With a Novex monitor. Having sound, a joystick port, and about £40 of software including a wordprocessor and asylum. Lower case facility. All for £160 ono. Tel: Cholesbury 575.

● DRAGON software: Edit + £22, Alldream £17, Sprint £10, Forth £10. Books: Programming-6809 £8, Color-Graphics £2. Data Sheets £2. Lots more. Tel: Dave 0702 76205.

● SINCLAIR QL. Why wait months when you can buy mine? Brand new, boxed, including Psion business packages, leads, RS232, manual and QLUB membership, £375 ono. Tel: Little Haywood (0889) 882340.

● COMMODORE PET 3016. With new ROM, large keyboard, 16k memory, dedicated cassette. Very good condition, £250 including games, Invaders, Breakout, etc. Tel: Wolverhampton 757584.

● DUAL disks, Commodore 4040 with Dams interface for Commodore 64, £500. Swap for 1541 plus, £350. Practical C disk 64, £25. Tel: Hornchurch (040 24) 55733 eve/weekends or 01-594 3495 work. Cole.

● OSBORNE 1, excellent condition, WordStar, Mailmerge, Supercalc, MBasic, CBasic, CP/M, great value at £650. Tel: Horley 71266.

● COMMODORE 3032 cassettes, Basic 4.0, 3022 printer, 3040 disk, Wordcraft, plus manuals, all leads, £950. Tel: 07744 (Leyland) 51425 day.

● ATARI 800, 810 disk drive, 1050 disk drive, cassette, 850 interface, touch tablet, manuals etc, plus estimated £1,000+ worth of software, £850 for the lot. Tel: Kes on 01-669 1973, Carshalton, Surrey.

● HARDLY used, Torch Z80-Pack fitted to BBC-Micro, 2×400k disk drive, Z80 second processor, 64k RAM, Perfect Software and Torchnet packages, CIS-COBOL (over £400), all for £990. Tel: Helen on 01-584 7580, London SW7.

● DISK drive plus controller and PSU, all cased, connects to any machine via parallel port, flex O/S for 6800, £250. Tel: Mike on 01-542 4977.

● APRICOT monitor with carry case, hardly used, only £125. Tel: Rob Crocker, Oxford (0865) 57671 eve after 7.30.

● PANASONIC JD800, 64k RAM, CP/M, full-size keyboard, screen, twin 8" disk drives, Imeg runs Basic complete with WordStar, word processing software, £600 ono. Tel: 0564 824128 home, 021-706 9748 work, Stewart.

● BBC Model B, mint condition, original packing, still under guarantee, plenty of games, joystick, cassette leads, dust cover, advanced user guide, programming the 6502, £350 ono. Tel: 01-748 4202.

● BROTHER EP44 printer/typewriter, 80 column with LCD display and RS232 interface, high resolution letter quality with 4-page storage and editing facilities, new and little used. Tel: 021-429 9171.

● SHARP MZ80A, boxed with manuals, 30 tapes, with Kuma, Forth, Zen and games, many mags and books, worth £700+, £350 ono, will swap for good games computer. Tel: York 425513.

● MICROPRO software, never used, Reportstar, Datastar, Mailmerge, Spellstar, also Wabash 5¼" disks DSDD 80 track, any reasonable offers considered. Tel: Ian on Harlow 443767.

● DRAGON 32k for sale, perfect working order, two years old, £80 ono or other offers considered. Tel: 0224 636914 or 23 Richmond Terrace, Rosemount, Aberdeen AB2 4RQ.

● SHARP MZ-80A, hardly used, still boxed, includes owner's manual, software, Basic, Star Trek, Space Invaders, Home Finance and others, also Chess game, £300 ono. Tel: 01-500 5016.

● APPLE II Europlus, 48k, 12in monitor, 2 disk drives, comms card, printer in need of service, Modem, assembler and Applesoft compiler, £700. Tel: St Austell (0726) 842428.

● MICROLINE 83A printer, 120 cps, friction and tractor plus spare ribbons, serial and parallel interfaces, true descenders, technical manual included, a bargain at only £220. Tel: Andy on Tonbridge 350981.

● EXIDY Sorcerer, 32k plus word processor, Rompac plus utilities, games, magazines, a bargain at £140; also Hitachi monitor and tape recorder available. Tel: Andy on Tonbridge (0732) 350981.

● SHARP MZ80K, 48k, integral display and cassette, printer interface, several Basics, Sharp and Hisoft Pascal, Zen assembler, spreadsheet etc, £200. Tel: Ivybridge 4836 (Devon).

● NASCOM 48k RAM B board, Eprom board, colour graphics and sound board in rack, disks and power supplies, DCS DOS, Zeap and more software, manuals, £500. Tel: 02406 2138 after 7pm.

● GET into print with your Sharp MZ-80K. Interface which fits internally in any Epson MX/RX/FX printer plus Kuma's excellent Wdpro word processing package, only £40. Tel: Norwich (0603) 618995 eve.

● COMMODORE 4032 + 4040 disk drives, complete with cables, manuals, disks, datasette, DMS, other software, suit small business, £750. Anadex DP8000 printer (needs repair) free to buyer. Tel: Ely (0353) 778457.

● PRESTEL acoustic modem for BBC plus Micronet ROM, only £40 ono. Tel: Milton Keynes (0908) 665806.

● NEWBRAIN A, Sanyo green monitor, data recorder, NewBrain dissected manuals, and leads worth £350, offers over £200. Tel: Huddersfield (0484) 846291.

● APPLE II parallel interface, £25. Z80 + CP/M, £75. Versawriter graphics tablet, £25. WordStar + Mailmerge + Datastar, £200. Multiplan, £90. Visidex, £45. Information Master, £25. Games, books, Artist Designer, £15. Tel: Reading (0734) 866372 anytime.

● EPSON MX80 Type III dot matrix printer with user manual and free paper, £200 ono. 64k Apple II plus with Epson printer card, £350 ono. Disk drives also available. Tel: 01-854 5854.

● BBC Model B, 1.20S, perfect condition, leads, some software incl Database, £330 ono. Tel: 01-639 6872.

● SHARP MZ-80A plus over £50 of software, manuals, vgc, cost over £500 new, a snip at £230 ono. Tel: 051-639 4625, ask for Clive or Don. Wallasey, Merseyside.

● EPSON HX20, mint, unused, with manuals, power supply, printer and hard case, cost over £450 new, will accept £325 ono. James, Edenbridge (0732) 865162.

● APPLE II + 64k new motherboard disk + card, M&R-80-col superchip, Pascal/system language, clock, colour, serial cards, Hitachi 12" mon, joystick, speech/lab, Symtec-l/pen, prism-modem, superchip, Super-Talker, Var-software, will separate. Offers to: 08277 2560.

● NASCOM-1 without power supply, £130 ono. Tangerine Microtan-65 bare board, £15. Full documentation for both. Tel: 021-523 6752 (Birmingham) eve after 7pm.

● S-100 stereo sound effects board, two AY-3-8910s, internal amplifiers, all you need is two speakers. Four parallel ports and on-board prototyping area, connectors and data, £36. Tel: Sheffield 396995.

● SHARP MZ-80K, 48k RAM, inbuilt monitor and cassette, many languages with manuals, debugger, assembler, disassembler and lots of other software, ex condition, only £210. Tel: (0273) 419300.

● TRS80 Model 3 (48k), twin disks, assembler, manuals, excellent condition, £990 ono. Tel: 02514 3780 after 7pm.

● ATARI 800, 48k, plus Atari 810 disk drive, fitted with chip 2 + centronics interface + 80 disks of software, joysticks, paddles and manuals, the lot for £850 ono. Tel: (0903) 45200.

● GEMINI Multiboard, GM811CPU, GM812IVC, GM802RAM boards, £225. GM803 EPROM board + EPROMS, £50. Nascom I/O board, £50. 10 slot 80bus card frame with 3amp PSU, £65. Some software and magazines. Tel: 01-303 7852.

● SHARP MZ-80K, 48k, hardly used and in vgc, all manuals, games etc included. Will arrange delivery in original packing, £230 ono. Tel: 0407 810523 after 6pm.

● TRS80 Mod III, 48k, disks, RS232, dot printer 80cps, BI-direct, amp + speaker, joystick, cover, software: LDOS, Edtasm, VisiCalc, Cobol, ZBasic, Aids III + much more, many games, books, £1,440 ono. Tel: 0734 732115 after 6pm.

● STRAIGHT exchange - Peugeot 604 (body damaged) for Iona 64k with DSDD dual disk drives, VDU and printer (other 64/128/256k business machines considered if WordStar etc included. Tel: Dunstable (0582) 666705.

● PRISM VTX 5000Micronet modem for 48k Spectrum, £50. Tel: Woking 72739 after 8pm.

● TRS-80 Model I/L2, 48k, no reasonable offer refused, 2 × 100k Canon drives with Tandy interface, parallel printer interface, PSU, special BBC cable, LDOS 5.1.4, £325. New Kaga monitor, £75. Tel: 0438 811082, Hertfordshire.

● SHARP MZ80K microcomputer, 48k with Quantum hi-res + I/O box + Sharp MZ80P3 printer, Hi-soft Pascal, Zen assembler + many other programs, best offer over £295 secures, must sell. Tel: Godstone 843679.

● APPLE II copy anything Snapshot. Two Digitek 16k RAM expansion. Also Locksmith. Lots of games software, Graforth with manual, Olympic Decathlon. A gift at £100. Tel: Horndean (0705) 594871 (after 6pm).

● VIDEO GENIE 48k. With synthesizer, software including Edtasm/Plus, Forth, APL, Pascal, Sargon, 40+ games, £150. Termiprinter 72 column printer, 300 baud, Genie interface, £100. VDU 80×25, RS232, £80. Tel: (0625) 31357.

● NASCOM 2 with Nas Sys 3, 48k RAM with extended Basic. Kenilworth case. All manuals plus software. Hardly used, £150 for quick sale. Tel: Coventry (0203) 412073 Curtis.

● COMMODORE 8096. Complete with 8050 disk drives, 4022 printer, Silicon Office, Visicalc and DM5. Best offer near £1500 including VAT. Will Chapman, 13 Grove Road, Twickenham TW2 5WH. Tel: 01-977 0076.

● SHARP MZ80B with twin disk drives and parallel interface. Very little used. £650 ono. Tel: Ann Kemp on 01-833 2531 (daytime).

● TRS-80 Model 1, Level 2, 16k. With monitor UHF Mod, cassette recorder, leads, manuals and some software. Excellent condition. Little used. Bargain, £75. Tel: 01-570 1679.

● VIDEO GENIE 48k, £150 (including expansion box). Ikegami b/w monitor, £50. Microware twin disk drives (40 TRK), £180 (with power supply). Many books and 10 disks, software available. Tel: Tony on 01-693 8975.

● PROFESSIONAL CPM/86 system, 8086, 128k, twin floppies, centronics port, Basic, Cobol, £800. Tel: 01-202 8363.

● APPLE III including monitor, additional drive, Z80 card, parallel card, plus software, Business Basic, Business Graphics, Applewriter, Mail-list Manager, PFS-File, PFS-Report, Pascal, Visicalc, £1,750. Tel: Thurley on 01-326 1025 (day), 01-363 1122 (eve).

● NEWBRAIN AD. With leads, manuals, unwanted gift, unused, will deliver London area or send Securicor anywhere. Best offer over £125. Bargain. Tel: Walford on (0847) 81356.

● COMMODORE 64. Disk drive, cassette recorder, joystick, printer interface, for centronics. Software includes Easyscript, Superbase 64, Busicalc 2, Assembler, Simons Basic, Solo Flight, Chess, other games, books, £500. Tel: 01-934 5962.

● NASCOM 2, 64k RAM card with 48k RAM, Nas Sys 3 monitor, graphics ROM, Kenilworth case, Hisoft Pascal compiler, £270 ono. Tel: Paul Brown on Slough (0753) 79181 after 6pm or weekends.

● SHARP MZ-80K. Boxed, perfect. Several Basics, many Basic and M/C games, Fig Forth, books, user notes, cover, reset button, 48k A good compact machine, £195. Tel: Reading (0734) 694345.

● EPSON HX20 + Ecalc. Hardly used, £250. Tel: Mr. P. Simpson on 01-930 3343.

● DATA DYNAMICS model 390 printer terminal, £30. I.E. Teletype keyboard and punched tape facility. 24in × 20in × 9in and working on RS232. Bucks. Tel: Beaconfield 3868 (eve and weekends).

● HEWLETT PACKARD 41 series card reader and cards, games ROM, Quad RAM. Tel: David Johnson on (0754) 66629 (eve).

END

TRANSACTION FILE ADVERTISEMENT FORM

All Transaction File ads must be submitted by readers on this form or a photo-copy of this form. Maximum 30 words. Print one word per box, very clearly. Name, address and/or telephone number must be included in the 30 words. All ads must be accompanied by a flat fee of £2.50. Make cheques or POs payable to Personal Computer World. Ads accepted from private readers only. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by printing your ad very clearly. Send form to: Transaction File PCW, 62 Oxford Street, London W1A 2HG.

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

ACC NEWS

Rupert Steele provides up-to-date details on what is happening in computer clubs around the country.

Mike Houghton, of 1 Sherwell Avenue, Barkers Lane, Wrexham, Clwyd LL13 9TZ, writes to tell me of the Wrexham and District Computer Club. The club has a total membership approaching 600, 100–200 of whom regularly attend weekly meetings at the Memorial Hall, Wrexham. With such a large membership (the largest I have ever heard of for a local group), it has been able to buy equipment for the use of club members. This includes a dot-matrix printer with interfaces for most home computers, a four colour plotter, two modems, 12 TVs and 160 programs on tape for members to try (but not copy, of course!). As well as its meetings, this extremely enterprising club organised The North Wales Computer Fair a few months ago with competitions and prizes. I think a prize is due to the organisers of this club for producing so much in the first 18 months of its existence — if you want to find out more, write to the address above or call Mike on Wrexham 351304.

Many thanks to the secretary of the Grimsby Computer Club for sending me a copy of its newsletter. The club holds meetings every two weeks, with a mixture of informal workshops (that is, meetings where people bring and/or play with computers) and speaker meetings. The newsletter has a good selection of light articles, plus a 'stolen' feature. The club has also purchased a number of disks in bulk, and can therefore make them available cheaply to members. For details, write to the club at 23 Elm Road, Cleethorpes (tel: 694047).

Also in the North East is the Boston Computer Club which has a lot of contact with the ACC, and is affiliated (as are the Grimsby and Wrexham clubs above). It has links with a club in Skegness, and produces a regular newsletter. For more information, drop a line to the chairman: Rodney Ashton, 17 Coningsby Close, Boston, Lincolnshire PE21 8HP.

Over on the west is the Blackburn Computer Club, formed early this year. It is open to all interested in computers, whether or not they own one. As ACC affiliates, the club benefits from the ACC's block public liability insurance policy. It meets on alternate Monday nights at the Fernhurst Hotel, Bolton Road, Ewood and annual subscription is £5 (or £3 for children, £10 for a family) — but you can attend a single meeting for 50p (refundable if you join during the meeting). For further information, contact the publicity officer, John Schofield, on Blackburn 28127 or write to him at 1 Sutton Street, Feniscowles, Blackburn BB2 5ES.

Down in Brighton, there are two clubs. There is the Brighton, Hove and District Computer Club, whose secretary is Mr JE Smith of 30 Leicester Villas, Hove, East Sussex BN3 5SQ. I don't have any further details on this one. Also there is Brighton Area Micro-Enthusiasts, whose address is: the club secretary, 3/29 St. Aubyns, Hove BN3 2TH. The club meets once a month, and has an interest in Prestel and ClubSpot. Why not visit both and see which you prefer?

Also in the Deep South is the West Surrey Computer Club. Mr PJ Wicks of 235 Stoughton Road, Guildford GU2 6PG (tel: Guildford 35608) writes to tell me of its activities. It serves an area of about 15 miles around Guildford and many machines are used; the BBC B being particularly popular, with a special Beeb group meeting monthly at Guildford Technical College. The club meets monthly and has strong links with the local branch of the British Computer Society.

Tony Green, of 14 Radway Close, Redditch, Worcs B98 8RZ writes to tell me about Redditch Computer Club. It meets on alternate Wednesdays (which alternate Wednesdays? A better rule is to say first and third Wednesday of each month) at Bridley Moor High School. The members have a range of computers, including Sinclair, BBC, Dragon, Sharp, Oric and UK101. For more information write or phone Redditch 61434.

In Essex we find the recently formed Witham and District Computer Club, which caters for computer enthusiasts in the Witham area. To find out all about it, write to the club secretary, Mr LA Cooper, of 28 Avenue Road, Witham, Essex CM8 2DP. While in Essex, please note that the Canvey Computer Club has closed down owing to lack of members. So if you were about to write to Dean Williams asking when the next meeting is, it's too late!

A quick visit to the big smoke finds Richard Alexander at 55 Dupont Road, London SW20 8EH (tel: (01) 540 7234). Richard wants to start a new computer club in Merton, so why not give him a call?

Finally, I have been inundated with letters from the founders of the Independent Coleco Adam Users' Club. The club's address is PO Box 9, Towcester, Northants NN12 7QG. A national club for owners of the Coleco Adam, it plans to have 10 issues of its newsletter each year with a wide variety of content. Also planned are area meetings around the country, a software library and much, much more. Prospective members (whether they own an Adam, use somebody else's, or are thinking of getting one) should send an SAE.

If you would like a mention for your club here, or would like a club information kit, details of the ACC's insurance schemes, information on ClubSpot or any other help, then contact me at the address below: Rupert Steele, ACC chairman, 17 Lawrie Park Crescent, London SE26 6HH or tel: (01) 370 0601 day or evening. **END**



'I believe he's cooking the books again.'

WRITING FOR PCW

PCW welcomes approaches from would-be writers, even those who have never appeared in print before. In this game it's often those with practical experience who have important things to say, so we don't mind if your prose is less than perfect — providing submissions have a sensible structure and follow a logical sequence, we can take care of the polishing.

If your article is already written, send it in — taking care to ensure that your name and address, together with a daytime phone number if possible, appear on both the covering letter and the manuscript. Manuscripts should, preferably, be typed or printed out (dot matrix output is quite acceptable) but *must* be double line-spaced with ample margins top and bottom and on each side. We'll try our best to return submissions, as long as they are provided with a suitable sae, but make sure you keep a copy of everything as well.

If you have an idea for an article or a series, write us a letter outlining your ideas. A one- or two-page synopsis giving the proposed structure, sequence and content is what we're looking for. But before you send anything to us, take a good look through *PCW* to see what sort of articles get published and to see what style of writing we prefer (basically, avoiding pomposity at one extreme and flippancy at the other). Also take a look through the Back Issues advert to see what sort of things we have already published — no point in re-inventing the wheel.

Once you've sent off your article or proposal, please don't hassle us for a decision. We receive far more submissions than we can ever use and it takes us a while to sort through them, acknowledge receipt and give an opinion one way or the other.

Please be sure to tell us if you've sent the article to another magazine — it would be very awkward indeed if the same article were to appear simultaneously in two publications! Frankly, we're more likely to accept something which has been offered exclusively to us.

Finally, we do pay for published work but please be patient! Payment *normally* follows about 4-6 weeks after publication.

END

CTUK

The decrease in numbers of Computer Towns has forced us to close down this section of the magazine. But there are still a few in evidence. If you can't find one near you, then why not contact the ACC for more info.

Computer Towns were set up as a network of computer literacy centres where members of the public could get free access to computer equipment. But since we last revised the list of Computer Towns, their number has fallen. Computer Town Cleveland is one of the Towns to have closed, but Ray Skinner is willing to help anyone who wishes to re-open it. The address to write to is 22 Colsterdale Close, High Grange, Billingham, Cleveland.

In the south-east of London, Computer Town Woolwich meets on the first Thursday of each month at 147 Powis Street, London SE18. John Mileham is the organiser. However, in the north of London, Computer Town Palmers Green no longer meets at frequent intervals, concentrating its efforts instead on more ambitious occasions. The last event was held at Palmers Green Library on a Saturday when about 250 people took the opportunity to try out the various micros on show. Write to Ted Ellerton, 25 Beechdale, London N21 for details of future events.

In Middlesex, Computer Town Hayes continues to meet monthly, with members bringing and demonstrating their own equipment. The address to write to is Hayes Library, Golden Crescent, Hayes, Middlesex, and the person to contact is Martin Hough. Computer Town Eastcote is also based in Middlesex, at Eastcote Library, Field End Road, Eastcote. Robert Shipton is the organiser and meetings are held on the evenings of the first and third Tuesdays of each month. Robert's address is 17 Woodlands Avenue, Eastcote, Ruislip, Middlesex.

In the north of England, Computer Town Burton has moved from its local library to the local information technology centre, where it meets once a month, taking full advantage of the centre's BBC Micros. Other facilities on offer include a library of 400 brochures, 200 magazines and 30 books, a software library and an index to all the magazine programs. The address to write to is 31 Hopley Road, Anslow, Burton on Trent, Staffordshire.

Computer Towns Newcastle and South Shields are also going strong, under the care of John Bone. The Newcastle branch meets each Saturday at the Blandford Street Science Museum from 10am-4pm. Admission is free and more than 15 machines are usually up and running. The South Shields meetings are held every week in the YMCA building off Fawcett Street from 10am-3pm. Admission costs 20p to cover the cost of hiring the room. John's address is 2 Claremont Place, Gateshead, Tyne and Wear.

Down in Kent, Computer Town Thanet meets about once every six weeks in local libraries in Broadstairs and Ramsgate. Each meeting is in the form of an exhibition, with a different theme each time. Micros on show vary according to the theme, as does the software. For further details write to Peter Kiff, Flint Cottage, 2 Ranelagh Grove, St Peter's in Thanet, Broadstairs, Kent.

Two other Computer Towns are being run in Kent, organised by Brian Taylor whose address is 22 Millbrook, Leybourne, near Maidstone, Kent. Computer Town Tonbridge runs on alternate Saturday mornings at Tonbridge Central library, Avebury Avenue, Tonbridge. Computer Town West Malling runs every second Friday in the evenings at West Malling Library, High Street, West Malling.

Colchester Computer Society is now the home of Computer Town Colchester. Meetings are held on the first and third Wednesday evenings each month. Allan Potten is the man to contact, at 14 Foxmead, Rivenhall End, Witham, Essex.

And a Welsh Computer Town has a new home as well — at Newton and District Computer Club. The next two main events on its calendar are the Mid-Wales Home Computer Exhibition on the 10 November and a business equivalent next April. John Dale is the organiser and his address is Poplar Road, Newtown, Powys.

In view of the fall in numbers of Computer Towns and their increasing cooperation with clubs, their activities will now be covered in the Clubs section of *PCW*. Any Computer Towns missed out of this round-up should contact *PCW*, as should any readers interested in starting one as we can supply guide-lines.

The last words rightly belong to one of the founding organisations. Computer Town Caversham Park Village had its first meeting in February 1981 and closed earlier this year. Pat Colley

recalls: 'I remember it was not uncommon then for 'dads' to come in to find out which computer to buy for their children, and they had no conceptual idea of what this computer would consist of. We had to explain what hardware was involved and what it did.' As Pat says: 'How things have changed since those days.' END

BENCHMARKS

Test your micro's speed of execution by running our Benchmarks.

A listing of the Benchmarks used when evaluating micros is given below. An explanation can be found in the December '83 issue.

```
100 REM  Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT  K
140 PRINT "E"
150 END
```

```
100 REM  Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF  K<1000  THEN 130
150 PRINT "E"
160 END
```

```
100 REM  Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF  K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM  Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM  Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF  K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM  Benchmark 6
110 PRINT "S"
120 K=0
130 DIM  M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 220
170 FOR  L=1 TO 5
180 NEXT  L
190 IF  K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM  Benchmark 7
110 PRINT "S"
120 K=0
130 DIM  M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR  L=1 TO 5
180 M(L)=A
190 NEXT L
200 IF K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM  Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF  K<1000  THEN 130
180 PRINT "E"
190 END
```

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making arrangements, in order to avoid wasted journeys due to cancellations, printer's errors, etc.

Doncaster	(Exbn Centre), Business & Technology Trade Fair. Contact: R & VG Exbns Ltd, (0273) 203601	21-24 Oct
London	(Earls Court), London Business Equipment Show. Contact: Christine Prentice, (01) 674 1001	23-26 Oct
London	(Alexandra Palace) Electron & BBC Micro User Show. Contact: Database Publications, (061) 456 8383	25-28 Oct
London	(Dulwich College), Educational Software Exbn. Contact: C Sweeten, (0865) 725904	26-27 Oct
Bristol	(Exbn Complex) Home Tech 84. Contact: Nationwide Exbns Ltd, (0272) 650465	26-29 Oct
Singapore	(World Trade Centre) Percomp Asia. Contact: J Pritchard, (01) 4861 951	29 Oct-2 Nov
Bournemouth	(Town Hall) Personal Computer Fair. Contact: M Schofield Promotions, (0202) 36899	30 Oct-1 Nov
Glasgow	(Anderston Centre) Computers in Action Exbn. Contact: Trade Exbns, (0764) 4204	30 Oct-1 Nov
Glasgow	(Anderston Centre) Scottish Home Computer & Electronics Show. Contact: Trade Exbns, (0764) 4204	9-11 Nov
London	(Olympia) Compec Exbn. Contact: Reed Exbn, (01) 643 8040	13-16 Nov

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PROGRAM FILE

PCW is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation, and a listing on plain white paper — typed if you have no printer. If possible, the printout format should match what appears on the screen. (Commodore 64 owners should use the Brackets program printed in the June issue to make control codes understandable.)

Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number.

All programs should be fully debugged and your own original, unpublished work.

We prefer to receive programs which adhere to the following criteria:

1 Maximum 80-column width; and
2 Emphasised typeface.

We'll do our best to return any submissions that are sent in with the appropriate postage and packing, but please keep a copy of everything yourself.

Programs are paid for at the rate of £50 per page of published listing, plus a £50 bonus for the Program of the Month. Send your contributions to Nick Walker, PCW Programs, 62 Oxford St, London W1A 2HG.

This month's selection has a utilities flavour and covers a wide range of machines, but this serious front is broken by some excellent games. Program of the Month is a utility for educational institutions and has the highest recommendation — it is currently in use in a number of schools. Titled 'Marksman' and running on the BBC Model B, it is used for recording and analysing pupils' results in tests and exams. The program is menu-driven and very simple to use. It also received a rave review from our software referee, a teacher who is now using the program.

Basic programmers who want to gain an insight into the speed and power of machine code should try 'Life' for the Sinclair Spectrum. This 13-line program is a complete version of the popular computer game and produces new generations at a rate of nine per second — try doing that with Basic. Any machine code experts who think they can write a faster and shorter version please send me a copy.

Golf is a difficult game to simulate, so I was pleasantly surprised by 'Golf' for the BBC. It has all the features of the real game and can be played at a similarly leisurely pace. An evening spent playing this game resulted in a handicap of 30 and still five over par, which is an accurate reflection of my true golfing abilities. Perhaps someone will write a more appropriate Pitch and Put simulation!

Spectra-draw is a program for the Spectravideo SV318 and SV328. Two simple changes listed with the program will enable it to run on MSX machines. It's well worth the effort and rivals some commercial paint-box programs in quality.

Finally, there's a professional character generator for the Sirius, a utility which adds two graphic commands to the Commodore 64, a NewBrain easy menu utility for use in Basic programs and a cassette indexer for the TRS-80 and Video Genie.


Games


Scientific/mathematic


Business


Toolkit/utilities


Educational/Computer Aided Learning

PROGRAM FILE

Program of the Month
Marksman
by BR Matthews

'Marksman' is an educational utility for the BBC Model B, and allows teachers to store, retrieve and analyse mark and form lists. The program is now in use at the school of one of our software referees, and also at the author's local school.

It allows data on 250 pupils to be stored in the computer simultaneously (it is suggested that each year of the school be stored as separate files if there are over 250 pupils). Two sets of marks can be stored, with one acting as a running total. The total mark can be updated from the last mark on request, and both can be stored as a percentage. The program also sports a colour bar graph analyser with self-adjusting y-axis.

You'll be presented with the main menu which lists seven options; to select one, press the letter next to it.

Option A Disk filing: select for any operation involving disk work. This includes listing all files on disk, loading and saving information to disk, and merging two or more files together.

Option B Sorting information: the program can sort information into alphabetical or rank order (on either last mark or total mark). When sorting alphabetically, girls names are sorted separately from boys. Information can be grouped into forms or sets.

Option C Analyse: covers drawing distribution graphs and totalling marks. The x-axis of the graph shows marks in groups of 10. No scale is shown on the y-axis, as it adjusts itself automatically to suit the number of pupils involved.

Option D Input information: used to type any fresh information into the computer. This includes new student information and new marks.

Option E Edit information: probably the most frequently used option. Any aspect of the information can be altered. All the marks of an entire file can be wiped clean for fresh marks, say, at the start of a new term. If an identical piece of information has to be altered in a number of items, such as the alteration of a form name, then the global search and replace can be used. Item correction allows correction and addition of single items, such as the addition of new pupils.

Option F Printing information: allows you to list on screen or on the printer the file currently in memory. You can also reference an individual pupil using the item list option.

```
 10*KEY10 OLD:MRUN:M
 20 ON ERROR GOTO 3840
 30 REM*******************************
 40 REM*         Marksman            *
 50 REM*                             *
 60 REM*     By B.R.Matthews         *
 70 REM*                             *
 80 REM*      Started 25/5/84        *
 90 REM* (Max. capacity=250 records)*
100 REM*******************************
110 MODE 7:CLS
120 PRINT TAB(5,7);"*************************"
130 PRINTTAB(5,8);"*                        *"
140 PRINTTAB(5,9);"*      Marksman          *"
150 PRINT TAB(5,10);"*                        *"
160 PRINT TAB(5,11);"*    By  Bramley         *"
170 PRINT TAB(5,12);"*                        *"
180 PRINT TAB(5,13);"*************************"
190 B$=GET$
200 REM********      MENU      ******
210 MODE 7
220 CLS:RESTORE:PROCmenu
230 PROCchoose
240 IF CH=1 THEN PROCdmenu
250IF CH=2THENPROCsmenu
260 IF CH=3 THENPROCdatmenu
270 IF CH=4 THEN PROCinmenu
280 IF CH=5 THEN PROCedmenu
290 IF CH=6 THEN PROCprintmenu
300 IF CH=7 THEN STOP
310 CLS:GOTO220
320 DEF PROCsmenu
330 RESTORE 4020
340 PROCmenu
350 PROCchoose
360 ON CH GOTO 1690,1570,2170,2260,370
370 CH=-1:ENDPROC
380 DEF PROCdmenu
390 RESTORE 4100
400 PROCmenu
410 PROCchoose
420 ON CH GOTO1180,1080,1820,730,7
430 CH=-1:ENDPROC
440 DEF PROCinmenu:RESTORE4150:PROCmenu:PROCchoose:ON CH GOTO810 ,1380,450
450 CH=-1:ENDPROC
460 DEF PROCprintmenu
470 RESTORE 4220:PROCmenu:PROCchoose
480 ON CH GOTO 1310,3410,2310,490
490 CH=-1:ENDPROC
500 DEF PROCedmenu
510 CLS:RESTORE 4130
520 PROCmenu:PROCchoose
530 ON CH GOTO 2750,2650,2700,540
```


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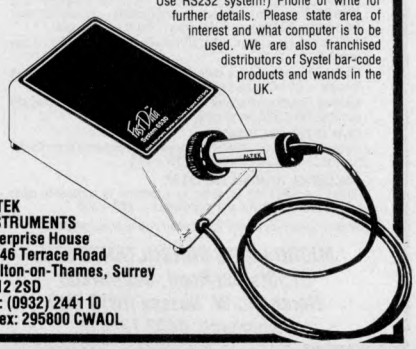

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PROGRAM FILE

```
540 CH=-1:ENDPROC
550 DEF PROCdatmenu
560 RESTORE 4070
570 PROCmenu:PROCchoose:ON CH GOTO 3500,3210,590
580 CH=-1:ENDPROC
590 DEF PROCmenu:CLS
600 READN
610 Y=2:B=0
620 REPEAT
630 READ I$:PRINT TAB(5,Y);CHR$(B+65);")";" ";I$;
640 Y=Y+2:B=B+1
650 UNTILE=N
660 CH=-1:ENDPROC
670 DEF PROCchoose
680 PRINT
690 A$=GET$:CH=ASC(A$)-64:IF CH=14THEN 3760
710 IF CH<1 OR CH>N THENN?20
720 ENDPROC
730 REM******** DIRECTORY ****
740 CLS:PRINT"Which Drive?"
750 REM INTO THIS SPACE WILL GO
760 REM THE PRINTER DRIVER
770 D$=GET$:D=VAL(D$):IFD=0THENCLS:*CAT0ELSEIFD=1THENCLS:*CAT1ELSEGOTO620
780Z$=GET$
790CH=-1:ENDPROC
800 REM******** INPUT ******
810 CLS
820 CLEAR
830 P=0
840 INPUT"How many pupils :"A
850 IF A>250 THEN CLS:PRINT TAB(10,10);"Not enough memory.":D$=GET$:GOTO 220
860 DIM C$(850)
870 FOR B=1 TO A
880 CLS:PRINT"Pupil #";B
890 PRINT:INPUT"Surname :"C$(B):C$(B)=C$(B)+" "
900 INPUT"First name :"D$:C$(B)=C$(B)+D$:C$(B)=C$(B)+" "
910 C$(B)=C$(B)+"¦"
920 PRINT:PRINT"Sex :(M/F)";
930 B$=GET$:IF B$<>"M" AND B$<>"F" THEN GOTO 930
940 IF B$="M"THEND$="Male "ELSED$="Female"
950 PRINT TAB(5,5);D$:C$(B)=C$(B)+B$:C$(B)=C$(B)+" "
960 B$=GET$
970 PRINT
980 INPUT"Form :"D$:REPEAT:D$=D$+" ":UNTIL LEN(D$)=4:C$(B)=C$(B)+D$:PRINT
990 INPUT"Math's Set :"D$:REPEAT:D$=D$+" ":UNTIL LEN(D$)=3:C$(B)=C$(B)+D$
1000 INPUT"English set :"D$:REPEAT:D$=D$+" ":UNTIL LEN(D$)=2:C$(B)=C$(B)+D$
1010 C$(B)=C$(B)+" "
1020IF P=-100THENP=0:RETURN
1030 PRINT TAB(0,19);"Is this correct?";
1040 B$=GET$:IFB$="Y"THEN D$="":NEXTB:GOTO 210
1050 IF B$="N"THENC$(B)="":GOTO880
1060 GOTO 1040
1070 REM******** SAVE DATA ****
1080 CLS
1090 INPUT"File name :"F$
1100 PRINT:PRINT"Saving"
1110 X=OPENOUT (F$)
1120 PRINT#X,A
1130 FOR B=1 TO A:PRINT#X,C$(B):NEXT I
1140 CLOSE#X
1160 GOTO 220
1170 REM******** LOAD DATA ****
1180 CLS:CLEAR
1190 INPUT"File name :"F$
1200 PRINT:PRINT"Loading"
1210 X=OPENUP (F$):INPUT#X,A
1220 DIM C$(250):FOR B=1 TO A
1230 GOTO 1260
1240 X=OPENOUT ("LIST"):PRINT#X,0
1250 CLOSE#X:RETURN
1260 INPUT#X,C$(B):NEXT B
1270 CLOSE#X
1280 GOTO 1310
1300 REM********* SCREEN LISTING****
1310 CLS:FOR B=1 TO A
1320 IF INT(B/8)=B/8THENF$=GET$:CLS
1330 PROCSHIFT
1340 PRINT TAB(0);B;")";TAB(3);N$:NEXT
1350 B$=GET$
1360 GOTO 220
1370 REM******** INPUT MARKS ****
1380 CLS:PRINT"Do you want to percentage the marks";
1390 B$=GET$:IF B$="N" THEN T=100:GOTO1410
1400 IF B$<>"Y"THENGOTO1390
1410 PRINT:INPUT"What are the marks out of? "T
1420 FOR I=1 TO A:CLS
1430 PRINT "Pupil #";B
1440 PROCSHIFT
1450 PRINT TAB(0,10);N$
1460 PRINT TAB(0,15);""
1470 INPUT"Mark :"M
1480 M=INT((M/T)*100)
1490 M$=STR$(M)
1500 REPEAT
1510 M$=M$+" "
1520 UNTIL LEN(M$)=4
1530 C$(B)=LEFT$(C$(I),LEN(C$(I))-4):C$(B)=C$(B)+N$
1540 NEXT B
1550 GOTO 220
1560 REM******** RANK SORT *****
1570 CLS:PRINT"Sort Total mark or last mark? (T/L)"
1580 B$=GET$:IFB$="T"THENZ=39ELSEIFB$="L"THENZ=43ELSEGOTO1580
1590 CLS:PRINT TAB(15,10);"Sorting":I=1:P=1:C=1:M=0:N=1
1600 FOR E=C TO A
1610 PROCMID(Z,4):D=VAL(M$)
1620 IF D>M THEN M=D:P=E
1630 NEXT B
1640 E$=C$(N):C$(N)=C$(P):C$(P)=B$
1650 C=C+1:N=N+1:P=C:M=0
1660 IF N>A THEN GOTO 1310
1670 GOTO 1600
1680 REM******** ALPHA SORT *****
1690 CLS:PRINT TAB(15,10);"Sorting":FOR B=1 TO A:PROCMID(28,1):IFM$="M"THENC$(E
="ZZ "+C$(B)
```

PROGRAM FILE

```
1700 NEXT B
1710 C=1:M$="ZZZZZZZ"
1720 FOR B=C TO A
1730 IF C$(B) <M$THEN M$=C$(B) :P=B
1740 NEXT B
1750 B$=C$(C):C$(C)=C$(P):C$(P)=B$
1760 C=C+1:P=C:M$="ZZZZZZZ"
1770 IF C=A THEN GOTO 1790
1780 GOTO 1720
1790 FOR B=1 TO A:PROCMID(28,1):IFM$="M"THEN C$(B)=RIGHT$(C$(B),(LEN(C$(B))-3))
1800 NEXTB:GOTO 1310
1810 REM********  MERGE SEQUENCE ***
1820 CLS
1830 CLEAR
1840 INPUT"How many files do you want to merge :"N
1850 DIM N$(N)
1860 FOR M=1 TO N
1870 PRINT:PRINT "File name #";M;:PRINT TAB(15);":";:INPUT""N$(M
1880 NEXT M
1890 P=0
1900 CLS:PRINT TAB(15,10);"Loading"
1910 FOR M=1 TO N
1920 X=OPENUP (N$(M))
1930 INPUT#X,O:P=P+O
1940 CLOSE#X
2000 NEXT M
2010 IF P>250 THEN PRINT:PRINT"Not enough memory":B$=GET$:GOTO220
2020 A=P
2030 DIM C$(250):D=1
2040 CLS:PRINT TAB(15,10);"Loading"
2050 FOR M=1 TO N
2060 X=OPENUP (N$(M))
2070 INPUT#X,C
2080 GOTO 2110
2090 X=OPENUP (F$):INPUT#X,A
2100 CLOSE#X:RETURN
2110 FOR B=D TO D+C-1
2120 INPUT#X,C$(B)
2130 D=D+1:NEXT B
2140 CLOSE#X
2150 NEXT M
2160 GOTO 1310
2170  Z=30
2180 REM********  FORM/SET SORT  ***
2190 CLS:PRINT TAB(15,10);"Sorting":C=1:N$="ZZZ"
2200 FOR B=C TO A
2210 PROCMID(Z,3):D$=M$
2220 IF D$<N$THENN$=D$:P=B
2230 NEXTB:D$=C$(C):C$(C)=C$(P):C$(P)=D$:C=C+1:P=C:N$="ZZZ"
2240 IF C=A THENGOTO 1310
2250 GOTO 2200
2260 CLS:PRINT"Sort on:-":PRINT"E) English sets":PRINT"M) Maths sets";
2270 B$=GET$:IF B$="E" THEN Z=36:GOTO2190
2280 IF B$="M"THEN Z=33:GOTO 2190
2290 GOTO 2270
2300 REM********   GLOBAL SEARCH ***
2310 CLS
2320 INPUT"Enter the first few letters of the      surname of the re      :"S$
2330 B=1
2340 IF LEFT$(C$(B),LEN(S$))=S$THEN GOTO 2380
2350 B=B+1:IFB>A THEN GOTO 2360 ELSE GOTO 2340
2360 PRINT:PRINT"Pupil not found.":PRINT:PRINT"Try again ?";
2370 I$=GET$:IFI$="N"THENGOTO220ELSEIFI$="Y"THENGOTO2310ELSEGOTO2370
2380 PRINT:PRINT"Found :";LEFT$(C$(B),LEN(C$(B))-22):PRINT"Correct ?:",
2390 B$=GET$:IFB$="N"THEN2350ELSEIFB$="Y"THEN2400ELSE2390
2400 CLS
2410 PRINT"Pupil #";B
2420 PRINT
2430 C=1
2440 IF MID$(C$(B),C,1)=" "THENGOTO2460
2450 C=C+1:GOTO 2440
2460 PRINT"Surname :";LEFT$(C$(B),C)
2470 PRINT:D=C:C=C+1
2480 IF MID$(C$(B),C,1)=";"THENGOTO2490ELSEC=C+1:GOTO2480
2490 PRINT"First name :";MID$(C$(B),D,C-D)
2500 C=C+1
2510 PRINT:PRINT"Sex :";
2520 IF MID$(C$(B),C,1)="M" THEN PRINT"Male" ELSE PRINT "Female"
2530 C=C+2
2540 PRINT:PRINT Form :",MID$(C$(B),C,3):C=C+4
2550 PRINT:PRINT"Maths set :";MID$(C$(B),C,1):C=C+3
2560 PRINT:PRINT"English set :";MID$(C$(B),C,1):C=C+2
2570 PRINT:PRINT"Last mark :";RIGHT$(C$(B),4)
2580 PRINT:PRINT"Total mark :";MID$(C$(B),C,4)
2590 PRINT:PRINT:PRINT:PRINT"Z for last pupil.  ? for next pupil.      E to end";

2600 B$=GET$:IF B$="Z"ANDB>1THENB=B-1:GOTO 2400
2610 IF B$="X" AND B<A THEN B=B+1:GOTO2400
2620 IF B$="E" THEN GOTO 220
2630 GOTO 2600
2640 REM********  EDIT MARKS  ******
2650 CLS:PRINT"Remove all marks (R)":PRINT"Or edit (E)"
2660 B$=GET$:IF B$="R" THEN GOTO 2740
2670 IF B$<>"E" THEN 2660
2680 CLS:INPUT"Pupils number :"B
2690 PRINT:PRINTC$(B):PRINT"Edit ?"
2700 B$=GET$:IF B$="N" THEN GOTO 220 ELSE IF B$<>"Y" THEN GOTO 2700
2710 INPUT"New mark :"C:INPUT"New total :"T:I$=STR$(C):REPEAT:B$=B$+" ":UNTIL L
EN(B$)=4:T$=STR$(T):IFT=0THENT$="    "ELSEREPEAT:T$=T$+" ":UNTILLEN(T$)=4
2720 C$(B)=LEFT$(C$(B),LEN(C$(B))-8):B$=T$+B$
2730 C$(B)=C$(B)+B$:GOTO 220
2740 FOR B=1 TO A:C$(B)=LEFT$(C$(B),LEN(C$(B))-8):C$(B)=C$(B)+"          ":NEXT:G
OTO 220
2750 CLS:INPUT"What is the number of the pupil you wantto edit? :"B
2751 IF B>A THEN A=A+1:B=A
2760 REM********  PUPIL EDIT  ******
2770 P=-100:GOSUB 880
2780 GOTO 220
2790 CLS:PRINT"Do you want to replace :-"
2800 PRINT TAB(5);"A) The form"
2810 PRINT TAB(5);"B) The maths set"
2820 PRINT TAB(5);"C) The english set"
2830 B$=GET$
2840 IF B$="A" THEN P=30:Q=18:E=4:GOTO2880
```


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PROGRAM FILE

```
2850 IF B$="B" THEN P=34:Q=14:E=3:GOTO2880
2860 IF B$="C" THEN P=37:Q=11:E=3:GOTO2880
2870 GOTO 2830
2880 PRINT :PRINT"Global or selective search? (G/S)";
2890 B$=GET$:IF B$="G" THEN PROCglobe:GOTO 220
2900 IF B$="S" THEN PROCselect:GOTO220
2910 GOTO 2890
2920 DEF PROCglobe
2930 PRINT:INPUT"Search string :"S$
2940 REPEAT:S$=S$+" ":UNTIL LEN(S$)=E
2950 PRINT:INPUT"Replace string :"R$
2960 REPEAT:R$=R$+" ":UNTIL LEN(R$)=E
2970 FOR B=1 TO A
2980 PROCMID(P,E)
2990 IF M$<>S$ THEN GOTO 3050
3000 PROCSHIFT
3010 PRINT"Found :";N$:PRINT
3020 Y$=RIGHT$(C$(B),(Q-E))
3030 X$=LEFT$(C$(B),(LEN(C$(B))-Q))
3040 C$(B)=X$+R$+Y$
3050 NEXT B:ENDPROC
3060 DEF PROCselect
3070 PRINT:INPUT"Search string :"S$
3080 REPEAT:S$=S$+" ":UNTIL LEN(S$)=E
3090 FOR B=1 TO A
3100 PROCMID(P,E)
3110 IFM$<>S$THEN3190
3120 PROCSHIFT:PRINT:PRINT"Found :";N$:PRINT"Replace ?";
3130 B$=GET$:IF B$="N" THEN GOTO 3190
3140 IF B$<>"Y" THEN GOTO 3130
3150 PRINT:PRINT"Replace ";S$;" with :"::INPUT R$
3160 REPEAT:R$=R$+" ":UNTIL LEN(R$)=E
3170 Y$=RIGHT$(C$(B),(Q-E)):X$=LEFT$(C$(B),(LEN(C$(B))-Q))
3180 C$(B)=X$+R$+Y$
3190 NEXT B:B$=GET$:ENDPROC
3200 REM******** TOTAL MARKS *****
3210 CLS
3220 PRINT"Do you want to percentage the total ?"
3230 B$=GET$:IF B$="N" THEN T=100:GOTO 3260
3240 IF B$<>"Y" THEN GOTO 3230
3250 PRINT:INPUT"What is the total out of ",T
3260 FOR B=1 TO A
3270 S=0
3280 PROCMID(39,4):S=VAL(M$)
3290 PROCMID(43,4):S=S+VAL(N$)
3300 S=INT((S/T)*100)
3310 PROCSHIFT
3320 PRINT N$:PRINT"Total =";S
3330 S$=STR$(S)
3340 REPEAT:S$=S$+" ":UNTIL LEN(S$)=4
3350 M$=RIGHT$(C$(B),4):C$(B)=LEFT$(C$(B),LEN(C$(B))-8):S$=S$+M$
3360 C$(B)=C$(B)+S$
3370 NEXT B
3380 GOTO 220
3390 CLS:PRINT TAB(10,10);"Sorry - No Graph routine":B$=GET$:GOTO220
3400 REM********** PRINTOUT *******
3410 CLS
3420 PRINT"Do you want to put a title on the list?"
3430 B$=GET$:IF B$<>"Y"THEN3450
3440 INPUT"Title :"T$:GOTO3460
3450 T$=""
3460 VDU2:PRINTT$:PRINT:PRINT
3470 PRINT"          Name                              F   M   E   T   M":PRINT
3480 FORE=1TOA:PROCSHIFT:PRINT TAB(0);E; TAB(4);")";TAB(6);N$:PRINT:NEXT
3490 VDU3:GOTO220
3500 REM********** GRAPH ************
3510 CLS
3520 PRINT TAB(5,10);"Graph Drawer"
3530 B$=GET$
3540 CLS:PRINT"Do you want to graph :-":PRINT"   T) The total mark     or":PRINT"   L) The last mark"
3550 B$=GET$:IF B$="T" THEN Z=8:GOTO 3570
3560 IFB$="L"THENZ=4:GOTO3570 ELSE GOTO 3550
3570 CLS:FOR X=0 TO 39:PRINTTAB(X,21);"_":NEXT
3580 FOR X=0 TO 39 STEP 4:PRINTTAB(X,22);(X/4)*10:NEXT
3590 C=151
3600 X=0
3610 R=(A/61.6)
3620 FOR N=5 TO 95 STEP 10
3630 M=0
3640 FOR B=1 TO A
3650 D$=LEFT$(RIGHT$(C$(B),Z),4):D=VAL(D$):IF D>N-5 AND D<=N+5 THEN M=M+1
3660 NEXTB
3680 M=(M/R):M=M+0.49:M=INT(M)
3690 FOR Y=20 TO 20-M STEP -1
3700 IF N<95ANDY>0ANDM>0THENPRINTTAB(X,Y);CHR$(C);CHR$(255);CHR$(255);CHR$(255);ELSE IFY>0ANDM>0THENPRINTTAB(X,Y);CHR$(C);CHR$(255);CHR$(255);CHR$(255);
3710 NEXT Y
3720 C=C+1:IFC>150THENC=145
3730 X=X+4:NEXT N
3740 FOR Y=1 TO 21:PRINTTAB(0,Y);"I";:NEXT:PRINT TAB(0,23);"":B$=GET$:GOTO 220
3750 FOR Y=1 TO 21:PRINTTAB(0,Y);"I";:NEXT
3800 DEF PROCBREAK
3810 STOP
3830 REM******** ERROR **************
3840 IF ERL=1160 THEN GOSUB1240:GOTO1150
3850 IF ERL>1080 AND ERL<1320 THEN CLOSE#X
3860 IF ERL>1840 AND ERL<2190 THEN CLOSE#X
3870 IF ERR=26 OR ERR=17 THEN220 ELSE CLS:PRINTTAB(10,10);"ERROR ":ERR:B$=GET$:GOTO 220
3880 FOR B=1 TO A:B$=LEFT$(C$(B),20):A$=RIGHT$(C$(B),LEN(C$(B))-20)
3890 REPEAT:B$=B$+" ":UNTILLEN(B$)=20
3900 C$(B)=B$+A$:NEXT B:GOTO 1310
3910 *KEY0 LIST,8890:M
3920 *KEY1 CH."1":ENDPROC:M
3930 *KEY2 C$(B)
3940 STOP
3950 DATA 7,"Disk filing menu"
3960DATA"Sort menu"
3970DATA"Data analysis menu"
3980DATA"Input menu"
3990DATA"Edit menu"
40000DATA"Printout menu"
40100DATA"Escape program"
40200DATA 5,"Alphabetical sort"
```

PROGRAM FILE

```
4030DATA"Rank sort"
4040DATA"Form sort"
4050DATA"Set sort"
4060DATA"Main menu"
4070DATA3,"Graph drawer"
4080DATA"Total marks"
4090DATA"Main menu"
4100DATA5,"Load a file"
4110DATA"save a file"
4120DATA"Merge files"
4130DATA"Disk directory"
4140DATA"Main menu"
4150DATA3,"Input name list"
4160DATA"Input marks"
4170DATA"Main menu"
4180DATA4,"Item correction"
4190DATA"Remove/Edit marks"
4200DATA"Global search and replace"
4210DATA"Main menu"
4220DATA4,"Screen listing"
4230DATA"Printer listing"
4240DATA"Item list"
4250DATA"Main menu"
4260 DEFPROCMID(X,Y)
4270 X=X-26:F$=RIGHT$(C$(B),21)
4280 M$=MID$(F$,X,Y)
4290 ENDPROC
4300 DEFPROCSHIFT
4310 N$=LEFT$(C$(B),(LEN(C$(B))-22))
4320 REPEAT:N$=N$+" ":UNTIL LEN(N$)=26
4330 N$=N$+RIGHT$(C$(B),20)
4340 ENDPROC
```

Spectravideo Spectra-draw

by Graham Bland

Spectravideo 'Spectra-draw' is a program for the SV318 and SV328 machines. It allows you to design custom screens using the cursor as a paint-brush. While the idea of a paint-box program is not original, this version has some excellent features and rivals most of the commercially available programs of this nature. Features include:

1 Multi-coloured screen design.
2 Magnification of an area for intricate detailed design.
3 Paint-brush, eraser, pencil and mirror drawing styles.
4 Line, box and circle drawing.
5 Fill and air brush routines.

One nice little feature is the cursor character which looks like a paint-brush when paint-brush is used, a spray can when the air brush is used, and so on. The program contains all the necessary instructions within it.

```
10 REM ************************
20 REM *                      *
30 REM *     SPECTRA-DRAW     *
40 REM *                      *
50 REM *    G. BLAND  1984    *
60 REM *                      *
70 REM ************************
80 CLEAR
90 REM *
100 REM * Disable CTL-C with dummy
110 REM * interrupt routine
120 STOP ON : ON STOP GOSUB 4580
130 DEFINT A-Z
140 RESTORE
150 REM *
160 REM *
170 REM *  Main Menu
180 REM *
190 SCREEN 0,0 : COLOR 15,4 : CLS
200 LOCATE 14,1,0 : PRINT "SPECTRA-DRAW":LOCATE 14,2:PRINT"............"
210 LOCATE 8,7 : PRINT "1. Run SPECTRA-DRAW"
220 LOCATE 8,9: PRINT "2. List Instructions"
230 LOCATE 8,11: PRINT "3. Exit To BASIC"
240 LOCATE 8,15:PRINT "Enter Option [ ]"
250 T$="+" : R$ = " "
260 LOCATE 22,15:PRINTT$;
270 A$=INKEY$ : IF A$ = "" THEN SWAP T$,R$: GOTO 260
280 IF ASC(A$)<49 OR ASC(A$)>51 THEN GOTO 260
290 LOCATE 22,15:PRINT A$
300 LOCATE 8,20 : PRINT "Proceeding..."
310 FOR I = 1 TO 5000 : NEXT
320 IF A$="1" THEN GOTO 350
330 IF A$="2" THEN GOTO 4150
340 IF A$="3" THEN GOTO 4630
350 REM * Enable Spacebar Interrupt
360 REM *
370 STRIG(0) ON: ON STRIG GOSUB 1960
380 REM *
390 REM * Set Function Key Traps
400 REM *
410 KEY ON : ON KEY GOSUB 2430,2570,2660,2920
420 DIM Z(8,2): REM * Joystick offsets
430 DIM GC(8,8):REM * Edit Colours
440 DIM IK(2,7):REM * Icon Ref. Table
450 DIM CP(2,14): REM * Icon Placement reference Table
460 REM *
470 REM * Define Pythagorus Function
480 REM *
490 DEF FNC(M,N,O,P)=SQR((ABS((M-O)^2))+(ABS((N-P)^2)))
500 REM *
510 REM * Initialise Joystick Offsets
520 REM *
530 FOR I = 1 TO 8: FOR J = 1 TO 2
540 READ A : Z(I,J) = A
550 NEXT J : NEXT I
560 DATA 0,-1,1,-1,1,0,1,1,0,1,-1,1,-1,0,-1,-1
570 REM *
580 REM * Initialise Icon Array
590 REM *
```


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PROGRAM FILE

```
600 FOR I = 0 TO 1
610 FOR J = 0 TO 6
620 READ A : IK(I,J)=A
630 NEXT J
640 NEXT I
650 REM *
660 REM * Initialise Icon Placement Table
670 REM *
680 FOR I = 1 TO 14
690 READ A : CP(1,I)=A
700 READ B : CP(2,I)=B
710 NEXT I
720 REM *
730 REM *  Array Data
740 REM *
750 DATA 1,3,5,7,9,11,13,2,4,6,8,10,12,14
760 DATA 38,4,54,4,37,20,52,20,36,36,52,36
770 DATA 37,52,52,52,36,68,54,68,37,84,54,84
780 DATA 38,100,54,100
790 REM *
800 REM * Screen Initialisation
810 REM *
820 SCREEN 1 : CLICK OFF
830 COLOR 15,15,15 :CLS
840 S=12 : IC= 12 : T=1 : CC=1
850 GOSUB 1340:GOSUB 1600: GOSUB 1260: S = 0
860 REM *
870 REM * Main Loop
880 REM *
890 UL=1:RL=255:BL=190:LL=67
900 KA = 4 : X=160 : Y = 96 : S=12: IC =12 : BC = 1 : PC=1 : BH = 0 : PH = 0
910 EC = 1 : EH = 0 : T = 1 : TH = 15
920 MC =1 : MH = 0
930 REM *
940 REM * Place Current Cursor
950 REM *
960 PUT SPRITE 0,(X,Y),T,S
970 REM *
980 REM * Poll Joystick
990 REM *
1000 IF STICK(0) = 0 THEN 960
1010 REM *
1020 REM* Add offsets and validate
1030 REM *
1040 X=X+Z(STICK(0),1):Y=Y+Z(STICK(0),2)
1050 IF X<LL THEN X=LL
1060 IF X>RL THEN X=RL
1070 IF Y<UL THEN Y=UL
1080 IF Y>BL THEN Y=BL
1090 REM *
1100 REM * If Pen selected - Draw
1110 REM *
1120 IF S=12 AND PC=1 THEN PSET(X,Y),CC
1130 REM *
1140 REM * If Brush Selected - Paint
1150 REM *
1160 IF S = 1 AND BC = 1 THEN GOSUB 2990
1170 REM *
1180 REM * If Eraser Selected - Erase
1190 REM *
1200 IF S =11 AND EC = 1 THEN PSET(X,Y),15
1210 REM *
1220 REM * Mirror Mode Plot
1230 REM *
1240 IF S=4 AND MC = 1 THEN PSET(X,Y),CC:PSET(256-(X-66),Y),CC:PSET(256-(X-66),1
92-Y),CC:PSET (X,192-Y),CC
1250 GOTO 960
1260 REM *
1270 REM * Place Sprite "Icons"
1280 REM *
1290 FOR I = 1 TO 14
1300 PUT SPRITE I,(CP(1,I),CP(2,I)),1,I
1310 NEXT
1320 RETURN
1330 REM *
1340 REM * Screen Definition Routine *
1350 REM *
1360 LINE (0,0)-(64,112),1,B:LINE (66,0)-(254,192),1,B
1370 LINE (32,0)-(32,112),1 : LINE (0,114)-(64,126),1,B
1380 LINE (32,114)-(48,126),1,B
1390 LINE (2,116)-(30,124),1,BF
1400 REM *
1410 REM * Draw colour palette
1420 REM *
1430 C=1
1440 FOR I = 2 TO 18 STEP 16
1450 FOR J = 2 TO 98 STEP 16
1460 LINE (I,J)-(I+12,J+12),C,BF
1470 C=C+1
1480 NEXT J
1490 NEXT I
1500 REM *
1510 REM * Draw Icon Lattice
1520 REM *
1530 FOR I = 16 TO 112 STEP 16
1540 LINE (32,I)-(64,I),1
1550 NEXT I
1560 LINE (48,0)-(48,112),1
1570 LINE (0,128)-(64,192),1,B
1580 RETURN
1590 REM *
1600 REM * Sprite Definition
1610 REM *
1620 FOR N = 0 TO 15
1630 S$ = ""
1640 FOR S = 1 TO 8
1650 READ A$ : S$ = S$ + CHR$(VAL(A$))
1660 NEXT S
1670 SPRITE$(N)=S$
1680 NEXT N
1690 RETURN
1700 REM *
1710 REM * Sprite Definition Data
1720 REM *
1730 DATA 240,192,160,144,8,4,2,1
1740 DATA 240,240,240,000,240,96,96,96
1750 DATA 224,64,64,64,64,64,64,224
1760 DATA 60,66,129,153,153,129,66,60
1770 'DATA 60,126,255,231,231,255,126,60
1780 DATA 254,146,146,254,146,146,254,0
1790 DATA 255,129,129,129,129,129,129,255
1800 DATA 255,255,255,255,255,255,255,255
1810 DATA 254,170,170,170,170,170,170,254
1820 DATA 255,129,255,129,255,129,255,0
```

PROGRAM FILE

```
1830 DATA 255,255,255,255,129,129,129,255
1840 DATA 224,62,34,250,136,136,136,248
1850 DATA 255,195,165,153,153,165,195,255
1860 DATA 128,64,32,16,8,4,0,0
1870 DATA 112,136,128,128,128,136,112,0
1880 DATA 112,136,136,136,168,144,104,0
1890 DATA 64,224,64,0,0,0,0,0
1900 REM *
1910 REM * Spacebar Interrupt Routine
1920 REM *
1930 REM * Determine Current Screen
1940 REM * Area and Branch
1950 REM *
1960 IF KA = 1 THEN GOTO 2030
1970 IF KA = 2 THEN GOTO 2130
1980 IF KA = 3 THEN GOTO 2340
1990 IF KA = 4 THEN GOTO 3120
2000 REM *
2010 REM * Colour Selection Routine
2020 REM *
2030 IF POINT(X,Y)=15 THEN PLAY "v10l16o2c":RETURN
2040 PLAY "l24o5co6c":CC=POINT(X,Y)
2050 REM *
2060 REM * Update Colour Indicator
2070 REM *
2080 LINE (2,116)-(30,124),CC,BF
2090 RETURN
2100 REM *
2110 REM * Icon Selection Routine
2120 REM *
2130 PLAY "l24o5Co6c":V=INT((X-32)/16): W = INT(Y/16)
2140 IF W<6 THEN IC=IK(V,W) : EG = 0 : FG = 0 : ST = 0 : GOSUB 2280 : RETURN
2150 REM *
2160 REM * Handle CLS function
2170 REM *
2180 IF V=0 AND EG=1 THEN LINE (66,0)-(256,192),15,BF:LINE (66,0)-(256,192),1,B
: EG=0 : FG=0 : GOSUB 2280 : RETURN
2190 REM *
2200 REM * Handle Exit to Main Menu
2210 REM *
2220 IF V=1 AND FG=1 THEN GOTO 80
2230 REM *
2240 REM * Set Status Indicators
2250 REM *
2260 IF V=0 THEN EG=1:LINE (34,116)-(46,124),8,BF : FG = 0 : GOSUB 2280 : RETURN
2270 IF V=1 THEN FG=1:LINE (50,116)-(62,124),8,BF : EG = 0 : GOSUB 2280 : RETURN
2280 REM *
2290 REM * Reset CLS and Exit Status
2300 REM *
2310 IF EG = 0 THEN LINE (34,116)-(46,124),15,BF
2320 IF FG = 0 THEN LINE (50,116)-(62,124),15,BF
2330 RETURN
2340 REM *
2350 REM * Handle Edit Update
2360 REM *
2370 V = INT(X/8) : W = INT((Y-128)/8)
2380 IF GC(V,W) = 15 THEN GC(V,W)=CC : GOTO 2400
2390 IF GC(V,W) < 15 THEN GC(V,W)=15
2400 PLAY "l24o5co6c"
2410 PSET(AX+V,AY+W),GC(V,W)
2420 LINE ((V*8)+2,(W*8)+130)-((V*8)+6,(W*8)+134),GC(V,W),BF: RETURN
2430 REM *
2440 REM * Handle Function Keys
2450 REM *
2460 REM * (F1) : Colour Select
2470 REM *
2480 IF KA = 3 THEN EX=X : EY =Y
2490 IF KA = 1 AND EF =1 THEN X=EX : Y = EY : PUT SPRITE 0,(X,Y),T,S : KA = 3: S
=0 :LL=1 : UL=129:BL=190:RL=63: RETURN
2500 IF KA = 1 AND EF = 0 THEN X=AX : Y = AY : PUT SPRITE 0,(X,Y),T,S : KA = 4:
S=IC :LL=67 : UL=1:BL=190:RL=254: RETURN
2510 IF KA = 3 AND EF=1 THEN X=24 : Y =104 : PUT SPRITE 0,(X,Y),T,S : KA = 1: S=
0 :LL=1 : UL=1:BL=112:RL=31: RETURN
2520 IF KA<4 THEN RETURN
2530 KA = 1
2540 LL=1 : UL=1:BL=111 : RL = 31 : AX=X : AY = Y
2550 X = 16 : Y = 64 : S = 0
2560 PUT SPRITE 0,(X,Y),T,S : RETURN
2570 REM *
2580 REM * (F2) : Icon Select
2590 REM *
2600 IF KA = 2 THEN X=AX : Y = AY : PUT SPRITE 0,(X,Y),T,S : KA = 4: S=IC :LL=67
 : UL=1:BL=190:RL=254: RETURN
2610 IF KA<4 THEN RETURN
2620 KA = 2
2630 BL=111 : RL = 63 : LL= 33: UL=1: AX=X : AY = Y
2640 X = 48 : Y = 64 : S=0
2650 PUT SPRITE 0,(X,Y),T,S : RETURN
2660 REM *
2670 REM * (F3) : Editing Screen
2680 REM *
2690 IF KA = 3 THEN X=AX : Y = AY : PUT SPRITE 0,(X,Y),T,S : KA = 4: S=IC :LL=67
 : UL=1:BL=190:RL=254: EF = 0 : RETURN
2700 IF KA < 4 THEN RETURN
2710 KA = 3 : EF = 1
2720 BL=190 : RL = 63 : LL= 1: UL=129: AX=X : AY = Y
2730 X = 60 : Y = 132 : S=0
2740 PUT SPRITE 0,(X,Y),T,S
2750 REM *
2760 REM *  Set up Edit Array
2770 REM *
2780 FOR I = 0 TO 7
2790 FOR J = 0 TO 7
2800 GC(I,J)=POINT (AX+I,AY+J)
2810 NEXT J
2820 NEXT I
2830 REM *
2840 REM * Plot Edit Area
2850 REM *
2860 FOR I = 0 TO 7
2870 FOR J = 0 TO 7
2880 LINE ((I*8)+2,(J*8)+130)-((I*8)+6,(J*8)+134),GC(I,J),BF
2890 NEXT J
2900 NEXT I
2910 RETURN
2920 REM *
2930 REM *  (F3) Switch Cursor Colour
2940 REM *
2950 SWAP T,TH : RETURN
2960 REM * MMMM
2970 RETURN
2980 MM = 1 : RETURN
2990 REM *
3000 REM * Paintbrush Routine
```


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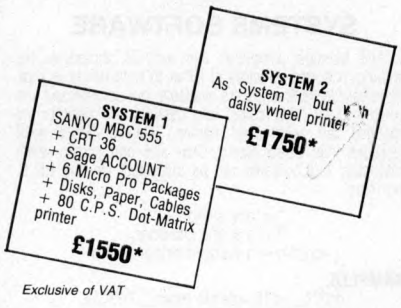

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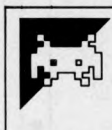
PROGRAM FILE

```
3010 REM *
3020 PW = 3
3030 IF  X + PW > RL THEN PW = PW -1 : GOTO 3030
3040 FOR I =0 TO PW
3050 PSET (X+I,Y),CC
3060 NEXT
3070 RETURN
3080 REM *
3090 REM * Service the interrupt
3100 REM * by currently selected icon
3110 REM *
3120 ON IC GOTO 3130,3170,3220,3270,3470,3520,3570,3700,3830,3900,4070,4110
3130 REM *
3140 REM * Lift / Put down Paintbrush
3150 REM *
3160 SWAP BC,BH  : RETURN
3170 REM *
3180 REM * Draw A Line
3190 REM *
3200 IF ST = 1 THEN LINE (P1,P2)-(X,Y),CC: ST = 0 : PUT SPRITE 15,(0,209),1,15 :
RETURN
3210 P1 = X : P2 = Y :ST = 1: PUT SPRITE 15,STEP (-1,-1),1,15 : RETURN
3220 REM *
3230 REM * Plot Plain Circle
3240 REM *
3250 IF ST = 1 THEN GOSUB 3310 : ST=0 : PUT SPRITE 15,(0,209),0,15 : RETURN
3260 P1 = X : P2 = Y : ST = 1 : PUT SPRITE 15, STEP (-1,-1),1,15 : RETURN
3270 REM *
3280 REM * Toggle Mirror Status
3290 REM *
3300 SWAP MC,MH : RETURN
3310 REM *
3320 REM * Calculate Radius
3330 REM *
3340 R = FNC(X,Y,P1,P2)
3350 REM *
3360 REM * If the circle arcs beyond
3370 REM * the screen boundary then
3380 REM * redraw all outside the
3390 REM * drawing area.
3400 REM *
3410 IF P1 - R < LL THEN RD = 1
3420 IF P2 + R > BL THEN RD = 1
3430 IF P2 - R < UL THEN RD = 1
3440 CIRCLE (P1,P2),R,CC,,,8/7
3450 IF RD = 1 THEN LINE (0,0)-(64,192),15,BF : GOSUB 1260 : GOSUB 1330 : GOSUB
1400 : RD = 0
3460 RETURN
3470 REM *
3480 REM * Draw A Box
3490 REM *
3500 IF ST = 1 THEN LINE (P1,P2)-(X,Y),CC,B: ST = 0 : PUT SPRITE 15,(0,209),1,15
 :RETURN
3510 P1 = X : P2 = Y :ST = 1: PUT SPRITE 15,STEP (-1,-1),1,15 : RETURN
3520 REM *
3530 REM * Draw A Box And Paint Fill
3540 REM *
3550 IF ST = 1 THEN LINE (P1,P2)-(X,Y),CC,BF: ST = 0 : PUT SPRITE 15,(0,209),1,1
5 :RETURN
3560 P1 = X : P2 = Y :ST = 1: PUT SPRITE 15,STEP (-1,-1),1,15 : RETURN
3570 REM *
3580 REM * Box with vertical fill in
3590 REM *
3600 IF ST = 1 THEN LINE (P1,P2)-(X,Y),CC,B: GOSUB 3620 : ST = 0 : PUT SPRITE 15
,(0,209),1,15 :RETURN
3610 P1 = X : P2 = Y :ST = 1: PUT SPRITE 15,STEP (-1,-1),1,15 : RETURN
3620 REM *
3630 REM * Vertical Box Fill
3640 REM *
3650 STP = 2 : IF X-P1<0 THEN STP= -2
3660 FOR I = P1 TO X STEP STP
3670 LINE (I,P2)-(I,Y),CC
3680 NEXT I
3690 RETURN
3700 REM *
3710 REM * Box with horz. fill in
3720 REM *
3730 IF ST = 1 THEN LINE (P1,P2)-(X,Y),CC,B: GOSUB 3750 : ST = 0 : PUT SPRITE 15
,(0,209),1,15 :RETURN
3740 P1 = X : P2 = Y :ST = 1: PUT SPRITE 15,STEP (-1,-1),1,15 : RETURN
3750 REM *
3760 REM * Horizontal Box Fill
3770 REM *
3780 STP = 2 : IF Y-P2<0 THEN STP= -2
3790 FOR I = P2 TO Y STEP STP
3800 LINE (P1,I)-(X,I),CC
3810 NEXT I
3820 RETURN
3830 REM *
3840 REM * Paint Enclosed Area
3850 REM * Redraws Border in Current
3860 REM * Colour
3870 REM *
3880 LINE (66,0)-(256,192),CC,B
3890 PAINT (X,Y),CC : RETURN
3900 REM *
3910 REM * Air Brush Routine
3920 REM *
3930 REM * Establish A Spray Area
3940 REM *
3950 SV = 8
3960 IF (X-SV)<LL THEN SV=SV-1 : GOTO 3960
3970 SW = 8
3980 IF (X-SW)<UL THEN SW=SW-1 : GOTO 3980
3990 SR = INT(RND(1)*6): IF SR<2 THEN 3990
4000 REM *
4010 REM * Spray Area in Curr. Colour
4020 REM *
4030 FOR I = 1 TO SR
4040 PSET (X-INT(SV*RND(1)),Y-INT(SW*RND(1))),CC
4050 NEXT I
4060 RETURN
4070 REM *
4080 REM * Toggle Eraser Value
4090 REM *
4100 SWAP EC,EH : RETURN
4110 REM *
4120 REM * Lift/Place Pencil
4130 REM *
4140 SWAP PC,PH : RETURN
4150 REM *
4160 REM * User Information
4170 REM *
```

```
4180 CLS
4190 PRINT "Function Keys":PRINT"............."
4200 PRINT : PRINT
4210 PRINT"[F1] Colour Selection:":PRINT
4220 PRINT "Position the Cursor over the desired"
4230 PRINT "colour and press the space bar.":PRINT : PRINT
4240 PRINT"[F2] Object Selection:":PRINT
4250 PRINT "Position the Cursor over the desired"
4260 PRINT "object and press the space bar."
4270 PRINT "To (C)lear the Drawing Screen, or "
4280 PRINT "(Q)uit to the Main Menu, press the"
4290 PRINT "space bar TWICE.  In both cases, a"
4300 PRINT "warning will be given in the form of"
4310 PRINT "a red box."
4320 LOCATE 0,23: PRINT "Press a Key for More..";
4330 A$=INKEY$ : IF A$="" THEN 4330
4340 CLS:PRINT : PRINT"[F3] Local Screen Edit - or 'FAT BITS'": PRINT
4350 PRINT"An 8x8 area local to the cursor is ":PRINT"Displayed in the edit fiel
d."
4360 PRINT "Pressing the Spacebar will alternately"
4370 PRINT"remove and replace specific pixels on":PRINT "the main screen."
4380 PRINT"Colour selection is available during":PRINT"a local edit.":PRINT
4390 PRINT"[F4] Cursor Switching":PRINT
4400 PRINT "This key will change the cursor from"
4410 PRINT "Black to White or Vice Versa."
4420 LOCATE 0,23: PRINT "Press a Key for More..";
4430 A$=INKEY$ : IF A$="" THEN 4430
4440 CLS
4450 PRINT "Object Summary":PRINT ".............":PRINT : PRINT
4460 PRINT"Paint Brush, Eraser, Pencil, Mirror -":PRINT
4470 PRINT "Pressing the space bar will lower or":PRINT"raise the Object.": PRIN
T
4480 PRINT "Line, All Boxes, Circles -":PRINT
4490 PRINT"One press of the space bar determines"
4500 PRINT "the startpoint of a box or line or the"
4510 PRINT "centre of a circle.  A second press ":PRINT "defines the end point f
or the object."
4520 PRINT "and the article is drawn."
4530 PRINT: PRINT"Air Brush, Paint Filler -":PRINT
4540 PRINT "One press sprays or fills in an area":PRINT "of the screen."
4550 LOCATE 0,23:PRINT"Press any key to return to menu...";
4560 A$=INKEY$ : IF A$ ="" THEN 4560
4570 GOTO 160
4580 REM *
4590 REM * Dummy CTL-C Trap
4600 REM *
4610 RETURN
4620 REM * Terminate
4630 SCREEN 0,0: LOCATE ,,1: COLOR 15,4 : CLS
4640 END
```



BBC Golf

by Simon Bigg

Golf is a simulation for the BBC Model B. Handicaps, club selection, graphic representation of each hole and a separate putting screen make this an excellent game.

You type in your handicap (30 if you're a total novice) and select your golfing weakness from a list of six. You are then presented with a graphic representation of the hole and asked to select a club. Type 1-4 for the 1-4 woods and 11-19 for the 1-9 irons. If you select a wood, you'll be prompted to select fade or draw; type F for fade and D for draw. For those who know nothing about golf, fade means pull to the right and draw means pull to the left. If you select an iron, you'll be prompted for a percentage swing; 10% is a gentle tap, 90% is an all-out belt. Assuming you make it to the green, you'll see a flagpole and your ball; type a number between one and 15 to pot the ball if you can.

For cassette-based systems, lines 10 to 50 inclusive must be omitted as they just move the program down $E00. The program must be saved before it's run as the move routine deletes itself.

In lines 700 to 1000, embedded teletext codes are used in PRINT statements. In the listing they are printed in reverse video as detailed below:

Inverse Symbol	Colour	ASCII code	Enter as	Function key definition
R	Red	129	Shift f1	A
G	Green	130	Shift f2	B
Y	Yellow	131	Shift f3	C
M	Magenta	133	Shift f5	E
C	Cyan	134	Shift f6	F
F	Flash	136	Shift f8	H
S	Steady	137	Shift f9	I

The function key definitions are included for the benefit of OS 0.1 users. If all the keys are defined before entering the listing, they can be used when required. OS 1.2 users can obtain the colour codes directly from the keyboard as already described.

This game's tough — after many rounds my best score was five over par with a handicap of 30.

```
LIST
   10 VDU21:*FX18
   20 P%=&3F00:[OPTO:LDA#&8C:LDX#0:STX&70:STX&72:JSR&FFF4:LDA&18:STA&71:LDH#&E:S
TA&73:LDY#0:LDA(&70),Y:STA(&72),Y:DEY:BNE&3F15:INC&71:INC&73:LDA&73:CMP#&34:BCC&
3F13:LDA#&E:STA&18:RTS:]
   30 *K.ODEL.10,50|MCALL&3F00|MEND|MRUN|F|M
```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PROGRAM FILE

```
  40 *FX138,0,128
  50 END
  60 MODE7
  70 PROCINIT:PROCDIR:PROCKEY
  80 MODE2:PROCCOL:N%=N%+1:READD%,P%:PROCPHOLE
  90 W%=200:R%=RND(10):PROCBACK:TX%=0:TY%=0
 100 IFR%>6THENPROCTREE
 110 PROCFAIRWAY:PROCGREEN:PROCBUNKER
 120 IFD%>450ANDD%<550THENPROCRIVER
 130 BX%=140:BY%=700:HX%=1000:HY%=YC%:A%=0:FL%=0:L%=1
 140 GCOL0,4:PLOT69,1000,HY%:PLOT69,1000,HY%-4
 150 PROCBALL
 160 REPEAT:FL%=0:CLS:PRINT"Shot ";A%+1
 170 PRINT"Which club ";:INPUT C%:C%=ABS(C%)
 180 IFC%<1ORC%>19OR(C%>4ANDC%<11)THENPRINT"No such club":PROCDELAY:FL%=1
 190 UNTILFL%=0
 200 Q0=0:IFC%<15THENB%=100:PROCFADR:GOTO220
 210 REPEAT:INPUT"Percentage swing",B%:PROCSOUND:UNTIL B%>0 AND B%<101
 220 B=B%/100:IF F%=3 THEN B=B*0.85
 230 IFL%=2THENB=B*AA:IFC%<3THENB=B*0.7
 240 M%=309-FNA(12)-(H%+30)*0.7-C%*8.3
 250 M%=INT((B*M%*860/D%)+.5):Q=0
 260 PROCUNBALL:A%=A%+1
 270 IFRND(1)>.3+H%/90 THEN310
 280 Q=(H%+30)*(RND(1)+.1)*PI/500
 290 IFF%>2THENU=0.5ELSEQ=Q*1.5:U=.9:IFF%=2THENU=0.1
 300 IFRND(1)>U THENQ=-Q
 310 IFHX%=BX%THENT=PI/2:HX%=HX%-30*SGN(BY%-HY%)ELSET=ATN((BY%-HY%)/(HX%-BX%))+
Q-Q0
 320 U=BX%+SGN(HX%-BX%)*INT(M%*COS(T)+0.5)*TR%
 330 BY%=BY%-SGN(HX%-BX%)*INT(M%*SIN(T)+0.5):BX%=U
 340 TR%=1:FL%=0
 350 IFBX%>1260ORBY%<420ORBY%>980THENPROCOOB:ONFL%GOTO360,720
 360 IFSQR((BX%-HX%)*(BX%-HX%)+(BY%-HY%)*(BY%-HY%))<W%/2+4THEN440
 370 C3%=POINT(BX%,BY%)
 380 C4%=POINT(BX%,BY%-4)
 390 IFC3%=2ORC4%=2THENPROCBALL:L%=1:GOTO160
 400 IFC3%=3ORC4%=3THENPROCBUNKSHOT:GOTO250
 410 IFC3%=6ORC4%=6THENPROCWETBALL:GOTO720
 420 IFC3%=1ORC4%=1THENL%=4:PROCINTREE:PROCDELAY:GOTO160
 430 L%=2:PROCROUGH:PROCDELAY:GOTO160
 440 PROCBALL:PROCDELAY:CLG:T=1:M=1:IFF%=5THENM%=3
 450 PRINT"On the green in ";A%:VDU20
 460 IFRND(1)>0.6THENJA=1ELSEIFRND(2)=1THENJA=0.73:PRINT"Slow green"ELSEJA=1.27
:PRINT"Fast green"
 470 GCOL0,2:MOVE10,500:DRAW1270,500:MOVE1270,496:DRAW10,496
 480 CF%=RND(6):IFCF%=4ORCF%=2THEN480
 490 GCOL0,CF%:MOVE920,504:DRAW920,800
 500 VDU5:MOVE920,800:PRINTCHR$231;CHR$231
 510 MOVE920,768:PRINTCHR$231;CHR$231:VDU4
 520 D%=INT(SQR((BX%-HX%)^2+(BY%-HY%)^2)/2)
 530 IFD%=0THENPRINT"You holed out!!!":GOTO710
 540 IF D%>55 THEN D%=53+FNA(4)
 550 GCOL0,7:VDU5
 560 MOVE888-D%*15,536:PRINTCHR$232:VDU4
 570 PROCDELAY
 580 CLS:PRINT"Shot ";A%+1
 590 PRINT"You are ";D%;" f";:VDU(101-10*(D%=1)),101-10*(D%=1):PRINT"t"'"from t
he pin.Input'"strength (0-15)";:INPUT C
 600 IF C>0 AND C<15.01 THEN A%=A%+1 ELSE 580
 610 PROCSOUND
 620 VDU5:E=C*(4+M*RND(1))-2.5+(RND(1)*(H%+30)/40)*M:E=INT(E*JA):M=M*0.8
 630 FORI=1TOE:X%=888-15*D%*T:GCOL0,0:MOVEX%,536:PRINTCHR$232:GCOL0,7
 640 IFD%=0ANDI>=E-1THENI=E:GOTO670
 650 D%=D%-1:X%=888-15*D%*T:MOVEX%,536:PRINTCHR$232
 660 FORJ%=1TOI*10:NEXT:IFX%>920ORX%<864THENGCOL0,CF%:MOVE920,504:DRAW 920,800:
GCOL0,7
 670 NEXTI:IFD%<0THEND%=-D%:T=-T
 680 IFX%>874ANDX%<902THENFORI%=1TO100:NEXTI%ELSEVDU4:PROCDELAY:GOTO580
 690 GCOL0,0:MOVEX%,536:PRINTCHR$232:VDU4:FL%=1
 700 GCOL0,CF%:MOVE920,504:DRAW920,800
 710 FORI%=1TO2:PROCDELAY:NEXTI%
 720 CLS:MODE7:PRINT':IFFL%=2 THEN 740
 730 PRINT"You're down in "A%
 740 IFA%>P%THENPRINT"HMMM...":GOTO810
 750 ON(A%-P%+4)GOTO790,780,770,760
 760 PRINT"A par- nice going":GOTO810
 770 PRINT"A birdie-well played !":GOTO810
 780 IFP%<>3THENPRINT"A great big eagle!!":GOTO810ELSEGOTO800
 790 IFP%<>4THENPRINT"An albatross- a rare bird indeed!!!":GOTO810
 800 PRINT"A hole in one!!!"
 810 PRINT''
 820 P1%=P1%+P%:A1%=A1%+A%:S%(N%)=A%:IFP1%=A1%THENPRINT"You are level";:GOTO8
50
 830 A$="under":IF A1%>P1% THEN A$="over"
 840 PRINT"You are ";ABS(A1%-P1%);" ";A$;
 850 PRINT" par after ";N%;" holes";:IFN%=1THENVDU127
 860 PRINT'''';PROCKEY
 870 IFN%<18THENVDU19,3,3,0,0,0:GOTO80
 880 CLS:PRINT'"Your scorecard"'
 890 PRINT"Hole  Par  Score     Hole  Par  Score"
 900 RESTORE:@%=4:FORI%=1TO17STEP2:READP%:READP%
 910 IF S%(I%)<P%THENVDU134 ELSEVDU135
 920 PRINTI%;"     ";P%;" ",S%(I%);"     ";:READP%,P%
 930 IF S%(I%+1)<P%THENVDU134 ELSEVDU135
 940 PRINTI%+1;"     ";P%;" ",S%(I%+1)
 950 NEXTI%:@%=2570
 960 PRINT''''"You had a round of";A1%
 970 PRINT'"Par is";P1%
 980 PRINT''"Do you want to play again?";:REPEAT:A$=GET$:UNTIL INSTR("YyNn",A$
)>0
 990 IFINSTR("Yy",A$)>0THEN RUN ELSECLS:END
1000 DEFPROCINIT
1010 DIMBX%(4),BY%(4),BK%(4),S%(18)
1020 VDU23,224,0,0,28,28,28,8,8,8
1030 VDU23,225,12,124,255,255,251,123,120,0
1040 VDU23,226,0,3,31,31,31,31,7,7
1050 VDU23,227,0,192,224,248,248,248,248,248
1060 VDU23,228,14,14,56,63,31,31,31,12
1070 VDU23,229,0,0,0,16,16,0,0,0
1080 VDU23,231,255,255,255,255,255,255,255,255
1090 VDU23,232,0,24,60,126,126,60,60,24
1100 N%=0:P1%=0:A1%=0:TR%=1
1110 ENDPROC
1120 DEF FNA(X)=INT(X*RND(1))
1130 DEF PROCCOL
1140 VDU19,1,0,0,0,0,19,5,2,0,0,0
1150 FORI%=8TO15:VDU19,I%,8,0,0,0:NEXT
1160 *FX9,10
1170 *FX10,10
1180 ENDPROC
1190 DEF PROCPHOLE
1200 VDU28,0,31,19,20,30
1210 PRINT"Hole:";N%;"  Par:";P%
```

PROGRAM FILE

```
1220 PRINT"Distance:";D%;" yards"
1230 VDU28,0,31,19,23,30:ENDPROC
1240 DEF PROCFAIRWAY
1250 YC%=700:INC%=(RND(3)-2)*4
1260 PROCCIRCLE(200,700,-W%/2,0)
1270 FORX%=200TO1000STEP16:TP%=INC%
1280 REPEAT:INC%=TP%:INC%=INC%+INT((8-9*RND(1))/7)*4
1290 UNTILABS(INC%)<20
1300 IF ABS(INC%+YC%-700)>100 THEN INC%=0
1310 YC%=YC%+INC%
1320 W%=W%+INT((8-9*RND(1))/7)*16
1330 IFW%<120THENW%=120
1340 IFW%>400THENW%=400
1350 MOVEX%,YC%-W%/2:DRAWX%,YC%+W%/2
1360 MOVEX%+8,YC%-W%/2:DRAWX%+8,YC%+W%/2
1370 IFX%=600THENWW%=W%:YCC%=YC%
1380 NEXT
1390 PROCCIRCLE(1000,YC%,0,W%/2)
1400 ENDPROC
1410 DEFPROCGREEN
1420 W%=W%*0.8:IFW%<100THENW%=100
1430 IFW%>200THENW%=200
1440 GCOL0,3
1450 FOR X%=-W%/2 TO W%/2 STEP8
1460 Y%=SQR(W%*W%/4-X%*X%)
1470 MOVEX%+1000,Y%+YC%:PLOT21,X%+1000,YC%-Y%
1480 IFPOINT(X%+1000,YC%)<>POINT(X%+992,YC%)THEN1520
1490 GCOL0,2:DRAWX%+1000,Y%+YC%
1500 MOVEX%+1000,Y%+YC%+4:GCOL0,3
1510 PLOT21,X%+1000,YC%-Y%+4
1520 NEXTX%
1530 ENDPROC
1540 DEFPROCRIVER
1550 GCOL0,6
1560 X%=200+RND(200):U%=8
1570 IFRND(1)<0.5THENX%=X%+500:U%=-8
1580 B%=504+RND(50)*8
1590 FORY%=400TO1000STEP8
1600 MOVEX%,Y%+4:DRAW X%+8,Y%+4
1610 IFY%=B%THENVDU5,8,226,227,4
1620 MOVEX%,Y%:DRAWX%+8,Y%
1630 IFRND(1)>.4THENX%=X%+U%
1640 NEXTY%
1650 ENDPROC
1660 DEFPROCTREE
1670 VDU5
1680 TX%=(RND(3)-1)*430:TY%=(RND(2)-1)*300+400
1690 FORK%=1TO75
1700 GCOL0,1:X%=RND(430):Y%=RND(300)
1710 MOVEX%+TX%-32,Y%+TY%+16:PRINTCHR$224
1720 NEXT:GCOL0,2:VDU4
1730 ENDPROC
1740 DEF PROCBUNKER
1750 VDU5
1760 BX%(1)=-32:BY%(1)=W%/2+40
1770 BX%(2)=-0.43*W%-80:BY%(2)=W%/4+16
1780 BX%(3)=-0.43*W%-80:BY%(3)=-W%/4+16
1790 BX%(4)=-32:BY%(4)=-W%/2-8
1800 FORI%=1TO4:BK%(I%)=I%:NEXT
1810 FORI%=1TO4:R%=RND(4):J%=BK%(R%):BK%(R%)=BK%(I%):BK%(I%)=J%:NEXT
1820 R%=INT((W%-100)/46)+2:IFR%>4THEN R%=4
1830 FORI%=1TOR%
1840 MOVEBX%(BK%(I%))+1000,BY%(BK%(I%))+YC%:IFBK%(I%)=2ORBK%(I%)=3THENPRINTCHR$
228ELSEPRINTCHR$225
1850 NEXT
1860 IFP%=3THENVDU4:ENDPROC
1870 R%=RND(2)
1880 IFR%=2THENPROCSHORT:PROCLONGER:GOTO1900
1890 IFRND(1)>.5THENPROCSHORT ELSEPROCLONGER
1900 VDU4:ENDPROC
1910 DEFPROCSHORT
1920 MOVE470+RND(150),YCC%+WW%/2-8-RND(50):PRINTCHR$225
1930 ENDPROC
1940 DEFPROCLONGER
1950 MOVE470+RND(150),YCC%-WW%/2+40+RND(50):PRINTCHR$225
1960 ENDPROC
1970 DEFPROCBACK
1980 GCOL0,5
1990 LOCAL X%
2000 FOR X%=0 TO 1280 STEP 16
2010 MOVEX%,400:PLOT21,X%,1000
2020 MOVEX%+8,404:PLOT21,X%+8,996
2030 NEXTX%
2040 GCOL0,2
2050 ENDPROC
2060 DEFPROCCIRCLE(A%,B%,C%,D%)
2070 LOCALX%,Y%
2080 FORX%=C%TOD% STEP8
2090 Y%=SQR(W%*W%/4-X%*X%)
2100 MOVEX%+A%,Y%+B%:DRAWX%+A%,B%-Y%
2110 NEXTX%
2120 ENDPROC
2130 DEFPROCKEY
2140 *FX15,1
2150 PRINT"Press any key"
2160 A$=GET$:ENDPROC
2170 DEFPROCDIR
2180 REPEAT
2190 PRINTCHR$131;"Handicap (0-30)";:INPUTH%
2200 UNTIL H%>-1 AND H%<31
2210 PRINT''CHR$131;"Difficulties at golf:"
2220 PRINT"  1) Slicing"
2230 PRINT"  2) Hooking"
2240 PRINT"  3) Poor distance"
2250 PRINT"  4) Trap shots"
2260 PRINT"  5) Putting"
2270 REPEAT
2280 PRINT'CHR$130"Your worst";:INPUTF%:F%=ABS(F%)
2290 UNTILF%<>0 AND F%<6
2300 PRINT'CHR$131;"Clubs:"
2310 PRINTCHR$130;"Yardage      Clubs      No."
2320 PRINTCHR$134;"280-200     1-4 woods   1-4"
2330 PRINTCHR$134;"200-100     1-5 irons  11-15"
2340  PRINTCHR$134;"100-0       6-9 irons  16-19"''
2350 ENDPROC
2360 DEFPROCBALL
2370 C1%=POINT(BX%,BY%)
2380 C2%=POINT(BX%,BY%-4)
2390 GCOL4,8
2400 PLOT69,BX%,BY%:PLOT69,BX%,BY%-4
2410 ENDPROC
2420 DEFPROCDELAY
2430 LOCALTM%
2440 TM%=TIME:REPEATUNTILTIME-TM%>260
```


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PROGRAM FILE

```
2450 ENDPROC
2460 DEFFPROCFADR
2470 PRINT'"Fade or draw ";:INPUTA$
2480 IFA$="D"THENQQ=0.15
2490 PROCSOUND
2500 IFA$="F"THENQQ=-0.15
2510 ENDPROC
2520 DEFPROCUNBALL
2530 GCOL4,0
2540 PLOT69,BX%,BY%
2550 PLOT69,BX%,BY%-4:ENDPROC
2560 DEFPROCLOSTBALL
2570 COLOUR2:PRINT"Lost ball":COLOUR3
2580 PRINT"Penalty - ";:COLOUR0:COLOUR131:PRINT"6 strokes"
2590 COLOUR3:COLOUR128:A%=A%+6
2600 ENDPROC
2610 DEFPROCOOB
2620 IFBX%>1320THEN2670
2630 IFBX%>1260THENBX%=1260
2640 IFBY%<981ANDBY%>419THEN2710
2650 IFBY%>980ANDBY%<1200THENBY%=980:GOTO2710
2660 IFBY%<420ANDBY%>300THENBY%=420:GOTO2710
2670 PRINT"Too much club"
2680 PROCLOSTBALL
2690 PROCKEY
2700 FL%=2:ENDPROC
2710 PRINT"Out of bounds"
2720 PRINT"Penalty - ";:COLOUR0:COLOUR131:PRINT" 1 stroke "
2730 COLOUR3:COLOUR128:A%=A%+1
2740 FL%=1:ENDPROC
2750 DEFPROCBUNKSHOT
2760 PROCBALL
2770 COLOUR2:PRINT"** Bunkered **":COLOUR7
2780 SOUND0,-15,2,30
2790 INPUT"Which club",C%:C%=ABS(C%)
2800 IFC%>11ANDC%<20THEN2820
2810 PRINT"You won't get out"'"with that!":GOTO2790
2820 INPUT"Percentage swing",B%
2830 M%=68+FNA(17)-(19-C%)*5-(100-B%)*.4
2840 IFF%=4 M%=M%*0.7
2850 IFRND(1)<0.4THENM%=M%/3
2860 IFM%>25THENQQ=0:B=1:ENDPROC
2870 PRINT"You fluffed it":A%=A%+1:GOTO2770
2880 DEFPROCROUGH
2890 IFABS(BY%-700)>230THENPRINT"In heavy rough":AA=0.5ELSEPRINT"In light rough
":AA=0.75
2900 PROCBALL
2910 ENDPROC
2920 DEFPROCINTREE
2930 PRINT"In the trees"
2940 IFTX%<500THENPRINT"You can only hack"'"out sideways":TR%=0
2950 PROCBALL
2960 ENDPROC
2970 DEFPROCWETBALL
2980 COLOUR2:PRINT"** SPLASH **"
2990 FORZ%=-15TO-1:SOUND0,Z%,100,1:NEXTZ%
3000 PRINT"In the stream -"
3010 PROCLOSTBALL
3020 FL%=2:PROCBALL
3030 PROCKEY
3040 ENDPROC
3050 DEFPROCSOUND
3060 SOUND1,-15,150,1
3070 ENDPROC
3080 DATA367,4,445,4,314,4,189,3,520,5,331,4,468,4,375,4,177,3,424,4,562,5,336,
4,208,3,447,4,298,4,543,5,385,4,478,4
>
```



Sirius Grafchar

by Barbara Binless

The problem with most character set editors, both commercial and home-spun, is that they restrict the user to editing only one character at a time. This is fine for alternative character fonts, but awkward when designing graphic displays.

'Grafchar' is a character set editor for the Sirius, and overcomes this problem by allowing the user to design characters in four by four blocks. The whole character set is displayed alongside and continuously updated, so that the editing effect can be seen at once. Character sets can be stored, recalled or saved as data, and the original character set can be restored at the end of editing if required.

Prompts are shown at the bottom of every screen, and are brief. From the main screen:

ALT E: transfers to the character set editor.
ALT D: writes the custom character set to disk as data statements for inclusion in a Basic program.
ALT W: writes a custom character set to disk, which can then be restored for further editing.
ALT R: reads a character set from disk for further editing.
ALT Q: quits the program and gives you the option of restoring the original Sirius character set.

From the character set editor:

1-9: act as cursor keys, with the 5 key toggling on or off a single pixel.
ALT N: moves to the next block of four by four characters.
ALT E: returns you to the main menu.

```
1 ' Character editor  Version 3.4                    (c) Barbara Binless 1984
2 '
3 '     This program allows the user to redefine the current character set, and to save
4 '     and load complete sets of characters.  Characters may also be saved as DATA
5 '     for use in BASIC programs.  To read back from DATA statements into CHR$(CHAR%):-
6 '     DEF SEG=200 : FOR J%=0 TO 31 : READ X% : POKE 32*CHAR%+J%,X% : NEXT
7 '     Characters are displayed for editing in blocks of 4, but the whole set is used
8 '     for ^W and ^R, and any number of consecutive characters may be saved as data.
```

PROGRAM FILE

```
9 '
10      DEF FNNUM$(X)=RIGHT$(STR$(X),LEN(STR$(X))-1)
17 '
18 ' Common initialization block
19 '
20      DEF FNC$(ROW%,COL%)=ESC$+"Y"+CHR$(31+ROW%)+CHR$(31+COL%) :
        DEF FNRAND(X%)=INT(RND(1)*X%+1)
30      DEF FNCENTRE$(ROW%,T$)=FNC$(ROW%,40-LEN(T$)\2)+T$ :
        DEF FNUP$(X$)=CHR$(ASC(X$)+32*(ASC(X$)>96))
40      ESC$=CHR$(27) : CLS$=ESC$+"E" : EREOL$=ESC$+"K" : EREOF$=ESC$+"J" :
        ERBOL$=ESC$+"o" : ERBOF$=ESC$+"b"
50      HION$=ESC$+"(" : HIOFF$=ESC$+")" : REVON$=ESC$+"p" : REVOFF$=ESC$+"q" :
        UNDON$=ESC$+"0" : UNDOFF$=ESC$+"1"
60      CURON$=ESC$+"y5" : CUROFF$=ESC$+"x5" : CURSAV$=ESC$+"j" :
        CURBAK$=ESC$+"k" : BELL$=CHR$(7)
70      LINON$=CURSAV$+ESC$+"x1"+FNC$(25,1) : LINOFF$=ESC$+"y1"+CURBAK$ :
        BLINKON$=ESC$+"2" : BLINKOFF$=ESC$+"3"
80      CLRALL$=ESC$+"z" : YES%=-1 : NO%=0 : WIDTH 255
87 '
88 ' trap odd file names, set segment to start of characters
89 '
90      ON ERROR GOTO 20000 : DEF SEG=200
97 '
98 ' set up initial screen
99 '
100     PRINT CLRALL$ LINON$ : WIDTH 255 : FINISHED%=NO% : CH$(0)="." : CH$(1)="O"
110     FOR J%=0 TO 254
120             PRINT FNC$(7+J%\20,58+J% MOD 20) ESC$ "8" CHR$(J%);
130             IF J% MOD 20=0 THEN PRINT FNC$(7+J%\20,53); : PRINT USING "£££";J%;
140     NEXT
150     PRINT REVON$ FNCENTRE$(1," GRAPHICS CHARACTER EDITOR ") REVOFF$ : GOSUB 10000
157 '
158 ' save current character set
159 '
160     BSAVE "CHARSET.$$$",0,8192
197 '
198 ' loop until ^Q to quit
199 '
200     WHILE NOT FINISHED%
210             IN$=INPUT$(1)
220             IF IN$=CHR$(23) THEN GOSUB 1000
230             IF IN$=CHR$(18) THEN GOSUB 2000
240             IF IN$=CHR$(4) THEN GOSUB 3000
250             IF IN$=CHR$(5) THEN GOSUB 4000
260             IF IN$=CHR$(17) THEN FINISHED%=YES%
270     WEND
277 '
278 ' restore old character set if required
279 '
280     PRINT FNC$(25,1) EREOL$ "Do you want to restore the original character set? ";
290     IF FNUP$(INPUT$(1))="Y" THEN BLOAD "CHARSET.$$$",0
300     DEF SEG : KILL "CHARSET.$$$" : PRINT CLRALL$ : END
997 '
998 ' save character set to disk
999 '
1000    PRINT FNC$(25,1) EREOL$;
1010    INPUT;"Name to give character set (up to 8 letters) : ",FILE.NAME$
1020    FILE.NAME$=FILE.NAME$+".CHR"
1030    BSAVE FILE.NAME$,0,8192
1050    GOSUB 10000 : RETURN
1997 '
1998 ' get saved character set from disk
1999 '
2000    PRINT FNC$(25,1) EREOL$;
2010    INPUT;"Name of character set to load  : ",FILE.NAME$
2020    FILE.NAME$=FILE.NAME$+".CHR"
2030    BLOAD FILE.NAME$,0
2050    GOSUB 10000 : RETURN
2997 '
2998 ' save block of characters as DATA statements
2999 '
3000    PRINT FNC$(25,1) EREOL$; : INPUT;"Save from character";CHAR%
3010    INPUT "  to character";CHAR2%
3020    PRINT EREOL$ "File name for DATA statements (up to 8 letters) : ";
3030    INPUT FILE.NAME$ : FILE.NAME$=FILE.NAME$+".BAS"
3040    PRINT EREOL$; : INPUT;"Starting line number";LINE.NUM
3050    INPUT "  step size";STEP.SIZE : PRINT EREOL$ "Saving data .....";
3060    OPEN "O",£1,FILE.NAME$ : NO.CHARS%=CHAR2%-CHAR%
3070    PNTR%=32*CHAR%
3080    FOR CH%=0 TO NO.CHARS%
3090            PRINT £1,STR$(LINE.NUM) " DATA ";
3100            FOR ADDR%=PNTR% TO PNTR%+30 STEP 2
3110                    LOBYT%=PEEK(ADDR%) : HIBYT%=PEEK(ADDR%+1)
3120                    PRINT £1,FNNUM$(LOBYT%);",";FNNUM$(HIBYT%);
3130                    IF ADDR%<PNTR%+30 THEN PRINT £1,",";
3140            NEXT : PRINT £1,""
3150            PNTR%=PNTR%+32 : LINE.NUM=LINE.NUM+STEP.SIZE
3160    NEXT
3170    CLOSE £1 : GOSUB 10000 : RETURN
3997 '
3998 ' edit existing character set
3999 '
4000    PRINT FNC$(25,1) EREOL$ "Character number to start at"; : INPUT CHAR% : IN$=""
4010    PRINT EREOL$ REVON$ FNCENTRE$(25,
        " 5=toggle blob, 1-9=move cursor, ^N=next block, ^E=end edit ") REVOFF$
4017 '
4018 ' display existing characters
4019 '
4020    WHILE IN$<>CHR$(5)
4030            FOR J%=4 TO 20 : PRINT FNC$(J%,45) ERBOL$; : NEXT
4040            PNTR%=32*CHAR% : PRINT FNC$(4,5) "<-      ->      <-      ->      <-      ->"
4050            FOR CH%=0 TO 3
4060                    COL%=10*CH%+5 : PRINT FNC$(4,COL%+3) CHAR%+CH%;
4070                    FOR ADDR%=PNTR% TO PNTR%+30 STEP 2
4080                            LOBYT%=PEEK(ADDR%) : HIBYT%=PEEK(ADDR%+1)
4090                            ROW%=(ADDR%-PNTR%)\2+5
4100                            FOR C%=0 TO 9
4110                                    BIT%=0
4120                                    IF C%<8 AND (LOBYT% AND 2^C%)>0 THEN BIT%=YES%
4130                                    IF C%>7 AND (HIBYT% AND 2^(C%-8))>0 THEN BIT%=YES%
4140                                    PRINT FNC$(ROW%,COL%+C%) CH$(ABS(BIT%));
4150                            NEXT
4160                    NEXT : PNTR%=PNTR%+32
4170            NEXT : GOSUB 4200
4180    WEND : GOSUB 10000 : RETURN
4197 '
4198 ' use numeric pad to move cursor and toggle bit
4199 '
```


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```
4200    ROW%=5 : COL%=5
4210    WHILE IN$<>CHR$(5) AND IN$<>CHR$(14)
4220            PRINT FNC$(ROW%,COL%); : IN$=INPUT$(1)
4230            IF IN$="5" THEN GOSUB 4500
4240            IF IN$="1" OR IN$="2" OR IN$="3" THEN ROW%=ROW%-(ROW%<20)
4250            IF IN$="7" OR IN$="8" OR IN$="9" THEN ROW%=ROW%+(ROW%>5)
4260            IF IN$="1" OR IN$="4" OR IN$="7" THEN COL%=COL%+(COL%>5)
4270            IF IN$="3" OR IN$="6" OR IN$="9" THEN COL%=COL%-(COL%<44)
4280    WEND : IF IN$=CHR$(14) THEN CHAR%=CHAR%+4 : IN$=""
4290    RETURN
4497 '
4498 ' toggle bit at cursor
4499 '
4500    X%=ROW%-5 : Y%=COL%-5
4510    ADDR%=32*(CHAR%+Y%\10)+2*X%-(Y% MOD 10>7)
4520    Y%=Y% MOD 10 : IF Y%>7 THEN Y%=Y%-8
4530    POKE ADDR%,PEEK(ADDR%) XOR 2^Y%
4540    IF (PEEK(ADDR%) AND 2^Y%)>0 THEN BIT%=YES% ELSE BIT%=NO%
4550    PRINT FNC$(ROW%,COL%) CH$(ABS(BIT%));
4560    RETURN
9997 '
9998 ' display control keys, clear edit section of screen
9999 '
10000   PRINT FNC$(25,1) EREOL$ REVON$
10010   PRINT FNCENTRE$(25,
        " ^Q=quit, ^E=edit, ^D=save as DATA, ^W=write set, ^R=read set. ")
10020   FOR J%=4 TO 20 : PRINT FNC$(J%,45) ERBOL$; : NEXT
10030   PRINT REVOFF$ FNC$(25,78); : RETURN
19997 '
19998 ' recover after bad file name, otherwise stop
19999 '
20000   IF ERL<>3060 AND ERL<>1030 AND ERL<>2030
        THEN PRINT "Error" ERR "in line" ERL : STOP
20010   PRINT FNC$(25,1) "Invalid file name  - press a key to continue"
20020   IN$=INPUT$(1) : GOSUB 10000
20030   IF ERL=3060 THEN RESUME 3170 ELSE RESUME NEXT
```

Hi-res Plot
by HG Herbert

'Hi-res Plot' is a graphics utility for the Commodore 64. The 64 has no graphics commands, and the usual PEEK and POKE method is both slow and clumsy. Hi-res Plot adds two graphics commands to the 64's vocabulary: INIT sets the machine in hi-res graphics mode and clears both screen and colour memory; and PLOT(X),(Y) sets any pixel on the screen. X must be in the range 0 to 319 and Y in the range 0 to 199. The routine is in machine code with no checksum done when POKEing it in, so type in and save the program *before* you run it — any error in the machine code may cause the machine to crash and lose the program.

Lines 310 to 450 are a demonstration program using these new commands, so should be omitted when the commands are used in your own programs.

For programmers using Hi-res Plot with a large Basic program, or Basic and machine code programs, the routine is located at $C000 and can be easily relocated if necessary.

```
10 A=49152:PRINT"■■■"TAB(10)"ENTERING HI RES PLOT"
20 READA$:IFA$="END"THEN310
30 FORI=1TO16:D=ASC(MID$(A$,2*I-1,1))-48
40 IFD>9THEND=D-7
50 P=D*16:D=ASC(MID$(A$,2*I,1))-48
60 IFD>9THEND=D-7
70 P=P+D:POKEA,P:P=0:A=A+1:NEXT
80 GOTO20
100 DATAA59DF0034CEDF6A57A85F8A57B85F920
110 DATA7900C93AD01F207300C950F00FEAEAEA
120 DATAEAEAEAEAEAC949D00C4C1DC14C0BC1EA
130 DATAEAEAEAEAEAEAA5F8857AA5F9857B4CEDF6
140 DATA20730020F1AE20BFB1A56485FBA56585
150 DATAFA20F1AE20BFB1A56585FC2062C0D0A7
160 DATAF0A5A92085FEA90085FDA5FC29F84A4A
170 DATA4AA8F01018A5FD694085FD9002E6FEE6
180 DATAFE88D0F066FBA5FA6A4A4A0A0A2A9003
190 DATAE6FE1865FD85FD9002E6FEA5FC290718
200 DATA65FD85FD9002E6FEA900A885FBA5FA29
210 DATA07AAE83866FBCAD0FBA5FB11FD91FD60
220 DATAA9200D11D08D11D0A9080D18D08D18D0
230 DATAA92085FEA90085FDA000A90091FDC8D0
240 DATAFBE6FEA5FEC940D0F1A90085FDA90485
250 DATAFEA000A92791FDC8D0FBE6FEA5FEC908
260 DATAD0F12073004C07C04C35C0A000207300
270 DATAD92FC1D0F3C8C003D0F34C40C0A00020
280 DATA7300D932C1D0E1C8C003D0F34CC0C04C
290 DATA4F544E49540000000000000000000000
300 DATAEND
310 REM*START OF DEMONSTRATION PROGRAMME*
320 PRINT"■■■■■■■■■■AT THE END OF PLOT HIT 'B' TO RETURN TO"
330 PRINT"■■"TAB(17)"BASIC"
340 FORN=1TO5000:NEXT
350 POKE53280,0
360 POKE808,0:POKE809,192:REM*CHANGE STOP VECTOR*
```

PROGRAM FILE

```
370 A=49396:POKEA,39:REM*SET COLOUR*
380 :INIT:REM*NEW COMMANDS MUST FOLLOW COLON*
390 FORX=0TO319STEP.5:Y=90:PLOT(X)(Y)
400 Y=INT(90+80*SIN(X/50)):PLOT(X)(Y)
410 NEXT
420 GETA$:IFA$=""THEN420
430 POKE53265,155:POKE53272,21:REM*RETURN FROM BIT MAP MODE*
440 PRINT"□":REM*CLEAR SCREEN OF COLOUR DATA*
450 END

READY.
```

Video Genie/TRS-80 Automatic Cassette Indexer

by Alan Kirk

This program is a Video Genie version of a cassette indexer program that was printed for the BBC Micro back in May. All you have to do is run the program, insert the cassette to be indexed and leave it for 30 minutes.

On your return, the program will produce a catalogue of the programs it found which can then be printed out to form a cassette inlay.

The program differentiates between Basic, machine code, Basic data files, assembler and rubbish. It will add the type to the entry for each program it finds, together with the program's name and position on the tape.

```
5 REM   ++++++++++++++++++++++++++++++++++++++++++++++
6 REM   + GENIE/TRS-80  Automatic Cassette Indexer +
        +                  By Alan kirk            +
        + 1984 (C)                        Version 1.2 +
        ++++++++++++++++++++++++++++++++++++++++++++++

10 CLEAR 500:DEFINT A-Z:DEFSTR B,D,E,L,M,N,P:DIM PN(40),PK(40):CLS
20 POKE 16526,0:POKE 16527,125:F=1:DF=STRING$(3,211):LI=STRING$(64,45):EA=CHR$(2
11):MA=STRING$(2,176)
30 FOR I=0 TO 16:READ A:POKE I+32000,A:NEXT
40 PRINT@18,"Automatic Cassette Indexer":PRINT@82,STRING$(26,131)
50 PRINT"   Press :-        'F1' for internal cassette.":PRINT TAB(18)"Or for ext
ernal, just play."
60 IFINP(255)=127 THEN 60ELSEPRINT"Reading tape.....":PRINT@320,LI;
70 X=USR(0):FOR I=0 TO 9:NA=NA+CHR$(PEEK(32032+I)):NEXT
80 IF LEFT$(NA,3)=DF THEN NA=MID$(NA,4,1):M="BASIC":GOTO120
90 IF LEFT$(NA,1)="U" THEN NA=MID$(NA,2,6):M="MACHINE CODE":GOTO120
100 IF LEFT$(NA,1)=EA AND MID$(NA,8,2)=MA THEN M="ASSEMBLER":NA=MID$(NA,2,6):GOT
O120
110 IF LEFT$(NA,3)<>DF THEN NA="????":M="DATA FILE"
120 GOSUB 350:PRINT"File no."|F|"is "|M|".":PRINT"The name of this "|M|" file is
: '"|NA|"'":PRINTLI;:PN(F)=NA:PK(F)=M
130 OUT 255,0:IF INP(255)=127 THEN C=C+1
140 IF C=17 THEN 180
150 OUT 255,0:IF INP(255)=255 AND (C)1 AND C<15) THEN C=0
160 IF PEEK(14400)=128 THEN 200
170 GOTO 130
180 F=F+1:C=0:OUT 255,0:OUT 255,1:OUT 255,0:POKE 15422,32:POKE 15423,32:NA="":GO
TO 70
190 DATA 243,205,150,2,33,32,125,6,9,205,53,2,119,35,16,249,201
200 CLS
210 PRINT@0,;:INPUT"Do you wish to print out a catalogue";B:IF B="N"THEN 330 ELSE
 IF B<>"Y" THEN 210
220 IF PEEK(1489)=0 THEN 240
230 IF PEEK(14312)<>63 GOSUB 320:GOTO 210
240 IF INP(253)<>63 GOSUB 320:GOTO 210
250 INPUT"Enter TABULATION value";TA:IF TA<1 OR TA>50 THEN 250
260 LPRINT TAB(TA)"CATALOGE FOR TAPES"
270 LPRINT TAB(TA);STRING$(18,42):LPRINT:LPRINT
280 LPRINT TAB(TA)" File no.   Name.        Type.":LPRINT TAB(TA);STRING$(39,45)
290 FOR I=1 TO F:LPRINT TAB(TA);"!";TAB(TA+3);I;TAB(TA+12);PN(I);TAB(25);PK(I);T
AB(TA+38);"!"
300 NEXT I
310 LPRINT TAB(TA);STRING$(39,45);STRING$(3,13):GOTO210
320 PRINT:PRINT"###   PRINTER NOT ON-LINE   ###":RETURN
330 CLS:INPUT"Do you wish to scan another tape (S), or finish (F)";B
340 IF B="S" THEN RUN ELSE IF B="F" THEN END ELSE 330
350 IF PEEK(16416)+PEEK(16417)*256 =>16192 THEN PRINT@384,;
360 RETURN
```

Spectrum Life

by ITR and JH

This must be the shortest and fastest 'Life' program ever written for the Sinclair Spectrum. For anyone who hasn't yet seen the game of Life, here are two simple rules:

1) A cell dies if it has more than three or fewer than two neighbours.

2) A cell is born if an empty space has exactly three neighbouring cells.

A random screen of cells is generated first, then successive colonies. Eventually, a colony will either die out, become stable and static or stable and dynamic. Pressing any key at any time

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will return the routine to Basic. To re-start the program, type in the following two lines and RUN the program:

```
10 RAMDOMIZE USR 32768
20 GOTO 10
```

The machine code routine is 159 bytes in length, residing at address 32768. The 'playing area' uses the attribute area onscreen, with each generation built up in a 768-byte table, then block loaded onto the screen. The program produces approximately nine generations per second; the code is simple, and interesting to disassemble and modify.

```
10 CLEAR 32767
20 FOR F=32768 TO32926
30 READ N: POKE F,N:NEXT F
40 BORDER 0: PAPER 0:CLS
50 RANDOMISE USR 32768: GOTO 50
100 DATA 4,17,6,3,33,-2,-1,58,252,-1,31,
    31,31,31,174,15,203,22,43,203,22,43
110 DATA 203,22,43,203,22,58,-2,-1,230,
    1,237,68,2,3,27,122,179,32,219,221,33,0
120 DATA 88,33,0,129,17,0,88,1,0,3,237,176,
    219,-2,238,-1,192,38,88,17,0,91
130 DATA 14,32,237,176,33,224,90,17,224,87,
    14,32,237,176,38,129,1,0,3,221,126,1
140 DATA 237,68,221,86,33,146,221,86,32,146,
    221,86,31,146,221,86,-1,146,221,86,223,146
150 DATA 221,86,224,146,221,86,225,146,221,
    86,0,245,122,167,40,23,241,54,0,-2,4,48
160 DATA 6,-2,2,56,2,54,-1,35,221,35,11,120,
    177,32,194,24,148,119,241,254,3,32
170 DATA 240,54,255,24,236
```

NewBrain Easy Menu

by C Jones

'Easy Menu' is a useful NewBrain utility allowing you to include a menu into any Basic program. A list of options is displayed, one of which is in inverse video; the inverse video option can be selected by hitting NEW LINE. To step through the options, use the space bar: each successive option will then be highlighted.

The program is simply written and can easily be incorporated into Basic programs. The highlighting of options should reduce mistakes and make your programs more user-friendly.

```
10    REM NewBrain Easy Menu
20    REM Author C. Jones
30    REM August 1984
34
35    REM Initialize
36
40    OPEN#0,0,"s24":PUT23,"D",1:CLOSE#6:
      OPEN#6,6:z=5:ONERRORGOTO50
44
45    REM Display menu
46
50    RESTORE:op=1:PUT31:?:?TAB(15);
      "Main Menu":?TAB(15);"=========="
60    FORh=1TOz:READa$:PUT22,8,h*2+6:
      ?a$:NEXTh
70    PUT22,0,23:?" 'return'to select,";
      " or'space'for next":  ?" option";
      " (note:2 char keyboard buffer!)";
74
75    REM Main body
76
```

PROGRAM FILE

```
80    GOSUB800
90    GET#6,a:IFa<>13ANDa<>32THEN90
95    IFa=13THEN110
100   GOSUB800:op=op+1:GOTO80
110   ONopGOSUB1000,2000,3000,4000,5000
114
115   REM End
116
120   FORh=1TO255:CLOSE#h:NEXTh:
      PUT31:ONERRORGOTO0:END
124
125   REM Menu option names
126
130   DATA Go for a walk,
      Watch television,Have a bath,
      Go to bed,Write a program
794
795   REM Subroutines
796
800   a1$="":PUT22,8,op*2+6:
      FORh=1TO19:PUT20:GETa:
      a1$=a1$+CHR$(a):PUT26:
      NEXTh:PUT22,8,op*2+6,14:?a1$;:
      PUT15:IFop>zTHENop=0:RETURN
900
1000  RETURN
2000  RETURN
3000  RETURN
4000  RETURN
5000  PUT31,22,5,12:?"Good for you !":
      FORh=1TO500:NEXTh:RETURN
```



Dayfinder

by Mark Needham

Following the *PCW* Teach yourself Lisp series (July-October issues), here is a short Lisp program to determine which day of the week any given date in history was on, or will be on in the future. The program was written on a BBC Model B, but will run on practically any Lisp system as it's written using common Lisp commands. Dayfinder allows you to find out what day you were born on, what day your next birthday will be on, or what day it will be on in a hundred years' time. The program will work out the day for any given date based on the current calendar system. Also submitted with the program was a Basic version, which graphically illustrated that Lisp can be very readable and understandable, unlike most Basics.

To run the program, type:
(WHAT-DATE '(dd mm yy yy))
where dd is the day, mm is the month, and yy yy is the year. So, for example, to find the day for the 16th of September 1984, type:
(WHAT-DATE '(16 9 19 84))

The day, month and two parts of the year must be separated by spaces, and the whole date must be surrounded by brackets as shown with an apostrophy in front. The number entered is checked for illegal dates.

As Lisp is an extenable language, it would be easy to incorporate this routine into any Lisp program.

```
(DEFUN WHAT-DATE (DATE)
(FIND-DATE DATE)
(SETQ DATE-OK T)
(COND
((OR (GREATERP MONTH 12)(LESSP MONTH 1)
(GREATERP YEAR1 99)(LESSP YEAR1 0)
(GREATERP YEAR2 99)(LESSP YEAR2 0)
(GREATERP DAY 31)(LESSP DAY 1))
(SETQ DATE-OK 0)))
(COND
((EQ DATE-OK T)
(SETQ MONTHS (LIST 31
(COND ((EQ (REMAINDER YEAR2 4) 0) 29)
```


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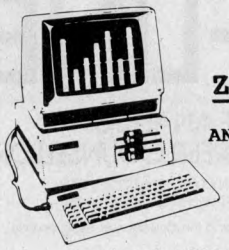

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PROGRAM FILE

```
(T 28)) 31 30 31 30 31 31 30 31 30 31))
(SETQ TEMP MONTHS)
(SETQ A MONTH)
(LOOP
(SETQ B (CAR TEMP))
(SETQ TEMP (CDR TEMP))
(UNTIL (ZEROP (SETQ A (SUB1 A)))))
(COND
((GREATERP DAY B)(SETQ DATE-OK 0)))))
(COND
((EQ DATE-OK 0)(PRINC 'ERROR))
(T
(SETQ DAYS (QUOTE (SUN MON TUE WED THU FRI SAT)))
(SETQ MONS (QUOTE (JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC)))
(SETQ A (QUOTE (5 4 3 2 1 0 6)))
(CALC-DATE)
(PRINT-DATE)
)))


(DEFUN FIND-DATE (DATE1)
(COND ((EQ DATE1 NIL)(SETQ DATE1 (QUOTE (-1)))))
(SETQ DAY (CAR DATE1))
(COND ((LISTP (CDR DATE1))(SETQ DATE1 (CDR DATE1)))
(T (SETQ DATE1 (QUOTE (-1)))))
(SETQ MONTH (CAR DATE1))
(COND ((LISTP (CDR DATE1))(SETQ DATE1 (CDR DATE1)))
(T (SETQ DATE1 (QUOTE (-1)))))
(SETQ YEAR1 (CAR DATE1))
(COND ((LISTP (CDR DATE1))(SETQ DATE1 (CDR DATE1)))
(T (SETQ DATE1 (QUOTE (-1))))))
(SETQ YEAR2 (CAR DATE1)))


(DEFUN CALC-DATE ()
(SETQ T1 (ADD1 (REMAINDER YEAR1 7)))
(LOOP (SETQ D1 (CAR A))
(SETQ A (CDR A))
(UNTIL (ZEROP (SETQ T1 (SUB1 T1)))))
(SETQ T1 (REMAINDER (TIMES 5 (QUOTIENT YEAR2 4)) 7))
(SETQ D1 (SKIP (PLUS D1 T1)))
(SETQ T1 (REMAINDER YEAR2 4))
(COND ((GREATERP T1 0)
(SETQ D1 (SKIP (PLUS D1 T1 1)))))
(SETQ N 0)
(SETQ L MONTH)
(COND ((GREATERP L 1)
(SETQ L (SUB1 L))
(LOOP (SETQ N (PLUS N (CAR MONTHS)))
(SETQ MONTHS (CDR MONTHS))
(UNTIL (ZEROP (SETQ L (SUB1 L)))))))
(SETQ N (REMAINDER (PLUS N DAY -1) 7))
(SETQ D1 (ADD1 (SKIP (PLUS D1 N))))
(LOOP (SETQ TODAY (CAR DAYS))
(SETQ DAYS (CDR DAYS))
(UNTIL (ZEROP (SETQ D1 (SUB1 D1))))))


(DEFUN PRINT-DATE ()
(PRINTC)
(PRINC TODAY BLANK (QUOTE THE) BLANK DAY BLANK
(COND ((OR (EQ DAY 1) (EQ DAY 21) (EQ DAY 31))
(QUOTE ST))
((OR (EQ DAY 2) (EQ DAY 22))
(QUOTE ND))
((OR (EQ DAY 3) (EQ DAY 23))
(QUOTE RD))
(T (QUOTE TH)))
BLANK
(QUOTE OF) BLANK)
(LOOP (SETQ MON (CAR MONS))
(SETQ MONS (CDR MONS))
(UNTIL (ZEROP (SETQ MONTH (SUB1 MONTH)))))
(PRINC MON BLANK YEAR1 YEAR2))


(DEFUN SKIP (X)
(COND ((GREATERP X 6)
(DIFFERENCE X 7))
(T X)))
```



QL Palette

by Edward Leigh

QL Palette is a simple utility for selecting colours on the Sinclair QL. The program allows the user to view all the colour combinations for two of the four stipples (the number of each stipple is displayed in the black boxes at the top left-hand corner of the grid). The display can be toggled between the other two stipples by pressing the space bar. The program works for colour modes four and eight, and can also be used to view a screen filled with only one colour.

PROGRAM FILE

```
100 DIM stp(2,2):MODE 4:CLS #0:PRINT:INPUT "Which mode (4 or 8) ? ";m
110 INPUT "Which two stipples together : 0 and (1 to 3) ? ";stc
120 IF stc(1 OR stc)3 THEN PRINT "out of range":GO TO 110
130 PRINT:PRINT "On the Y-axis are the background colours"
140 PRINT "On the X-axis are the foreground colours (2 stipples to each)"
150 PRINT:PRINT "Press any key":z$=INKEY$(-1)
160 stp(1,1)=0:stp(1,2)=stc:IF stc=3 THEN stp(2,1)=1:stp(2,2)=2
170 IF stc=2 THEN stp(2,1)=1:stp(2,2)=3
180 IF stc=1 THEN stp(2,1)=2:stp(2,2)=3
190 stn1=1:stn2=1:MODE m
200 FOR y=0 TO 7
210  FOR x=0 TO 15
220   WINDOW 27,25,48+27*x,16+25*y:PAPER y,INT(x/2),stp(stn1,stn2)
230   CLS:BORDER 1,7:IF INT(x/2)=0 AND y=0 THEN PRINT stp(stn1,stn2)
240  stn2=3-stn2:END FOR x
250 END FOR y
260 WINDOW 448,210,32,6:PAPER 0:INK 7:CLS #0
270 CSIZE #0,0,0:CSIZE 0,0:IF m=4 THEN CSIZE #0,2,0:CSIZE 2,0
280 FOR t=0 TO 7:CURSOR 0,25*t+20:PRINT t:CURSOR 54*t+37,0:PRINT t:NEXT t
290 PRINT #0," Press space bar for other stipples"
300 PRINT #0,"Press 'V' to view a particular colour"
310 PRINT #0,"   Press 'R' to re-run the program"
320 PRINT #0,"    Press 'T' to stop the program"
330 z$=INKEY$(-1):IF z$=" " THEN stn1=3-stn1:GO TO 200
340 IF z$="T" OR z$="t" THEN CLS #0:STOP
350 IF z$="R" OR z$="r" THEN RUN
360 IF z$="V" OR z$="v" THEN
370  CLS #0:INPUT #0,"background colour number ";a:IF a)7 THEN GO TO 370
380  INPUT #0,"foreground colour number ";b:IF b)7 THEN GO TO 380
390  INPUT #0,"          stipple number ";c:IF c)3 THEN GO TO 390
400  CLS #0:PAPER a,b,c:CLS:PRINT #0,"press any key to return to palette"
410  z$=INKEY$(-1):PAPER 0:CLS:CLS #0:GO TO 200
420 END IF
430 GO TO 330
```

Brimstone Part One

by Paul Gallagher

Brimstone is a three-part adventure game for the Dragon 32; parts two and three will be published in the next two issues of *PCW*. Part one will be of particular interest to Advanced Dungeons and Dragons players, as it provides a means of evolving new characters by closely following the AD+D format. It was designed by an AD+D player to generate new characters, and also allows preparation of the characters' subsequent development when group AD+D sessions are not in session. It's so comprehensive that it represents a game in its own right, as well as being a useful tool for AD+D players.

The program creates and equips a single character at a time, and then allows the final result to save as a file. No knowledge of Dungeons and Dragons' character formation is required as full instructions are given in the program. Several characters can be thus generated and combined into a variety of adventure parties.

Next month we'll publish the first scenario for your newly-developed character. This will be a traditional dungeon which uses the basic AD+D rules and 'dice' percentages. Up to four characters can adventure together, so you may like to get a team of characters together with friends to tackle the 75-room, seven-floor dungeon that's coming. Alternatively, one person could control between one to four characters making up an adventure party. Survivors of that dungeon can progress to part three, 'The Tavern', in two months' time.

It's also easy to create your own dungeons, so if the following scenarios are a success we'll publish more dungeons sent in by other 'Dungeon masters'.

```
5 'BRIMSTONE PART I:copywrite P.Gallagher 1984
10 DIM E@(22),F@(1,22):GOTO50
20 K@=INKEY@:IFK@=""THEN20ELSERETURN
30 PRINT@257,STRING@(31,32):PRINT:PRINT:PRINT:PRINT:PRINT:RETURN
40 '*****************************
50 CLS:PRINT@167,"DUNGEON & DRAGONS";:PRINT@230,"CHARACTER GENERATOR"
60 GOSUB20 '*DELAY*
70 PRINT:PRINT"THIS SUB-PROGRAM GENERATES SIX  INITIAL CHARACTERS FOR YOU TO  C
HOOSE ONE & THEN ADAPT IT TO  YOUR REQUIREMENTS."
80 PRINT:PRINT"THIS PROCESS CLOSELY FOLLOWS THER.D.& D.PLAYER'S HANDBOOK."
90 PRINT:PRINT"YOU CAN THEN SAVE YOUR CHARACTERFOR SUBSEQUENT ADVENTURES IN A  P
ARTY OF UP TO FOUR."
100 '**BASIC ABILITIES ROUTINE**
110 FORI=1TO3
120 S(1)=S(1)+RND(6):S(2)=S(2)+RND(6):S(3)=S(3)+RND(6):S(4)=S(4)+RND(6):S(5)=S(5
)+RND(6):S(6)=S(6)+RND(6)
130 I(1)=I(1)+RND(6):I(2)=I(2)+RND(6):I(3)=I(3)+RND(6):I(4)=I(4)+RND(6):I(5)=I(5
)+RND(6):I(6)=I(6)+RND(6)
140 W(1)=W(1)+RND(6):W(2)=W(2)+RND(6):W(3)=W(3)+RND(6):W(4)=W(4)+RND(6):W(5)=W(5
```


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PROGRAM FILE

```
)+RND(6):W(6)=W(6)+RND(6)
150 C(1)=C(1)+RND(6):C(2)=C(2)+RND(6):C(3)=C(3)+RND(6):C(4)=C(4)+RND(6):C(5)=C(5
)+RND(6):C(6)=C(6)+RND(6)
160 D(1)=D(1)+RND(6):D(2)=D(2)+RND(6):D(3)=D(3)+RND(6):D(4)=D(4)+RND(6):D(5)=D(5
)+RND(6):D(6)=D(6)+RND(6)
170 R(1)=R(1)+RND(6):R(2)=R(2)+RND(6):R(3)=R(3)+RND(6):R(4)=R(4)+RND(6):R(5)=R(5
)+RND(6):R(6)=R(6)+RND(6)
180 NEXT:GOSUB 20 '*DELAY*
190 CLS:PRINT"CHARACTER     1  2  3  4  5  6";
200 PRINT:GOSUB740'**ABILITIES**
210 FORX=1TO6
220 PRINT@(74+X*3),"";:PRINTUSING"##";S(X);
230 PRINT@(106+X*3),"";:PRINTUSING"##";I(X);
240 PRINT@(138+X*3),"";:PRINTUSING"##";W(X);
250 PRINT@(170+X*3),"";:PRINTUSING"##";C(X);
260 PRINT@(202+X*3),"";:PRINTUSING"##";D(X);
270 PRINT@(234+X*3),"";:PRINTUSING"##";R(X);
280 NEXTX
290 PRINT@384,"CHOOSE ONE SET OF ABILITIES";:INPUTA
300 IFINT(A)<1ORINT(A)>6THEN290
310 S=S(A):I=I(A):W=W(A):C=C(A):D=D(A):R=R(A)
320 CLS:PRINT"CHARACTER ";A;": BASIC ABILITIES"
330 GOSUB740'**ABILITIES**
340 GOSUB830'**ABILITY VALUES**
350 GOSUB970'**RACE ADJUSTMENT**
360 PRINT@15,R$
370 GOSUB830'**ABILITY VALUES**
380 GOSUB30 '**CLEAR**
390 GOSUB1060'**CHARACTER CLASS**
400 PRINT@15,R$;" ";C$
410 GOSUB30 '**CLEAR**
420 PRINT@320,"WHAT IS THIS CHARACTER'S NAME":INPUTN$:PRINT@0," ";N$;" - ";R$;"
";C$
430 GOSUB30 '**CLEAR**
440 PRINT@352,"DO YOU WISH TO CONVERT ANY OF  ";N$;"'S ABILITIES.(Y/N)":INPUTQ$
450 GOSUB30 '**CLEAR**
460 IF Q$="Y"THEN ON A1 GOSUB 1150,1240,1330,1460 '*ABILITY TRADE*
470 GOSUB1870'** GOLD & HP **
480 ON A1 GOSUB 1630,1690,1750,1810 '*SUB-CLASS ROUTINE*
490 LL=1:PRINT@0,N$;" - ";R$;" ";C$;" (LEVEL";LL;")";
500 IF S>17 THEN B$=RIGHT$(STR$(B),2):PRINT@80,"/";B$
510 PRINT@114,"GOLD";GP;"GP";
520 IF C$="RANGER"THEN HP=HP+RND(8)
530 IF C<7 THEN HP=HP-1
540 IF C=15 THEN HP=HP+1
550 IF C>15 THEN HP=HP+2
560 PRINT@146,"BASIC";HP;"HP";
570 GOSUB1930'*STR. ADJUSTMENTS*
580 PRINT@178,"HIT@ +";STR$(SB);
590 PRINT@210,"DAMAGE@ +";STR$(DB);
600 PRINT@242,"CARRY:";WA;
610 GOSUB30:PRINT@263,"**** WEAPONS ****":PRINTC$;", YOU MAY CHOOSE FROM:";
620 ON A1 GOSUB 2060,2140,2240,2380,2060,2480,2610,2240,2240,2240 '***** WEAPONS
 *****
630 AC=9:GOSUB30 '**CLEAR**
640 ON A1 GOSUB 2730,2820,2820,3110,2730,2730,3110,2820,2820,3110 '***** ARMOUR
& AC *****
650 GOSUB20 '**DELAY**
660 GOSUB3190 '**EQUIPMENT**
670 IFA1=1THENGOSUB3940'              ** MU SPELLS **
680 IFA1=2THENGOSUB4350'              ** CLERIC SPELLS **
690 IFA1=5THENGOSUB4260'              ** ILLUSIONIST'S SPELLS **
700 IFA1=7THENGOSUB4460'              ** DRUID'S SPELLS **
710 GOSUB3740'*FINAL CHARACTER*
720 GOSUB4560 '*SAVE ROUTINE*
730 END
740 '******** ABILITIES********
750 PRINT@64,"STRENGTH      ";
760 PRINT@96,"INTELLIGENCE ";
770 PRINT@128,"WISDOM       ";
780 PRINT@160,"CONSTITUTION ";
790 PRINT@192,"DEXTERITY    ";
800 PRINT@224,"CHARISMA     ";
810 RETURN
820 '*****************************
830 '***** ABILITY VALUES ******
840 IF S>18 THEN S=18
850 PRINT@78,"";:PRINTUSING"##";S;
860 IF I>18 THEN I=18
870 PRINT@110,"";:PRINTUSING"##";I;
880 IF W>18 THEN W=18
890 PRINT@142,"";:PRINTUSING"##";W;
900 IF C>18 THEN C=18
910 PRINT@174,"";:PRINTUSING"##";C;
920 IF D>18 THEN D=18
930 PRINT@206,"";:PRINTUSING"##";D;
940 IF R>18 THEN R=18
950 PRINT@238,"";:PRINTUSING"##";R;:RETURN
960 '*****************************
970 '**RACE ADJUSTMENT ROUTINE**
980 PRINT@257,"WHAT RACE DO YOU WISH TO BE:":PRINT"  HUMAN":PRINT"  ELF":PRINT"
 DWARF":PRINT"  HALFLING":PRINT"  HALF-ELVEN    ";:INPUTR$
990 IF R$="HUMAN"THEN RETURN
1000 IF R$="ELF"THEN D=D+1:C=C-1:RETURN
1010 IF R$="DWARF"THEN C=C+1:R=R-1:RETURN
1020 IF R$="HALFLING"THEN S=S-1:D=D+1:RETURN
1030 IF R$="HALF-ELVEN"THEN D=D+1:RETURN
1040 GOTO970 'CHOOSE AGAIN
1050 '*****************************
1060 '*****CHARACTER CLASS******
1070 PRINT@257,"WHAT CHARACTER CLASS DO YOU":PRINT" WISH TO BE:  MAGICIAN":PRINT
@334,"CLERIC":PRINT@366,"FIGHTER":PRINT@398,"THIEF":INPUTC$
1080 IFC$="MAGICIAN"AND(R$="HUMAN"OR R$="ELF"OR R$="HALF-ELVEN")ANDI>8 AND D>5 T
HEN A1=1:RETURN
1090 IFC$="CLERIC"AND(R$="HUMAN"OR R$="HALF-ELVEN")AND W>8 THEN A1=2:RETURN
1100 IFC$="FIGHTER"AND S>8 AND C>6 THEN A1=3:RETURN
1110 IFC$="THIEF"AND D>8 THEN A1=4:RETURN
1120 GOSUB30:PRINT@290,"YOUR PRIME ABILITIES ARE TOO    LOW OR YOUR RACE IS INEL
IGIBLE  FOR THIS CLASS.":PRINT"  PLEASE CHOOSE AGAIN.":GOSUB20:GOSUB30:GOTO1060
1130 '*****************************
1140 '*ABILITY VALUE TRADE*
1150 '** MAGICIAN **
1160 PRINT@299,"1) 2 WISDOM."
1170 PRINT@331,"2) 3 STRENGTH."
1180 FORX=1TO2STEP0:GOSUB1550
1190 IF O=1 AND I<18 AND W>10 THEN I=I+1:W=W-2:GOSUB830'*ABILITY VALUES*
1200 IF O=2 AND I<18 AND S>11 THEN I=I+1:S=S-3:GOSUB830
1210 IF O=3 AND I<17 AND W>10 AND S>11 THEN I=I+2:W=W-2:S=S-3:GOSUB830
1220 IF O=4 THEN RETURN
1230 NEXTX'**********************
1240 '** CLERIC **
1250 PRINT@299,"1) 3 STRENGTH."
1260 PRINT@331,"2) 2 INTELLIGENCE."
1270 FORX=1TO2STEP0:GOSUB1550
```

PROGRAM FILE

```
1280 IF O=1 AND W<18 AND S>11 THEN W=W+1:S=S-3:GOSUB830
1290 IF O=2 AND W<18 AND I>10 THEN W=W+1:I=I-2:GOSUB830
1300 IF O=3 AND W<17 AND S>11 AND I>10 THEN W=W+2:S=S-3:I=I-2:GOSUB830
1310 IF O=4 THEN RETURN
1320 NEXTX'**********************
1330 '** FIGHTER **
1340 PRINT@299,"1) 2 INTELLIGENCE."
1350 PRINT@331,"2) 3 WISDOM."
1360 FORX=1TO2STEP0:GOSUB1550
1370 IF R$="HALFLING"AND S>16 THEN RETURN
1380 IF R$="ELF"AND S>17 THEN B=RND(75)
1390 IF R$="HALF-ELVEN"AND S>17 THEN B=RND(90)
1400 IF (R$="HUMAN"OR R$="DWARF") AND S>17 THEN B=RND(100)
1410 IF S>17 OR O=4 THEN RETURN
1420 IF O=1 AND S<18 AND I>10 THEN S=S+1:I=I-2:GOSUB830
1430 IF O=2 AND S<18 AND W>11 THEN S=S+1:W=W-3:GOSUB830
1440 IF O=3 AND S<17 AND I>10 AND W>11 THEN S=S+2:I=I-2:W=W-3:GOSUB830
1450 NEXTX'**********************
1460 '** THIEF **
1470 PRINT@299,"1) 2 INTELLIGENCE."
1480 PRINT@331,"2) 1 WISDOM."
1490 FORX=1TO2STEP0:GOSUB1550
1500 IF O=1 AND D<18 AND I>10 THEN D=D+1:I=I-2:GOSUB830
1510 IF O=2 AND D<18 AND W>9 THEN D=D+1:W=W-1:GOSUB830
1520 IF O=3 AND D<17 AND I>10 AND W>9 THEN D=D+2:I=I-2:W=W-1:GOSUB830
1530 IF O=4 THEN RETURN
1540 NEXTX'**********************
1550 '*GENERAL ABILITY TRADE*
1560 PRINT@257,C$;", YOU MAY CONVERT:";
1570 PRINT@363,"3) BOTH.";
1580 PRINT@395,"4) NONE.";
1590 PRINT@416,"YOU CANNOT DECREASE ANY ABILITY BELOW NINE.";:INPUTO
1600 RETURN
1610 '**************************
1620 '*** SUB-CLASS CHOICE ***
1630 '** ILLUSIONIST **
1640 IF R$<>"HUMAN"OR I<15 OR D<16 THEN RETURN
1650 GOSUB30 '*CLEAR*
1660 PRINT@288,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTURE AS AN ILLUSIONIST.
DO YOU WISH TO CONVERT TO THIS  SUB-CLASS.";:INPUTQ$1670 IF LEFT$(Q$,1)="Y"THEN
C$="ILLUSIONIST":A1=5
1680 RETURN'**********************
1690 '**DRUID/MONK**
1700 Q$="":IF R$="HUMAN"AND S>14 AND W>14 AND C>10 AND D>14 THENGOSUB30: PRINT@2
88,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTURE AS A MONK. DO YOU  WISH TO CONV
ERT TO THIS CLASS.":INPUTQ$
1710 IF LEFT$(Q$,1)="Y"THEN C$="MONK":A1=6:RETURN
1720 IF (R$="HUMAN" OR R$="HALF-ELVEN")AND W>11 AND R>14 AND LEFT$(Q$,1)<>"Y"THE
N GOSUB30:PRINT@288,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTURE AS A DRUID.DO
YOU  WISH TO CONVERT TO THIS CLASS.":INPUTQ$
1730 IF LEFT$(Q$,1)="Y"THEN C$="DRUID":A1=7
1740 RETURN:'**********************
1750 '**RANGER/PALADIN**
1760 Q$="":IF R$="HUMAN"AND S>11 AND I>8 AND W>12 AND C>8 AND R>16 THENGOSUB30:
PRINT@288,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTURE AS A PALADIN.DO YOUWISH
TO CONVERT TO THIS CLASS.":INPUTQ$
1770 IF LEFT$(Q$,1)="Y"THEN C$="PALADIN":A1=8:RETURN
1780 IF (R$="HUMAN"OR R$="HALF-ELVEN")AND S>12 AND I>12 AND W>13 AND C>13 AND LE
FT$(Q$,1)<>"Y"THEN GOSUB30:PRINT@288,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTU
RE AS A RANGER.DO YOU WISH TO CONVERT TO THIS CLASS.":INPUTQ$
1790 IF LEFT$(Q$,1)="Y"THEN C$="RANGER":A1=9
1800 RETURN'**********************
1810 '** ASSASSIN **
1820 IF R$="HALFLING"OR S<12 OR I<11 OR D<12 THEN RETURN
1830 GOSUB30 '*CLEAR*
1840 PRINT@288,"YOUR ABILITIES ARE HIGH ENOUGH  TO ADVENTURE AS AN ASSASSIN.
DO YOU WISH TO CONVERT TO THIS  SUB-CLASS.";:INPUTQ$1850 IF LEFT$(Q$,1)="Y"THEN
C$="ASSASSIN":A1=10
1860 RETURN'**********************
1870 '** INITIAL MONEY & HP **
1880 IF C$="CLERIC"THEN GP=(RND(6)+RND(6)+RND(6))*10:HP=6+RND(2)
1890 IF C$="FIGHTER"THEN GP=(RND(4)+RND(4)+RND(4)+RND(4))*10:HP=8+RND(2):
IF C=17 THEN HP=HP+1ELSE IF C=18 THEN HP=HP+2
1900 IF C$="MAGICIAN"THEN GP=(RND(4)+RND(4))*10:HP=4
1910 IF C$="THIEF"THEN GP=(RND(6)+RND(6))*10:HP=6
1920 RETURN'**********************
1930 '**STRENGTH ADJUSTMENTS**
1940 IF S<12 THEN SB=0:DB=0:WA=500:RETURN
1950 IF S=12 OR S=13 THEN SB=0:DB=0:WA=600:RETURN
1960 IF S=14 OR S=15 THEN SB=0:DB=0:WA=700:RETURN
1970 IF S=16 THEN SB=0:DB=1:WA=850:RETURN
1980 IF S=17 THEN SB=1:DB=1:WA=1000:RETURN
1990 IF S=18ANDB<1THEN SB=1:DB=2:WA=1250:RETURN
2000 IFB<51THENSB=1:DB=3:WA=1500:RETURN
2010 IFB<75THENSB=2:DB=3:WA=1750:RETURN
2020 IFB<90THENSB=2:DB=4:WA=2000:RETURN
2030 IFB<100THENSB=2:DB=5:WA=2500:RETURN
2040 IFB=100THENSB=3:DB=6:WA=3500:RETURN
2050 '**************************
2060 '***** WEAPONS *****
2070 '**MAGICIAN/ILLUSIONIST**
2080 PRINT@352,"1. DAGGER(2),  2. 2DARTS(1)      3. STAFF(2)":PRINT"YOU MAY PURCH
ASE ANY ONE.";:INPUTW1
2090 IFW1=1THENW$(1)="DAGGER":GP=GP-2
2100 IFW1=2THENW$(1)="2DARTS":GP=GP-1
2110 IFW1=3THENW$(1)="STAFF":GP=GP-2
2120 PRINT@114,"GOLD";GP;"GP";
2130 RETURN'**********************
2140 '**CLERIC**
2150 PRINT@320,"1. FLAIL(3)  2. HAMMER(1)        3. MACE(8)   4. STAFF(2)"
2160 FORX=1TO2:PRINT@448,"YOU MAY PURCHASE ANY TWO.";:INPUTW1
2170 IFW1=1THENW$(X)="FLAIL":GP=GP-3
2180 IFW1=2THENW$(X)="HAMMER":GP=GP-1
2190 IFW1=3THENW$(X)="MACE":GP=GP-8
2200 IFW1=4THENW$(X)="STAFF":GP=GP-2
2210 PRINT@114,"GOLD";GP;"GP";
2220 NEXT:RETURN
2230 '**************************
2240 '*FIGHTER CLASS & ASSASSIN*
2250 PRINT@320,"1.DAGGER(2)   2.BATTLE-AXE(5)   3.SPEAR(1)    4.BROAD-SWORD(10)
5.MACE(8)     6.SHORT-SWORD(8)  7.LONG-BOW(12)8.CROSS-BOW(12)";
2260 FORX=1TO3:PRINT@448,"YOU MAY PURCHASE ANY THREE.";:INPUTW1
2270 IFW1=1THENW$(X)="DAGGER":GP=GP-2
2280 IFW1=2THENW$(X)="BATTLE-AXE":GP=GP-5
2290 IFW1=3THENW$(X)="SPEAR":GP=GP-1
2300 IFW1=4THENW$(X)="BROAD-SWORD":GP=GP-10
2310 IFW1=5THENW$(X)="MACE":GP=GP-8
2320 IFW1=6THENW$(X)="SHORT-SWORD":GP=GP-8
2330 IFW1=7THENW$(X)="LONGBOW":GP=GP-12
2340 IFW1=8THENW$(X)="CROSS-BOW":GP=GP-12
2350 PRINT@114,"GOLD";GP;"GP";
2360 NEXT:RETURN
2370 '**************************
2380 '**THIEF**
```


MICROMART

CP/M FOR MICROS + VDU's

SCSI Enhancement Creates Distributed system Bus (London, England) — Quant systems has announced an enhancement to the Small Computer Interface (SCSI) that adds significant power and capability. With this enhancement, SCSI has evolved to the status of a loosely coupled distributed system bus, filling the gap in performance between STD Bus and Multibus. Hence the new name, Small Computer System Architecture (tm) or SCSA (tm).

The SCSI bus was originaly developed by shugart associates as a high level interface to disk and tape controllers. QUANT Systems extension to the SCSI bus called SCSI/Plus(tm) defines an additional bus phase, called the Master/slave phase. This new bus phase alows up to 256 "dumb" I/O modules to be added to an SCSI bus, without interfering with normal SCSI operation or specifications.

SCSI/Plus is a superset of the American National Standards Committee standard number X3T9.2, taking advantage of unused control signal status to add the Master/Slave phase. In the Master/Slave phase, slave modules assume a passive role, with no intelligence required for bus interfacing. Normally, SCSI devices require a microprocessor for bus control and interface. But in the Master/Slave phase of SCSI/Plus, slave interface requirements are minimal, making it practical to add numerous functions to SCSI, such as real time clocks, industrial control interfaces and other cost-sensitive devices.

SCSI/Plus transforms SCSI into a multi-mater high speed parallel bus with shared access to as many as 256 slave modules, while not interfering with the normal operation of "traditional" SCSI disk controllers, tape controllers, etc. with this added flexibility, SCSI/Plus represents a new system bus architecture, utilising single board CPU's such as QUANT System OMEGA, SCSI disk and tape controllers such as the Adaptec ACB4000, and assorted SCSI/Plus slave modules.

QUANT's SCSI/Plus adapter for OMEGA allows one or more of that companies single board CP/M computers to share an SCSI/Plus bus with SCSI disk and tape controllers, and to access up to 256 SCSI/Plus slave modules for the addition of other required system functions.

AVAILABLE: October, 1984

OMEGA SCSI/PLUS ADAPTER

Preliminary data sheet — 22/9/84

FEATURES:

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DESCRIPTION:

The SCSI/Plus adaptor provides the OMEGA with the added features of a hard disk and tape controller interface, general purpose I/O expansion, and optional DMA. Its size and mounting hole configuration make it an ideal companion to OMEGA, and simplify the addition of these features to any system based upon it.

QUANT's SCSI/PLUS adaptor utilises a unique extension to the ANSI SCSI specification which allows the addition of up to 256 dumb I/O ("slave") boards for process control, special input/output functions etc. The slave boards may even be present on the SCSI/PLUS bus along with SCSI disk and tape controllers. For example, OMEGA could have an SCSI Winchester controller as well as slave boards proving Real Time Clock, Serial Port Expansion, etc.

The SCSI/PLUS adapter connects to OMEGA by means of jumper cable which plugs into OMEGA's Z80A socket (the Z80A is then plugged into a socket on the adaptor board). A socket for the Z80A DMA controller is provided on the adaptor board allowing the option of adding DMA for extremely fast transfers to and from the SCSI/PLUS bus.

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PROGRAM FILE

```
2390 PRINT@320,"1. DAGGER(2)  2.2DARTS(1)       3. SLING(2)   4.SWORD(8)"
2400 FORX=1TO2:PRINT@448,"YOU MAY PURCHASE ANY TWO.";:INPUTW1
2410 IFW1=1THENW$(X)="DAGGER":GP=GP-2
2420 IFW1=2THENW$(X)="2DARTS":GP=GP-1
2430 IFW1=3THENW$(X)="SLING":GP=GP-2
2440 IFW1=4THENW$(X)="SWORD":GP=GP-8
2450 PRINT@114,"GOLD";GP;"GP";
2460 NEXT:RETURN
2470 '*****************************
2480 '**MONK**
2490 PRINT@320,"1. CROSSBOW(12)  2. DAGGER(2)   3. HAND-AXE(1)   4. JAVELIN(1)
5. POLE-ARM(6)   6. SPEAR(1)    7. STAFF(2)      8. CLUB(2)";
2500 PRINT@448,"YOU MAY PURCHASE ANY ONE.";:INPUTW1
2510 IFW1=1THENW$(1)="CROSSBOW":GP=GP-12
2520 IFW1=2THENW$(1)="DAGGER":GP=GP-2
2530 IFW1=3THENW$(1)="HAND-AXE":GP=GP-1
2540 IFW1=4THENW$(1)="JAVELIN":GP=GP-1
2550 IFW1=5THENW$(1)="POLE-ARM":GP=GP-6
2560 IFW1=6THENW$(1)="SPEAR":GP=GP-1
2570 IFW1=7THENW$(1)="STAFF":GP=GP-2
2580 IFW1=8THENW$(1)="CLUB":GP=GP-2
2590 PRINT@114,"GOLD";GP;"GP";
2600 RETURN'*******************
2610 '**DRUID**
2620 PRINT@320,"1. DAGGER(2)  2. 2DARTS(1)      3. HAMMER(1)  4. SCIMITAR(15)
5. SPEAR(1)   6. STAFF(2)";
2630 FORX=1TO2:PRINT@448,"YOU MAY PURCHASE ANY TWO.";:INPUTW1
2640 IFW1=1THENW$(X)="DAGGER":GP=GP-2
2650 IFW1=2THENW$(X)="2DARTS":GP=GP-1
2660 IFW1=3THENW$(X)="HAMMER":GP=GP-1
2670 IFW1=4THENW$(X)="SCIMITAR":GP=GP-15
2680 IFW1=5THENW$(X)="SPEAR":GP=GP-1
2690 IFW1=6THENW$(X)="STAFF":GP=GP-2
2700 PRINT@114,"GOLD";GP;"GP";
2710 NEXT:RETURN
2720 '*****************************
2730 '**ARMOUR & ARMOUR CLASS**
2740 '**MU/ILLUSIONIST/MONK**
2750 PRINT@320,"YOU ARE NOT ALLOWED TO WEAR ANY ARMOUR.YOUR ARMOUR CLASS = 9":AC
=9
2760 IFD<7THEN AC=AC+1:PRINT"  DEXTERITY PENALTY -1: AC=";AC;
2770 IFD=15THEN AC=AC-1:PRINT"  DEXTERITY BONUS +1: AC=";AC;
2780 IFD=16THEN AC=AC-2:PRINT"  DEXTERITY BONUS +2: AC=";AC;
2790 IFD=17THEN AC=AC-3:PRINT"  DEXTERITY BONUS +3: AC=";AC;
2800 IFD=18THEN AC=AC-4:PRINT"  DEXTERITY BONUS +4: AC=";AC;
2810 RETURN '*******************
2820 '**CLERIC/FIGHTER CLASS**
2830 CLS:PRINT"YOU MAY PURCHASE ANY ARMOUR:"
2840 PRINT" 1.LEATHER OR PADDED(5)"
2850 PRINT" 2.LEATHER + SHIELD(17)"
2860 PRINT" 3.RING MAIL(30)"
2870 PRINT" 4.RING MAIL + SHIELD(42)"
2880 PRINT" 5.SCALE MAIL(45)"
2890 PRINT" 6.SCALE MAIL + SHIELD(57)"
2900 PRINT" 7.CHAIN MAIL(75)"
2910 PRINT" 8.CHAIN MAIL + SHIELD(87)"
2920 PRINT" 9.SPLINT OR BANDED MAIL(90)"
2930 PRINT"10.SPLINT/BANDED + SHIELD(102)"
2940 PRINT"11.PLATE MAIL(400)"
2950 PRINT"12.PLATE MAIL + SHIELD(412)"
2960 PRINT@450,"GOLD";GP;"GP";:INPUTAA
2970 IFAA=1ANDGP>5THENA1$="LEATHER":GP=GP-5:AC=8
2980 IFAA=2ANDGP>17THENA1$="LEATHER+SHIELD":GP=GP-17:AC=7
2990 IFAA=3ANDGP>30THENA1$="RING MAIL":GP=GP-30:AC=7
3000 IFAA=4ANDGP>42THENA1$="RINGMAIL+SHIELD":GP=GP-42:AC=6
3010 IFAA=5ANDGP>45THENA1$="SCALE MAIL":GP=GP-45:AC=6
3020 IFAA=6ANDGP>57THENA1$="SCALEMAIL+SHIELD":GP=GP-57:AC=5
3030 IFAA=7ANDGP>75THENA1$="CHAIN MAIL":GP=GP-75:AC=5
3040 IFAA=8ANDGP>87THENA1$="CHAINMAIL+SHIELD":GP=GP-87:AC=4
3050 IFAA=9ANDGP>90THENA1$="SPLINT MAIL":GP=GP-90:AC=4
3060 IFAA=10ANDGP>102THENA1$="SPLINTMAIL+SHIELD":GP=GP-102:AC=3
3070 IFAC=9THEN2960
3080 PRINT@450,"GOLD";GP;"GP, ARMOUR CLASS=";AC
3090 GOSUB2760 '*DEXTERITY BONUS*
3100 RETURN '*******************
3110 '**DRUID/THIEF/ASSASSIN**
3120 PRINT@288,"YOU MAY WEAR ONLY LEATHER ARMOURYOU CAN PURCHASE FROM:":PRINT"1.
LEATHER(5) 2.PADDED(4)";:INPUTAA
3130 IFAA=1THENA1$="LEATHER":GP=GP-5:AC=8
3140 IFAA=2THENA1$="PADDED":GP=GP-4:AC=8
3150 PRINT@114,"GOLD";GP;"GP";
3160 PRINT@448,"YOUR ARMOUR CLASS =";AC
3170 GOSUB2760 '*DEXTERITY BONUS*
3180 RETURN '*******************
3190 '***** EQUIPMENT *****
3200 CLS:PRINT"THE FOLLOWING EQUIPMENT IS ON   SALE AT THE LOCAL MARKET: GP"
3210 PRINT:PRINT" 1.LEATHER BACKPACK          2"
3220 PRINT" 2.TEN CANDLES                1"
3230 PRINT" 3.SMALL WOODEN CHEST         1"
3240 PRINT" 4.LANTERN & OIL              8"
3250 PRINT" 5.METAL MIRROR               8"
3260 PRINT" 6.BELT POUCH                 1"
3270 PRINT" 7.50FT.ROPE                  1"
3280 PRINT" 8.TINDER BOX,FLINT&STEEL     1"
3290 PRINT" 9.20 TORCHES                 1"
3300 PRINT"10.1 WEEK OF RATIONS          4"
3310 K$=INKEY$:IFK$=""THEN3310
3320 CLS:PRINT"11.WINE IN SKIN              1"
3330 PRINT"12.WOLVESBANE&GARLIC BUDS   1"
3340 PRINT"13.VIAL OF HOLY WATER      25"
3350 PRINT"14.HOLY CROSS               2"
3360 PRINT"15.FLASK OF OIL             1"
3370 PRINT"16.CART                    50"
3380 PRINT"17.PONY                    15"
3390 PRINT"18.LIGHT WARHORSE         150"
3400 PRINT"19.SMALL BOAT              75"
3410 PRINT"20.THIEVES'PICKS & TOOLS   30"
3420 PRINT:PRINT"PRESS R TO REVIEW."
3430 PRINT"       F TO FINISH."
3440 PRINT"       OR ENTER THE THE ITEM            NUMBER REQUIRED.";
3450 FORX=1TO2STEP0
3460 INPUTK$:IFK$="R"THEN3190
3470 IFK$="F"THENRETURN
3480 K=VAL(K$):CLS:PRINT:PRINT"GOLD";GP;"GP";
3490 IFK<1ORK>20THEN3460
3500 IFK=1ANDGP>2THEN E$(1)="LEATHER BACKPACK":GP=GP-2
3510 IFK=2ANDGP>1THEN E$(2)="CANDLES":GP=GP-1
3520 IFK=3ANDGP>1THEN E$(3)="SMALL WOODEN CHEST":GP=GP-1
3530 IFK=4ANDGP>8THEN E$(4)="LANTERN & OIL":GP=GP-8:LI=LI+10
3540 IFK=5ANDGP>8THEN E$(5)="METAL MIRROR":GP=GP-8
3550 IFK=6ANDGP>1THEN E$(6)="BELT POUCH":GP=GP-1
3560 IFK=7ANDGP>1THEN E$(7)="50FT.ROPE":GP=GP-1
3570 IFK=8ANDGP>1THEN E$(8)="TINDER BOX":GP=GP-1
3580 IFK=9ANDGP>1THEN E$(9)="TORCHES":GP=GP-1:LI=LI+20
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PROGRAM FILE

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3590 IFK=10ANDGP>4THENE$(10)="RATIONS":GP=GP-4
3600 IFK=11ANDGP>1THENE$(11)="WINE IN SKIN":GP=GP-1
3610 IFK=12ANDGP>1THENE$(12)="WOLVESBANE&GARLIC":GP=GP-1
3620 IFK=13ANDGP>25THENE$(13)="HOLY WATER":GP=GP-25
3630 IFK=14ANDGP>2THENE$(14)="HOLY CROSS":GP=GP-2
3640 IFK=15ANDGP>1THENE$(15)="FLASK OF OIL":GP=GP-1:LI=LI+10
3650 IFK=16ANDGP>50THENE$(16)="CART":GP=GP-50
3660 IFK=17ANDGP>15THENE$(17)="PONY":GP=GP-15
3670 IFK=18ANDGP>150THENE$(18)="LIGHT WARHORSE":GP=GP-150
3680 IFK=19ANDGP>75THENE$(19)="SMALL BOAT":GP=GP-75
3690 IFK=20ANDGP>30THENE$(20)="PICKS & TOOLS":GP=GP-30
3700 PRINT@32,"GOLD";GP;"GP"
3710 PRINTE$(K);:PRINT:E=E+1:F$(1,E)=E$(K):E(1)=E
3720 CC=CC+1:IFCC>7THENPRINT@224,"OVERLOADED-NO MORE EQUIPMENT    MAY BE PURCHAS
ED.":GOSUB820:RETURN
3730 IFGP=0THENRETURNELSENEXT
3740 '*** FINAL CHARACTER ***
3750 CLS:PRINTN$;":";R$;" ";C$;"(LEVEL";LL;")"
3760 GOSUB740'**ABILITIES**
3770 GOSUB830'***VALUES***
3780 IFS>17THENPRINT@80,"/";B$
3790 PRINT@114,"GOLD";GP;"GP";
3800 PRINT@146,"BASIC";HP;"HP";
3810 PRINT@178,"HIT@ +";STR$(SB);
3820 PRINT@210,"DAMAGE@ +";STR$(DB);
3830 PRINT@242,"CARRY:";WA;
3840 PRINT@256,"*WEAPON*:  ";W$(1)
3850 PRINT@298,W$(2);"  ";W$(3)
3860 PRINT@320,"*ARMOUR*  ";A1$;"(AC";AC;")"
3870 PRINT@352,"EQUIPMENT:  ";
3880 FORX=1TOE(1):IF F$(1,X)=""THEN 3900
3890 PRINTF$(1,X);";";
3900 NEXT
3910 PRINT@448,S$(1);" ";S$(2);" ";S$(3);
3920 GOSUB820:RETURN
3930 '*************************
3940 '**MAGIC USER'S SPELLS**
3950 IF I=9THEN SP=35:SM=6
3960 IF I>9ANDI<13THENSP=45:SM=7
3970 IF I=13ORI=14THENSP=55:SM=9
3980 IF I=15ORI=16THENSP=65:SM=11
3990 IF I=17THEN SP=75:SM=14
4000 IF I=18THEN SP=85:SM=18
4010 CLS:PRINT"YOUR INTELLIGENCE ALLOWS YOU TO KNOW A MAXIMUM OF";SM;"FIRST LEVE
L SPELLS.":PRINT"THE CHANCE TO KNOW EACH SPELL   WHEN YOU FIND THEM IS";SP;"%"
4020 PRINT"YOU AUTOMATICALLY KNOW:          1.READ MAGIC.":S$(1)="READ MAGIC"
4030 PRINT"CHOOSE ONE SPELL FROM:"
4040 PRINT"2.CHARM PERSON."
4050 PRINT"3.mAGIC MISSILE."
4060 PRINT@320,"4.sLEEP.":INPUTS2
4070 PRINT@448,"";:PRINT
4080 IFS2=2ANDF(2)=0ANDRND(100)<SP THENS$(2)="CHARM PERSON"
4090 IFS2=3ANDF(3)=0ANDRND(100)<SP THENS$(2)="mAGIC MISSILE"
4100 IFS2=4ANDF(4)=0ANDRND(100)<SP THENS$(2)="sLEEP"
4110 IFF(2)=1ANDF(3)=1ANDF(4)=1THENF(2)=0:F(3)=0:F(4)=0
4120 IFS$(2)=""THENF(S2)=1:PRINT@448,"UNSUCCESSFUL-TRY ANOTHER SPELL.";:GOTO4060
4130 PRINT@416,S$(2);": SUCCESSFUL.":FORX=1TO800:NEXT
4140 PRINT@205,S2;".";S$(2);
4150 PRINT@256,"5.FEATHER FALL"
4160 PRINT"6.SHIELD(v)"
4170 PRINT@320,"7.DETECT MAGIC":INPUTS3
4180 IFS3=5ANDF(5)=0ANDRND(100)<SP THENS$(3)="FEATHER FALL"
4190 IFS3=6ANDF(6)=0ANDRND(100)<SP THENS$(3)="SHIELD(v)"
4200 IFS3=7ANDF(7)=0ANDRND(100)<SP THENS$(3)="DETECT MAGIC"
4210 IFF(5)=1ANDF(6)=1ANDF(7)=1THENF(5)=0:F(6)=0:F(7)=0
4220 IFS$(3)=""THENF(S3)=1:PRINT@448,"UNSUCCESSFUL-TRY ANOTHER SPELL.";:GOTO4170
4230 PRINT@416,S$(3);": SUCCESSFUL."
4240 GOSUB820 '*DELAY*
4250 RETURN '******************
4260 '** ILLUSIONIST'S SPELLS**
4270 CLS:PRINT@96,"  *ILLUSIONIST'S SPELL-BOOK*"
4280 S$(1)="COLOUR SPRAy":S$(2)="hYPNOTISM":S$(3)="DETECT MAGIC":PRINT:PRINT
4290 PRINT@200," 1.";S$(1)
4300 PRINT@232," 2.";S$(2)
4310 PRINT@264," 3.";S$(3)
4320 PRINT:PRINT@329,"-----***-----"
4330 GOSUB820:RETURN
4340 '*************************
4350 '** CLERIC'S SPELLS **
4360 CLS:PRINT@100,"**CLERIC'S SPELLS**
4370 IF W<13 THENPRINT@160,"YOU ONLY HAVE SUFFICIENT WISDOM TO CARRY ONE SPELL..
..."
4380 IF W=13 THENPRINT@160,"YOUR WISDOM GIVES YOU A BONUS.. ENABLING YOU TO CARR
Y TWO SPELLS"
4390 IF W>13 THENPRINT@160,"YOUR WISDOM GIVES YOU A BONUS...ENABLING YOU TO CARR
Y.....    THREE SPELLS."
4400 S$(1)="CURE LIGHT WOUNDS"
4410 PRINT@262,"1.";S$(1)
4420 IF W=13 THENPRINT@294,"2.COMMAND(h)";:S$(2)="COMMAND(h)"
4430 IF W>13 THENPRINT@294,"2.COMMAND(h)":S$(2)="COMMAND(h)":PRINT@326,"3.DETECT
 MAGIC";:S$(3)="DETECT MAGIC"
4440 PRINT:PRINT@390,"------***------":GOSUB20
4450 RETURN'******************
4460 '** DRUID'S SPELLS **
4470 CLS:PRINT@100,"**DRUID'S SPELLS**"
4480 IFW<13THENPRINT@160,"YOUR WISDOM ALLOWS YOU TO CARRY TWO SPELLS...."
4490 IF W>12 THENPRINT@160,"YOUR WISDOM GIVES YOU A BONUS.. ENABLING YOU TO CARR
Y.....    THREE SPELLS;"
4500 S$(1)="eNTANGLE":S$(2)="DETECT MAGIC"
4510 PRINT@262,"1.";S$(1)
4520 PRINT@294,"2.";S$(2)
4530 IFW>12THENS$(3)="CURE LIGHT WOUNDS":PRINT@326,"3.";S$(3)
4540 PRINT:PRINT@390,"------***------":GOSUB20
4550 RETURN'******************
4560 '**SAVE CHARACTER ROUTINE**
4570 N$(1)=N$:R$(1)=R$:C$(1)=C$:M$(1)=LEFT$(N$,8)
4580 B$(1)=B$:A$(1)=A1$:L(1)=LL:W1$(1)=W$(1):W2$(1)=W$(2):W3$(1)=W$(3)
4590 S$(1,1)=S$(1):S$(1,2)=S$(2):S$(1,3)=S$(3)
4600 S(1)=S:I(1)=I:W(1)=W:C(1)=C:D(1)=D:R(1)=R
4610 GP(1)=GP:HP(1)=HP:SB(1)=SB:DB(1)=DB:WA(1)=WA:AC(1)=AC:SP(1)=SP:SM(1)=SM:LI(
1)=LI
4620 CLS:PRINT@5,"*DO YOU WISH TO SAVE*":PRINT@39,"*THIS CHARACTER*"
4630 PRINT@77,"";:Q$=INKEY$
4640 IFQ$="N"THENEND
4650 IFQ$="Y"THEN4670
4660 GOTO4630
4670 PRINT:PRINT" PREPARE TAPE & THEN PRESS       ANY KEY....."
4680 K$=INKEY$:IF K$=""THEN4680
4690 PRINT@234,"**SAVING**":PRINT@268,N$(1):OPEN"O",#-1,M$(1)
4700 PRINT#-1,N$(1),R$(1),C$(1),L(1),S(1),I(1),W(1),C(1),D(1),R(1)
4710 PRINT#-1,B$(1),GP(1),HP(1),SB(1),DB(1),WA(1),W1$(1),W2$(1),W3$(1),A$(1),AC(
1),LI(1),E(1),Q(1)
4720 FORX=1TO8:PRINT#-1,F$(1,X),S$(1,X):NEXTX:FORY=1TO5:PRINT#-1,T$(1,Y):NEXTY
4730 CLOSE#-1:PRINT@234,"***DONE***":RETURN
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REFORMATTER CP/M ↔ DEC	Microtech Exports	●			
REFORMATTER CP/M ↔ IBM	Microtech Exports	●	●		

Word Processing/ Text Editing/Editors

		CP/M	CP/M-86	MS-DOS	PCDOS
EDIT-80 V2.02	Microsoft	●			
FRIDAY	Ashton Tate	●	●	●	●
MAILMERGE	Micropro	●	●	●	●
MEMOPLAN	Chang Labs	●	●		●
WORD	Microsoft				●
WORD WITH MOUSE	Microsoft				●
PARAGRAB	Focus	●			●
PEDIT	Phoenix	●			
PLANSTAR	Micropro				●
PMATE	Phoenix	●		●	●
SPELLSTAR	Micropro	●	●	●	●
STARBURST	Micropro				●
STARINDEX	Micropro	●	●	●	●
WORDMASTER	Micropro	●	●		
WORDSTAR	Micropro	●	●	●	●
WORDSTAR PROFESSIONAL (WS+MM+SS+STAR INDEX)	Micropro	●	●	●	●

Databases/Data Management Systems

DATASTAR	Micropro	●	●	●	●
dBASE-II	Ashton Tate	●	●	●	●
FRIDAY	Ashton Tate	●	●	●	●
FRAMEWORK	Ashton Tate				●
INFOSTAR	Micropro	●	●	●	●
REPORTSTAR	Micropro	●	●	●	●
dBASE III	Ashton Tate				●

Financial Accounting

INCOMPLETE RECORDS SYSTEM	MPI	●	●	●	●
NOMINAL LEDGER	Padmede	●		●	●
OPEN ITEM PURCHASE LEDGER	Padmede	●		●	●
OPEN ITEM SALES LEDGER	Padmede	●		●	●
PADMEDE BUSINESS CONTROL SYSTEM	Padmede	●		●	●
PAYROLL	MPI	●		●	●
PURCHASE LEDGER	Padmede	●		●	●
SALES INVOICING	Padmede	●		●	●
SALES LEDGER	Padmede	●		●	●
TIME & COST RECORDING	Padmede	●		●	●

Financial Modelling/Problem Solving

CALCSTAR	Micropro	●	●	●	●
DECISION ANALYST	Executive Software	●	●	●	●
LINEAR & GOAL PROGRAMMING	E A S	●			
MATHSPACK	MPI	●		●	●
MICROPLAN	Chang Labs	●		●	●
MULTIPLAN	Microsoft	●		●	●
PLANTRAC 1	Computerline	●		●	●
PLANTRAC 1+	Computerline	●		●	●
PROFIT PLAN	Chang Labs	●	●		●
QSTAT	Pivotal Software	●			
STATSPACK	MPI	●		●	●
TK! SOLVER	Software Arts				●
TK! SOLVER PACKS					
FINANCIAL MANAGEMENT					●
MECH ENGINEERING					●

Business Applications

JOB COSTING	Heseltine	●	●	●	●
POLICY MASTER	CSA Micro Systems	●	●	●	●
PRINT ESTIMATION	Software Mgmt Systems	●		●	●
STOCK CONTROL	Padmede	●		●	●

Training Aids

CP/M TUTOR	Syntax Software	●			
KEYBOARD MASTER	Anthony Ashpitel	●	●		●
TYPING MASTER	Anthony Ashpitel	●	●		●

Graphics

dGRAPH	Fox & Geller	●			●

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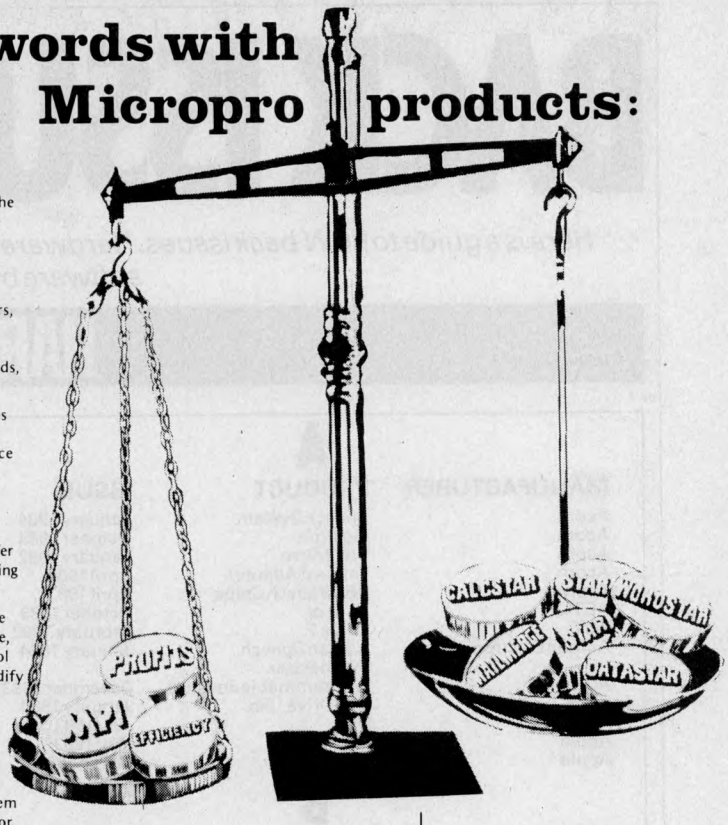

WORDSTAR

WordStar is probably the most popular word processing package available for use on microcomputer systems. It offers a complete range of word and text processing facilities that are both powerful and simple to use. Text files can be created easily and editing, formatting and screen manipulation is simple and easily learned.

WordStar features include comprehensive screen editing facilities with menu and four levels of help messages as required: powerful editing commands that allow text to be inserted, deleted, moved, copied or read from files: word-wrap, which eliminates the need for carriage returns: a wide range of print enhancements such as boldface, double strike, underline, superscripts and variable line height: flexibility in formatting, which allows justified or ragged right margins (or both), and in pagination where the user selects page length, margins and headings and footings: a decimal tab facility that allows columns of numbers to be typed easily; paragraph indenting; and program execution, which allows another program - for example a system utility - to be executed with an automatic return to WordStar.

MAILMERGE

MailMerge is a powerful file merging tool that is ideal for mailing applications where lists are selected on a range of criteria. Operating in conjunction with WordStar, it allows the creation of 'personalised' letters by incorporating specified variables such as salutation or name into the basic document file prepared on WordStar.

MailMerge features include the use of the same data file for both form letters and mailing labels; multiple copy printing, which allows the same file to be automatically printed more than one time; and chained printing where a file name can be specified within text for subsequent automatic printing.

SPELLSTAR

SpellStar is a powerful spelling checker that finds spelling and typing errors in word processing text files. It is ables to proof-read the files at many thousands of words per minute, comparing the file to its integral 20,000-word dictionary stored on disc.

Operating only in conjunction with the WordStar word processing package, SpellStar features include showing the error highlighted in context on-screen within the WordStar file; and the provision of three subsequent options: change the spelling, leave the spelling as it is, or leave the spelling and add the word either to the integral dictionary or a specifically created supplementary dictionary.

STARINDEX

StarIndex runs with WordStar data files to create indexes, tables of contents, figures and tables, and to enhance the print control of the file to improve presentation.

Commands are typed into the file at the appropriate place so that comprehensive, truly alphabetical indexes can be constructed, tables of contents etc produced, or the pages, table of figures sequentially numbered. It can also be used to enhance the quality of the printed document with the inclusion of such commands as boldface, double-strike, underline, space and elongate.

STARBURST

StarBurst is a management tool designed for developing complex overall systems from a range of standard packages. A vocabulary of 24 commands allows the user to develop a specific menu that will carry out multiple keystroke operations with a single keystroke. No programming knowledge is needed.

The program will work with all the Micropro range as well as many other standard applications packages.

DATASTAR

DataStar is a powerful yet easy to learn data entry system that allows users to generate the specific forms and parameters for data entry, and then retrieve and update the information as required. The files that can be constructed using DataStar can be used with applications programs that have been written in BASIC, COBOL or FORTRAN.

The package consists of two separate programs, DataStar itself, and FormGen. The latter gives users, the necessary tools to design and generate the forms needed for data entry, on screen. This includes not only defining the location of data fields, but defining their contents as well.

DataStar features include powerful editing facilities normally found only on large key-to-disc systems; several different forms of data verification to reduce errors; a wide range of comprehensive help messages and instructions on-screen; the provision of arithmetic functions with results automatically entered to desired data fields; and powerful search/retrieve and edit/updating facilities that offer several ways of locating desired records and updating updating them.

DataStar can be easily integrated with a wide range of other applications programs. It can, for example, be used as the data entry portion of a stock control or employee record suite without the need to modify the existing packages.

INFOSTAR

InfoStar is a data management system that has been developed by combining the capabilities of Micropro's DataStar data entry and updating system with a high speed and full featured report generator called ReportStar.

Up to 65535 records can be maintained per file, with records being of variable length. There can be up to 255 fields per record, with each field containing a maximum of 120 characters. Data can be entered using DATASTAR, which can easily be customised to suit a users specific requirements. Sorting updating and reporting is performed by ReportStar, which can sort on upto 32 key fields at speeds of up to 560 records per minute. This speed is maintained in reporting, where a report can be produced in under 60 seconds.

To further enhance its capabilities, the package can be interfaced with other Micropro business programs, such as WordStar.

CALCSTAR

CalcStar is similar to the popular Visicalc package, but has been specifically configured for CP/M-based systems. It offers the same spread-sheet modelling facilities that make financial modelling and analysis so much easier.

CalcStar features include screen 'windowing' onto a matrix of up to 600 entries arranged to user requirements; and easy programming of user-defined formulae for modelling and simulation.

The package has the advantage of being able to interface directly with the popular WordStar word processing package, and makes use of WordStar command keys. This interfacing allows full management reports incorporating a variety of models and simulations to be prepared easily.

WORDMASTER

Intended primarily for use by programmers, WordMaster provides a comprehensive on-screen text editing capability. It is equipped with a scratch-pad memory facility that allows text to be stored temporarily for subsequent insertion, any number of times, into the file being edited.

WordMaster features include on-screen insertion, and deletion of text; block definition and movement; a wide range of cursor commands such as tab, page and scroll; and the use of the scratch-pad memory to hold complex strings of commands for later execution.

PLANSTAR

A sophisticated financial planning tool.

With PlanStar, plain English is all you need from data input and manipulation to production of finished reports.

Consolidation of many spreadsheets takes just a single command. Virtual Memory allows over 32,000 cells per spreadsheet and 1,000 sheets per project. Since formulae and data are stored separately, temporary worksheets can be used to ask "What-if" questions over and over again, leaving your original data intact.

It comes complete with an indexed and cross-referenced User Manual, on-screen tutorial program, reference card, Help screens and sample models to help you to get started.

PlanStar's editor uses the familiar WordStar commands. The PlanStar window lets you view and modify data as you would with CalcStar. Move data from a DataStar, InfoStar and CalcStar files straight into a PlanStar to give your final reports a truly professional appearance. Or use StarBurst to create your own menus for a customised financial modelling system.

PlanStar also accepts DIF (Data Interchange Format) files and comma-separated ASCII files. PlanStar also allows transfer of control to and from your own BASIC program.

SUPERSORT

SuperSort is a powerful and extremely flexible tool for sorting, selecting and merging data from a number of files. Up to 32 separate files can be merged into one file, in most cases at the rate of 560 records per minute, and up to 32 different selection criteria can be specified.

SuperSort features include the integration of new records into a master file with just one operation; acceptance of data in a wide range of forms, including justified or unjustified text that can incorporate floating decimals, exponential notation, or be in a number of standard formats such as binary, BCD or ASCII; the provision of plain English help and error messages; and a maximum record length of 4096 bytes. SuperSort will not sort files larger than 512K bytes.

All the Micropro products can work together to create a comprehensive working system. StarBurst (with an IBM-PC) can even allow you to switch from one package to another by means of menu.



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BACK ISSUES SERVICE

Here is a guide to PCW back issues. Hardware reviews/Benchtests are indexed by manufacturer, software by product name.

HARDWARE

MANUFACTURER	PRODUCT	ISSUE
A		
Acorn	Speech System	January 1984
Acorn	Electron	October 1983
Acorn	BBC Micro	January 1982
Acorn	Teletext Adaptor	April 1984
Acorn	BBC Speech Chips	April 1983
ACT	Apricot	October 1983
ACT	Sirius 1	February 1982
Adman Electronics	Adman Speech Synthesiser	January 1984
AGF	Programmable Joystick	December 1983
AMS	Disc Drive : 3in	January 1984
Apple	Lisa	July 1983
Apple	III	May 1982
Apple	Macintosh	March 1984
B		
British Micro	Mimi 801	July 1982
Brother	EP44	April 1984
C		
C/WP	Cortex	December 1983
Camputers	Lynx	March 1983
Canon	AS-100	December 1983
Canon	CX-1	November 1982
Canon	X-07	March 1984
Casio	PB-100	May 1983
Casio	fx-9000p	February 1983
Casio	602p	May 1982
Casio	FP-10 Printer	April 1982
Coleco	Adam	April 1984
Commodore	715	January 1984
Commodore	64	May 1983
Compudata	Tulipsystem 1	October 1983
Conchess	Monarch/Ambassador/ Escourter	March 1983
Corvus	Concept	March 1983
Currah	Microspeech Unit	January 1984
D		
Dacom Systems	Buzzbox	January 1984
DCP Microdevelopments	Speech Pack	August 1982
Digihurst	Microsight 1	October 1983
Digital Equipment	Rainbow 100	November 1982
Dragon Data Ltd	Dragon 32	August 1982
E		
Eaca International	Colour Genie	June 1983
Electroni-Kit	FX System	November 1983
Electroplay	My Talking Computer	November 1983
Epson	QX-10	July 1983
Epson	HX-20	December 1982
Epson	FX-80	July 1983
Epson	PX-8	June 1984
F		
Ferranti	Argus PPC	November 1983
Fidelity	Prestige	February 1983
Fortune	Fortune 32:16	August 1983
Future	FX20	October 1983
G		
Gavilan	Gavilan MC	February 1984
GCE	Vectrex System	August 1983
GCS	Ferrett	June 1984
Gemini	Multiboard	February 1982
GRiD	Compass	June 1984
Gulfstream	Hyperion	October 1983
H		
Hewlett-Packard	HP-75C	November 1982
Hewlett-Packard	15C and 16C	September 1982
Hewlett-Packard	HP86	October 1982
Hewlett-Packard	HP-125	April 1982
Hewlett-Packard	HP-IL	March 1982
High Tech Electronics	Sid 1 Colour Board	April 1982
Hitachi	MB16001	June 1983
Hitachi	Peach	May 1982
I		
IBM	9000 Instrumentation Computer	March 1983
IBM	PC Junior	March 1984
Ikon	Hobbit	January 1984
IO Research Ltd	Pluto	December 1982
J		
Jonos	Jonos	April 1984
Jupiter Cantab	Ace	January 1983
L		
LSI	M-Four	April 1983
M		
Magus Computer Systems Ltd	Add-On Graphics Board	September 1983
Mannesmann Tally	MT160L Dot-Matrix Printer	August 1983
Mattel	Aquarius	November 1983
Microwriter Ltd	Microwriter	September 1982
Milton Bradley	Phantom	July 1983
Monroe	Monroe 8820	April 1982
Motorola	MC68000	December 1982
Multitech	Micro-Professor II	September 1983
N		
NCR	Decision Mate V	August 1983
NEC	PC-8201A	December 1983
NEC	APC	September 1983
Notting Dale Itec	G007 Graphics Module	March 1983
Novag	Constellation	October 1983
O		
Olivetti	M20	September 1982
Oric Products	Oric I	April 1983
Osborne	Executive	July 1983
P		
Positron	9000	October 1982
R		
Robocom Ltd	Bit Stik	November 1982
S		
Sage	II	February 1983
Scisys	Chess Champion Mark 5	January 1983
Semi-Tech	Pied Piper	September 1983
Sharp	MZ-700	February 1984
Sharp	PC1251	February 1983
Sharp	PC1500	June 1982
Sharp	MZ-80A	June 1982
Sharp	MZ-80A	April 1984
Shelton Instruments	Sig/Net	April 1983
Sinclair	Microdrive	October 1983
Sinclair	ZX Spectrum	June 1982
Sinclair	ZX81 Printer	January 1982
SMT	Goupil-3	December 1983
Sord	M5	August 1983
Sord	Exleigh Expert	August 1982
Spectravideo	SV-318 and SV-328	March 1984
T		
Tandata	Homedeck	April 1984

T

Tandy	MC-10	November 1983
Tandy	Model 100	August 1983
Texas Instruments	TI Professional	May 1983
Texas Instruments	TI-88	July 1982
Texas Instruments	TI-99/4A	March 1982
Texas Instruments	TI-59	January 1983
Torch Computers	Torch	January 1983
Tradecom	Newbrain AD	July 1982
Tycom	Microframe	January 1984

W X

Walters Microsystems	120 Printer	December 1982
Watanabe	Personal Plotter	February 1982
Wave Mate	Bullet	February 1984
William Stuart Systems	Chatterbox	January 1984
Wren Computers	Wren	April 1984
Xerox	16/8	February 1984
Xerox	820	January 1982

SOFTWARE

PROGRAM	ISSUE
1-2-3	April 1984
1-2-3	November 1983
1982 Database Roundup	December 1982
1983 Database Roundup	December 1983
1983 Spreadsheet Roundup	December 1983

A

Accountancy Programs (General)	June 1983
Aquila	September 1982

B

Benchmarks Explained (Reference Article)	January 1984
Beta	August 1983
Brainstorm	February 1984
Busifile	January 1984
Busipost	February 1983

C

Cardbox	August 1982
Color Scarfman	December 1982
Condor Database	November 1982

D

Databases (Choosing One)	March 1982
Dataplan	August 1983
Dataprism	March 1983
DBMS2	June 1982
Delta	October 1983
Desq	December 1983
DMS	March 1982
Dragon Disks	June 1984

E

E40	September 1982
Ecalc	July 1983
Everyman	February 1984
Expert-Ease	June 1984

F

Falc	January 1984
Financial Director	June 1983
FMS80	April 1982
Freqout	February 1982

H

Homeword	February 1984
HP41-C Text Editor	November 1982
Home Accounts/Finance Manager	January 1984

I L

Information Management	April 1984
Infostar	September 1983
Lisawrite	August 1983

M

Master Planner	April 1984
Master Planner	October 1983
Mathemagic/Graphmagic	August 1983
Micro FCS	October 1983
Micropen	May 1983
Microscript	May 1983
Microtax	July 1983
MS-DOS & CP/M-86	October 1982
MS-DOS 2	May 1983
Moneywise	June 1984
Multiplan	April 1983

O

Omnis	July 1983
Open Access	June 1984
Optimum	November 1983

P

Peachcalc	March 1984
Pearl	October 1982
Perfect Calc	October 1983
Personal Data Base	March 1984
Petspeed	April 1983
Plannercall	May 1983
Prophet II	March 1983

R

Rescue	April 1983
Revelation	April 1984

S

Sage 400 (Accounting)	October 1983
Scred	August 1983
Scripsit 2.0	February 1982
Search and Find	December 1983
Select	September 1982
Silicon Office	July 1982
System Builder	June 1984
Software Various	April 1984
Superdeflex	January 1983
Superfile	January 1983

T

The Financial Planner	December 1983
The Spreadsheet	September 1983
TK! Solver	February 1984
Tomorrow's Office	June 1983

V

View	August 1983
Visi On	November 1983
Visi Calc	June 1983
Visuall	February 1984
Vu-Calc (for Spectrum)	September 1983

W

Word Handler II	March 1983
Word	June 1984
Wordspell	March 1984
Workslate	January 1984
dBase II	May 1982

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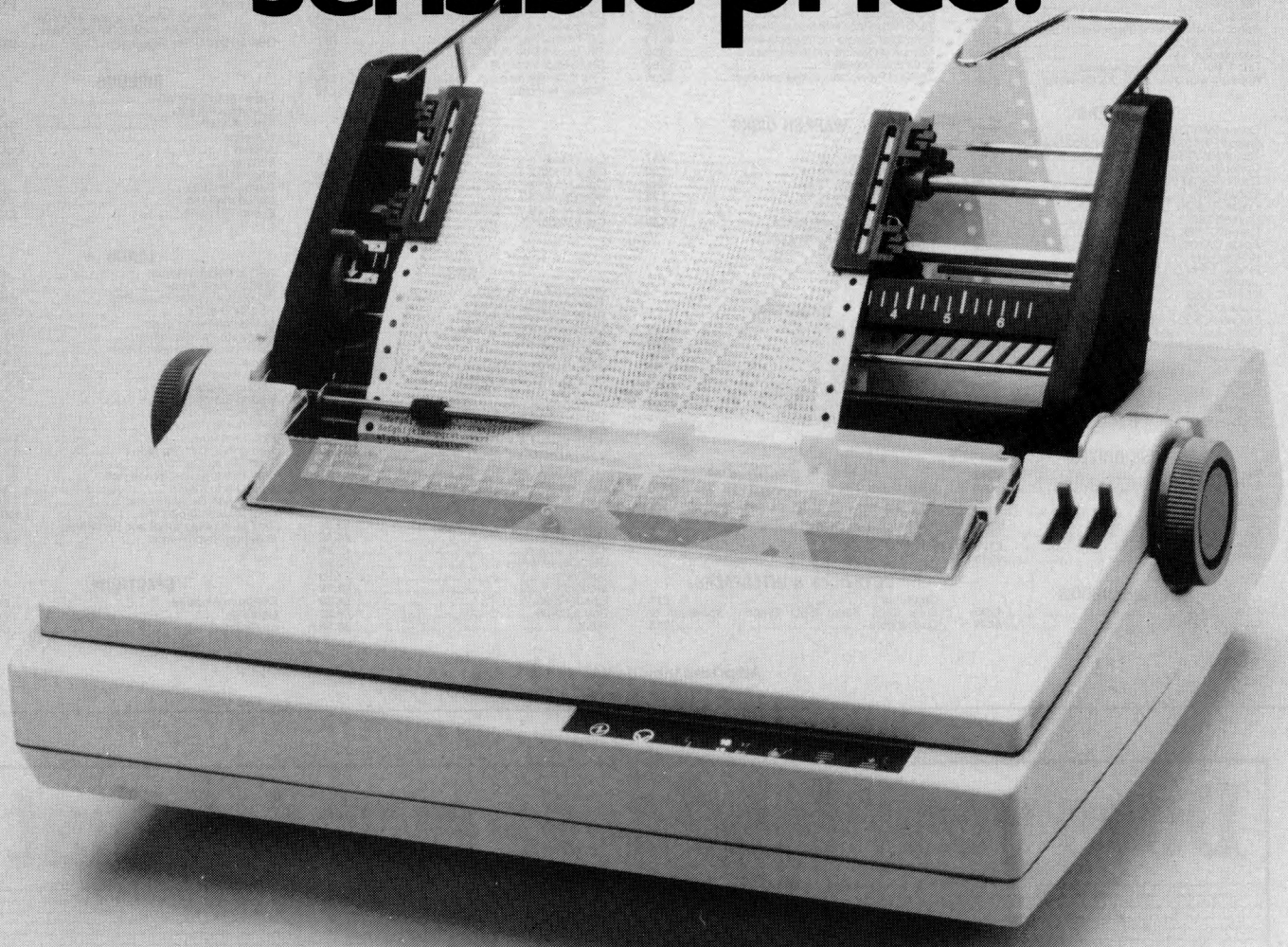

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NEC 8023	£7
Canon PW1080	£11
Canon PW1156	£11
Epson 100 Refill	£3.30

LEADS

BBC to Parallel Printer	£10
BBC to Serial Printer	£10
RS423 5-pin DIN to 5-pin DIN	£4.50
RS232 'D' to 'D'	£13.50
Memotech Printer Lead	£10
Dragon to Parallel Printer	£13.50
Commodore to Parallel Printer	£13.50
Oric to Parallel Printer	£13.50
Pet to Parallel Printer	£13.50
Atari to Parallel Printer	£13.50
BBC to Single Disk Drive	£13
BBC to Dual Disk Drive	£16
BBC Single Power	£5
BBC Dual Power	£5.50
7-pin DIN to DIN and jack	£2.40
7-pin DIN to 3 jacks	£2.40
5-pin DIN to 5-pin DIN and jack	£2.40
5-pin DIN to 3 jacks	£2.40
Sinclair 48K Cassette Lead	£1.80
RGB Monitor (6-pin DIN)	£3.20
THE PLUG suppressor and RF1 Filter	£16
Spectrum on/off switch	£3.99

SPECTRUM

Spectrum Amplifier	£10
Light Pen	£18
Keyboard	£45

All prices include VAT and delivery

Does your business ever get that sinking feeling?

EXTENDED VERSION

Important new features. Design your own applications. Upgrades from version 2 available. Brochure available on request. Dealer enquiries welcome

INFORMATION MANAGEMENT SYSTEM

RESCUE

SINGLE/MULTI USER
CP/M MSDOS PCDOS CP/M-86

GRADE ONE

Computing Services Ltd.,
Hawkshead House,
Hope Street,
Glossop,
Derbyshire
SK13 9SB
Tel: 045-74 63819/ 66680

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Sensational ZX Spectrum Offer from Spectrum



ZX Spectrum 48K

Including

FREE!

Software 6 pack

Containing: • Computer Scrabble • Computer Chess • Survival game • Chequered Flag game • Horace goes Skiing game • Make-a-Chip

Worth £56.70

SPECTRUM PRICE

£129.95

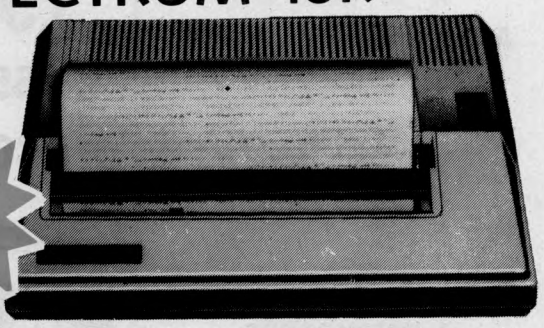
Scoop Purchase!

Timex 2040

Thermal Printer for the SPECTRUM 48K

SPECTRUM PRICE

£77.50



This top-value thermal dot matrix printer is designed especially for use with the Spectrum 48K computer. With a print rate of 80cps on no-ribbon thermal paper and a maintenance-free life, plus 80 dpi graphics capability, the 2040 really is a terrific buy at our low price!

Sinclair QL

ARRIVING SOON!

32-bit power . 128K RAM . . . business software . . . it's the amazing QL!



SPECTRUM PRICE

£399

The Rat

Cheetah Remote Action Transmitter



SPECTRUM PRICE

£29.95

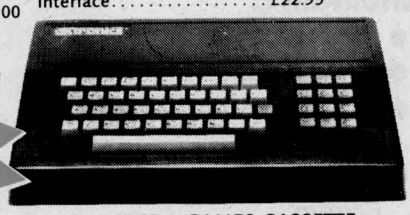
Cheetah's Remote Action Transmitter (R.A.T.) is the most sophisticated computer controller around. Cordless Infra Red transmission lets you sit back (up to 30 feet away) in your chair and enjoy the action! Electronic Touch Control system means no moving parts, superfast action, long life.

DK'Tronics Keyboard

D'Ktronics Lightpen £19.95
D'Ktronics Dualport Joystick Interface £13.00
D'Ktronics Programmable Joystick Interface £22.95

SPECTRUM PRICE

£45



Plus! FREE 4 GAMES CASSETTE

DK Tronics Joystick Interface – Dual Port

The 2 joystick facilities are:
1st port simulates 6789 & 0 keys; the 2nd port simulates in (31) command. It will run any software. 1-Using keys 6789 and 0; 2-Having redefinable key function; 3-Using in (31) fully Kempston compatible; 4-Any software you write yourself

SPECTRUM PRICE

£13



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NEWS!

WIN!

A fabulous holiday for you and 3 friends in sunny

Florida

Including Disney World Kennedy Space Centre & Florida Keys

WITH SPECTRUM & COMMODORE

★★★★PLUS★★★★

£2,500 spending money

★★★★PLUS★★★★

The 10 Runners-Up each get a £100 Voucher o spend in any Spectrum store – anywhere in the country.

Just look at the fabulous 1st prize in this new ompetition – a super holiday for you and 3 iends among the sun, sea and palm trees of lorida, PLUS an incredible £2,.500 to spend hen you get there.

There's exciting day trips too to the Kennedy entre, the famous DISNEY WORLD and more!

The competition closes on December 31st 984 – call into your Spectrum dealer NOW and ollect an entry form - you could win the holiday f a lifetime!

MICRO UPDATE

– Spectrum's own magazine for home and small business computers

AUTUMN ISSUE

Have you seen our MICRO UPDATE magazine et? It's Spectrum's own computer guide, ublished by the experts for YOU – and the utumn issue will be out soon.

It's packed with illustrations and descriptions f just about everything you're likely to meet in ome micro hardware, add-ons and accessories. lus there's information on current software, nd hints and tips from experts about home omputing.

Call in to your local Spectrum dealer and get OUR copy – it's great!

Just Arriving

New! Commodore 16

Including Commodore 1531 Cassette Recorder





THE PERFECT INTRODUCTION TO HOME COMPUTING

Introducing the new Commodore 16 – the advanced micro that's designed with the beginner in mind.

This brand new micro features a powerful 16K RAM, a full professional keyboard, superb graphics with 121 colours, plus terrific built-in sounds.

In its 32K ROM is a new BASIC 3.5 with over 75 commands including graphics plotting and program editing. There's a unique HELP key that highlights errors when you're learning to program.

It's a tremendous new micro and the Spectrum package includes a Commodore Model 1531 Cassette Data Recorder too. See it at your local Spectrum dealer now!

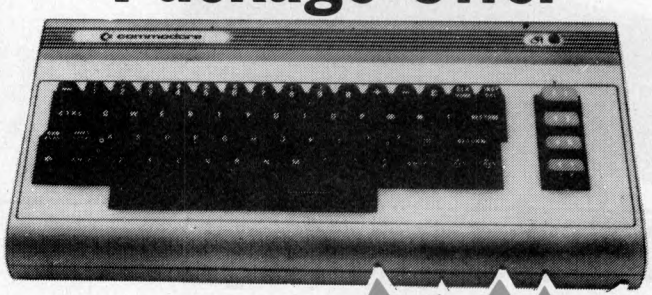
SPECTRUM PRICE ONLY **£139.99**

Add-ons

Simon's Basic	£50.00
Intro to Basic Pt 1	£14.95
Intro to Basic Pt 2	£14.95
MPS801 Printer Ribbon	£9.95
MPS802 Printer Ribbn	£12.95
64 Magic Voice Speech Synthesiser	£50.00

Sensational Value! Commodore 64 Compatible Data Recorder ONLY **£34.99**

Commodore 64 Package Offer



Including:

- Commodore 64
- A Joystick
- C2N Cassette Recorder
- 4 Cassette Games

AND ALL FOR ONLY **£249**

Not all stores carry every advertised item, please phone before making a journey - prices correct at time of going to press E&OE

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Latest News

for up to date news, information & offers from SPECTRUM - see PRESTEL page 600181 for details

See the super new Commodore Range at your local Spectrum Dealer - Now!



Commodore MPS802 Printer

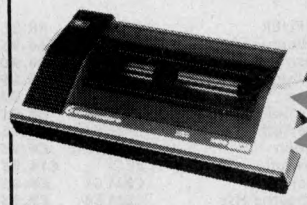
SPECTRUM PRICE

£345.00



MPS801 Printer

SPECTRUM PRICE



£230

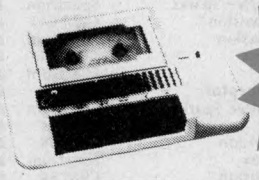
1542 Disk Drive

SPECTRUM PRICE

£229



1530 Data Recorder



£44.95

1531 Data Recorder

SPECTRUM PRICE

£44.95



Just Arriving New!

Commodore Plus/4

Commodore's new, advanced Plus/4 bridges the gap between home and business micros in a way that's unique - and at a price that's unbelievable!

The Plus/4 features, besides its powerful 64K of RAM memory, has a host of features to make computing easier.

For starters, there are four popular software packages built-in - Word Processing, Spreadsheet, Database and a Business Graphics program. That's all a small businesses needs - in a budget-priced micro!

Besides that, there's a HELP key that highlights errors in program lines, plus built-in graphics, advanced BASIC 3.5 with over 75 commands, separate cursor controls, a full 32K ROM and 4 programmable function keys.

SPECTRUM PRICE

£299.99

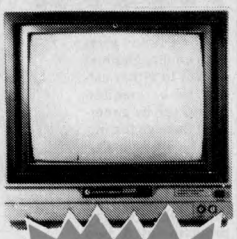
New! DPS1101 Printer



SPECTRUM PRICE

£399.99

Commodore 1701 Monitor



£230

For further information on these products - see Spectrum's own magazine MICRO UPDATE. Ask your local dealer for a copy!

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Micro Dealer UK's TOP 50
Britains No.1 Weekly Software Chart







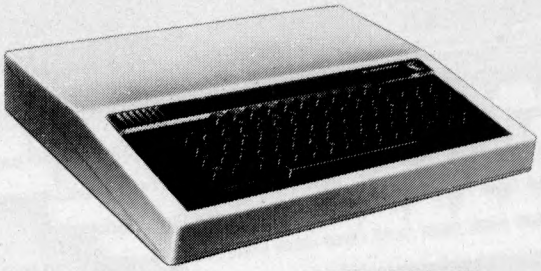
PROGRAM	SUPPLIER	MACHINE	PRICE
New!Sherlock	Melbourne Hse	Spectrum	£14.95
Daley Thompson	Ocean	Spectrum	£6.90
Decathlon	Activision	CBM 64	£9.99
Daley Thompson	Ocean	CBM 64	£7.90
Astro Chase	State Soft	CBM 64	£8.95
Flip & Flop	State Soft	CBM 64	£8.95
Monty Mole	Gremlin	Spectrum	£6.95
New!Elite	Acornsoft	BBC	£14.95
Death Star Interceptor	System 3	CBM 64	£9.95
New!Zim Sala Bim	Melbourne Hse	CBM 64	£9.95
Full Throttle	Micromega	Spectrum	£6.95
Olympicon	Mitec	Spectrum	£5.95
New!High noon	Ocean	CBM 64	£7.90
Hero	Activision	CBM 64	£9.99
Forest at World's end	Interceptor	Spectrum	£5.50
Bear George	Cheetahsoft	Spectrum	£6 95
Monty Mole 64	Gremlin	CBM 64	£7.95
Lords of Midnight	Beyond	Spectrum	£9.95
Beamrider	Activision	CBM 64	£9.99
New!Stuntbike	Ocean	CBM 64	£6.90
Battle for Midway	PSS	CBM 64	£14.95
Frank N Stein	PSS	Spectrum	£6.95
Pitfall	Activision	CBM 64	£9.99
Tiler	Interceptor	Spectrum	£5.50
Strip Poker	Datasoft	CBM 64	£9.95
Star Striker	Superior	BBC	£7.95
Jet Set Willy	Software Projects	Spectrum	£6.95
New!Pitfall II	Activision	CBM 64	£9.99
Gisburnes Castle	Martech	BBC	£7.95
Sabre Wulf	Ultimate	Spectrum	£9.99
New!River Raid	Activision	Spectrum	£7.99
New!Black Hawk	Creative Sparks	Spectrum	£6.95
New!Havoc	Dynavision	CBM 64	£9.95
New! Enduro	Activision	Spectrum	£7.99
Beachead	Access	CBM 64	£9.95
New!Kokotoni Wilf	Elite	Spectrum	£5.95
Wunda Walter	Interceptor	VIC 20	£6.00
New! Delta Wing	Creative Sparks	Spectrum	£6.95
New!Kokotoni Wilf	Elite	CBM 64	£6.95
New! Zenji	Activision	CBM 64	£9.99
T.L.L.	Vortex	Spectrum	£6.95
New! River Raid	Activision	CBM 64	£9.99
New!Toy Bizarre	Activision	CBM 64	£9.99
New!Jetpac	**Ultimate**	**BBC**	**£7.95**
New!H.E.R.O.	Activision	Spectrum	£7.99
New!Stagecoach	Creative Sparks	Spectrum	£6.95
Giants Revenge	Thor	Spectrum	£6.95
New! Poster Paster	Taskset	CBM 64	£6.90
Stop the Press	Sinclair	Spectrum	£5.95
Matchpoint	Psion	Spectrum	£7.95

Amstrad Software all at £8.95

EDUCATIONAL SOFTWARE
Wordhang
Happy Numbers
World Wise
Animal, Vegetable, Mineral
Happy Letters
Happy Writing
Time Man 1
Time Man 2
Map Rally

ARCADE GAMES
Home Runner
Harrier Attack
Sultans Maze
Spanner Man
Oh Mummy
Roland in Care
Roland on the Ropes
Electron 22622
Gems of Stradus
Chess
Laser Wrap
Haunted Hedges
Codename Matt
Xanagrams
Hunter Killer
3-D Invaders
Alien break-in
Atom smasher
Electro Freddy
Fire Blaster
Admiral Graf Spee
Star Commands
Crazy Golf
Punchy

BBC Model B
Package Offer



HURRY! Offer extended WHILE STOCKS LAST

Including FREE!

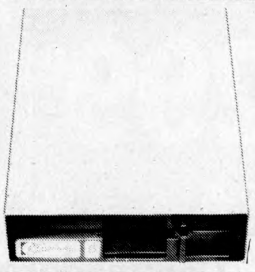
• Cassette recorder • 5 pieces of software

when you purchase a BBC 'B' from Spectrum.

The BBC MODEL B, probably the most flexible personal microcomputer available today. Using powerful BBC BASIC, the BBC B is widely accepted as providing the educational standard for computer learning.

The model B features a variety of interface ports allowing easy connection not just of ordinary peripherals but also second processors or devices to give access to teletext or prestel services.

£399

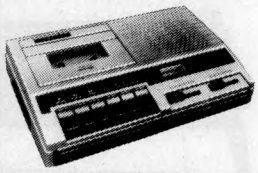


Cumana Disc Drives

CSX 100 £129.95
CS 100 £159.99

Super Value-For-Money Shado Data Recorder

Compatible with ACORN BBC and ELECTRON micros



SPECTRUM PRICE
£32.95

Acorn Electron

The Electron gives high quality graphics output to either colour TV or monitor. Sound can be generated through the internal loudspeaker. The Electron comes complete with a free introductory cassette, containing 19 free programmes & two manuals - the User Guide and Start programming with the Electron."



SPECTRUM PRICE
£199.95

Not all stores carry every advertised item, please phone before making a journey - prices correct at time of going to press E&OE

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Up to £1000 Instant Credit

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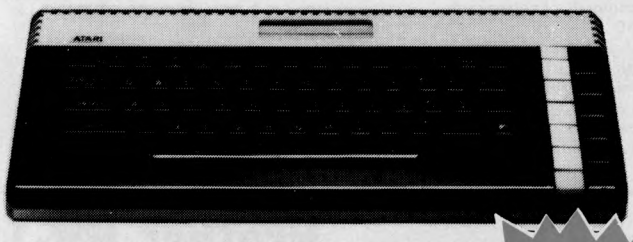
Atari

A great line up from one of the first names in home computing...
...Now at Super New Low prices from Spectrum

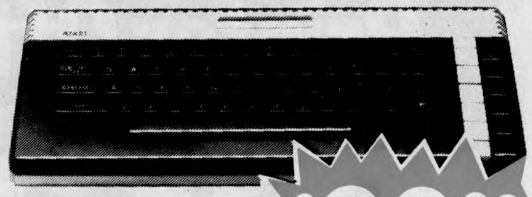
Atari 800XL



● Powerful 64K RAM ● Full-stroke keyboard ● Full sound with 3½ octave range ● 11 Graphic Display modes ● Full colour (256 Colours - 128 colours can be diplayed at one time) Ask to see this super new micro at your local SPECTRUM dealer NOW!

SPECTRUM PRICE £199.99

Atari 600XL

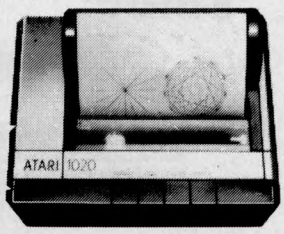


The 600XL features a 16K RAM, expandable to 64K with the memory expansion module. There's a 24K ROM operating system including ATARI BASIC. Plus 16 colours, 11 graphic modes and 4 independent 3½-octave sound synthesisers. It really is a top-value micro - come in and see for yourself!

SPECTRUM PRICE £99.99

Atari 1020 Printer/Plotter

Using 4 colour graphics and text, the 1020 colour printer/plotter is perfect for creating charts, graphs & even artistic designs. Very quiet operation.



SPECTRUM PRICE £99.99

Atari 850 Interface



Essential for more advanced work with their Atari computers. It provides 1 parallel output for a huge range of printers, and no less than 4 serial outputs which can be individually programmed for different purposes. It comes with a comprehensive manual, power pack & interconnecting cable to the computer.

SPECTRUM PRICE £99.99

Atari 1010 Program Recorder



Add storage and retrieval capability to your Computer system without spending a lot of money. Uses cassettes to store text, programs & other information.

SPECTRUM PRICE £34.99

Atari 1050 Disk Drive

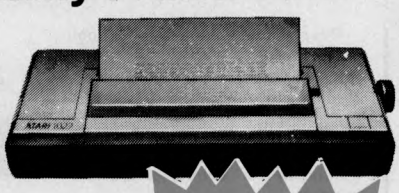


Add the Atari 1050 Disk Drive for fast, convenient data access by storing on compact, easy-to-handle 5¼" disks. Storage capacity with DOS 11 up tc 127K bytes, (around 100 pages) of information per disk.

SPECTRUM PRICE £199.99

Atari 1027 Letter Quality Printer

This superb Letter Quality Printer prints fully-formed letters just like a quality electric typewriter, making it the ideal word-processing companion for business correspondence. The Atari 1027 accepts single sheets of paper so you can even use your own letterhead paper.



SPECTRUM PRICE £249.99

Atari Software

Entertainment		Tennis	£9.99	(Cassette)	£22.99	Macro Assembler	
Asteroids	£9.99	Defender	£14.99	Invitation to Prog 3		(Disk)	£19.99
Basketball	£9.99	Dig Dug	£14.99	(Cassette)	£24.99	Micro Soft Basic &	
Caverns of Mars	£9.99	Donkey Kong	£14.99	Juggles Rainbow (Disk or		Manuals (Disk)	£49.99
Centipede	£9.99	Donkey Kong JR	£14.99	Cassette)	£19.99	Mickey & the Great Outdoors (Disk)	£24.99
Chess	£9.99	Joust	£14.99	Juggles House (Disk or		My First Alphabet	
Galaxian	£9.99	Ms pac Man	£14.99	Cassette)	£19.99	(Disk)	£19.99
Jungle Hunt	£9.99	Pole Position	£14.99	Touch Typing	£12.99	Paint (Disk)	£29.99
Pac Man	£9.99	Robotron	£14.99	Conversational French		Microsoft Basic II &	
Lone Raider	£9.99	Logo & Manuals	£59.99	(Cassette)	£22.99	Manuals	£49.99
Missile Command	£9.99	Video Easel	£22.99	Conversational German		Home Business	
Pengo	£9.99	Music Composer	£22.99	(Cassette)	£22.99	Atari Writer	£39.99
Qix	£9.99	Assembler Editor	£22.99	Conversational Spanish		Visicalc (Disk)	£49.99
Space Invaders	£9.99	Invitation to Prog 1		(Cassette)	£22.99	Timewise (Disk)	£19.99
Star Raiders	£9.99	(Cassette)	£19.99	Conversational Italian		And many more.	
Super Breakout	£9.99	Invitation to Prog 2		(Cassette)	£22.99		

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Sensational Printer Offers from Spectrum

Juki 6100

Super Value! **Daisy Wheel Printer**

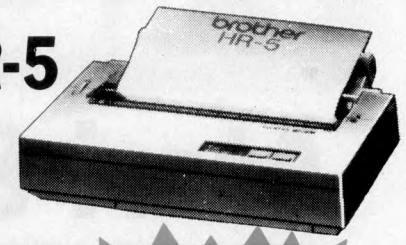


This fabulous new printer is a real breakthrough in the performance/value stakes! For a remarkably low price you get all these great features:

- Daisywheel printing
- 20cps (av. 18cps Shannon Text)
- 10/12/15 or Proportional character spacing
- Bi-directional friction-feed
- Tractor feed or cut paper
- Centronics as standard; RS232C optional
- 2K byte print buffer

£399

Brother HR-5

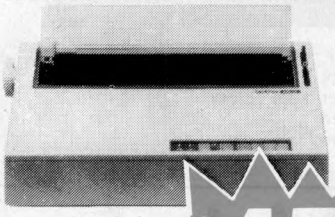


Super value printer that prints on plain paper, yet still fits in your briefcase.

- Operates on 4 standard batteries
- Incorporates Centronics or RS232C
- Bidirectional or unidirectional
- High quality Thermal head
- Prints at 30cps on plain paper (with ribbon) or directly onto thermal paper
- Weighs under 2kg

SPECTRUM PRICE **£159.95**

Brother HR-15

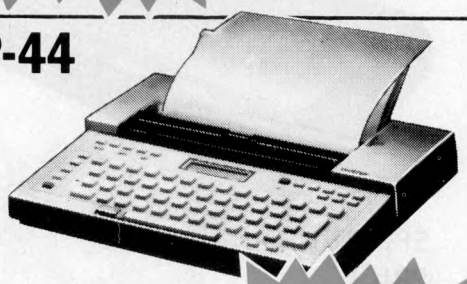


A great printer at a top-value price from Spectrum: Here's what you get:

- Letter-quality daisy-wheel printing
- Between 13 and 18cps
- Bi-directional printing
- Tractor-fed paper or single sheets
- Super low price!

SPECTRUM PRICE **£458.85**

Brother EP-44



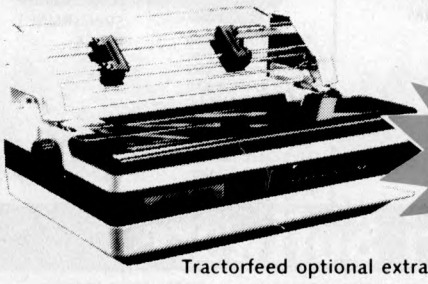
"Transforming Office Machines", runs Brother's slogan – with these super-compact battery powered typewriters, it's easy to see why!

- Top quality thermal printing head
- 4K of text memory (3 A4 pages)
- Text centring if required
- 15-digit LCD display for pre-printing corrections
- Line-by-line edit facility

SPECTRUM PRICE **£249.95**

Quendata

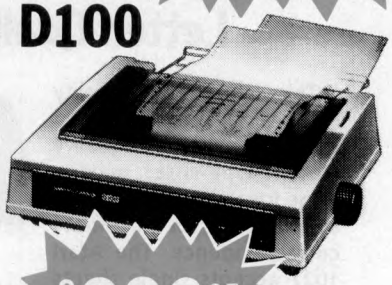
Just look at this for value - a true daisy-wheel printer offering top quality printing at a remarkably low price. Print speed is 18/20cps, uni-or bi-directional printing (depends on software), variable pitch.



Tractorfeed optional extra

SPECTRUM PRICE **£289.95**

Smith-Corona D100



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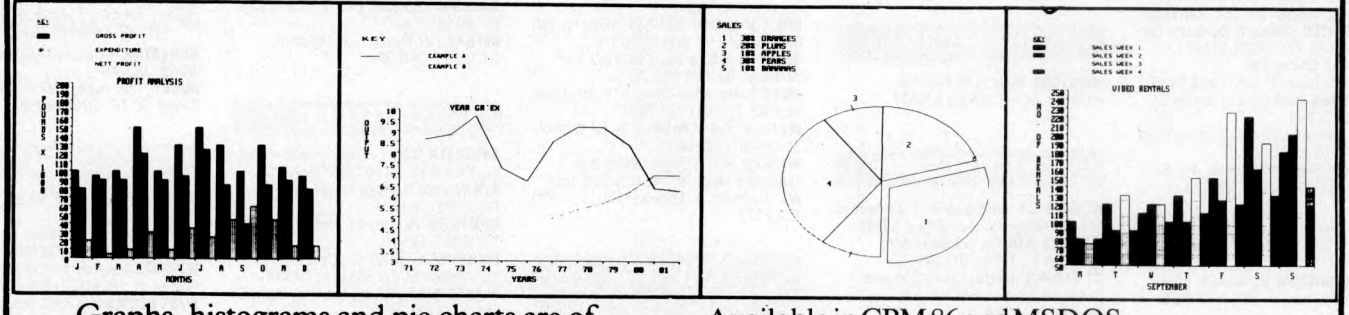

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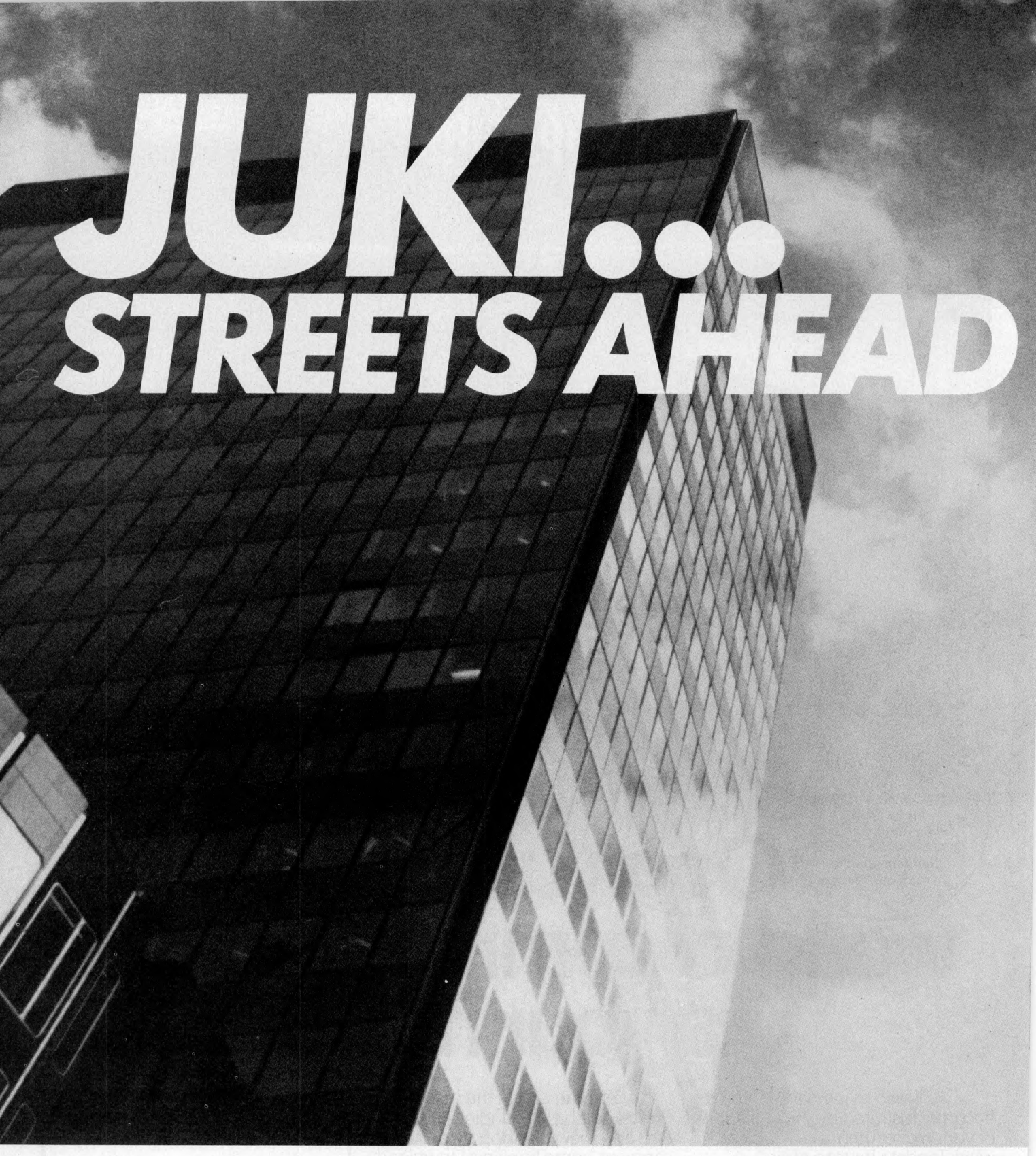

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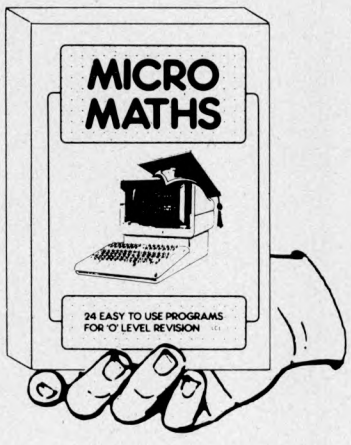

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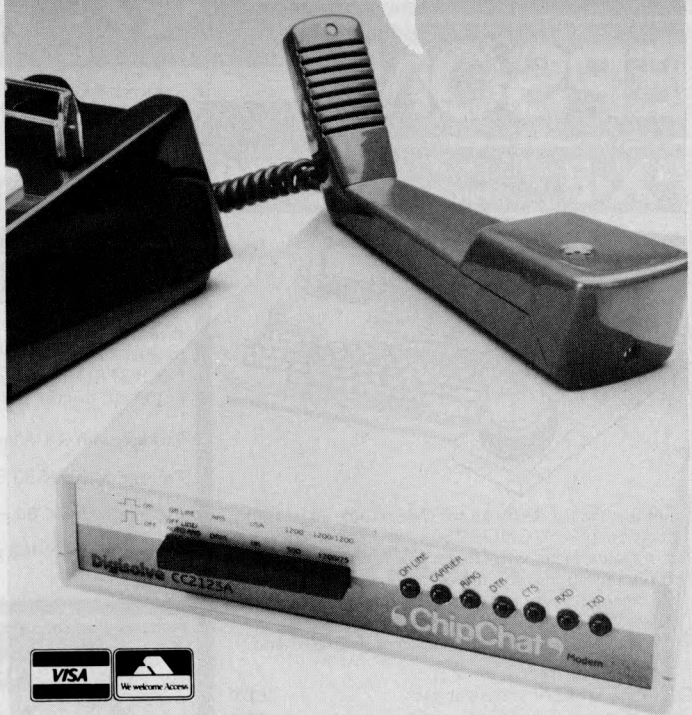

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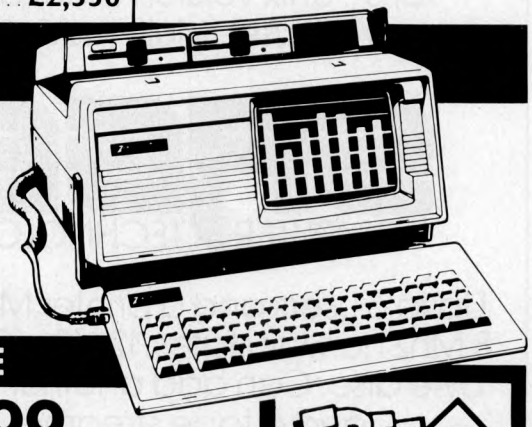

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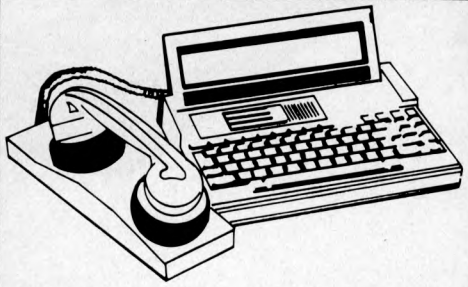

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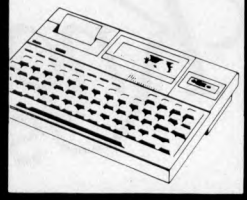



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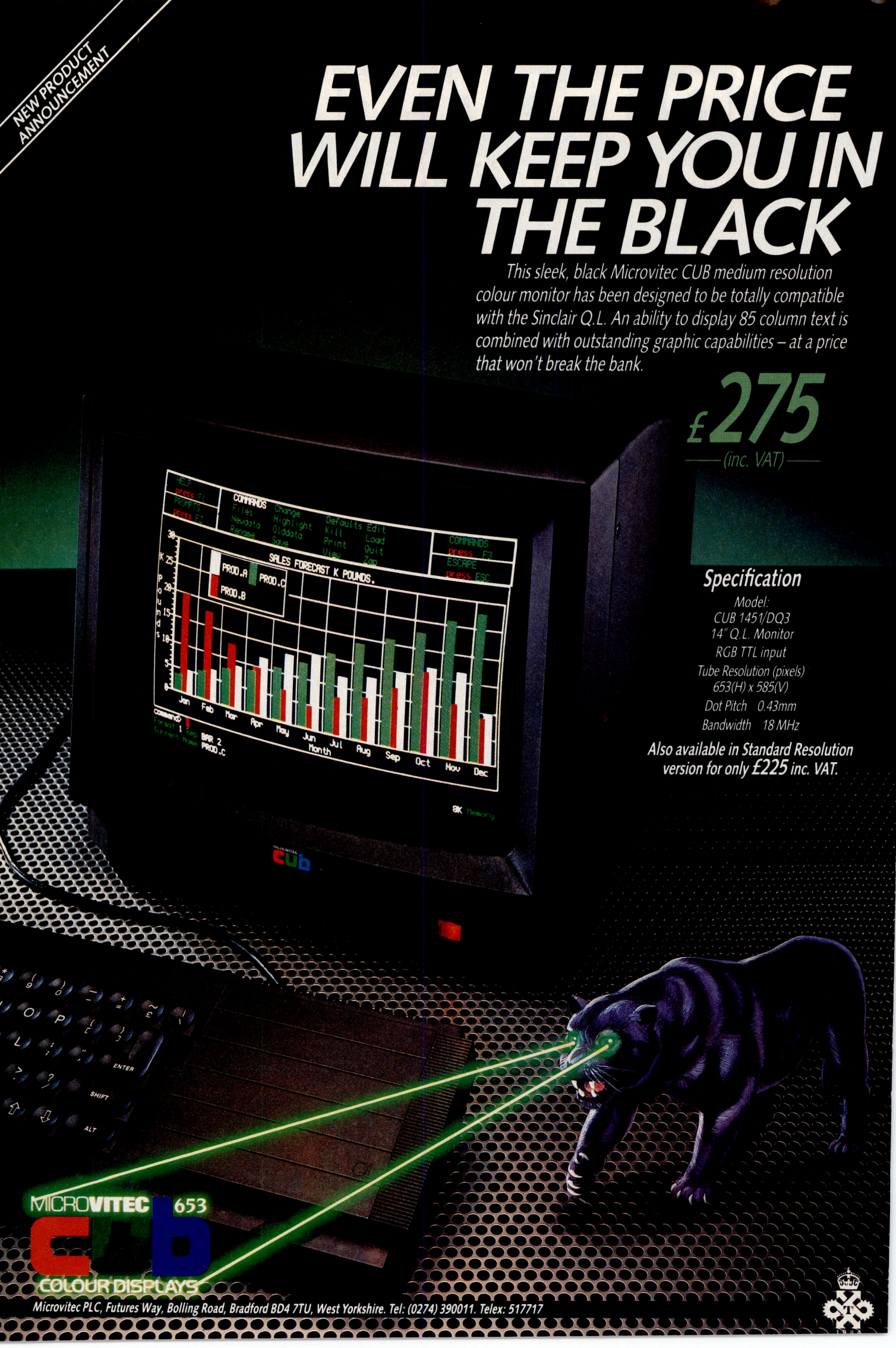

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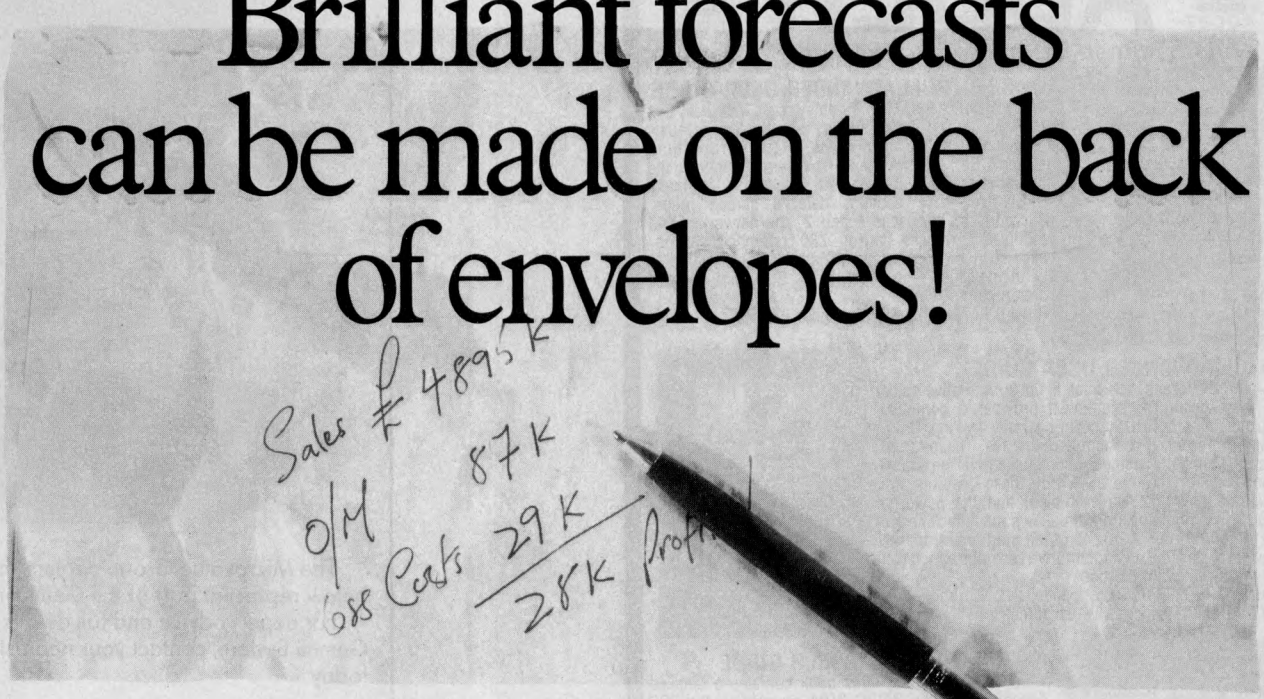

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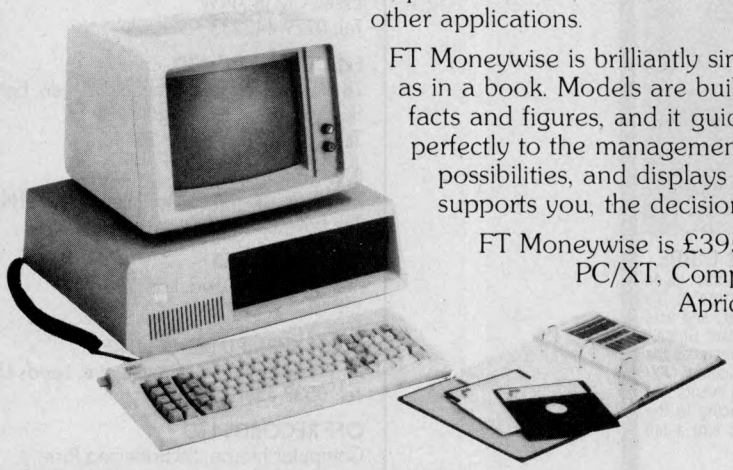

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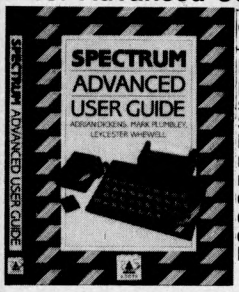

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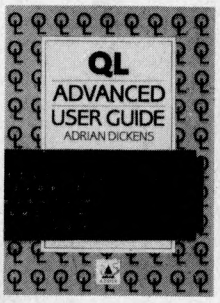

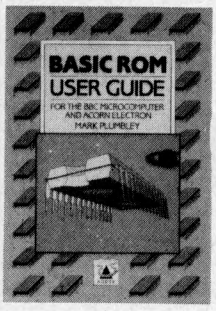

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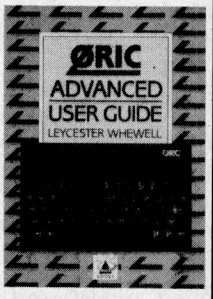

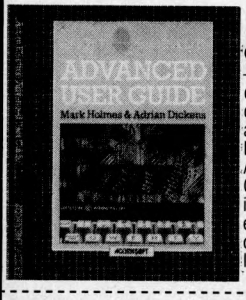

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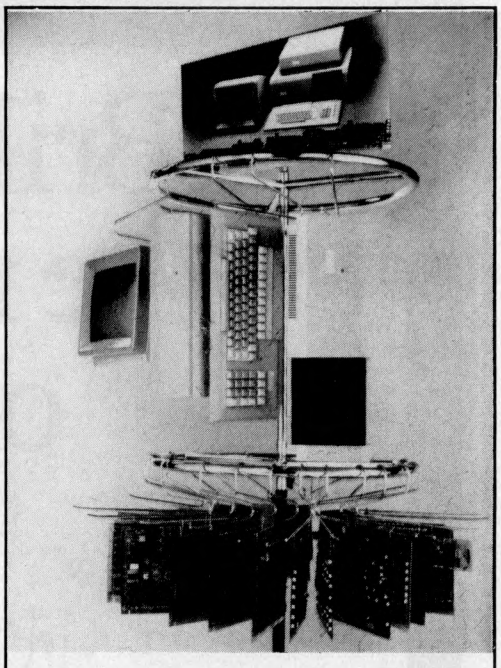

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Gemini Microcomputers

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at off-the-peg prices



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Whilst the Gemini system uses CP/M, the addition of a 16 bit card will allow you to run many popular programs now being generated.

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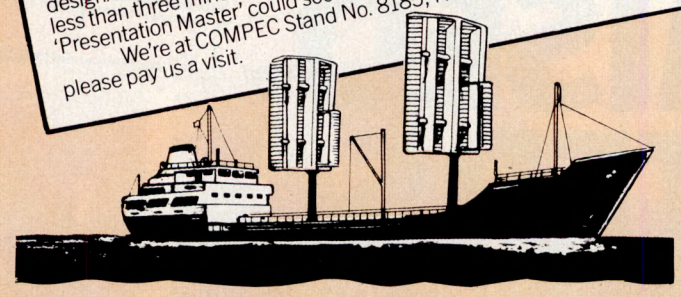
BYTE SHOP News

Major interest this month centres around new IBM and IBM PC compatible micros and peripherals. First out of the blocks are four new additions to the Compaq family under the 'Deskpro' banner. Based on the high-speed 8086 microprocessor, they offer up to three times the processing speed of standard PC's. IBM themselves have been active of late and we are expecting our deliveries of the 'AT', a 'supercharged' PC offering a more powerful performance and faster access. 'Starlink' is a hardware/software package from Digital Research which enables up to four slave terminals to be connected to a PC or XT in a multi-user configuration. It costs £1395 ex VAT and saves buying a complete computer for additional users. Also from DR is 'Presentation Master' which provides all you need to turn your PC/XT into a graphics design/slide production unit. Completion of design to finished slide takes less than three minutes and at an asking price of £1495 ex VAT, 'Presentation Master' could soon end up paying for itself!

We're at COMPEC Stand No. 8185, November 13-16, Olympia – please pay us a visit.



HOW APRICOTS SAVE THE JUICE

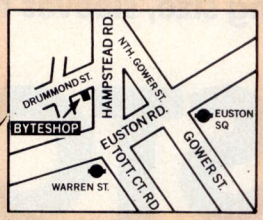
Walker Wingsail are using micro-computers in their own quest to spearhead a new technology – solid sails for commercial ships and tankers. Looking vaguely like aircraft wings standing upright, the sails can decrease fuel costs by over 25%.

ACT Apricots, supplied by Byte Shop Southampton, enable company documentation and financial information, including stock levels and share prices, to be produced and distributed cost-effectively, using far less man-hours. Computers are also used for predicting fuel savings for any given ship on a particular route.

Getting the right computer

At the Byte Shops we've helped countless companies of all sizes improve their efficiency by the introduction of microcomputers. Generally these are required to perform routine business tasks – but, however similar the application, we invariably find that no two customers have *exactly* the same requirements. When you come to the Byte Shop, you'll find that we are far more interested in finding out what jobs you require the computer to do both now and in the future. We then tailor a complete system including not only the hardware but the software, and the peripherals to meet your individual needs. We believe this is the only sensible way to sell computers. On this spread you'll find a number of 'Typical Ready To Run' systems. However we won't sell one to you – unless you force us – without asking a few questions first.

WHERE TO FIND US: London



Move to 173/175 Drummond St

Byteshop London have outgrown their premises and have moved to a new Business Centre just around the corner at 173/175 Drummond St. NW1. Significantly larger than the present Euston Rd. location, customers can look forward to some of the smartest and most spacious micro display facilities to be found anywhere in the UK. NB: Tel. No. remains 01-387 0505.

PROGRAMMERS CORNER

Wide selection of programming languages, plus utilities and tools from Microsoft, Digital Research, Microfocus, Xitan and Pulsar, incl. Basic, Fortran, Cobol, Pascal, Assembler, C&PL1.

CLEARANCE BARGAINS LONDON

The following are 'one-offs' and available on a first come first served basis.

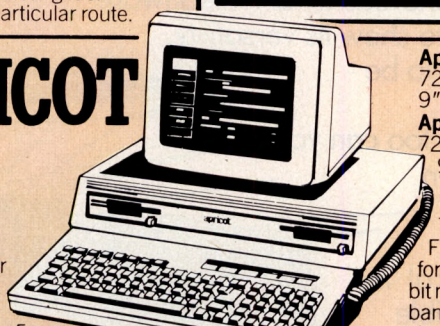
Qume 955 Daisy Wheel Printer (2348).....**ONLY 1.800.00**
Qume Cut Sheet Feeder for 955 (595).....**ONLY 475.00**
Timpro Computer Desks from.....**ONLY 35.00**
Olivetti DY211 Printer (695).....**ONLY 550.00**
Tecmar 5Mb Hard Disk Unit (2235).....**ONLY 775.00**

THE BYTE SHOPS - W ON GETTING THE R

ACT APRICOT

Already an outstanding success, the transportable Apricot offers a comprehensive specification at very low cost, making it a perfect system for the small businessman. The Xi models offer the advantages of Winchester disks in their most compact size yet – the revolutionary 3½" disk. New 12" screen is an optional extra for all models at a cost of £100. Included in the price are three operating systems MS/DOS 2.0, CP/M-86+, Concurrent CP/M-86 together with Microsoft and Personal BASICs, SuperCalc, SuperWriter, SuperPlanner and Asynchronous File Transfer Software.*

* Subject to availability



From **1595.00** *ex. VAT*

Apricot; single 315Kb floppy disk drive; 9" monitor.....**1595.00**
Apricot; twin 315Kb floppy disk drives; 9" monitor.....**1795.00**
Apricot; twin 720Kb floppy disk drives; 9" monitor.....**1995.00**

Apricot Xi; 5Mb hard disk & 720Kb floppy disk drives; 9" monitor.....**2695.00**
Apricot Xi; 10Mb hard disk & 720Kb floppy disk drives; 9" monitor.....**2995.00**

Apricot F1 (not illus.)
The revolutionary, transportable F1, offers the small businessman, for the first time, a full featured 16-bit micro that won't break the bank. Top specification includes standard 256Kb RAM expandable to 768Kb, 1×720Kb floppy disk drive, MS-DOS and Concurrent CP/M compatibility, remote operation, full featured keyboard, optional 'mouse' facility, ultra high resolution colour graphics. The stylish F1 comes with three popular software packages, SuperCalc, SuperWriter and SuperPlanner .....from **995.00**

Apricot Portable (not illus.)
A range of three highly innovative portable models with memory options from 256-512Kb standard RAM and 720Kb single floppy disk storage. Stunning specification includes sophisticated speech recognition system, cordless full function keyboard, cordless 'mouse' (top models as standard) and flat LCD screen. Complete with SuperCalc, SuperPlanner and SuperWriter software. Stylish matching printer. 10Mb storage unit and carrying case are available as extras .....from **1695.00**

ALL PRICES EX. VAT

TYPICAL APRICOT BUSINESS SYSTEMS

Word Processing
Apricot F1; SuperWriter; letter quality printer..... **1680.00**

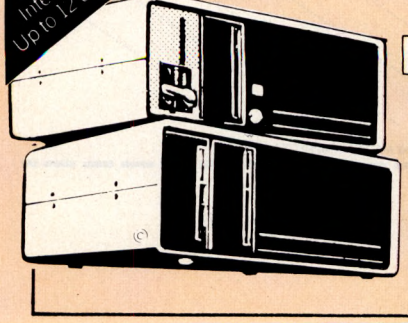
Financial Planning
Apricot; SuperCalc 3 upgrade; dot matrix printer.....**2499.00**

Database Management
Apricot Xi; dBase II; dot matrix printer.....**3535.00**

Small Business A/C System
Apricot Xi; Pulsar Sales, Purchase and Nominal Ledgers and Invoicing; dot matrix printer.....**4579.00**

COMART

CP2000 Series 'Supermicro' Intel 286, 287, CC/PM Up to 12 users from £2995



Comart Communicator multi-user systems have expandability built in and are the most cost-effective way of sharing computer power amongst your staff. You can start with a Communicator system to suit your current requirements – up to twelve people can share – and simply add new terminals as you grow. A considerable saving over buying a complete new computer each time.

COMMUNICATOR MULTI-USER/MULTI-PROCESSING SYSTEMS

£2119 per user*

Communicator CP1525M with M-BOS operating system, including 5 display terminals, dot matrix printer and cables **10595.00**

£1800 per user*

Communicator CP520MP including 5 display terminals, cables 6×processors and 6×64Kb memory **9095.00**

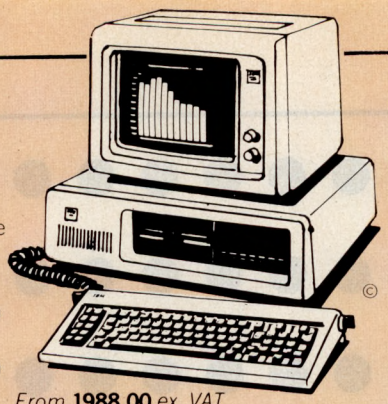


COMPAQ

Following phenomenal success in America, you can now find the portable, fully IBM PC compatible, Compaq micros at your local Byte Shop. Spec. for the Standard model includes 256Kb RAM, twin 360Kb floppy disk drives, high resolution screen and tough carry case.....
'Plus' model as above but with single 256Kb floppy and 10Mb hard disk drives.....

CHECK FOR LATEST PRICES

IBM/PC



The IBM PC/XT's versatility means that it's equally at home in a small business or as a stand alone desk top in a large corporate company linked to a mainframe.

IBM PC; dual 320Kb disk drives; 64Kb RAM; UK keyboard and screen **1988.00**

IBM PC; dual 320Kb disk drives; 128Kb RAM; DOS 2.1; UK keyboard and screen.....**2149.00**

IBM PC XT; 1 × 320Kb floppy disk plus 1 × 10 Mb hard disk; 128Kb RAM; ASYNCH COMMS; DOS 2.1; UK keyboard and screen.....**3432.00**

IBM PC AT (not illus.)
If you are doubtful whether a standard PC will have the processing speed or memory to keep up with your future developments then the AT is the obvious choice. The AT's 'formidable' spec. includes 256Kb standard RAM (512Kb enhanced version), 1.2Mb disk drive (plus 20Mb enhanced), new DOS 3.0 operating system, *From* **1988.00** *ex. VAT* monitor, new keyboard and expandability.
Basic..... from **3374.00**
Enhanced ..... from **4703.00**

New 'AT' – see next month for networking and multi-user

IBM PORTABLE PC (not illus.) Offers the features of PC computing in a self-contained portable package weighing only 30lb (13.6kg). Specification includes 256Kb RAM expandable to 512Kb, dual floppy disk drives, 9" amber screen and smart system carrying bag **2254.00**

PC/XT ADD-ON'S & ADD-IN'S

Alloy PC-Backup – cartridge tape unit for backing up, storing and retrieving data from hard disk.....**1,750.00**
Microvitec 1446 – 14" colour monitor **495.00**
Expansion Unit 1 – 10 Mb hard disk unit for PC.....**1,954.00**
Expansion Unit 2 – 10 Mb hard disk unit for PC/XT.....**1,581.00**
Tallgrass Datasave – 5¼" hard disk mass storage unit with 12, 20 or 35 Mb capacity plus integral streamer tape cartridge backup..from **2,820.00**
Hercules Graphics Card – allows high resolution bit mapped graphics on monochrome display.....**395.00**
Orchid PC Net Starter Kit – local area network allowing file and disk sharing plus optional electronic mail from **1350.00**
PC Net Cards – to link additional terminals to network from.....**675.00**
Quadram Cards – full range available inc. memory expansion & colour graphics from.....**194.00**
IBM colour monitor plus adapter card **685.00**
IBM printer inc. cable.....**469.00**
Epson FX80 printer inc. cable.**478.00**
Brother Letter Quality Printer..**445.00**

ALL PRICES EX. VAT

TYPICAL IBM BUSINESS SYSTEMS

Word Processing
IBM PC; Multimate, letter quality printer.....**3135.00**

Colour Spread Sheet
IBM PC; colour monitor; Symphony; full width dot matrix printer; 2 pen plotter **4999.00**

Information Management
IBM PC XT; dBase II; dot matrix printer **4399.00**

Accounting System
IBM PC XT; Sales, Purchase and Nominal Ledgers. Invoicing and Payroll; dot matrix printer.....**4999.00**
ALL PRICES EX. VAT

SYSTEM SPOTLIGHT



COMPAQ DESKPRO

Four new PC/XT compatible models from Compaq fully complementing the now established 'Standard' and 'Plus' models. By incorporating the high-speed 8086 microprocessor, Deskpros can offer 2-3 times faster processing speeds than standard PCs while running virtually all PC/XT software without modification.

Model 1; 128Kb RAM; single 360Kb disk drive.....
Model 2; 256Kb RAM; dual 360Kb disk drives .....
Model 3; 256Kb RAM; single 360Kb & 10Mb fixed disk drive.....
Model 4; 640Kb RAM; single 360Kb, 10Mb fixed disk drive plus an internal 10Mb fixed disk drive back-up .....

CHECK FOR LATEST PRICES

HERE YOU CAN COUNT IGHT COMPUTER.

At a glance Computer Checklist

	Act Apricot	IBM PC/XT	Comart	Compaq
Colour graphics	●	●		●
Multi-user			●	
Hard disk storage	●	●	●	●
Upgradeable	●	●	●	●
Expandable	●	●	●	●
Communications	●	●	●	●
Transportable	●			●
Networking	●	●	●	

TOP 20 SELLING SOFTWARE

1. **Lotus 1-2-3** – Remarkable integrated spreadsheet and information management package incorporating colour graphics for the IBM PC.....**375.00**
2. **dBASE II** – Powerful database management and applications generator with optional graphics and development tools.....**365.00**
3. **Symphony** – Complementary follow-up to 1-2-3 from Lotus including word processing, integrated spreadsheet, communications, database and colour graphics..**550.00**
4. **SuperCalc 3** – Latest SuperCalc version with colour graphics rivalling Lotus 1-2-3.....**295.00**
5. **WordStar** – Most popular wordprocessing program, easily integrated with MailMerge, SpellStar, Star index and SuperSort enhancements.....**295.00**
6. **Pulsar Accounts** – Complete integrated business accounting system includes sales, purchase, nominal ledgers, data analysis, stock control, invoicing and payroll – for Apricot and IBM PC.....per module **195.00**
7. **Open Access** – Exciting new integrated business package rivalling Lotus 1-2-3 with WP, Database, comms and 3-D graphics.....**450.00**
8. **Multi-Mate** – New standard in fast, easy to use, function key driven wordprocessing for the IBM PC **330.00**
9. **SuperCalc 2** – Sophisticated, easy to use financial spreadsheet for in depth analysis, modelling and forecasting **195.00**
10. **Framework** – Integrated package featuring word processing, spreadsheet, graphics, data management **495.00**
11. **Friday** – Personal file management package for the novice with quick custom reporting.....**195.00**
12. **dBASE III** – Powerful easy to use database with enhanced reporting facilities and ability to print mailing labels from files.....**495.00**
13. **Cardbox** – Simple to use data retrieval and information management tool.....**155.00**
14. **Level II Cobol** – Mainframe level II compiler, well suited for new applications development: tools and utilities available.....**965.00**
15. **GraphStat** – Up and coming statistics and colour graphics package for the IBM PC.....**195.00**
16. **CBASIC** – Widely used commercial programming language for business applications development, interpreter also available.....**115.00** (CP/M86.250.00)
17. **Delta** – Comprehensive and sophisticated database program with '3-D' file structures, links to Lotus 123, MultiPlan and WordStar.....**495.00**
18. **BSTAM** – Communications package for sending and receiving CP/M files over telephone lines.**133.00**
19. **Flight simulator** – Full colour game for both the novice and the potential fighter pilot on the IBM PC **45.00**
20. **Pascal MT+** – Comprehensive integrated language for developing production quality software.....**269.00** (CP/M86.462.00)

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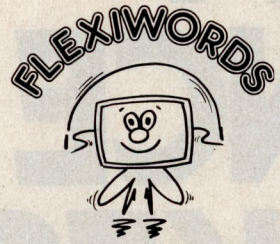

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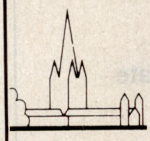

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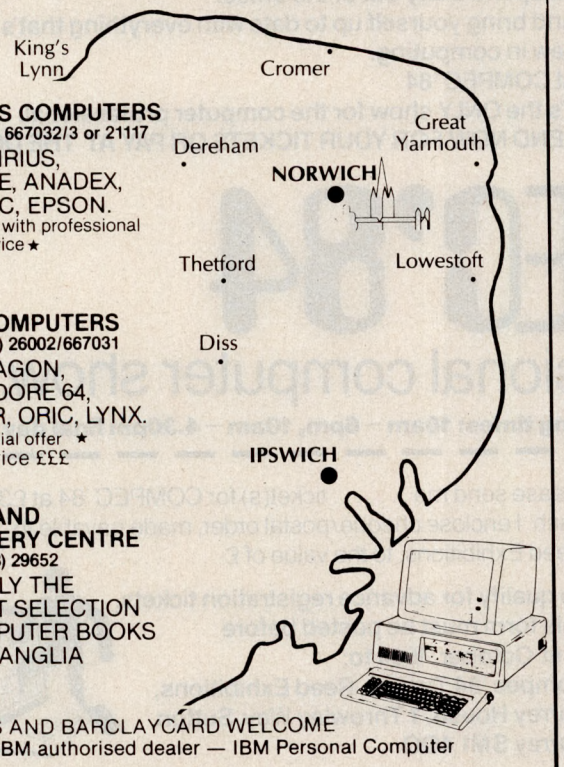

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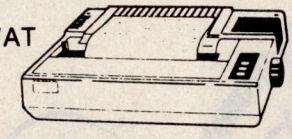

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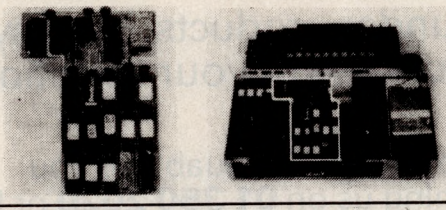

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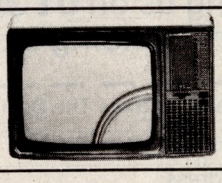

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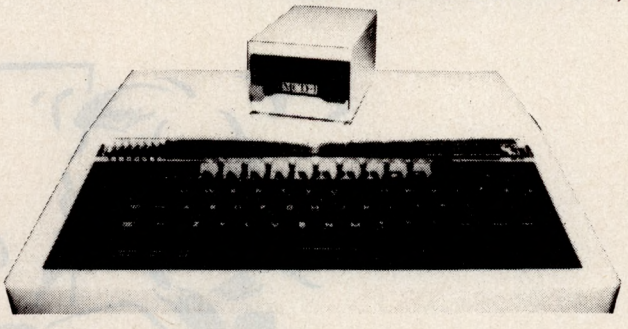

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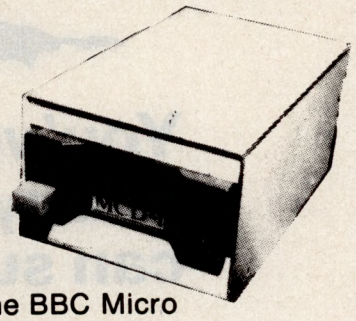

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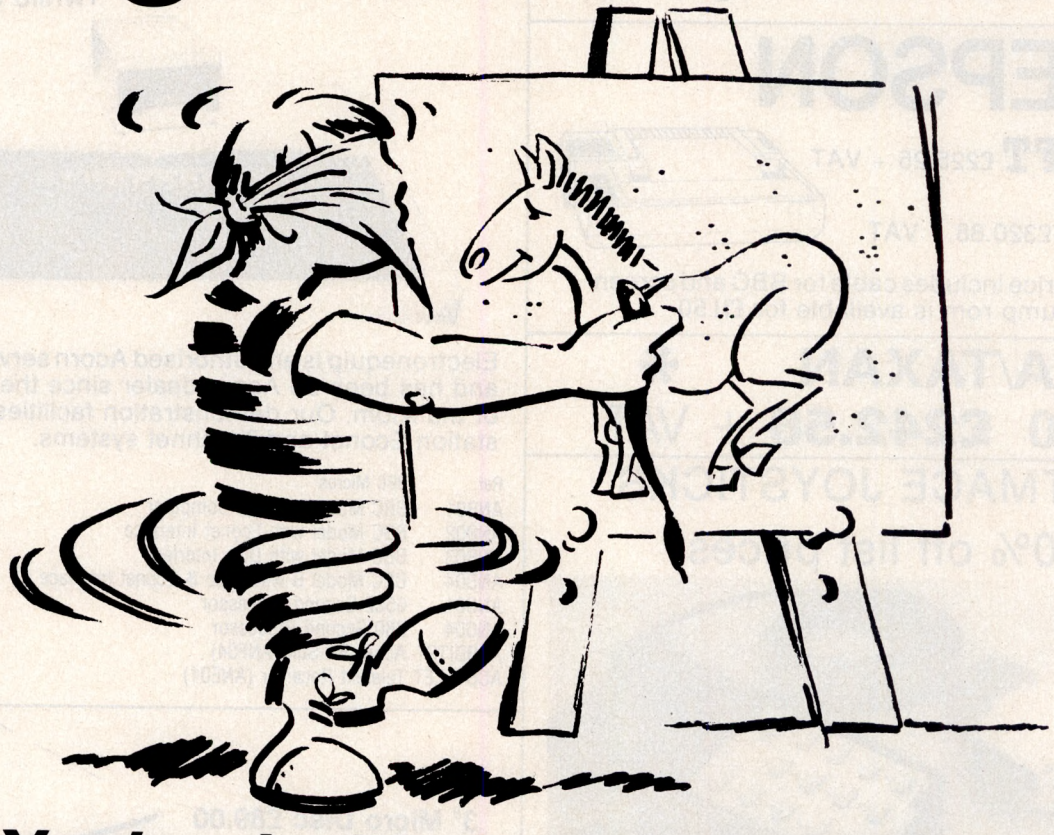

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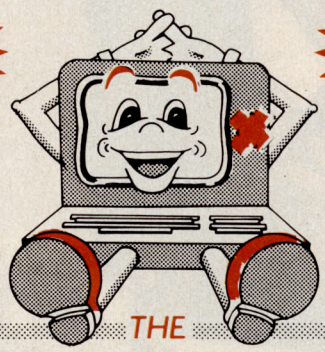

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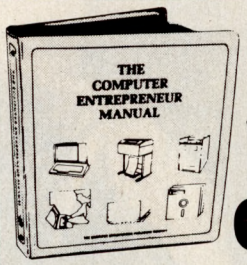

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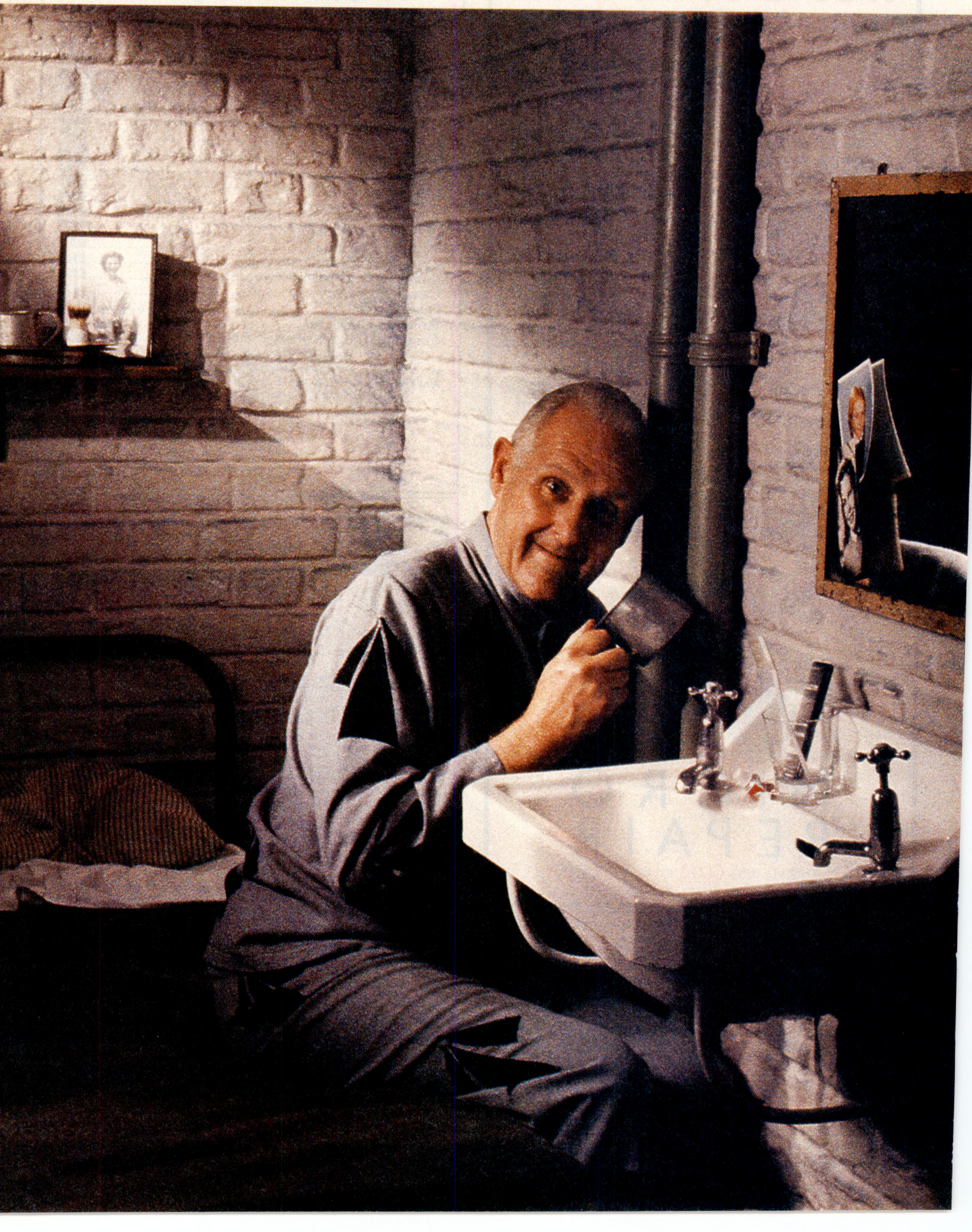

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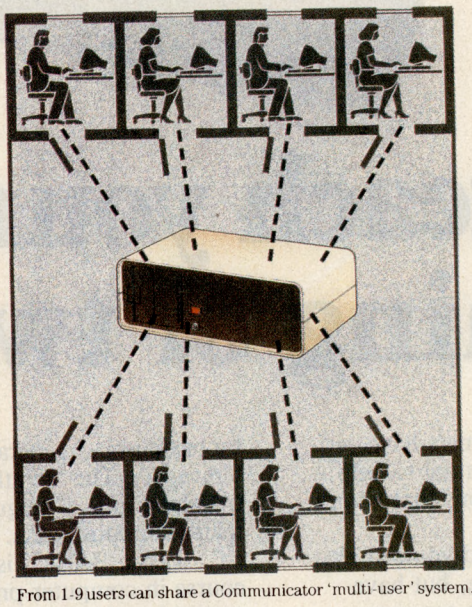

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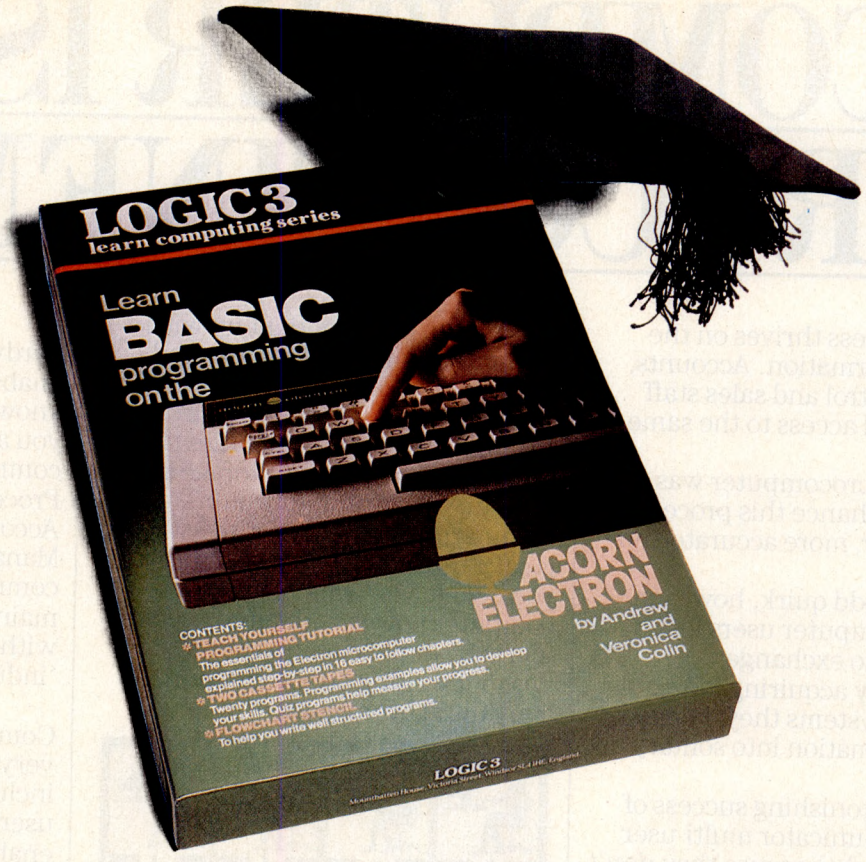

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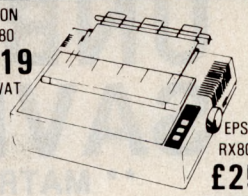

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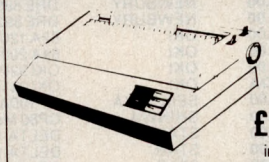

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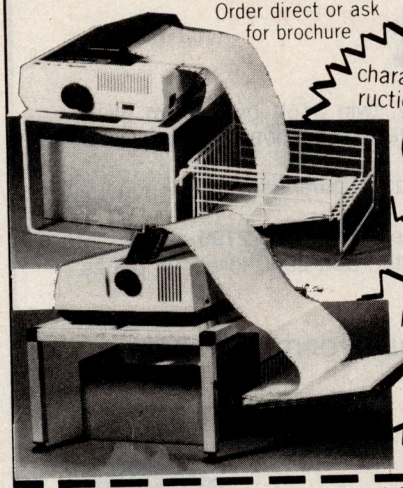

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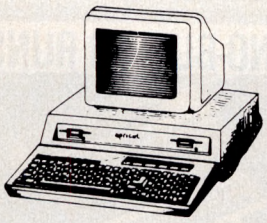

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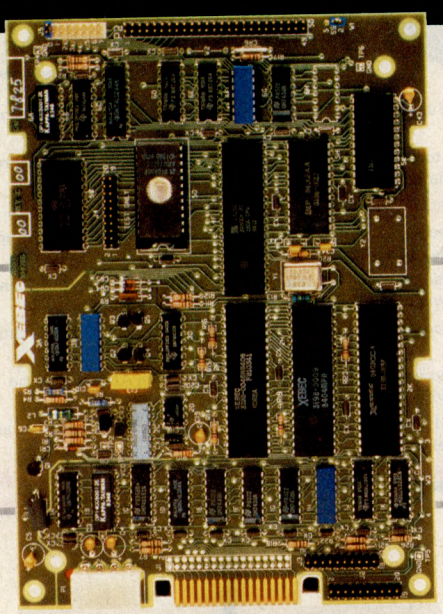

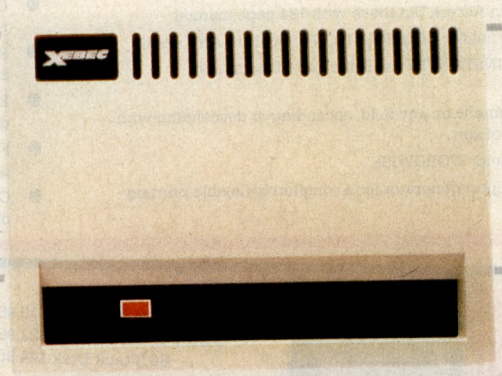

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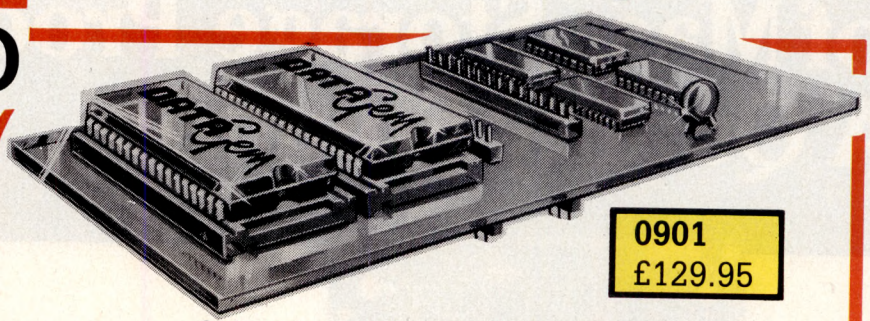

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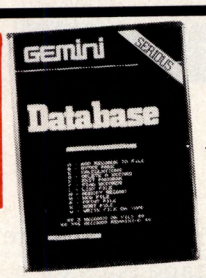

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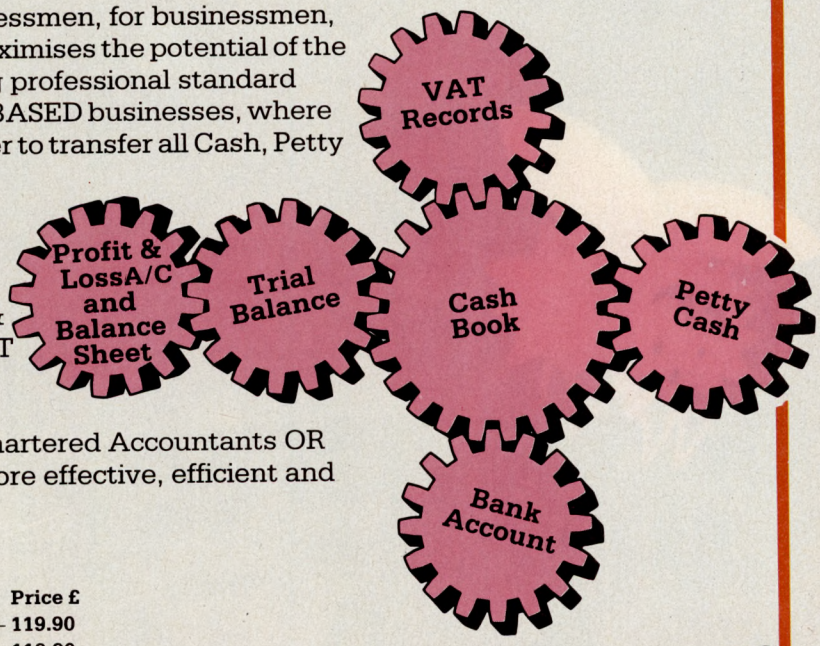

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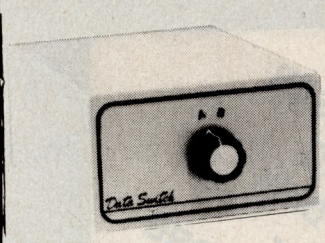

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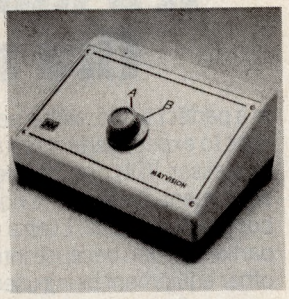

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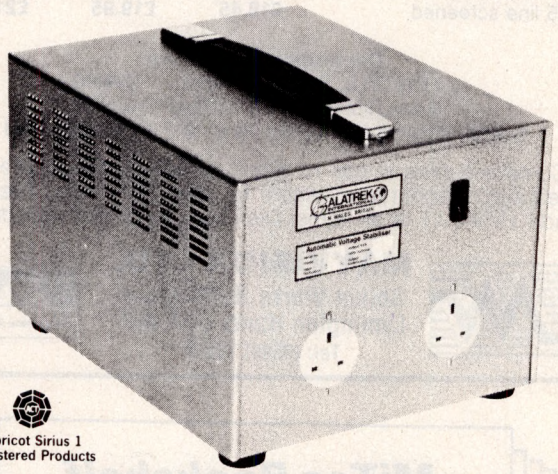

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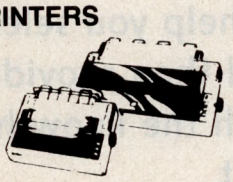

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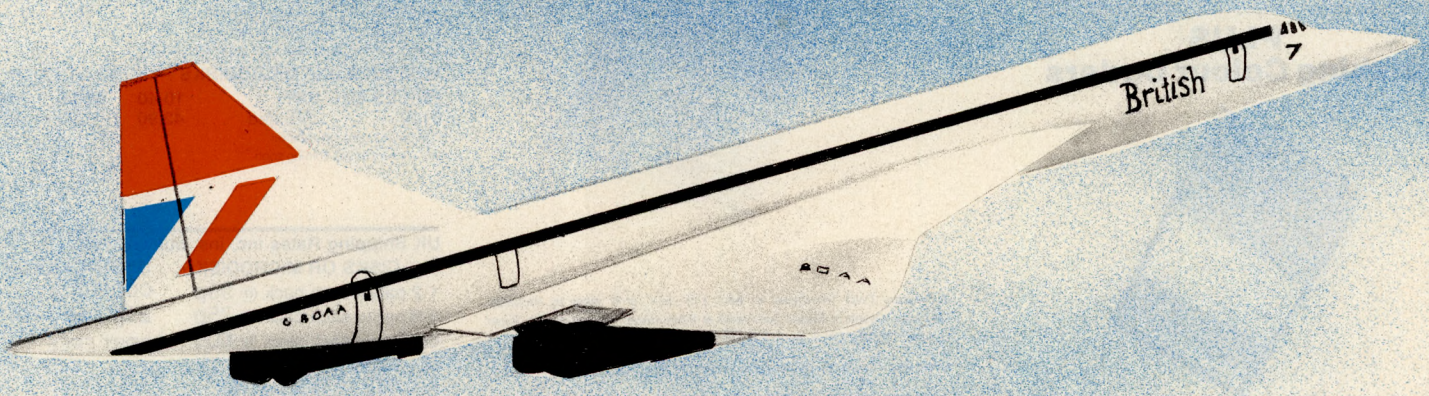



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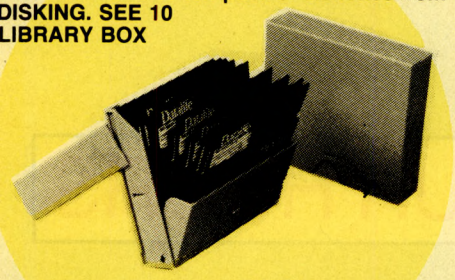

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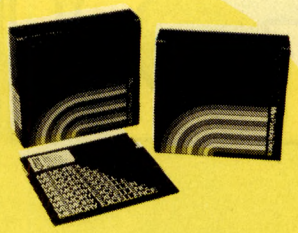

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96 tpi suitable for 77 or 80 track operation
10 and 16 Hard Sector available at same prices

MEMOREX 3½" MICRODISKS — HERE AT LAST!

PRICES EXC VAT			10-40	50-90	100+
6100	S/Sided	...	42.90	41.90	40.90

0.5M Byte rating auto shutter
3½" library boxes coming soon

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5¼" DISKS OR MICRODISKS
1-2 packs each pack @ 95p
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10+ packs POST FREE
ALL SEE 10 library boxes
ALL MEMOREX CLEANING KITS
1 off 60p each
2-7 off 40p each
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25p each — 5+ POST FREE

DISKING Means Business

NEW Memorex Cleaning Kits

Just arrived are the MEMOREX Computer Care range of cleaning kits. They represent fantastic value for money, and are available individually or with a discount if purchasing all three.

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MKEY	Case & Keyboard Cleaning Kit with one foam-clean aerosol, 20 Safe-buds & 5 Safecloths	4.90
MTV	VDU/TV Screen Cleaning Kit with 20 Safeclean screen wipes & 5 Safecloths	4.90
MDD	Drive Head Cleaning Kit 5¼" with cleaning fluid, 10 cleaning disks, jacket and glove	8.90

Buy all three Kits together and we will reduce the total price from £18.70 to £14.90 — A Bargain if ever we saw one!



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A massive 120 Minidisk capacity! With adjustable arms to compensate for less diskettes, keys and carrying handle. Buy 3 and STEAL one FREE.



Part No.	Description	1-3
JUMBO	120 Minidisk capacity	18.90

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Budget 30

30 Minidisk capacity, smart beige/brown with strong steel hinges complete with 5 coloured dividers. Buy 3 and STEAL one FREE.



Part No.	Description	1-3
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Diskette Storage

Executive Mini 100 & Executive Micro 50

The ultimate in quality, these beautiful Austrian made storage boxes in luxurious two tone dark brown come with everything one could ever want. The lids not only swing open and shut, but are also removable if shelf space is prohibitive. They come with ingenious dividers where even the tabs are adjustable and protected from dirty finger marks. The wonderfully engineered locking mechanism comes with 2 keys and a master filing tab. Buy 3 and STEAL one FREE.



Part No.	Description	1-3
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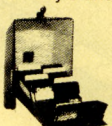
60 Minidisk capacity, complete with keys, dividers, tags and even built in carrying handles. Buy 3 and STEAL one FREE.



Part No.	Description	1-3
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204/1D	S/S	96 tpi	...	34.90	33.90	32.90
204/2D	D/S	96 tpi	...	42.90	41.90	40.90

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation
10 and 16 Hard Sector available at same prices.

8 INCH DISKETTES

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3740/2D	D/S	D/Dens	...	40.90	39.90	38.90

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MD1-DD	S/S	96 tpi	...	32.90	31.90	30.90
MD2-DD	D/S	96 tpi	...	42.90	41.90	40.90
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48 tpi suitable for 35 or 40 track operation
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8 INCH DISKETTES

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FD2-XD	D/S	D/Dens	...	39.90	38.90	37.90

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MD550	D/S	48 tpi	...	29.90	28.90	27.90
MD577	S/S	96 tpi	...	28.90	27.90	26.90
MD557	D/S	96 tpi	...	36.90	35.90	34.90

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation
10 & 16 Hard Sector available at same prices

8 INCH DISKETTES

PRICES EXC VAT				10-40	50-90	100+
FD32-9000	S/S	S/Dens	...	31.90	30.90	29.90
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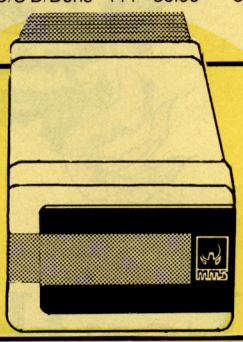

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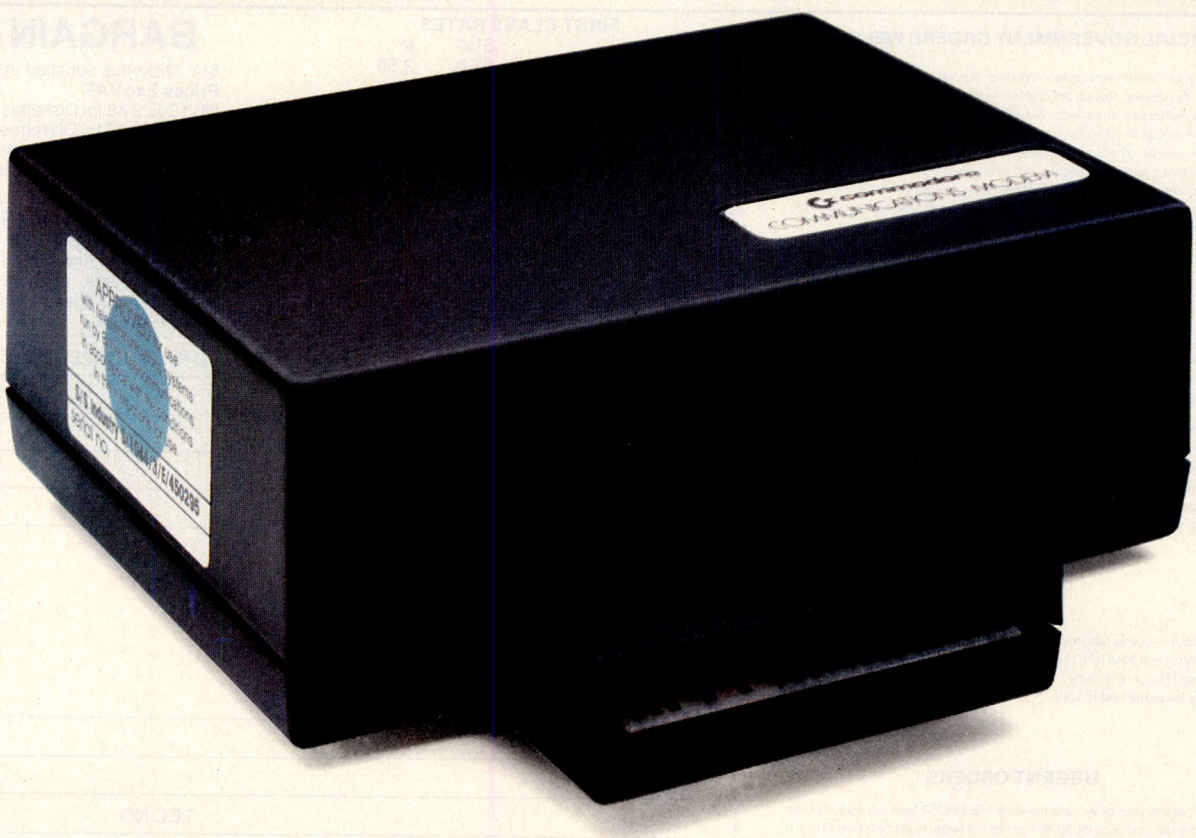



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Imagine the benefits of being able to communicate with other computer users.

Of letting your computer save money on new software as well as helping improve your programming skills.

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Our Modem is as easy to fit as it is to use. One end slots into your Commodore 64's cartridge port the other plugs into your telephone line.*

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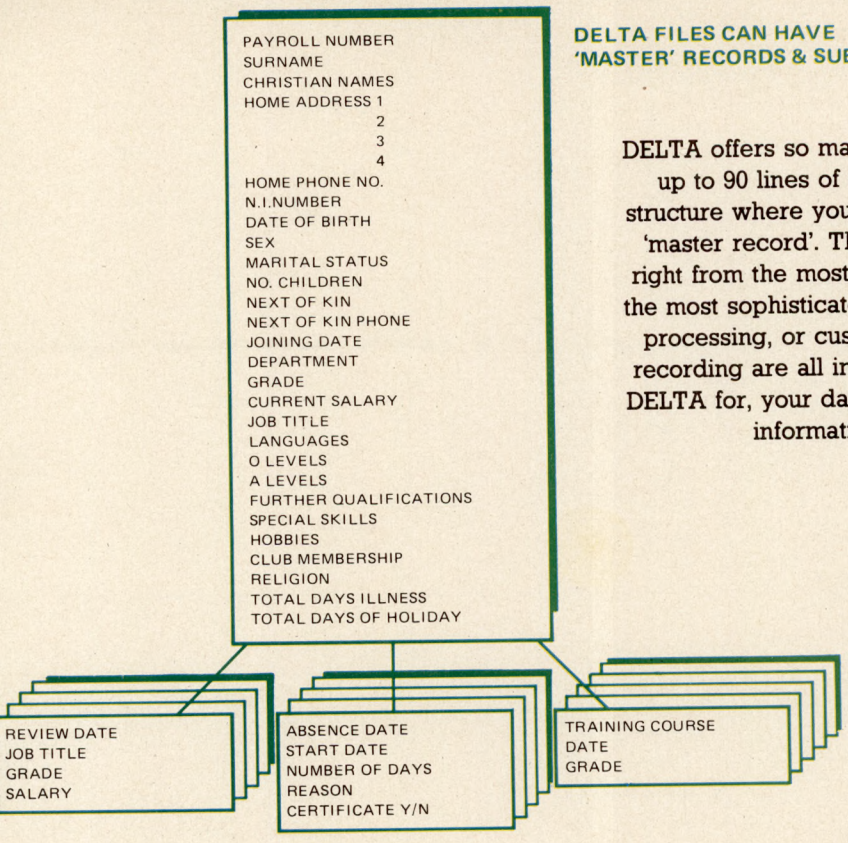

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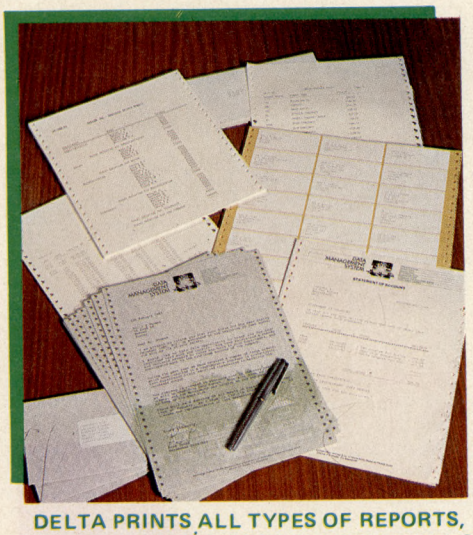

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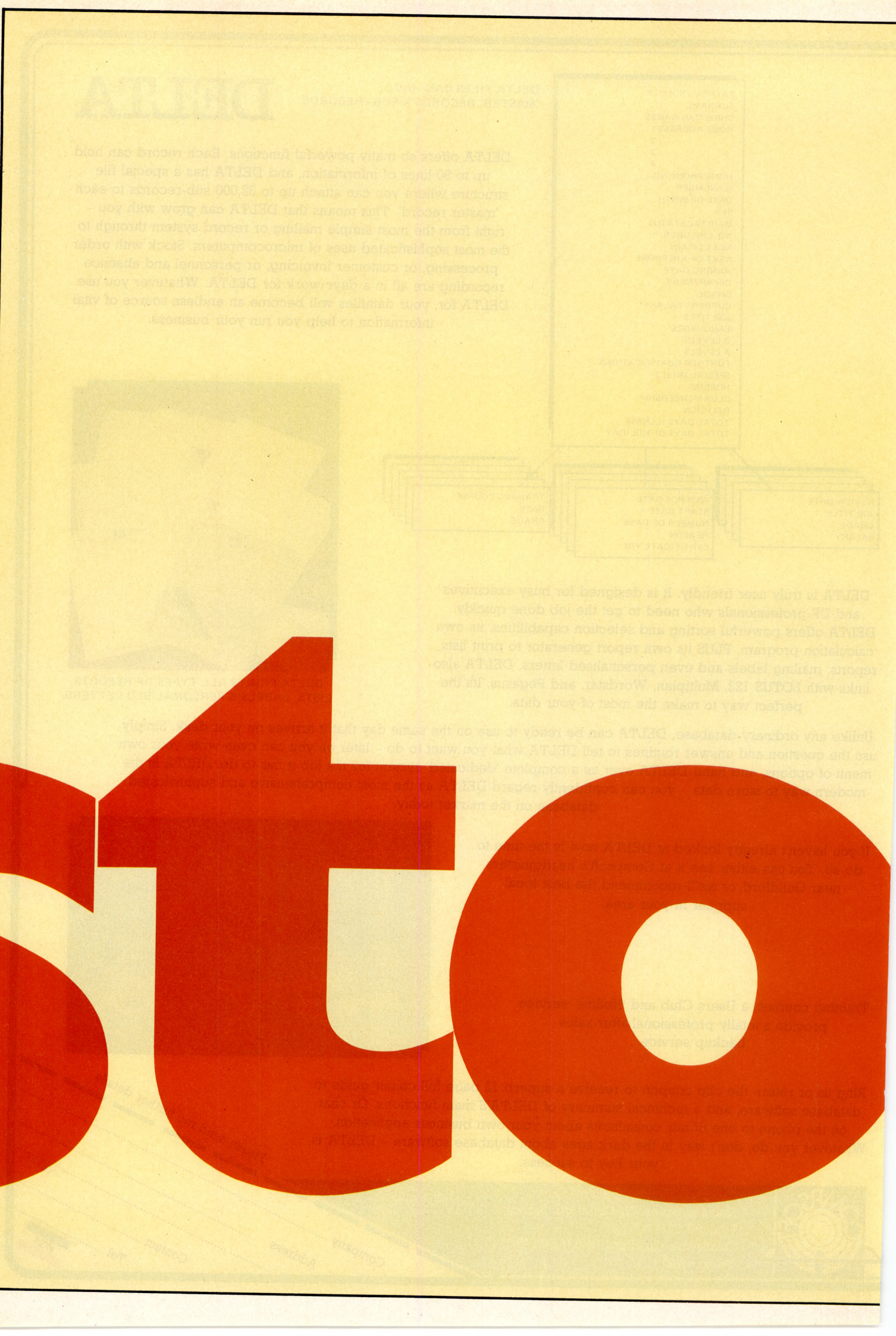

TABS

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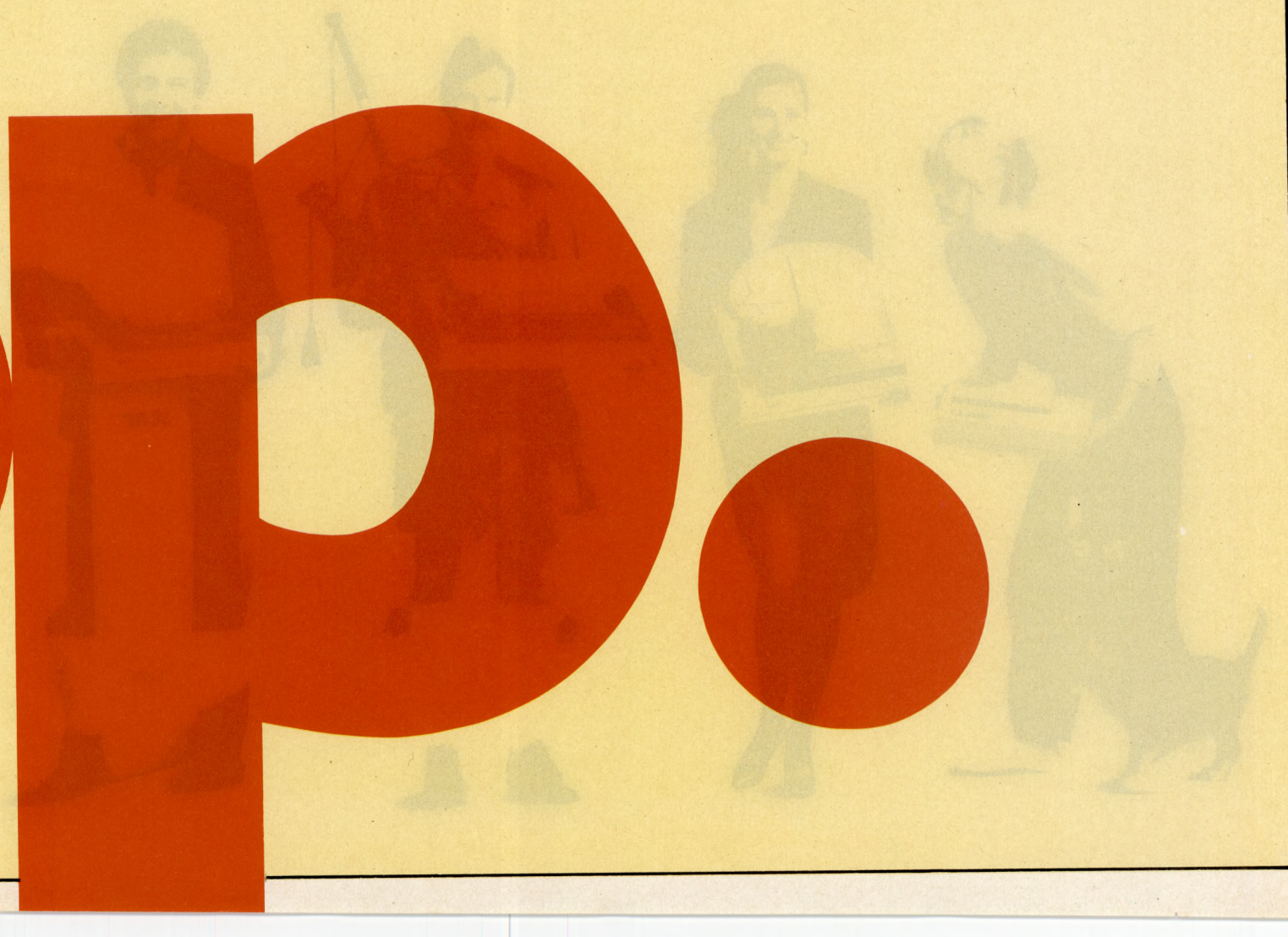

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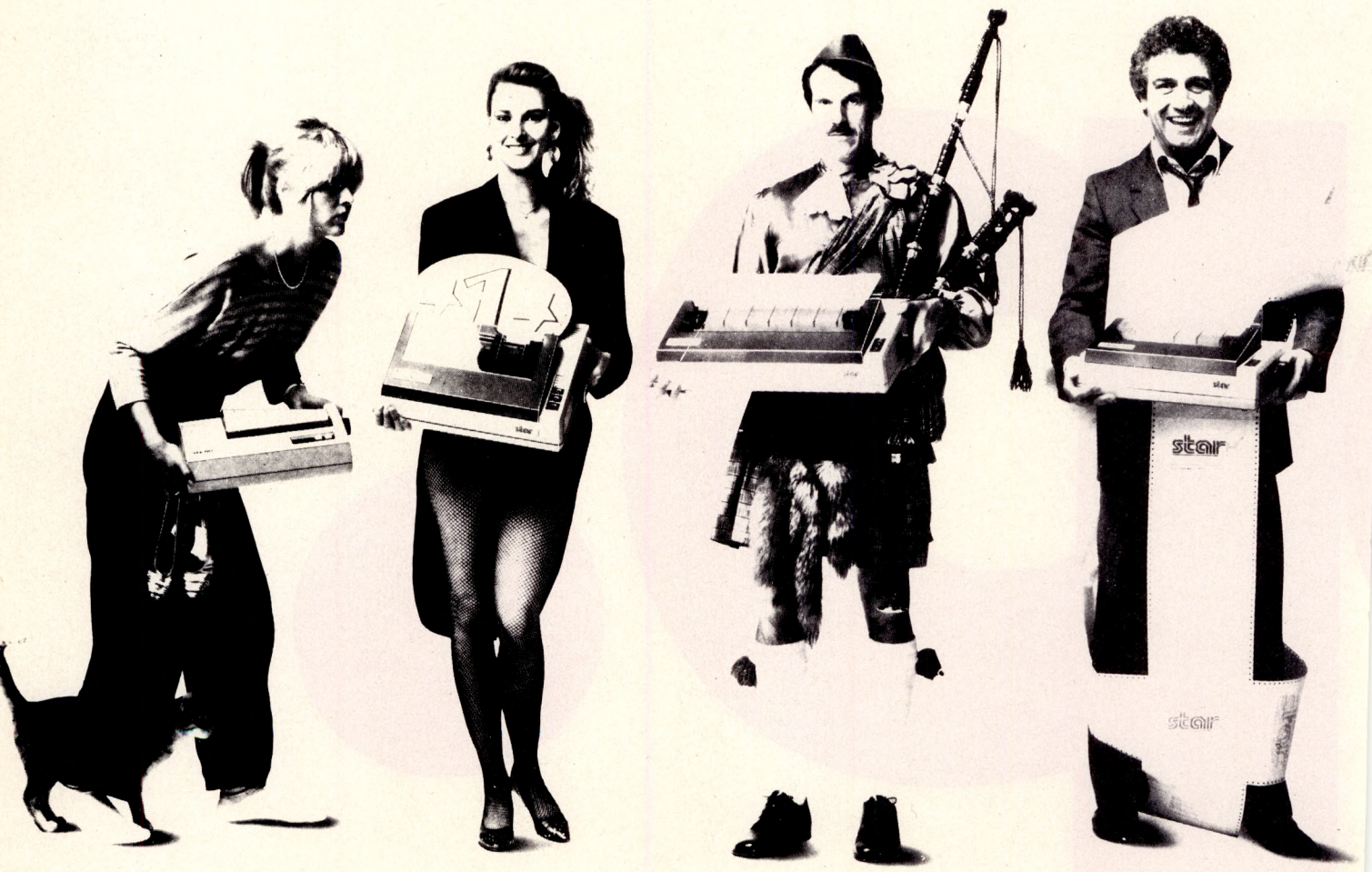

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The new Music System from Island Logic. That's what it's called. And what it actually does, in musical terms, basically, in a word, is everything.

You don't need any musical ability. The program is designed for the man in the street (the one carrying the BBC B micro).

And you don't need to be able to read music.

In fact all you need is one fully operative finger, one eye and one ear (two or more may be an advantage but are not essential).

You can create noises with the program (sounds of your own creation).

Or you can recreate the sounds of conventional instruments. Wind, strings, percussion and so on.



Or you can take tunes from the Song & Sound Library on the program and murder them in the name of art.

Then with these sounds you can build tunes before your very eyes – or ears.

Adding, taking away, juggling, jiggling, twisting the sounds, wowing the next door neighbours.

The program will even print out your compositions in proper music-manuscript form. And you don't need any knowledge of music to do it.

To Ludwig the prospect of music composition by the masses must make him turn in his grave.

But to us the prospect is heartening. Mr Beethoven, as you decompose, we compose.

DISK PACK £24.95 INC VAT. CASSETTE 1 (SYNTHESISER, KEYBOARD, SONG AND SOUND LIBRARY) £12.95 INC VAT. CASSETTE 2 (EDITOR, PRINT-OUT, SONG AND SOUND LIBRARY) £12.95 INC VAT. PLEASE ADD £1.25 P & P PER ORDER AND SEND A CHEQUE/PO. ACCESS OR VISA CARD NO. WITH ORDER TO: SYSTEM, 12 COLLEGIATE CRESCENT, SHEFFIELD S10 2BA. (CREDIT CARD HOTLINE 0742 682321).

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The Spotlight™ program is a set of convenient desktop accessories all in one package. No matter which application program you're working in – including VisiCalc,® 1-2-3,™ WordStar,® dBase II,® pfs:File,® MultiMate,® MicroSoft Word,™ TK!Solver,® and Symphony™ – Spotlight gives you instant access to six essential functions.

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Here's what you get:

Appointment Book – schedule daily and weekly meetings or display monthly calendar. Set a sound alarm to remind you of appointments, even if you're using another program.

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Spotlight is the great program behind any great program you use.

System requirements: IBM® PC or XT™, or COMPAQ® portable computers, one disk drive, 75K memory for RAM resident portion, DOS 2.0 or higher. Printer optional. Can be installed on hard disk. Runs with most IBM PC software packages.

Spotlight™

By Software Arts™

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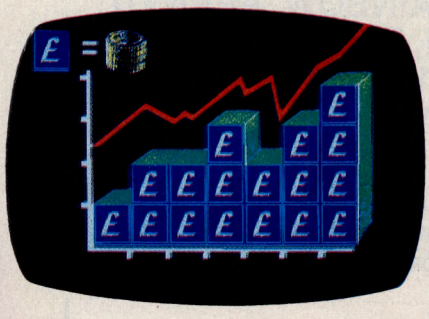

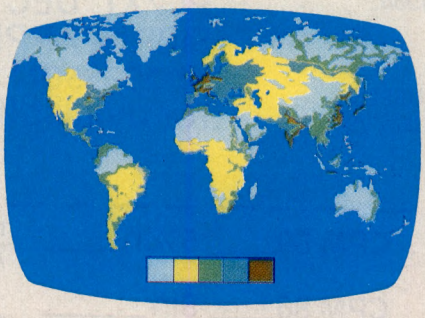

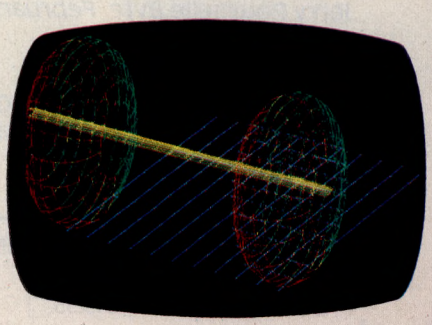

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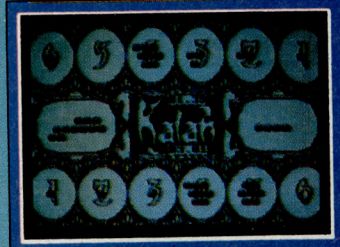



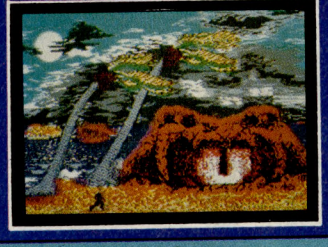



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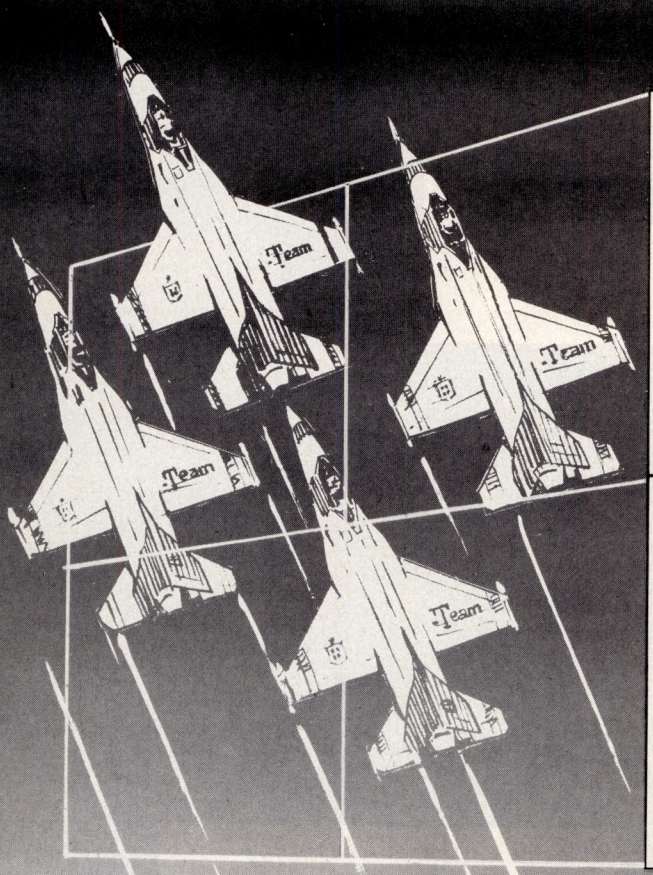

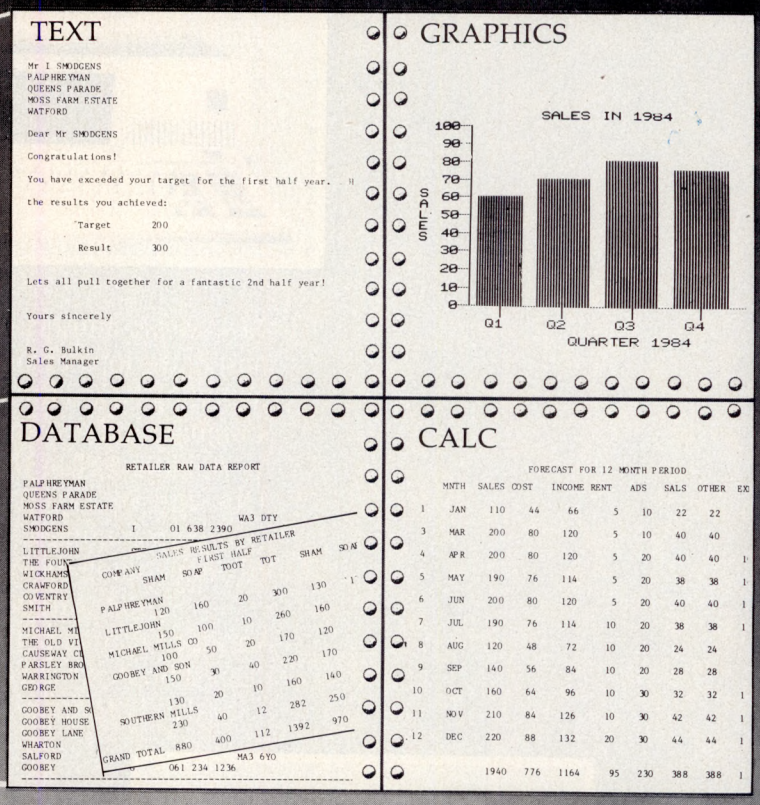

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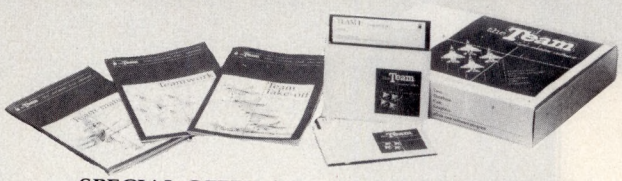

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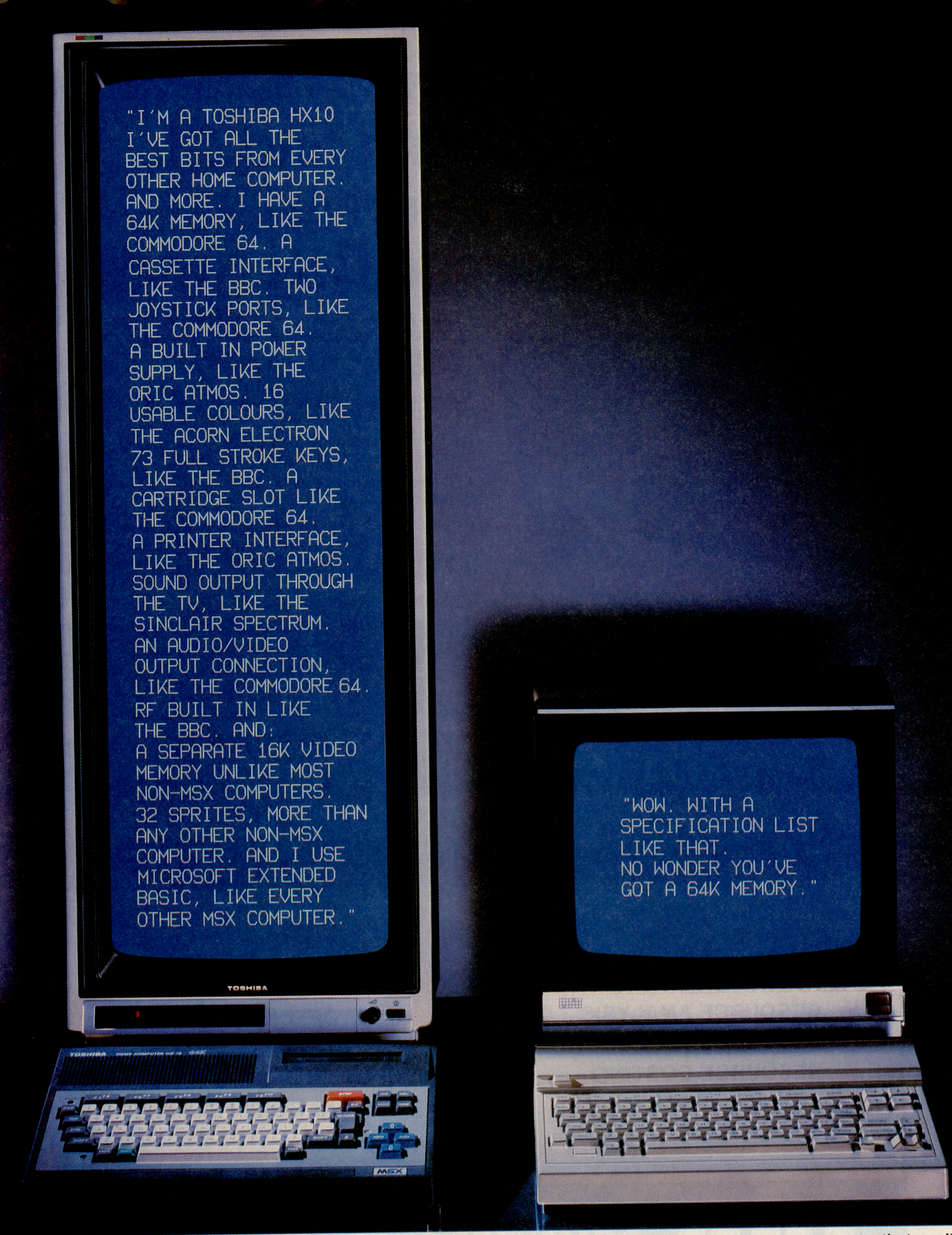

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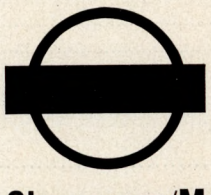

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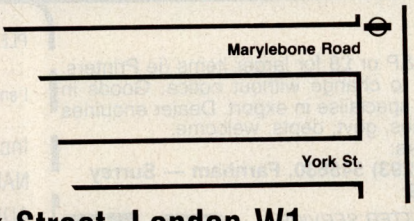

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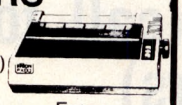

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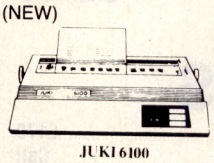

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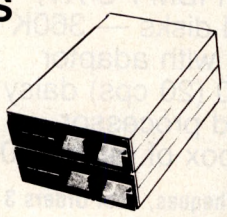

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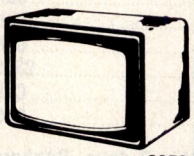

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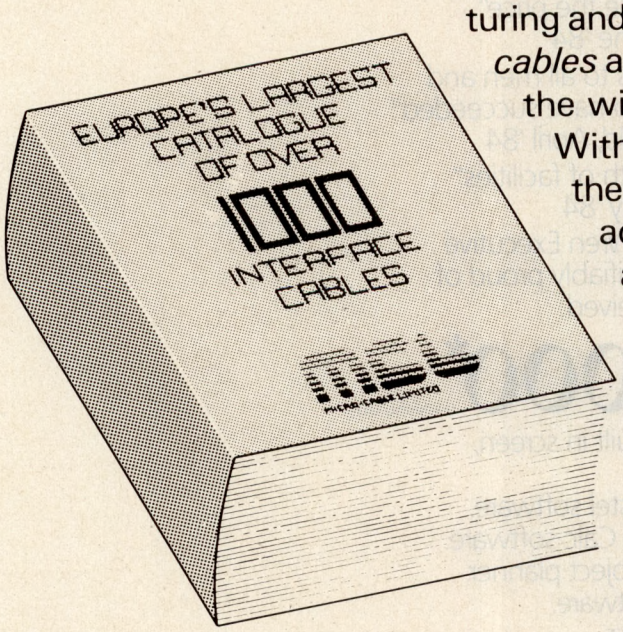

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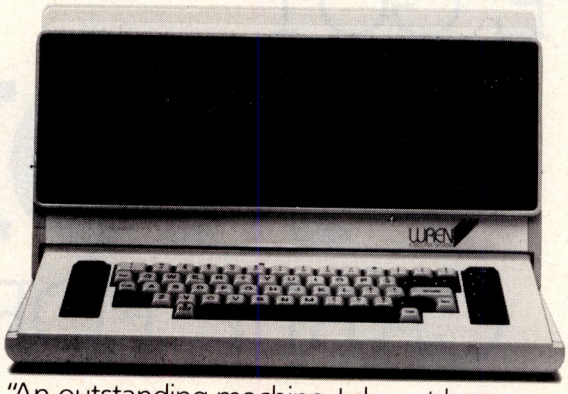

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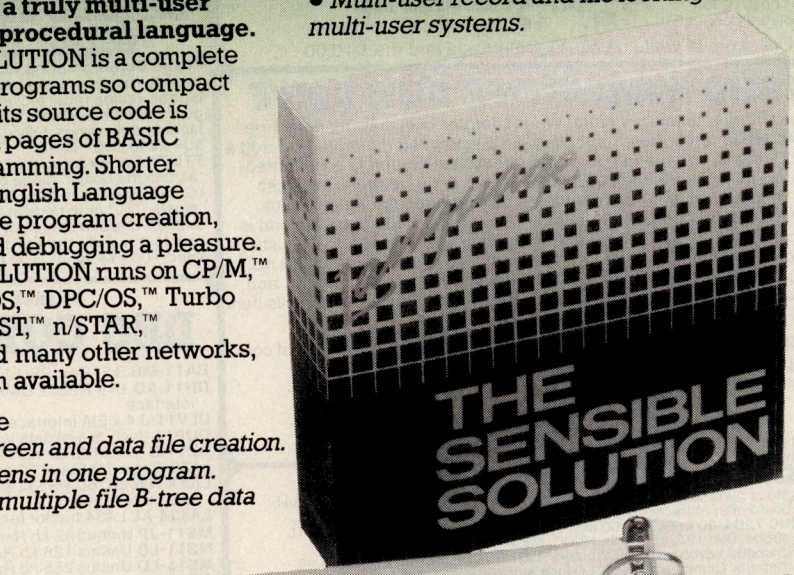

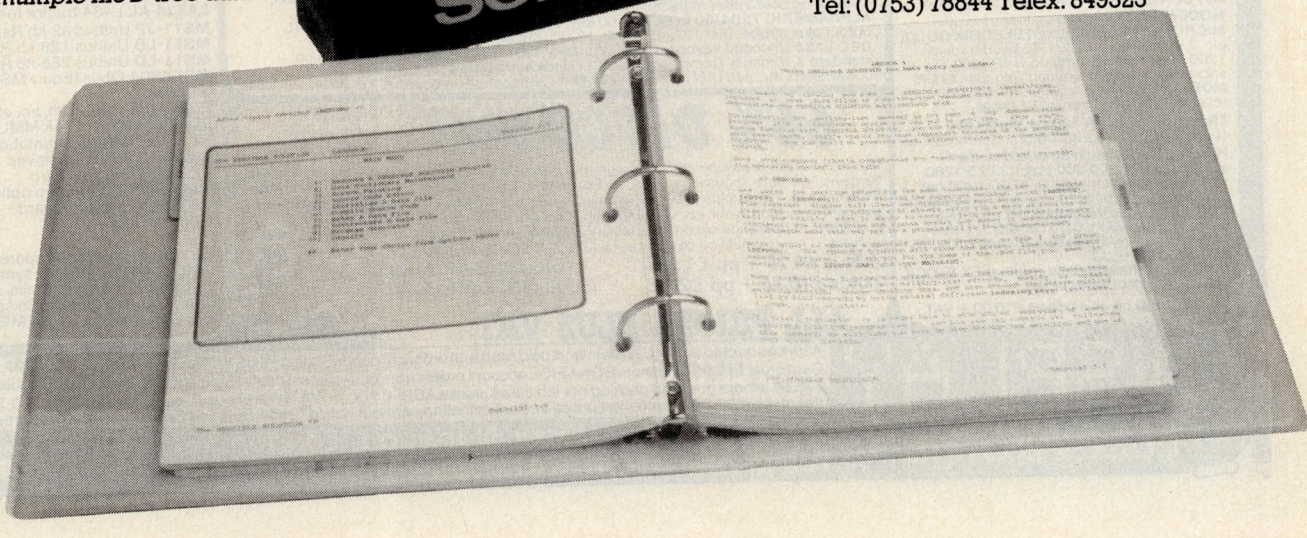

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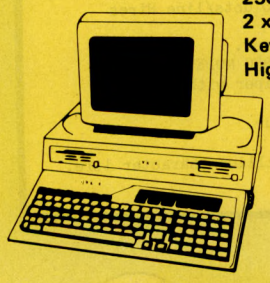

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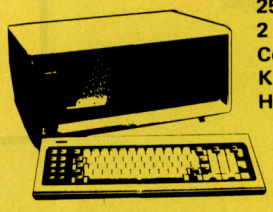

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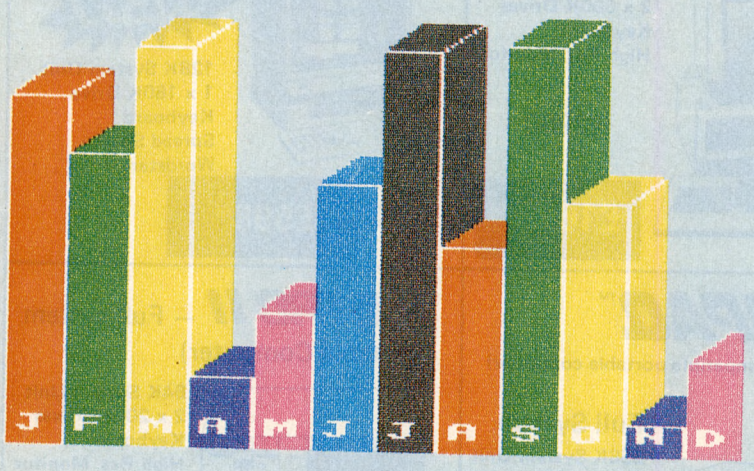

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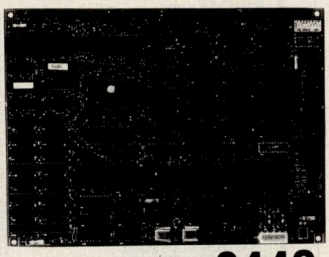

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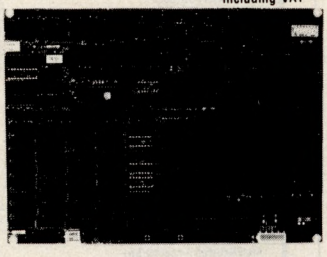

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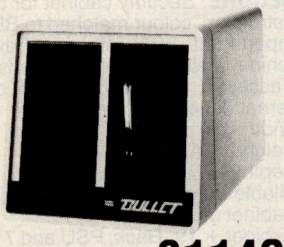

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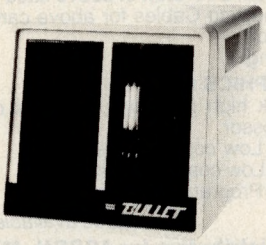

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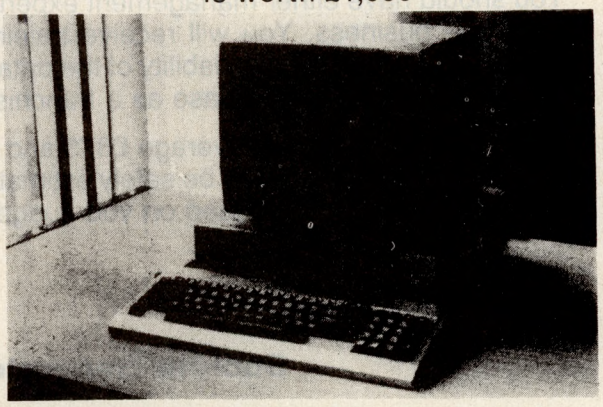

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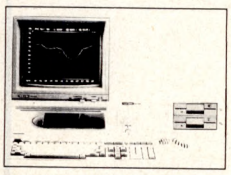

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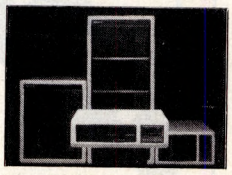

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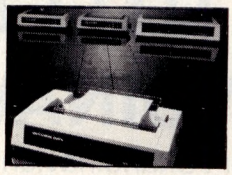

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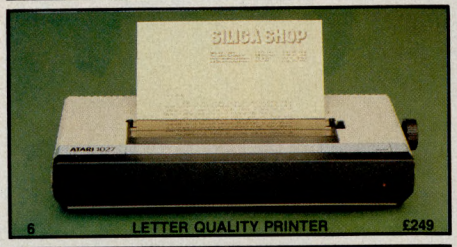

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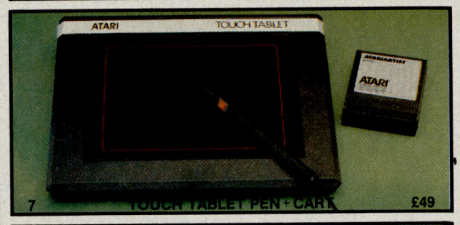

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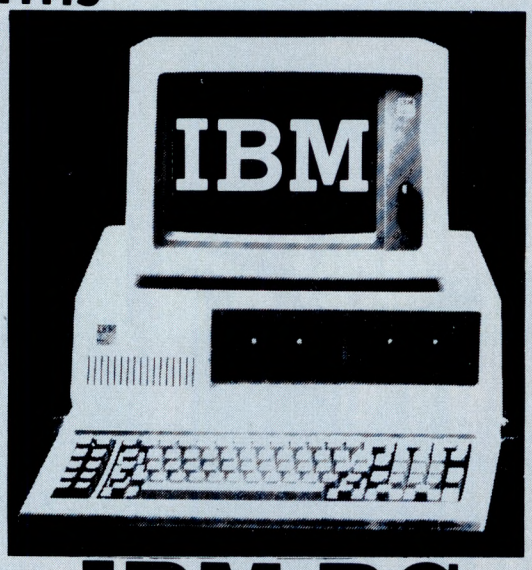

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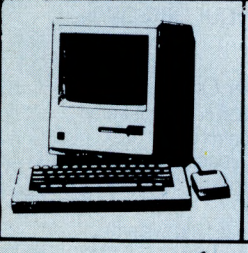

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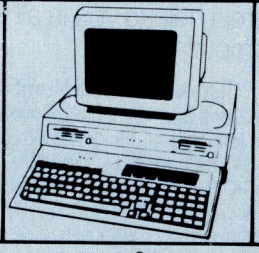

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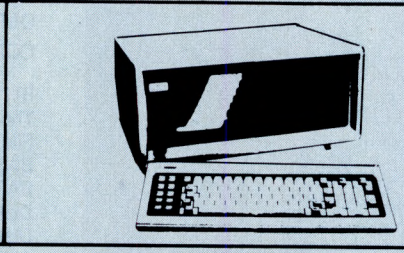

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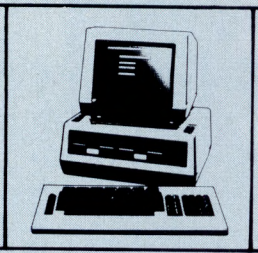

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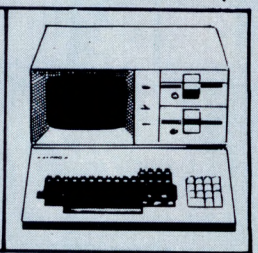

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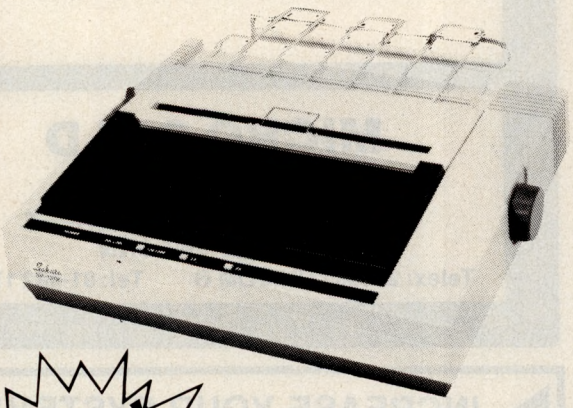

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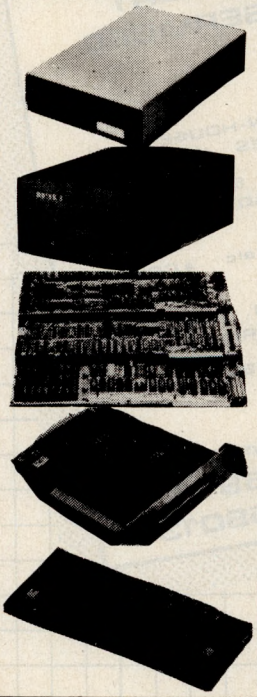

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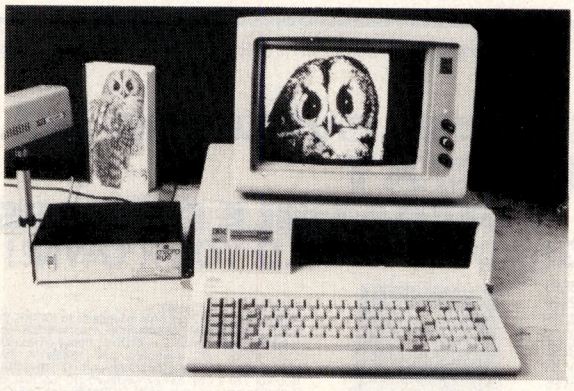

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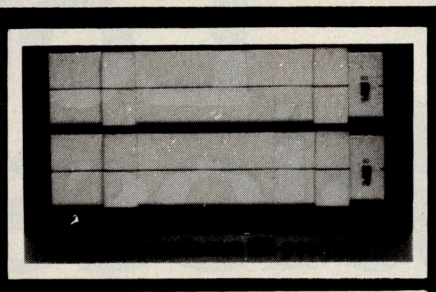

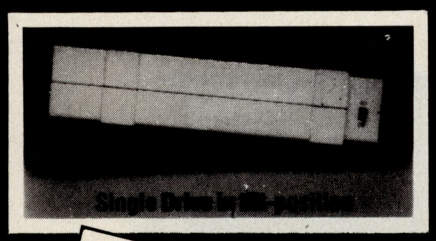

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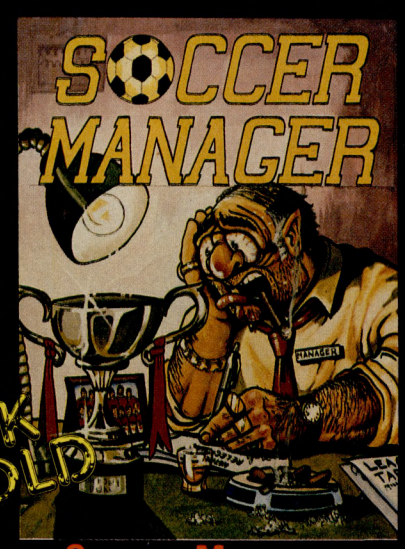

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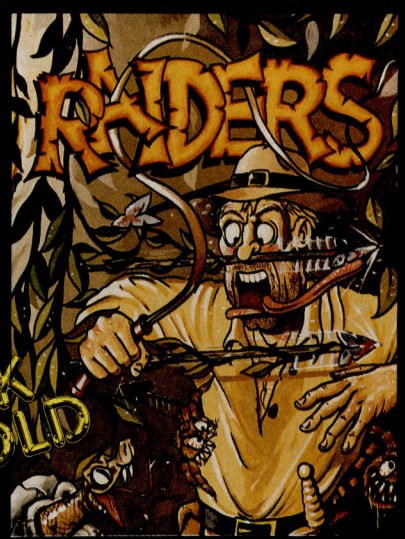

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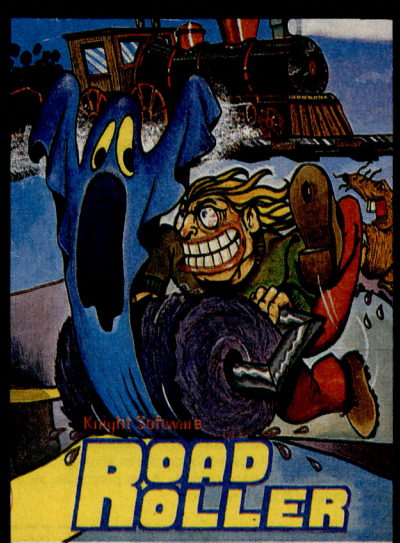

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The game addicts arcade game. Use your road roller to paint the roads making sure to avoid the pursuing ghouls. Meanwhile rats and motorcars foul up your efforts, squash them and clear up their mess. Addictive to say the least. P.S. Watch out for the train.



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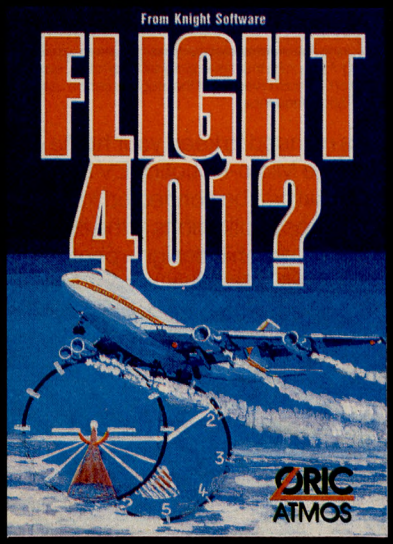

UK GOLD available soon on most popular home computers other than ones stated including Amstrad, CBM Plus 4, CBM 64 and Enterprise.

Programmes required for most computers. Cash purchase or royalties.

The above games are available from most leading retailers.
Dealer enquiries contact us for your nearest distributor.
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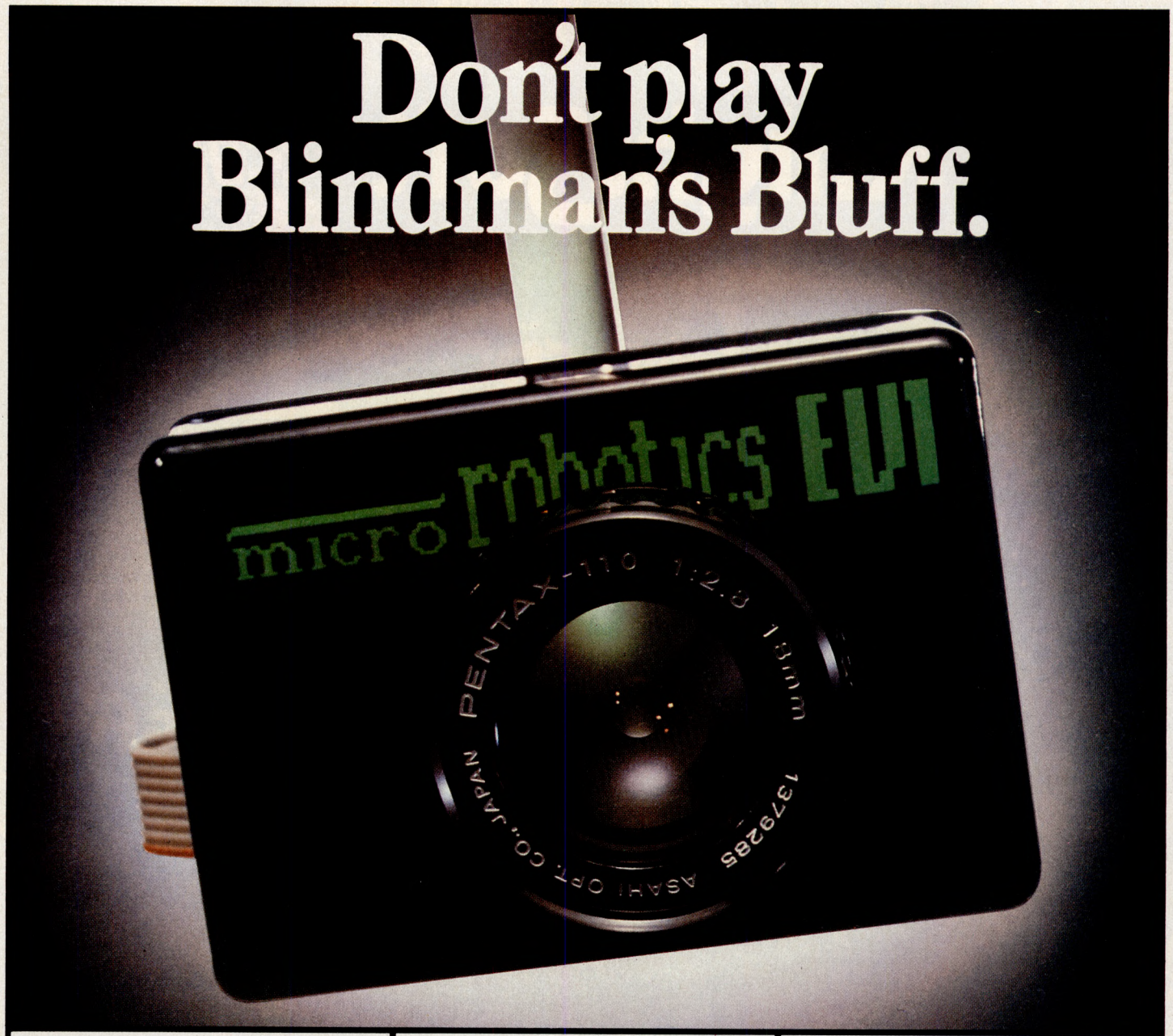
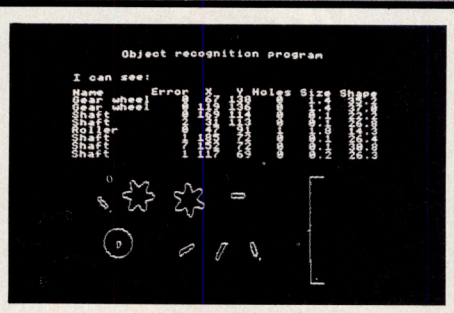
Don't play Blindman's Bluff.

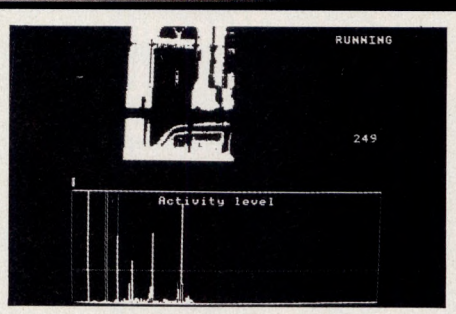




Imaging A program that takes pictures for printing, storage and transmission. A second version of the program can be used to record a short animation sequence.



Object recognition A powerful program for analysing a scene containing multiple non-overlapping parts. Area, perimeter, centre of gravity, are calculated in a split second.



Movement detection A program that analyses any movement in a scene which for example could be used to count the number of people moving down a street or ring an alarm if anything moves.

There's no need to keep your home computer in the dark a minute longer. The Micro-Robotics EV1 is a revolutionary new electronic camera that can be connected to your computer to give it the power of sight. It has applications in the fields of security, in industrial object recognition, graphic design, robotics and Artificial Intelligence. For the first time it is possible to capture black-and-white and grey scale pictures on a microcomputer without the use of an expensive external video camera. Full documentation and a comprehensive library of useful software are provided with each system, all for **only £129.95** (inc. VAT).

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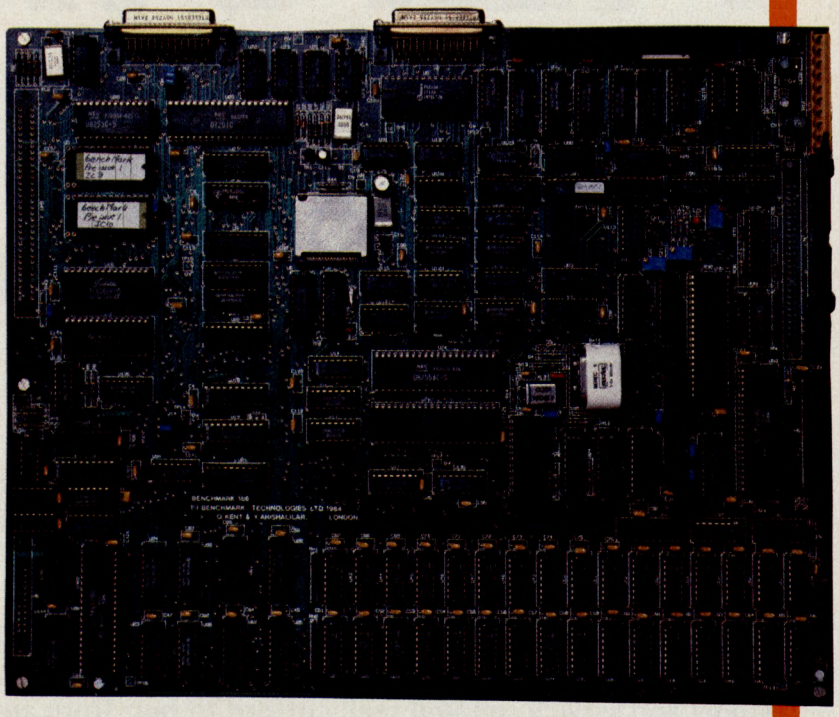

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VIDEO	16K separate character buffer
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	upto 160 x 60 characters text resolution.
	upto 16 x 32 bits character resolution.
	Fully bit mapped graphics.
	Soft character set of upto 2000 characters.
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	Composite or direct video drive.
COMMUNICATIONS	Two full RS232 channels with independent baud rate generation and with loop-in loop-out capability.
	Asynchronous and synchronous protocols.
FLOPPY	Controller for a upto 4 double sided, double density 8.5.25 or 3.5 inch drives.
HARD DISC	On board SASI bus and support for 2 hard disc drives (fixed + removable).
KEYBOARD	Parallel or serial keyboard interface.
PRINTER	Centronics compatible parallel keyboard interface.
REAL-TIME CLOCK	Battery backed clock with time, calendar and alarm functions.
CMOS RAM	50 bytes of battery backed RAM.
IEEE 488	Full electrical implementation of the IEEE 488 instrument control bus.
DMA CHANNELS	2 floating DMA channels. Most peripherals can be DMA and/or interrupt driven.
TIMER COUNTERS	3 uncommitted timer counters with external trigger and clock inputs.
EXPANSION BUS	Fully buffered expansion bus with access to interrupts, DMA channels and TIMERs.
ADD-ONs	8087 floating point module (November 84).
	Proximity string correlator module (January 85).
PCB	CAD/CAM 4 layer PCB (330mm x 280mm).

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MS-DOS 2.11	Multitasking implementation of MS-DOS operating system. The operating system itself also runs as a task.
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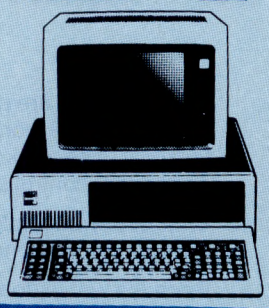

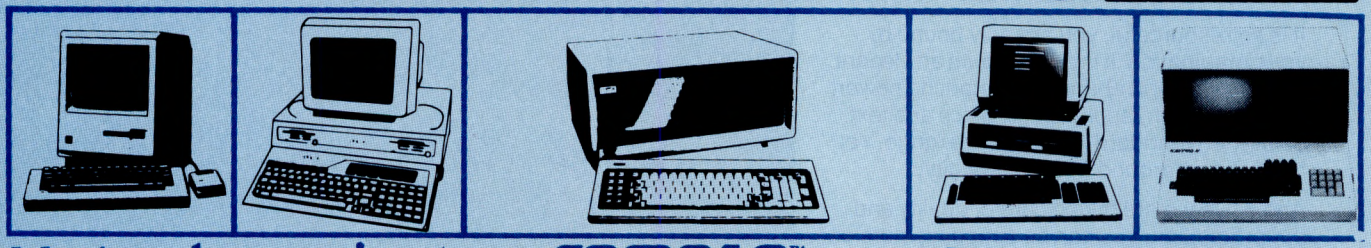

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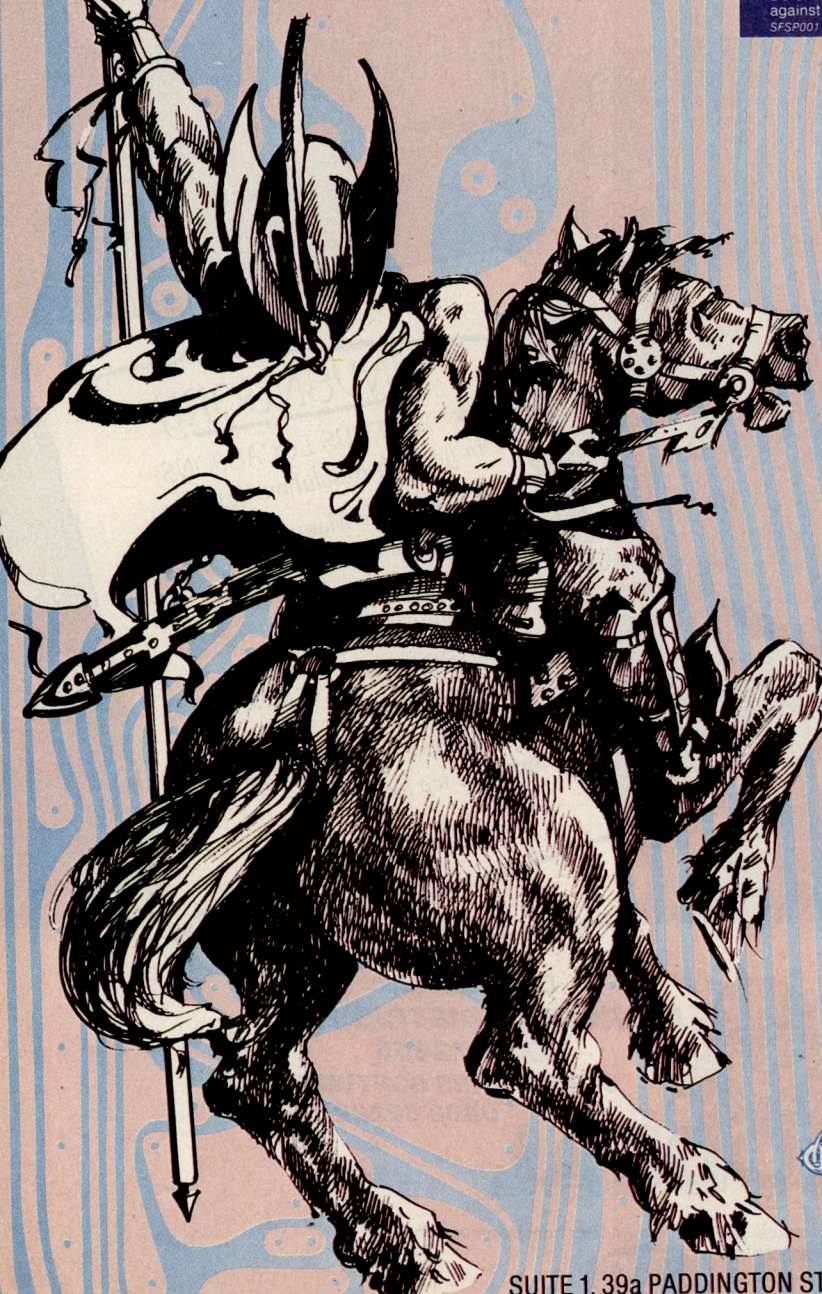



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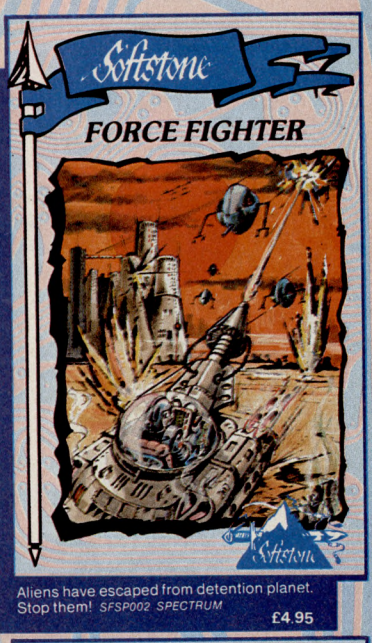

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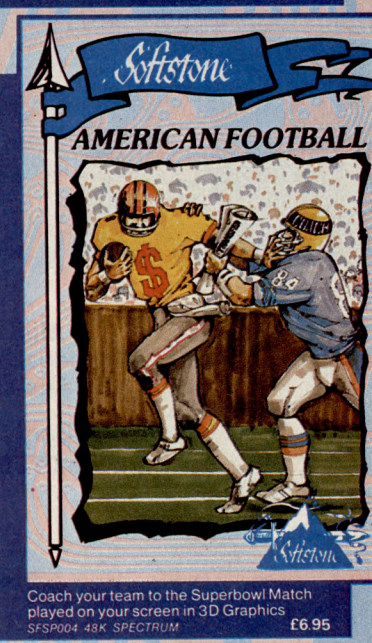

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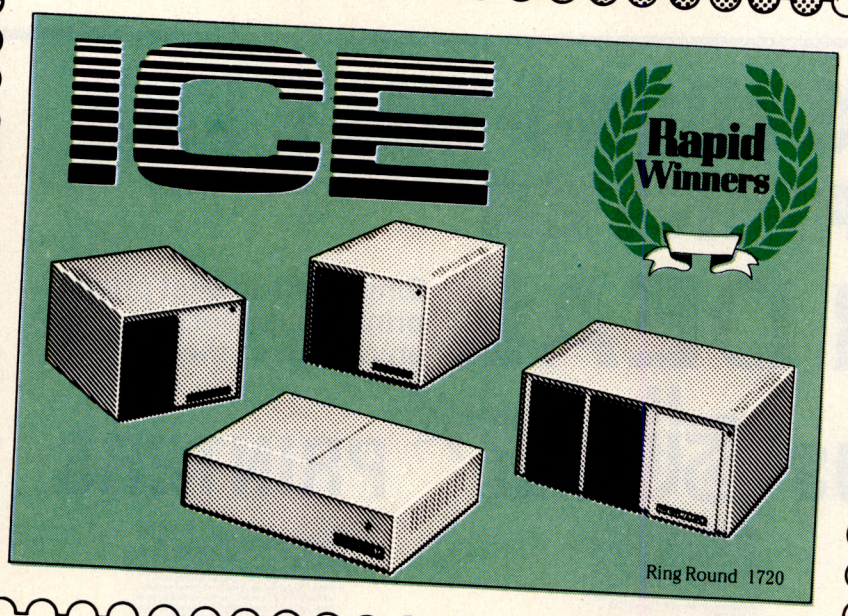

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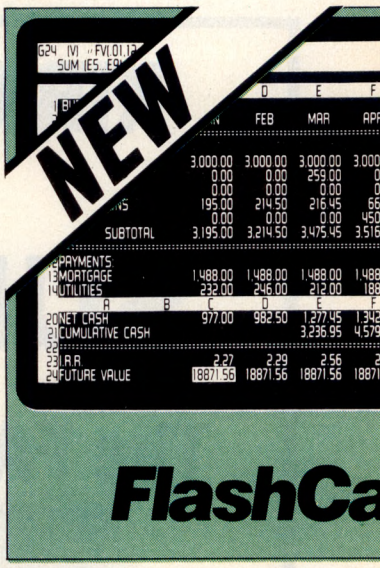

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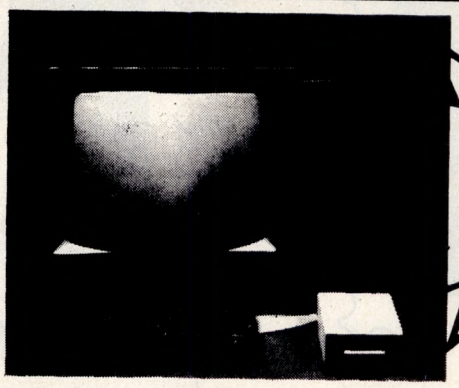

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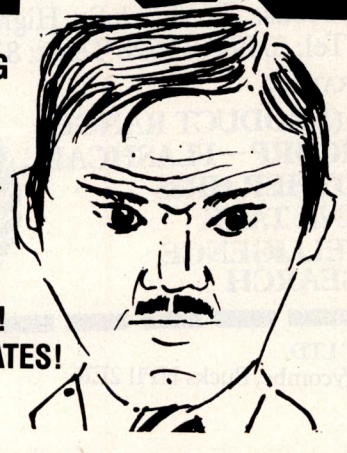

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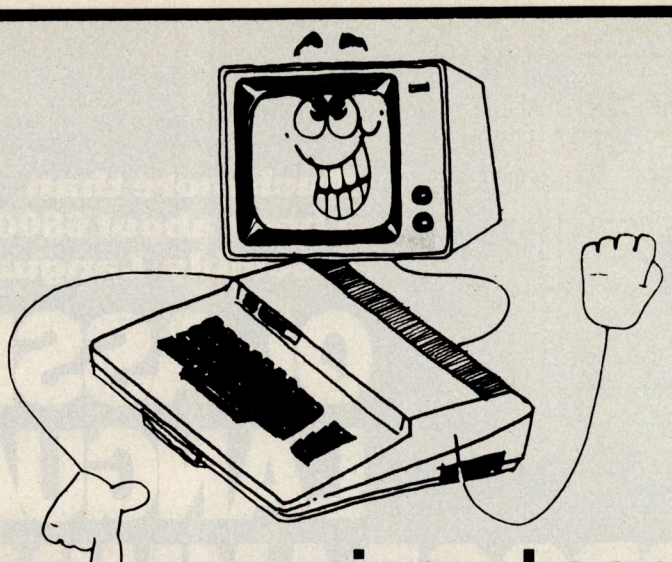

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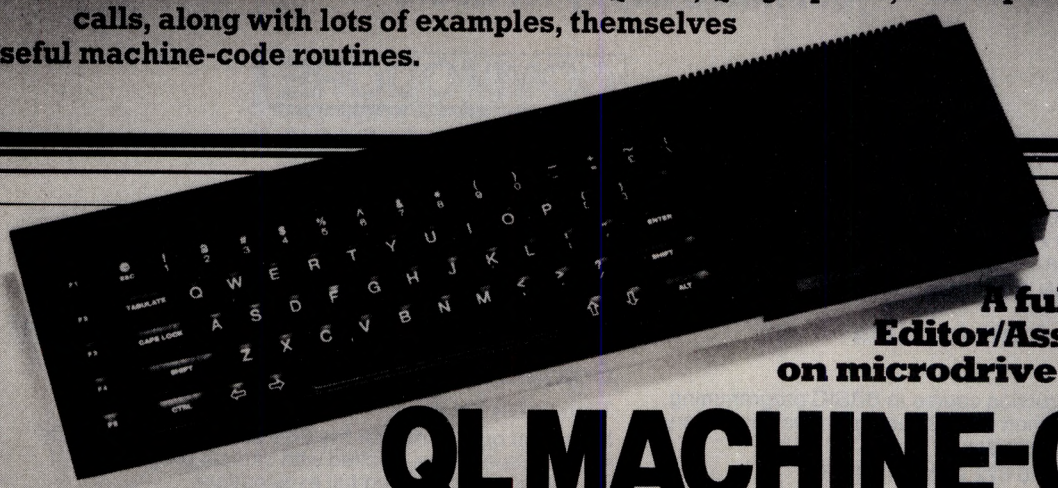

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CHIP CHAT

And we thought Quill was slow: the manual that comes with 68k/OS, the 'alternative' QL operating system from GST, makes interesting reading. For example, it promises that 'a real-time word processor should be available by the end of October.' In the meantime, ChipChat wonders, do you have to make do with the batch processing version?

Commercial break: if nothing else, Dragon Data's problems led to some bargain basement prices for the Dragon, both here and in the US. One American firm is offering the Dragon 64 for only $139, billing it as a 'smash hit sellout' produced under licence from the British Broadcasting Corporation. It's a shame that angle couldn't have been used for UK sales, things might have been different then. **All the nines:** having presented publicity photos of its Portable with a repeat row of 7,8 and 9 keys (and no 1, 2 or 3), ACT has obviously taken a fancy to the idea. Its annual report repeats the same trick on the front cover. Doubtless the figures inside are more accurate.

Fast-talker: the super-speedy TDI Pinnacle, ChipChat is told, is 'a combination of the very best of both British and American design.' It's even got a tie-up with Lamtek Industries, an American firm which designs and manufactures printed circuit boards for, among others, the US Department of Defence. TDI is proud of this connection because 'not surprisingly for any company involved with the Department of Defence Contracts, its products are of the very highest quality and reliability'!

This is unlikely to reassure users who have been following reports querying the reliability of the materials Texas Instruments is supplying to defend the good old US of A.

You must be kidding: the world's first *Computer Joke Book* has been announced, a Spectrum program which 'tells the types of juvenile jokes that schoolboys and schoolgirls tell each other.' The distributor explains that it contains more than 500 different jokes and also 'has considerable educational value.' For example, using the program means that 'young users have to practice spelling.' Possibly it might be better if these users were taught to spell correctly rather than to merely practise, as the verb is more usually spelled. **Robert Carrier, eat your heart out:** seemingly something unusual happened at the recent Acorn User Show. To be more precise, 'bored wives and girlfriends trailing behind their male partners found a program that interested them.' And what exactly was behind this great leap forward for emancipation? No less than a cookery package called Comp-u-Cater. **Getting technical:** the search goes on for somebody to handle the Computer Answers section of *PCW*. In the meantime, ChipChat would like to extend thanks to one young reader who rang up to apply. Saving up for his first computer, he argued that nonetheless he knew lots about micros. Asked to elaborate, he explained touchingly that he knew so much all his friends called him Database. **Any old iron:** ChipChat is delighted to hear from a company called Instrument Rentals. Not because it sell or rents computers, no. Nor because its prices and rates are so wonderful—they may be, but the company hasn't mentioned it. No, we're indebted to this company for a new English word, refreshingly free from the contamination of past associations such as apply to the words 'second-hand' or 'used'.

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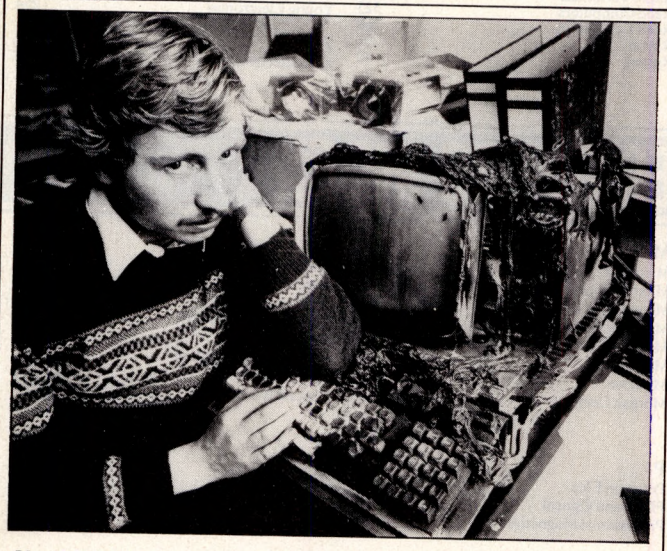

No, this isn't an example of what happens if you follow one of our construction articles. What it is, is really up to you. Think of a witty description and send it to us on the back of a postcard to arrive by 30 November. The best entry will receive a prize of £10, so remember to write your name and address on it too. The address to write to is Chip Chat, PCW, 62 Oxford St, London W1.

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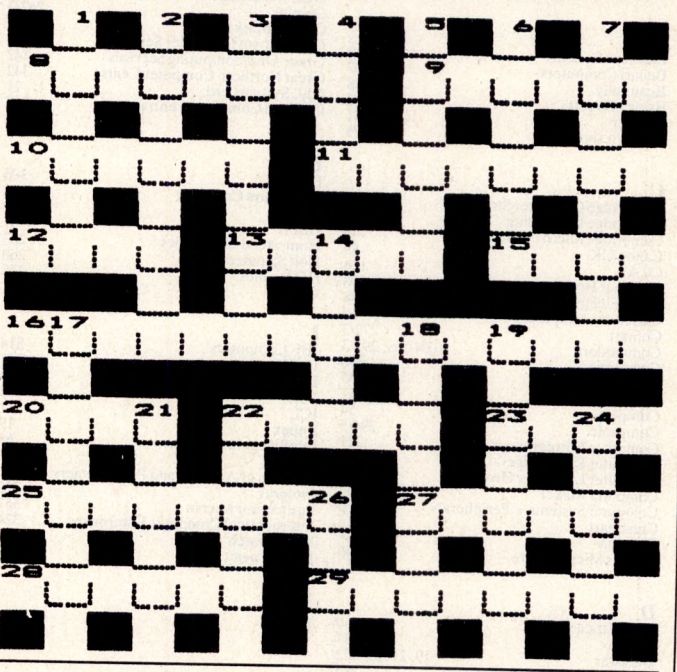

CLUES ACROSS

8 Confirm live data transfer . . . (8)
9 . . . won't harm the consumer (6)
10 Creator of *Gold and the God* (6)
11 US lawyer roundly beats a large store (8)
12 Oil company accepts £1 for screen effect (4)
13 LOWEST POINT= I(RND)+A(RANDOMIZE) (5)
15 Once the name of a computer in Ireland (4)
16 What mail order clients have been waiting for? (6-5,4)
20 New micro with 20% off — a hit in France (4)
22 Modify in general terms (5)
23 Worthless American with loud sales literature (4)
25 Connect joystick here and operate right and left (4,4)
27 Handy things, numbers! (6)
28 Video gamers' consuming passion? (6)
29 He's not quite kitted out with backup storage (8)

CLUES DOWN

1 Not quite the abused waiter—but just as incomprehensible? (6)
2 Handy peripheral (5,3)
3 Guarantee any TWA negotiations about Rolls-Royce (8)
4 Needed after a while, basically (4)
5 Permissive character? (6)
6 Quarter version of Bible in less than a byte! (6)
7 No profit in Gary's definitions of jargon words? (8)
14 Rid awful newspaper of aimless movement (5)
17 Commercial package disposed towards right (8)
18 Hospital discard corrupted storage medium (4,4)
19 Revised a lousy program? (8)
21 Plug-in memory in revolutionary shiny finish (6)
22 Dicky Carson's computers, generically (6)
24 There's little thanks in being like a swan: change! (6)
26 Presentable cartoonist (4)

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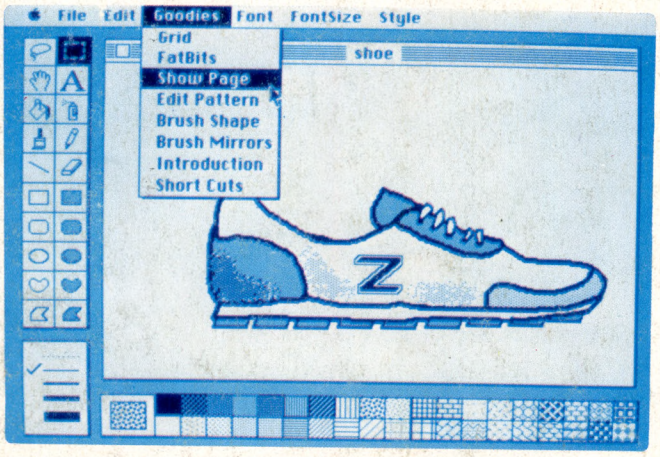

finitely better organised. Macintosh: a powerful productivity tool so easy to use you can set to work with just one finger.

Imagine: you select tasks, or edit text and data, by moving a 'mouse' on your desk to move a pointer on the screen.

Simple? Certainly. But ready for the most complex tasks.

This sample screen shows Mac's pull-down menu, and windows that let you work on several sets of data at once. All based on totally integrated software so you can move between graphics... word processing... project management... as fast as your creativity can run.

In addition to Mac's own software, world-famous packages from Microsoft — like Multiplan, Chart, Word and File — are now available to expand your business options.

Here's the fast way to get your hands on Macintosh: visit our brand-new Macintosh Centre, (Britain's first!) in the heart of London or call 01-377 1200.

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Apple have put your finger on it!