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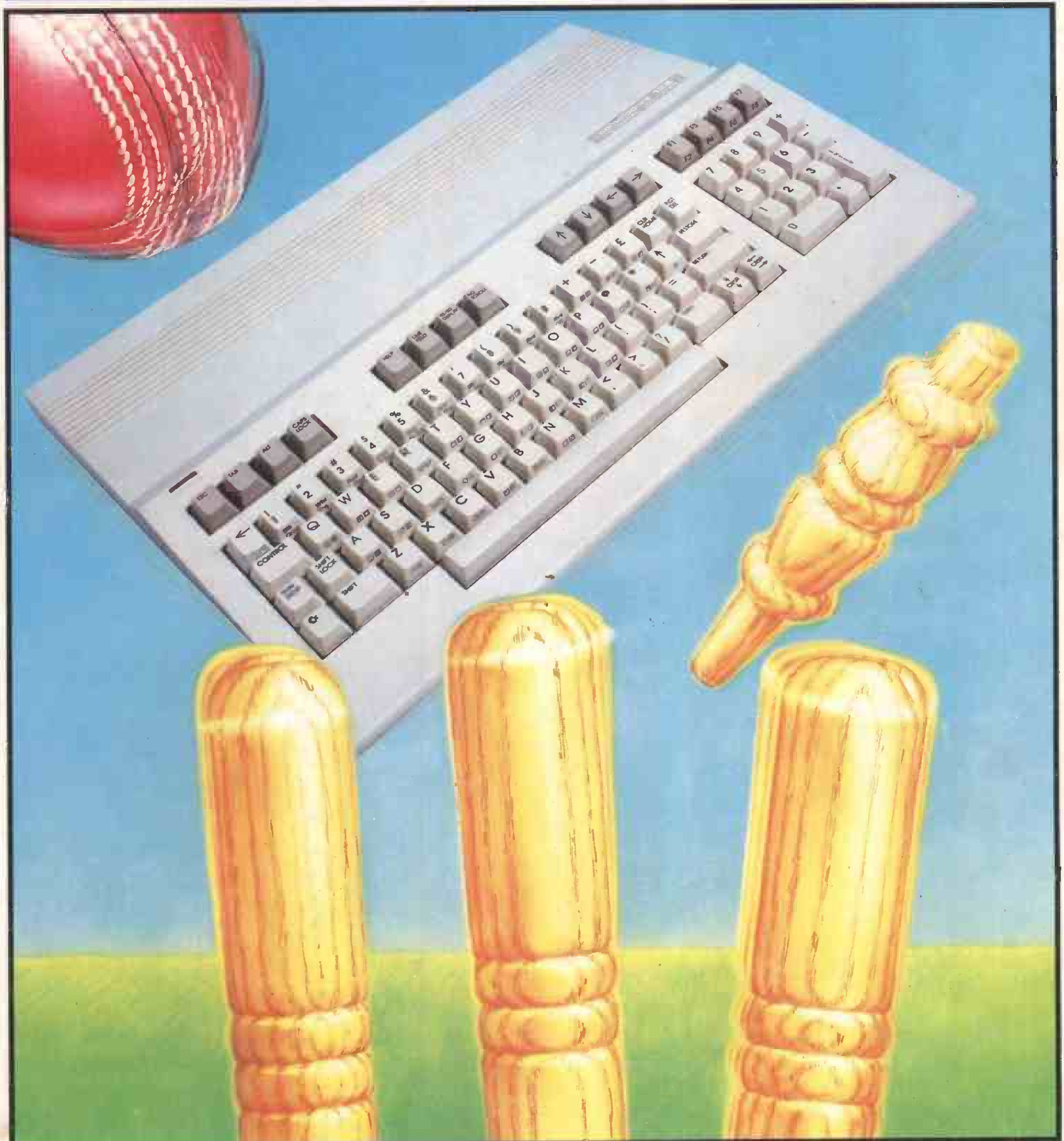

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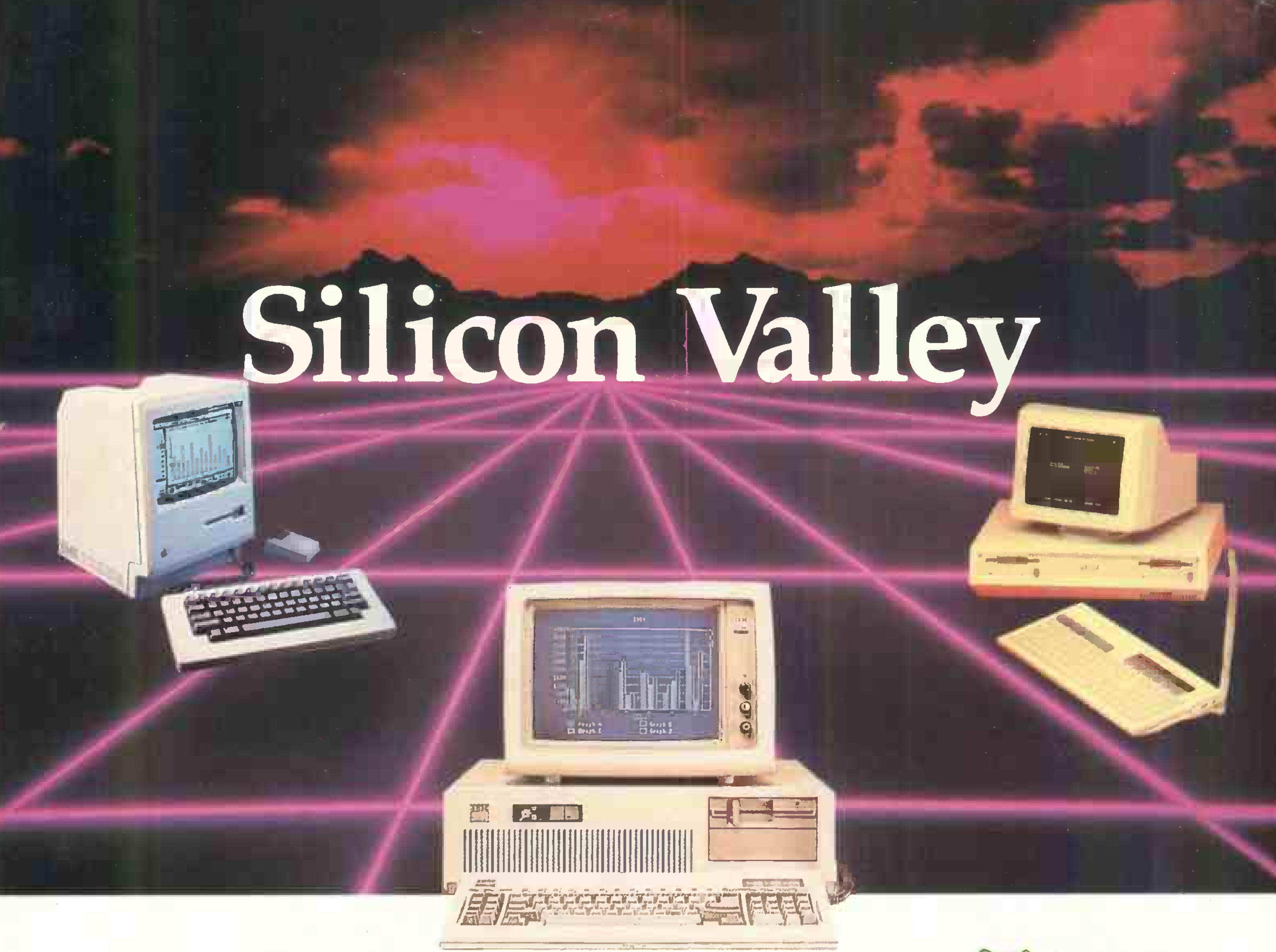

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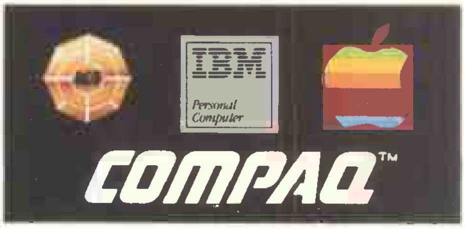

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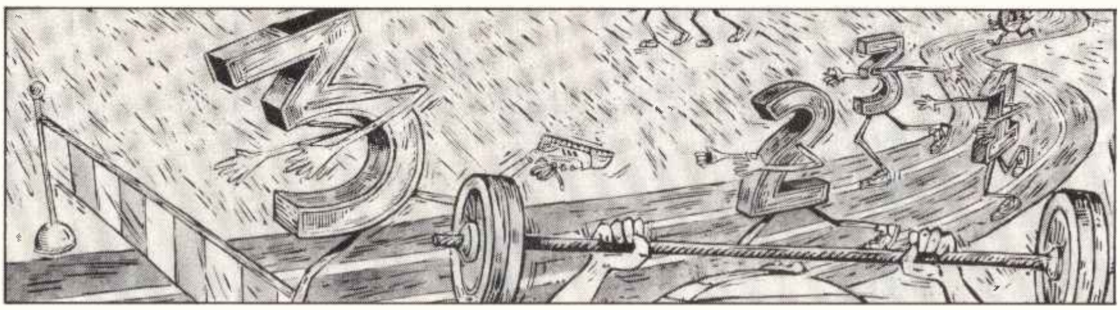

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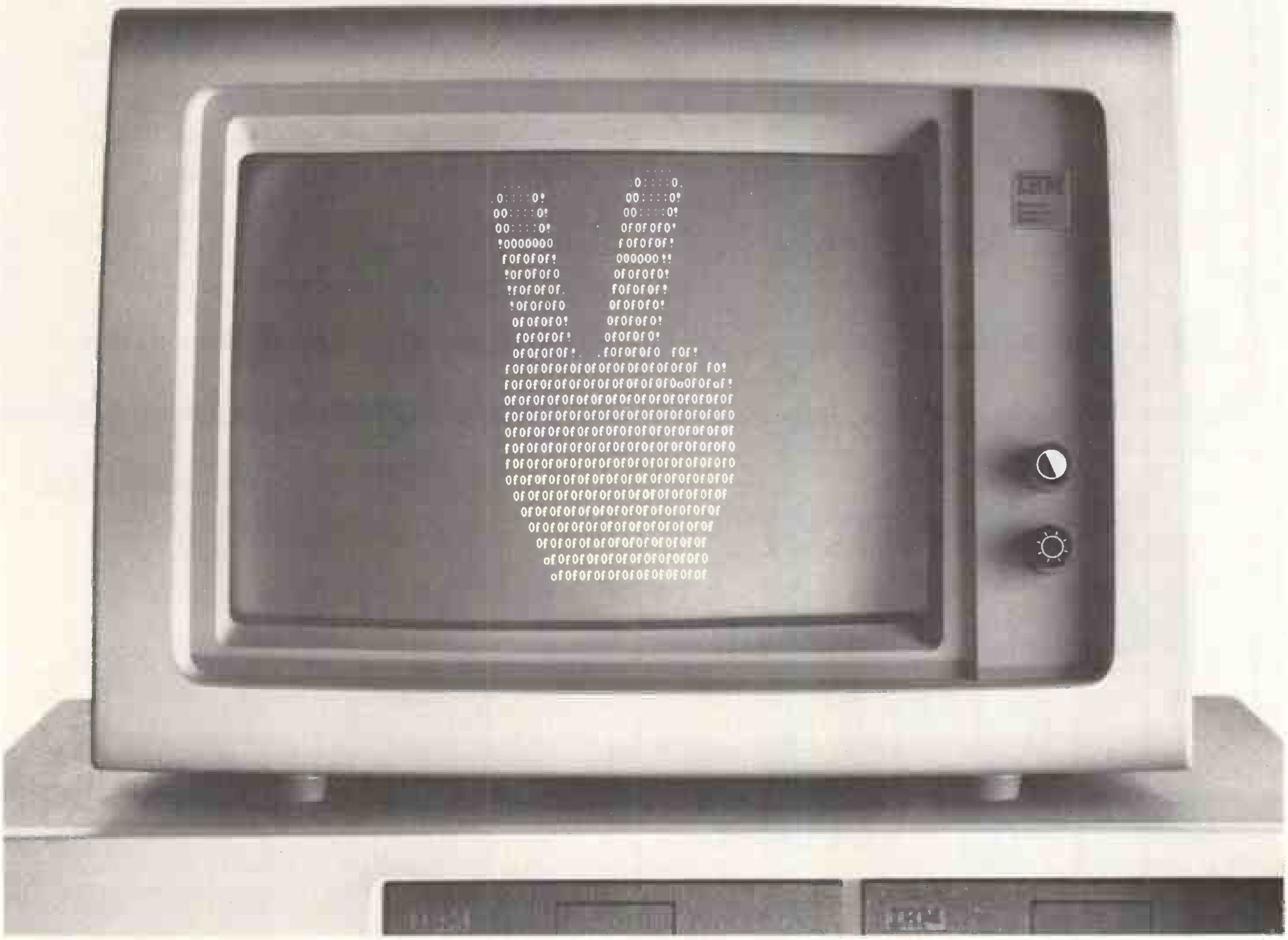

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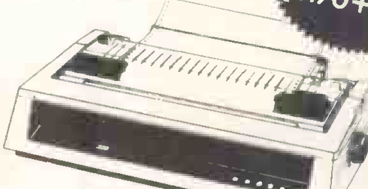

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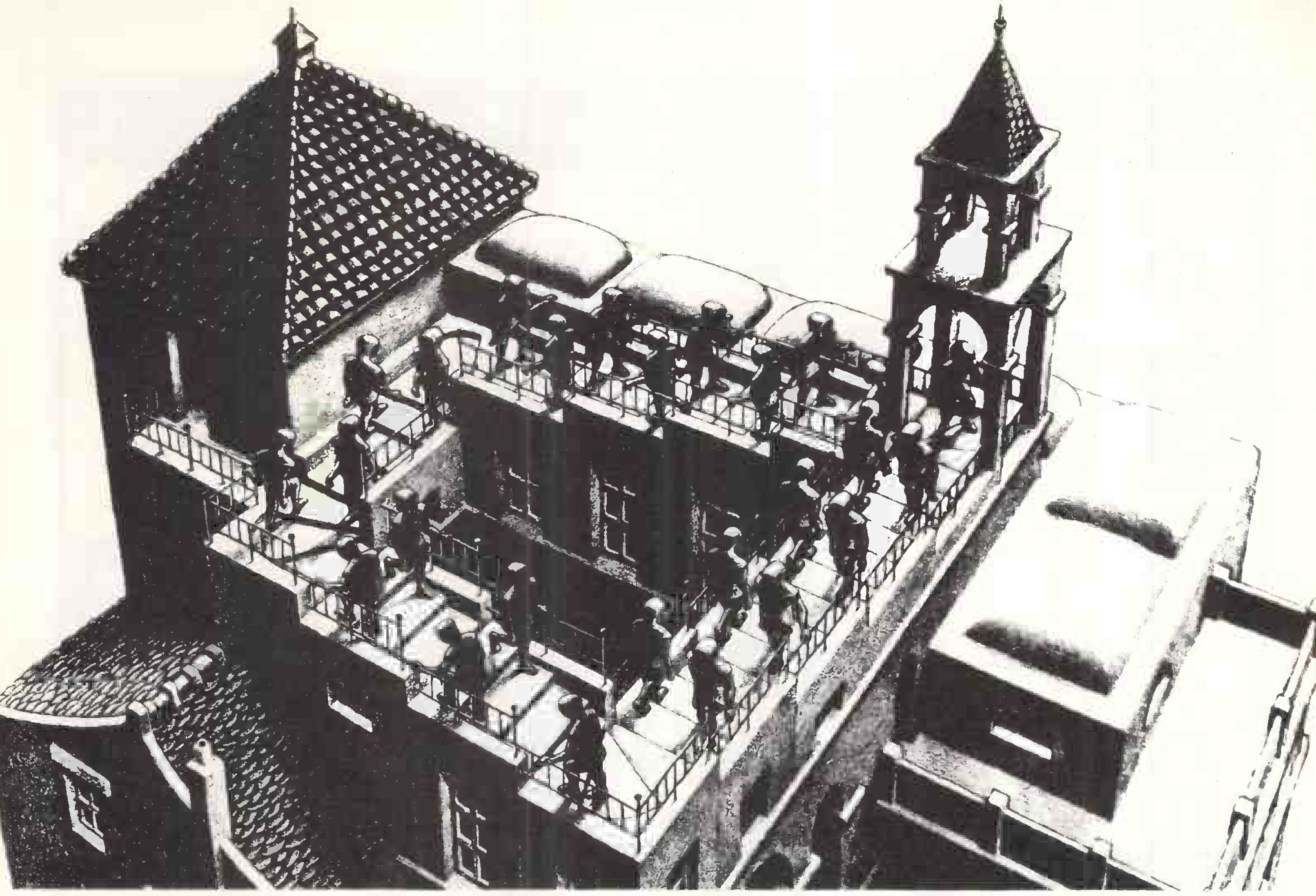

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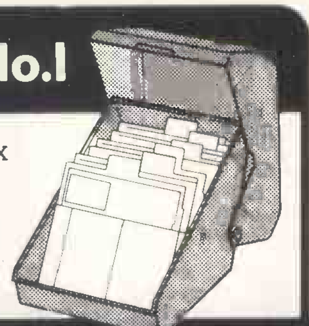

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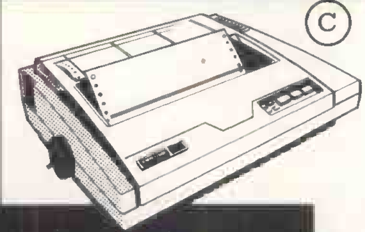

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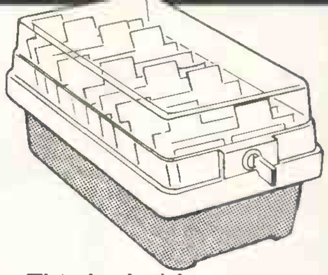

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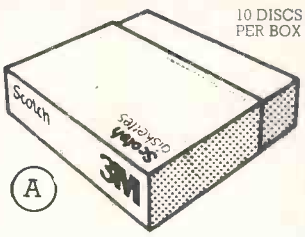

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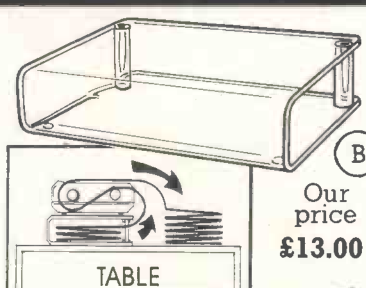

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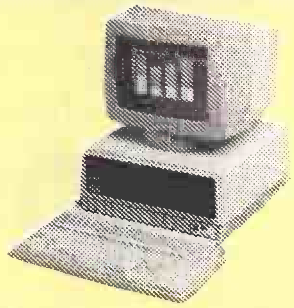

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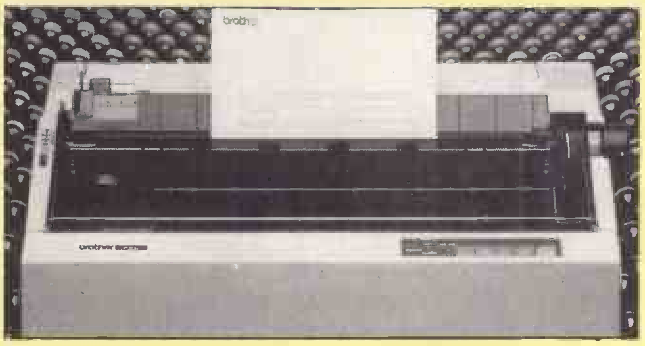

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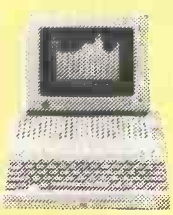

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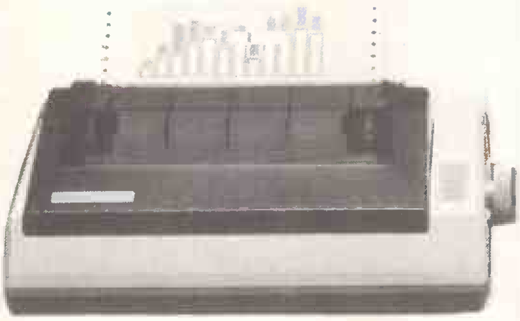

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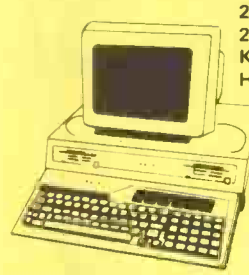

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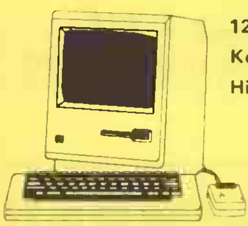

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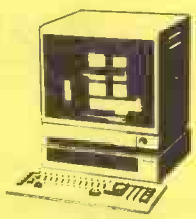

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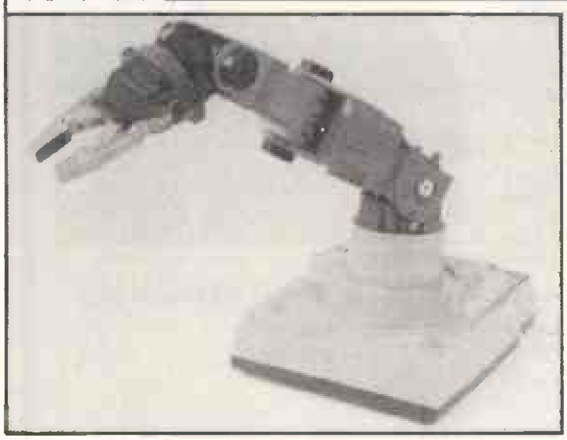

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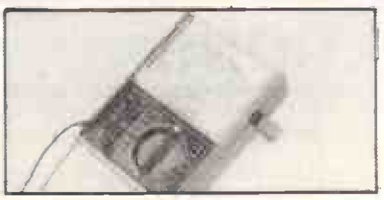

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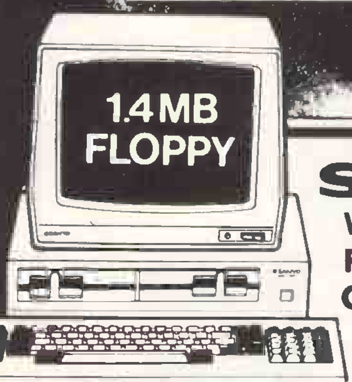

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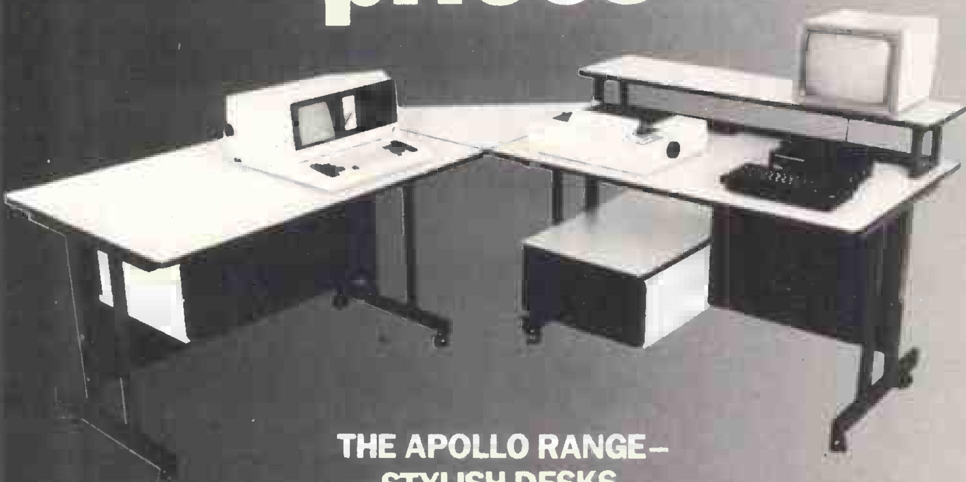

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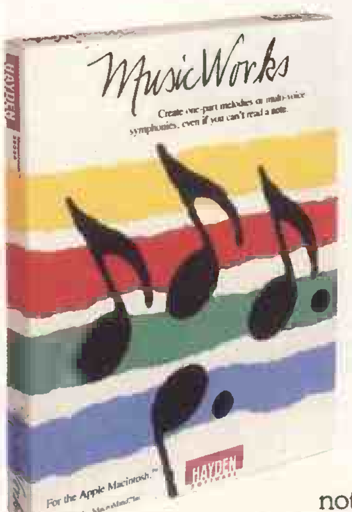

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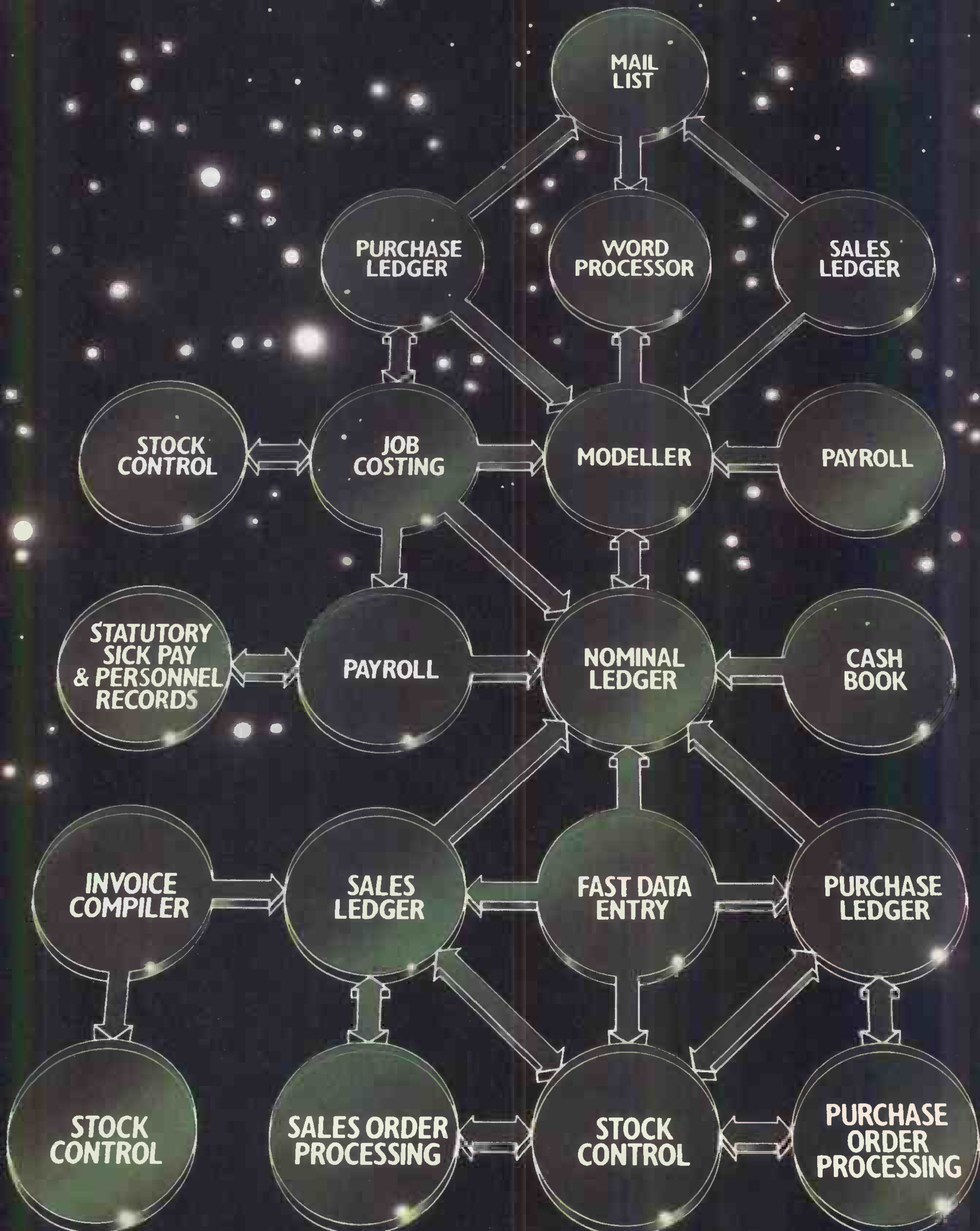

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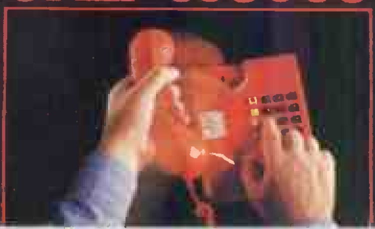

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Miss Carruthers beats the clock, thanks to Typing Tutor III™

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Miss Carruthers fumbled for her correction fluid once again. So much of the stuff was brushed on her letters, they had to be sent by parcel post.

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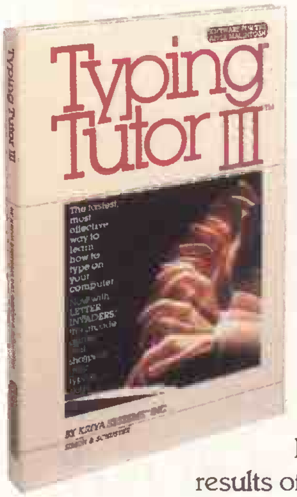
After all with a recently acquired computer in the office, she'd have to sharpen up her skills pretty quickly.

TYPING TUTOR III – THE KEY TO BETTER COMPUTING



Available for the Apple II,™ Apple Macintosh,™ Atari,™ Commodore 64™ and IBM PC.™ Typing Tutor III allows professionals, students, writers and secretaries to utilize the power of a personal computer to the full.

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Typing Tutor III contains a feature called Time Response Monitoring.™ TRM™ analyzes the results of each test and clearly shows your speed, accuracy, strengths and weaknesses. And to help you see the error of your ways your progress is reproduced in graph form.

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Typing Tutor III also comes complete with Letter Invaders.™ An exciting arcade-style game in which you have to defend earth from invading fleets from outer-space. As each letter or symbol comes into view, blast it by typing it on the keyboard. As your typing gets faster the game gets faster.

Typing Tutor III is simplicity itself to use and comes complete with reference manual.

It's available from your local Softsel dealer along with over 2,600 other titles from over 250 publishers.

Miss Carruthers typing improved beyond all recognition. So much so that Harry Armitage entered her for the Typing World Championships.

And although she romped home with a top score of 160 wpm. he knows of one lady who could beat his secretary out of sight in the words-per-minute stakes.

His mother-in-law.

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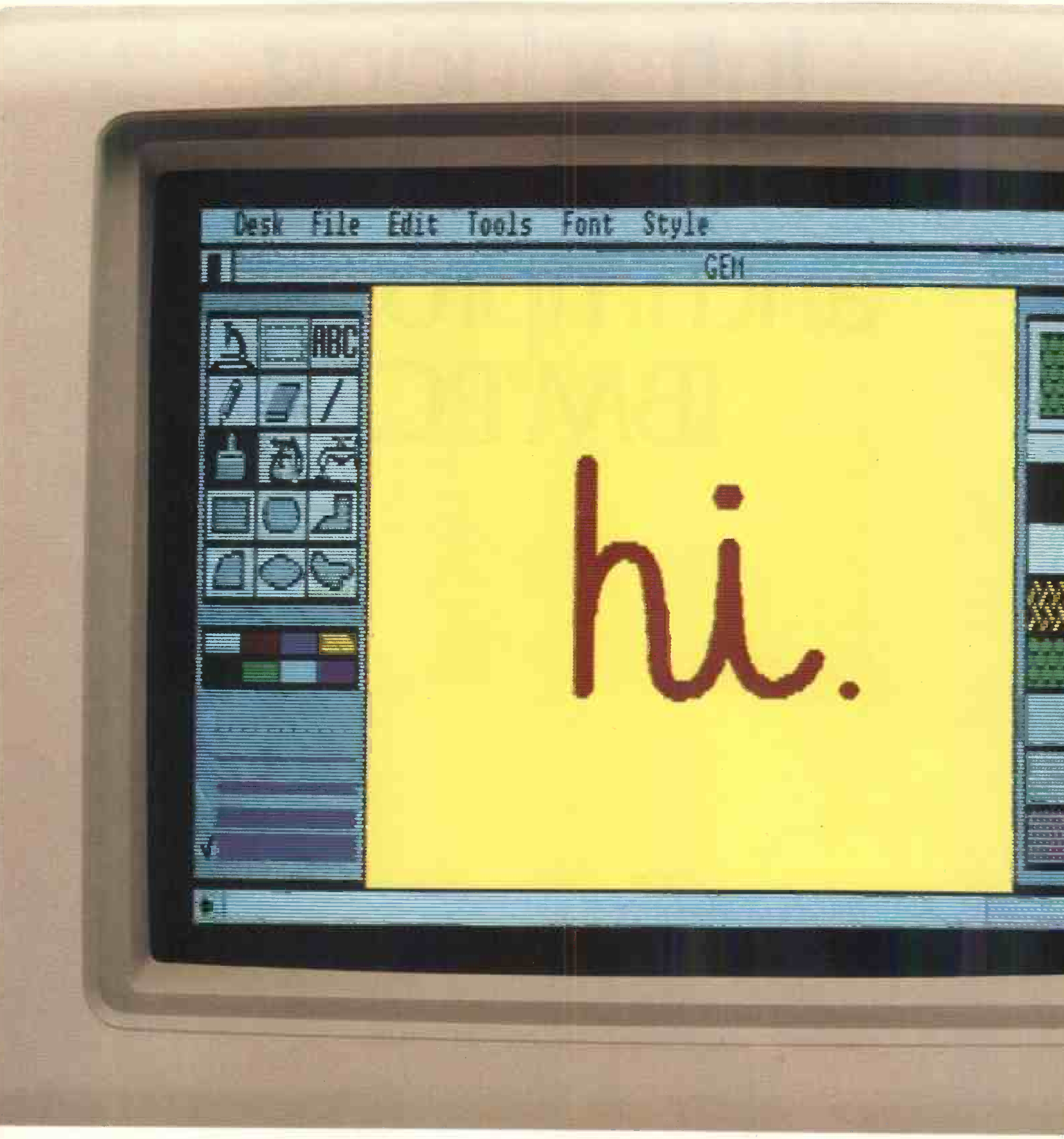
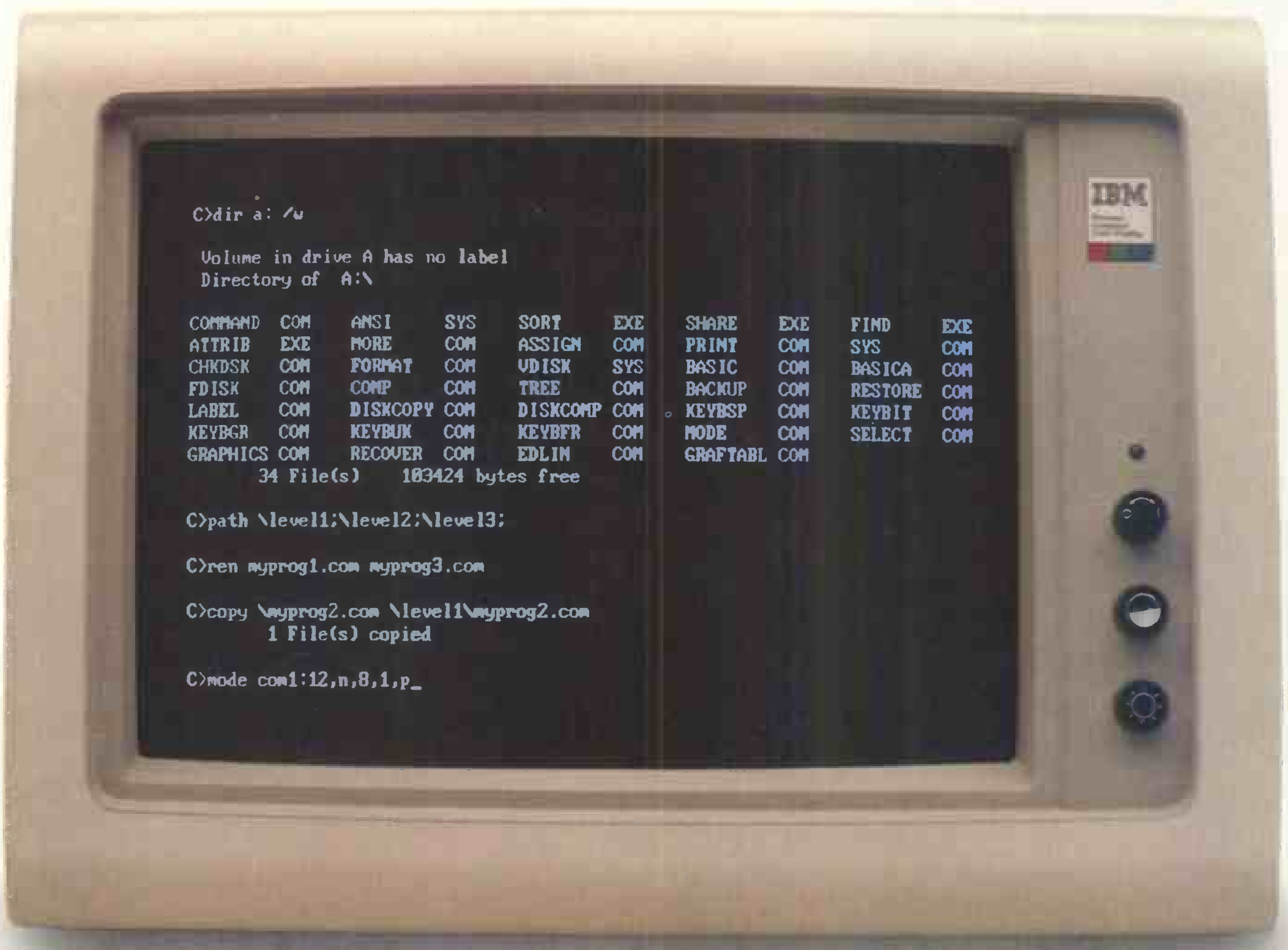
Introducing



To see how easy it is to use GEM, take this simple screen test.



OK. Take a close look at these two screens.

One is an IBM PC with PC DOS. The other is an IBM PC with GEM.

You can work out which is which.

The PC DOS screen is the one that seems to be designed for an engineer. Or someone with a photographic memory.

It requires you to type and memorize nonsensical terminology like *c>copy \ myprog2.com \ level1 \ myprog2.com*. All just to copy a file.

But most people think in ideas. Words. And pictures.

Which brings us to the GEM screen.

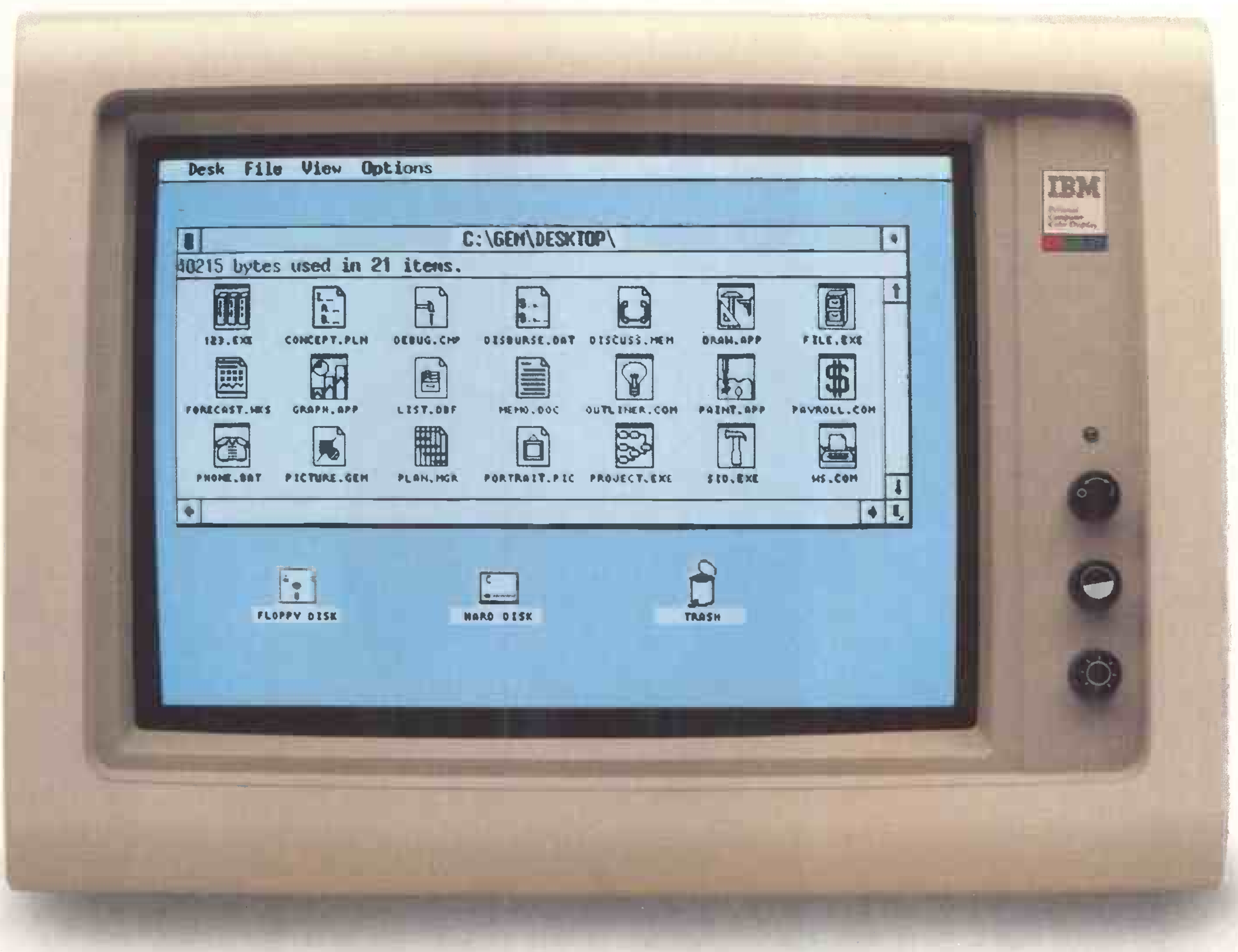
It's the one with pictures of the things you use in your office. Like file folders. Diskettes. And a wastebasket.

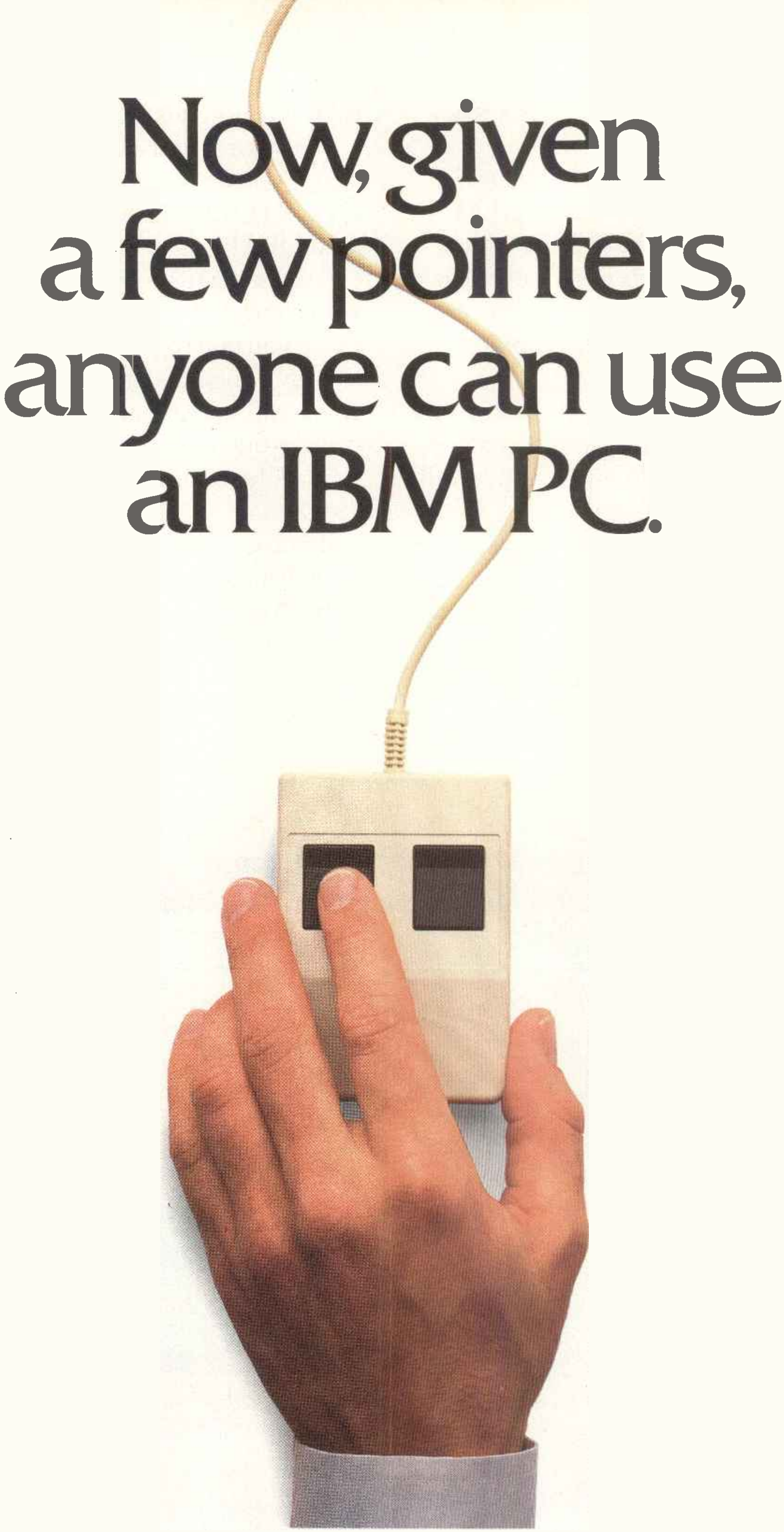
Plus words describing the kinds of things you do in your office. Like OPEN FOLDER. SAVE FOLDER. And QUIT.

Copying a file is as easy as pointing with a mouse (or cursor key – if mice make you uneasy) to the file you want to copy. Then you just slide the file across the screen to the diskette you want to put it on.

Well, by now we've probably given it away.

If you guessed that GEM is on the right-hand screen, you're absolutely right. And if you think GEM looks easy to use, you're right again.




Now, given
a few pointers,
anyone can use
an IBM PC.

Have you ever noticed how people in your company get up from their PCs looking rather dazed?

That's called PC DOS anxiety.

And it goes away when GEM enters the picture.

Because with GEM everybody already knows everything they need to know to run a PC.

Like how to point.

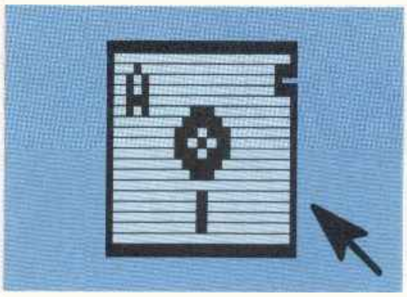
Click.

Read a menu.

Open a file folder.

Or throw a bad idea in the wastebasket.

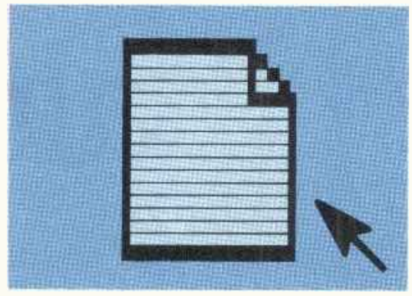
Who knows, GEM software could even turn people with deep-rooted PC-phobia into absolute PC-enthusiasts.



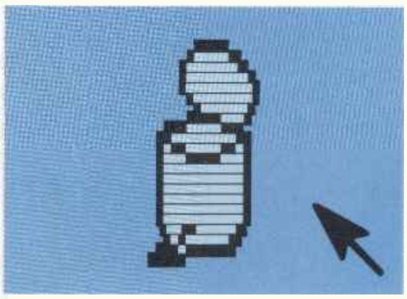
With GEM software you don't have to switch gears to switch drives. You can just point and click your way from drive to drive. No matter how many drives or diskettes you're using.

GEM file folders hold whatever you put on a diskette. From entire software programs to reports, pictures and presentations.

In fact, GEM file folders can even hold other file folders. And so on.



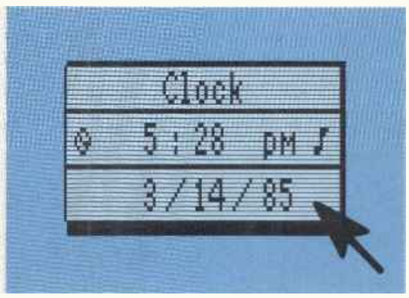
GEM software even includes "generic" file folders, places to hold random ideas, memos, numbers and the like until you're ready to file them in a GEM folder. Or in the wastebasket.



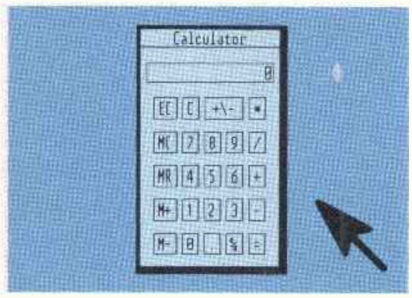
Part of getting organized is knowing when to let go of outdated files.

GEM can't tell you which files to get rid of. But it can help get rid of them.

And should you dispose of a file before its time, you even get a chance to change your mind.



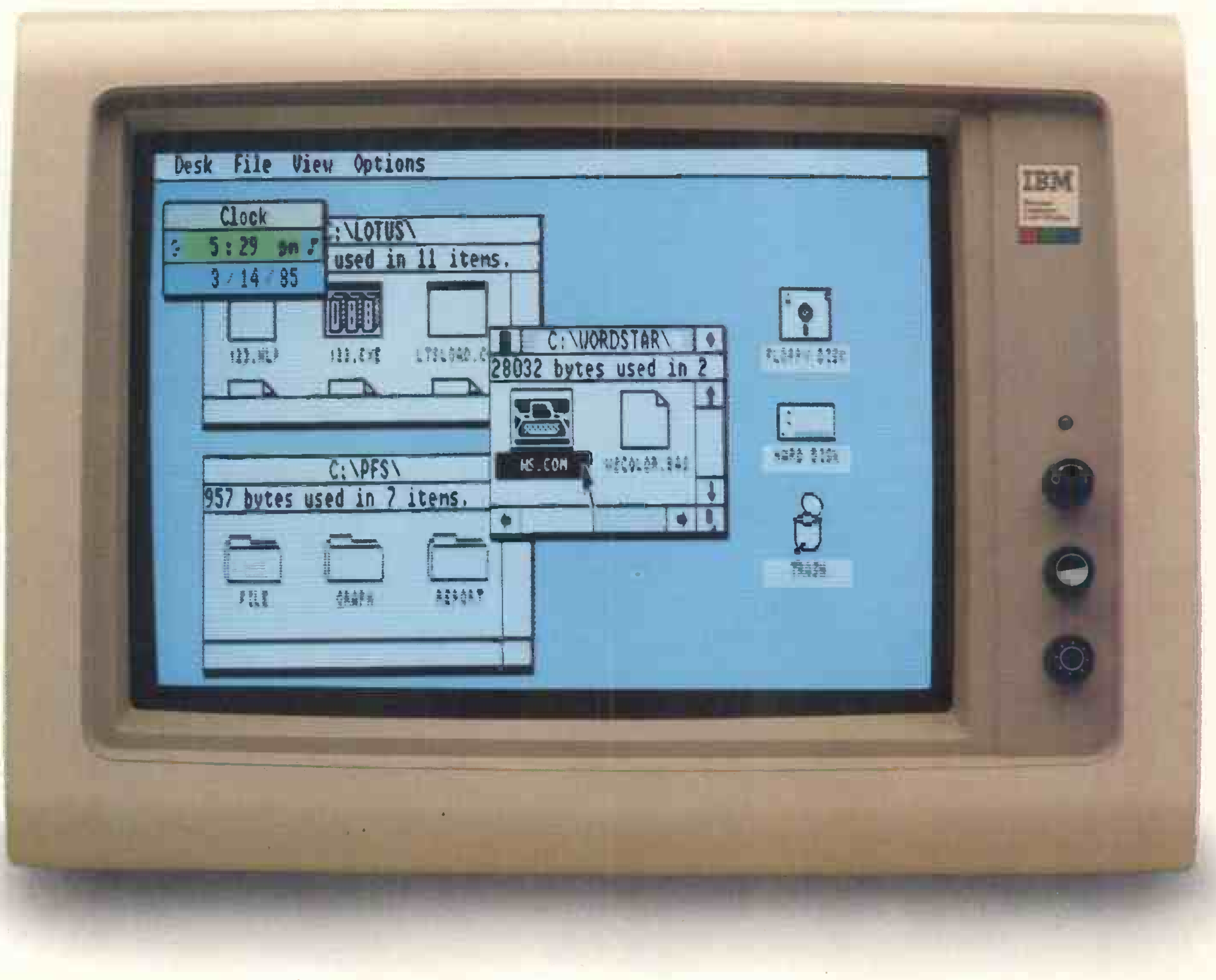
If you're clever enough to read these words, you've no doubt figured out what the GEM clock is for. Staying on schedule, for instance. Keeping track of the time it takes to do specific projects. Or getting to your airplane on time.



GEM even includes a calculator, so you can tally up all kinds of important things.

Like the time and keystrokes you save by working with GEM software.

GEM already works with most of the software you already have.



We know what you're wondering.

If GEM software is going to change the way you work with your IBM PC, will you still be able to work with your existing software?

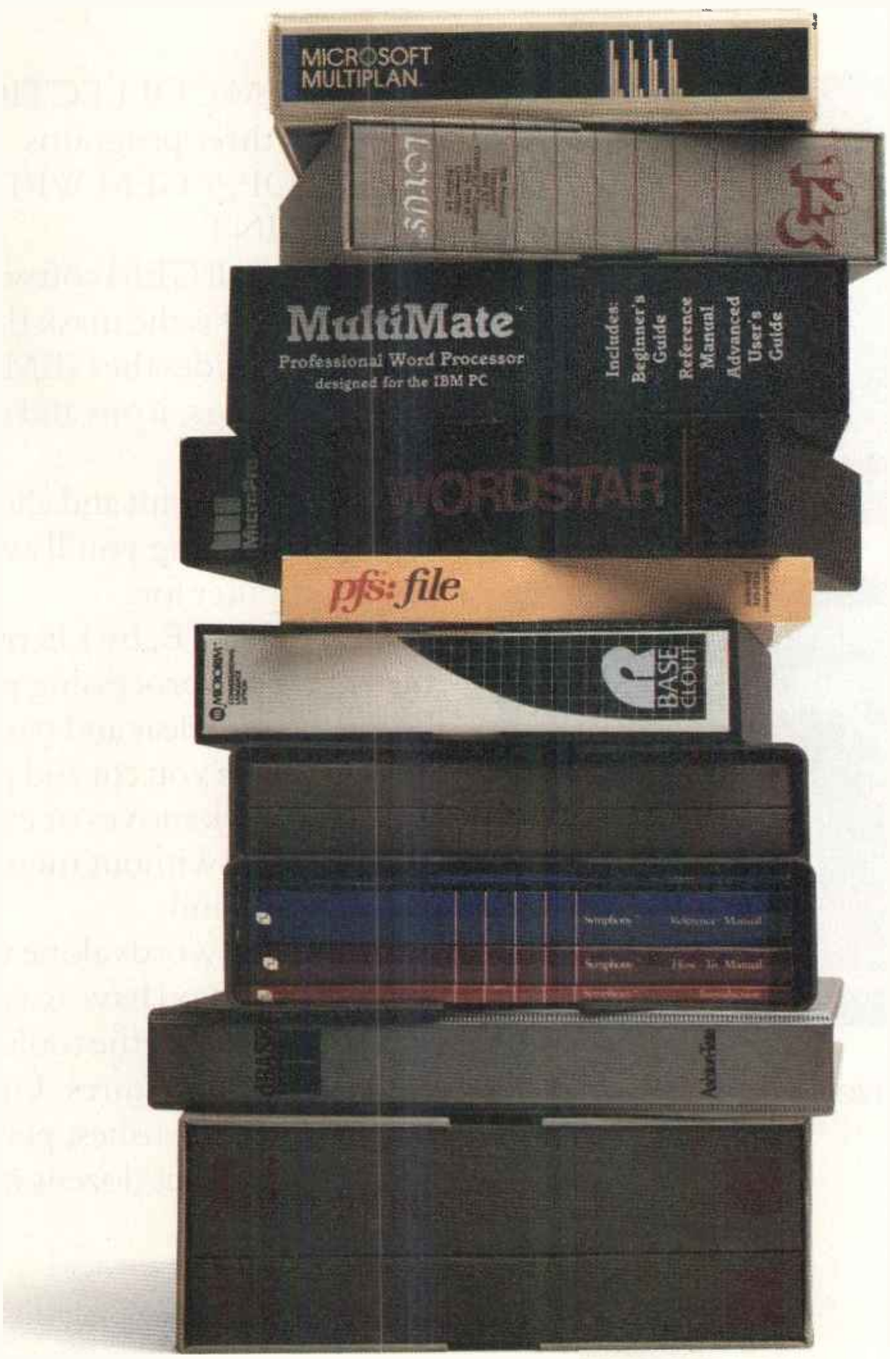
Of course.

GEM works with most important programs that work with the IBM PC.

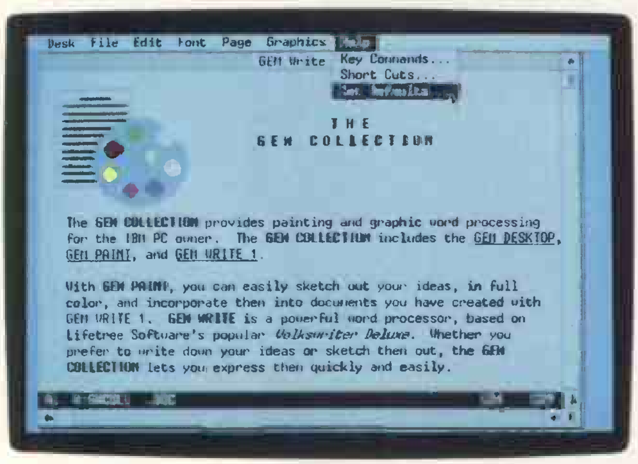
Like Lotus 1-2-3.™ Symphony.™ Multiplan®. dBASE III.™ Framework.™ And thousands more.

Technically, you see, GEM software doesn't actually change PC DOS. It just hides it.

So your software works just the way it always has. But without the long and cryptic PC DOS start-up procedures.



But the best software for GEM is GEM software.



The GEM COLLECTION
Now you can work with words and pictures together.

The GEM COLLECTION™† is a bundle of three programs, GEM DESKTOP,™ GEM WRITE,™ and GEM PAINT.™

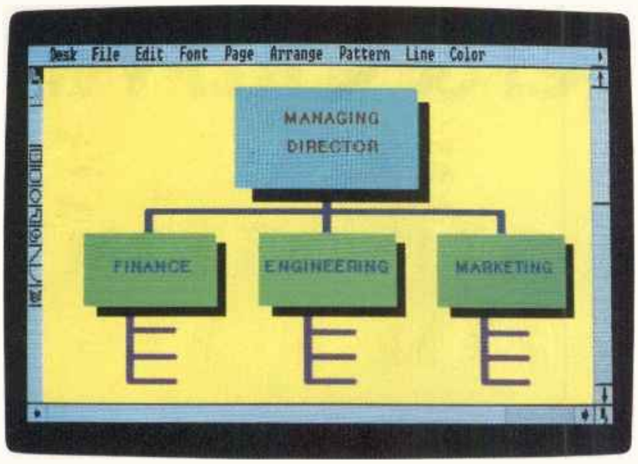
A part of all GEM software, GEM DESKTOP* is the mask that hides PC DOS. It includes the GEM pointer, menu headings, icons and drop-down menus.

So you can point and click your way through anything you'll ever want to use a computer for.

GEM WRITE, by Lifetree Software, Inc., is a word processing program featuring fast, clear and comprehensive editing. It lets you cut and paste, make multiple block moves or even create columns. All without memorizing a single command.

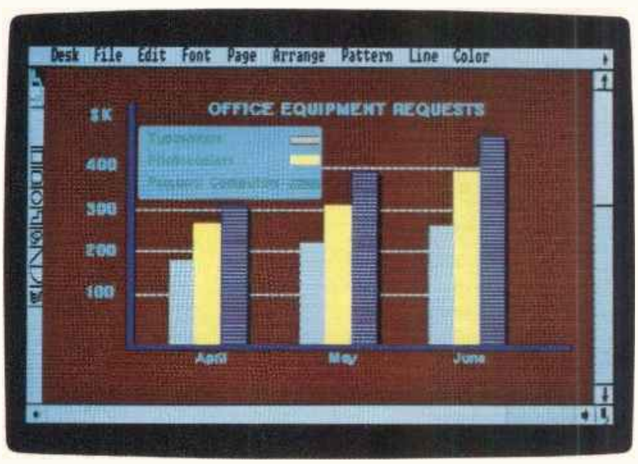
And when words alone won't express what you have to say, GEM PAINT gives you the tools to turn your ideas into pictures. Up to sixteen colours. Paint-brushes, pencils and a straightedge. Plus dozens of shapes and patterns.

*GEM DESK TOP is also avilable as a stand-alone product.
†GEM COLLECTION; available July 1985.



GEM DRAW
A perfect illustration of the power of GEM software.

GEM WORDCHART
Present it with style.



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**GEM WORDCHART and GEM GRAPH; available September 1985.

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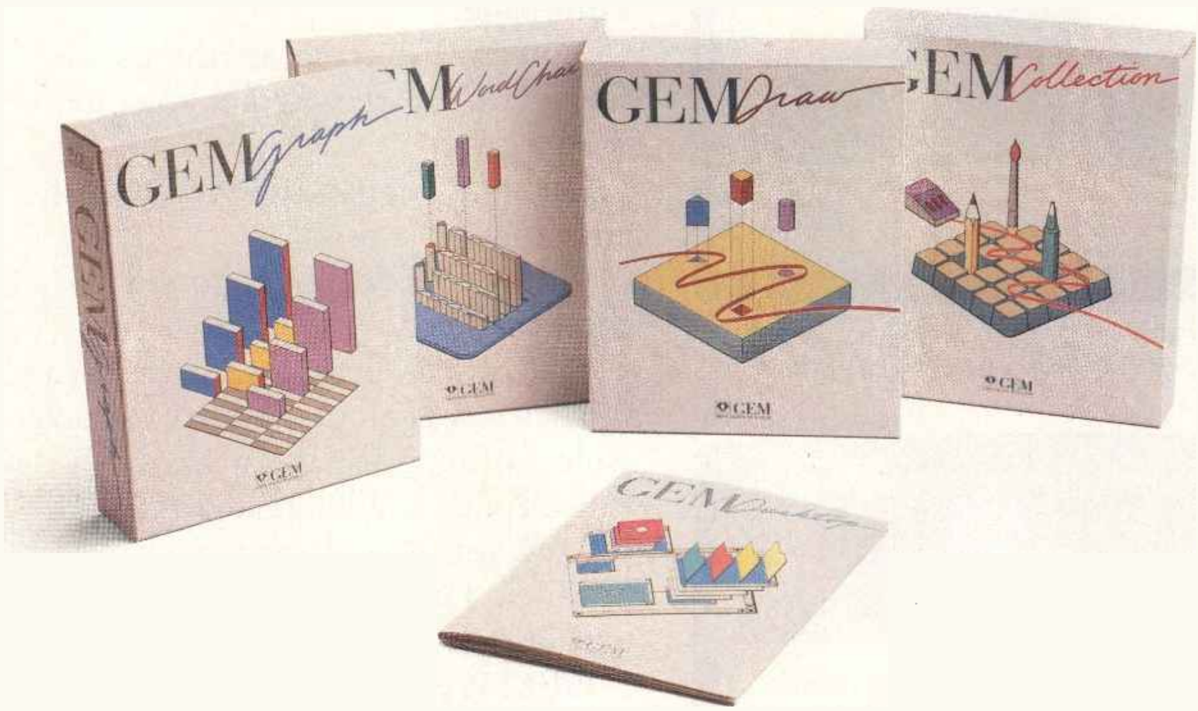

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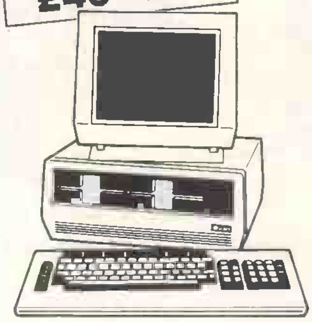

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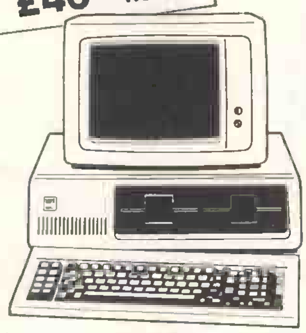

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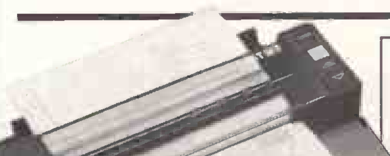

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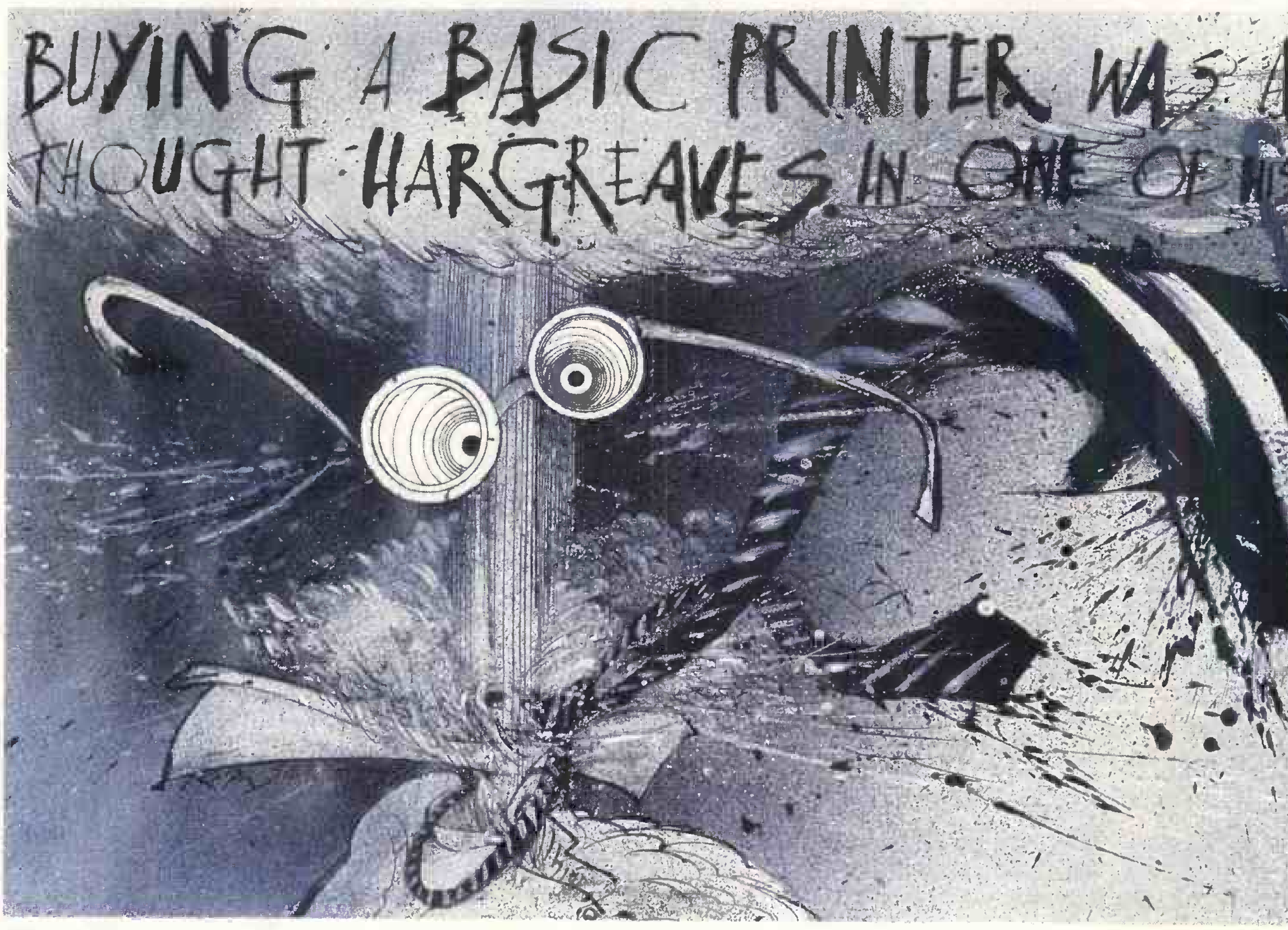

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FONT 464 is an easy-to-use program enabling you to design, edit, and save your own characters and graphics for simple use in BASIC programs. There are 6 predesigned fonts and sophisticated printer-driving software which allows high-resolution screen dumps and letter writing on Epson compatibles or the DMP1.

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Pascal is a valuable educational and development tool as well as running typically 40 times faster than a BASIC equivalent. Our compiler is an almost full implementation which compiles direct to machine code (no slow P-codes). Multiple file inclusion allows very large programs to be compiled.

MON QL is our latest product and our first on the QL; it was written by Andy Pennell, who has a great deal of experience on the QL. It is similar in style to the well-known MON 'front panel' in DEVPAC and includes additions like job control and multi-tasking support. It also catches system exceptions and includes fixes for QDOS.

Product Price Table

	Pascal £	DEVPAC £	C £	ULTRAKIT £	FONT 464 £
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Amstrad CPC464	29-95	21-95			7-95
MSX	29-95	19-95			
CP/M-80	39-95	39-95			
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All prices are for cassette versions (except CP/M and QL) and include VAT and p&p in the UK. Please contact us for export orders, disc formats or detailed technical information packs. All products are available by mail order: please send a cheque or Postal Order. Sorry, we do not accept credit cards.

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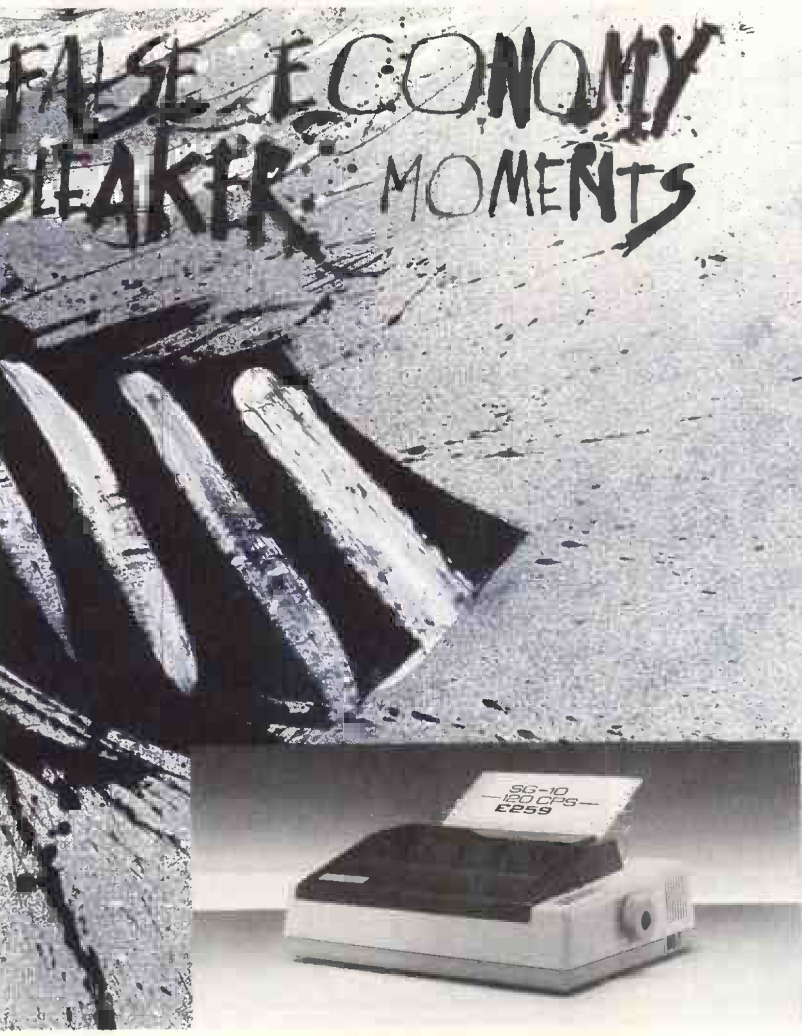

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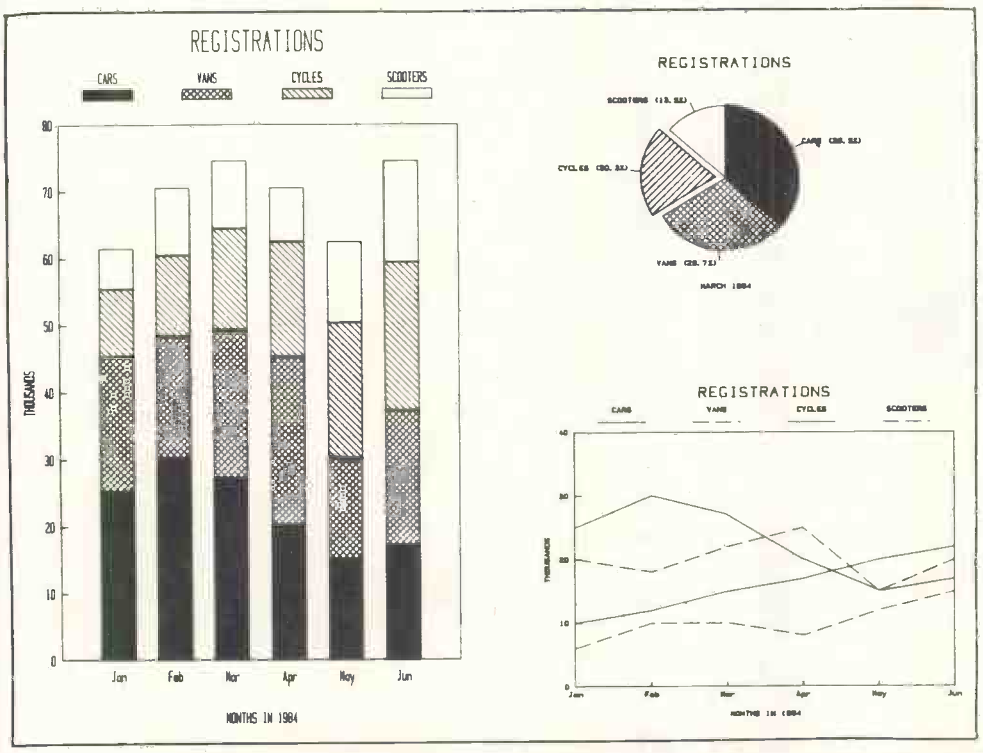

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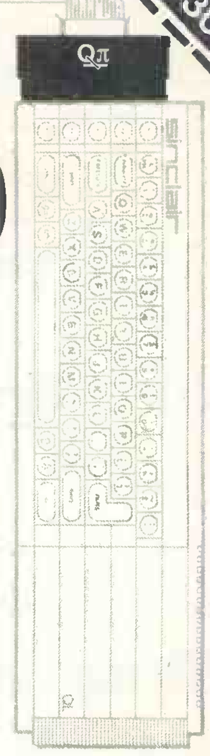

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BUSINESS OR · PLEASURE ·

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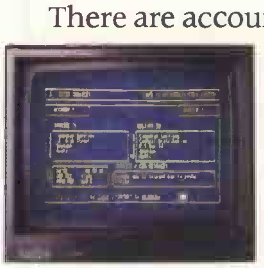

Amsoft Business Control, is a complete suite of programs for integrated sales invoicing, stock control and sales ledger for around £99. (Requires an additional FD-1 disc drive around £159 and DL-2 cable around £7).

The CPC 664 is also supplied with CP/M* to help make your business more efficient and effective by providing access to the famous range of CP/M* software.

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The one thing you won't need a computer to work out is that the Amstrad CPC 664 represents outstanding value for money.

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With a green screen monitor the cost is just £339. With a full colour screen it costs £449. And after you've saved money on the price of the computer itself, you go on saving on the price of software.

There are hundreds of programs for business or pleasure available on disc (and cassette) to CPC 664 users. Many from Amsoft, others from other famous-name software houses. Few will cost you more than £49 and most will cost you considerably less.

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There is a complete range of peripherals available to CPC 664 users which plug directly into the built-in interfaces.

These include a joystick, additional disc drive (to double your on-line storage) and the Amstrad DMP-1 dot-matrix printer. (There's also a cassette interface so that you can use CPC 464 programs on tape). And there are many more peripherals from Amstrad and other manufacturers which can be used to enhance the CPC 664.

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PCW SHOW FOCUS

The 8th Personal Computer World Show

The 8th PCW Show takes place at Olympia, London, 4-8 September. It's the biggest event of its kind in the UK, appealing to personal computer users in business, in the home, and in education. Here's the first detailed look at what's in store.

Making the most of the show

A day at PCW Show presents an ideal opportunity for first-time buyers in particular to see for themselves what's available in small business micro systems. The hard part, of course, comes later, choosing the one that's right for your individual business. As well as the stands on which companies will be demonstrating and displaying their products, and staff will be ready to answer questions, there are also some extra features which we've added to the show, both to help you make the most of your visit and to make that all-important decision afterwards.

The first two days are reserved for business and trade visitors, so they will probably be less crowded than the Friday, Saturday and Sunday. But whatever day you plan to come, if you're a business or professional user, you can apply for a complimentary ticket. This enables you to register in advance, to obtain a personalised VIP visitor pass which means you can walk straight in at the entrance to Olympia without having to fill in the registration form at the desk.

If you know the companies or the types of product you want to see, it also makes sense to use the product locator service. Just fill in the form and we'll give you a plan of the show, showing the location of the relevant stands. That way you can go straight to them, and avoid any wasted time and effort.

Anyone wanting to know what software is available for their specific application has two key sources of advice and information. On the Upper Level of Olympia 2 is the consultancy area, which brings together a number of specialist consultants with a wide range of experience, and the PCW Show Applications Software Advisory Service. This is a database system which lists every available piece of business software, identifying the application, supplier, operating system and other details — whether or not it is being demonstrated at the show.

The busy scene at last year's PCW Show: this year's will be even bigger.

On the ground level, look out for the NCC Microsystems Centre near the foot of the up escalator. The Microsystems Centre offers impartial advice and information, trying, in the words of senior consultant Eric Bagshaw "to educate the business user into a mood of cheerful scepticism. Cheerful, in the knowledge that, if he gets it right, the system will pay for itself in under a year, and sceptical in the knowledge that some of the salesmen he may deal with were selling used cars until last year."

Running on the stand will be the NCC Directories on Disc, which provide up-to-date information on microsystems, hardware, software and training: more than 5000 business software packages, 3000 different systems and 2000 training courses avilable throughout the UK. Next door in the PCW Show lecture theatre, a team of consultants from the Microsystems Centre will be running daily seminars on how to choose your system.

These sessions cover the main issues involved, starting with the question why use a micro at all? The NCC view is that one business in four needs a computer "like a hole in the head" while for the other three the difference between a successful, effective system, is one part discipline, one part training and operation, and one part dealer support. Other topics include the pre-conditions for success, choices and trade-offs (this can mean ease of use v flexibility and power as well as the more obvious price or performance decision), criteria for choosing a dealer as well as a system, and finally security, back-up and contingency planning (summed up by Bagshaw as "if it can go wrong — it will.")

The seminars will be given at 10.30 and 2.30 on Wednesday, Thursday and Friday, September 4, 5 and 6, and at 2.30 only on Saturday September 7. The fee at the door wil be £25 + VAT, but for those booking in advance there will be a 50% discount, making the fee £12.50 plus VAT.

NCC Microsystems Centre, 11 New Fetter Lane, London EC4A 1PU. Phone 01-353 0011/5.

Room with a view

"Very nice, dear . . . but what does it do?" For every home computer user whose demonstration of treasured system has brought this response from girlfriend, wife or mother, the National Hall at PCW Show has the answer.

Tomorrow's Micro Home at PCW Show brings together all the latest in home electronics and computing — TV, video, hi-fi and computer-linked videodisc, all in a futuristic "living room of the future" setting. Sponsored by Toshiba, the feature also includes the home control system recently unveiled in Japan which can answer the phone, adjust the heating and even control burglar or fire alarms. Final development of the system is still under way, to add a number of extra devices including one which will turn off the taps to stop the bath overflowing.

Although videodisc has had little or no impact in the home market so far, it does have its uses. The advantages of disc over tape for video are the same as for computers: speed of response and the ability to access frames in any sequence, including step-forward and step-back, which makes it useful for computer-aided learning and Toshiba believe that, as home computers develop, so will the interactive videodisc.

The setting will be more than a show stand. It will be a "room set" with furnishings by one of London's most exciting interior designers, providing a fitting setting for the new technology. Look out for further details nearer show time.

PCW SHOW FOCUS

Coming in from the cold

Teachers involved with computers in the classroom often complain that they feel "out in the cold" without much genuinely useful help and advice. Over the years many of them have found that visiting the show is a useful way to keep abreast of developments so we have now decided to give them some specific help through the PCW Show Computers in Education feature. Located in the main National Hall, this new centre will be manned by a team of specialists — teachers or former teachers with first-hand experience of using computers in primary and secondary schools, and in higher education. They will be able to answer questions, help in solving problems, and demonstrate some of the projects undertaken with their pupils and students.

The stand is sponsored by Computers in Education Journal, the specialist publication, which operates a comprehensive database listing thousands of educational hardware and software products, all listed and cross-indexed by age, subject and other parameters including operating system. The system will be operating on the stand so that teachers and others involved in the education world, such as advisers, trainers and local authority support staff, will be able to identify the products which meet their needs.

Complimentary tickets for individual teachers are available in advance from the show organisers and these are valid for any day of the show. Admission at the door is £2.00; groups of 10 or more (including school parties) can obtain a discount of 50p per head by booking in advance but these are only available for Friday-Sunday, 6-8 September.

Commodore debut

Commodore's new 128k machine will debut at PCW Show and will go on sale at about the same time. Full details are still under wraps, but it will be upwards compatible with the C64. The new machine will sell alongside the 64, which the people at Corby say is still selling well. Further developments are promised for the show, which will be available in time for the Christmas period.

As well as the serious home user, the new 128 is expected to appeal to small businesses and the self-employed, using CP/M software which Commodore say is comparatively cheap, still widely avaialble — and familiar to many users who want to upgrade their existing machine.

The big push for the business market, of course, comes with the Commodore PC, for which a lot of development work is under way, particularly in the field of multi-user and multi-tasking systems. The first results of this effort will be seen at the show, as part of what is promised to be a determined campaign to re-establish Commodore as a big name in the business computer market.

Faster printer

A letter-quality printer which can output 10 pages a minute, retailing for less than £2000 is one of more than a dozen new products to be launched at the show by Micro Peripherals. First deliveries to customers are expected "within a couple of weeks" after the show, according to Micro P director Ian Donaldson, who forecasts increasingly fierce competition at the quality end of the printer market.

Also new from the Basingstoke-based distributor is a range of 1024 x 1024 high-resolution monitors for graphics applications and a series of modems including an auto-answer machine for mailbox use, which will accept messages unattended.

Answers to the Organiser question

When the Psion Organiser hand-held computer first appeared at last year's PCW Show, a number of people commented: "Great idea — but what's it for?" At Olympia in September, they should be able to see at least some of the answers to that question in the shape of Organiser packages for a number of different applications. David Potter, Psion's founder and chairman, says that specialist contracts already announced are worth well in excess of £1 million and several others are on the way.

Finding a use for the Organiser in the construction industry, performing quantity and cost calculations on site.

The most visible of these applications is for charge-card validation at Marks & Spencer stores. The card validation list, held on an M & S mainframe, is downloaded and then copied on to EPROM datapaks which are distributed overnight to each store, where they are plugged into point-of-sale Organisers, ready for immediate use. When a customer presents his card, the assistant keys in the number and the computer display signals "OK" or "Call Supervisor" if the card is not valid. At the end of the day, datapaks are returned to the central office and erased by UV exposure.

Of more widespread interest is the Wessex Materials Computer, a development of the Organiser for cost-estimating in the building trades. This allows a builder or quantity surveyor to perform quantity and cost calculations on site, storing the information in an EPROM datapak. The software includes calculation formulae for all the major construction trades, including concrete, brick and block, woodwork, steelwork, roofing and finishing trades.

This points the way in which further applications for the Organiser are likely to be developed. The initial software was produced by Psion on its powerful VAX-based in-house development system. Further enhancements will be provided by Wessex's own programmers, using the Forth Development System from Psion, which enables customers to emulate the Organiser on an IBM PC and which will be demonstrated at the show.

The Organiser itself uses a simple programming language called POPL. This is designed to enable even inexperienced users to write and store programs but is obviously unsuitable for developing specialist applications and that's where FDS comes in.

The virtues of Forth are that the programming system itself can be very small, as little as 8K and it produces extremely fast and compact code. Anything you can do in machine code or C, you can do in Forth, often faster and, as in Basic, you can write and immediately test parts of a program, allowing a "suck it and see" approach which makes for fast development and debugging.

When programs have been completely developed and debugged, they can be sent back to Psion for final processing on the VAX master system. This, the company says, gives a reduction of at least 20% in the size of the code before it is copied on to program packs.

PCW SHOW FOCUS

Now being shipped at a rate of 2 000 a month, the Xi is ACT's best-seller in the Apricot range.

ACT broadens its appeal

At the past two PCW Shows, ACT have provided two of the main attractions, first with the Apricot PC and then the Apricot Portable, both, incidentally, winners of the Standard Micro-Business Awards in their respective years. This is a hard act to follow, but ACT are confident they will have no shortage of new products at Olympia again this year, appealing to the whole spectrum of customers, from first-time computer users in small firms to large organisations needing advanced multi-user installations.

Since the last show the availability of software for the Apricot has increased dramatically, so widening its appeal. And from ACT itself have come important enhancements such as Communique and the Telecom Gold-based Micromail, as well as several additions to the Apricot range of machines at various levels of sophistication. Using ACT's on-board modem, Communique enables an Apricot user to obtain a range of information such as commodity, foreign exchange and stock market prices from organisations such as Extel and Datastream, plus detailed company data from Dun & Bradstreet, and to access the Textline and Datastar databases. These include articles from hundreds of international newspapers and journals including the Financial Times, providing a valuable source of background information on company, industry and market developments. The package also includes a full incoming and outgoing telex facility via Telecom Gold.

Although the initial interest in the system came from some larger organisations, many small and medium-sized companies are also now starting to realise its potential. Tony Bryan, managing director of ACT Computer Services, explains: "Business is increasingly competitive and increasingly international and that means that companies need rapid access to various kinds of commercial information." At one time, this kind of information was the preserve of big companies with established "connections" and research facilities — now it is readily available on the desktop. The telex facility is also attractive to smaller companies: Tony Bryan says it is more cost-effective than purchasing a conventional telex machine, even for firms which do not already own an Apricot.

Another aspect of the Communique package which will increasingly prove popular is the PIPS and BACSPAY service which offers complete automation of company payroll, including automated payment of wages and salaries through the Bankers Automated Clearing Service — again a facility once regarded as the province of the large organisation which is now more widely available.

The Apricot range is widening and prices of several machines are being reduced. In addition to the PC and portable, the range now includes the F1 machine for small businesses with a more friendly front-end, and the low-cost F1E for schools and colleges.

The original Apricot Xi hard-disk machine has now been enhanced and is available in three versions, of which the most powerful, the Xi20S has 1Mbyte of RAM, 20Mbyte Winchester and 720K double-sided floppies. All of these are expected to be demonstrated at the show but it is not yet clear if they will be joined by the newest product in the ACT line-up, the F2. First deliveries are bound for the United States during the summer and it may therefore not be available in the UK until much later.

New luggable on its way

Interquadram, a company which until now has been best-known for its range of PC add-on boards, is now planning the launch of the Dataview 25, one of several new portables which will be seen at the PCW Show. Like several other luggables, it has a 25-line LCD screen and can run on mains or battery. What makes this one different is that it is fully compatible, using standard 5¼in. disks, so it can run commercial software which is copy-protected.

Trevor Sutton, marketing director of Interquadram, sees the full-size disk as a big plus point in the portable market, or at least certain sectors of it: "If you want a machine for portable data-entry, or simple word-processing, the disk factor may not be particularly important. But if you are looking at a machine to run your standard software while you are away from base, you want to be able to move freely from desktop to portable and if your portable uses 3½in. disks you could have problems."

As well as the busy executive who spends much of his time out of the office, Sutton believes that the Dataview 25 will appeal to a range of users who need its specific features. These include, for example, consulting engineers and similar specialists who may need to undertake complex calculations while they are actually on site, who will probably also appreciate another of the machine's features, the hefty 640kRAM provided as standard.

In addition to the new portable, Interquadram will also be showing the full range of add-on boards and taking the opportunity to demonstrate how easily they can be installed. Other new products include Asher, a device which enables simultaneous speech and data transmission over the same phone line and a new colour ink-jet printer for high-quality graphics.

Write it yourself

An easy-to-use development system for companies which want to write their own applications programs is being launched at the show by Satellite Computing, which combines full on-screen help with advanced facilities for design, information retrieval, reporting and integration with other software.

Satellite director Kathy White says the package draws on the company's experience in producing custom applications software for business and industrial uses over the past four years: "We had very clear ideas about what a development system had to do, and we also knew that several existing packages were not really satisfactory for end-users. For example, some of those which claim to be simple don't have on-screen help facilities. We believe that the manual is something you keep on the shelf as a reference book — not something you have to consult every few minutes whenever you are using the system."

The new package is intended both for experienced programmers and for those who want to develop new applications for their existing systems but have no previous

PCW SHOW FOCUS

The Enterprise 128, unveiled a few weeks ago, will be seen running a variety of disk software at the show. The new disk controller, to be launched at Olympia, will run both 3½in. and 5¼in. drives.

Software to be seen on both the 64 and 128 includes arcade, adventure and strategy games, educational programs, utility and small business application packages.

programming experience. Satellite is also keen to see it used to develop vertical market applications.

Other new products which will be shown at PCW Show include software which allows data from a NEC lapheld to be transferred into application software running on an Apricot. Satellite is also using the show to promote its custom software business, which Kathy White describes as "for people who make and sell things rather than the insurance, banking and commercial sector," covering both minis and micros. Such as the sales management system recently developed for a large confectionery firm, including orders, sales ledger, analysis and reporting functions, which runs on a Sirius network.

Awards attract

Entries are already coming in for the 1985 Standard Micro Business Awards, as announced in the May edition of PCW. Sponsored by The London Standard newspaper, the awards are given for innovations in hardware and software which offer "outstanding contributions to business efficiency and profit."

Now in their third year, the Awards are attracting entries both from some of the industry's big names and from some of the smaller specialised firms, particularly in applications software.

Last year's winners were ACT for the Apricot Portable and Torus Systems for the ICON network product. The other finalists included Macintosh, Amstrad's CPC464 small business system, and the hand-held Psion organiser. Three software products were shortlisted by the judges — all of them integrated business packages: Lotus Symphony, Ashton-Tate's Framework and Psion's Xchange.

This year's entries will again be judged by a panel drawn both from the computer industry and the world of business and finance. Anthony Hilton, City Editor of The Standard is chairman, and other members include Eric Bagshaw of the NCC Microsystems Centre, Dave Tebbutt, software author and consultant who edited the Business Computing Survival Guide published recently by PCW, and Graham Cunningham, editor of PCW. The closing date for entries is 15 July and judging of the finalists takes place in late August.

The shortlisted products will be featured at PCW Show, and the Awards presented to the winning companies at an industry luncheon which is held at Olympia on the opening day of the Show, 4 September.

Entry forms and further details: The Standard Awards, PCW Show, 11 Manchester Square, London W1M 5AB.

How to find it

For anyone who missed PCW Show last year when it moved to its new Olympia home, the venue is easy to find in Kensington, West London.

Olympia has its own Underground station so it can be easily reached from all parts of the capital. Travel to Earls Court on the District or Piccadilly Lines and look out for the special PCW trains running throughout the show. If you are travelling by car, Olympia is readily accessible from the M3, M4, M40 and North Circular Road. There is ample parking for cars and coaches within a few minutes walk of the exhibition halls. Anyone flying into Heathrow can take the Underground from the airport direct to Earls Court and change there; from Gatwick, train to Victoria then Underground.

If you want to stay overnight, special discounts have been arranged for PCW Show visitors at hotels in all price categories from budget to 5-star. For details phone the Expotel hot-line on 01-741 4411.

Times and tickets

From Wednesday to Saturday, 4-7 September, the Show is open from 10.00 to 19.00 daily; hours on Sunday are 10.00 to 17.00.

Admission at the door is £2 and tickets are also available in advance from PCW Show Ticket Office, 11 Manchester Square, London W1M 5AB. Cheques should be made payable to PCW85/Montbuild Limited.

For organised groups of 10 or more admission is £1.50 per head; this is obtainable only in advance and not at the door.

Business, professional, education and trade visitors can obtain complimentary tickets in advance; application must be made on official letterhead or enclosing a business card.

The 8th Personal Computer World Show

4-8 SEPTEMBER 1985
OLYMPIA, LONDON

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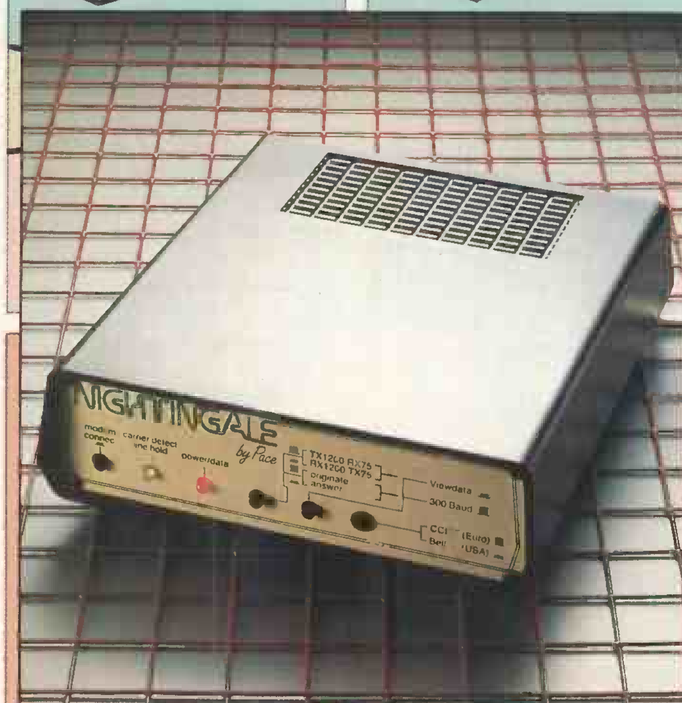
NIGHTINGALE – THE MODEM



The Nightingale modem is now established as the most popular multi-baud rate modem in its class. Nightingale lets you get on with the job. Whether you need to extract information from Prestel©, send telexes via Telecom Gold, download telesoftware or simply swap files with a colleague. Did you know that you can search British Library records through their on-line system BLAISE, or access your bank account through homebanking services. The possibilities are endless.

Nightingale operates at the two most popular baud rates, 1200/75 as used by both private and public viewdata systems, and 300/300 baud for communication with remote mainframe, mini or micro systems. Also included is 'reverse viewdata mode', 75/1200 and an optional auto-answer/auto-dial board.

Approved for use in the UK and several other countries, Nightingale can be supplied with quality software for a variety of the most popular micros. If you own or use any micro with a standard RS232 interface, including the BBC micro, IBM PC, Apricot, Sirius or an Apple //e, //c or Macintosh, etc, then we may be able to help you.

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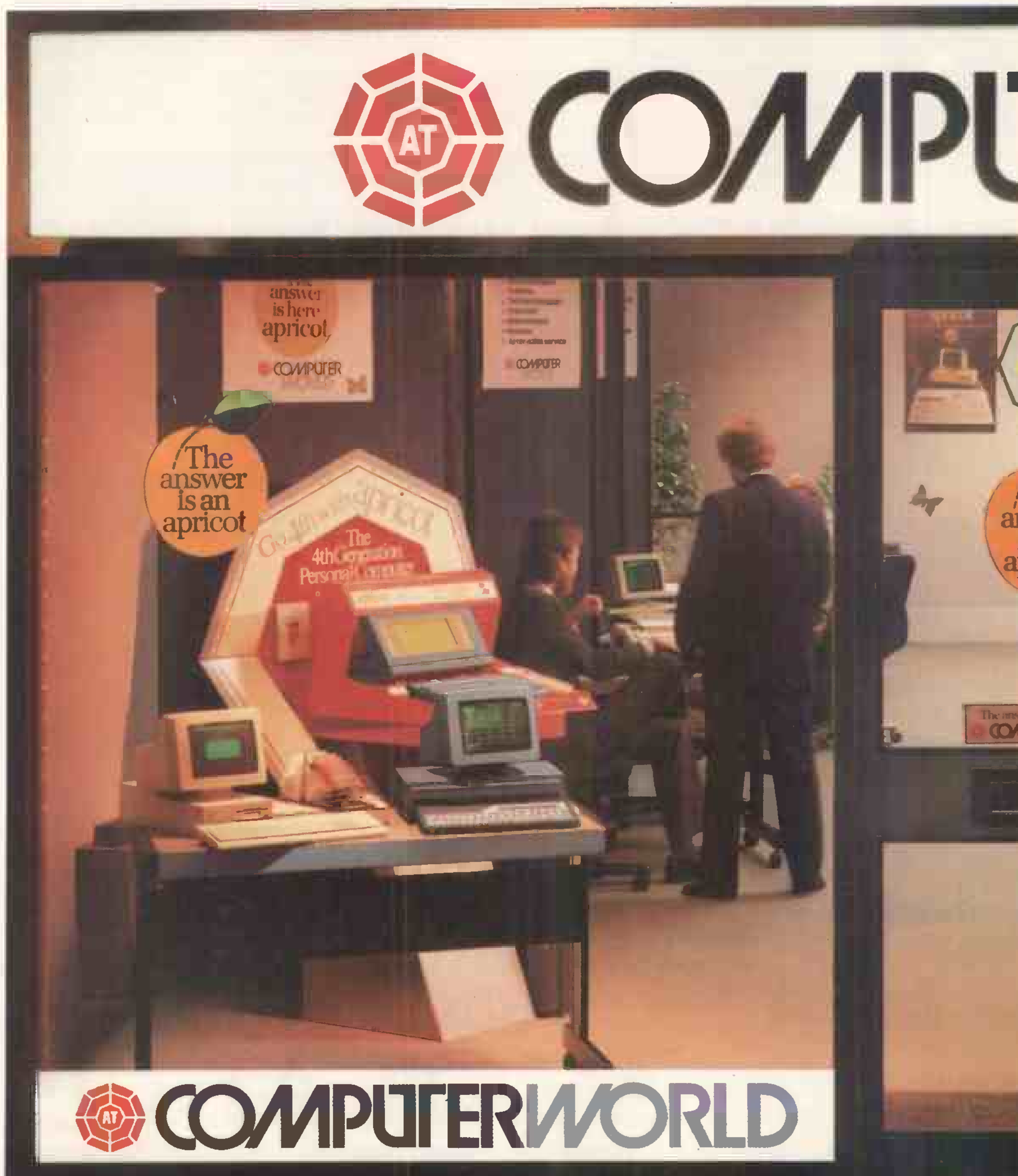

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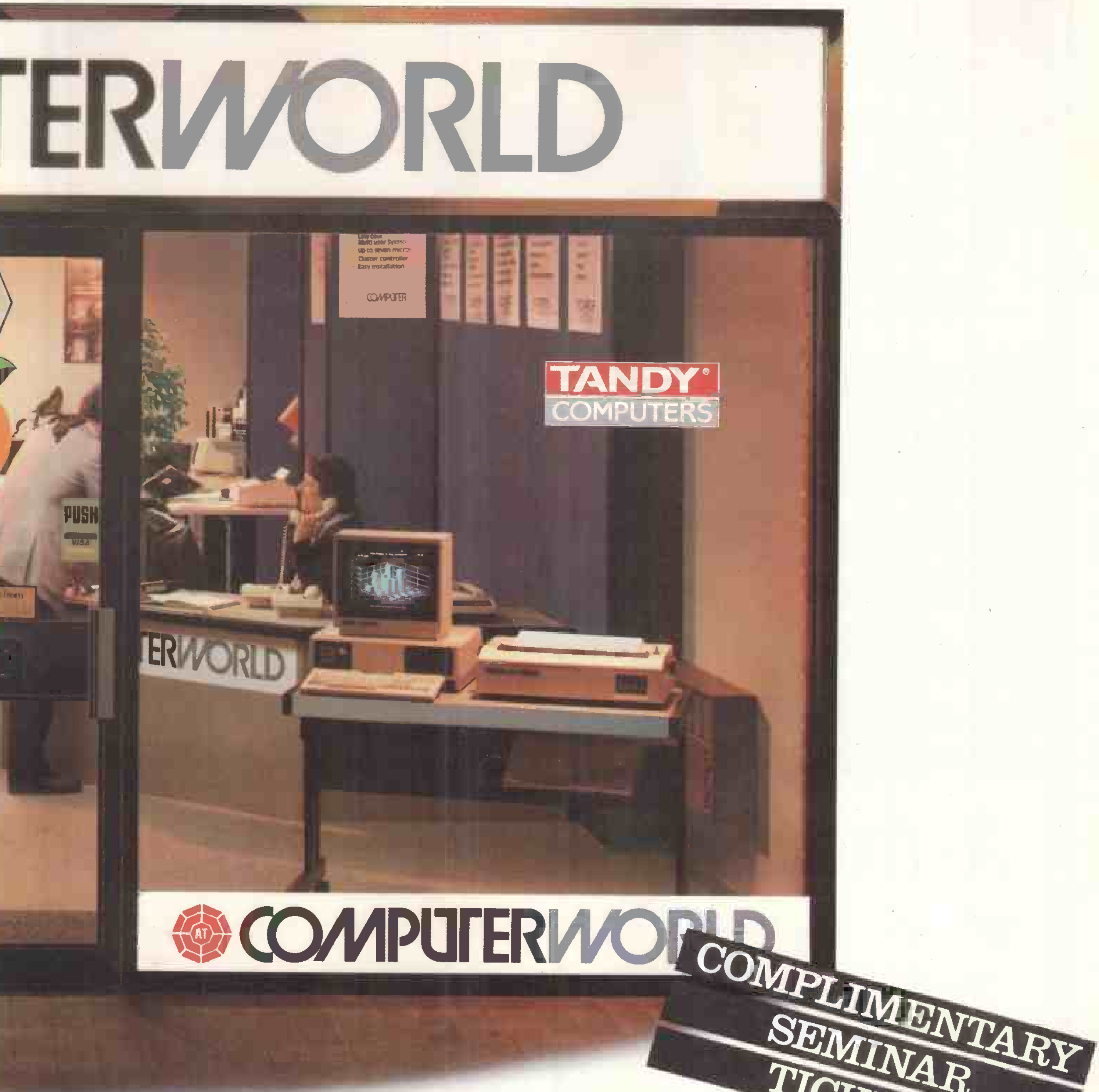

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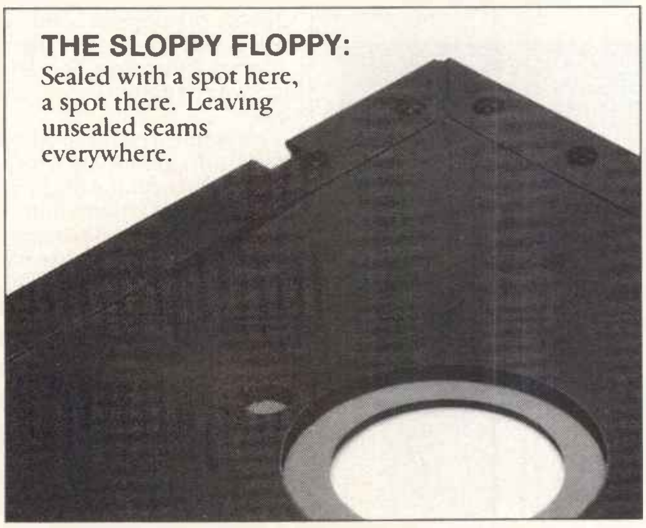

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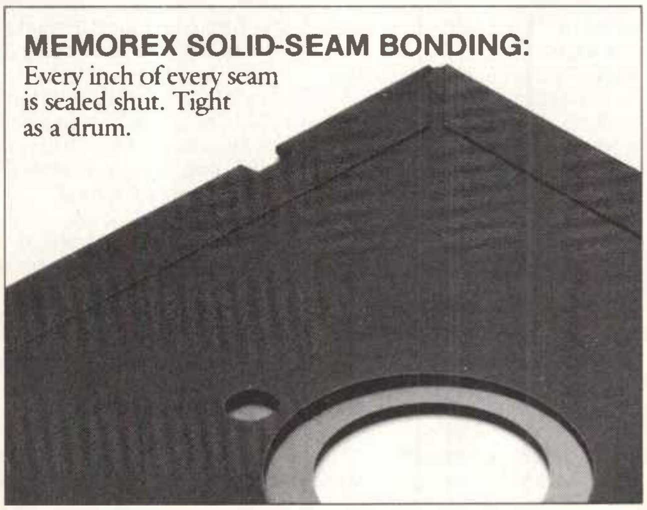

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Bowler and brolly at the ready, Guy Kewney goes to the City to reveal Sinclair's financial problems. He also knows about the new Enterprise and Atari's latest 400/800 lookalike. Read on . . .

In the City

No-one is pretending that Sinclair has no financial problems. At the time of writing, the only thing I couldn't establish was just how bad they might be. Sales of the Spectrum were low and sales of the QL were disappointing, to say the least. Parts had been returned to suppliers because there was no point in keeping them, and also because Sinclair didn't have the money to pay for them.

Yet a mere 12 months ago, the company was riding high on enormous profit figures, and people were actually hoping that Sinclair Research would go public, soon, so that they could buy shares.

Over in a different part of the forest, Micro Focus has been peddling Cobol compilers to a growing population. The company was the answer to any sceptics who said that the UK didn't have a micro industry, and indeed, the day its shares halved — more than halved — in value, I was on the phone to someone saying exactly that.

City analysts, like myself, don't like to feel foolish, and they were enraged to find that the company which they had been recommending as a safe bet in high technology was suddenly changing its accounting system, and their recommendations of the day before suddenly made them look ignorant and uninformed.

Neither Sinclair nor Micro Focus is in any doubt of long-term success — if they can get the money they need. With Micro Focus, the need for money isn't crippling; the City's reaction to the change is plain daft and the shares will be back soon.

In Sir Clive Sinclair's case, however, there are several secret but important projects on the boil in Cambridge which absolutely must have, now, a lot of capital.

When I worked in the construction business, I visited many sites where large structures were being built in muddy river beds. You just can't start building on a river bed by taking a space and pouring concrete into foundation trenches. You can if the tide is out, but when the water comes back it will obliterate everything you have done. Civil engineers build caissons (dry pits surrounded by metal) in which the main engineering work can take place.

To suggest that the possible failure of Sinclair Research is justifiable because it must be able to withstand the play of 'free market forces' is as sensible as suggesting that a bridge over the Thames is only viable if it can be erected at low tide by an army of navvies and a horde of brickies.

The tide is running hard against the micro industry at present. It will turn, and we will need the products of the industry of 1990. But at the current rate, there just won't be one in this country.

I only hope all you shareholders in British Telecom and Aerospace, and TSB, feel proud of yourselves when that day comes. You'll be able to use the profit you've made on your shares to buy some of the nicest Japanese and American technology you've ever seen.

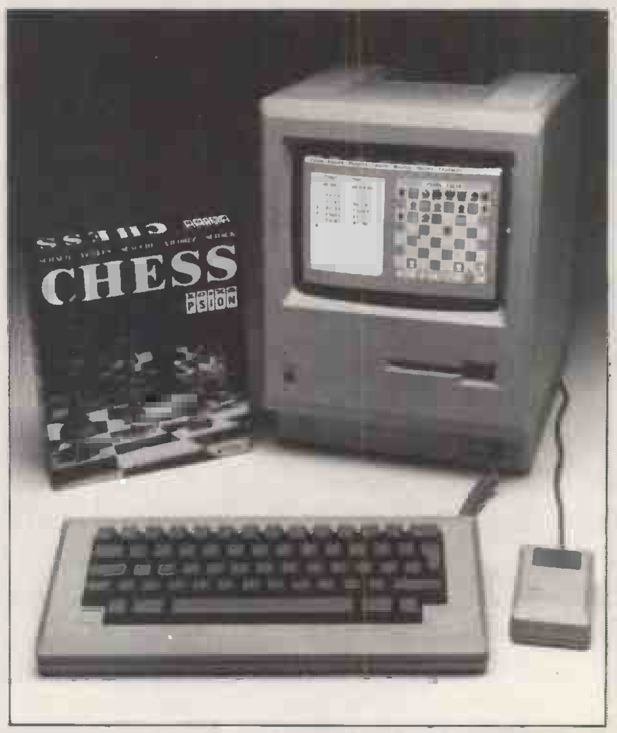
As for help from the Government, well, I have a nice little story from Metacomco in Bristol to illustrate just how helpful government machinery can be.

Metacomco sells software — systems software such as operating systems, languages, and so on — for 68000 machines. It sells a Pascal compiler for the QL, in particular, and the software is supplied on a microdrive cartridge (that's the only way of getting it into the machine).

Imagine the company's delight to be given a contract to supply some to overseas customers! And imagine its pleasure at being told by Customs officials that it had to apply for an export licence for each order for a microdrive cartridge.

The microdrive cartridge, you see, is smaller than a diskette. Therefore, it must be 'higher technology' and so must be subject to the laws that prevent us equipping the Russians with missile control systems.

Clever, eh?



No, this isn't the QL. It's the same game of chess that Psion originally wrote for the QL, yes, but this is a Macintosh screen. It costs £50.

Opening the box

Technically, there's little to expand on about the new BBC B+.

The disk operating system is now capable of being upgraded because at last, the Intel 8271 diskette controller has been abandoned.

The new chip, which has been available for nearly four years, is programmable. Theoretically, the BBC can now be used to read diskettes from other machines such as the IBM PC, and so on. In fact, this ability is going to have to wait; the file system is still just a rewrite of the old DFS, with 31 files per diskette.

The other thing the BBC badly needs is space to plug in ROM software.

The designers have given us sockets for bigger chips, taking the potential of plug-in word processing programs such as Wordwise and View up several steps. There are also six sockets, not five, and the Acorn-supplied software takes two, not three of them.

What they haven't given us is a way of getting into the box.

An Apple II has a lid which clicks off. Admittedly, you do have to take off the display screen first but that's not necessary on the Beeb, only because the Beeb's case isn't strong enough to hold one.

On the Beeb, you have to get your screwdriver out and take the case apart. This involves turning the thing upside down, which usually means first unplugging everything like disk drives, modems, and so on. Then, instead of sockets with levers that clamp the chip in place, you have to be an expert at putting chip packages into sockets — and, less likely, at getting them out again if you change your mind about their priority. The fact that you no longer have to undo the keyboard as well is welcome, but not really enough.

All these little niggles were previously always in the back of your mind when comparing the Beeb with the Apple. But you said to yourself: 'Ah, well, it's quite a bit cheaper, isn't it?' and muttered under your breath something like 'and anyway, it's a British design, and we're as good as those California freaks any day'.

The price comparison isn't so exciting any more. There's nothing like VisiCalc for the Beeb, and the Apple's price has dropped remarkably.

Perhaps we should all take up bee-keeping instead. At least bee-keepers don't expect progress, so they won't be disappointed at getting the same amount of honey from each bee every year. And they expect to get stung every now and then. I just had a different kind of dream in mind when I got involved with micros, that's all . . .

Amstrad denies nothing

I think (I'm not sure, mind you, I just think) that it is official: Amstrad will *not* be launching a 68000-based micro this year.

The company has said, many times, that it isn't in the business of driving ahead with new technology, that it wants to take tested technology and package it in the way that it (uniquely, it seems) understands. That is, in a nice-looking box with a price tag of less than it looks.

The Amstrad is, strangely enough, living proof of the fact that I was wrong in suggesting that MSX stood no chance. It is as close to MSX as you can imagine, but better packaged. MSX would have stood a chance packaged in the same way: that is, with a built-in screen and tape drive, and with a few cost savings to pull down the price.

There is now a new version of MSX called MSX II. That looks as likely to succeed as the previous version, which is to say, not at all.

However, not far down the road is MSX III. It looks likely to be around for Christmas 1986, and it looks likely to be a dual-processor Z80 and 68000 system.

That is where Amstrad's futuristic leanings are headed at the moment, and as soon as it has a chance to study MSX II, you can expect the company to make a decision.

Either it will imitate it, or, more likely, it will find one or two cost savings, a good gimmick and a neat packaging idea, and do something similar that looks much better.

But I think (again, I'm not sure) that rumours of a 68000-based system are based on the reluctance of senior Amstrad executives to play Twenty Questions. As one of them said to me: 'If you ask what we're doing, I obviously won't say. Then you ask me if I'm doing an 8086, and I say no, then you say what about a 68000 and I say no, and after a few questions like that, you will have a pretty good idea of what we're doing. So I'm not going to deny a thing.'

Silicon Office junior

The very first 'integrated' software I saw was not Lotus 1-2-3 but Silicon Office, and there is now a smaller version of that product available for machines like the Apricot F1E.

It provides integrated word processing, database management, a calculator, plus its own programming language which is said to be easy for the untrained business user to learn. It costs £295 plus VAT.

Olivetti to market Unix system

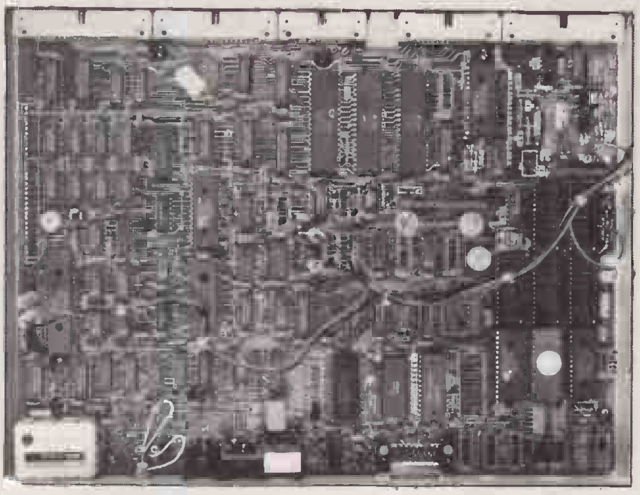
Olivetti has done well, if only in terms of public exposure, with its IBM-like M24. It recently did a deal, for example, with Rank Xerox (and its parent, Xerox Corporation) whereby Xerox will join American phone giant AT&T in selling the M24 under its own label.

The other side of the AT&T coin has just flipped over, and that is almost certain to give Olivetti a harder time because AT&T now wants Olivetti to sell its Unix machine in Europe.

Olivetti will market the 10-user Unix system under the B2 label in Europe, and is trying hard to persuade ordinary computer stores that they can sell this.

'We recognise that one problem will be raising the finance,' said an Olivetti executive, 'since the average PC sale involves a £1800 price tag, and with the Unix system we're talking about £20,000. So we're prepared to help finance sales from our own resources.'

Unix is as close to reality as it has ever been, but that still doesn't mean it will ever be a personal computing tool. And computer stores do sell personal computing, retail, to



Acorn didn't announce the new version of the BBC Micro, the B+, back in January because it is widely known that it is stupid to announce details of a new, faster, nicer product when you're still trying to sell off thousands of the old, expensive, creepy one.

If only it had been candid in January! All it had to say was: 'Don't get excited about the rumours of a new BBC Micro because you only get an extra 32k of memory, and the price will go up £100 to cover the disk controller chips which will be thrown in.'

Instead, Acorn pretended there was no 'release X' board (everyone had seen it, inside the ABC business computer) and that there were no plans to release an improved Beeb.

Everyone assumed, logically enough, that the new machine must be a real whizzer, and I'd really like to know how many unsold BBC Micros and Electrons remained unsold on that account, leading, as we all know now, to the collapse of the company's finances.

The new BBC B+, whose board is pictured above, doesn't even have the BREAK key disabled. This is 1985, and Apple learned not to have the RESET key where you could bump it by accident, five years ago. Acorn still hasn't worked this one out. The result: machine code programs that contain priceless information taking hours to work out (a game which has just reached level 20, a word processing program with hard-won information, and so on) can be literally wiped out by pressing function key 10 instead of function key 9.

All the signs are that this isn't the ultimate Acorn machine, and that work continues in the (vain, I think) hope of being ready for Christmas, with a real winner. But the signs are also there to suggest that very few of the remaining Acorn staff really believe in this project. Those who do have been leaving, apparently discouraged by the lack of firm direction.

What firm direction there is, it seems to me, is firmly committed to the ideas put forward in public by Alex Reid — that Acorn can't compete in the toy market, that there is a big untapped market for 'superior' hardware, and Acorn has the best machine in the world.

A BBC Micro system with two disks and a colour screen still fetches so close to £1000 that there isn't any point in counting what it does give you by comparison with other £1000 systems, such as the Atari 520ST or the Commodore Amiga. All it has today, over those systems, is availability and an analogue-to-digital conversion circuit.

They, on the other hand, have very high-res displays, very fast 16-bit processors, enormous memory maps, and multi-tasking operating systems — plus things like Midi interfaces to synthesisers, mouse interfaces, and proper word processing, spreadsheet and database software.

How can 32k of 'shadow' memory plus a DOS that gives you 31 files per disk in a machine that turns itself off when you touch a button, compare?

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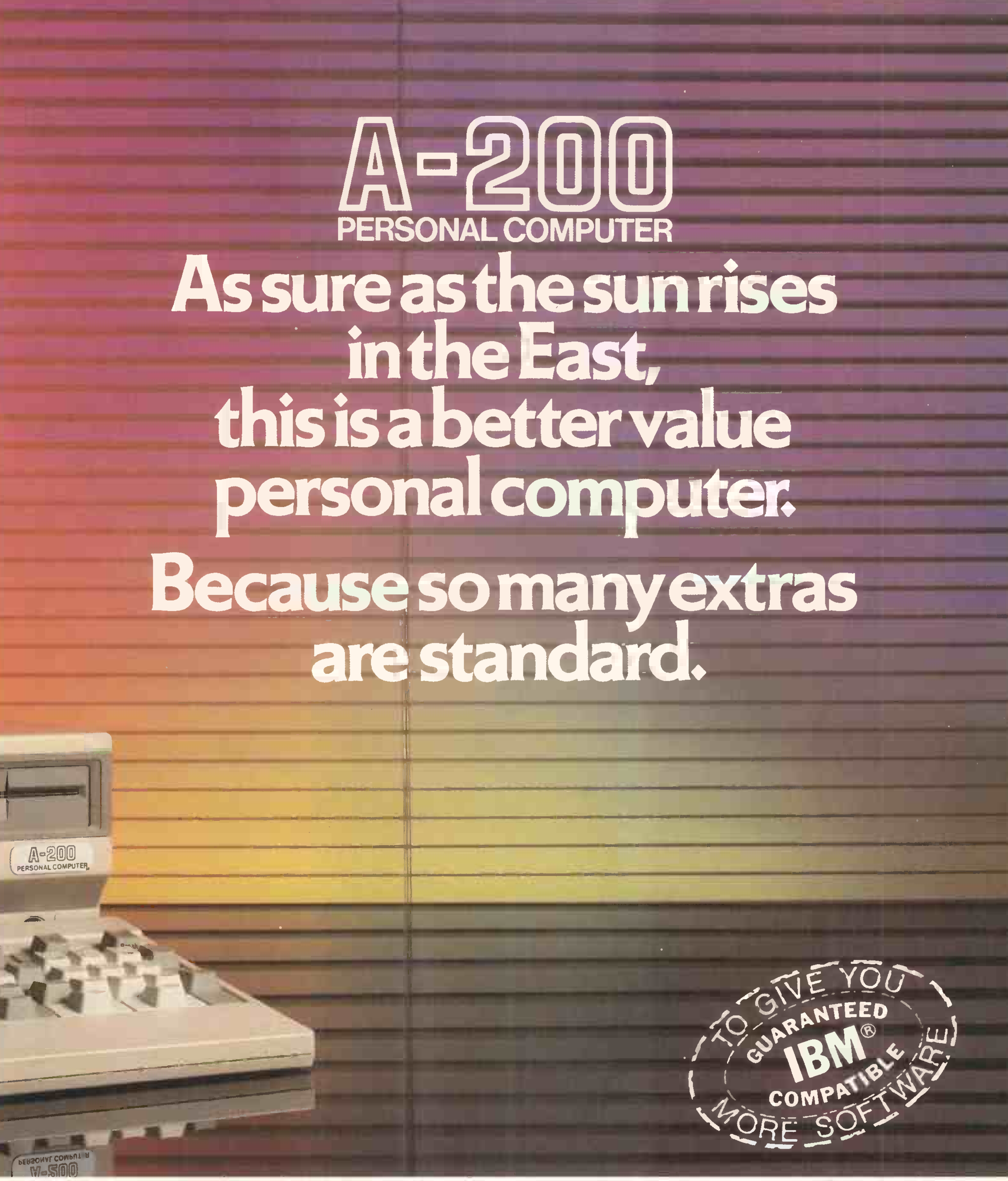

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single buyers. It remains to be seen whether people will really go into a store and ask for a 10-user Unix system to be installed in their department, but Olivetti insists: 'We have no direct sales force, and are committed to selling through dealers.'

Tiny Tripos

Anyone planning to make a lot of money from systems software, here's my tip: get into the property business.

I got this tip from Metacomco, the Bristol company which is quietly polishing up a multi-tasking operation system, Tripos, for the 68000. In order to borrow money from the bank (to finance future projects) the company has actually bought and paid for a splendid period mansion in the city (Bristol) because that's the only security that investors understand. Buying the place, of course, wasn't a problem — the company is quite rich. The fact that it has some of the best people in the business working for it doesn't appear to matter a damn.

For reasons which will become apparent with the passing of a little time, Tripos could turn out to be a very important operating system indeed.

Metacomco licence it from the original developers in the Cambridge Computer Unit, and has managed to fit it all into around 50k of portable code. For a multi-tasking operating system, that's tiny.

Zenith board compatibility

In a long-term, informal test of compatibility, I'm currently using a Zenith as my IBM software test bed, and so far have found no problem in persuading programs that they are running on a genuine PC.

The Zenith has tackled Lotus Symphony, Flight Simulator, PC-DOS 2.00 and PC-DOS 3.00 without any difficulty, plus things like Spotlight, Missing Link (communications), PC to Mac and Back (more communications), WordStar, Wordvision, Volkswriter, and a long list of other programs not guaranteed to work on anything except a genuine IBM. Even Dunzhin, which makes the thing talk . . .

After the Opus launch of a diskette interface for the Sinclair Spectrum, these disks have become popular — or at least, respectable.

Cumana, previously best-known for its BBC disk units, has now produced a £99 interface to connect the Spectrum to its standard 3½in drives and 5¼in units.

And Kempston, the joystick king, has also released a disk interface for almost exactly the same price which 'will work with any standard BBC disk drive'.

All these people have gone their own way, with no sign of agreement on disk standards. Clever.

Kempston has also announced a QL disk interface, which (like many) is compatible with QDOS (we'll have to commission a survey to find out if all these Tony Tebby-written operating systems are compatible with each other). The price of this one is £129.95.

Details of the Kempston units (including a QL Centronics printer interface) on (0234) 856633. Cumana is on (0483) 503121.

What is turning out to be worth consideration, however, is the question of compatibility at board level.

There are machines on the market (the Zenith isn't one) with faster-running 8086 chips inside them which make them 'significantly faster' than the original IBM PC with its 8088. But the 16-bit data bus means that several add-on boards just won't talk to these systems.

At the moment, the Zenith is away visiting Ashley Ward of Intelligence Research to sort out compatibility problems with the Hyperram board. Hyperram is the best-looking price-performance memory board available in the UK for the PC. Ashley Ward is leading his company back from hard times with this add-in board for the IBM (and others, too), and because you have the option of buying the board with only 64k and plugging in chips (cheap) it really can save a lot of money.

The only trouble is, so far, I haven't been able to persuade the Zenith that the Hyperram has memory in it.

The jury is out on this one until next month, when we will discover whether I've been particularly clumsy-fingered with the DIP switches, or whether the board is genuinely incompatible with the 320k that Zenith provides as standard in its PC.

But the general principle remains, especially when you look at the wide range of popular boards for the IBM such as the Six Pack, and the Hercules, and timers, and go-faster Express boards . . .

The Missing Link communications board works fine on the Zenith, by the way, giving the machine a passable Prestel capability as well as ordinary teletype capability. And it is really easy to use.

The problem is: it won't work with the thousands of American programs that specify a Hayes-type modem.

The Hayes design has become a 'standard' in the market; certain signals sent to the modem are instructions to it, telling it how to dial, what number to dial and when to disconnect.

Some programs that expect a Hayes modem can be fooled. You plug in your non-dialling modem, plug in an ordinary phone and dial the number by hand. Then you tell the program that it is 'online' and it goes ahead.

You can't do this with the Missing Link because the modem plugs into the phone direct, and into the PC at the other end. There's nowhere to plug in a phone.

It's a nice modem but a bit pricey for 300/1200.75, and why would anyone launch a non-Hayes modem in 1985?

Neat handling

No matter how good it sounds, a new database like Infoscope is often greeted with a shrug of the shoulders by users because 'we already have all our data stored in dBaseII format'.

Infoscope gets round that one quite neatly: it can handle those files with names ending in .DBF, and also the .DIF and SYLK files produced by Lotus 1-2-3, VisiCalc, and Microsoft products, as well as dBaseII files.

Why you might want to abandon an expensive program like dBaseII is fairly simple to explain: Infoscope can give the user access to eight databases simultaneously. And it can transfer files to the other software packages if need be.

The authors, Davidson Richards, claim high-speed sorting as a major feature of Infoscope. More significant for many users will be the speed advantage from quite another feature, however, and that is the 'hop' feature.

The system allows users of PC-DOS version 2.0 (or later) to hop out of Infoscope, use the diskette file manager or other programs, and then hop back into Infoscope with all work still intact.

'Typical uses for Infoscope,' says Nigel Jesty, software products manager, 'include mailing lists, employee records, parts inventory, customer lists and appointments book — all of which can be displayed on the screen simultaneously.'

Infoscope's own files are simple ASCII strings, with commas as the field markers.

The program occupies 192k of memory (minimum) and costs £195 plus VAT. Details on (0332) 382321.

Apricot Viewdata

You could set youself up as a rival, in a small way, to Prestel, providing you have the £10,000-odd it takes to buy ACT's Apricot-based Viewdata system.

The system involves a special bit of hardware known as the 'cheese wedge', which has eight serial ports coming out of it and which is driven from an Apricot Xi 10S with a hard disk, holding around 8000 'pages' of Prestel-style information.

The software is from Metrotel, and the only problems faced in the transfer from the original Z80 involve the rather inefficient code translation. In a nutshell, the system worked OK in the demonstration but used up phenomenal amounts of memory.

However, since the previous price for this type of system started at six to 10 times as much than the £10,000 needed for the Apricot Viewdata system, it's bound to attract one or two buyers in the next few months.

Upgrade assurances for 'flaky' drive

The cheapest disk in town for the BBC now sells at £60 plus VAT, and comes from RCS Computer Services.

The company will upgrade your ordinary BBC B with a kit of parts to provide DFS plus disk drive, for £168.50 including VAT.

The only caveat I have is that the drive is the Olivetti drive, which (when I knew it a couple of years ago) was the flakiest in town, but perhaps that has changed.

Get assurances in writing by phoning (01) 844 1333.

Pegasus database

Why has an accounting program suddenly acquired a database management module? I think I can tell you.

To my dismay, when I originally tested the Pegasus accounting system (the best-seller in the market), I found that it couldn't tell you the account number of a given company. You had to keep a card index with names and account numbers next to a computer which was (theoretically) capable of doing the same thing 100 times faster.

Pegasus executives rubbed their cheeks reflectively when I complained, but said nothing much.

Today, they have announced 'Information Manager', a database/ applications generator module which works with the Pegasus range.

It's not their own invention, it's a specially adapted version of SoSoft's Tomorrow's Office.

Details on (0536) 522822.

The Enterprise 128 — ideas and surprises

Doubling memory and getting a 30 per cent increase in speed sounds like a nice idea, and it's what Enterprise is offering with its 128k machine. With no changes to the operating system, the new Enterprise is running both Basic and machine code programs faster.

The speed is achieved by making sure that the most-used of the 128k machine's 16k pages are the ones most readily accessible to the good old Z80 processor. And just to prove the point, an old 64k Enterprise expanded to 128k will also be 30 per cent faster.

Enterprise, the company, is also offering a monitor and printer, and is trying very hard to provide a reasonable amount of software. Like Amstrad, it has signed up a number of software houses, US Gold and Ocean among them, to produce programs which are then sold under the Enterprise label.

But surprisingly, it has dropped plans to produce an Enterprise disk drive in favour of producing a disk drive controller and allowing users to choose their own drives. This may give users lots of choice, but it's likely to discourage software houses from developing software on disk.

The Enterprise 128 sells for £249.95, while the original Enterprise 64 takes a drop in price to £179.95. With Atari, Commodore and perhaps even Sinclair producing 128k machines, the Enterprise is up against some stiff competition. But having said that, it's worth noting that it's the only machine designed from the beginning to take more than 64k and use it properly, and its internal architecture is considerably more advanced.

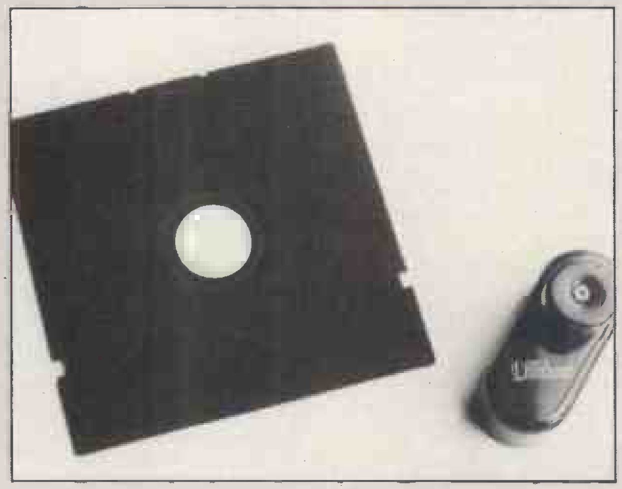
Reading is believing

The fact that Apple's shipments to retail stores in the States 'jumped dramatically from February to March' is the kind of interesting information that American surveys occasionally reveal.

Another is that although dBaseII, the database package from Ashton Tate, was number two in the software charts for April (after Lotus 1-2-3 and in front of Lotus Symphony), the other Big White Ashton Tate Hope, Framework (a rival to Symphony) didn't feature in the top 10 for that month at all.

This type of information is available from various information-gathering consultancies. The top 10 software list, for example, is published by Management Information Software Co in New York. The analysis of Apple's jump in sales is from IMS America of Ambler, PA.

The IMS America figure shows the fascinating detail that Apple's total share of the



Should you be tempted to try and use both sides of a diskette in your single-sided disk drive by buying a 'positioning guide' from Disk Doubler (through Associated Compuer Marketing), you should be warned of two things.

Firstly, the good news: you don't need double-sided diskettes. I've yet to find a single-sided diskette which had a faulty second side. Mind you, I've found three certified double-sided diskettes which were dud.

Secondly, the bad news: not all diskettes take kindly to being spun backwards. The inside of those black envelopes is a smooth cleaning fabric. Like all fabrics it has a 'nap'; some of them have very pronounced nap directions, and will scrape the disk if ground backwards.

Details of the £15 gimmick on (0252) 330100.

I have to admit that a device for putting an index hole in the other side of the diskette would be more help. Anyone can usually cut the slit in the side to enable writing to a disk, but locating the index hole is quite a trick.

This little template/cutter doesn't worry about that — it assumes you're using an Apple, Atari, Commodore or Sirius drive which ignores the index hole. Ah well, don't say you weren't warned.

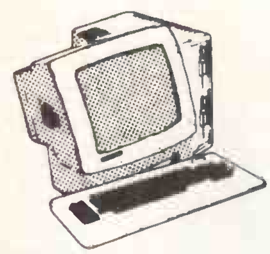
APRICOT WINDFALLS AT MORSE

We've pruned our Apricot prices at Morse, and we now offer stunning discounts across the entire range. Morse are ACT Blue Riband dealers, and we'll give you better support and value than anyone else. Call today!

Apricot PC, 2 315K drives, (RRP £1595): **£1125**
Apricot PC, 2 720K drives, (£1795), now: **£1375**
Apricot Xi, 10Mb, 720K drives, (£2795): **£2030**
Apricot F1, 720K drive, software, (£1090): **£995**
Portable, 720K drive, software, (£1695): **£1390**
Monitors: 9" £200, 12" £250, 10" colour £385

SANYO Superdeals at Morse! Special prices on MBC 550 series mean 16-bit computing for the cost of a home computer! Includes WordStar and others worth over £1000, MSDOS & 128K RAM.
Sanyo MBC 550, Single disk , (RRP £795): **£569**
MBC 555, 2 disks, extra software. (£995): **£749**
MBC 555-2, 2 320K disks, software (£1395): **£945**
Monitors: CRT36 12" £127, CRT70 colour £395
All Morse prices exclusive of VAT at 15%, E. & O.E.

DECMATE II, the famous wordprocessing system, includes system unit, 2 drives, display, software, RRP £3190. Ex display: **1690.00**
Brother EP44 (£249) **199.90**
Casio PB700 (rrp £110) **79.00**
Casio FP200 32K (£299) **215.00**
Casio FX450 Sci (£19.95) **12.95**
Casio PF3000 data (£39) **29.90**
Casio PF8000 touch (£49) **39.95**



Televideo TS1605, full IBM PC compatible, runs Flight Sim, 1-2-3, Framework. 2 360K drives, 128K memory, (512K for £400 extra), 14" display, RRP £1990 **1290.00**
Epson JX80 7 col. (£569) **540.00**
Epson HI80 plotter (£395) **375.00**
FX80 used, 1 only (£438) **250.00**
PFS·Graph IBM (£99) **59.90**
PFS Report IBM (£95) ... **57.50**

LOTUS 1-2-3, the most popular software package in the World is now available in Apricot and IBM formats. RRP now £440: **375.00**
WordStar 3.4 Professional, CorrectStar & Merge (£399) **299.00**
VisiCalc IBM (£195) **115.00**
VisiFile IBM (£219) **145.00**
VisiSchedule IBM (£219) . **145.00**
dB Master IBM (£445) ... **270.00**

MORSE

MORSE COMPUTERS 78 HIGH HOLBORN, LONDON WC1V 6LS. 01-831 0644. TELEX 916509.

PC market was 27 per cent in March, and, in spite of what all the 'experts' inside American and British businesses have been telling us, most of this was due to sales of the Macintosh.

Mac sales rose from $18m at wholesale prices in February to $29m for March. These sales are through stores, not the direct-to-business sales which account for so much of IBM's business.

Interesting, nonetheless.

View from the top

Programs 'which are not now, or in the near future going to be supported under TopView, include Lotus 1-2-3, Symphony, all Microsoft products, Multimate, dBase, Framework and R:Base 4000,' comments American industry observer Gerald Garvey in the American *MIS Newsletter*.

TopView was first seen on the IBM PC/AT, and was widely assumed to be written for that super-micro. It has now been revealed in the UK, six months later, as IBM's own operating system for all PC family machines — using windows. The stampede that has resulted seems unlikely to cause many casualites — there is a strong smell of indifference from the market.

It is a genuine operating system, despite the fact that some people have called it an 'operating environment' for the PC family, but many observers see it as being more bother than it's worth.

The problem isn't whether users find it easier to use. They do, mostly, but that hardly helps if the programmers can't use it, and it seems that largely, they don't think they can. The aforementioned list of unsupported programs is heavy condemnation of the product in its current form.

The trouble seems to be that it doesn't offer them enough, but does ask for a lot more work. An operating system like TopView has two parts: the visible part, which looks like a vague imitation of the Macintosh; and the invisible part, which looks a little bit like a multi-tasking version of PC-DOS.

Most software for the IBM isn't written in horrible detail by hot-shot assembler programs. Instead, it links in to existing code, sitting in the machine, which does the hard work of sorting out which sector of the disk the next data will be recorded on when there is enough information to fill a sector; or where in memory your program will keep its operating data; or how to calculate the delay before transmitting the next character — and all that is the task of the 'invisible' part of the operating system.

Unfortunately, the routines that you call under PC-DOS are in different places, and do different things, from what many programmers find they now have to do to work with TopView.

IBM and Microsoft say this isn't their fault. People have been writing programs for the IBM PC which ignore PC-DOS routines, and do so from scratch. They shouldn't — this is 'badly behaved' software.

It is a fact that much successful software is successful because it runs faster, does more, and is simpler to understand than well-behaved software because the designers of the DOS didn't foresee many of the requirements of programmers writing things like Lotus.

There is also the fact that many programs don't expect windows, and they have to before TopView will work. And Microsoft has its own windows standards which are different from TopView, hence the list excluding Microsoft applications.

TopView, like a rival product Desq (from Quarterdeck) is multi-tasking. That is, it tries to keep more than one application program running, juggling their attempts to use the DOS like an acrobat. Irritatingly, it seems that IBM has chosen a strange way of doing this — described as 'time-slicing' — which means that you can't use TopView for communications programs, or so say my friends at Digital Research. Worse, in a world where graphics are daily becoming more important to PC users, TopView can't cope with graphics.

Desq is text-only, like TopView, but according to Garvey's report, Desq is very much better at coping with the kind of program you're likely to buy than TopView.

The major advantage Desq has, today, over TopView is that it will run programs, even if they aren't Desq compatible. That means that Lotus 1-2-3 will run, even though Desq can't manage its windows. The result, says Garvey, is that a 1-2-3 user with Desq can take part of his spreadsheet and easily put it into a WordStar document. 'If you want to do this with TopView, you will have to wait until Lotus rewrites 1-2-3 (and others do the same) to be TopView compatible.' And he adds: 'It seems that a windowing environment program should be a help to the user today, not, maybe, a year down the road.'

Neither Desq nor TopView is for the user with 256k. Currently, TopView will leave you 80k free; Desq will leave you about 25 bytes.

The market wants multi-tasking, and it wants windows, and it wants graphics. People have seen the Macintosh, and they want their IBM PC to do the same thing.

But it looks as though they will wait for Microsoft's Windows (June? September? Which June?) or Digital Research's GEM, already out in early versions.

This is a computer with a radio in it. It costs $2295 which is a fierce price, especially when you realise that you need at least two of them to start working. You can, of course, get the modem alone, which will set you back just over $1100 for a low-power battery version, or just under $100 for the mains-powered model.

It has an operating radius of about a mile (bet on less in cities) but it will work at speeds of up to 2400 baud.

In the words of the company president, a man by the name of Kitchner: 'The Quest, like the modem, is not for everyone. We foresee it being used in places like large warehouses where inventory can be directly input through the Quest into the company's central computer. We also see it in forestry work, ranching, or anywhere mobility and computing are important.'

Well, it's a start. Details on (0101) 509 735 9092 from Electronic Systems Technology in Kennewick, WA 99336, USA.

Mega memory for the PC

The main advantage of the IBM AT over its earlier relatives is the amount of memory it can look at — 8Mbytes instead of 640k — and the disk size.

Lotus has decided to kill off half this advantage by announcing, with Intel, a way of expanding IBM PC memory up to 8Mbytes.

Intel is the chip maker which designed the IBM's processor, the 8088, so the specification worked out by the leading software producer and the 'horse's-mouth' hardware designer is likely to become the standard solution.

A version of Lotus 1-2-3 to take advantage of the expanded memory is due out later this year, but the really vital thing was for Lotus to expand Symphony, and an expanded Symphony will be available very soon.

Food for thought if you're about to do your accounts.

A constant diet of sales ledgers, payrolls, stock control, invoicing (and that's just for starters) is almost guaranteed to damage the health of your business.

You'd be far better off concentrating your energies on more profitable pursuits, like driving your business forward.

That's where your not-so-humble servant, the unique Apricot Accountant steps in.

Why 'not-so-humble'? Well, by the time you've finished reading this we believe you'll see that you can't afford to be without it.

FRUITFUL RELATIONSHIPS.

The Apricot Accountant is designed to work either with one Apricot personal computer or in a local network with the entire Apricot range.

Already, we're the most widely used range of business micro's in Great Britain.

A dynamic duo, without doubt.

Apricot Accountant, as you can see to your right, is as easy on the eye as it is to use.

Each slim module or Apricot Dataslate is dedicated to one particular accountancy function: Invoicing, Payroll, Stock Control, Sales Ledger, Purchase Ledger, Nominal Ledger and Data Analysis.

Apricot's Dataslates allow you to build your own compact desktop filing system.

Every slate has its own manual and file to house the 3.5in. micro floppy program disk.

A PLAIN DIET.

All the instructions are written in plain

English. So, if this is your first introduction to computers, Apricot protect you from the verbal fog of computer-speak.

Equally, if your staff aren't fully conversant with accountancy terms, they will more than welcome our plain speaking.

They'll also welcome the release from the drudgery of every-day routine.

Our expertise in accountancy is hardly surprising when you consider that as a company we have been writing accounting software for smaller businesses for 20 years.

Many of our dealers have been selling it for almost as long.

We've even thought about your stationery for use with the Accountant. A specially designed range of invoices, statements, payslips etc. are available from your dealer.

But if you'd rather use your own designs, we can organise that as well.

INTELLIGENT APRICOTS.

The Apricot Accountant is fast, efficient, thorough and clever.

Unlike other software packages it can be tailored to suit your business needs.

If you need analysis of data, for instance, the keyboard brings a speedy automatic answer.

We collate the information you feed in and automatically update the other relevant modules.

Our software complies with all current legislation and should the law change we'll up-date your system.

The system also knows how to keep a secret. Only specific password holders are allowed access to your information.

AN APRICOT CALLED GEORGE?

The Apricot Accountant has a unique, built-in autopilot called George.

(It has to be better than something with a name like a 'double faceted nerd fangler.')

George carries out certain regular procedures for you, such as producing a weekly stock report.

Switch your Apricot computer onto 'auto-Q', step through the procedure once, give the job a title and next time round George will handle it all for you.

He'll also train new staff by simplifying their role to a few simple keystrokes until they've got the hang of things.

APRICOT'S MAXI MICRO'S.

Whichever Apricot micro you choose you can rest assured you've chosen from the pick of the crop. Not only do we offer the largest compatible range in the world, but they can all be locally networked.

They are also fully capable of interfacing with mini and main-frame computers.

To top that lot, the Apricot software library is the absolute cream. We have the largest, published library in the UK.

And that includes the best-selling business package in the world, Lotus 1-2-3 as well as Symphony, their new all-in-one system for managers and professionals.

APRICOT Xi 10. 256K RAM, 10MB WINCHESTER. £2,795.*

All the other famous software names are there also: Micropro, Ashton-Tate, Microsoft, Digital Research and so on...

Finally, for those of you hungry for the latest facts and figures there is nothing to touch Communiqué.

Services such as Prestel and Pergamon Infoline as well as Telecom Gold and Easylink, our telex service, are yours at touch of a button.

Call in on your nearest Apricot dealer so you can get all the facts to chew on.

apricot ACCOUNTANT

TO FIND OUT WHERE YOUR LOCAL DEALER IS, OR FOR MORE INFORMATION ABOUT APRICOT COMPUTERS OR THE APRICOT ACCOUNTANT, EITHER CALL US ON 0454 617617 OR WRITE TO ACT LIMITED, FREEPOST (BS4251), PATCHWAY, BRISTOL BS12 4YZ. YOU CAN ALSO REACH US ON TELECOM GOLD-SYSTEM 81-JET 077. *PRICE EXCLUDES MONITOR OR VAT AND IS CORRECT AT TIME OF GOING TO PRESS.

The problem there was very simple: due to the enormous extra applications in Symphony (a big database, a big word processor and powerful graphics, plus communications) there just isn't memory space enough for the big 1-2-3 spreadsheets. Users who switched from 1-2-3 to Symphony have complained, very loudly, that they've upgraded, only to get a smaller spreadsheet.

It should be added that the AT will, of course, run faster than a PC or XT, even with expanded memory.

Meanwhile, taking advantage of the interest created, Mega-Omega Systems has announced that 'enhanced Lotus 1-2-3 needs a companion,' and has released a memory board for the IBM PC that can be expanded to 2Mbytes. The company doesn't claim that it is compatible with the Intel-Lotus standard, but neither does it admit that it isn't, which is just about forgiveable on the grounds that perhaps it didn't know the standard was coming when they prepared the literature.

The card is useful for providing a RAM disk, and Mega-Omega is on (0101) 214 828 0960. But it won't run Lotus version 1.1 — the Intel Above Board /PC is the first expanded memory board certified by Lotus as compatible with Symphony, and will be available shortly.

Gem Write for the IBM

Giving IBM users the chance to catch up (!) with Macintosh, the authors of Volkswriter have written Gem Write.

It works like MacWrite, under GEM on the IBM. It will be marketed by Digital Research which does GEM (the Macintosh-like environment for what Lifetree calls 'generic' personal computers).

Lifetree has received mad adulation for Volkswriter, which has tested out very well in 'objective' assessments of word processing. I have to confess that I found it hard to use, but it was quite powerful.

This new program isn't compatible with Volkswriter, but it should be very much easier to use. It will be sold for $199 as a package with GEM Paint and GEM Desktop from June, says Lifetree. Contact that company on (408) 373 4718 in Monterey, California.

Remote response

'I don't know the address,' said the voice on the other end of the phone, 'but it's on my IBM database back home. Just hang on, I'll dial through and see.'

The voice belonged to a hacker of the old school, who had written a routine to let him control his home system from his office. Within a minute, he'd logged on, retrieved the information and displayed it on his office machine. And ever since, I've been jealous.

Microstuff's answer to the problem, Remote, is said to work with any PC program 'except those that use colour graphics, and those that require you to change disks,' and that appeared in the UK earlier this year. Inevitably, it requires a Hayes-style auto-answer modem.

Software Synergy's Respond PC Host goes one better in that it can be active, not just passive. That is, it can call a remote computer automatically, as well as respond to a call from the remote unit. But, unlike Remote, Respond doesn't let you run the host programs — it just lets you download files.

There are times when your desire to watch a 3Mbyte file scrolling across the screen at 1200 baud is limited.

These are the winners of the John Menzies Young Programmers of 1984 competition. I show them here not just to fill space, but because the picture inadvertently gives a rare opportunity to see Tom Hartnell, one of the judges. Hartnell runs a publishing company, and I've never seen him in a suit before. Also in the picture is artifical intelligence pundit Donald Michie.

The real reason for printing the picture, however, is to encourage other girls by drawing their attention to Cathryn Dew, who won the Under 12 category. Don't believe boys who shoulder you aside from the computer on the grounds that girls can't do it. They can.

Scraping for profits

You may think that cutting the price of the ACT Apricot F1E was effectively aiming a large cannon at Acorn.

After reading this little analysis, however, you may wonder whether the weapon is pointing at Apple in Cupertino, or at least Hemel Hempstead. Consider:

If you think £500 is rather steep for an ageing BBC+, how about saving up the extra £100 needed for a 16-bit Apricot F1E? Today, that's the difference. What do you get?

You get a 256k memory, a 16-bit 8086 processor and a 3½in floppy disk (not just a disk file system) with 320k capacity. The filing system is MS-DOS, which these days opens up a path to running complex programs such as Symphony. But more significant for BBC users languishing with 31 files per disk, this is DOS 2.1. That means a hierarchical file structure — several directories on a single disk, each with sub-directories (and so on) if you like.

ACT has, as you will have deduced, cut the price of its bottom-end Apricot. But the comparison with the BBC+'s idiotic new price doesn't stop there. ACT has rubbed it in.

'Also available is a £30 program called B-Tran, which enables the Apricot F series and PC models to run virtually all programs written in BBC Basic.'

The claim obviously requires your programs to use no illegal POKEs or machine code. But most teacher-written code falls neatly into that category, and it is teachers who ACT is out to impress. Anyone who likes writing Basic, by the way, will quickly find that there are several things to get excited about in Microsoft's GW-Basic, even without procedures.

The really sad thing about it is that the gun isn't aimed at Acorn at all.

Oh, I know, the managing director of ACT (Brian Androlia) made the necessary gesture of patronising pity in Acorn's direction. Who could resist it? 'Since Acorn launched the BBC Micro, the requirements of educational computing have changed enormously,' he said sadly. 'Students are now demanding access to the greater sophistication offered by the 16-bit MS-DOS world. They need the experience of using serious industry-standard software, which normally will not run on 8-bit micros such as Acorn's BBC and the Apple II series.'

We're not going to actually mention the Apple as a serious contender, he hints casually, but just in case the thought did occur to you, dismiss it (he implies).

Not so. Apple is selling its IIe and IIc *very* hard indeed into the schools market, under a program called Our Kids Can't Wait. Acorn is not trying to sell in the States (at the time of writing, sanity prevails in Cherry Hinton at least so far) but Apricot Inc is. And Apricot Inc is using a picture of an Apricot, next to an Apple, to emphasise the fact in the American market.

Quite how well Apricot is doing in the Sates isn't clear. The word on the streets, when I was there for the Atlanta Comdex show, is that Apricot is looking good — especially with the launch of the 512k F1 at $999. But it's really too early to say.

Apple is not pleased, and is doing its best to chop down the Apricot tree at home in the UK. In retaliation, of course, ACT is going after the education market as hard as it can, keeping Apple out.

Included in the new low-cost F1E is software. It's possible to use Asynch to communicate with remote time-sharing systems such as Telecom Gold, but I wouldn't

As this photograph shows, the original Atari machine has seen the inside of a good few boxes. First there was the 400/800, then there were the XL models, and now there's the 130XE.

The 130XE is yet another version of the six-year-old Atari 400/800, repackaged in a sleeker and smaller case to match its 16-bit brother the ST, and offering 128k of RAM.

Inside, the chip count has been reduced from the XL, which itself was a reduction from the original machine. A new memory controller chip called 'Freddy' organises the extra bank of 64k RAM into four blocks of 16k, which is accessible by a switch at some obscure memory location in the operating system.

The machine has two standard joystick ports, a cartridge slot, a serial port, composite monitor output, television output and an additional, surprisingly small expansion port not found on the previous machines. The serial port will take all existing Atari peripherals. The cartridge port has been moved to the rear of the machine, with two weak plastic pins projecting from it that are in danger of breaking when a cartridge is inserted.

Also on the debit side, the keyboard has deteriorated slightly from the earlier machines, although it's still better than the one on the Spectrum + and it is full-sized.

Some jiggery-pokery with the video signal has occurred with the 130XE: the graphics are now far sharper and a little less bright, which makes programs such as Atariwriter and VisiCalc easier to read at the cost of games being rather dull.

Atari has also cured the television problem that has plagued it for years, the sound and picture being slightly apart on the tuning wheel.

The XE's operating system is the same as in the XL: that is, the original 400/800 bugs have been corrected so some of the old software won't run on the new machines. Atari supplies a translator program that loads the old operating system, complete with bugs, into RAM and switches out the ROM, allowing all software to run. For disk drive owners the first program to use that extra 64k of RAM will be DOS 2.5, Atari's new disk operating system. This will replace DOS 3.0 which was far too friendly and hence infuriating to use. DOS 2.5 returns to the old DOS 2.0-type menu with the additional feature of allowing you to set up a RAM disk in the extra memory. Whether DOS 2.5 will support double-density on the Atari 1050 disk drive wasn't clear at the time of writing.

The Basic in the 130XE is unchanged so it looks somewhat long in the tooth now, although Atari has taken the opportunity to insert Revision C Basic which should mean no more locked-up programs after hours of editing.

It's disappointing to see that there's a grand total of 37k available for Basic programs on this 128k machine. You can make the extra 64k available with a series of POKEs, but then you'd only be able to use it to store data, once again using POKEs, as the Basic knows nothing about this new-fangled bankswitch RAM. Obviously it's an open question as to how long it will take before commercial software that uses the extra RAM is available in any quantity, as software houses won't want to ignore 400, 800 and XL users. However, Atari is planning extended vesions of Atariwriter and VisiCalc which will use the extra memory.

As there's probably about 2000 'old' Atari programs already on sale in the UK, you won't go short of software. Some of this software is being sold at silly imported-from-America prices, but the likes of US Gold and Ariolasoft are now selling good American software for much less.

And there's some good serious software around, such as the Atariwriter and Homeword word processors, VisiCalc's spreadsheet, and many high-quality assemblers and programming languages.

The manual included with the 130XE couldn't be much worse than the 12-page pamphlet supplied with the XL. Although it isn't inspiring, the 132-page ring-bound manual is adequate as a teaching guide for anyone new to computing, and contains some very useful appendices including pin-outs of all the external ports.

At £169 the Atari 130XE is currently the cheapest of the 128k 8-bit machines, so in those terms it's good value. Inevitably, though, there must be some reservations about Atari's commitment to supporting its old 8-bit family in the light of the new ST range. And both machines in PCW's offices suffered from problems with the function keys, with one of the keys on each machine eventually giving up altogether. This is unfortunate as previous Atari machines have had a good reliability record.

Atari claims that 3½in disk drives, a new range of printers and lots of good serious software is on the way, but with the dropping of other machines in the XE range and of the wonder business package Infinity, it is difficult to judge how committed the company really is. Having said that, it obviously makes sense to have a cheaper machine sitting alongside the ST in the shops, especially one that looks so similar to the ST, so hope for Atari users' sake that the company continues to support both machines.

recommend it to a beginner. I haven't played with ACT Diary and Sketch yet, and Activity is an icon-driven 'Macintosh-like' interface of which I've heard both enthusiastic and disgusted reports, so it's clearly a matter of taste. And Gee-Whizz (GW-) Basic is very good, especially the editor.

There is one other comment that can't be avoided. The £600 price tag for the Apricot does make the £400 QL look rather steep for a 128k machine without disks, doesn't it? Even including the Psion software. The fact is that Sinclair Research desperately needs every scrap of profit it can get out of that box.

While you are waiting for your IBM PC/AT (and if you ordered one, you are almost certainly still waiting for it), Compaq distributor MBS Rentals suggest that you consider a Compaq Deskpro.

The reason, apparently, is that you rent the Deskpro until the AT is delivered, and there's no penalty for sending it back if the AT arrives early (fat chance!); and, should you decide to keep the Deskpro, MBS will take half of what you've already paid in rental off the price.

Details from Philip Ely on (0990) 28921.

Tramiel's 'millions' fall short: new ST for merchandisers

Jack Tramiel told me that he would sell 'millions' of Atari 800s at the new, low price. That was in February.

But in May, at the Comdex show in Atlanta, he gave me an opportunity to gloat — I had told him in February that the days of the 8-bit, single-tasking box were over. 'The users,' Jack confirmed at Atlanta, 'are cleverer than we are. They saw the 800 as an old-fashioned box, and they didn't buy it the way we thought they would.' Just how many boxes the 800 has been in makes an interesting story in itself — see the caption story on page 123 for more details.

Anyway, Jack's solution to all this was to invent a new machine. To the astonishment of the assembled industry observers, he began by spending 10 minutes talking about the evils of selling machines through 'mass merchandisers' and the wisdom of selling through computer stores, only to then start discussing what would happen when the mass merchandisers got hold of the product.

One polite observer tentatively remarked that he had trouble following this apparent contradiction. 'I'm quite used to the Press having trouble understanding me,' said Tramiel cheerily. 'What I'm referring to is the version of the ST which we will have specially for the mass merchandisers.'

Yes, another machine. It will have the same chip (Motorola 68000) as the ST, but no disk, no screen, no keyboard, and 'will therefore appear to be cheaper'. But by the time you've bought the bits to turn it into the ST, it will cost more, he promised.

The machine itself was on open demo at Comdex, which gave me my first chance to push the mouse around. Its colours and high-resolution definition are brilliant, and the drawing and drafting software is amazing.

But it is also clear that the price hasn't been finalised Once you build-in variables like a colour screen, software, and so on, I suspect you will have to find around £1000 for a working system. Above that Atari cannot go, because that would be to give the Macintosh, with its ready-to-go software, too much of an edge.

Tramiel still insists there will be hundreds of STs in September.

However, to my surprise, Atari appears to be letting American software writers believe that the machine is already available in the UK. One producer of programs told me (in the first week of May) that 'there are already machines on the shelves of shops in Britain, according to Sig Hartmann'. Hartmann is director of software.

Sig, on being asked whether he did say this, told me: 'Please, would you mind going in at the other door and signing the visitors' book so we have your details?' — and when I returned to the exit door where he had been, he was there no longer.

Anyone who knows of a store where Atari STs are actually on sale (not just up for demo) do let me know. My Prestel number is at the end of this Newsprint section.

PCII competition a gamble

Everyone and his uncle is now launching imitation IBM PC/ATs (the biggest version, with the big disks and big memory capacity, and the 80286 chip).

The list in the last month or so includes Televideo, Zenith, Compaq, Kaypro and many others, some as well known, some you've never heard of.

The question that hasn't been answered, however, is: can these machines compete with the new PCII?

It seems fairly certain to many observers that IBM has postponed the PCII launch, which was due in May. The reason is simple: the boss got himself promoted to a salt mine, and the new boss put the whole scheme on ice while he sorted out who was who in the organisation.

If it turns out that the PCII does use the 80286, then a lot of these AT clones are going to look sick.

Worse, there are signs that IBM hasn't yet quite made up its mind whether the AT is a finalised design. There may still be changes, which may leave all the imitators high and dry.

Compaq's attitude to the problem seems dangerously similar to hubris-inspired mania.

One of the company's executives recently said that 'the IBM standard isn't really an IBM PC standard at all, it's the IBM-Compaq standard'. Asked to explain this, he offered the perfectly accurate observation that the Compaq design left out several things that the IBM design included, and that no software worth speaking of tried to use these IBM specials (things like the Professional Graphics board, for example).

There is, of course, a difference between the unique hold that Compaq acquired in the market by producing a portable PC clone, and its chances of getting a similar, unique hold of the AT clone business. I hope Compaq isn't betting on winning because it's quite a gamble. END

Guy Kewney can be contacted on electronic mail. His numbers are Source TCK 106, and Telecom Gold 81: JDS018. The Prestel mailbox number is 01-802 2679.

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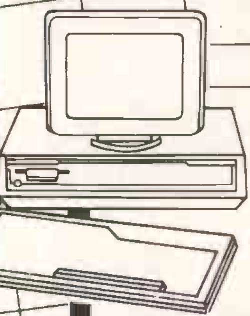

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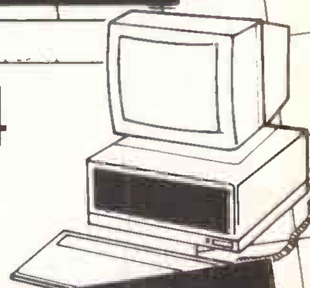

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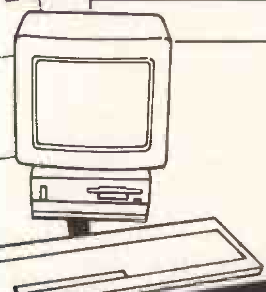

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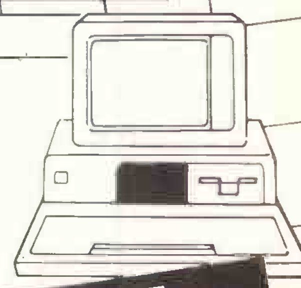

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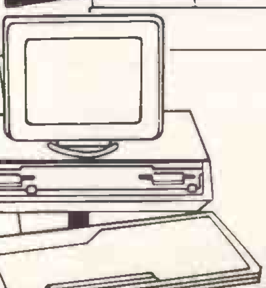

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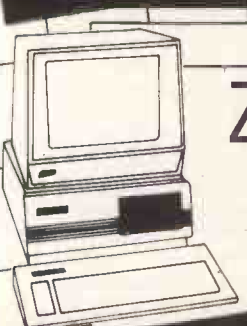

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The best-dressed desk-top will soon be wearing a cellular array processor to provide mainframe power, and Lotus isn't sitting on its laurels — David Ahl brings you the latest news Stateside.

Cell power

A cellular array processor (CAP) under development at the ITT Advanced Technology Centre has the potential to provide a desk-top computer with the processing power of a large mainframe, and to replace a mainframe with one a hundred times as powerful.

Compared to a conventional processor which performs operations sequentially (multiplication, for example, is a series of additions), a CAP does many operations simultaneously and in parallel. One of the main CAP parts is a VLSI array chip which contains one-bit processors; each one-bit processor has its own set of 32 general-purpose registers and its own memory of from 16k to 64k-bits. These processors can be duplicated as many times as will fit on a chip. Currently a chip with 16 processors has been fabricated, but the number is expected to rise as VLSI design and manufacturing techniques continue to improve. The CAP chips themselves can be wired together to form processing arrays of virtually any power and speed.

Flexibility results from the way the processors are programmed. For example, a 16 by 16 array of one-bit processors could do 32 simultaneous 8-bit additions or a single 256-bit addition.

Along with simplicity, flexibility and speed, the CAP design boasts high fault tolerance. As the technique is relatively inexpensive, it should result in inexpensive systems with high processing capability and excellent reliability.

As it can perform many simultaneous operations, the CAP is particularly suited to solving problems that involve large quantities of similar data, such as speech recognition, robotics and office automation.

The Lotus eaters

Lotus is a busy company these days — out on the acquisition trail while expanding its range of current products. It has signed a letter of intent to acquire Software Arts and hire its two founders, Dan Bricklin and Bob Frankston. Bricklin and Frankston are the inventors of the original spreadsheet, VisiCalc.

The decision to be acquired by Lotus, acknowledged Bricklin, was a result of a sharp reversal of Software Arts' fortunes. Software Arts had licenced VisiCalc to Personal Software (later renamed VisiCorp) to market and distribute. However, as the sales of VisiCalc declined the two companies came to legal blows from which neither fully recovered. In the face of mounting losses, VisiCorp was acquired last September by Paladin Software Corp, while Software Arts' revenue plunged to $3 million in 1984 from about $12 million a year earlier. Software Arts currently holds the licences for VisiCalc, TK!Solver and Spotlight.

In its first move into hardware, Lotus has signed a letter of intent to acquire Dataspeed Inc, a vendor of portable stock quote radio receivers. Dataspeed's two products, Quotrek and Modio, receive data transmissions from FM radio sidebands that carry stock quotations. The hardware can also load this information into Lotus spreadsheet programs. The transaction was valued at $6.5 million.

Lotus also announced new releases of its Symphony and 1-2-3 programs which will take advantage of up to 4Mbytes of RAM. The new releases use the new Lotus/Intel RAM spec which has an eventual capacity of 8Mbytes, and up to four 2Mbyte boards can be added to an IBM PC or PC-compatible to reach the specified 8Mbyte capacity. The specification has been made available to over 30 board makers and software developers.

In addition to utilising additional memory, Symphony 1.1 can also interface with 8087 and 80287 maths co-processors which should dramatically improve the computational speed of the software. Symphony 1.1 has a minimum memory requirement of 384k and is priced at $695. The revised 1-2-3, which will be available later in the year, will be priced at $495.

The final comeback?

Xerox has introduced five desk-top computers, two laser printers and related software programs in an effort to regain its position in the office automation market. An internal study indicates that Xerox must look to computers and related products for at least one half of its sales by 1990, but previous efforts to enter the market have been largely unsuccessful.

The new machines are not major technological breakthroughs. More significant is the marketing strategy which includes more aggressive pricing, an integrated approach to office automation (which Xerox calls 'document creation and distribution'), and marketing through a newly-merged 4200-man copier/computer sales force. In fact, the new computers and printers will not be sold through retail computer stores but will be sold only by the integrated sales force. Analysts feel this will put pressure on Wang and other vendors, but especially Apple which does not have a central sales force for large corporate accounts.

In another departure, the new computers will run IBM PC software and will communicate with local area networks other than Xerox's Ethernet. Analysts consider this to be important, but that success really depends upon the newly-combined sales force.

Random bits

Watch for the introduction later this year of a 10Mbyte hard disk on a single IBM PC board; the entire assembly is less than 1in thick . . . The Corporation for Science and Technology approved a $3.5 million contract with Int1 CMOS Technology and Purdue University for the development of an advanced erasable/programmable non-volatile memory product that incorporates 'technology which is expected to dominate the semiconductor industry for the next 10 years' . . . The Honeywell Physical Sciences Centre has announced an optical interconnect consisting of a gallium arsenide laser diode with its associated drive circuit and an optical detector and amplified on a single chip, coupled to an optical fibre. The interconnect, with transmission rates in the gigabit range, is ideal for short communications links between silicon chips, circuit boards, and processors in a distributed network . . . IBM has announced its intention to do battle with Japan in the low-end printer markets, and it has introduced two units. The $549 dot-matrix Proprinter offers three print speeds and near letter quality. A unique paper-feed mechanism allows it to handle both single sheets and envelopes while continuous form paper is left in the machine. The Color Jetprinter prints in seven colours on standard bond paper, coated stock and transparencies. The inks are stored in easy-to-change, no-mess cartridges . . . Abacus Software has announced two interesting products for the Commodore 64, Xper and Super C. Xper is said to be an expert system, although it sounds to me as though it is simply a database with an efficient search algorithm. Super C is a C language compiler which produces 6510 machine code from source files up to 41k in length . . . ITT has announced a repositioning of the ITT Xtra computer. 'Repositioning' in this case seems to mean a 41 per cent price reduction from $4395 to $2595 for the 256k Model III with a 10Mbyte hard disk. Similar price reductions were announced on other configurations . . . END

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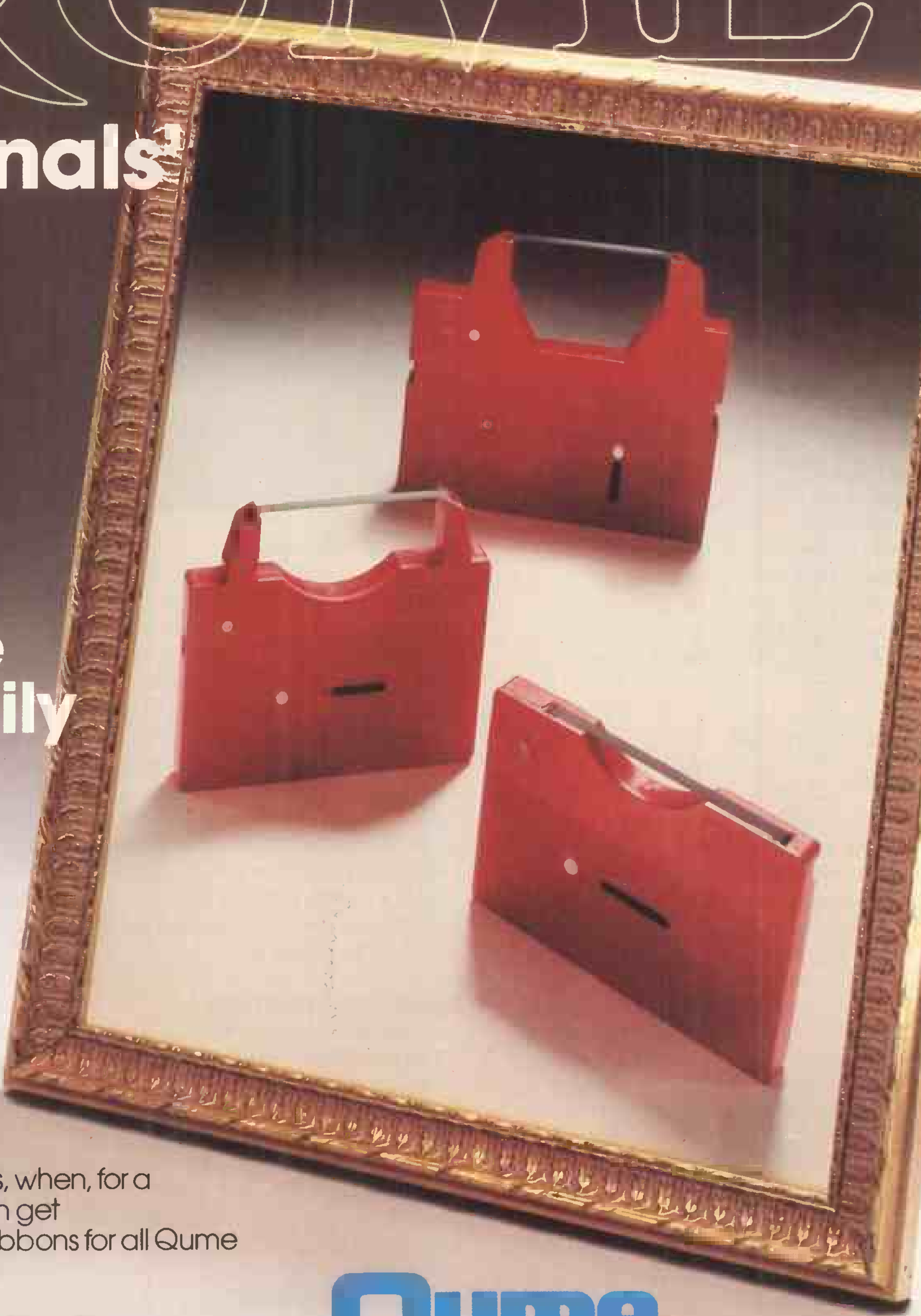

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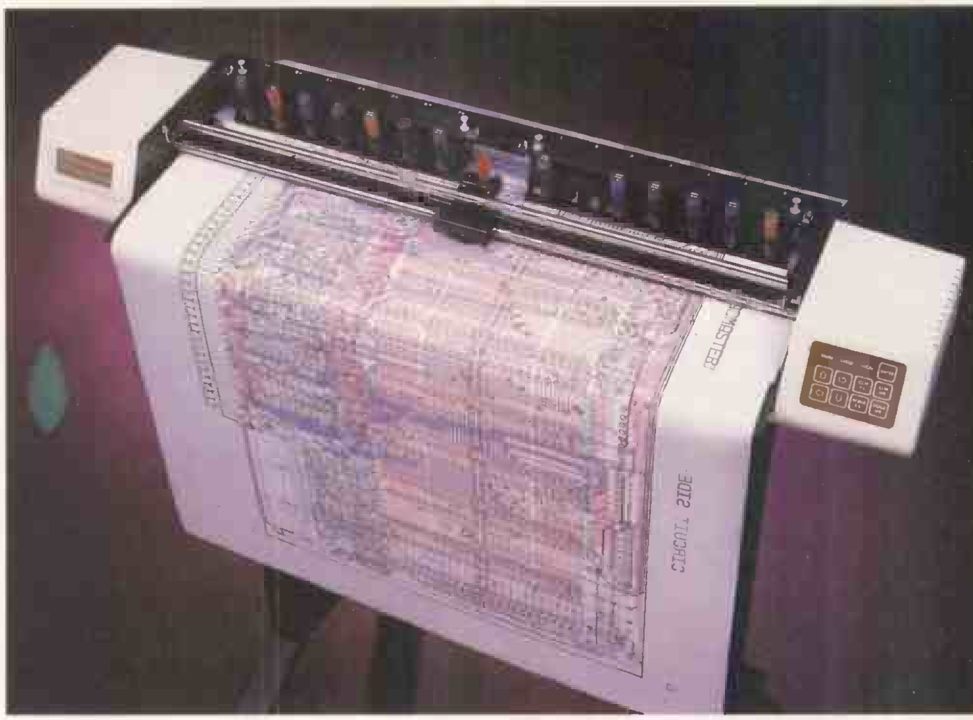

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Shinichiro Kakizawa diagnoses IBM Japan's terminal problems and tries his hand at forecasting the weather in this month's news from the Far East.

The trouble with IBM . . .

All is not well with IBM Japan, despite the launch of the 5540 business machine (described in the caption story on this page) which attempts to bridge the gap between the company's bottom-end JX micros and the struggling 5550.

The Japanese market has been a difficult one for IBM over the past 10 years. Unlike the situation in other countries, IBM Japan is not the top supplier here: Fujitsu has the biggest share of the market, with NEC following close behind. IBM is fighting a losing battle against Hitachi for third place.

IBM was once at the top, having more than 70 per cent of the Japanese market, but it has been steadily losing the market to Japanese suppliers in the last decade. This downward trend applies not only to one market sector but to all of them, including mainframes, small-business computers and micros.

The reason for IBM's failure is simple — it couldn't cope with the increasingly demanding user requirements. Until recently, IBM didn't even grasp the full extent of the ever-changing Japanese market.

Where does IBM Japan stand now? None of the IBM PC models are available here: IBM Japan created its own — the 5550, the JX and now the 5540. When the 5550 was introduced, the market was already dominated by NEC which had more than a 50 per cent share. But IBM's hopes ran high. It envisaged a repeat performance of a successful entry into a new market, and quick control of the dominant position was its ultimate goal.

But it didn't happen. While IBM was trying to sell the 5550 which featured just one model, NEC, Fujitsu and other local manufacturers began to expand their entire product ranges. The 5550 had achieved moderate success, primarily as a 3270 emulation terminal cum PC in the IBM mainframe user market, but had never taken off as a business micro. IBM pushed the 5550 fruitlessly for over a year, but finally realised that a new machine was imperative.

Last September a series of new-model JX machines was announced to fill the demand in the lower-end market (JXs are PCjr lookalikes and very cheap). IBM was confident that this time users would appreciate the real power of IBM, but again, to the company's surprise, things went wrong. While IBM was developing the JXs, its competitors had also strengthened their products.

IBM had to try something else so it announced the 5540, but this is a stripped-down version of the 5550: same 8086 chip, same MS-DOS operating system. Everything in the 5540 is identical to the 5550 except that a colour display and hard disk are not supported.

The market has reacted cooly. Many micro retailers in Akihabare — Japan's electronics bazaar — have ignored the 5540's launch. Now, with this product line considered unconvincing even by existing dealers, IBM Japan faces a difficult task — to gain a prominent position in a market where the users do not dance to IBM's tune.

If you think this machine looks less than exciting you'd be in agreement with many Japanese users. It's the IBM 5540 which consists of an 8MHz 8086 cpu, 256k main memory expandable to a maximum 640k, two 720k double-density 5¼in floppy disk drives and an amber-coloured display screen.

List price for the basic configuration is £1460, which does not include the display, but my IBM salesman unofficially suggested that I should be able to get 20 per cent discount.

DIY weather forecasts

IBC, a Kyushu software house, has developed a DIY weather forecast program. The program analyses data from the Japanese weather satellite 'Himawari' (Sun Flower) and apparently continually presents highly accurate forecasts.

Satellite data is captured through a parabola antenna on the roof; the data is analysed by the program and displayed on a VDU. With this DIY system, users can forecast the local weather and answer questions such as: 'How much rain should I expect in my garden half an hour from now?'

IBC says with a straight face that the DIY system provides a useful guide for setting up short and long-term marketing strategies for many service and leisure industries such as football stadiums, open-air children's parks, zoos, exhibitions, and catering services for these facilities. Farmers and other weather-dependent industries can also benefit.

The program runs on many popular 16 and 8-bit micros; the only functional difference between the two versions is that the latter displays the temperature on an eight-level scale while the former can do it on 64 levels.

To run the program, you need a parabola disc antenna of a small diameter and a down converter which is basically an A/D converter. Weather data transmitted from the satellite is captured by the antenna, converted to digital form and stored in a floppy disk; this data is then analysed by the program.

A moving picture of clouds, similar to those seen on TV weather programmes, can also be shown on the VDU. The picture can be enlarged up to 16 times the original size in order that the user can zoom in to a particular point on the map. IBC suggests that simply by watching the clouds moving on the screen, users can make a fairly accurate forecast themselves.

IBC also says that two to three weeks self-training will be required before users can enjoy the full benefits of the DIY system. As for the satellite data, anyone can use it provided he submits an application form to the Government Weather Authority, which owns the satellite.

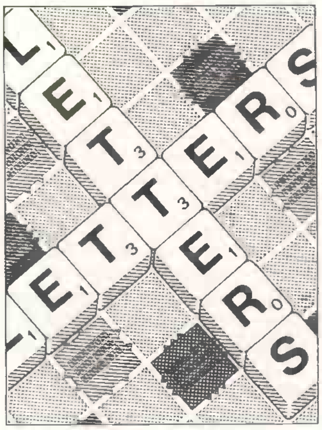
The program is called 'Weather Man' and costs £6600, inclusive of parabola antenna, A/D converter and interface cards.

Floppy converter

A unique stand-alone floppy disk converter has been released from Iwasaki Engineering in Kyoto. The machine has two drives, for 5¼in and 8in disks, and performs two-way copying of either-size floppy disks in a mere 160 seconds. Setting copy parameters is done through prompt messages on the single-line LCD screen located on top of the box. Entire disk or file-by-file copying is supported for any sequential files.

Iwasaki claims that the unit is useful in an IBM business data processing environment where 5¼in and 8in drives often co-exist. END

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.



Bravery . . .

In Guy Kewney's report on Tapestry, the network management product which he saw at the PC Trade Show (May 1985 issue) he claims to be confused by the PC Network and its software.

The situation is quite straightforward. The IBM PC Network was announced in September 1984, and became available in April this year. IBM offers a choice of two software programs to run the network: Torus' Tapestry or the IBM PC Network Program.

The report claims it is 'yet another non-standard IBM network standard'. This is not so — it is IBM's stated intention to connect the PC Network and IBM's planned industrial network to its future token ring local area network. Each network will have the ability to communicate with IBM System/370 host computers and applications.

MD Stott, Information and Services Manager, IBM United Kingdom Ltd

It takes a brave man to say that anything to do with networking is 'quite straightforward'. We remain sceptical: after all, bugs are still being discovered in PC-DOS. For example . . .

. . . and bugs

We have found a bug in PC-DOS/MS-DOS version 2.1 when copying more than 255 files using the wild card option (*).

If you attempt to copy files from one sub-directory to another, on a hard disk machine, using a command such as COPY *.* or COPY *.EXT and this results in more than 255 files being copied, the 256th file is not copied. This also applies to the 512th file (and probably all multiples of 256). The screen message tells you that the file is being copied, but this is not so.

The file count is reset to zero after 255 files and restarts counting from one as more files are copied. Therefore, when copying is complete, the screen message 'File(s) copied' gives you the true number of files copied — 255.

Since finding this fault two months ago, we have scanned the computer press to see if anyone else has reported it. Having notied with some surprise that no-one seems to have found it, we felt that we should report it to you.

W Clewlow, Bass Computer Services, West Bromwich

You're right — small though it may be, it's there in DOS 2 and 2.1. If it's any consolation, IBM says it's been fixed in DOS 3.0.

In the eye of the beholder

Having read Peter Bright's 'review' of the ABC 310 in the April issue, I feel I must redress the balance.

Firstly, the ABC's size. Who was it who said: 'Beauty is in the eye of the beholder'? If Mr Bright subscribes to this view (and I'm sure he does) why does he then make such a song and dance about the 'sheer ugliness' of the machine? I like the ABC, not because I like 'slab grey' (Mr Bright's words, not mine), but because I think that the all-in-one approach is much neater and more ergonomic (so did Mr Bright in his review of the C/WP Cortex in December 1983).

Next, the keyboard. Mr Bright may think it 'chunky' and 'dated', but did he notice that it is virtually the same as the BBC Micro's (except that the ABC's is 'slab grey', only it isn't, it's beige). Anyway, how does the colour of the keyboard (or, for that matter, of the computer) affect its performance?

Having expressed my opinions of its appearance, now for the computer itself. Has it not occurred to Mr Bright that, like the PCB, the OS chip might have been redesigned? (This, incidentally, is why the Electron has a 1.0 OS rather than a 1.2 OS.) Also, Mr Bright says, in the same issue, that the RM Nimbus being '. . . the third fastest we have ever tested, beaten only by a couple of Motorola 68000-based machines'. 68000-based machines like the Sage p-System, TDI Pinnacle, ABC 310 . . . ABC 310?! Yes, the ABC 310, which uses a humble 6502 and an Intel 80286, is timed with every test faster than the Nimbus, and an average 1.63 seconds less than the Nimbus.

I used to think that a Benchtest was a fair, unbiased review of a computer. Recently, though, I have had my doubts. Surely Acorn is in enough trouble already without being subjected to an unnecessarily bad review?

Hugh McLaren, Great Ayton, North Yorkshire

Redressing the balance is fine, and we obviously can't claim a monopoly on interpretation, but it's hard to agree with some of your points. We are in agreement about the all-in-one approach — Atari is also promising a neat monitor with built-in drive for its STs — but the ABC is a much bigger machine than the Cortex.

As for the keyboard, it looks and feels different to the one on the BBC. The Benchmarks are instructive, but we have to repeat the message that there's more to life than the speeds they measure.

Nor do we have any wish to add to Acorn's troubles — only to report them accurately, as is our policy in describing and assessing machines. Olivetti also seems to share our reservations about the 300 range.

Child's play

It is evident that whoever wrote ChipChat in your April issue, or at least the 'Trivial Fact no 437', has either forgotten all the O Level Physics he or she ever learnt, or never took it in the first place. As any schoolchild will tell you, the unit of electrical charge is not the farad but the coulomb — or wasn't the author in question quite up to spelling this?

Even if the error was originally the paper company's, such an illustrious magazine as *PCW* ought to have spotted it. Just because it's described as 'trivial' doesn't mean it shouldn't matter. We don't want to know about static measured in picofarads because it don't exist. Funny perhaps, but it would be helpful (and credible) if a few basic facts were right.

Thomas M Hawkins, Southampton

We could, of course, pretend that it was an April Fool's joke. On the other hand, we could admit that we got the unit wrong. By the way, the figure itself was correct.

Don't buy British!

Normally I am a gentle, kindly person but recent experience forces me to voice strong opposition to M Hamer's recent invocation to 'Fly the flag' (Letters, *PCW*, April 1985) and buy British micros. My general advice is not to buy British unless forced to at gunpoint, and even then ask for a second opinion. The Brits are marvellous at design and invention (I include the arts and sciences) and generous in providing free services (such as computer user groups), but when forced to work for reward, the quality of service and goods deteriorate remarkably.

Our laboratory minicomputer uses British terminals, brand X (to save embarassment and possible litigation). Company X also sells intelligent terminals with disk drives operating under CP/M. It was natural for us to buy this company's (rather more expensive, though well engineered) micros when we needed word processors in the department.

The company was reluctant to sell us a fourth X micro directly, and we were forced to buy the machine from an even more reluctant dealer many miles away. It was true we were demanding more than just a micro. We wanted WordStar, dBaseII, a daisywheel printer and accoustic hood as well. We also wanted the system to work! Instead of company X first installing and checking the system in its own premises, the goodies arrived accompanied by two nice blokes who did not know how to get the printer or programs to work (this is called software support!). They did not appreciate that a special printer cable was required, although we were ale to teach them from our own experience on the other X brands. This is called on-site training!

The dealer sent another expert (remember the experts were travelling at least a hundred miles a day to install the system) who decided they needed help from the X manufacturer. A software man from company X eventually got the goodies cobbled together. There are still bugs in the WordStar implementation and dBaseII has an unresolved problem. Public money (yours and mine) has been spent on a British system which has cost more in terms of wasted time than would have been necessary if a local dealer had sold and installed a system which he understood.

The distant dealer, who was forced to sell us brand X, complained that he did not get the software support from the parent company. This is probably true — our dealings with company X has revealed the usual discrepancies between the real machine and the documentation. Company X felt that it was not worth investing support in a small customer, and any information it did provide was done as a great favour. It was wrong. We are not naive computer users who need constant hand-holding. If the company provided us with reasonable and prompt support it could have access to in-house software which could be used by other laboratories. At present I must advise my colleagues in other NHS laboratories to avoid brand X.

This and similar experiences with other commercial companies has revealed some common failings. Sales and support staffs are separated, each ignorant of the other's activities. In general, technical and support departments appear to be pushed into back rooms and are less well paid. May I prescribe the following treatment before departing in my rusty but reliable (Japanese) car?
1) Reduce the sales staff.
2) Use the money to provide better goods, services and information for the customer.
3) The satisfied customer will do your selling.

Dr C Weinkove, Bramhall, Stockport

Temperature rules

Fahrenheit/Celsius conversions need not be as cumbersome as Mr Khatir's formula (Letters, *PCW*, May). The simplest rule, taught to me some 60 years ago, is based on the fact that −40 is the same temperature in both systems, so the rule is:
Add 40 : Multiply by 9/5 or 5/9 : Subtract 40 : END

For C to F you use 9/5ths; for F to C 5/9th (you are expected to remember that Celsius degrees are larger than Fahrenheit).

RA Fairthorne, Farnborough, Hants

Getting it taped

The Department of Trade is considering a levy on audio and video tapes to recompense for the alleged loss of royalties due to pirates. This is spelt out in the Green Paper *The Recording and Rental of Audio and Video Copyright Materials*, Published by HMSO.

The DOT has been impressed by the amount of support which has no doubt been produced by the trade lobbies. It also quotes an 'International trend towards a tape or equipment levy'. which all suggests that the levy will be introduced although it is claimed that no decision has been reached as yet.

A levy of 10p on an audio tape and 25p on a video tape may not cripple the innocent but it is a bad principle. The way it has been proposed assumes that pirating is related to the music and video industry because that is where the strong lobbies exist, but it is not going to be long before the computer industry wants a share of the cake. This will lead to an increase on the levy and eventually to applying it to disks. Even a person who never even thought about pirating will still be penalised on the grounds that he could have if he had wanted to.

Now we all know that pirating goes on but the figures are wrong. a person who pirates a copy of WordStar for a pound or two would not pay out £250. A business user would not bother to pirate software because the support and manual are worth more than the cost (or they should be). The same applies to all popular home pirating. All pop pirates that I have met seem to spend most of their money on records and they tape music that they cannot afford to buy, therefore the industry does not lose as much as it would like us to believe and much of its reduced income is due to the reduced purchasing power of the market.

Commercial pirating is just plain stealing and should not be glamourised by an exotic title. We should not have a levy on the innocent — it is like charging you 50p to walk the streets because you might mug someone.

If enough people protest it will have a balancing effect on the trade-sponsored lobby which is pushing the matter despite early government doubts. If this levy does come about it will spread, and could be applied equally to magnetic disks. A more ominous threat is that the levy could be applied to equipment. Eventually it could be applied to plain paper because it's used to photocopy sheet music. Whatever the outcome, it is likely to be effective for a long time because no government misses a trick to raise money.

D Taylor, Hornchurch, Essex

As far as we know, only a levy on video tape is being considered now, which doesn't alter the fact that penalising the 'innocent' along with the 'guilty' doesn't make much sense to us either.

Knowing about Aslib

I read with interest Stephen Farr's article 'In the Know', *PCW*, April. I was surprised, however, that there was no reference to the fact that there is a national centre in the UK which was set up specifically to give information and advice about online databases.

The Online Information Centre, which is now part of Aslib, can provide detailed information about the systems which are available and the equipment and training needed. An annual subscription covers a monthly newsletter and gives access to an advisory/information service, but new contacts can usually be helped with their initial enquiries with no obligation to subscribe. The centre has over 800 subscribers in the UK and overseas, and answers over 2000 enquiries every year.

The Online Information Centre can be contacted c/o Aslib, The Association for Information Management, 26/27 Boswell Street, London WC1N 3JZ. Tel: (01) 430 2671.

Dr D A Lewis, Aslib

Printers, problems and praise

I have previously written to you regarding the problems I had correctly connecting the Spectrum Interface 1 with the Brother HR-5 printer, and would now like to inform you that Brother's service department in Audenshaw, Manchester, sorted out the difficulties. Some of the wires from the RS232C port from the printer's side have to be linked together before it will work correctly. The correct linkage is:

ZX IFI	HR-5
2	2
3	3
4	20
5	5
7	7

The 4, 6 and 8 wires should be linked on the Brother's side.

Although this printer and the Spectrum are normally linked via an extra Centronics interface, it seems a good idea for those who normally have the ZX Interface for their Microdrives to obtain normal-sized printing using the HR-5 with the RS232C interface.

Furthermore, the HR-5 switches should be set to eight bits and the Spectrum baud rate to 300 (FORMAT "t";300 : OPEN #4;"t": REM for text: FORMAT "b";300 : OPEN#5;"b" : REM for control characters). Text can the be printed using the fourth channel (PRINT#4; "text";), control characters (underlining or emphasised characters using the fifth channel (PRINT'#5; CHR$;), which is rather more complicated than the method mentioned in the manual.

Henk van de Pol, Geneva, Switzerland

It's good to know that some suppliers can be helpful. We've also received words of praise for Pace Software Supplies of Bradford and DGR Computer Products of Tonyrefail in mid-Glamorgan. END

BANKS' STATEMENT

Picture talk

Martin Banks muses on the impending significance of graphics and networks in the small-business market.

As I sit here in front of my machine, it is the middle of April. I mention this for no other reason than by the time you read this, it will be the best part of June and the world will probably have changed.

For a start, we'll be a lot nearer the day (which I'm sure you've all been waiting for) when you can actually buy Microsoft's Windows and IBM's Topview. Both packages are relevant to my first theme — graphics front ends to applications programs. My second theme is networking, especially small, tolerably cheap networks. These two mark what is likely to be the dominant thrust in the small-business marketplace, and any manufacturer of hardware or software which does not have at least a stated position on them may well have no position at all in the near future.

The reason that these two are going to be significant has nothing specifically to do with them being explicitly used together, though this will almost certainly be the case. Rather, it is that they represent a growing industry trend to make all this clever technology do something that the user can not only understand, but can see a simple reason for using. Of such philosophies are sales made.

It is the potential arrival of MS-Windows that is prompting my interest in graphics. According to Bill Gates, who, as boss of Microsoft really should know, Windows is going to be the greatest graphical thing since sliced bread. Users and software authors will be able to do things with it that will make you thrill with excitement. The trick, as first developed by Xerox in the US and followed by Apple with the Lisa (sorry — the Macintosh XL) and the Mac itself, is to put graphics at the human interface to an applications program. This has the remarkable effect of making the program understandable in operation and easy to use.

I appreciate that some computing devotees will find such an idea heretical, but the users like it. There is no reason why someone can't walk up to an applications program that has not been encountered before and rapidly get it going in a usable fashion; that is what these graphics front ends can do.

Digital Research was quick to spot the opportunity and produced GEM (Graphics Environment Manager). This adds the same type of Macintosh facilities to a wide range of machines, not least of which is the IBM PC. GEM, though disparaged by Microsoft's Bill Gates when compared to the upcoming Windows, has one distinct advantage — it is available and working. For those who had one particular reservation about the Macintosh, GEM can also work in colour.

The sneaky Japanese have now got in on the act too — Epson recently launched its QX16 PC-compatible machine. As hardware, it is a fairly average box with not too much to distinguish it from the general PC throng. But it has one special feature — a graphics front end called Taxi, a package developed by Epson UK and currently on sale only in Europe. If it is pushed hard in the US as well it could prove quite a sales aid in that important market. Taxi offers the usual Macintosh facilities and can be added to any standard MS-DOS applications package in about a day. (It should only take a beginner a couple of days to fit up a package, according to the company.)

'Getting the cost of networking down by using the latent intelligence of the hardware more wisely makes a great deal of sense, not least to the user who gets a cheaper network that is easier to work with.'

Once seen, the advantages of all these graphics front ends are obvious, and you begin to wonder why you ever felt at home with the dear old A> prompt as the only intro to anything.

With a bit of lateral thinking, however, graphics can be taken much further than just as a helpful front end to applications: it can become the application itself. For example, I recently saw a demonstration of a Macintosh program which is ideal for any small publisher. Called Pagemaker, it allows the operator to take words prepared on any Mac-oriented word processing program and paste them down onto a 'page' format onscreen. Headlines can be written, typefaces can be tried out, and different sizes and shapes of article can be toyed with on the page until the user is happy with the result. When the job is complete, the idea is that the user will then fire the page round the AppleTalk network to the new LaserWriter, which is a dashed clever (if expensive) box of tricks that can print fancier and better than most micro owners would feel they have a right to expect. (Pagemaker is not yet available.)

Mention of AppleTalk neatly brings in theme two — networks. Currently, networks are an adequate solution for some people, but users have to be prepared to pay large amounts of money. AppleTalk is one of the first systems to attempt to keep the interconnection costs low by putting most of the network's required intelligence in the hardware rather than the interface. The LaserWriter, for example, has a 68000 processor and 2Mbytes of memory built into it. The file server will be similarly equipped. The idea is that connection charges, for a simple twisted pair cable and a connector box, will be around the £50 per station mark.

This can be achieved by making use of the processing power available. For example, instead of trying to transmit a full bit-map to the printer, the network is used to send only enough data for the internal system of the printer, which uses the Linotype-developed PostScript language to reconstruct what is required.

Getting the cost of networking down by using the latent intelligence of the hardware more wisely makes a great deal of sense, not least to the user who gets a cheaper network that is easier to work with. The British Micro Manufacturers' Group is seeking a similar end, with its recent requests to the Department of Industry for development funds for a network scheme. This, if and when it gets off the ground, could be even better because it will work with more than one type of hardware. Sometimes, technology can be made to look quite reasonable, really. END

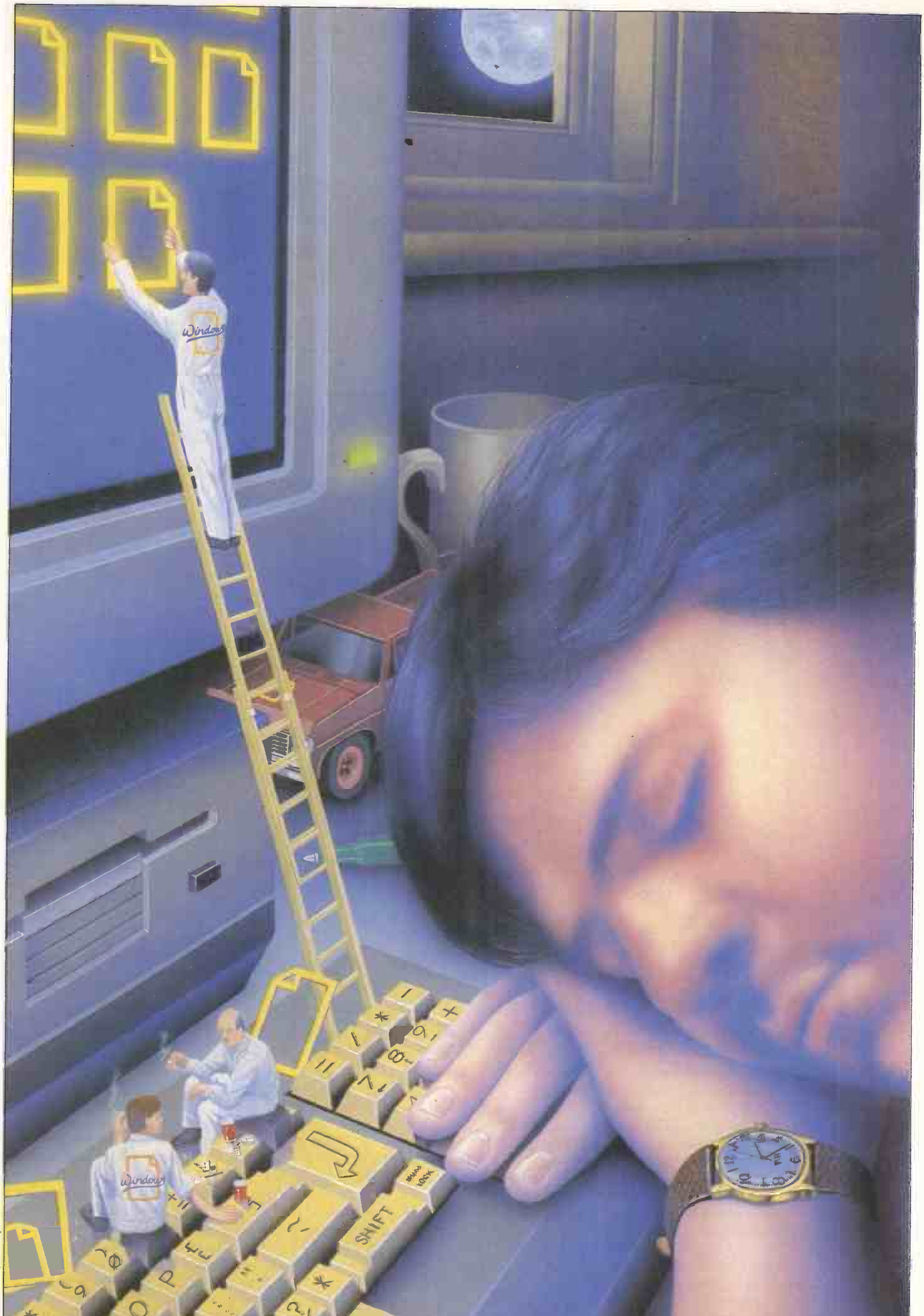


Illustration by Tony Randell

Commodore 128

The C128 is Commodore's answer to its critics — it sports an improved Basic, and Commodore 64 compatibility coupled with originality. But has it come too late in the light of strong competition from Atari and Amstrad? Peter Worlock takes a look.

In its earliest days Commodore enjoyed a remarkably successful run with the Pet, the Vic-20 and the Commodore 64, all selling in large numbers. But just when the company began to look invulnerable, it stumbled over the launch of the C16 and Plus/4 models in the crucial pre-Christmas period of last year, which makes its next offering, the C128, even more interesting.

In a sense, the C128 isn't a new machine, more a logical development of its predecessors. Indeed, there's a Commodore 64, complete in every respect, lurking beneath the skin. But the C128 is much more than a Commodore 64 with a few extra bells and whistles — it's three computers in a single unit. It also functions in the new C128 and CP/M modes.

The machine reviewed was a pre-production model but lacked only the CP/M implementation and full documentation. The 128 and 64 modes worked flawlessly, and the former proved to be an impressive demonstration of what Commodore can achieve when it gets things right.

Hardware

The C128 consists of a single unit housing the keyboard, circuitry and input/output ports. The unit is an attractively-styled low wedge in off-white and grey, with the power switch and interfaces neatly tucked away at the rear and right-hand side. The connectors are mostly solidly-mounted sockets, except for the familiar gold-plated edge connectors which have been long employed by Commodore for cassette, cartridge and user ports.

After a brief flirtation with non-standard connectors on the C16 model, Commodore has enjoyed a return to common sense. The C128 features Commodore 64-compatible cartridge and cassette ports; the user port (for modem and IEEE devices) is the same as that on the Pet, Vic-20 and Commodore 64; the two joystick ports are also standard 9-pin D-types; and the standard Commodore serial port for printers and disk drives is also present, plus the composite video output port.

However, there are two new features, both welcome and long-overdue on Commodore's machines — a reset switch and an RGB monitor interface. The reset switch is set into the casing so accidental operation is avoided, but neither is it necessary to dig around with the end of a ballpoint or the like.

The RGB interface is required for the 80-column display as Commodore's standard composite monitors lack the necessary resolution.

The keyboard looks large although it isn't much wider than that on the Commodore 64; the impression of width comes from the addition of a numeric keypad on the right-hand side. Other new features include the moving of the four programmable function keys from a vertical strip on the right to a horizontal strip above the numeric keypad. They have been joined by 12 other dedicated function keys, including four cursor keys, although the traditional Commodore arrangement of cursor control from two keys next to the right-hand SHIFT key is retained.

'In a sense, the C128 isn't a new machine, more a logical development of its predecessors. Indeed, there's a Commodore 64, complete in every respect, lurking beneath the skin.'

The other function keys include ESCAPE, TAB, ALT (a kind of secondary CONTROL key), HELP, LINE FEED, 40/80 COLUMN DISPLAY, CAPS LOCK and NO SCROLL. The LINE FEED key looks as though it's there just to make up the numbers since the same effect is achieved with SHIFT/RETURN, but CAPS LOCK is welcome to word processor users, and the HELP key is a boon to programmers, identifying the location of program errors.

Overall, the keyboard is as good as any on machines costing less than £1000. It's pleasantly sculpted, has a light but positive feel, and once again emphasises the point that there's no excuse for supplying computers with unprofessional keyboards.

Getting inside the machine is difficult. Six screws hold the casing together, with the circuit board fixed to the lower half and the keyboard fixed to the upper. Two bundles of connecting wires link the two sections. The circuit board is covered with a metal shield, and removing this reveals a neat board design which takes up the whole of the available space.

On the review machine nearly all the major components were on EPROMs with the exception of the RAM block and two interface controllers, the latter handling all I/O including keyboard, cartridge and user ports, and joysticks.

The C128 has two main processors — the 7510 (another development of Commodore's line of 6502-compatible chips) and the Z80 for CP/M operation. The 7510 is an upgrade of the Commodore 64's 6510, and allows the C128 to completely emulate that machine while also providing the ability to handle the extra bank of 64k RAM and the new ROMs. (An examination of the C128 memory map should prove an interesting exercise as the machine is obviously doing some very sophisticated memory paging.)

Graphics and sound are handled by two custom chips — VIC (Video Interface Chip) and SID (Sound Interface Device), both inherited from the Commodore 64. SID is arguably the most powerful sound synthesiser available on any micro, giving three independent sound channels, full ADSR enveloping, filtering, hard sync and ring modulation, and four waveforms — pulse, sawtooth, triangle and white noise.

In addition to normal alphanumerics, the C128 features the full range of Commodore block graphics characters which can be displayed in either 80×25 or 40×25 text mode. The advanced graphics features are available in 40-column mode only and include eight programmable sprite graphics, 320×200 high-resolution graphics mode, and 160×200 multi-colour mode.

The C128 offers 16 colours, available from the keyboard, and can display all 16 at once in text mode. In the highest-resolution mode, two colours can be displayed in each 8×8 character 'cell', and in multi-colour mode four colours can be displayed in each cell at the cost of half the horizontal resolution.

System software

CP/M's movement into the home market continues with the C128, but whereas Acorn, Amstrad and others have offered it as an upgrade, the C128 features CP/M as standard. The C128's other plus is that it features CP/M version 3.0, not the older version 2.2.

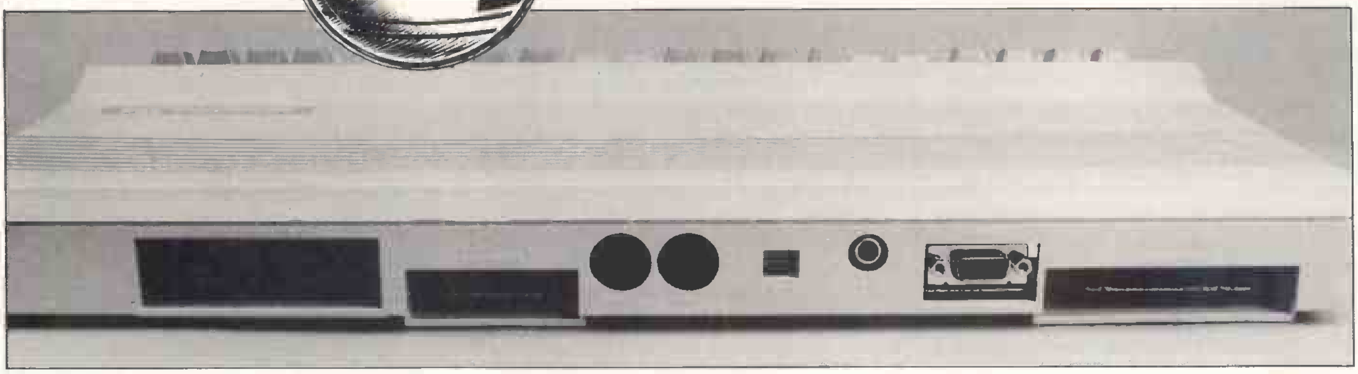
'If Commodore had got this machine to market before last Christmas, instead of the Plus/4, it would almost certainly have wiped the floor with its major competitors. The market's a tougher place now.'

Commodore has further customised the operating system to take advantage of the 128k of RAM and the machine's sound facilities, although how this affects operation remains to be seen. However, CP/M was not implemented on the pre-production review machine, which may indicate problems in installing the software.

The inclusion of CP/M should be a distinct advantage and widens the scope of the C128 considerably. CP/M holds out the promise of access to an enormous range of applications programs, and already Thorn-EMI has announced that it will convert its Perfect suite of business software — word processor, spreadsheet and database — to Commodore disk format.

In 128 mode, the machine holds no surprises for anyone familiar with

View from the side: two standard joystick ports, the reset button and power on/off



The cartridge and cassette ports, the user port, the standard serial port and the RGB interface

Commodore machines, with the possible exception that disk commands are now built into Basic. The unwieldly syntax of LOAD "$", 8: LIST simply to get a disk directory is now replaced by the DIRECTORY command, and other disk functions are similarly catered for.

The addition of an ESC key is welcome since escape codes for, for example, printer operation can now be generated direct from the keyboard. Another development involves the 'programmable' function keys; on the Vic-20 and Commodore 64 these were programmable only through interrupt-driven machine code. The C128 features a KEY command that allows you to define each key to perform any desired function. This can either print a string, an oft-used Basic statement for example, or a direct command can be issued by adding CHR$(13) — a carriage return — to the key definition.

One other welcome surprise awaits — the inclusion of a sprite-definition program in ROM. Simply issuing the command SPRDEF calls up a sprite grid which gives control of sprite design, mode and colour. The definition is placed in sprite memory with SPRSAV, and all definitions can be saved to tape or disk with the BSAVE command.

Applications software

The new version of Basic on the C128 is one of the most attractive features of the machine. Although its line of descent is clearly traceable from the Vic-20's Super Expander Basic through the version implemented on the C16 and Plus/4, it is a good deal more comprehensive than any Commodore Basic to date although it is still short of the standards set by Acorn's BBC Basic and Amstrad's Locomotive version.

Benchmarks

BM1	2
BM2	11.8
BM3	22
BM4	23.3
BM5	26.5
BM6	42.4
BM7	67.3
BM8	126
Average	40.1

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January issue.

There are a host of new commands and functions, largely covering the areas of graphics, sound and disk control. It remedies most, if not all, of the shortcomings of programming on the Commodore 64.

Sprite control is easy with new commands such as SPRITE for turning on, colouring and positioning each sprite; MOVSPR which allows you to determine the direction and speed of movement of each sprite; and COLLISION which is interrupt-driven and transfers program control to a specified subroutine when a sprite-to-sprite or sprite-to-background collision is detected. Sprites can also be drawn on the high-resolution screen and transferred by means of the SSHAPE and SPRSAV functions.

The convoluted manner of high-resolution graphics on the Commodore 64 is also gone. A GRAPHIC command allows you to set up one of five screens: text, high-resolution, multi-colour and two split screens of either text and high-resolution, or text and multi-colour. The split screens default to a five-line text window, but this can be altered by the addition of an extra parameter to the GRAPHIC command.

Others include DRAW and BOX with the ability to rotate the object drawn, CIRCLE which caters for arcs, ovals and elipses, a PAINT command for solid colour fills, and CHAR which displays text and block graphics on the high-res screen. The system now features automatic clipping so that out-of-range values don't crash your program — the operating system 'clips' them to fit the screen.

In text mode a WINDOW command allows you to define an active text area, which means that user input and messages can be displayed without destroying a previously-defined screen made up of block or user-defined characters.

The other main bugbear in Commodore 64 Basic is controlling the machine's sound facilities. Again the C128 goes a long way towards putting things right with four new commands: SOUND takes the arguments voice, pitch, duration; PLAY sounds a string of notes; TEMPO allows you to control the duration of each note in a PLAY

The numeric keypad gives an impression of width

command; ENVELOPE gives control of ADSR envelope and waveform; and FILTER implements some of the SID chip's advanced features.

The PLAY command is enormously flexible and powerful. Notes are given simply by name, for example A,B,G with # and $ signifying sharps and flats, and envelope, waveform and filter can be altered with the inclusion of single-letter controls. A musical piece of some length, with three voices and several waveform and envelope variations, can be created with just a few PLAY statements.

As mentioned, disk control is fully implemented in Basic. There are new commands for formatting disks (HEADER), saving and loading to disk, and deleting a file (SCRATCH), as well as a RECORD function which makes the handling of random access files much easier than on the Commodore 64.

The new Basic features improved program control with the addition of DO LOOP . . . WHILE and UNTIL and multiple IF . . . THEN clauses through new BEGIN, BEND and ELSE functions. There are error-trapping commands, functions for reading joystick, light-pen and game paddle input, programmer's aids like AUTO, RENUMBER, TRON and TROFF, a facility to save and load machine code and data with BSAVE and BLOAD, and extra functions for number and string manipulation. The single, major ommision is the facility for procedures with parameter-passing.

The last new feature is the inclusion of a built-in machine code monitor, accessed by the simple MONITOR command. This offers all the usual features of an advanced monitor including assembler, disassembler, memory fill and display, hex dump, block moves, block compare, and the facility to save and load from tape and disk.

Documentation

The review machine was accompanied by a bundle of photocopied sheets which form only part of the eventual documentation. In its final form this is likely to comprise two manuals to be supplied with the machine, with a third, the *Programmer's Reference Guide*, to be supplied separately.

The material supplied looked like an introduction to programming, covering the new Basic with comprehensive sections on sound and graphics, plus appendices on using the machine in 64 mode. The manual will also include a brief guide to machine code and CP/M. Although the manual was well written and should serve newcomers to programming quite well, the *Reference Guide* should prove essential reading.

Prices

Commodore has not yet announced final pricing on the C128, although when the machine made its European debut at the recent Hanover Fair it was quoted at around £300.

Pricing will be crucial. Although Atari is offering the 128k XE at £170, the C128 is sufficiently better to hold a price higher than that — but not too much higher. On the other hand, the price difference between the Commodore 64 and the C128 will have to be substantial, otherwise you'd be a fool to buy a Commodore 64 with the C128 offering so much more. This indicates a price cut on the Commodore 64, perhaps to around £150, with the C128 coming in at the £225 level.

Although the C128 is compatible with the full range of Commodore 64 peripherals, including the 1541 disk drive at £220 and the 1701 colour monitor at about the same price, Commodore is promising a new range featuring the high-resolution RGB monitor which will be essential for 80-column and CP/M applications, and a faster drive. No pricing has been announced on these products, but expect to pay the same or slightly more than for the current range.

Conclusion

Commodore at last appears to have listened to its critics. When Commodore 64 owners decried its abysmal Basic, Commodore responded with the C16 and Plus/4 — better Basic certainly, but at the expense of much of the hardware that made the Commodore 64 such a great machine.

In the C128, Commodore has solved the old problem of maintaining compatibility while offering a great deal that's new, and the Basic is better than many could have hoped.

The pity now is one of timing. If Commodore had got this machine to market before last Christmas, instead of the Plus/4, it would almost certainly have wiped the floor with its major competitors. The market's a tougher place now. Although I would strongly argue that the C128 is better than any 'home' machine available as I write this, it's open to question how it will fare against the likes of Atari's forthcoming ST series.

The C128's main strength is compatibility with the enormous range of Commodore 64 software — and that's a range that includes some of the best packages available for any machine, covering everything from games to serious business applications. Upgrading those applications to take advantage of the extra memory should not be difficult, and that, coupled with CP/M, could win it a lot of friends among small-scale business and professional users, while the combination of the hardware and new Basic make it an excellent programmer's machine.

The C128 is an outstanding product. Provided Commodore does not get pricing outrageously wrong, it deserves to be one of this year's most successful machines. END

Technical specifications

Processor:	8502 (6502 compatible) plus Z80A
ROM:	64k
RAM:	128k (two banks of 64k)
Screen:	40/80×25 text, 320×200 graphics
Keyboard:	91-key, full travel with numeric keypad, cursor keys, four programmable function keys, eight dedicated function keys
I/O:	Serial I/O, user port, cartridge port, cassette, composite and RGB monitor, two joystick ports
DOS:	Commodore Basic 7 and CP/M 3.0 in ROM

In perspective

The C128 shapes up very well against the current competition, specifically the Amstrad machines and the Atari XE. The XE competes with its 128k of memory, but loses in comparison with the C128's implementation of Basic, the keyboard and facilities such as CP/M, the built-in machine code monitor and sprite-definition utility.

The Amstrads have a distinct price advantage, offering colour monitor and tape deck at £340 or 80-column monochrome monitor and disk drive at the same price. Even if Commodore keeps the machine price down to around £200, a comparable C128 system is going to cost around £600 which probably awards the victory to Amstrad, although Commodore 64 compatibility gives the C128 a better chance than it would otherwise have had, and in the small-business market buyers may prefer to deal with a company of Commodore's standing. In the longer term, the new range of Atari ST machines stand an excellent chance of capturing a significant part of the C128's natural market.

However, for many Vic-20 and Commodore 64 owners, the C128 represents the ideal upgrade.

SCREENTEST

ISO Pascal

Adam Denning roots out the advantages of an ISO standard Pascal compiler over other, non-standard packages with the aid of comparison Benchmark results.

There's a Unix utility called yacc, which stands for 'yet another compiler compiler'. Perhaps there should be one on the QL called yapc—'yet another Pascal compiler' — as there are now three different packages for the machine. However, the one reviewed here differs from the rest mainly by virtue of its ISO (International Standards Organisation) standardisation, which brings it up to the level Pascal programmers have been told they should adopt.

What advantages does an ISO standard Pascal compiler have over its non-standard brethen? The main point is that any program which you write on one machine will compile and work without alteration on another machine, as long as it too has an ISO compiler. A laudable idea, except that in my experience there's not much you can do efficiently in Pascal unless you extend, and therefore break, the standardisation rules.

This package is from Metacomco of Bristol, the company which has already provided QL owners with a macro assembler, a BCPL compiler and a Lisp interpreter. It costs £89.95, which is over twice as much as the competition from Computer One, and £10 less than the p-System plus UCSD Pascal compiler from TDI.

The package comes as two microdrive cartridges, an EPROM cartridge and a hefty manual. The microdrive cartridges contain most of the compiler, a screen editor, the linker and a few 'include' files. The EPROM cartridge contains the rest of the compiler and needs to be plugged in only during compilation. It goes into the socket which used to house the 'dongle' on very old and dodgy QLs, but has the virtue of being rather more attractively packaged than that dongle.

The screen editor is the usual Metacomco product, as supplied with all the company's products and the Sinclair assemblers, and is a version of the BCPL editor used on BBC Micro and Sage Tripos BCLP systems. It supports all the usual screen editing facilities, and also allows the use of command lines to execute complicated exchanges in one easy go. It has the slight disadvantage of allowing its files to be only RAM-based, but that hasn't been a problem to date.

The Pascal compiler

In common with all Metacomco products, the Pascal compiler is written in BCPL, a high-level systems language that *PCW* reviewed in June. This highlights one of the shortcomings of Pascal — why program in Pascal at all when it simply cannot do the things BCPL (and C) can do?

'Pascal is undeniably an extremely popular language, and this ISO compiler is probably a dream come true for those who remain exponents of the language. I'd prefer a nice C . . .'

A further advantage of having the compiler written in BCPL is that the end result of each compilation is simply a BCPL binary module, which means that it can be linked with sections of programs written in BCPL and 68000 assembler. If you thought that some sections of code would be better expressed in Pascal than in BCPL or assembler, you could write that bit in Pascal and link it with the rest of the program written in BCPL: the best of both worlds with very little effort. The end result is unlikely to compile on the average ISO Pascal compiler, however!

To reverse the saying, every silver lining has a cloud, and the one here is that the Pascal compiler is huge. Leaving out the EPROM, there are four program sections (three overlays); the largest of these is over 42k. This leads to a couple of related problems. As the compiler is overlaid, each overlay has to be loaded into RAM during compilation. This is fine if you have floppy disks or a lot of RAM (more slave blocks, you see), but the standard QL with microdrives is almost as slow at compiling a program as the IBM PC is with Digital Research's MT+ compiler.

Nevertheless the compiler is one-pass, which means that it generates its binary file with only one read of the source file. The result is a surprisingly small BCPL module, comprised of native 68000 machine code and some linkage details. This is processed by the linker, Paslink, which combines it with any other subject files you choose to include and then transfers the executable code to a named file. The linkage process naturally links in the run-time system at the same time, but this is one of the bad parts. In common with the BCPL compiler there is no selective library linkage, so the entire run-time system and library is always linked into each file. This isn't significant if the program is fairly large, but it does mean that each Benchmark program is approximately 22k long!

A further side-effect of the compiler's size is the workspace used during compilation. Without expansion RAM it uses most of the screen to store its working tables, resulting in a pretty selection of green, red and white squiggly lines all over the screen. It initially gives the impression that the system has crashed, but when you get used to it the idea doesn't seem that odd.

When the compiler is invoked you are given the option of producing listing and code files, which may be given any valid file name, and then you're asked if you want to omit the range-checking code. The answer to this would normally be 'no' (the default) until a program has been fully developed and debugged. The range-checking code slows down the speed of the resultant code quite considerably.

You are then asked whether you want to include extensions to the ISO standard. If you reply 'no' and your program contains non-standard routines, calls, and so on, a compile-time error results.

Finally, you are asked for the size of the workspace the compiler can use. The default is 20k which is enough for the average compilation, but for any more you really need a RAM extension.

Compilation then proceeds at a fairly respectable rate, and details of the amount of workspace used are printed. At the end of each compilation, you are asked whether you want to compile any more files. This saves repeated loading of the compiler, which is very handy if you're stuck with microdrives.

Documentation

The manual provided has the mandatory 'How to use it' section, along with a brief description of how to install the compiler to use floppy disks rather than microdrives. Following this is a complete reference section detailing the syntax of the language, with numerous examples. There are also explanations of each predefined identifier (built-in procedures, functions and variables) and a list of compile-time and run-time error messages. This is followed by details of the available extensions to ISO along with QL-specific material dealing with windows, multi-tasking, and so on. There is even a special function called QTRAP which allows you to access any of the QDOS internal trap-invoked routines from within Pascal.

Comparisons

Given that there are three different Pascal compilers available for the QL, which compiler do you buy? If price is your sole consideration, there's no question — Computer One's. At £39.95 it's a bargain, although it isn't ISO approved and only compiles to an interpretive p-Code (for more details, see February's review).

The TDI p-System compiler and operating system costs £99.95 and comes complete with an assembler, but I was unable to examine this at the time of writing as it wasn't quite finished. The compiler on this system obviously conforms to the UCSD standard rather than ISO, so some aspects of it are going to be different from those on ISO products.

The main advantage of this ISO package is that it compiles to native 68000 machine code, which means that programs written in it will generally execute far faster than those produced on the other two systems. The speed advantage is not stunningly noticeable until you remove the range-checking code, when ISO Pascal roars ahead of the rest. It suffers slightly in its handling of reals (floating-point numbers), even though (or possibly because) it uses the internal floating-point routines built into QDOS.

If you look at the *PCW* Benchmark results in Fig 1, you will see that the averages at the bottom of each column confuse the issue. Only Acornsoft ISO Pascal (reviewed last December) is consistently awful, but even the £500 MT+ 86 compiler from Digital Research shames itself when running the real arithmetic Benchmarks. Both QL Pascals follow a fairly uniform execution rate, but QL ISO Pascal wins in the end. If the Benchmarks are run without range-checking code, the figures diverge more, with QL ISO Pascal being much faster than Computer One's except for reals. For more details on the Benchmark programs, see the December 1984 issue.

The Spectrum compiler looks good in any comparison, with only the MT+ and unchecked QL ISO Pascal beating it in the integral tests. Considering the £25 price tag on Spectrum Pascal and £500 for MT+, not to mention the difference in machine prices, you may wonder why people buy PCs in the first place!

	QL ISO	QL Comp. 1	DR MT+	Acorn ISO	Hisoft ZX
Magnifier	0.70	1.00	0.10	2.38	0.85
Forloop	12.21	11.00	3.0	31.27	7.10
Whileloop	13.20	45.10	3.0	126.50	8.90
Repeatloop	10.92	40.10	2.80	127.07	7.80
Literalass	13.49	22.00	3.80	52.60	7.50
Mem access	13.50	20.70	4.00	53.00	7.80
Real arith	52.30	43.80	391.70	60.80	20.70
Real algeb	49.10	37.90	317.60	58.25	21.40
Vector	21.32	77.50	9.30	202.50	17.00
Equalif	16.53	42.50	5.20	107.00	10.60
Noparams	9.20	15.30	1.99	31.10	6.50
Unequalif	15.78	40.50	5.20	106.00	10.60
Value	10.51	18.70	2.50	36.10	7.20
Reference	9.91	17.50	2.70	35.20	7.20
Maths*	10.50	10.20	328.30	35.07	9.30
Average	17.28	29.59	72.03	70.99	10.03

All compilations were done with no special compiler options (for example, removal of range-checking code)
Benchmark 15, maths, has been run with an iteration count of 1000 rather than 10,000 as it is by far the slowest test
Digital Research's MT+ 86 compiler was run on a Zenith Z-150 PC, which is an IBM PC compatible

Fig 1 Pascal compiler Benchmark results

Conclusion

QL ISO Pascal is a very good package, and even at £89.95 proves to be excellent value for money. Perhaps Borland could be convinced that it would be worth doing a Turbo Pascal for the QL in addition to the implementations reviewed in April, but I can't see it being that much cheaper.

The problems with Metacomco QL Pascal are not insurmountable. The first step should be a selective linkage editor, following the Sinclair standard format. Then a way to avoid the necessity of an EPROM should be found, as this must considerably increase the price. At the same time, it shouldn't be impossible to cut down the size of the compiler. All this would mean yet another trip through the ISO evaluation suite, which is gigantic and often well over the top, but the step must be worth thinking about.

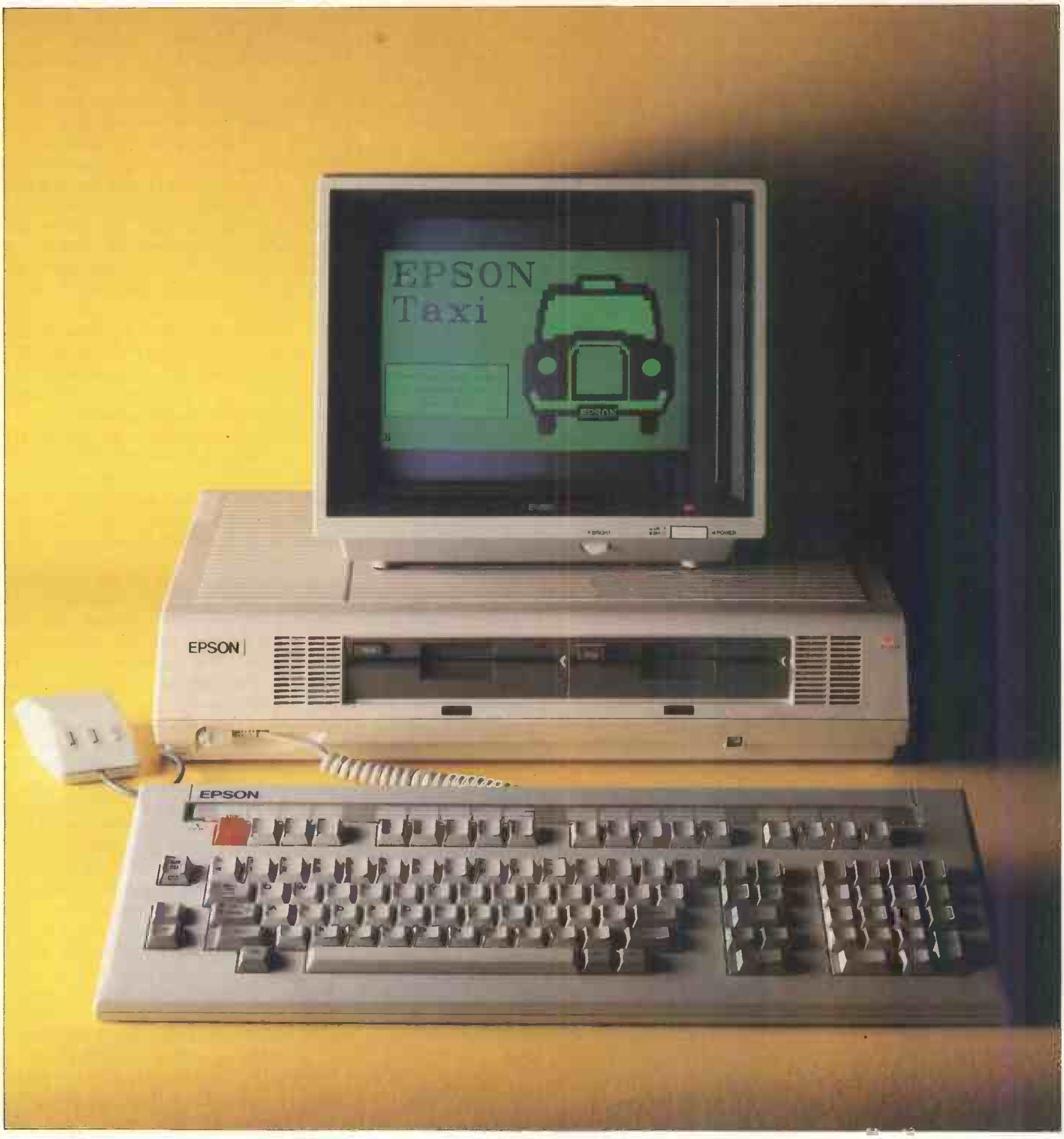
Pascal is undeniably an extremely popular language, and this ISO compiler is probably a dream come true for those who remain exponents of the language. I'd prefer a nice C with structures, floats, and so on, or a BCPL compiler.

Metacomco is one of the few companies with enough confidence in Sinclair to continue taking the QL seriously, and with the impending release of the Lattice C compiler through the company, Sinclair should get its marketing together and sell the QL to the right sector. It is not much more than adequate as a business PC-style machine, but it's damn good as a development system for Atari STs.

By the time you read this it will be one year since the real launch of the QL, and for a machine that's only sold 60,000 at £400, it has a good deal more development software than most. If you bought a C compiler (I'm talking real C here, not one of those toy Cs with none of the language's useful features), a BCPL compiler, an assembler and an ISO Pascal compiler for the PC, you would need to spend in the region of £1200, while £290 will get you the lot on the QL. That range of software alone (remember the 'ISO' tag on the Pascal compiler) makes the QL an ideal machine for further education. END

Epson QX-16

Epson has entered the 16-bit league with the QX-16, a sturdy if standard machine which boasts IBM compatibility and a friendly user interface. But are these features enough to ensure Epson's success in this PC-dominated market? Peter Bright has the answer.



Epson made its name in microcomputing as purveyor of printers to the masses, then made its break in producing micros with the 8-bit QX-10. This was widely regarded as one of the nicest CP/M-80 machines around. However, it was overpriced, and was launched at a time when 16-bit machines were establishing their supremacy.

Now Epson has launched its own 16-bit machine which boasts IBM compatibility, an 8088 processor and Epson's unique Taxi friendly user interface.

Hardware

Physically the Epson QX-16 is very similar to the older QX-10 8-bit machine. The main unit is 20 ins wide by 13 ins deep by 4 ins high. While the unit is quite broad this gives it a pleasing low-line appearance which reduces its visual impact on your desk. The casings are constructed from high-quality plastic with rounded edges on most of the surfaces to further enhance the lines of the unit.

The overall colouring is also standard Epson — predominantly cream with touches of grey on the disk drives, monitor and some of the keys.

The front panel houses the twin half-height 5¼in disk drives, the DIN keyboard socket, the reset switch and a little red power-on LED. The power switch lives at the right-hand side of the back panel.

On the rear panel from left to right we have: power-in, monitor-out, eight system DIP switches, speaker volume control, a Centronics printer port and an RS232 serial port. There are also four covers which may be for expansion cards — we'll find out later.

It isn't immediately obvious how to get inside the QX-16, but it is, in fact, a two-stage affair. Most people want to get inside their machine to fit a new expansion card. To make this as easy as possible, the QX-16 has a special hatch which you can remove to gain access to the expansion slots. When you have removed this cover, you also gain access to two of the four screws which hold the main cover in place. The other two are below the lever-off caps on the top of the main casing.

When you have removed the four screws, you have to undo an earth strap before you can lift off the top casing and disk drives as one unit.

> *'Overall, the construction quality of the casings and the PCBs is very high. The casings feel solid, and the PCBs look well made . . .'*

Despite the size of the system box, the internal electronics are tightly packed. The disk drives live in the top casing while the bottom casing houses the digital electronics and the power supply. The main PCB runs along most of the width of the system box, stopping just short of the power supply circuitry. Two extra heavily-shielded PCBs piggyback onto the main board; one of these handles the display via two very small, densely-packed, surface-soldered custom chips.

The main PCB also acts as a motherboard for up to three plug-in expansion cards. Strangely, the casing has space for four cards but the PCB has only three slots. On the review machine two of these slots were in use, leaving just one available for future use. If you need the extra space, one of the cards is only used by the Z80 processor so can be removed when you are running 16-bit software.

The QX-16 comes with two processors: an 8-bit Zilog Z80 and a 16-bit Intel 8088. In addition to running modern 16-bit software, it can also run general-purpose CP/M-80 software and programs written for Epson's 8-bit QX-10.

The base model QX-16 comes with 256k of RAM which is internally expandable to 512k. It also has 24k of ROM.

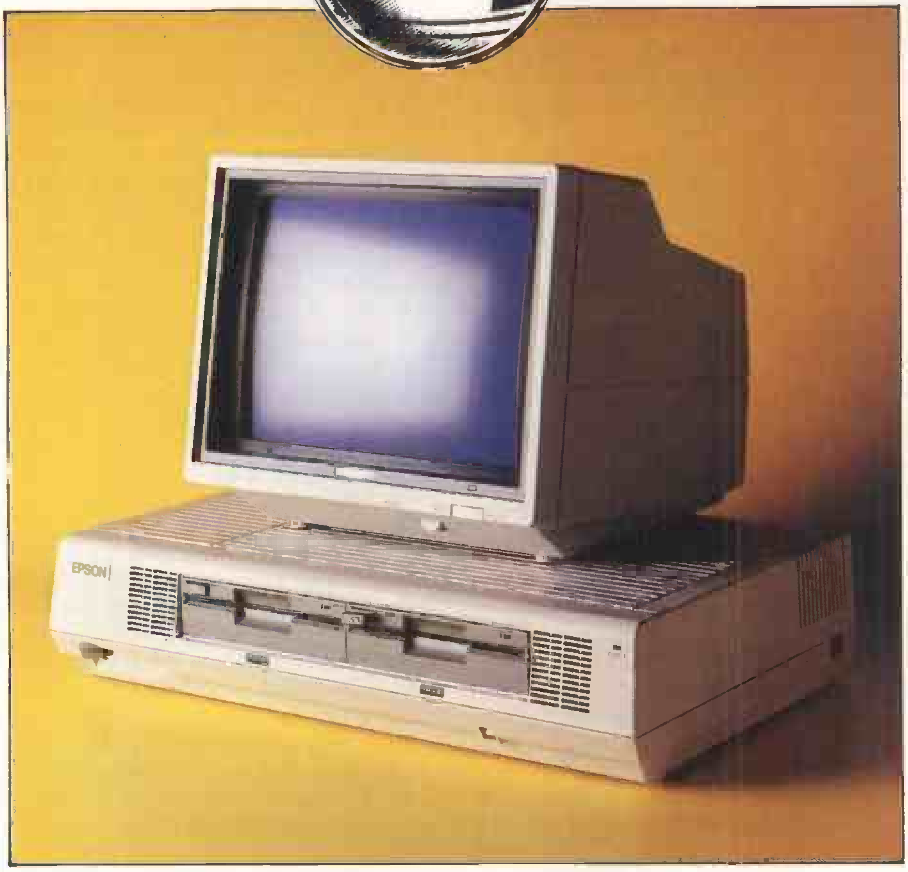
Overall, the construction quality of the casings and the PCBs is very high. The casings feel solid, and the PCBs look well made with no signs of last-minute patches. Although everything inside the system box had obviously been well screened for RF emissions, some noise was still audible on my radio.

The review machine was supplied with twin half-height 5¼in floppy disk drives which can work in two modes — either 360k IBM compatible or 720k native mode. 10Mbyte hard disk versions of the machine will be available in due course.

The review system was supplied with a green-on-black monochrome monitor which plugs into the back of the main unit via a short cable and a couple of DIN plugs. In monochrome mode, the QX-16 displays 80 characters by 25 lines and 640 × 200 pixels in IBM mode, or 640 × 400 pixels in native mode. This is put to very good use by the Taxi software. Also, like Epson's older 8-bit machine, the QX-16's graphics are 'soft' and can be specially programmed.

Colour is achieved by plugging a colour monitor into the same port on the back of the system box. The Epson's

The keyboard sports an impressive 105 keys grouped in a fairly standard manner



The monitor has a good display and standard controls

colour graphics specifications are exactly the same as those on the IBM PC.

As it stands, the system character set on the QX-16 is the best I have seen on any micro. Each character is extremely well formed and easy to read without becoming bloated like the characters on the IBM PC. The letter 'G' is especially good!

The monitor is a good-looking unit with power and brightness controls at the front, and vertical hold and contrast controls at the back. Its display is generally good, but despite using long-persistance phosphor onscreen, there was still some evidence of flicker on displays where most of the pixels are switched on.

The keyboard is decidedly non-IBM compatible. It is a very slim unit, but it covers a large area. It has two adjustable feet on its underside which allow you to type flat (very uncomfortable), at 10 degrees (very comfortable) or at 15 degrees (like typing on a cliff face). It connects to the main unit via a short length of coiled cable and two DIN plugs.

Even if the processing power of the QX-16 doesn't win you over, Epson is certainly going for a win in the keyboard stakes with an impressive tally of 105 keys. These include a big red button marked 'STOP' in the top left-hand corner. The last time I saw one of these was on the system console of an IBM System 370 mainframe at college — a friend pushed it just to see what would happen . . .

Luckily the effects of pushing the QX-16's STOP button range from midly boring to nothing at all.

The rest of the keys are grouped in a fairly standard manner, although the individual postioning is rather idiosyncratic. Most of the space is occupied by the main qwerty typing area; to its left are three keys which set and release tabulations and margins. The margin key doubles as the ESCape key.

To the right of the qwerty typing area are the editing keys with the usual cursor keys, plus INSERT, DELETE FORWARD, LINE and WORD keys. To the right of this is the numeric keypad which features all the usual arithmetic operators.

Running along the top are 17 programmable function keys and the STOP key.

All the keys auto-repeat very fast, resulting in a supersonic DELETE key which happily outran my reactions and ate hundreds of words I wanted to keep.

As mentioned, although the general layout of the keyboard is fairly standard, the individual placement of keys is sometimes rather odd. The main culprit is the ALT key which hides down by the space bar next to the CTRL key. It also took me a while to realise that the escape key is marked 'MARGIN RELEASE'.

The final oddity is that the QX-16 keyboard differentiates between SHIFT LOCK and ALPHA LOCK. Both, inciden-

The rear panel has space for four expansion cards but the PCB will only support three

tally, are on the same key, which may be confusing. If you select ALPHA LOCK, you get what I usually refer to as 'shift lock': that is, you get capital letters but the numbers on the top row remain the same.

To select SHIFT LOCK you simultaneously press one of the SHIFT keys and the ALPHA LOCK key. This gives you capital letters, but instead of giving you numbers on the top row, you get '!', '&', and so on.

This is probably what all you typists out there prefer, but I prefer the normal computer version.

The feel of the QX-16 keys is quite soft but still positive. This isn't to my taste; I prefer the IBM PC or Apple MacIntosh feel, but I know many people will appreciate this keyboard.

'Like the other friendly systems, Taxi makes heavy use of windows, ikons, mice and pull-down menus . . . Epson hasn't gone quite as far as GEM . . .'

System software

When you first switch on the QX-16, it displays the not-particularly-friendly message: 'IPL Version 3.0A Testing RAM'. It then sits around for a while pretending to be doing something useful before it asks you if you would like to put a disk into the drive. When you do this it says: 'Power on self test in process' and tries to amuse you by flashing the keyboard LEDs. Eventually it boots the operating system.

The QX-16 cleverly decides which processor to use. If you put a CP/M-80 boot disk in the drive, it automatically uses the Z80; if you use an MS-DOS 2.11 disk, it uses the 8088.

Assuming that most people buy a 16-bit machine to run 16-bit software, I'll concentrate on MS-DOS and its applications. In the case of the QX-16 this means MS-DOS version 2.11 with some special help from a utility called Taxi.

1985 is very much the year of the friendly user interface. No longer is the Apple Macintosh the lone voice in the dark of the mass market. Now the big software guns appear to have cottoned on to the fact that there may be more to life than the A> prompt. The first on the market was Digital Research with its GEM user-friendly user interface. This sits on top of the operating system and gives a graphical user interface which is reminiscent of the Macintosh. GEM has the potential to run on a wide range of machines, and currently can be found on the Atari 520ST, ACT Apricot and IBM PC.

Next is Microsoft with its oh-so-long awaited Windows package. This isn't quite as friendly as GEM, but it does give the operating system lots of bolt-on goodies in the way of multi-tasking.

Instead of licencing GEM or Windows, Epson developed its own user-friendly user interface package, Taxi.

When Taxi is first booted, you are greeted with — you've guessed it — a black London cab. This doesn't stay on the screen for long.

Like the other 'friendly' systems, Taxi makes heavy use of windows, ikons, mice and pull-down (or in this case pop-up) menus. However, Epson hasn't gone quite as far as GEM in terms of user interface.

In the case of Taxi, there are a maximum of two windows on the screen at one time. Both windows are fixed in terms of size and position onscreen, primarily because it takes a lot of calculation to track and resize multiple windows so the speed overhead can be quite high. Also, for much the same reason, it isn't possible to drag ikons around the screen as you can with GEM or the Mac. This makes copying files less intuitive, but it does make the system fast.

The first things you see on the screen (when the picture of the taxi has gone) are two disk ikons running down the left-hand side of the screen. It must be said that the quality of the ikon drawings is very high, certainly much better than, say, GEM on the IBM PC. A nice touch is that the disk ikons show the actual names of the disks rather than just the drive letters A or B.

To open an ikon, you use the mouse to move the pointer to the desired disk and hit one of the mouse buttons; this opens a window which shows ikons representing the files and directories on the disk.

Sub-directories are represented by a picture of a filing cabinet, general executable files by a piece of paper tape. All Taxi system files are stored in a sub-directory called 'Garage', represented by a picture of a garage. When asked why, I was told that taxis live in garages . . .

Benchmarks

BM1	1.4
BM2	4.7
BM3	10.1
BM4	10.4
BM5	11.4
BM6	20.1
BM7	31.3
BM8	33.1
Average	15.37

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January issue.

To run an applications program you first double-click its ikon; this writes the name of the program to a command line at the top of the screen. You can then add any necessary parameters to the command line. You then use the mouse to move the pointer to the command line and click the mouse again, and the program will be run. This can be rather long-winded, but it does give you the flexibility of being able to add parameters.

Whenever an error occurs, a dialog box is displayed in the middle of the screen telling you what has gone wrong and what to do about it.

'The QX-16 is a pleasant, fairly IBM-compatible machine which is being marketed as part of a competitive package. The friendly user interface is useful.'

As well as having ikons and windows, Taxi also provides a pop-up menu which runs along the bottom of the screen. This has five headings: Disk, File, Window, Help and Accessories.

Disk has two options — 'Change' and 'Rename'. Change tells Taxi that you want to change the disk in one of the drives, but it isn't strictly necessary to use this because Taxi will re-read the name eventually. Rename allows you to change the name of a disk.

File contains the options 'View', 'Print', 'Make', 'Copy', 'Rename', 'Remove' and 'Run'. View lets you see the contents of a text file on the screen; Print lets you print it; and Make lets you create a new sub-directory. Copy will copy a file from one window to another, so you need to have the right windows open before you can use it. Rename renames a file; Remove deletes a file; and Run is the same as double-clicking an ikon.

Window contains the following options: 'Where' displays the MS-DOS pathname of the current window; 'Tidy Up' rearranges the ikons in a window; 'Switch' transposes the active and inactive windows; 'Open' opens a file; 'Close' closes the active window; 'Desktop' closes all the sub-directories in the current window and then closes the window; and 'Close All' closes both windows.

Help has two options: 'Describe' prints a predefined text about a program file, and 'Get Info' displays statistics about the disk or file selected.

Accessories is probably the most useful of the pop-up menus. It contains utilities for installing printers and useful accessories such as a calculator, clock calendar and note pad. These are all selected using the mouse, and are displayed onscreen over whatever else might be there. The Accessories heading also includes an Othello game so you can while away the hours.

Taxi differs from GEM in that GEM stops as soon as you call an applications program. It doesn't matter how friendly GEM is, if you run WordStar you are stuck with the WordStar commands.

Taxi is different in that it goes some way in allowing you to modify standard applications programs. This is possible because part of Taxi is co-resident, it stays in memory when you load the applications program. This allows Taxi to exercise some control over the applications program while it is running.

You can usually modify the appearance of a program in two ways. Firstly, you can use the mouse to move the cursor; and secondly, you can install your own pop-up menu on the 25th line of the display.

If you want to alter a standard package in this way, you have to install it into Taxi by creating an .INF file for the program. This describes the ikon to be used for the program as well as the system details needed to control it. I had hoped to be able to play around with installing applications programs, but unfortunately the manual refers users to their dealer and I couldn't find a utility that would let me edit an .INF file.

Applications software

Luckily, Epson supplied three packages for which it had written the necessary .INF files. These were Enable — an integrated program, GW-Basic and good old WordStar.

WordStar is a good test of this kind of thing as it is notorious for not liking simulated keyboard input — it usually can't keep up. Epson overcame this problem by using the new revised and presumably faster WordStar 3.4.

WordStar usually displays its own function key assignments on the 25th line of the display which, of course, is where Taxi wants to display its pop-up menu. To get around this, the middle button on the mouse is used to select the Taxi pop-up menu which, in turn, has an option to return to WordStar's own status line display.

Mouse control of the cursor works well. WordStar's usual habit of not keeping pace is signalled by exclamation marks all over the screen. There was certainly no sign of this, even with the most vigorous mouse movement.

Having said that, I don't think the mouse was any great improvement over the cursor control in this case. The problem is that packages which weren't specifically designed for use with a mouse can't handle the quick diagonal movements you often want to make. A bottom-left to top-right movement ends up as up-a-line, right-a-bit, up-a-line, right-a-bit-more, and so on, which can be exasperating.

The pop-up menus were more successful and could make life easier for a first-time user, although being used to WordStar I didn't use them very much.

As far as IBM compatibility is concerned, the QX-16 willingly booted PC-DOS out of the box and ran Lotus 1-2-3 quite happily.

Documentation

The documentation supplied with the system was very pre-production — it consisted entirely of photocopies of the drafts of the manuals. These were quite helpful, but it would not be fair to discuss them in detail as they will change when they are printed.

Prices

Unlike most other machines, the Epson QX-16 is being sold as part of a package rather than just as a piece of hardware. Three packages are available. The first is the 'Business System' which sells for £2750. This includes the QX-16 with 256k of RAM, twin disks, a monochrome monitor, an RX100 printer, Taxi and the Enable integrated business system.

The 'Word Processing System' replaces Enable with a customised version of WordStar and substitutes a DX100 daisywheel printer. It cost £2650.

The Graphics System comes with the Logistics graphics package as the applications software and an HS80 colour plotter instead of a printer. This costs £2550.

Conclusion

The Epson QX-16 is a nice machine; not wonderful, just nice. The hardware is well built if unspectacular in terms of its performance.

The QX-16's main claim to fame is its Taxi friendly software, which again is useful rather than wonderful. As far as its user interface is concerned, it is closer to Microsoft's Windows than to Digital Research's GEM. Like Windows it doesn't go in for processor-intensive graphics, but unlike Windows it doesn't have multi-tasking.

The QX-16 is a pleasant, fairly IBM-compatible machine which is being marketed as part of a competitive package. The friendly user interface is useful. The fact that it is non-standard need not be a problem because no standard has yet emerged. END

Technical specifications

Processor:	Zilog Z80, Intel 8088 running at 5.3MHz
RAM:	256k expandable to 512k onboard
ROM:	24k
Mass storage:	Twin 360/720k 5¼in floppy disks
Keyboard:	105 keys typewriter style
Size:	20ins × 13ins × 4ins
I/O:	RS232, Centronics, three expansion ports
DOS:	CP/M-80, MS-DOS version 2.11 plus Taxi

In perspective

In terms of hardware, there is nothing unusual about the Epson QX-16. It is a fairly standard IBM-compatible machine. But in terms of packaging, the machine is quite different.

The most notable feature is the way Epson is selling the machine as part of a package that is designed to run out-of-the-box. Usually it would be up to the dealer to fill out the details of printer, software, and so on. This makes sense from Epson's point of view because it means the company shifts more printers and software, and it creates a nice, integrated image.

But it may not be so good from the dealer's point of view: he might have preferred to discount the machine and sell a high-margin printer and software. It all depends on the deal Epson is offering its dealers.

Another interesting point is Epson's decision to go it alone with the Taxi user interface rather than licence GEM from Digital Research or Windows from Microsoft. I'm not sure if this is a good idea from a marketing point of view.

At present the decision doesn't lock Epson out of any IBM software, but if software houses write for the GEM or Windows environments in the future, it could be a problem. I can't see major software houses rewriting their software for the Taxi environment for what, after all, is just an IBM-compatible machine.

Fast timing

Tests for measuring the speed and accuracy of standard Basic functions and operations on nine popular machines — presented by Dusko Savic and Ninoslav Cabric

Many people think that the word 'computer' is a synonym for speed and accuracy. When compared to human methods of operation it certainly is, but it is also true that computers vary greatly. To form a complete picture of the value of a computer, many elements must be taken into account (available memory, peripherals, existing commercial programs, price, and so on), but here we'll concentrate on the speed of execution and numerical accuracy of usual Basic functions and operations.

We have measured the speed of execution of 37 elementary Basic instructions on nine different computers. Our results show that virtually all versions of Basic have at least one 'blind spot', and there are also many programming bugs. The knowledge we gained from the tests enabled us to fully exploit the Basic/hardware combinations that we regularly use.

Programs written in different dialects of Basic and run on the same computer are executed at different speeds. For example, on the Sharp MZ-80K, the calculation of the square root of 5 in SP-5025 Basic takes 12.2 milliseconds(ms) and in Xtal Basic 3.1 it takes 43.4ms, although the latter works with one significant digit less than the SP-5025 Basic.

Measuring speed

For the purpose of our tests, we used a program called Speed Test (Fig 1), which can be easily rewritten in any Basic dialect. The FOR . . . NEXT loop was measured first; then, instead of the REM statement in line 40, operations from Fig 2 were inserted in the program. From the measured time we subtracted the timing of the FOR . . . NEXT loop, which gave us the net time for certain operations. Timing is measured from the first BEEP signal (line 20) to the second BEEP signal (line 60); these BEEPs are convenient if the time is measured with a stopwatch.

Alternatively, if the Basic supports a real-time clock, that can be used: the BEEPs are replaced by the corresponding clock initialisation and reading. This concept is very different from other speed-testing methods, and gives the possiblity of analysing every command individually. There were five basic groups of statements; for every group, an average timing is also given (Fig 2).

The results show that the computer's clock does not crucially influence the final speed of execution, although with the same CPU (Z80A) the Spectravideo and Spectrum are much slower than the Sharp MZ-700. The Apple II, which has an older CPU and a slower clock, the BBC Model B and the Commodore 64 (which only has a 1MHz clock) are also faster than the Spectrum. The speed of the Olivetti M20, and especially the PDP 11/34, should be considered separately. They have 16-bit processors, and both their prices and program support cannot be compared with other (home) computers that were tested.

Further analysis of the results in Fig 2 shows a great dispersion inside these five groups of statements. Some computers are faster when assigning numbers to variables (Spectrum, Sharp MZ-80K) but the majority are faster when assigning constants. A similar trend applies to arrays and matrices.

```
 10 DIM X(20),Y(20),A(20,20),
    B(20,20)
 20 K=5:(15)=7:B(5,10)=3:BEEP
 30 FOR I=1 TO 1000 :REM can be
                     greater than
                     1000 for fast
                     computers
 40 REM Here you insert one of the
        operations from Fig 2
 50 NEXT I
 60 BEEP:END
200 RETURN
```

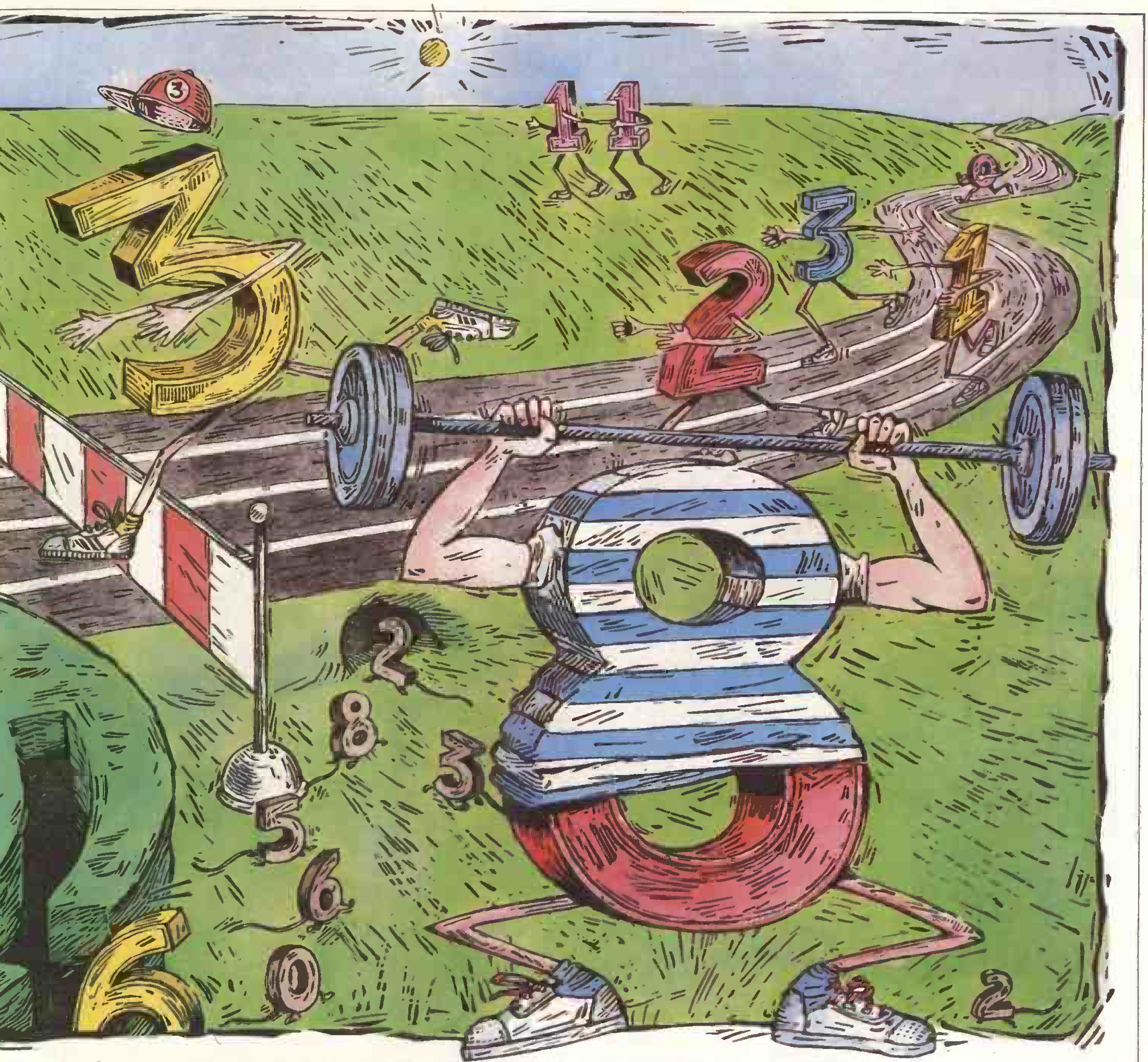
Fig 1 The Speed Test program

The fastest arithmetic operation on all the tested machines is addition and the slowest is division (except for the PDP 11/34); therefore, it is better to multiply with 0.5 than to divide by 2. Any great difference in the speed of multiplication and division indicates bugs and weaknesses in a computer's architecture, or in the system support.

Mathematical functions

To write a program for computing elementary mathematical functions, a programmer must have, apart from an excellent knowledge of programming, a thorough knowledge of numerical mathematics, something which doesn't appear to be a strong point of the system programmers who designed these nine Basics. There is no other explanation for the catastrophically slow algorithms for calculating a square root on the Spectravideo and

Illustration by Jo Lawrence



the Spectrum. Even though these two machines work with the greatest number of significant digits, this cannot be used as an excuse. In Hu-Basic, which is an alternative language for the Sharp MZ-80K and works with 16 digits, the square root is taken in a mere 29ms — compare this with the Spectrum's 118ms or the Spectravideo's incredible 164ms! (With regard to Sharp, it is surprising that the new S-Basic on the MZ-700 does not use that excellent algorithm from the older MZ-80K.)

A usual programmer's dilemma is whether to save memory space or to gain in speed, but it seems that the majority of the tested computers' programmers have decided to save space. Let's take a very common operation as an example — squaring a number. There are two ways to do it: by ordinary multiplication, or by means of logarithms. The former is faster but is not general, which means that the other must reside in memory at the same time. Of the models tested here, only the BBC B and the Spectravideo 'recognise' squaring and perform it through multiplication; the others square a number as if it were an exponent.

The Speed Test program reveals that the BBC B is a very professionally designed machine, but there is a bug in the algorithm for computing SIN(X). Normally, computers have a detailed program for computing one trigonometric function, while other functions are calculated by means of the resulting formula. If you know the value of COS(X), then you can easily find SIN(X) using the formula SIN(X)=COS(90−X): that is, one subtraction, one assignment and a call of COS(X). This is just a little slower than the computation of COS(X).

As one mistake leads to another, the computation time of TAN(X) also becomes unnecessarily slow as it is always found by means of division — SIN(X)/COS(X). This can also be used as an example of when the advantages of Basic in ROM become disadvantages; the average programmer might be able to remedy the situation, but it isn't possible to do it elegantly.

Of all the tested computers, only the Sharp machines load Basic from cassette and place it into RAM. Each loading thus wastes two-three minutes, but the Basic can be changed and a new version saved for later use. The use of disks is an ideal solution to similar problems as disk Basics easily lend themselves to internal changes.

As far as string operations are concerned, most computers work at approximately the same speed as for numbers. The only exception is the Sharp MZ-80K, which takes 51.8ms for a simple string assignment such as A$="A". The speed of string operations is, of course, important when writing games in Basic.

In all other commands the tested computers achieve enviable speeds, but the differences present, although initially appearing small, cannot be regarded as unimportant. All these commands are frequently used, and even a slight deficiency is multiplied many times in a program. Top marks

Micros (see key below).	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. FOR...NEXT	5.8	1.4	1.7	1.0	0.7	1.9	1.1	2.5	2.5
ASSIGNMENT									
2. X=5	2.3	2.7	1.0	0.7	0.7	1.5	0.3	2.0	1.9
3. X=K	3.0	1.1	1.7	0.6	0.6	1.3	0.2	2.0	1.3
4. X=Y(15)	4.6	4.9	2.8	1.2	1.1	3.9	0.7	3.2	2.1
5. X(7)=K	5.1	4.8	2.5	1.1	0.9	3.9	0.7	2.5	1.8
6. X(7)=5	3.5	6.0	2.1	1.2	1.0	4.2	0.9	2.6	2.2
7. X(7)=Y(15)	6.0	8.6	3.9	1.7	1.3	6.5	1.4	3.7	2.4
8. A(1,12)=B(5,10)	9.4	13.7	6.1	2.7	2.6	14.1	3.0	6.9	4.7
9. A(1,12)=K	6.0	7.2	3.7	1.6	1.6	7.3	1.6	4.3	2.7
10. A(1,12)=5	5.4	8.6	3.2	1.7	1.7	8.3	1.8	4.3	3.1
average........	5.0	6.4	3.0	1.4	1.4	5.7	1.2	3.5	2.5
II ELEMENTARY MATHEMATICAL OPERATIONS									
11. X=5+6	3.1	5.3	1.7	1.1	0.9	3.2	0.8	2.5	2.3
12. X=5-4	3.3	5.5	1.8	1.1	1.0	3.6	0.8	2.7	2.3
13. X=5*4	3.5	5.9	2.0	1.1	1.1	4.0	0.9	3.8	2.5
14. X=5/4	5.4	6.6	2.6	1.5	2.6	4.9	0.7	6.5	6.7
average........	3.8	5.8	2.0	1.2	1.4	3.9	0.8	3.9	3.4
III MATHEMATICAL FUNCTIONS									
15. X=SQR(5)	118.0	12.2	32:8	2.0	10.2	55.1	1.7	49.0	164.0
16. X=5↑2	113.3	45.7	32.0	1.8	4.0	53.7	1.4	49.0	2.7
17. X=ABS(5)	3.3	3.3	1.6	1.0	0.9	2.5	0.5	2.7	2.2
18. X=LOGe(5)	69.4	24.6	17.7	2.9	17.6	24.3	0.9	24.5	128.5
19. X=EXP(5)	44.1	22.4	17.1	1.0	12.4	27.4	0.9	23.9	105.5
20. X=SIN(5)	49.2	22.2	20.1	2.6	30.3	30.0	1.0	21.5	89.5
21. X=COS(5)	50.2	21.6	19.5	2.7	19.2	28.9	0.9	22.5	94.5
22. X=TAN(5)	92.2	42.8	39.7	4.5	45.0	53.6	2.6	45.5	197.5
23. X=ATN(.5)	66.2	20.2	19.5	2.7	22.7	43.5	1.5	27.5	119.5
average........	67.3	23.9	22.2	2.4	18.0	35.4	1.3	29.6	100.4
IV STRING OPERATIONS									
24. A$="A"	3.6	51.8	1.2	0.7	0.5	1.1	0.4	1.9	1.5
25. X=VAL("1")	7.8	4.7	2.7	1.8	1.0	2.0	1.2	4.5	2.7
26. A$=CHR$(64)	5.8	54.2	2.1	1.1	0.8	4.1	0.9	3.0	2.0
27. X=ASC("1")	2.9	2.2	1.7	1.1	0.8	2.0	0.9	3.5	2.3
28. A$=STR$(1)	13.6	59.2	5.2	1.5	6.6	11.1	2.2	4.7	3.9
29. A$=INKEY$	3.6	3.5	1.6	0.8	1.2	1.4	0.6	2.4	1.2
average........	6.2	29.3	2.4	1.2	1.3	3.6	1.0	3.3	2.3
V MISCELLANEOUS									
30. CLS(not in average)	64.2	32.3	67.1	31.4	4.2	43.3	?	17.0	18.5
31. GOSUB200	2.4	3.0	0.6	0.6	0.4	1.4	0.1	1.2	0.7
32. GOTO 50	1.4	1.7	0.2	0.2	0.2	0.6	0.1	0.7	0.5
33. IF K=14 THEN X=1	3.0	3.0	1.7	1.4	1.0	3.7	0.7	3.3	2.8
34. PLOT 3,4	2.4	5.8	1.9	2.5	1.0	6.5	?	2.0	2.0
35. X=RND	15.6	4.7	2.3	0.7	1.5	6.3	0.5	4.5	2.1
36. X=PEEK(32000)	3.3	1.9	1.8	?	1.2	6.9	?	2.7	2.5
37. POKE 32000,0	3.0	3.6	1.9	?	1.0	6.5	?	2.0	?
average........	4.4	3.4	1.5	1.1	0:9	4.6	0.4	2.3	1.5
Processor	Z80A	Z80	Z80A	Z8001	6502	6510	?	Z80A	Z80A
Clock (MHz)	3.6	2	3.6	4 ?	1	1	?	2	3.6
Average timing	20.5	13.8	7.5	1.1	5.7	12.5	1.0	10.0	27.6

Key to micros: (1) Spectrum 48k, (2) Sharp MZ-80K, (3) Sharp MZ-700, (4) Olivetti M20, (5) BBC B, (6) Commodore 64, (7) PDP 11/34, (8) Apple II, (9) Spectravideo SV328.

Fig 2 Operations for speed measurement (all timings in milliseconds) here to the BBC B, which is, in the last group of statements (Fig 2), even faster than the more expensive Olivetti.

There aren't many people who would continually erase the screen in each program, but nevertheless it cannot be said that the Basic authors put a lot of effort into this area. The exception is, again, the BBC B. The Spectrum should do it faster: the Spectravideo has the same processor and screen resolution as the Spectrum but erases the screen at three times the speed. (Incidentally, the Olivetti does it only twice as fast.)

Average values are not always the most respectable measure, but there's no harm in comparing them. It would also be interesting to compare values from our tests with 'official' test methodologies, for example Benchmarks. Although Benchmarks are often used, they do not help you to get the most from your computer, but they are nonetheless a competent guide to machine performance. Before buying a computer, a new Basic or any other language (say, Pascal), you should try the battery of tests featured here to ensure that your money is well spent.

Accuracy comparison

There are two reasons why a computer might perform 'incorrect' calculations. Firstly, not every decimal number can be accurately represented; this is particularly evident where 8-bit computers are concerned. Secondly, and more important, is the choice of non-optimal algorithms by firmware writers. Different writers use different algorithms, instead of drawing from others' good experiences. Beginners' solutions are common: they approach the problem with the attitude 'Here's what I can do' instead of 'Here's the best solution'. Let's see how this looks in practice by comparing eight computers (the PDP 11/34 is omitted).

Sixteen expressions were used for testing; variables take values from a predefined interval with a predefined step. The expressions were chosen with the criteria they should all be 0 — or, at least, 0 in normal mathematics. But, using the Accuracy Test program (Fig 3), the result will frequently be different from 0; the value of this declination is shown in Fig 4. The results measured are the biggest absolute errors within the interval, and show the given step.

```
10 DEF FNY(X):REM insert an
          expression from
          Fig 4
20 M=0:PI=3.14
30 FOR X = lower limit TO upper
          limit STEP step
40 Y=ABS(FNY(X))
50 IFY>M THEN M=Y: J=X
60 NEXT X
70 PRINT"Error is ";M;" for X=";J
80 END
```

Fig 3 The Accuracy Test program

A manufacturer would proudly show you the data from expressions 4 and 15 (Fig 4): due to the nature of functions ATN and TAN, as well as LN and EXP, the appliance in given order cannot produce any significant error. But you need only change the order of these functions and, immediately, errors start to creep in (see the results for expressions 1, 2, 3 and 16).

The errors that occur with the Apple II (using Microsoft Basic) when calculating large arguments in expressions 2 and 3 are a consequence of the fact that the argument of TAN(X) must be within the interval −90° to +90° (in radians). This Basic cannot produce an angle from this interval so a programmer must do it: it's a slow, tedious operation if done in Basic source code instead of machine language.

The results of expression 8 are very interesting — who would have thought that there are computers (the Spectrum, Olivetti M20 and Spectravideo) which cannot divide exactly with an integer number such as 255? To make the mystery greater, the number 255 has a finite binary representation and there cannot exist a conversion from base 10 to base 2: the error surely originates from the division routine. Sinclair was at least honest — it is well known that the division routine in the Spectrum ROM contains a bug which gives a wrong end result. Perhaps the other two machines suffer for the same reason.

Expression 13, X*X−X↑2, contains another surprise. Is it true that for all integers from 0 to 100, the value of that expression is not 0? The Apple II's error is no less than 0.005. Not even an error of two magnitudes less, as with the Sharp MZ-700 and the Spectrum, can be tolerated.

The right-hand side of expression 14 is known as Heron's Formula. It computes the value of a square root but in an ideal way: in every iteration, it doubles the number of significant figures compared to the previous value. It's a shame that no other systems programmer has used it; the result of such negligence is a slow, error-prone algorithm for computing the square root.

Testing the expressions 9 to 12 lets you select which is most appropriate. The expression of type 12 will run faster, but note that it will not give the most precise values for all tested computers.

Conclusion

A computer is only as powerful as a programmer makes it. To get the most from your machine, it is essential that you know what it does quickly and accurately (in order to use those features), and, conversely, to be aware of things it cannot do (in order to avoid them). You will soon start to use your computer as a computing tool, which will be a real test of its capabilities.

Know your Basic — it will save you time and cut down on frustration.

We leave the pleasure of further research to you! END

	Expressions	Interval	Step	(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)
1	TAN(ATN(X)) − X	(0,1)	0.01	1.2E−9	1.5E−8	2.8E−9	1.8E−7	1.6E−9	4.7E−10	1.2E−7	2.0E−10
2	TAN(ATN(X)) − X	(1,50)	0.5	8.0E−7	1.2E−6	4.9E−7	3.7E−4	6.6E−7	7.5E−7	50	1.0E−9
3	TAN(ATN(X)) − X	(50,100)	10	3.9E−4	4.5E−4	1.7E−4	1.5	2.2E−6	2.4E−4	999	7.8E−8
4	ATN(TAN(X)) − X	(−PI/2,PI/2)	0.01	7.0E−10	0	2.1E−9	1.2E−7	7.0E−10	4.7E−10	7.2E−7	9.6E−11
5	SIN(X)*SIN+COS(X)*COS(X)−1	(0,100)	1	9.3E−10	5.0E−8	2.4E−8	1.2E−7	4.7E−10	2.2E−8	5.6E−6	3.0E−14
6	ABS(SIN(X))−SQR(1−COS(X)*COS(X))	(0,100)	1	2.3E−8	4.0E−7	3.1E−8	8.9E−7	1.5E−8	2.2E−8	7.1E−6	1.4E−12
7	ABS(COS(X))−SQR(1−SIN(X)*SIN(X))	(0,100)	1	2.2E−8	1.2E−6	3.1E−8	3.7E−6	3.5E−8	3.3E−8	1.7E−5	1.4E−12
8	X − X/255*255	(0,100)	1	3.0E−8	0	0	7.6E−6	0	0	0	2.0E−12
9	X − (SQR(X)↑2)	(0,100)	1	1.8E−7	0	7.2E−7	7.6E−6	6.0E−8	2.1E−7	6.1E−5	4.0E−12
10	X − SQR(X↑2)	(0,100)	1	1.8E−7	0	4.8E−7	0	0	7.3E−8	3.1E−5	0
11	X − SQR(X)*SQR(X)	(0,100)	1	1.2E−7	0	5.1E−7	7.6E−6	6.0E−8	5.0E−8	3.8E−5	4.0E−12
12	X − SQR(X*X)	(0,100)	1	1.5E−7	0	5.1E−7	0	0	3.4E−8	4.6E−5	0
13	X*X − X↑2	(0,100)	1	2.7E−5	0	4.6E−5	0	0	6.4E−6	4.9E−3	0
14	SQR(X) − 0.5*(SQR(X)+X/SQR(X))	(1,100)	1	1.1E−8	0	4.6E−5	9.5E−7	0	3.7E−9	2.9E−6	0
15	X − LN(EXP(X))	(1,100)	0.1	3.7E−9	0	3.7E−9	6.0E−8	3.7E−9	4.8E−10	2.9E−6	5.0E−13
16	X − EXP(LN(X))	(1,100)	0.1	7.4E−9	0	1.9E−8	9.5E−7	7.5E−9	5.1E−9	4.8E−7	2.0E−12
	No of digits onscreen			8	8	8	6	9	9	7	14
	Maximum number (approximately)			1E+38	1E+18	1E+38	1E+38	1E+38	1E+38	1E+38	1E+64

Note: a usual mathematical notation is used throughout these tables.
For example, 1.2E−7=0.00000012.

Key to micros: (1) Spectrum 48k, (2) Sharp MZ-80K, (3) Sharp MZ-700, (4) Olivetti M20, (5) BBC B, (6) Commodore 64, (7) PDP 11/34, (8) Apple II, (9) Spectravideo SV328.

Fig 4 Accuracy tests

Go Forth and prosper

Keith Bowden argues the case in defence of the much-maligned Forth language, and presents a comprehensive Benchmarks update for various Forth systems.

Forth is a much misunderstood language, and few writers in the popular field have ever put over its true power to the reader, preferring to emphasise its apparently peculiar syntax. But if my experience is anything to go by, this neglect is undeserved.

Initially I discovered Algol 68 and all was happiness. I could define matrices, and I could define my own operators to add them together, multiply them, read them in and print them out. In the statement A=B+C*D, the symbols + and *, and indeed =, would do different things depending on the types of the operands B, C and D. If they were real or integer, then ordinary scalar multiplication and addition would be performed, or, if they were arrays, then the rules of matrix algebra would be followed, or any set of rules the user cared to define for a particular type, for example set theory. But the true beauty of Algol 68 is its 'orthogonality' or context independence, which is the way that any sensible syntax will work in any context, provided it is not ambiguous.

After purchasing a Commodore 64, I started to look for a language which had the aforementioned features, but which would run on my new machine and let me define all the sound and graphics commands that Commodore had omitted from its own Basic. I had previously come across Forth, but had been frightened off by the use of Reverse Polish notation.

As a 'stack-orientated' language, Forth performs the (Basic) operation PRINT B+C in the order in which it is written in the language: that is, B C + . (where . is Forth for PRINT). This says 'put B on the stack, put C on the stack, add the top two things on the stack together and put the answer on the stack, print out the value on the top of the stack'. This has three main consequences: it is fast (most languages convert to Reverse Polish themselves anyway); it makes brackets unnecessary; and it makes the language very difficult to read and write (it takes a lot of practice to overcome this problem). This is not helped by the almost deliberately obscure notation used by Forth (for example, '.' for PRINT).

All Forth syntax is reversed (with the single exception PRINT "string"— ."string"). For example, a statement of the form IF 1>0 THEN PRINT 2 ELSE PRINT 3 becomes 1 0 > IF 2 . ELSE 3 . THEN. Note how this can be shortened to 1 0 > IF 2 ELSE 3 THEN. as 2 just means 'put the integer 2 on the stack'. This is typical of the economy of expression available within an orthogonal language.

I could not, however, see the point of a language in which the user has to do work which the computer could well do itself. I spent a considerable amount of time working on a 'front-end processor' to convert ordinary notation into Reverse Polish as a program is typed into the Forth interpreter. The reason why this type of front end is not more popular is that it actually decreases the power of the language. Infix (ordinary) notation only allows two operands and one result for each operator (consider A=B+C). Even procedure-based languages such as Pascal only allow one result (consider A=MAX(A,B,C)). Stack-orientated languages allow as many operands and results of one operation as the user desires, as they are pushed onto the stack ready for such time as they are needed. Indeed, use of variables is rare in good Forth programs.

What is good about Forth? It is orthogonal; all grammar is independent of context; and it is extensible — you may define your own operators and your own syntax. If you don't like the control statements provided in the

Forth Benchmarks update

Package	Artic Forth	48/80 Forth	Z-80 Forth		Wycove Forth	Premier FIG Forth	80 Series Forth
Compiler	Artic	East London Robotics	Laboratory Microsystems		Wycove Systems	Premier Software	HP Users' Group
Machine	Spectrum	Spectrum	Vector 4	Pericom 7800	TI/994A	Superboard II	HP-85
Processor	Z80A	Z80A	Z80B	Z80	9900	6502	n/a
Clock rate	3.5MHz	3.5MHz	5.1MHz	n/a	3MHz	1MHz	n/a
Benchmark							
Magnifier	1.7	1.4	1.1	1.0	1.18	2	2
Do loop	14.3	11.3	8.6	7.8	9.28	15	19
Literal	20.1	15.2	12.0	10.7	14.00	24	26
Literal store	29.6	22.0	17.7	15.6	23.57	40	40
Variable	18.8	14.2	11.1	9.9	13.60	24	24
Variable fetch	24.4	18.0	14.4	12.7	18.58	32	31
Constant	20.2	14.8	11.8	10.6	13.87	24	26
Dup	24.6	18.4	15.0	13.2	18.87	31	32
Increment	43.1	32.7	14.8	13.1	17.72	53	34
Test >	49.5	39.6	20.7	18.1	43.27	63	47
Test <	32.1	26.0	20.4	17.9	36.72	42	47
While loop	53.0	41.5	21.1	18.1	41.70	69	50
Until loop	36.8	30.5	23.4	20.1	38.15	70	55
Nest	14.2	10.8	8.8	7.9	9.95	14	14
Arithmetic	16.5	40.3	24.4	21.6	8.62	57	47
Average time	26.5	22.4	15.0	13.2	20.61	37	32.9

language, you may define your own versions of IF, LOOP, REPEAT, and so on, to your heart's content. This is the whole philosophy of the languge, that rather than writing pages of code for one subroutine, each new bit of code has its own name. You may build up a graphics library with commands such as CIRCLE, LINE and FILL. You can design a language entirely to your own specification — a 'super-language', but entirely in Reverse Polish. As your familiarity and experience with Forth grow, you will build up libraries of Forth words which can be incorporated into later programs. You never have to write the same bit of code twice.

To define your own words in Forth, you must use defining words such as : and VARIABLE. The first word following : must be a new word and the sequence following that, up to a semicolon, is a definition of the new word. For example, : SQR DUP * ; defines a word which will square the number at the top of the stack. (DUP is the Forth word which duplicates the object at the top of the stack.) Similarly, VARIABLE defines a new Forth variable.

New Forth defining words may themselves be defined. Definitions of new defining words come in two parts: one to be carried out at compile (define) time, and one to be carried out at run time. The Forth brackets <BUILDS and DOES> provide this facility. It is not unusual for a Forth program to create new words while it is running, and it may be necessary for a particular action to be taken each time a certain form of word is defined.

SMALL BEAUTIFUL IS (and FAST): the two outstanding features of Forth are its speed and size. It has all the advantages of an interpretive language yet it runs faster than many compiled languages. A complete Forth interpreter, with screen editor, assembler and all the words you need to start programming, will fit into an 8k RAM cartridge leaving plenty of addressing space for your program on the average micro.

>BLKS	Transfers video screen to current editing screen; translates from screen code to program code
n BLOCK	Transfers screen n from disk to a buffer
EMPTY-BUFFERS	Empties buffers without copying to disk
LOAD n	Begins interpretation of screen n
UPDATE	Marks the most recently referenced block as updated — automatically transferred to disk if its buffer is required

Fig 1 FIG Forth standard commands

Like its cousin Lisp, Forth is a 'threaded interpretive language' (TIL): much of the computer's work is carried out while the program is being typed in (or loaded). Each Forth word is stored in a 'dictionary' as a sequence of other Forth words. A Forth program consists of just one word which is typed in to execute it. At run time, the Forth interpreter looks to see which words are used to define the program word, and then which words are used to define these words, and unwinds — or unthreads — the sequence until it arrives at words which are defined in machine code, which are then executed. These core words, which are supplied with the Forth system, are the kernel of the language. (More strictly, the kernel is the minimal set of words needed to implement the language.)

Interpretive Basic systems tend to be incredibly slow compared to compiled languages, as the computer spends most of its time running the interpreter and hardly any time running the user's program. Threaded interpreters, due to the stack-based nature of the languages they are running, attain speeds of the same order of magnitude as machine language programs — it is possible to implement the kernel of Forth in only 40 bytes!

It is little known that there are two possible implementations for threaded languages, known as 'direct threaded' and 'indirect threaded'. Indirect-threaded Forth dictionaries are stored as a list of pointers to subroutines: for example, the SQR word defined earlier would be compiled, by :, into the dictionary as

```
DUP
*
```

where DUP and * are the addresses of the routines in question. This list is then interpreted as a series of subroutine calls by the tiny inner Forth interpreter.

Direct-threaded Forth is stored as a sequence of machine language subroutine calls: for example, SQR would be stored as

```
JSR DUP
JSR *
RTS
```

and is thus essentially a compiled program. Direct-threaded systems are often called Forth compilers and run up to 10 times faster than indirect-threaded systems, although they take up more space and in some ways are not as flexible. FIG Forth is indirect threaded (this is the Forth standard defined by the Forth Interest Group).

The FIG Forth editor and assembler are both written in Forth and can be extended in exactly the same way as the rest of the language. All editor and assembler words are part of the Forth language and can be used as such. Naturally, Forth assembler mnemonics must be expressed in Reverse Polish and look something like this — 22 # LDA — rather than LDA #22.

Series 80 Forth	83 Standard Forth	X Forth 2	C64 Forth	Tiny Forth	Romik Forth	Forth 64
HP Users' Group	Added Dimension Software	n/a	Handic	Abacus	Romik	Audiogenic
HP-86A	n/a	Torch Unicorn	CBM 64	CBM 64	CBM 64	CBM 64
n/a	8088	Z80	6510A	6510A	6510A	6510A
n/a	5MHz	6MHz	1MHz	1MHz	1MHz	1MHz
2	0.34	1	2	2	2	1
19	3.16	5	17	17	17	10
26	4.45	6	25	25	27	14
40	8.16	9	45	55	43	25
24	5.33	6	25	30	26	35
31	6.93	7	35	40	34	30
25	5.34	7	26	28	25	25
31	5.93	7	34	35	33	14
33	5.73	7	56	60	57	15
47	7.88	16	67	85	68	35
47	7.88	10	45	60	46	30
50	9.30	10	75	94	75	28
55	8.63	9	90	109	90	40
14	3.75	4	16	19	16	3
47	2.40	13	65	66	65	30
32.7	5.68	7.8	42	48	44	24

Forth source is stored in 1024-byte blocks, each of which may be displayed and edited on the computer screen. The FIG Forth standard uses a virtual memory or paged system for storing source. Only a small number of blocks, or screens (typically six), are held in RAM at any one time, in 1k buffers; these are automatically paged on and off disk when needed, but this is invisible to the user (although he may hear his disk drive whirring).

Each buffer contains a register which holds information regarding the length of time since that screen was last used. When all the buffers are occupied and a screen is needed that is not currently in RAM, then the least recently used screen is automatically transferred to disk and replaced in memory by the one required. When an edit session is finished, all remaining updated buffers which have not been transferred to disk can be so moved by using the FLUSH command.

Unlike Basic systems, the FIG Forth system only uses a relatively tiny amount of memory for storing source; the rest is reserved for the dictionary. This is a linked list of threaded object code which is produced when compiling words such as : are used. The commands in Fig 1 are FIG standard and handle the virtual memory system.

Forth treats text from the disk and text from the screen in an identical manner. One of the buffers is the editor screen, and can be edited using the rather old-fashioned line editing system. Only on the editor screen can Forth commands be used in direct mode. The Forth editor screen is defined as 16 rows of 64 characters which is fine on an 80-column screen, but causes problems on the Commodore 64. Modern implementations usually provide a full cursor-controlled screen editor.

Each screen can be linked to the next by the —> symbol. On large computers (like the Commodore 64) you can define so many words when writing a package that you lose track of what's going on. Further, it's easy to find yourself trying to define one word to do two different things in two different contexts.

To eliminate these difficulties, a two-level hierarchical word definition structure is used. For example, the command VOCABULARY GRAPHICS causes all words on succeeding pages to be defined into a special area with the name GRAPHICS. When interpreting, the meaning of a word is always first looked up in the 'current vocabulary', so a number of different word libraries can be built up and used whenever the need arises.

Implementations

I looked at four packages for the machine which sparked my interest — the Commodore 64. The first two are cartridge-based — C64 Forth from Handic at £35, and Forth 64 from Audiogenic at £30.

The Handic implementation was written by Dataprint AB in Stockholm and is based on the old Pet Forth. It is the largest of the four systems and probably the truest to the FIG standard, with a full virtual memory implementation using disks without directories. It is also the only one of the four systems with a resident assembler (although the source of this is available from FIG and is only an hour's work to install on other systems). The manual supplied with the system is nothing more than a list of FIG Forth commands, and to get any implementation details it is necessary to purchase the Pet Forth manual with 322 glossy A4 pages from Handic. This increases the price of the system somewhat and the manual is not even fully compatible, but it is nonetheless very good. For a FIG Forth expert this system is ideal, but a beginner would be absolutely lost with only the manual supplied.

The Audiogenic system is a direct-threaded system, and as such is about twice as fast as any of the other systems. The loose-leaf 82-page manual is reasonably clear, even for a beginner, and includes most of the information you will need to know. Despite the fact that this is the only non-FIG standard system I looked at, it is the only one that sticks to the 16 by 64 screen format. It gets around the problem of only having a 40-column screen by scrolling the text left and right across the page; this is OK once you get used to it, and it does leave a convenient space at the bottom of the page for system information.

The system includes a powerful text compression algorithm for storing the source code; this is essential as all source code is stored in memory at once. There is no virtual memory management scheme. The SSAVE command saves the whole of the source to disk, and the SLOAD command loads and appends. The compiled code grows up from the bottom of memory, and the source code expands down from below the Forth cartridge to meet it. 255 screens are available, although this is probably dependent on the density of the source.

A number of special words for the Commodore 64, including IEEE commands and function key definitions, are included.

The review copy of the third system, Romik Forth, came on cassette so it was difficult to test the virtual memory system to the full. A disk version is also available at the same price, £15. The 'temporary' manual is a tiny 64-page affair that, like the Handic one, contains nothing but a list of FIG Forth commands. The powerful screen editor has pattern-matching and searching.

The last package, Tiny Forth from Abacus in the US, is distributed by Adamsoft in the UK, also for £15 on tape or disk, and is a subset of FIG Forth with simplified paging. The GET and PUT commands must be used to transfer screens manually between disk and buffers. The SYS command which jumps to a machine code routine is a neat addition. The 45-page A5 manual is very clear and includes most of the necessary information, and full instructions are given for producing your own superset of Forth and saving it as a separate system. Tiny Forth is not so tiny! There are more words built into the Abacus implementation than there are in Romik Forth.

In January 1983 (updated in December 1983) *PCW* published Benchmark timings for a number of Forth systems. I carried out the Benchmarks on the four Commodore 64 packages, and confirmed the general trend that the three FIG Forth systems ran at about the same speed (which is hardly surprising as the code is supplied by FIG), and the Audiogenic system runs approximately twice as fast. The results are shown here, along with timings for other systems submitted since the previous articles were published.

Conclusion

Forth is a difficult language, but in my view it is the most powerful generally available on microprocessors. Of the four systems looked at here, each has its place in the market. If money were no object, it would be worth buying both the Handic and the Audiogenic cartridges. The former is the most powerful system available for the Commodore 64 and is full FIG standard. The latter is much faster and has a number of other advantages, not the least of which is that it should be possible to take the compiled code out of the system and run your program on a machine without the cartridge. The Romik system is a cheaper implementation of the FIG standard, and Tiny Forth is undoubtedly the easiest system for the beginner.

Thanks to Roger Beaumont, Dr MA Slifkin, Gerard O'Toole, DH Long, Wycove Systems and Added Dimension Software for sending in their Benchmark timings. Any other results are welcome.

Dave Middleton (author of Audiogenic Forth) points out that the PCW Benchmarks are biased against direct-threaded Forth systems in that all but one of the tests are very low-level routines, thus Dave's package does very well on the dictionary search which is very heavily nested. In real applications, direct-threaded Forth could well be 10 times as fast as indirect-threaded. END

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Television tune-in

Visicode is a new method of receiving software via your television. John Billingsley explains how you can use your Commodore 64 or BBC Micro to receive the TV transmissions and join in this software revolution.

In recent experiments shown on Channel 4's *4 Computer Buffs,* software was transmitted in the form of a spot in the corner of the television screen. The TV team tried the experiment for two reasons. Firstly, a teletext adaptor costs about £100 as it must contain a special tuner and a quantity of its own storage; in contrast, the spot data can be received with a few pounds-worth of home-built components. Secondly, the production team can build in the spot as part of the picture tape for transmission, and the spot and its data can be recorded at home on a video.

But the first spot suffered from one big disadvantage — it was too slow to be really useful. At only 50 bits per second, it took over three minutes to transmit one page of text. Only one short program for one machine could be included in each *4 Computer Buffs* programme to allow viewers time to tune in their receiving circuits.

The new developments made by the author and Jim Crowther of Thames TV change all that (and introduce the term Visicode for using light pulses to transmit software over the TV screen). The new receiver circuit is much more reliable, has no knobs to twiddle, and costs much less in components than the previous one. A new technique allows a byte of data to be transmitted on each half-frame, 50 times per second. The data rate is much improved, and a full page of text now takes a mere 20 seconds to send. Extra control bits allow end-of-file markers to be sent so that machine code programs can be broadcast, too.

To get round the construction problems some users had with the first experiment (*PCW* March, 'Light Fantastic') an electronics company, Magenta Electronics, is offering a ready-built receiver unit. Details of the components and circuitry are included in this article for readers with construction experience. Combine the receiver unit with the programs published here and you'll be ready to receive Visicode transmissions.

The first transmissions take place during the *Database* TV show on 4 July, preceded by programmes about Visicode on 20 and 27 June. *Database* is at 10.30pm on Thursday evenings on Thames TV — the transmission time varies from region to region so check local details. Visicode transmissions continue on 11 July, 18 July and 25 July, using a BBC Micro to generate the transmitted pattern.

Visicode transmissions can be received on a range of micros provided suitable hardware can be interfaced. I've covered the BBC and Commodore 64 in this article, but the principles explained here can be put into practice on other machines. To celebrate the first Visicode broadcasts Micronet 800 has agreed to provide £2000 worth of prizes — to win you have to solve a puzzle which will be broadcast in text form in the first four transmissions.

Speed-up technique

The techniques used to speed up the transmissions are fairly simple.

The previous system uses a single spot, which is either on or off each half-frame of the transmitted signal. The signal is coded in a form similar to the ASCII teletype code used in RS232 links. To start each byte of data, a 'start bit' guarantees that the spot is on. Eight more data bits follow, least-significant bit first, where the spot is on for a 1 or off for a 0. A final 0 'stop bit' ends each byte, so there will be an off-to-on transition at the next start bit. The old circuit included a retriggerable monostable to stretch out the pulses received from the photocell into a waveform resembling a teletype signal. The receiving program waited for the first edge of each start bit, waited a further 10 milliseconds, and then sampled the signal at 20 millisecond intervals.

It is hard to avoid thinking of the spot as a single on-off blob, and therein lies the improvement. The picture is made up of scan lines. It takes nine 'stripes' on successive lines of each half-frame to make up a spot of the size transmitted, therefore the signal received by the photocell consists of not one but nine pulses each half-frame. There are over 60 microseconds between these pulses, plenty of time in which to build up the byte from the train of bits. After the electron beam has passed, there are again 20 milliseconds to wait before the next byte starts. This time can be used to advantage, permitting a large part of the receiving software to be written in Basic for simplicity and easy modification.

Now you can obtain a start bit by always setting the top stripe to be on. The next eight stripes can represent the data, and there is no need for a stopbit. But there is a more important use for an extra final stripe — the transmission of control codes.

If the picture just above the window is rather bright, the photocell could pick up pulses before the blob has started: this would, of course, wreck the data received. I suggest you use two more lines at the top of the blob, forming the pattern 101 before the data bits: now the chances of accidentally picking up

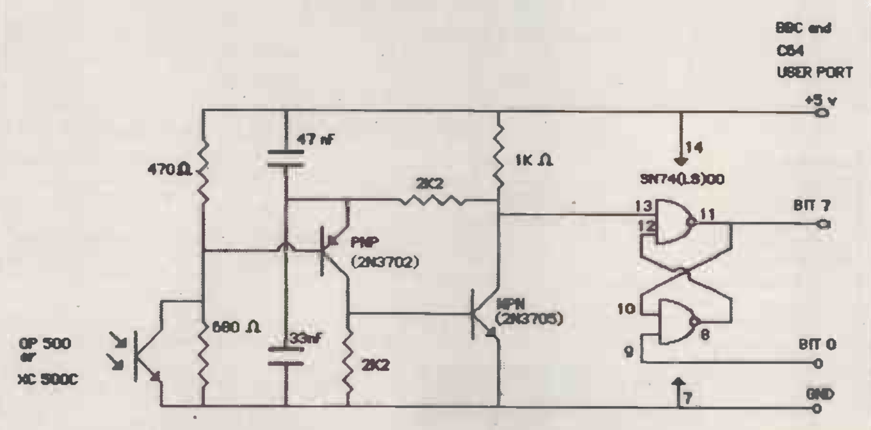

Fig 1 Circuit diagram for the Commodore 64 and BBC receiver unit

this pattern are much less. A splodge of bright picture would give 111, and at the second 1 the computer would go back and look again for the start pattern. If the cell catches just the bottom of the surroundings, reading 100, then the program will again loop back to search for the start code. As long as there are at least three blank lines above the blob, the software will be in time to find it correctly.

Control codes

The old system was restricted to sending Basic or text so that the end of the data could be detected as three successive zero bytes, or whatever, depending on the computer being used. If an end-of-file signal is included any data can be sent — machine code programs, binary data, start addresses and so on. The bytes can be in the same form received from a floppy disk driver routine and anything is possible.

The bottom stripe will indicate that the blob is a control code. A continuous train of codes for tuning will be sent before the start of the data to allow the photocell to be correctly placed and the brightness on the set to be adjusted. When you are satisfied, press the space bar and the program will be ready to load the data. The saving software waits for the first non-control code before beginning. As bytes are received, they are saved until another control code is received to end the data.

With 256 codes available there are a lot of possibilities — but the allocation of codes can quickly mount up. For tuning up, a suitable code is <$> where the brackets imply 'control'. Together with its start code the stripe pattern would be 101001001001 — a hard pattern to miss! It corresponds to hex 124.

As I mentioned, only text will be transmitted in the first series. In the future, sets of software for a variety of machines might be sent in a single procession. How will each machine know which section of the data stream it should load? That's where the codes come in. For example, before Amstrad software there will be a stream of <A>s; at the end of the section there will be some <$>s, the tuning signal. Then might follow a string of <B>s, to wake up the BBC Micros, and again <$>s to end the section. <C> tells the Commodore to load, <S> the Spectrum, <Q> the QL, and other letters for other machines. At then end of the stream some <&FF>s will tell everyone to stop. As text files are Universal, any machine will load a section starting <U>.

Very long programs might require time-out breaks to save them to disk. The code <5> signals that there is a break of five seconds in the data and will be sent continuously, counting down to <0>. Another code <T> is used to signify a title, and is followed by a string of letters (not codes) indicating the machines for the software that follows. For a single machine, three multidigit numbers indicate the number of bytes, load address and execution address, all separated by returns. In all cases, the title will then follow, terminated by <$>. As the title can be of any length, this can be used to put text and instructions on the screen without saving them.

Other codes will certainly be found to be necessary, and it is important for everyone to maintain the same standard. The safest proposal is to write to Nick Walker at *PCW* so that codes can be noted as they are claimed.

Resistors ¼ watt carbon film 5%
470R, 680R, 1k, 2 x 2k2 .... 2p each
Capacitors — miniature polyester 20% type rated 63 volts or more
33nF & 47nF .... 8p each
Transistors
BC213, or use BC178 or 2N3702 PNP type .... 11p each
BC183, or use 2N3705 or BC108 NPN type .... 11p each
Phototransistor — OP500 or XC500C .... 78p each
Integrated circuits
SN74LS00 .... 40p each
4-way ribbon cable two metres 60p/2m
20-way IDC socket — BBC .... £1.74 each
12+12 way 0.156in edge connector — Commodore 64 .... £1.66 each
0.1in plain perforated board 1in x 2ins (BBC & Commodore 64) .... 26p each
Prices quoted are from Magenta Electronics, which is also supplying complete kits and ready-built units.
Magenta Electronics Ltd, 135 Hunter St, Burton-on-Trent, Staffs DE14 2ST. Tel: (0283) 65435

Fig 2 Components list for Commodore 64 and BBC Micros

The receiver unit

The old circuit cannot be used, as its 20-millisecond monostable obliterates any fine detail, but some means must be used to stretch the thin pulse which arrives each time a bright line is written under the phototransistor. The answer is to use an 'R-S flip-flop' which will be set any time a pulse is received, and which can be reset by the computer when it has seen the result.

The R-S flip-flop is simply made by cross-coupling two gates of an SN74LS00 quad NAND gate chip (SN7400 or any equivalent will do). It is now connected to two bits of the user port (in the case of the BBC or Commodore — see Fig 1). One bit inputs the state of the flip-flop while the other is used to reset it.

With the increased data rate, phosphor persistence can be a problem. When the top slice is written on the screen, there is a sharp increase in the photocell current. The photocell itself will take five microseconds or so for the signal to fall, but the screen might glow for many tens of microseconds more. A middle 'off' stripe could therefore 'fill in' if its predecessors are lit. The answer is to look at the rate of change of the signal as the stripe is written, rather than at its DC value, then persistence and photocell time-constance lose their importance.

By adding two amplifying transistors to the phototransistor, an auto-biasing arrangement can be found which will tolerate an enormous range of brightness. This brings the total component count to one SN7400 (or SN74LS00), one OP500 phototransistor (or similar), one PNP and one NPN general-purpose transistor (such as 2N3702 and 2N3705), two small capacitors of values .047 and .033 microfarad, and five resistors (values 470 ohms, 680 ohms, 1k and two at 2k2. The total cost should be small (Fig 2).

The circuitry can comfortably be mounted on a 1in x 2ins unclad 0.1in perforated circuit board, and with a couple of metres of instrument wire you only need add the user port connector.

The components should be available at your local electronics store, but Magenta Electronics can supply any that you have problems finding. Its address is 135 Hunter Street, Burton-on-Trent, Staffordshire DE14 2ST, or call (0283) 65435. This is a mail-order service only and payment is needed with each order — cheque, postal order, Access or Visa are accepted (for details of Magenta's prices, see Fig 2). Only users able to work out wiring layouts from the circuit diagram published here are advised to buy the components individually. Magenta will also supply complete kits including wiring layouts, a case and a drilled, tinned, printed circuit board or ready-built Visicode receiver units. The kits cost £5.44 for the Commodore 64 and £5.52 for the BBC. The Commodore 64 version of the ready-built unit costs £7.10 and the BBC £7.20. All prices include VAT; postage and packing is 60p extra for each order.

Receiving transmissions

You'll need two televisions or one television and a monitor to receive Visicode: tune one into your computer and one to the TV station. Insert the Visicode receiver in the user port of your computer and load up the receiving software ready for the transmis-

```
 10 REM ****************************   :Do not enter the comments
 20 REM *                          *   : on this side of the page.
 30 REM *        VISICODE          *   :They are intended to be useful
 40 REM *  BASIC receive routine   *   : both to those using BBC micros and
 50 REM *  (C) Jim Crowther 1985   *   : those who wish to work out a receive
 60 REM *                          *   : routine for different computers.
 70 REM ****************************   :Remember that the timings are critical
 80                                    : and that a TV line is 64 microseconds.
 90 *KEY10O.|M                         :Not essential but useful.
100 byte=&70                           :Location of received byte.
110 control=&71                        :Contains the control bit.
120 count=&72                          :Contains number of bits received.
130 tries=&73                          :No. of times we ignore duff syncs
140 store=&3000                        :Start of text store in RAM.
150 DDRB=&FE62                         :Data Direction Register B
160 IRB=&FE60                          :I/O port B
170 osasci=&FFE3                       :Prints on screen.
180 osargs=&FFDA                       :Performs various filing functions.
190 oscli=&FFF7                        :Executes a line of text.
200 DIM command 30                     :This is where we store this text
210 code=&900                          :Can be changed if required.
220                                    :
230 PROCassemble                       :Assemble machine code
240 IF NOT FNcheck THEN PRINT          : and check it's correct,
    "Machine code not set up":END      : if not exit program.
250                                    :
260 REPEAT                             :Main loop.
270   PROCinit                         :Display menu and act on it.
280   UNTIL FALSE                      :For ever!
290 END                                :End of main program.
300                                    :
310 DEFPROCassemble                    :Assembles machine code.
320 FOR N=0 TO 2 STEP 2                :Two pass assembly.
330   P%=code                          :Location of code.
340   [                                :Start of assembler language.
350   OPT N                            :Screen listing disabled.
360 .get_byte                          :Start label.
370   sei                              :No time to service interrupts.
380   ldy #0                           :Preset control to "0" to enable
390   sty control                      : a tally if no sync sequence found.
400   lda #8                           :Preset locations "count" & "tries".
410   sta count                        :No. of bits in received word.
420   sta tries                        :No. of times we ignore duff syncs.
430 .duff                              :Loop for checking duff reception.
440   sty IRB                          :regY=0
450   inc IRB                          :Reset interface flip-flop.
460   dec tries                        :If we get duff reception more than
470   beq out                          : eight times, exit this routine.
480 .wait                              :Wait until a "1" is received.
490   lda IRB                          :This loop takes 7 machine cycles
500   bpl wait                         :i.e. 3.5 micro-secs.
510   ldy #9                           :Padding to make up a half-line
520 .half                              : delay.
530   dey                              :This loop takes 46 machine cycles
540   bne half                         : i.e. 23 micro-secs.
550   jsr clear                        :Reset flip-flop, takes 24 m-cycles.
560   ldy #17                          :Preset delay in get-bit routine.
570   jsr get_bit                      :Returns next bit in carry flag.
580   bcs duff                         :We want a "0".
590   ldy #17                          :As above.
600   jsr get_bit                      :Get next bit.
610   bcc duff                         :We want a "1".
620   jsr gbend                        :6 microsecond delay.
630 .loop8                             :Main loop to receive a byte.
640   ldy #15                          :Preset delay in get_bit routine.
650   jsr get_bit                      :Get next bit.
660   ror byte                         :Rotate carry flag into byte.
670   dec count                        :Find how many times we have looped.
680   bne loop8                        :If not 8 times, loop again.
690   ldy #15                          :As above.
700   jsr get_bit                      :Get control bit.
710   rol control                      :Put it in control location.
720   inc control                      :Add 1
730 .out                               :This is exit point for "duff" routine.
740   dec control                      :Subtract 1. "control"=&FF if duff.
750   cli                              :Enable interrupts again.
760   rts                              :Return to BASIC.
770                                    :
780 .get_bit                           :Routine to get a bit at a time.
790   nop                              :Delay padding.
800   nop                              :  "     "
810 .line                              :Rest of line delay i.e. 64 micro-secs.
820   dey                              :"Y" has been preset above.
830   bne line                         :Each of these loops takes 5 m-cycles.
840   lda IRB                          :Get bit from interface.
850 .clear                             :Reset flip-flop.
860   sty IRB                          :regY=0
870   inc IRB                          :Set bit 1 (o/p bit) to "1".
880   aslA                             :Shift bit 7 (i/p bit) into carry flag.
890 .gbend                             :Label for end of code.
900   rts                              :Return to main routine.
```

Fig 3 BBC Visicode receive routine

Fig 3 (continued)

```
 910                                   :End of assembler language.
 920   ]
 930   NEXT                            :Two pass assembly.
 940 ENDPROC                           :End of assembly.
 950                                   :REM
 960 DEFFNcheck                        :This is a check to ensure
 970 B%=0                              : machine code is set up correctly.
 980 FOR P%=get_byte TO gbend          :We add up all the machine-code
 990   B%=B%+?P%                       : bytes and make sure the total
1000   NEXT                            : is what we expect.
1010 IF B%=11362 THEN =-1 ELSE =0      :Returns "TRUE" or "FALSE".
1020                                   :
1030 DEFPROCinit                       :Menu routine.
1040 CLS                               :Tidy screen.
1050 X%=&80                            :Find filing system in use
1060 Y%=0                              : by using the routine
1070 A%=0                              : provided in the OS ROM.
1080 T%=USR osargs AND &FF             :We want the contents of regA.
1090 IF T%=1 OR T%=2 THEN T$="tape"    :Filing systems other than tape
1100 IF T%=4 THEN T$="disc"            : or disc are not provided for.
1110 PRINT"1 Save text to ";T$         :Print menu on screen.
1120 PRINT"2 Load text from ";T$       :  "    "    "    "
1130 PRINT"3 View text"                :  "    "    "    "
1140 PRINT"4 Receive VISICODE          :  "    "    "    "
     transmission"                     :  "    "    "    "
1150 REPEAT                            :Wait for a key to be pressed.
1160   A=GET                           :
1170   UNTIL A>&30 AND A<&35           :If not what we want, try again.
1180 IF A=&31 OR A=&32 THEN INPUT      :For a LOAD or SAVE we need
     "FILENAME ",F$                    : to know the filename.
1190 IF A=&31 PROCoscli("SAVE "+F$+    :If you have BASIC II or HIBASIC
     "3000 "+STR$~(store)):ENDPROC     : you can use the command OSCLI
1200 IF A=&32 PROCoscli("LOAD "+F$+    : instead of the procedure below.
     "3000"):store=&3000+!&2F8         :Location &2F8 contains length
     :ENDPROC                          : of loaded file.
1210 IF A=&33 PROCview:ENDPROC         :Views text from &3000 to store.
1220 IF A=&34 PROCreceive:ENDPROC      :Receives the VISICODE data.
1230                                   :
1240 DEFPROCoscli(C$)                  :This routine is only
1250 $command=C$+CHR$13                : necessary for those with
1260 X%=command MOD 256                : BASIC I. It executes
1270 Y%=command DIV 256                : a line of text pointed to by
1280 CALL oscli                        : regX and regY.
1290 ENDPROC                           :
1300                                   :
1310 DEFPROCview                       :Outputs text received to screen.
1320 IF store =&3000 ENDPROC           :If no text received then exit.
1330 PRINT"Press SHIFT to scroll"      :We are going into paged mode.
1340 VDU14                             :Thus!
1350 *FX15                             :Flushes all buffers.
1360 FOR P%=&3000 TO store             :P% points to text.
1370   A%=?P%                          :A% contains byte for output.
1380   CALL osasci                     :Prints byte, linefeeds for A%=&0D.
1390   NEXT                            :Keep on going till end of text.
1400 VDU13                             :Cancel paged mode.
1410 REPEAT                            :Wait for another press
1420   UNTIL INKEY(-1)                 : of the SHIFT key
1430 ENDPROC                           : before returning.
1440                                   :
1450 DEFPROCreceive                    :Main receive routine.
1460 store=&3000                       :This is where we store text.
1470 PROCassemble                      :Cassette users have to re-assemble.
1480 ?DDRB=1                           :Bit1 of IRB as o/p, rest as i/ps.
1490 CLS                               :Tidy screen.
1500 REPEAT                            :This is the IDLE loop.
1510   PROCfetch                       :We wait until we receive the
1520   IF A%<>&24 OR B%<>1 THEN        : STANDBY code "U" for
       PRINTTAB(0,0);"Not receiving    : "Universal text"
       correctly" ELSE PRINTTAB(0,0);  :Also tells us if the sensor is
       "Receiving correctly  "         : not picking up the correct code.
1530   UNTIL A%=ASC"U" AND B%=1        :When we receive "U"
1540 ?(wait-1)=0                       : we disable the "duff" routine,
1550 CLS                               : tidy screen,
1560 PRINT"STANDING BY"                : inform of standby mode
1570 REPEAT                            : and enter a loop which waits
1580   PROCfetch                       : for the STANDBY mode
1590   UNTIL A%<>ASC"U" AND B%<>1      : to finish.
1600 VDU15,30                          :Page mode off, cursor to top.
1610 REPEAT                            :Main data receive loop.
1620   CALL osasci                     :Print text on screen,
1630   ?store=A%                       : and store in in RAM.
1640   store=store+1                   :Increment RAM pointer.
1650   PROCfetch                       :Get next byte.
1660   UNTIL A%=&FF AND B%=1           :Until End Of Text code.
1670 store=store-1                     :Adjust RAM pointer
1680 ENDPROC                           :Return to menu.
1690                                   :
1700 DEFPROCfetch                      :We have time to make this
1710 CALL get_byte                     : a separate procedure,
1720 A%=?byte                          : and it does make the program
1730 B%=?control                       : tidier!
1740 SOUND&13,-7,A%,1                  :We can hear the data arriving, use
1750 ENDPROC                           : *FX210,1 to turn sound off.
```

sion. When the standby signal is transmitted, proceed as follows:

BBC Micro Run the program and select option four from the menu, and position the Visicode receiver in the bottom left-hand corner of the screen over the transmission area. Re-position the receiver until the computer displays 'OK', and secure the receiver with sellotape or, preferably, Blu-Tac.

The software will automatically load and return to the main menu when finished, where you can save and view the transmission. You can test out the receiver hardware by running the test routine program and following the same procedure for positioning the receiver.

Commodore 64 Run the program and wait for the screen to go blank, and position the Visicode receiver in the bottom left-hand corner of the screen over the transmission area. Press the space bar and view the computer display. Re-position the receiver and hit the space bar until the computer displays 'OK'. Secure the receiver with sellotape or Blu-Tac and press 'R' to receive. The software will now load and return to a menu which allows you to save or view the transmission. If you have access to a BBC Micro you can test the system beforehand using the test routine for the BBC Micro and the receive software for the Commodore 64.

Receiver software

The receiver routine for the BBC (Fig 3) is fully annotated to show users of other machines how to set about conversion, so the comments at the side don't need to be typed in. The routine is compatible with Basic I and II. If you have Basic II, the assembler routine can be put on multi-statement lines, and PROCoscli becomes redundant.

The test routine (Fig 4) allows you to check your Visicode receiver unit ahead of transmission, while the receive routine is the one you actually use for the transmissions. The test listing has nearly the same assembly language as the receive routine, so by typing in the test routine first, with the judicious use of DELETE and RENUMBER, the receive routine is easier to enter. The comments for the receive routine apply to both. The machine code for the test routine can be checked with the following program line:
B%=0: FOR N=receive TO tx3+5: B%=B%+?N: NEXT: PRINT B% and B% should be 14976!

If you are writing a routine for your own micro, remember that timings are critical. The delay loops have to be accurate to within better than five per cent to receive the last line of Visicode data correctly. The BBC is able to do this easily, having an internal clock frequency of 2MHz, but programming for slower machines will need a lot of care. Interrupts must not occur while the machine code routine is being called.

The best way to test the main delay loops is to point the sensor at a TV screen at peak white, preferably from an off-air transmission such as a test card, and observe the timings on an oscilloscope. Although you may be used to thinking that machine code routines are incredibly fast, it's quite instructive to see the effect of just one more NOP in the delay loops! Remember that a TV line is exactly 64 microseconds in duration, and your timing has to be accurate over 11 lines after the first start bit.

The briefer Commodore 64 routine needs a little more explanation. As shown on the BBC routine, the receiver software is most easily arranged by combining machine code with Basic. The machine code routine waits for a spot, reads its value and checks whether it has the control bit set. It plants the byte value in the first Basic variable, A%, and plants 1 in the second variable B% if a control bit is sensed (A% and B% must be declared in the first line of the program). If it objects to the spot, it sets B% to 255.

The Basic program can now control the saving of the data by first POKEing it into a safe region of memory. In the case of the Commodore 64 it must also switch off the display, as this steals memory cycles and confuses the timing. This might leave you guessing about the quality of the input, so the sound channel has been called into action. The machine code plants the value of each received byte into the pitch 1 high byte. The decay is set to give a brief 'ping' as each byte arrives, scattered up and down in pitch. Every time a control bit is found, the second sound channel is strobed. This is set to give a long deeper 'plung', so that you can easily hear when the set-up blob is being correctly decoded. When you are happy with it, press the space bar and the program will wait for the data to start. It will save it and restore the display when the final control code is received. The rest is up to you.

The 'pseudocode' version of the machine code is as follows. The Commodore version is given, but apart from lines 15 to 18 the method is common to most micros.

1 Inhibit interrupts.
2 Pulse bit 0 of the port down and up to clear the latch.
3 Load COUNT and TRIES with 8, set B% to zero.
4 Decrement TRIES; if zero then flag B% is 'no good', enable interrupts and return to Basic.
5 Input the port, if no pulse go to 5 (wait for start bit).
6 Wait half a line, clear the latch.
7 Call GETBIT — bistable sense bit is bit 7.
8 If bit 7 is set, go to 4 to try again.
9 Call GETBIT.
10 If bit 7 is clear, go to 4 to try again.
11 Call GETBIT.
12 Combine the input bit with the byte so far.
13 Decrement count; if not zero, loop back to 11.
14 Call GETBIT; if bit 7 is set then B%=1 (control).
15 Save the byte in A% — STA (VARPTR),Y where (Y)=3.
16 Save the byte in sound pitch channel one high-byte.
17 If B% is non zero, pulse sound channel two.
18 Pulse sound channel one.
19 Enable interrupts, return to Basic.
GETBIT:

```
   10 REM ***************************
   20 REM *                         *
   30 REM * VISICODE test routine   *
   40 REM * (C) Jim Crowther 1985   *
   50 REM *                         *
   60 REM ***************************
   70
   80 DDRB=&FE62
   90 IRB=&FE60
  100 byte=&70
  110 control=&71
  120 screen=&72
  130 count=&74
  140 tries=&75
  150 X=0
  160 Y=30
  170 c=&5800+X*8+Y*320
  180 ?screen=c MOD 256
  190 ?(screen+1)=c DIV 256
  200 ?DDRB=1
  210 PROCassemble
  220 MODE4
  230 VDU23,255,255,255,255,255,255,255,
255,255
  240 PRINTTAB(0,28);CHR$255;CHR$255;
CHR$255;CHR$255
  250 PRINTTAB(0,29);"   ";CHR$255
  260 PRINTTAB(0,30);"   ";CHR$255
  270 PRINTTAB(0,31);"   ";CHR$255;
  280 A%=&55
  290 REPEAT
  300 A%=A% EOR &FF:CALLtx
  310 CALL receive
  320 SOUND&13,-7,?byte,1
  330 IF?byte=A% AND ?control=1 THEN
PRINTTAB(0,10);"O.K." ELSE
PRINTTAB(0,10);"DUFF"
  340 UNTIL FALSE
  350
  360 DEFPROCassemble
  370 FOR N=0 TO 2 STEP2
  380 P%=&900
  390 [
  400 OPT N
  410 .receive
  420   sei
  430   ldy #0
  440   sty control
  450   lda #8
  460   sta tries
  470   sta count
  480 .duff
  490   sty IRB
  500   inc IRB
  510   dec tries
  520   beq out
  530 .wait
  540   lda IRB
  550   bpl wait
  560   ldy #9
  570 .half
  580   dey
  590   bne half
  600   jsr clear
  610   ldy #17
  620   jsr get_bit
  630   bcs duff
  640   ldy #17
  650   jsr get_bit
  660   bcc duff
  670   jsr gbend
  680 .round
  690   ldy #15
  700   jsr get_bit
  710   ror byte
  720   dec count
  730   bne round
  740   ldy #15
  750   jsr get_bit
  760   rol control
  770   inc control
  780 .out
  790   dec control
  800   cli
  810   rts
  820
  830 .get_bit
  840   nop:nop
  850 .line
  860   dey
  870   bne line
  880   lda IRB
  890 .clear
  900   sty IRB
  910   inc IRB
  920   aslA
  930 .gbend
```

Fig 4 BBC Visicode test routine

Fig 4 (continued)

```
  940   rts
  950
  960
  970 .tx
  980   sta control
  990   lda #255
 1000 .tx1
 1010   sta c-313
 1020   sta c-315
 1030   sta c+320
 1040   ldy #7
 1050 .tx2
 1060   lda #0
 1070   rol control
 1080   bcc tx3
 1090   lda #255
 1100 .tx3
 1110   sta (screen),Y
 1120   dey
 1130   bpl tx2
 1140   rts
 1150 ]
 1160 NEXT
 1170 ENDPROC
```

20 Wait for one-line period.
21 Read the input port.
22 Toggle bit 0 of the port to clear the bistable.
23 Return.

Spectrum dilemma

After a week of frantic effort, the question still hangs in the balance: 'Will the Spectrum be able to receive Visicode?'.

After an uncomfortable experience trying to get the timing loop correctly balanced on the Commodore 64 — solved by killing the screen display — I was a little cautious in claiming that Visicode would work for the Spectrum. But a brief two-liner which planted and ran a simple machine code loop gave a beautifully clean signal on the oscilloscope, so I felt safe in predicting success.

The assembler routine worked out rather neatly, and a prod to the ULA produced a gratifying stripe of colour and a click as each byte was received. To save effort, I tacked the receiving optics onto the Spectrum's own screen to line up the timing, and in no time had it balanced. Next came a live test on data transmitted from the BBC computer's screen — and then my troubles really started.

The machine code is loaded from a Basic program which then tests the received byte for quality. If it matches the test pattern, the screen shows 'OK'; if not, you have problems. The relative display timing of the two computers is not exact. The point at which the photocell received the spot was rolling slowly on the Spectrum's screen. While it corresponded with the part of the screen which shows text, all was well. As soon as it rolled to the border area, the timing was too far in error. A quick bodge to the machine code changed all that. Now the spot was perfectly decoded in the borders, but went to pieces in the text area. Just as in the case of the Commodore 64, the display was causing trouble.

During display output, the ULA in the Spectrum rations out the clock pulses to the processor, leaving itself time to drag display bytes out of memory. Program execution therefore speeds up in the gaps. There were a number of possibilities: kill the display altogether, as in the Commodore 64; persuade the ULA to stop stealing cycles; persuade the ULA to steal cycles the whole time; or hope that the two screens stay in step, perhaps bending the clock rate to lock them.

Clearly I needed to know more about the innermost workings of the Spectrum. Where better to look for help than Sinclair Research? I am sure it is easier to telephone the headquarters of the CIA, but I eventually obtained a number and a name to contact. 'No, you can't disable the display. All you need to do is move your machine code to the top of the 48k memory.' Hopefully I tried it. It didn't work. What had looked like a clean oscilloscope trace was hopelessly dependent on the part of the display in which it was triggered, although I still believe that I once got a completely clean pulse when the machine crashed.

```
READY.

10 POKE56,29:CLR:REM PROTECT STORE AREA
15 A%=0:B%=0:MC=30*256:I=0:DL=36:CU=85:P=32*256:Q=128*256
20 GOSUB1000: REM LOAD MACHINE CODE
25 POKE54273.80:POKE54280,32:POKE54296,15:POKE54277,2:POKE54284,7:REM SOUND
30 VD=53248+17:VO=PEEK(VD):POKE VD,VO AND 239:REM SCREEN OFF
35 SYSMC:SYSMC:GETA$:IFA$=""THEN35
40 IF A%<>DLOR B%<>1THEN POKE VD,VO:PRINT"NOT HAPPY !":GOTO30
42 IF A$<>"R" THEN PRINT"OK":POKEVD,VO:GOTO 30
45 POKE54280,40:SYSMC:REM CHANGE PITCH, SYNCHRONISE BLIP
46 SYS MC:IF B%<>1 OR A%<>CU THEN46:REM WAIT CONTROL U
50 SYSMC:IFB%THEN50:REM WAIT FOR DATA
60 FOR I=P TO Q:POKE I,A%:SYS MC:IF B%=0 OR A%<>255THENNEXT
70 R=I:I=Q:NEXT
80 POKE VD,VO:PRINT"":D=3:REM CLEAR SCREEN, SET WHITE TEXT
100 OPEN1,D:FORI=PTOR-1:PRINT£1,CHR$(PEEK(I));:NEXT:CLOSE1
110 INPUT"3 FOR SCREEN, 4 TO PRINT";D:GOTO 100
1000 I=MC: PRINT" LOADING MACHINE CODE"
1005 PRINT"PRESS SPACE TO TEST, R TO RECEIVE"
1010 READ A$:IF LEN(A$)<>2 THEN RETURN
1020 A=ASC(A$)-48+7*(A$>":")
1030 B$=MID$(A$,2)
1040 A=16*A+ASC(B$)-48+7*(B$>":")
1050 POKE I,A:I=I+1:GOTO1010
2000 DATA A9,01,8D,03,DD,A0,00,8C
2010 DATA 01,DD,8D,01,DD,78,A9,08
2020 DATA 8D,84,1E,8D,85,1E,CE,85
2030 DATA 1E,F0,47,AD,01,DD,10,FB
2040 DATA A0,01,20,73,1E,20,6E,1E
2050 DATA 30,EC,20,6E,1E,10,E7,20
2060 DATA 71,1E,CE,84,1E,D0,F8,8A
2070 DATA A0,03,91,2D,8D,01,D4,20
2080 DATA 71,1E,A2,00,09,00,10,0A
2090 DATA E8,A0,20,8C,0B,D4,C8,8C
2100 DATA 0B,D4,8A,A0,0A,91,2D,A0
2110 DATA 20,8C,04,D4,C8,8C,04,D4
2120 DATA 58,60,A0,0A,A9,7F,91,2D
2130 DATA A0,03,91,2D,58,60,EA,EA
2140 DATA EA,A0,04,88,D0,FD,AD,01
2150 DATA DD,8C,01,DD,EE,01,DD,0A
2160 DATA 8A,6A,AA,60,XXX

READY.
```

Fig 5 Commodore 64 receive routine

Back to the telephone: 'I'll ask a hardware man.' Soon a determined, anonymous voice was advising me to pull one of the expansion port pins high so that the ULA could not see the I/O request. It didn't work. From the circuit diagram I then saw that the pin was already pulled high for the particular address I was using.

Perhaps a reader has the answer. The ULA has a write line to the memory, so it could use memory locations to keep track of byte and line count — and these could be nobbled. If you have the answer, please let *PCW* know.

In the meantime, an Amstrad is waiting in my hallway to be given the treatment. I do hope it's easier!

Micronet prizes

Once you've received the Visicode transmission, you can start to ponder the puzzle which makes up the four broadcasts. Each of the four 'clues' will take approximately 6k of memory and they will all piece together to give a final answer. Put them together correctly and you could win one of 30 free yearly combined subscriptions to Prestel and Micronet 800 (together worth £2000).

In addition to being transmitted via Visicode on the four *Database* programmes (4, 11, 18 and 25 July), the competition will also be run on the Prestel/Micronet 800 database and on the Prestel Free Access Area (a special database available to modem owners and Micronet demonstration retailers at a local phone call rate). To access this second service, dial 100 and ask Freefone Prestel Service for your area telephone number, then key in 4444444444 as an identity number and 4444 as a password.

To round off the competition, the winners will be announced on the *Database/PCW* special that will be transmitted from the *PCW Show* on 5 September.

Many thanks are due to Jim Crowther for his enthusiastic collaboration, and to Michael Feldman and the rest of the Database *team for their encouragement. Thanks will also be due to readers who join in the experiment, helping to bring about a change in public domain software. Receive routines and circuit diagrams for machines other than those covered here are obviously welcome. Send them to Nick Walker at* PCW *so that they can be checked and published.*

END

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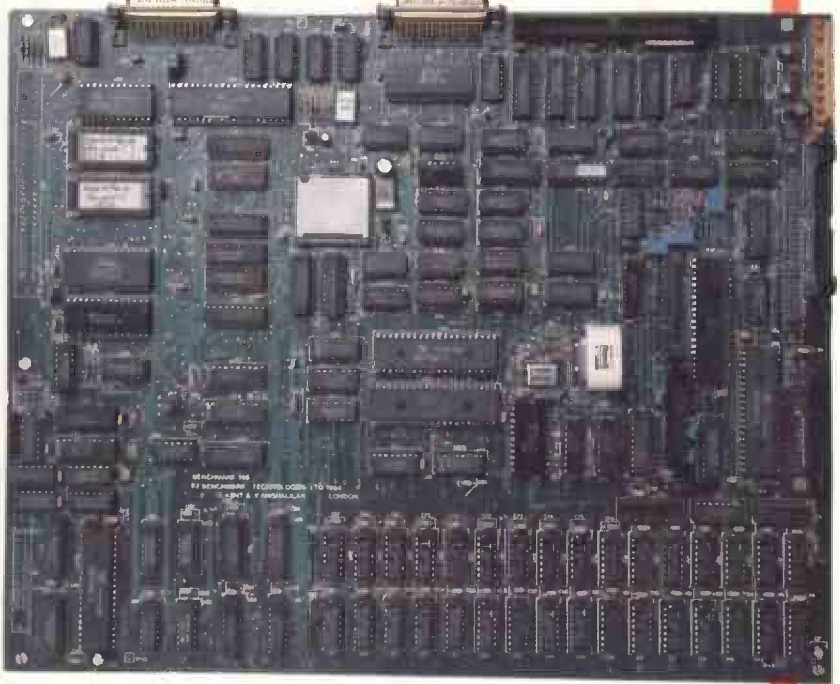

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HARDWARE SPECIFICATIONS

CPU	80186 6 or 8 MHz
EPROM	32K
	RAM128K to 1M on board
VIDEO	16K separate character buffer.
	upto 1280 x 800 pixels bit resolution.
	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.
	Full attributes and soft scroll.
	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).

SOFTWARE

MS-DOS 2.11	Multitasking implementation of MS-DOS operating system. The operating system itself also runs as a task.
'C' COMPILER	Specific support for the Lattice 'C' compiler and tools with benchMark specific libraries.
bRTX	benchMark multitasking real-time executive.
bCD	benchMark concurrent debugger.
bVT220	benchMark VT220, VT100, VT52 emulation.
bSAS	benchMark signature analysis stimuli.
bDEF	benchMark hardware definition libraries.

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Business begins at home

At last — the definitive way to make sure you don't overspend. Impossible? Bob Hinton shows you how, using Psion's Xchange suite on the QL.

Only a small minority of people who buy a Sinclair QL will immediately plunge happily into programming in SuperBasic. Most will turn first to Psion's Xchange, the four software packages called Quill, Abacus, Easel and Archive that are bundled with the computer for ease of use.

In practice I found that I had to put in a lot of hard work before I could make use of the programs. Probably the best way to learn is to work through a practical example. There are several of these in the QL's manual and they are certainly useful, but I learned more about Abacus and how to display some of its results with Easel from the exercise described here.

Anticipating risks

The exercise is not very sophisticated, but it should be useful to anyone who needs to live within his income and who wishes to have reasonable warning of the risk of failing to do so. For this I wanted a system which could:
— list planned spending month by month;
— compare it with likely income;
— compare it with actual spending as it occurred;
— forecast the peaks and troughs of over and under-spending likely over the course of the year; and
— warn when spending is beginning to overshoot this forecast and so prompt action to avoid disaster.

The heart of the system is the chart showing the income and expenditure for each month of the year. The chart for January is shown in Fig 1, the other months following the same basic pattern. Both income and expenditure have information in four columns. Alongside each item of income is the estimate of what it is likely to be, and next to that a column to record the actual income when received. The end column records the difference between the two. Items of expenditure are treated in the same manner.

All the columns are totalled and income is compared with expenditure to produce the monthly summary figures at the bottom. The summary shows how well or badly you have done over the month, but more importantly it forms the basis for the chart in Fig 2 which builds up the picture for the year as the figures for each month are transferred to it.

At the start of the year, the estimate for each month can be fed into the top line of Fig 2 for the whole 12 months. This automatically produces a line of figures in the fourth line ('Estimated to date') which tells you how you are likely to stand overall at each stage of the year. A + sign indicates that your income is estimated to exceed expenditure at that stage; a – sign means you are likely to spend more than your income.

This highlights the times in the year when you might have cash-flow problems, and by warning you in advance enables you to do something about it: for example, plan economies, earn extra income, withdraw savings or defer payment of bills.

As the year goes by, the actual result for each month is transferred from the monthly summary to line two, and this

```
  :        A          |B:  C    :   D    :   E   :     F      :  G    :     H
 1|                                   HOUSEHOLD BUDGET
 2:                                   ================
 3|January
 4|-------            INCOME
 5:                   ------
 6:Item                 Estimate (£)     Actual  (£)        Difference (£)
 7|----                 ------------     ----------         --------------
 8:Salary                    820              820
 9|Expenses                   25               45                20
10:
11:
12:
13:
14|                       ------           ------            ------
15|Total  Income             845              865                20
16|                       ------           ------            ------
17:
18|                   EXPENDITURE
19|                   -----------
20|Item                 Estimate (£)     Actual  (£)        Difference (£)
21|----                 ------------     ----------         --------------
22|Mortgage repay't          120              120
23:Water rate                 15               15
24|General rate               43               43
25|Insurance                  15               15
26|Housekeeping              300              310               -10
27|Barclaycard                30               26                 4
28|Entertainment              20               44               -24
29:Personal Expenses          90               90
30|Gas                        80              125               -45
31|Electricity                90               85                 5
32|Contingency                30               21                 9
33|
34|
35|
36|
37|
38|
39|
40|
41|
42|                       ------           ------            ------
43:Total Expenditure         833              894               -61
44|                       ------           ------            ------
45|
46|MONTHLY SUMMARY
47|---------------
48|Estimated result for month:                 12
49|Actual result for month:                   -29
50|Variation from estimate:                   -41               -41 Ref:HBJFMA
```

Fig 1 January income and expenditure

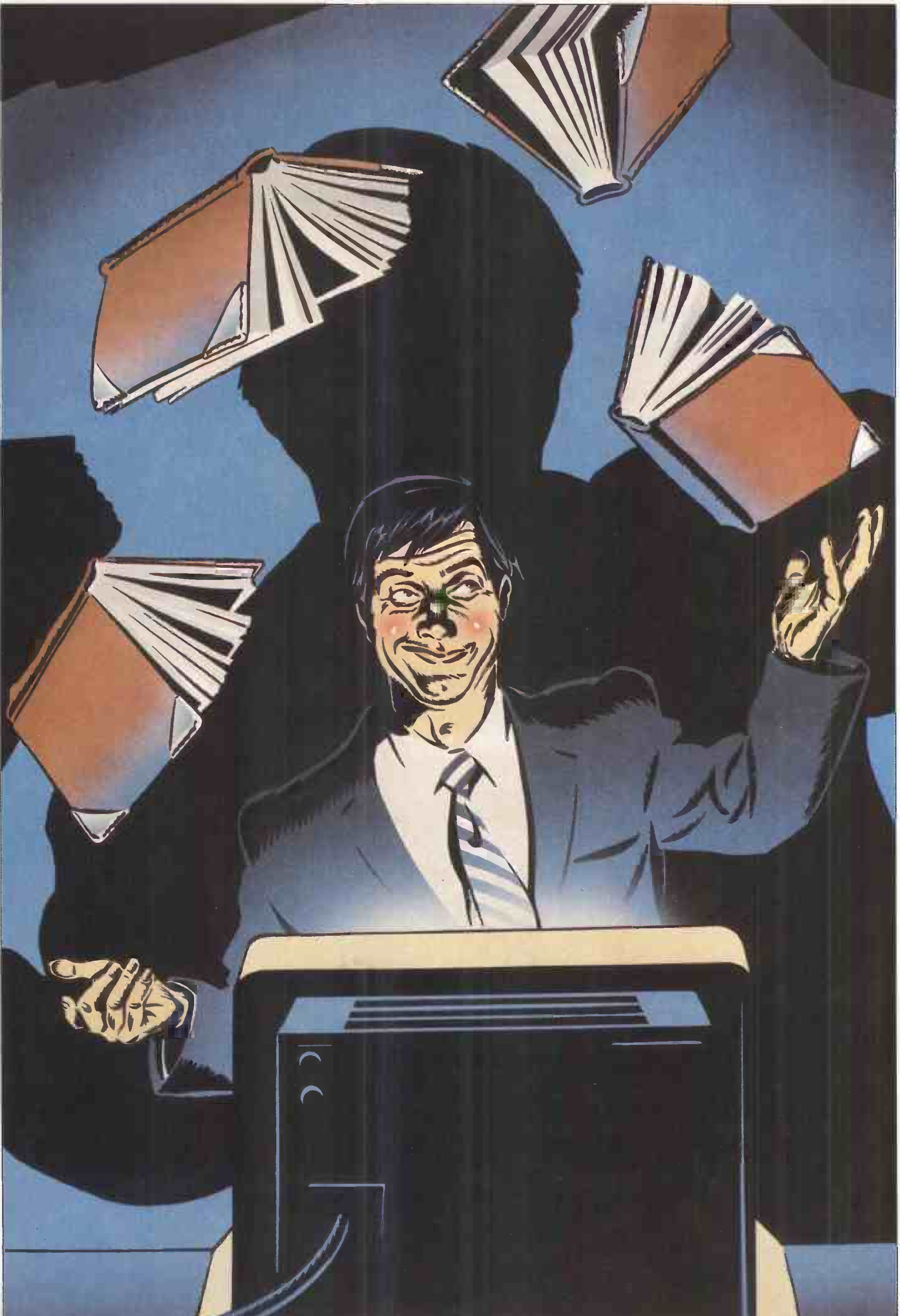

Illustration by Mark Thomas

in turn automatically produces the row of figures in line five ('Actual to date'). This builds up a picture of the year to compare with the expected figures in line four. It will tell you whether your planned efforts to avoid disaster are working, or, if there seemed to be nothing to worry about at the start of the year and your control has been slack, this line will act as a warning as, for the months yet to come, it projects the new pattern now developing from the actual results.

In case you should want an overall assessment of whether it will be a good year or a bad one, the year-end forecast is added at the bottom.

The monthly chart

After loading Abacus, the first thing to do is to adjust the width of the columns to suit the chart. Column A should be 16 characters wide to allow room for the words of the items. If you adjust column B to one character, you can position the main income and expenditure headings slightly out of line with others to make them stand out. Columns C, E and G will hold the figures — six characters should be enough for most people's monthly income! D and F are spacing columns and eight characters should be sufficient (note that the column headings spill over into them so they should not be less than this).

The widths are adjusted by the GRID command by choosing the width option and following the prompts to get the result you want.

The following are the cell references in sequence and the content to insert:

D1 "Household budget (you may wish to add the year to the text of this heading).

D2 Here you have a choice. You may feel it is simpler to add the underline by inserting "=======. If you prefer to use a formula, you will find the pattern at A4.

A3 "January

A4 rept ("–",len(A3)) (Here you must use the formula linking the length of the underline to the text in A3 in order that it adjusts to different months when you insert these in the copies of the chart you will make later.)

B4 "Income

B5 "—–—— (This six-character underline will be useful and can be referred to as B5 whenever needed.)

A6 "Item (The other column headings go in row 6 followed by the underlines in row 7.)

C8 and E8 It might be a good idea to put numbers in these cells *pro tem* just to test the operation of the formulae you will now insert.

G8 Diff = Est – Act (from 8 to 13) (This uses the excellent facility whereby Abacus recognises cell labels in formulae and applies the facility to a range of cells. It gives you space for six items of income.)

C14 B5 (Remember? And in C16, E14 & 16 and G14 & 16.)

A15 "Total income

C15 Row = sum(col) (from 8 to 14) (from C to G).

This entry totals the rows, but it may worry you to see stray 0s in columns D and E. Not to worry, we can shift these with the DESIGN command later on.

B18 & 19 Entries for expenditure like B4 & 5.

A,C,E,G20 Enter A6 C6 E6 & G6 respectively to repeat headings, followed in row 21 by the underlines from row 7.

G22 Diff = Est – Act (from 22 to 41) This will give space for the entry of 20 items. Adjust if you think you need more or less.

C42 B5 (Again! And five more times as in rows 14 & 16.)

A43 "Total expenditure

C43 Row = Sum(col) (from 22 to 42) (from C to G).

With this entry the basic monthly grid is complete. If you now add a few trial figures in columns C and E, you can test the operation of the whole grid and go on to create the display and formulae for the whole grid. Then you can create the display and formulae for the Monthly Summary.

A46 "Monthly summary (followed by underline at A47).

In the next three lines in column A insert the three items under that heading in the chart.

E47 "£ (This will be centered with the JUSTIFY command later on. Until then it will be out of line with the figures below it.)

E48 C15 – C43 (As an alternative you could use the cell labels here, but as they are long I prefer the cell references.)

E49 E15 – E43

E50 E49 – E48

G50 G15 + G43 (This should produce the same figure as E50, and so is a check that you have entered the formulae correctly. If it does check,

```
  !    A    !    B    !    C    !    D    !    E    !    F    !    G
 1!        HOUSEHOLD BUDGET - TABLE OF MONTHLY AND CUMULATIVE PERFORMANCE
 2!          ===========================================================
 3!   1984            January      February       March        April        May
 4!-------------------------------------------------------------------------------
 5!Estimated result      12          -20          -109          44          106
 6!
 7!Actual result        -29          -49           -87         -23          126
 8!
 9!Variation            -41          -29            22         -67           20
10!-------------------------------------------------------------------------------
11!CUMULATIVE
12!==========
13!Estimated to date     12           -8          -117         -73           33
14!
15!Actual to date       -29          -78          -165        -188          -62
16!===============================================================================
17!                     June         July         August     September    October
18!-------------------------------------------------------------------------------
19!Estimated result     -73          112          -150         126           23
20!
21!Actual result        -33          134          -120         126           23
22!
23!Variation             40           22            30           0            0
24!-------------------------------------------------------------------------------
25!CUMULATIVE
26!==========
27!Estimated to date    -40           72           -78          48           71
28!
29!Actual to date       -95           39           -81          45           68
30!===============================================================================
31!
32!                   November     December
33!-----------------------------------------
34!Estimated result     -58           44
35!
36!Actual result        -58           44
37!
38!Variation              0            0
39!-----------------------------------------
40!CUMULATIVE
41!==========
42!Estimated to date     13           57
43!
44!Actual to date        10           54
45!=========================================
46!
47!
48!YEAR END FORECAST
49!=================
50!Original estimate     57
51!
52!Current forecast      54
53!
54!Performance forecast  -3       (A plus figure is better than originally
55!                                forecast, a minus figure is worse)
56!                      -3
```

Fig 2 Building up a picture of the budget for a year

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Canon PW1156A NLQ	£365.90+VAT=	**£420.79**
Canon PJ1080A Colour	£479.90+VAT=	**£551.88**
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you can delete it if you wish.)

H50 This is a convenient place to put the name under which you will eventually save the chart on microdrive. It is useful for reference on the printout (if you make one) and will also help to ensure column H is included — it has to be since the contents of G20 spill over.

Having completed the basic chart, you should now enter in the Income and Expenditure columns any items which will recur in all or most months. We are going to create the charts for the other months with the COPY command so there is no point in entering these 12 times over. In Fig 1 the first eight items might be in this category, and you should be able to enter the figures for the first five as well. If they do alter as the year goes by, it is easy enough to change them.

You will note that I suggest the use of integers throughout; it is too fiddly and hardly relevant for monthly and yearly budgeting to include the pence.

Next come two bits of tidying up:
JUSTIFY,cells,text,centre,range E47 to E47 (centres the £ as promised).
JUSTIFY,cells, numbers, centre, range E48 to E50 (centres the figures under the £ sign).

When the screen display shows DESIGN, press B to give a YES opposite BLANK IF ZERO; this clears all the single 0s off the chart. Also, change the LINES figure to 55 in order to get a separate page for each month if you are to print out hard copy.

Now use the COPY command to take the whole chart to a new location with A56 as the top left-hand corner; this gives you the chart for February. Then copy the whole of what you now have to the location A111, and you have added March and April also. If you started out, as I did, with only 15k of spare memory, I should stop there as you probably have only 4k left and quite a few entries still to make. If you are going to pack each month very tight with entries, you might feel safer with groups of three months rather than four if you are short of space at this stage.

To create your charts for the whole year, save the current version in its present form before making any further entries of income and expenditure items. It can be loaded to form the basis for the May/August and September/December charts when you come to do these.

All that remains now is to make the remaining income and expenditure entries for the first four months. When you do this at the start of the year, you must put in the Actual columns the same figures as you put in the Estimates column, or, put in the Actual column balancing figures equal to the totals in the Estimates column under both Income and Expenditure. When we come to the Cumulative chart, these figures will have to be entered for all the months of the year at the outset if the year-end forecast is to be revised each month as the year goes by.

Don't forget to change the month title at A3 on each chart, then save the complete chart with a new file name to distinguish it from the basic one already saved. Load the basic file again, and complete and save May/August followed by September/December to complete the year.

The cumulative chart

Until such time as Abacus, when loaded, leaves you with enough space to hold a whole year on the spreadsheet at once, the chart shown in Fig 2 will have to be created separately and the figures individually entered from the monthly summaries.

The headings and other text are created in the same way as the monthly chart. The column headings and figures are lined up at the end with the JUSTIFY command, as before.

The most important point for simplifying your task with this chart is to create the top section (January to May), and use the COPY command on A4:G16 to repeat this for June to October and on A4:D16 for November/December. Most of the work only has to be done once, apart from a few adjustments. The following are the main points:

B3 row=month(col ()−2) (from C to G) (This creates the column headings. Why '−2'? Work it out! Column C, where we want to start, is column 3 but January is month 1. 3−2=?.)

A4 row=rept ("−",width()+1) (And enter A4 at A10 & A16.)

C9 row=Act−Est (from C to G) (If you want to check that this works, put a few trial figures in rows 5 and7.)

C13 and C15 Enter C5 and C7 respectively.

D13 C13+D5

E13 D13+E5 . . . continue pattern for F13 & G13.

D15 C15+D7 . . . in similar pattern for E15−G15 .

This completes the top section which is copied as already described for the later months. The adjustments are:

B17 row=month(col ()+3) (B32 the same, but '+8').

C27 G13+C19 (This picks up the preceding cumulative figure for May from G13 and the rest of row 27 adjusts automatically.)

By the same token we get:

C29 G15+C21 C42 G27+C34 and C44 G29+C36

All that remains is to add the year-end forecast, the first two items of which are simply the two cumulative figures for the last year of the month, the third being the difference between them. We therefore get:

C50 D42 C52 D44 and C54 D44−D42

If you want to check on the accuracy of the last figure, you can total up the figures in the variation row 9 with an entry at H9 of sum(row) (from C to G). If you do this before you copy it will be repeated at H23, otherwise you will have to enter it again there and, in any case, at H38. Total these figures with the entry of sum(col) at H39. If you then enter H39 at C56, you should see the same figure appear as at C54. If not, something is wrong!

Save the cumulative chart for updating.

For these graphs you create one set of figures as soon as Easel is loaded and name it 'Estimate', and create the second set with the NEWDATA command. The two are combined with the VIEW command.

Graphs to show the overall monthly performance, for the year as a whole to date (in this case we are at the end of August) and the trend for the rest of the year, can easily be created with Easel.

General tasks

At the start of the year you will have the chore of entering all the data for the first year in each monthly chart, but then you have broken the back of it for future years because the pattern usually stays much the same. Don't forget to put the same figures in the Actual column (or a balancing total) so that the monthly summary gives you a figure to put in the 'Actual to date' line of the Cumulative chart. Without this, you will have no revised forecast for the year-end as the months go by.

Similarly, create the chart in Fig 2 at the start of the year, putting the Estimate figures in the Actual result row at this stage. They will be replaced by the real figures at the monthly updates. On the graphs there is no point in entering anything other than the Estimate figures before the year starts: you can add the Actuals in both graphs when you have some results at the end of the first month.

At the end of each month, peruse your records of expenditure for that month and fill in the details of Actual expenditure item by item on the chart for the month. I use my cheque book stubs for the manual record of most of this information, even if payments have not necessarily been by cheque. From the monthly summary you then have two figures for updating the performance chart and, in turn, the graphs.

In the examples shown here, the person whose budget is shown in part on these pages began to use the system around April when he suddenly realised his expenditure was racing away from income. Since then he has reigned it back, so that by the end of August he will be back on target and set fair for the rest of the year. END

Fatten up your Mac

Soldering iron and pliers at the ready, David Burns presents a step-by-step guide to expanding the Macintosh — four times the memory for a third of the price.

When Apple produced the first Macintosh computers, the new 256k RAM chips were not widely available. So, rather than be late into the marketplace, the company fitted 64k memories as a temporary measure. Although promoted as 128k computers, they are, in fact, only 64k word machines and much of this memory is taken up by the Mac's own software. Users of programs such as MacWrite and MacPaint soon became aware of the limitations of this memory — a mere seven A4 pages when word processing.

The new, larger memories were introduced and the 'Fat-Mac' was born: four times the memory and a boon to those sick of waiting for the Mac to dump to its clattery old disk drive so that they could add a bit more text or do another doodle. The problem, though, is the cost of the upgrade — around £800. The cost of the memories themselves, however, has recently fallen rapidly, and the 16 256k RAMs needed to 'fatten up' your Mac can now be obtained for around £15 each — a total of less than £250. With the other few items required, the whole job can be done for well under £280, or a third of Apple's price.

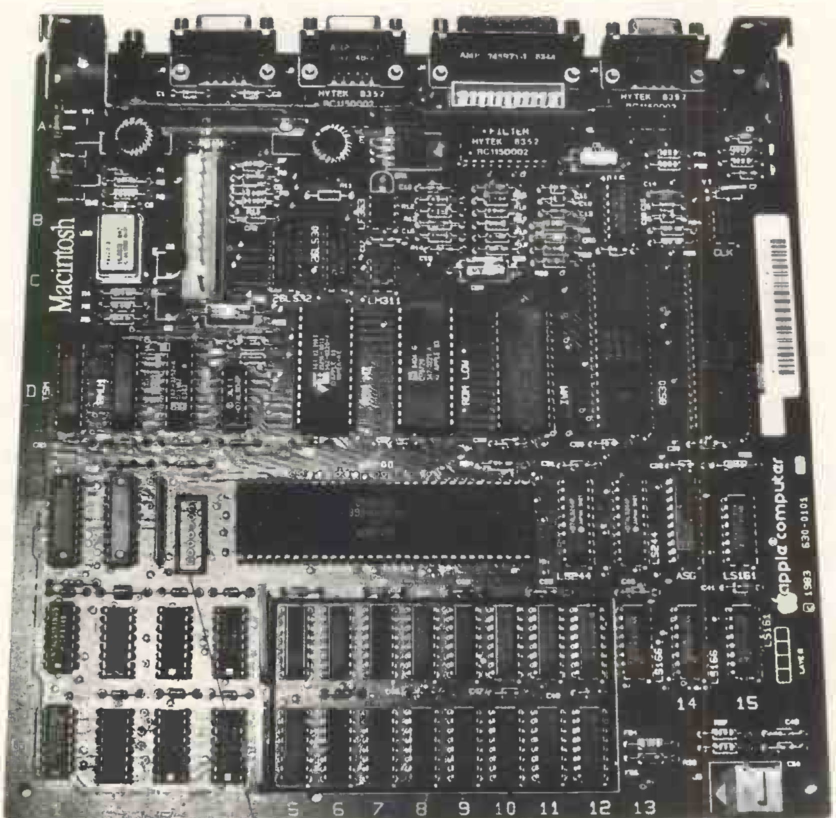


Fig 1 The Macintosh board

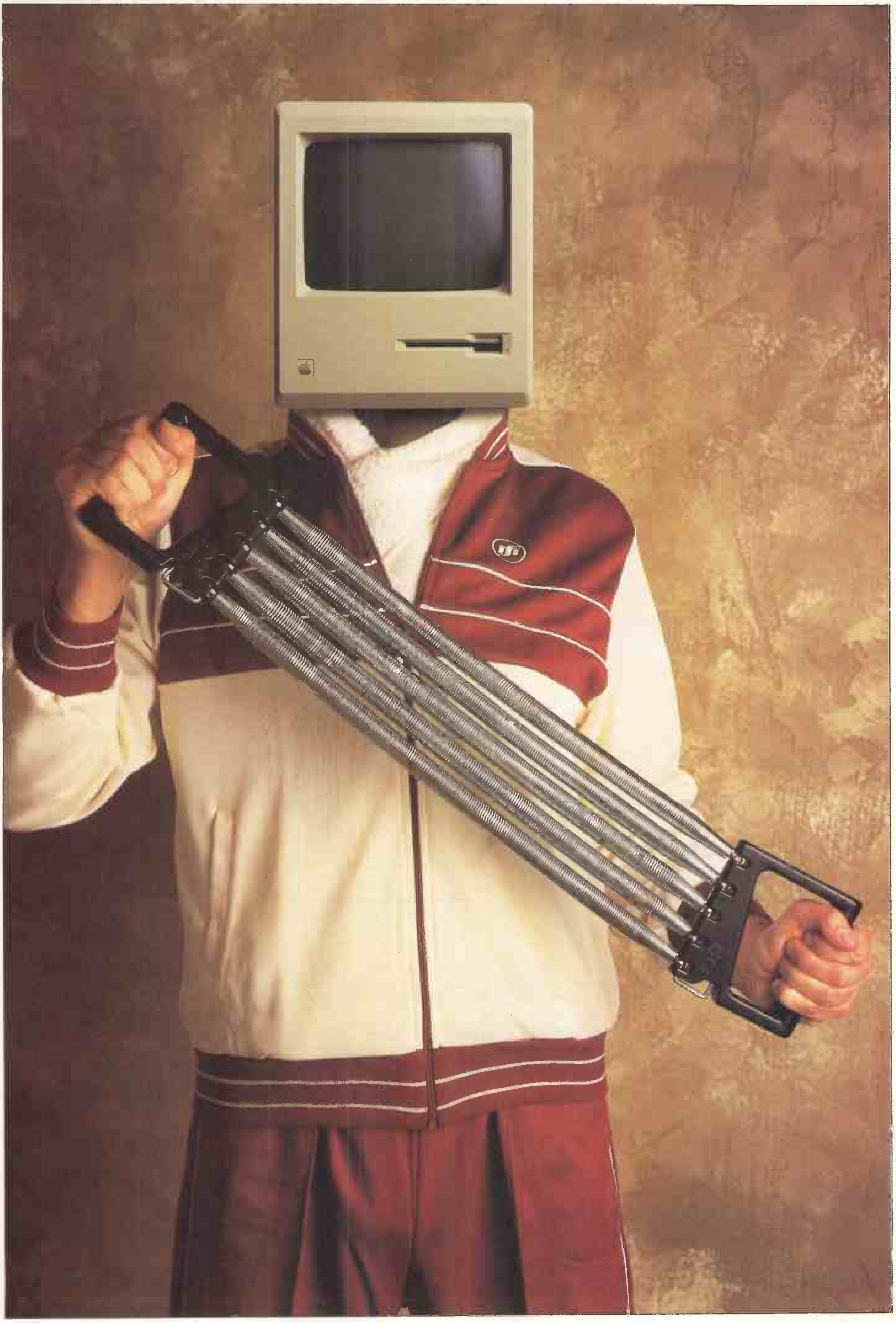
Needless to say, Apple is not keen to be done out of sales of its new Fat-Mac boards. DIY upgrades will certainly invalidate any warranty, but if the machine is a year or more old then this should be of little consequence. Doing it yourself may involve a small risk to the computer, but the task is not difficult (if a little fiddly) for anyone who is reasonably competent with a soldering iron. The £500-plus saved will buy a lot of extra software or hardware — or a service contract for that matter!

Requirements

The main additional components are the 16 256k dynamic RAM chips. A suitable device is the Hitachi HM50256P-15, although equivalents are available from several sources; both Semi-Components, tel: (0932) 241866 and Happy Memories, tel: (054) 422 618 stock these at about £15 each. It's worth shopping around as prices (at the moment) are dropping all the time.

You will also need another IC — I've specified the type used by Apple, the 74F253 — to act as the address multiplexer required by the larger RAMs. It's important that this device is fast — Fairchild's FAST or the Texas Instruments Advanced Shottky series — don't use ordinary TTL or low-power Shottky. They may work but cannot be guaranteed to do so. Other, similar multiplexer chips could be substituted, but it seems reasonable to use the device already used by Apple to multiplex the other address lines.

The only other components required are a 47-ohm, ⅛watt resistor, a small piece of circuit board (Veroboard will do), solder and some solid wire. Necessary tools include a good, small soldering iron of reasonable capacity (25 watts minimum), a small screwdriver, and pliers. You'll also need an efficient desoldering tool — the chips aren't socketed. A small solder-sucker such as the miniature one sold by RS Compo-



Photograph by Peter Smith.
Sports goods courtesy of the Syndale Country Club

nents (order number 547 391) which costs a little over £7 is ideal, although there are several types available from other dealers.

Finally, you need a 3/32in Allen key with a long (six inches or so) handle to open the Macintosh. If you can't get a long-handled one, it's easy enough to make one by cutting the bent end off a short one and soldering the resultant key into the end of a nut spinner or similar. The total cost of these 'extras' should not be more than £15.

Memories

Dynamic RAMs generally have multiplexed address lines to save on pin connections and hence package size. With the original 64k RAMs 16 address lines are needed, but the 16-pin package only allows for eight address connections: A0-A7. Consequently, the address is loaded in two 'chunks'.

Firstly, half of the microprocessor's 16 low-order address lines are switched to the memories' A0-A7 pins, and a signal called $\overline{\text{RAS}}$ (row address strobe) is activated. Next, the other half of the low-order address lines are switched in, and a signal called $\overline{\text{CAS}}$ (column address strobe) is activated. This is achieved in the Macintosh using 74F253 mutliplexer chips. With 256k RAMs you obviously need two more address lines but, because of the multiplexing system, only one more pin is required; this is pin 1 which is unused on the 64k device.

On the Mac board, all the pin 1s of the memory chips are connected and taken to a row of pads on the printed circuit next to the microprocessor chip shown in Fig 1. I've called this signal 'RAM A8' in Fig 2a. This pad is next to the one marked '+5 volts', and on the 'thin' Mac these two pads are connected; they will have to be disconnected. The other pads in this set of seven are: 0 volts (ground); A17 and A18 from the computer address bus (these are the two extra address lines — for some reason

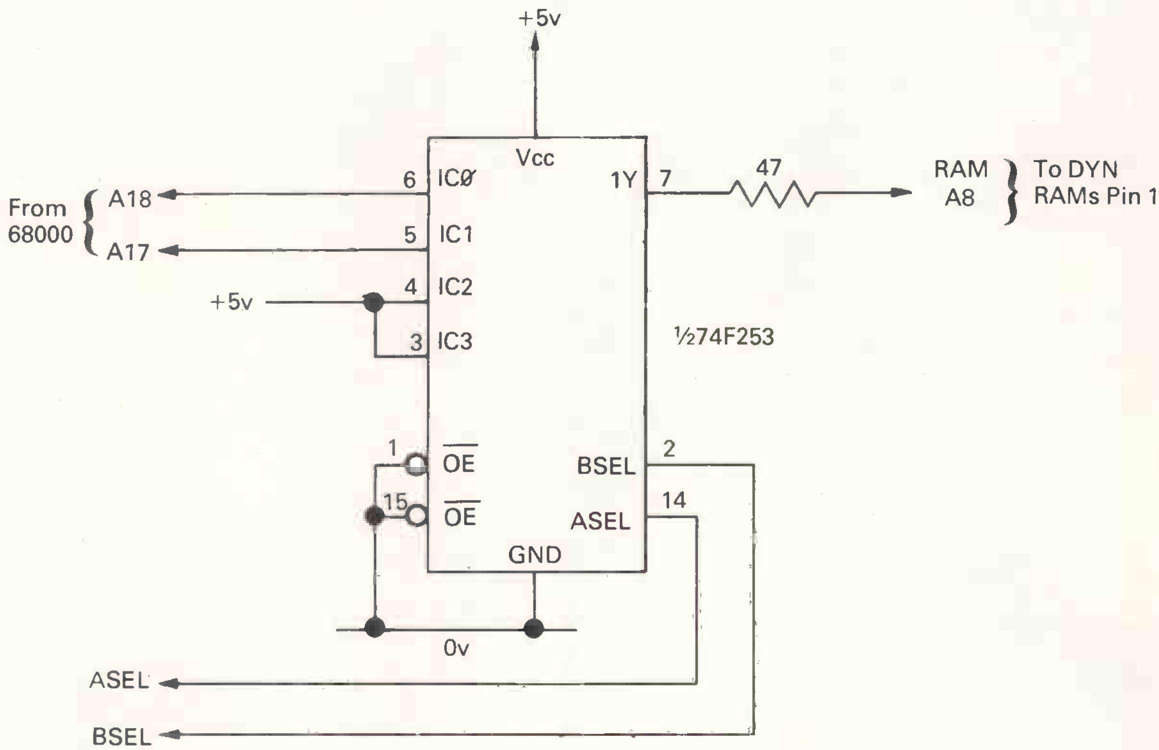


Fig 2a A diagram of the pad layout

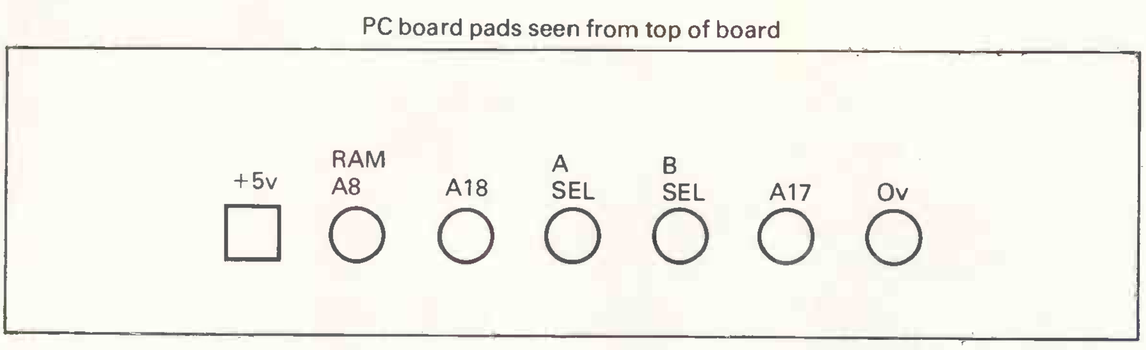


Fig 2b The circuit required for multiplexing

Figs 3a-3c The position of the five Allen screws which hold on the back of the Macintosh

Motorola starts counting its addresses at A1 and not A0); and 'A select' and 'B select' (my signal names) which are the two multiplex control signals that allow you to switch between A17 and A18, and, incidentally, the register which controls the memory refresh. A diagram of the pad layout is shown in Fig 2a, and the circuit required to do the multiplexing is in Fig 2b. Note that the output of the 74F253 is connected to the RAM A8 signal via a 47-ohm resistor. This circuit can be made up on a small piece of Veroboard or home-made printed circuit (as mine is) for direct mounting on the Mac board. (I suspect that Apple has a small hybrid or similar circuit that slots in at this point — our upgrade will have to be a more modest affair.) The pad spacing is 0.1ins and the +5-volt end is identified by a square printed circuit 'land', while all the others are round. It's important that pins 3 and 4 of the 74F253 are connected to +5 volts as shown or the circuit will not work properly. When you've made up this small board, you're ready to do the rest of the upgrade.

Making a Fat-Mac

The best way to approach this job, as is often the case, is step-by-step.

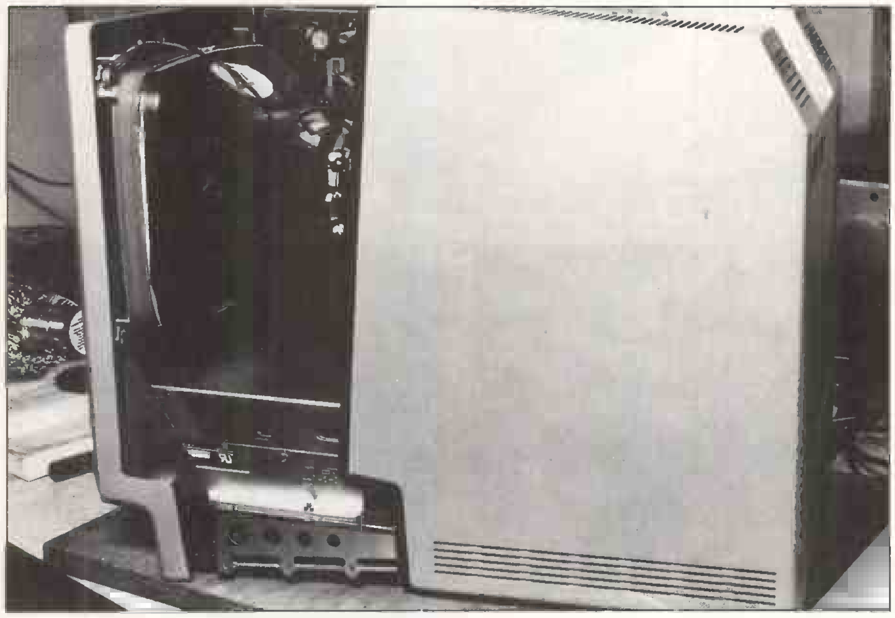


Fig 4 The front and back separated

1) Unplug everything — especially the mains! Find yourself an uncluttered area and get all the tools and parts to hand. Read the previous instructions thoroughly to make sure you haven't forgotten anything.

2) Remove the reset push-button from the lower rear left-hand side of the case (looking from the front) by gently prising it out. It should come out quite easily — whatever you do, don't force it.

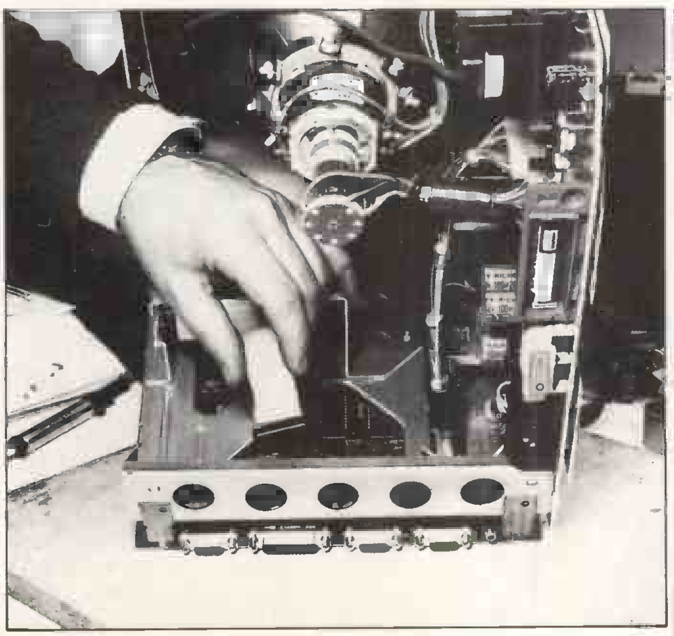


Fig 5a The removal of the disk drive cable

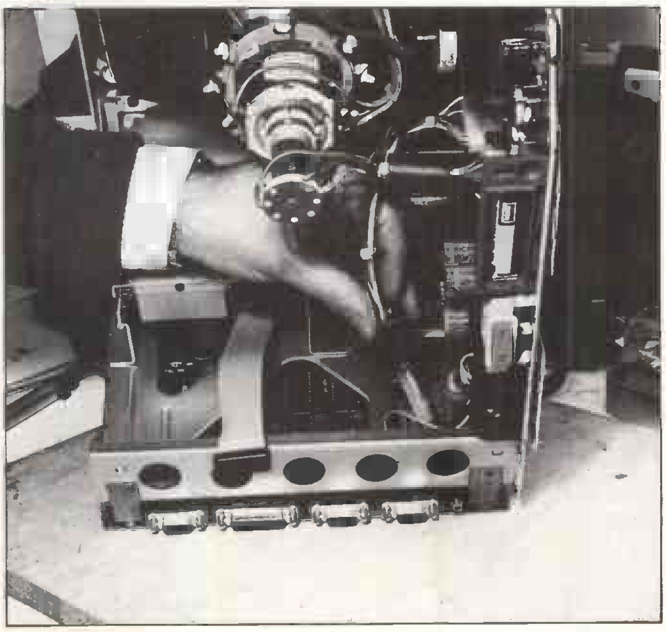


Fig 5b The power and video connector

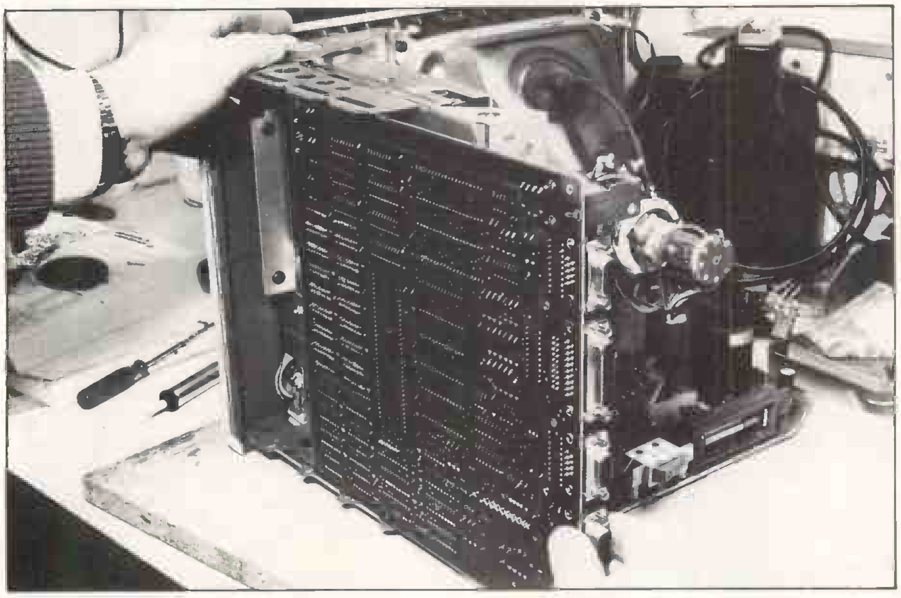


Fig 6 The board slides from under the machine

Fig 7 Sucking the solder from the same side of the board as the iron

Fig 8 Heating one side of the board and sucking from the other

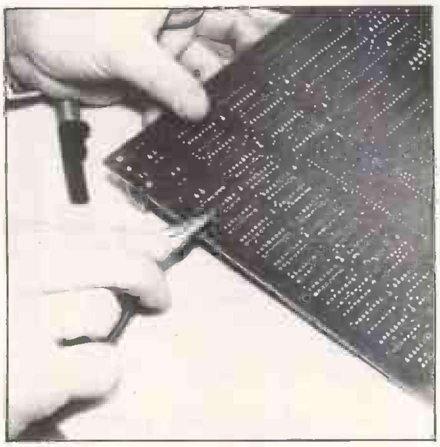
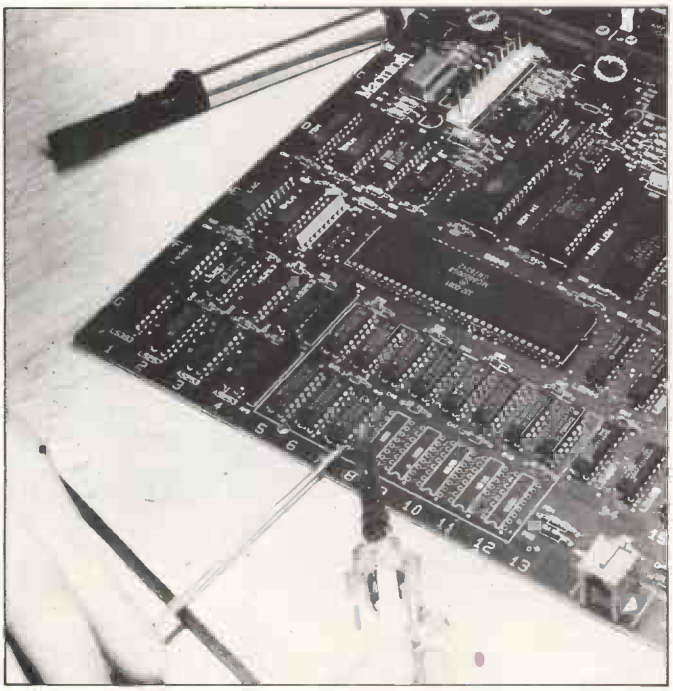


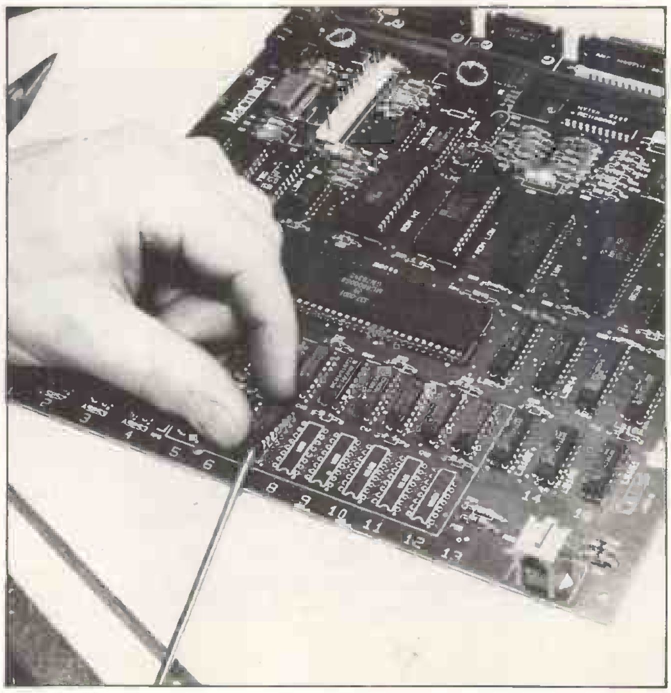
Fig 9 Straightening the IC pins

Use as broad-bladed a screwdriver as possible so as not to damage the plastic case. Take off the battery cover from the back of the case and remove the battery which powers the real-time clock.

3) You can now unscrew the five Allen screws which hold on the back, all of which are at the rear. Two are at the bottom corners, one is under the battery cover, and two are under the lip which forms the carrying handle (that's the reason for the long-handled Allen key). Figs 3a-3c show these positions.

4) Now comes the bit which at first seems impossible, but is really quite simple. The rear of the case slides off to give access to the interior. *Do not* try to prise the two apart by sticking a screwdriver into the gap just behind the front of the screen — you'll only ruin the case. Simply work out the front by pressing the screen surround forward while pushing into the battery compartment at the rear. It may also help to push gently on the mains plug inserted into





Figs 10a & 10b Care should be taken when lifting the pads

the rear mains inlet, bearing in mind the following warning. Above all, don't be too forceful — the case *will* come apart.
Warning: don't poke your fingers into the back of the mains inlet unless the Mac has been powered-down for some time. Apple has been rather naughty with the design, in that some time after the computer has been unplugged there is sufficient charge remaining on internal power supply capacitors to give you an unpleasant shock from the mains connector. It's wise to either switch off the Mac for some time before doing this upgrade or to discharge these capacitors (*if you know what you're doing*) through an appropriate resistance.

5) Eventually the back cover should slip off quite easily. Fig 4 shows the two parts separated.

6) Pull out the two connections to the main board. Fig 5a shows the removal of the disk drive cable and Fig 5b shows the power and video connector. There is also a metallised screen which normally sits over the rear serial I/O and printer connectors; this may have stayed in the back of the rear casing. Put this to one side.

7) The board should now easily slide from under the Mac (Fig 6).

8) You can now proceed to unsolder all the RAM chips shown in Fig 1. There are 16 altogether and numbers such as MCM6665 or 4164 will be inscribed on them. Make sure you don't take out anything else — you'll have enough of a job getting out the 16 correct ones. You can use several techniques to desolder these devices. If you're using a desolder gun you can try sucking the solder from the same side as the iron (Fig 7), or, holding the board vertically, you can heat one side and suck from the other (Fig 8). If you're not interested in the continued well-being of the 64k RAMs you're removing, then you can simply cut the legs off them and remove each pin separately. You should also clear the seven holes where your extra address decode circuit will go.

The Mac printed circuit board comprises four layers, with the two internal ones carrying +5 volts and ground. Consequently, there will be a significantly greater heat-sinking effect when you're trying to desolder the power pins of the memories (pins 8 and 16), so don't be surprised if this is the case and it's harder to melt the solder satisfactorily. Whatever happens, don't overheat the pads too much, and allow 'difficult' lands to occasionally cool down otherwise they will lift from the board.

9) Fig 9 shows the straightening of the IC pins under the board to ensure that they are not still soldered to the sides of the plated through-holes.

10) *Gently* work each old memory chip from the board. *Don't prise against the tracking which runs under the chips or you'll damage them*: lever against the edge of the board itself. Some holes may still require a little heat to loosen

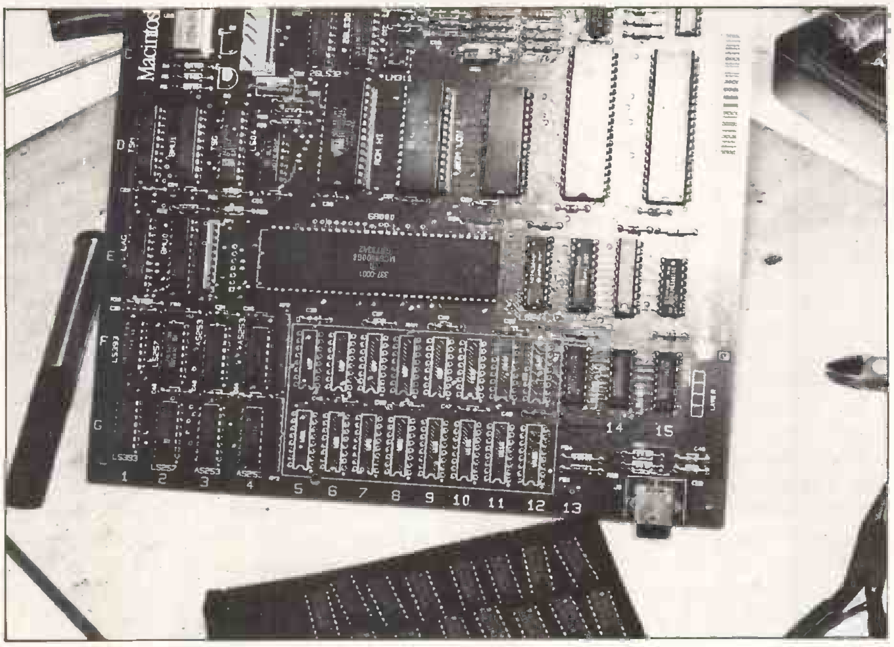


Fig 11 The cleaned board ready for new RAM chips

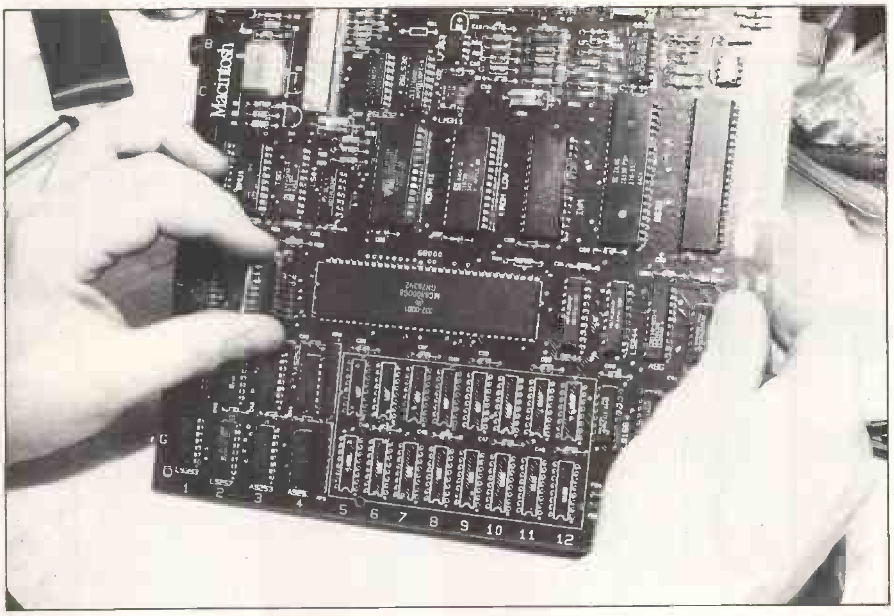


Fig 12a Inserting the extra address decode circuit

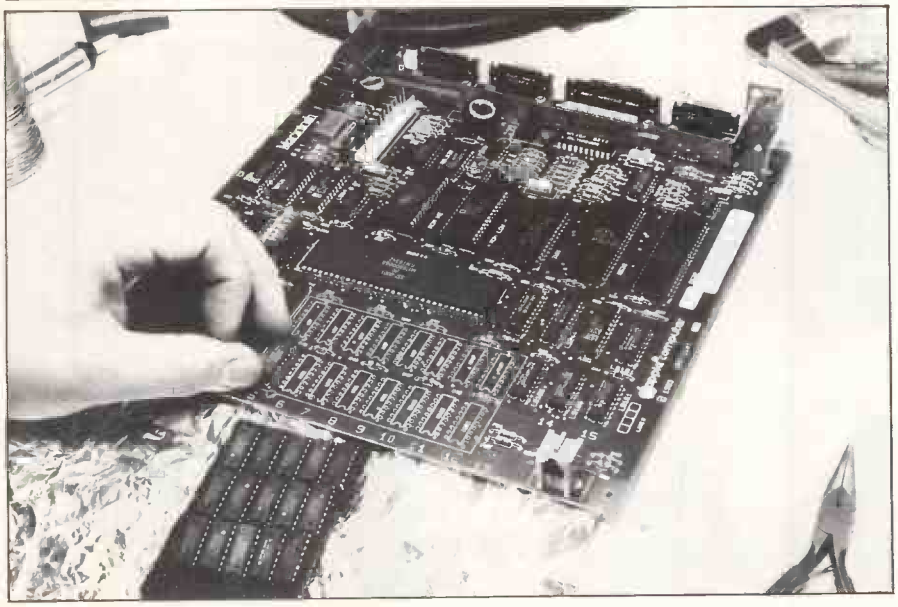


Fig 12b Working with a sheet of aluminium foil as a base is ideal

the remains of the solder, *but don't overdo it*. Don't forget, be careful when lifting the pads (Figs 10a and 10b).

11) This dismantling and desoldering should take no more than an hour if you're familiar with desoldering plated through-hole boards, but will take perhaps twice that if you're not. Either way, take your time. You're saving a lot of money, but you won't if you rush the job and damage the board.

12) At this stage, it's best to clean the board with a flux remover. Not only does it look nicer, but it will show up any damage you might have done which would have otherwise been covered up. Don't use any old solvent — you might take off the solder resist, the screen-printed component markings and dissolve a few connectors in the process. Fig 11 shows the cleaned board ready for the new RAM chips.

13) You can now insert and solder your extra address decode circuit into the row of seven holes on the left of the microprocessor chip (Fig 12a). Use wire links or pins to make the connection, and check the orientation of this circuit. Cut the track on the underside of the board between the +5 volts (square land) and the RAM A8 line next to it — *this is important*. A scalpel or sharp Stanley blade is suitable. Now insert the new RAM chips (don't put the old ones back in!) bearing in mind the usual precautions for dealing with MOS integrated circuits.

Working with the whole board, the packaging of the new chips and yourself resting on a sheet of aluminium foil is ideal (Fig 12b). Before picking up the iron, *make sure all the RAMs are the correct way round* — a mistake here can prove very expensive. Now solder in the whole lot, watching out for solder bridges between tracks in particular. Again, clean the board with a suitable flux remover and check for any obvious bridges or missing solder joints. Most importantly, make sure that no IC legs are folded under the chips instead of being inserted in the holes. Fig 13 shows a completed board.

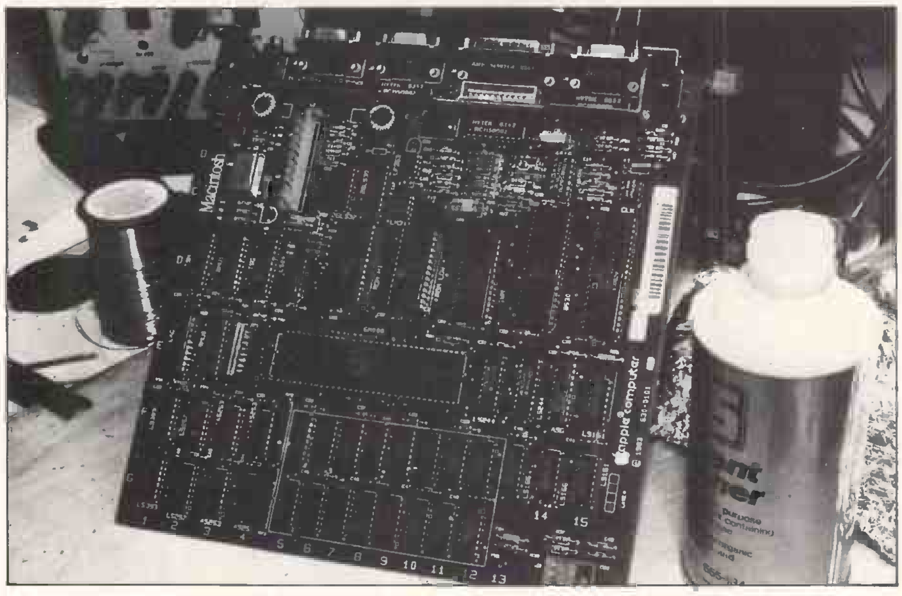


Fig 13 A completed board

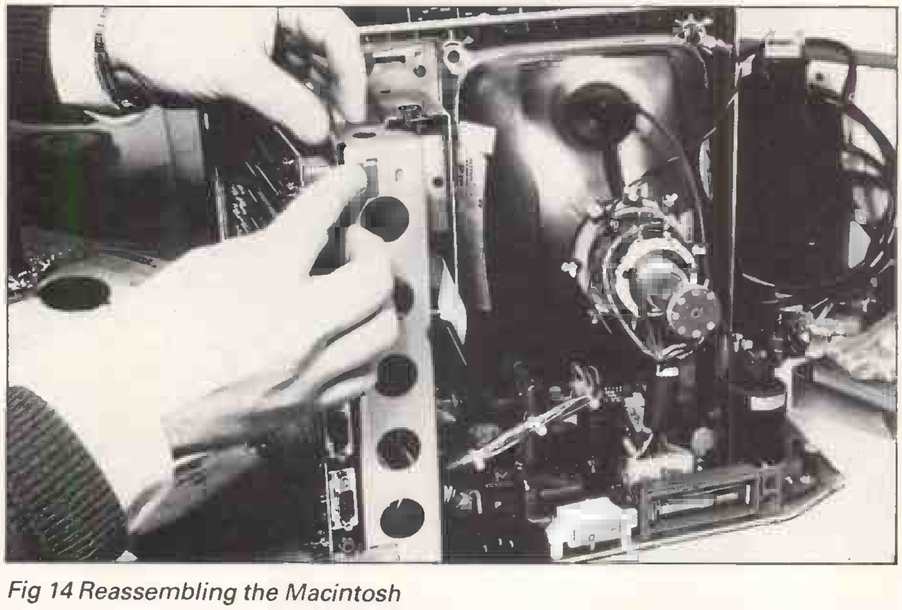


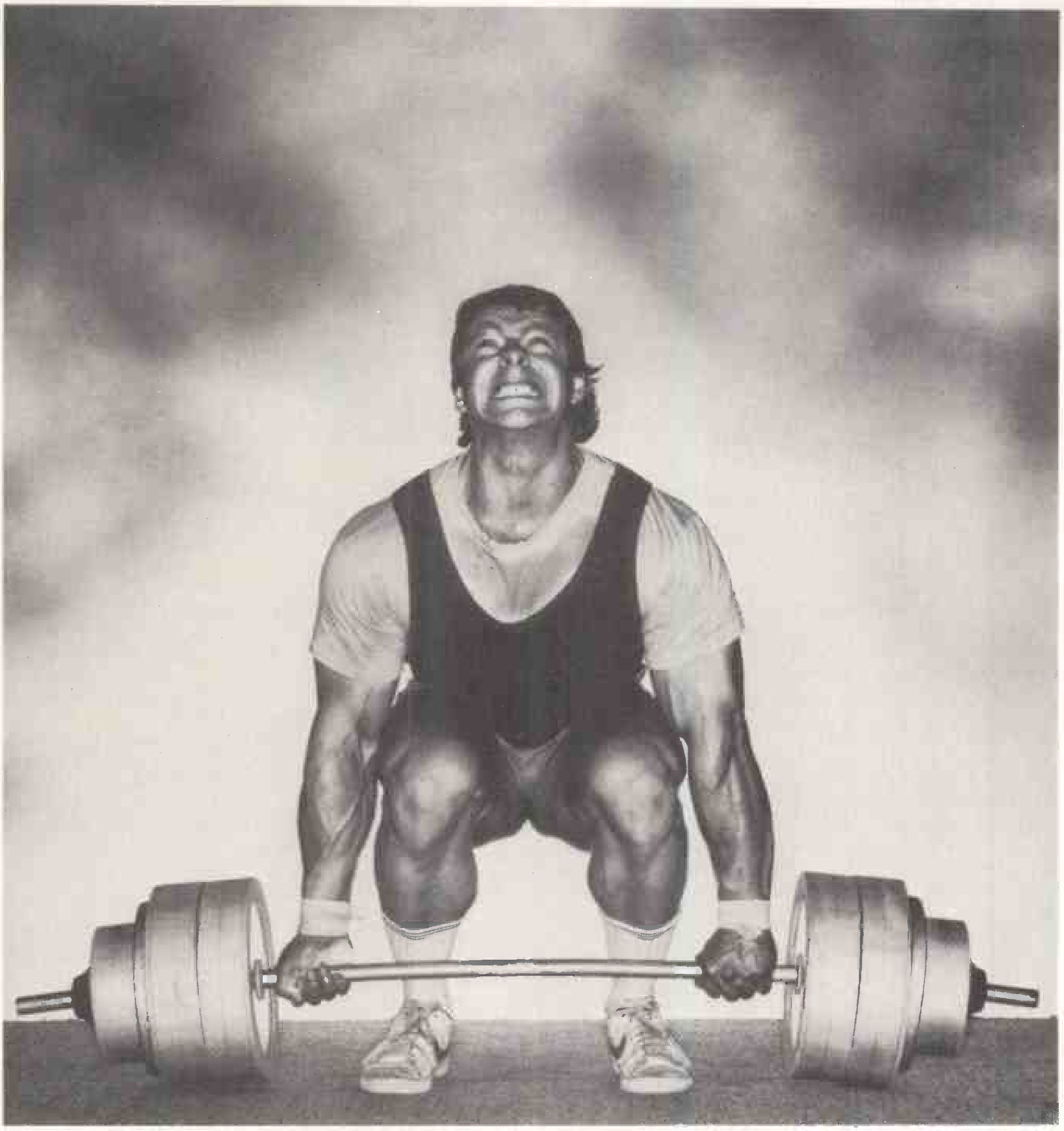
Fig 14 Reassembling the Macintosh

14) When you're satisfied that all is well, you can reassemble the Mac by reversing the disassembly procedure. Take note of Fig 14, and ensure that the small tags on the back of the printed circuit board fit into the slots on the main frame. Now push back the disk drive and power connectors, making sure they are properly seated. Tilt the whole computer forward and drop the metallised foil screen over the rear connectors. Check whether the power supply and video board which sit vertically to the right (viewed from the rear) are seated in the slots down the front of the casing. You should now be able to slide on the back of the case. Make sure no wires are snagging and, above all, don't force anything. The five Allen screws can now be replaced along with the battery, its cover and the reset switch which simply pushes back into position.

15) Plug everything back in — mouse, keyboard, and so on — and switch on. If there's no smoke, breathe your first sigh of relief. Fat-Mac should now be asking for a disk. Put one in and shortly after, your new, enlarged Mac should be smiling its usual smile and pinging its usual ping. Another sigh of relief. Now check if *all* the memory is working; use a program that you know uses up a lot of memory. For example, if you have MacWrite, load some text and copy it continually to see how soon the computer fills up. Originally, this should have occurred after only seven or so A4 pages; now it should allow you to go much further. If it does, go out and celebrate with some of the money you've saved. If it doesn't, it means that the microprocessor is not 'seeing' all the extra RAM. Firstly, check your additional circuit; and did you cut the track between +5 volts and RAM A8 properly? If there's no response whatsoever from your Mac, you will have to check things a little more closely. Look especially at the soldering to the RAMs and their orientation.

The finished product

Don't be put off by some of the more dramatic warnings in this article. With patience the whole job should not take more than a couple of hours, and with care should not unduly threaten the health of your Macintosh. Apple and its dealers, however, will more than likely say that the job is too risky — but then they would, wouldn't they? After doing three upgrades without problems I'm convinced that it isn't too risky, although I have to add that *PCW* cannot accept responsibility for any damage caused by following this advice. END



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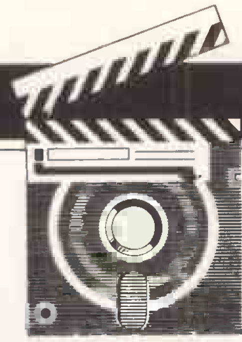


SCREENTEST

Samna+

Kathy Lang looks at Thorn EMI's Samna+, an impressive word processing package with the capabilities to rival other dedicated systems on micros.

An increasing number of word processing packages are becoming available for micros which rival in power and flexibility the software available on dedicated word processors. Indeed, some of the newer packages provide a level of facility not common even on dedicated word processors. Such a system is Samna, a word processor available at present only on the IBM PC. Samna comes in four versions: Samna I, II and III are increasingly powerful word processing packages, while Samna+ is Samna III word processing plus two extra features — a spreadsheet and a document indexing facility.

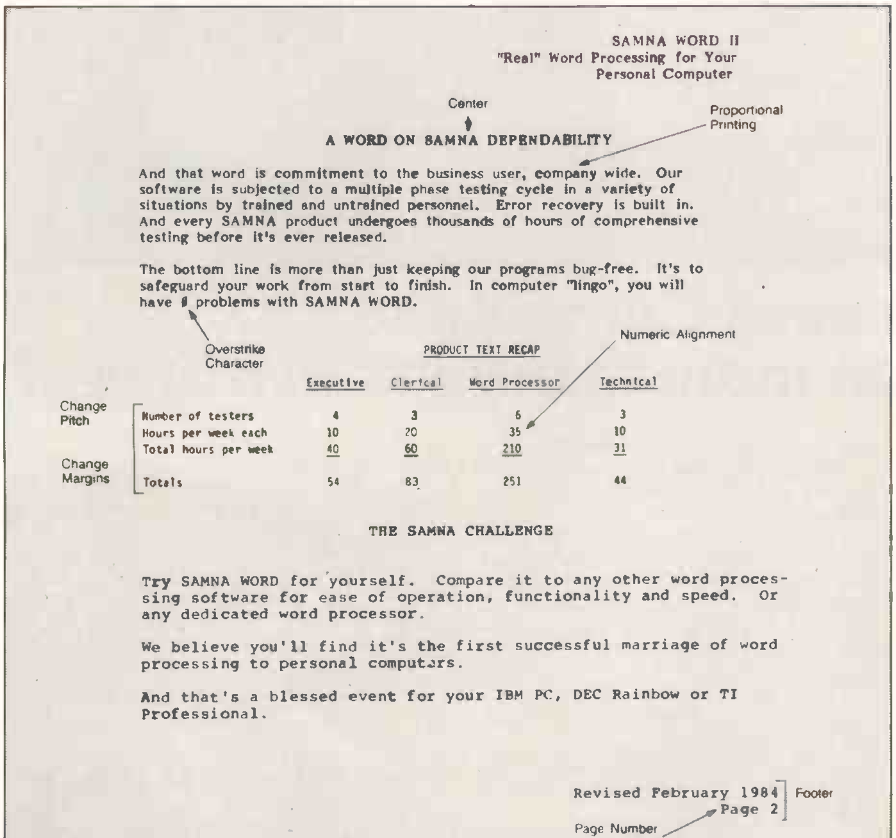
Samna III requires a minimum of 256k memory; Samna+ needs 384k. Samna is not cheap — Samna III is £490 while Samna+ is £640 (you can upgrade from one to the other for the difference between the two prices) — but, as you will see, an impressive set of facilities is provided for your money.

Installing Samna is straightforward: you just run a program called Instal that is provided with the package. This carries out the initialisation procedures such as installing a printer, and sets up a directory called Samna, together with (on hard disk systems) a program in the root directory which automatically takes you into the right directory and loads the program.

Unlike most systems, you are immediately placed in an editing mode rather than having to go through a menu option first — all functions in Samna are carried out as commands within the ambit of the editing mode. The screen displays the word READY! in the top left-hand corner and the current column, line and page number in the top-right, together with the name of the document being edited. Initially, this will be the so-called 'scratchpad'. You can start typing this in right away and create a file in which to store the text later, or print out what you have typed without storing it. Alternatively, you can set up a file by pressing a function key and naming the file (Samna sensibly checks that you do want to create a new file) and then enter text for that file. If the file already exists, you can enter its name rather than the name of a new document — you have access to directory information at this point if you need it. Another option is to go into spreadsheet mode and create a model, but more about this later.

General editing

Once into creating or editing a document, Samna provides a good range of features for amending text. The cursor can be moved by character, line, word, sentence, paragraph and page, to a particular page number and to the start and end of the document. All except the character move are circular: that is, moving a word left at the start of a line moves to the last word on the previous line. You can also place marks into the text to which the cursor will jump, but these are identified only by their



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Hours per week each	10	20	35	10
Total hours per week	40	60	210	31
Totals	54	83	251	44

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Revised February 1984
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Footer

Page Number

Fig 1 An example of the Samna general word processing road map relative position, so you can go forward or backward to the 'next' marker but not to a particular marker. When adding text at the end of a document, you can scroll the text so that some blank screen is in view; this avoids the common problem of having to enter new text on the bottom line, with the whole screen being refreshed after each line.

Samna is usually in Overtype mode: that is, any text entered replaces what is already there. To insert new text, you must enter Insert mode. In this mode, no cursor movement is allowed except backspace (which deletes the character preceding the cursor), so if you want to make several small insertions you have to take the rather tedious approach of invoking and cancelling Insert mode each time. Text may be deleted either by using backspace, or by pressing the DELETE key and then using the cursor movement keys to shade the area to be deleted. This works well, and saves having a lot of special, separate functions keys for cursor movement and for deletion, as do most packages. There is also an UNDO command which restores the most recent deletion — a most useful feature.

Powerful automatic search and replace features are provided, allowing you to search and replace forwards and backwards by exact match or ignoring case and emphasis, and by whole words or parts of words. Replacement can be automatic or with confirmation from the keyboard.

Samna allows you to copy or move sections of text, either lines or columns. However, if the amount you want to move is more than a paragraph or so, you must name a temporary file to act as a working area to hold the text being moved. The same mechanism allows copying of text between documents.

One of Samna's most unusual features is the ability to use a number of different sets of keyboard characters; these include several foreign language sets with accented characters which display correctly on the screen, as well as a Greek/Maths symbol set. Invoking a different character set involves just a couple of keystrokes. Another unusual and helpful feature is the ability to draw lines around tables and boxes on diagrams, although the exact representation of these on your printer will depend on the print wheel you use.

When you have finished typing, you save your file with a function key. According to how your package defaults are set up, Samna will either keep no back-up copy of your text, or two (so that you have grandfather-father-son copies) — there doesn't seem to be a way to keep just one back-up copy! If you have made a complete mess of your editing session, you can exit without saving your changes, but Samna will ask you to confirm that you really want to do that. There is no way to save an interim copy of your document and then continue editing without re-specifying the file name.


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   a. no competition
   b. no limitations for length and width
2. "Fold" Feature
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   b. allows side-by-side comparisons
3. Aligning Numbers
   a. automatic[1]
4. Format Flexibility
   a. allows for mixed formats on one page

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SAMNA's intelligence makes you look good on paper. Just a few keystrokes will have you automatically boldfacing, centering, underlining, double underlining, typing superscript (H^2O) or subscript (H_2O).

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SAMNA gives you full control so you can play the keyboard like a virtuoso. Even if you're not a professional typist.

1. You can even change the tab stops after you have typed the columns and SAMNA WORD will automatically adjust the columns to the new settings.

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Page 1

Fig 2 A Samna road map showing formatting indicators

Text formatting

Samna displays on the top of the screen a ruler which shows the left and right margins, and tab positions. You can change these at any time while typing a document; changes are stored with the text and automatically activated as the cursor moves around the document. The package also displays a border around your text so that you see the text plus two hashed borders covering the area which would otherwise be blank — I found this quite a helpful approach, but you can turn off the border display if you don't like it. The same shading is used to show page breaks. Unlike many packages which mimic dedicated word processors, Samna treats a document as a continuous whole, so that you can at any time see the end of one page and the beginning of the next together on the screen, with the shaded boundary between.

Text is formatted to the current margins onscreen, including justification if that is set on — again, many packages do not show text justified on the screen. As text is inserted and deleted, reformatting automatically takes place. Sometimes Samna seems to get in a muddle with the reformatting and spreads a line out with far too many spaces, but invoking and cancelling Insert mode puts the problem right.

Samna allows you to have lines of text spaced in increments of 1/48th of an inch if necessary, but this is specified in units of lines where a line is 1/6 of an inch. So, if you want one-and-a-half line spacing, you ask for 1.5 spacing and that's fine; but if you want something a bit more complicated, it is less easy to work out what is needed. This should not worry the average user, who tends to think in terms of single, one-and-a-half, double-line spacing, and so on. More esoteric requirements are harder to specify, but at least you can specify the full range of daisywheel printer capabilities, unlike the majority of packages of this type which prevent you from exploiting the printer's abilities to the full. Samna is a little less generous with pitch variation — you can choose 8, 9, 10, 12 or 15 pitch, again more than most packages will allow, but a smaller range than most word processing printers can handle.

You can indent paragraphs to tab markers, either directly or by using the Section Outline feature. This is a very useful facility for anyone who has to prepare long, numbered documents like manuals, as it allows you to specify up to six levels of numbered indentation (1, 1.1, 1.1.1, and so on), using three different styles of which the wholly numeric is one. Section numbers are not displayed during editing, only at print time, but the corresponding indentation is displayed. As sections are inserted, removed or moved to different parts of the document, Samna automatically renumbers the sections to match. You can also mark these or any headings for inclusion in a table of contents, for which you can specify a special layout.

Samna does not hyphenate text while typing, but will suggest hyphenation points while proof-reading (for spelling errors) if you request it. Awkward page endings can be prevented in several ways. You can specify that widows and orphans (single lines at the start or the end of a page) must be avoided, or that page breaks must occur only between paragraphs. You can also specify that a specific number of lines must be kept together, either to avoid an unwanted page break or to allow space for a separate figure which must appear on a single page. You also have the opportunity to dynamically adjust page breaks if you request the Repagination option.

Tables can be typed using text or decimal tabs, and automatically reformatted if the tabs are changed. Columns can be moved or copied as desired. For extra-wide tables which will not fit within the width of the screen, Samna has a useful feature called 'folding' which allows you to see the left-hand side of the table (where you usually enter the titles) together with the right-hand side, and with the middle 'folded' away. There is also a Calculator mode which allows you to carry out arithmetic operations, using a totalling register plus two user registers which can store intermediate results; the effect is rather like a pocket calculator with two memories.

Headers and footers can be created, to be printed on every page or just on specified pages, and you can have several in the course of one document. Samna also allows true footnotes, a very unusual feature which not everyone needs, but which is indispensable for some applications. Footnotes can be printed either on the page on which the reference occurs, or in a list at the end of the document.

Formatting instructions are not displayed in Samna unless you request them, although you can tell by inspection if text is to be underlined (underlined text is shown underlined on a monochrome monitor, and in a different colour on a colour monitor), subscripted or superscripted, or emboldened; forced carriage returns are also shown. As marks for change of pitch and so on are shown only on request, you don't get problems with the marks interfering with formatting during normal typing.

The upshot of all this is that Samna has, in my view, succeeded in getting the extent of WYSIWYG (what you see on the screen is what you get on the printer) just about right. Apart from things you physically cannot display, such as changes in character size and true porportional spacing, the major omission is in displaying changes in line spacing, and here it seems that the disadvantages of showing double-spaced text as such onscreen outweigh the advantages.

Printing

Samna supports a wide variety of printers, and allows you to specify six different printwheels for use with each one. If you want to change printwheels within the text — for instance, to use a different character set — you must place a 'change wheel' mark in the text, and Samna will stop printing for you to make the change. When printing, text can be emphasised by single or double underlining or emboldening, or you can overstrike text.

If you want to type short letters or if you are a beginner, there is a Typewriter mode which simply echoes what is typed on the screen directly to the printer.

Repeated text

Samna allows you to store up to 10 abbreviations which are accessed by pressing a function key followed by a digit. The total length of all 10 items accessed in this way may be a maximum of 500 characters, which should allow sufficient scope for most needs. The stored characters can include instructions as well as text, so you can use the abbreviation facility to put together sequences of commands which you frequently execute.

For longer sections of text which are used in many places in one document or in several documents, you can create standard paragraph libraries, called 'glossaries' in Samna. These consist of sets of named paragraphs or longer sections of text, recalled by name from named glossary files.

Samna also provides a mail-merge facility, which allows you to create a template document to be merged with variable information to create several different copies of the same basic letter or report. Variables to be entered in the template document are referred to by name; you can then use the same names to create a form, to be filled in, for each set of values to fill those variables. This approach is much easier for novice users than simply entering strings of names and addresses interspersed with commas, as most micro packages require, and quicker than those which oblige you to use variable names in each record but do not use a form with these already provided. Records are stored in order by the first field in each so that you can retrieve

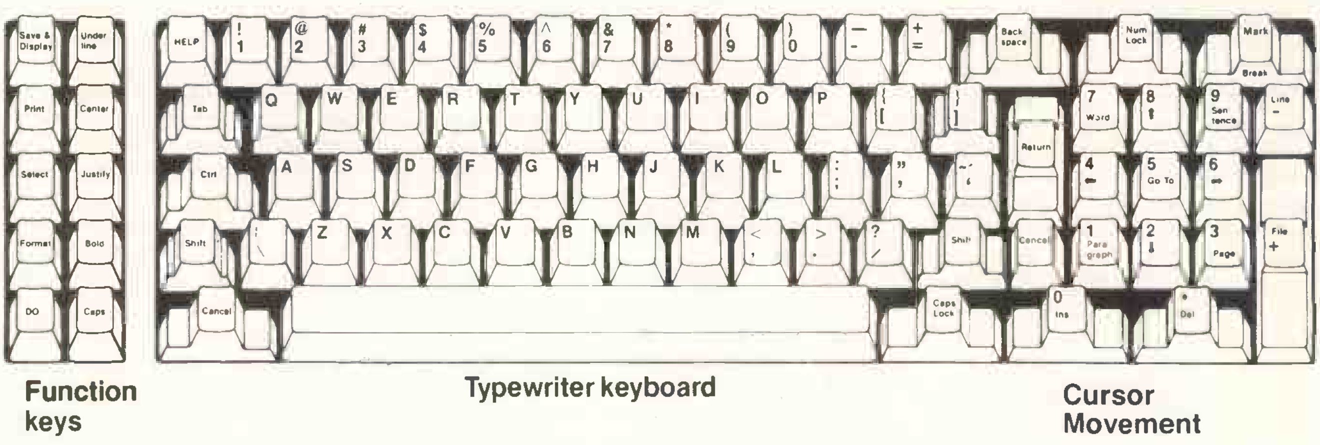


Fig 3 The Samna keyboard layout

individual records for editing. You can also specify start and end points for the values of this field if you want to print just a subset of your letters; this provides a very primitive selection capability.

You can request that the records be reordered by any one field before merging — useful if, for instance, you want to output labels by post office sorting code. However, I couldn't find a way to get multi-column labels printed — there is a simple multi-column feature, but I could not see how to apply it to automatic merging.

Housekeeping

Documents can be copied within Samna; you can also copy whole directories, or parts of them, using the same wild code facilities as those provided in DOS. Files do not need to be in the Samna directory — you can set up path names, and edit documents from other directories. Samna allows you to import ASCII text files, and to output documents in ASCII format.

Samna+ provides an extremely powerful method of finding documents which meet particular criteria. You can use a feature called Word-base to create an index of all the documents in one directory, or just some of them. If you did this with, say, a set of reports on individual projects, you could then use the index to find all the projects with deadlines in the next three months or with a priority greater than a specified lower limit. Or you could index all committee minutes for the last three years, and then pull out all references to a particular discussion topic. Word-base thus provides simple, text-oriented data management features within the context of a word processor. Like many of Samna's more sophisticated features, not everyone will need it — but in many applications it could justify the cost of the software by itself.

Samna also provides a spelling checker, which is invoked from within the package. You can use your own dictionary in addition to that provided with the package, and add words to your dictionary. You can only have one dictionary of your own on each disk, so on a hard disk system you would, if you needed more than one dictionary, have to store all but one under pseudonyms until you needed them. Again, not a problem for most people, but irksome if you do not have this requirement. While checking, the speller offers alternatives to misspelled words if it can, and Samna automatically reformats paragraphs as words are corrected.

You can create a printable index based on the contents of any document. Most packages which allow this expect you to mark every occurrence of words to be indexed. Samna takes the opposite approach of allowing you to enter a list of words to be indexed; it then creates an index, showing the page numbers on which each reference occurs. This index is an ordinary Samna document which can be edited in the usual way.

Spreadsheet

The Samna+ spreadsheet works in partnership with the word processor so there is always a text 'view' of the spreadsheet, and you can take copies of it or parts of it and insert them in the text as needed. These copies can be kept in step with changes in the calculation version of the spreadsheet if you wish. You can also specify 'floating' cells for insertion within the actual text of the document, which can also be kept up-to-date as the cell values change — perhaps to include varying figures such as total profits in textual descriptions.

The maximum size of the spreadsheet is 6400 cells, with a maximum of 250 characters on each row. The usual range of arithmetic features is included, plus a number of functions such as net present value, loan rate, standard deviations and variances. Recalculation may be automatic or manual, and you can determine the order in which recalculation takes place.

In use

Samna commands are invoked by function keys, or by a function key followed by a character key. Throughout, extensive help is provided for beginners, although you can decrease the level of help as you become more experienced. If the prompts provided are insufficient, you can access more information by pressing a help key — surprisingly, this is the ESCape key. When you need to cancel commands, the ALT key, rather than ESCape, is used. The modes of use are the same for both the word processing and spreadsheet parts of the package, including cursor movement, block copying and moving, and so on, so it's quite easy to move between the two.

Other aspects of the package will be of particular interest to experienced users. You can have two windows open at once, allowing you to view either two parts of the same document or a section of each of two documents. I've mentioned the fold facility; if you have a graphics board, you can also zoom pages of a text document to see the shape of a complete page on the screen (though of course without being able to read the text).

Samna comes complete with a reference manual, a reference summary and a set of stickers to identify the special keys. There is no tutorial guide as such, although there is a 'Read Me First' booklet to get you started, and a tutorial disk is provided which contains a set of self-paced lessons. These allow you to select sections of the package which you want to learn about, and provides a reasonable way of getting started with the word processor. There are however, no tutorials on the spreadsheet.

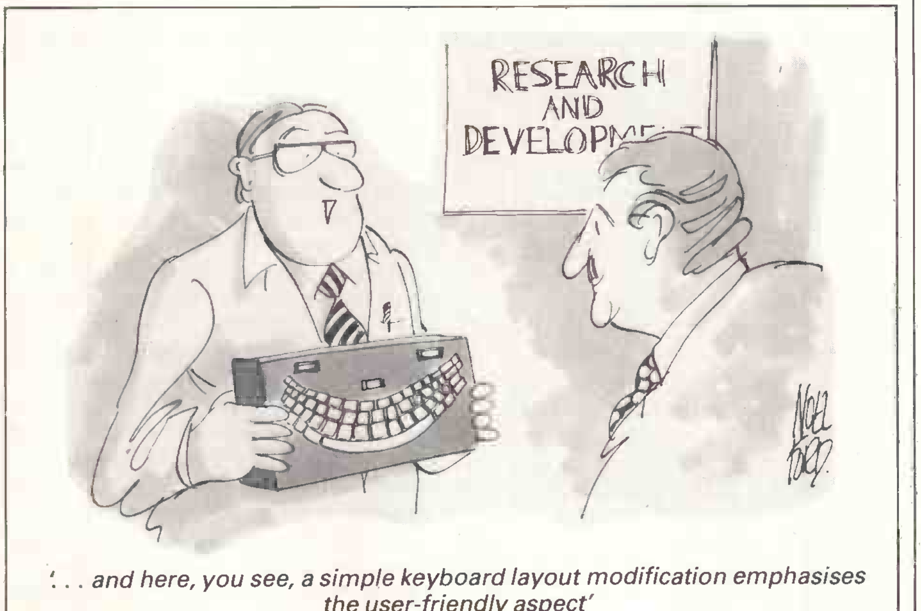
Conclusion

Samna III provides a powerful range of word processing facilities with a high degree of WYSIWYG, and includes a spelling checker, the ability to create an index for a document, and some unusual formatting features such as outlining and true footnotes. It is remarkably easy to use for such a powerful package. Not surprisingly there a few small glitches, but these should not affect its use to any significant degree.

The spreadsheet which forms part of Samna+ also has a good range of features, and is well integrated with the word processor. The Word-base facility would be invaluable in a wide range of applications.

All in all, other packages providing word processing facilities on micros to rival the dedicated systems had better look out.

Supplier: Thorn EMI Computer Software, Thomson House, 296 Farnborough Road, Farnborough, Hants GU14 7NF. Tel: (0252) 543333. END



'. . . and here, you see, a simple keyboard layout modification emphasises the user-friendly aspect'

CHECKOUT

McMill 68008 card

The McMill package for the Apple II+ and the Apple IIe comprises an economically-designed 68008 processor card, software and a variety of books and manuals. Mike Liardet looks at this ideal aid to learning 68000 code.

A co-processor card transforms the Apple II into a different machine. The card contains a processor with as many support chips as is necessary to interface it to the Apple, and can be inserted into the Apple via one of the expansion slots. When the machine is activated, the processor mounted on it takes over the running of the system, replacing the Mostek 6502 processor that is normally in control. The processor is the most fundamental component in a computer, so the effect of installing a co-processor card is quite profound — the computer equivalent of a transplant.

With the exception of the Z80 and super-6502 cards, most of the co-processor cards offer access to only very limited software. They are aimed more at the assembler programming and hardware enthusiast rather than the applications user.

This is the thinking behind the McMill 68008 card. With the assembler included in the package, it provides an excellent vehicle for learning 68000 assembly language. Utilising the Apple's versatility, it can also form the nucleus of a 68000 development environment, with the possibility of 'downloading' the code to 68000-based home computers such as the Sinclair QL. The McMill's name implies that it offers the same 'mill' (processor) as the Apple Macintosh, and broadly speaking this is true, but be warned: it does not enable you to run Macintosh software on the Apple II.

```
PR£3
1000     .OR        $4000
1010     .TF        PCWDEMO
1020 ADD64
         MOVEM.L    D2-D3/A0,-(A7)
1030     MOVEA.L    12(A7),A0
1040     MOVEM.L    (A0)+,D0-D3
1050     ADD.L      D3,D1
1060     ADDX.L     D2,D0
1070     MOVEM.L    (A7)+,D2-D3/A0
1080     ADDI.L     £16,2(A7)
1090     RTS
PR£1
LIST
PR£3
SAVE PCWDEMO.SOURCE,D2
ASM
RUN MONITOR,D1
```

Fig 1 Setting up a simple 68000 subroutine

The McMill package

In addition to the co-processor card, the McMill package includes a number of manuals, books and software: everything you need to develop, test and run 68000 code, plus a little more besides.

The McMill card is surprisingly small, about the size of an Apple disk controller card, and contains just eight socketed ICs which are dwarfed by the giant 68008 processor. It was designed by an ex-Apple engineer, Ron Nicholsen, and has an economy of design worthy of Apple originator Steve Wozniak himself. Unlike some 68000 co-processor options, all the circuitry is on a single card (half a card, really) and there is no need for a separate power supply. The only snag is that the card doesn't contain any extra RAM, so its range of operation is limited to the amount of memory in the Apple — just 48k or 64k for many systems.

The software accompanying the card comprises a 68000 macro assembler, a monitor/debugger and a 68000 version of the Forth programming language.

The rest of the package is the system's weak point, namely the documentation and manuals. There is a short leaflet giving technical information about McMill; the assembler manual; a guide to programming the 68000; a hardware technical manual for the 68008; a software technical manual for the 68008 instruction set; and miscellaneous leaflets. The quantity is certainly present — it's just that the quality is lacking in some quarters.

The McMill is compatible with both the Apple II+ and IIe, but not the IIc. Installation is very simple — you just slide it into a vacant slot in the Apple. The McMill does not affect the normal operation of the Apple until it is activated under software control. In particular there were no problems with a Microsoft Z80 card alongside it: both cards operated normally, ignoring the presence of the other, and both remained 'off' for normal 6502 operations. With the two cards in place it was possible to run CP/M applications, normal Apple programs and 68000 software without once opening up the Apple or flicking any switches. All three processors can be activated under the appropriate software control embedded in the application programs.

All disks supplied with McMill are in Apple DOS 3.3 format and can be copied in the normal way using Apple DOS utilities. There are no instructions for doing this, but anyone contemplating work with the 68000 assembler ought to be enterprising enough to manage this with instructions from Apple's own manuals. When the disks are copied, any one of them can be booted in the same way as any other Apple DOS disk. It is natural to choose the macro assembler disk first.

The macro assembler

The macro assembler was produced by S-C Software, and one of its most surprising features is that it does not actually use the McMill card at all. It is implemented in 6502 code and will operate even if the McMill card is not present, but of course the output-executable object code is only usable by a 68000 processor such as the one on the McMill.

When the macro assembler disk is booted it presents a menu which includes the option to 'load the assembler into l/c'; attempting to discover the meaning of 'l/c' introduces the manual. Although the assembler manual is well written it only documents the S-C 6502 macro assembler, and the only 68000 acknowledgement is a few short introductory pages. This is not as bad as it seems: about 75 per cent of the assembler is unchanged for 68000 operation and the other manuals in the package make up the shortfall, but it is still not easy to get started. Eventually you will find that 'l/c' stands for 'language card', and this is the preferred option (if you have one) as it frees more of the main board memory for the text of the program, allowing bigger programs to be created.

One of the most appealing features of the S-C assembler is that the input, editing and other activities involving the creation of an assembly source program are as similar as possible to the normal Applesoft DOS procedures for developing an Applesoft Basic program. This makes it very easy for seasoned Applesoft programmers to adjust to the new system.

The assembler contains some powerful facilities such as conditional assembly and macros, and can respond to a number of directives embedded in the code; these can control the assembly process. The most notable omission is the lack of facilities for referencing labels defined in other files. If an assembler source file gets too big and must be split, the management of external label references between files falls on the programmer. More sophisticated 'relocatable' assemblers can automatically deal with external references. As the assembler source must be fully loaded into the Apple's limited memory space for editing, this could become a problem for the development of medium-to-large applications.

Coding and debugging

Due to space restrictions, it is not possible here to give a full assessment of all the features and facilities of the 68000-range processors, or of the assembler and monitor provided with McMill. But in order to give a flavour of the complete system, I'll present a short session to develop a simple routine to add two 64-bit integers. This will give some idea of the power in the 68000 instruction set.

Using the S-C assembler we can enter the sequence shown in Fig 1. Except for the actual program content in lines 1000 to 1090, this session should be familiar to regular Applesoft users. PR£3 activates an 80-column display card in slot three (assuming one is present — it is not essential to have one), then the lines of code are entered in the normal way. All the normal conventions for line-numbering and editing apply, and the familiar Applesoft screen editing facilities can be used in an almost identical fashion. PR£1 activates the printer, and the next statement, LIST, lists the program on the printer. PR£3 reselects the screen for output, and SAVE saves the program in a file called PCWDEMO .SOURCE on the disk in drive two. (In CATALOGs the program is listed as an integer-Basic type, which it is not, but this is a difficulty caused by the Apple DOS filing system which only allows four types of file.)

ADD64 is called by

```
JSR ADD64
.DA $12345678,$9ABCDEFO
.DA $99999999,$AAAAAAAA
......
```

and resumes execution at '......', with all data and address registers preserved except D0 and D1 which hold the result of adding the two 64-bit numbers following the JSR call to the subroutine.

Line 1020 saves the values of data registers D2 and D3 and address register A0 on the stack. This single instruction can be used to save any combination of registers. Address register A7 is the normal stack pointer, used automatically by JSRs for holding the return address. The '.L' in the instruction means that long (that is, 32-bit) values are to be used. In common with most instructions, '.W' and '.B' for word and byte values are also available.

Line 1030 reads the subroutine return address from the stack into address register A0. This is the location where the numbers are stored.

Line 1040 reads the two numbers into data registers, D0 to D3, and 1050 and 1060 adds them together, with the result in D0 and D1.

Line 1070 restores D2, D3 and A0 from the values held on the stack.

Line 1080 adjusts the return address on the stack so that the return point is after the numbers and not at the start of them, and 1090 causes return from the subroutine with the result.

The ASM command assembles the program at the M68000 address of 4000 hexadecimal, saving the executable code on the disk in a (binary executable) file called PCWDEMO (the 'assembler directives' in lines 1000 and 1010 cause this to happen). The RUN command runs a normal Applesoft program that loads the monitor and the PCWDEMO program, and then enters the monitor.

At this stage it is useful to use the monitor to run the program for two reasons: firstly, because the program may need debugging; and secondly, because the monitor handles all the details of activating the 68008 processor so that it can execute the code. If the monitor were not used, the executable file would have to start with a few 6502 instructions in order that when it was BRUN from Apple DOS, it could switch on the 68008 and start it running on the right piece of code. This does not involve many instructions, but as the McMill's addressing of the Apple memory is different from the 6502 some careful thought is needed, and this is a complication best avoided in the early stages.

Using single-letter commands, the monitor allows the user to view and change memory locations and registers, start program execution, and so on. The more powerful facilities include the setting of break points (to stop the program executing at a pre-determined point) and a single-step facility (to execute one instruction at a time). Using these monitor commands, it is possible to set up the registers to test the loaded ADD64 routine.

There is one undocumented facility in the monitor which I only hit upon by accident. It has a 'reverse assembly' facility that unscrambles a block of code into a close approximation of the original assembler source. With reverse assemblers it is not possible to be fully accurate, but the output is close enough to help you find your way around if you compare it to the original source.

Conclusion

For any Apple owner with a tight budget but who wishes to start 68000 coding, the McMill package should prove invaluable. An obvious alternative would be to buy a Sinclair QL with a 68000 assembler (for example, Metacomo's), which would mean sacrificing the keyboard and disk drives of the Apple for the QL keyboard and microdrives.

Seasoned Apple programmers will quickly grasp the workings of the S-C assembler as it is similar to Applesoft DOS, and they can save all their energy for learning the intricacies of the powerful 68008 processor. The assembler offers some very powerful features and is a delight to work with, for the simpler programs at any rate.

The package's only significant letdown is the rough edges in the documentation. The Forth manual must be ordered separately, but otherwise all the required information is there — it just takes some effort to find it. Any budding 68000 programmer worth his salt should be able to get round this obstacle, but it does slow things down initially. In the long-run it is worth it — the 68000 processor is a generation ahead of its contemporaries. END

The McMill package contents

McMill card for Apple II+ or IIe with 68008 processor
Three disks: S-C macro cross-assembler 68000; monitor/debugger; version 1.0 Fig Forth
S-C assembler Manual
McMill Operation Guide
Programming the M68000 by Tim King and Brian Knight; Addison-Wesley 1983
S68000 User's Guide; Signetics Corporation 1982
MC68008 microprocessor (Motorola 1983)
Price: $295
Contact: Stellation Two, PO Box 2342, Santa Barbara, California 93120. Tel: (805) 569 3132

Slicing the pie

Create pie charts, bar charts and graphs on your IBM PC — Phil Cohen delves into the more artistic realms of Basic programming.

Business graphics — the drawing of charts and graphs based on business statistics — is becoming commonplace these days. Spreadsheet and database packages, and even printing pocket calculators, are producing bar and pie charts to order.

But there are cases where the abilities of a package are not enough. As they have to be user-friendly, they stick to standard forms of graphics (bar, line, pie) and often do not give enough flexibility to produce quite what you want.

On the other hand, there is Basic. Although nowhere near as easy to use as a package, this will give you exactly what is required and will allow your imagination to run riot. This article looks at Basic's graphics capabilities.

Graphic Basic

At the heart of Basic graphics is the SCREEN command; this lets you select from three screen modes. SCREEN 0 gives the normal 80-column non-graphics screen that you get when you first enter Basic. SCREEN 1 gives a 320 × 200-dot screen on which you can use limited colour (all the programs in this article use screen mode one). SCREEN 2 gives a higher-resolution screen (640 × 200) which is limited to black and white.

Having chosen mode one you have a choice of three colours, the option to change the background colour, and to change the palette (the particular set of three colours used on the screen).

COLOR sets the background colour, and also specifies the palette.

LINE draws a line from one position on the screen to another. 'LINE (10,20) — (40,55)' draws a line from the point (10,20) — that is, 10 from the left and 20 from the top of the screen — to the point (40,55), 40 from the left and 55 from the top. The screen in mode one is 320 × 200, so (319,199) is at the bottom right-hand corner of the screen.

```
10                                          REM Squaring the circle
20 SCREEN 1
30 CIRCLE (50,50), 20
40 LINE (50,50) - (70,50)
50 LINE (50,50) - (50,70)
```

Fig 1

```
10                                          REM Program to draw a bar chart
20                                          REM First, reset the screen for input
30 SCREEN 0,0,0
40 DIM A(10)
50                                          REM Now input the data
60 FOR I=1 TO 10
70 PRINT "POINT";I;
80 INPUT A(I)
90 IF A(I)>10 OR A(I)<0 THEN BEEP : GOTO 70
100 NEXT I
110                                         REM Now set the screen for display
120 SCREEN 1
130 KEY OFF
140                                         REM Draw the axes
150 LINE (25,10) - (25,180)
160 LINE (25,180) - (300,180)
170                                         REM and the axis 'ticks'
180 FOR I=1 TO 10
190 LINE (25,180-I*17) - (20,180-I*17)
200 NEXT I
210                                         REM Finally, draw the bars
220 FOR I=1 TO 10
230 LINE (I*25,180) - (20+I*25,180-A(I)*17),1,BF
240 NEXT I
250                                         REM and wait for a key to be pressed
260 IF INKEY$="" THEN GOTO 260
```

Fig 2

By adding a number to the end of LINE you can make it draw lines in different colours. 'LINE (10,20) — (40,55), 1' produces a line in colour one.

Adding the letter 'B' to the end turns the line into a box. 'LINE (10,20) — (40,55), 1, B' produces a box in colour one, which has its top left-hand corner on (10,20) and its bottom right-hand corner on (40,50). If instead of 'B' you add 'BF', the box will be drawn and then 'filled in' — the whole area covered by the box will be turned into colour one.

For pie charts you need circles as well as lines, and the CIRCLE statement produces just that. 'CIRCLE (40,55), 20' produces a circle with its centre at (40,55) and a radius of 20.

Deviations

This is where Basic becomes devious. As the screen is not square, a circle drawn normally would look squashed. This is because a radius of 20 units horizontally appears as, say, one centimetre, but the same radius vertically would be 1.16 centimetres due to the shape of the screen.

Basic assumes that when you tell it to draw a circle, you want it to automatically make allowance for this. The circle it draws will look circular, but if you start to draw lines around it in Basic they will be in the wrong place.

Try the program in Fig 1. The first line will meet the edge of the circle as you would expect it to, but the second will end outside the circle. Although the circle looks round on the screen, it is (in terms of its coordinates within the computer) smaller from top to bottom than it is from side to side.

You will find when you come to look at the pie chart program that all distances vertically have to be squashed by a factor of five or six in order to fit with a circle drawn on the screen.

The first step in drawing a bar chart is to draw the axis lines. Drawing these is a simple matter once you have decided where to put them. Putting 'ticks' on the axes to show the actual scale is a little more difficult, but can be handled with a FOR loop (Fig 2, lines 140 to 200). Line 190, although it looks complicated, just puts 10 ticks (short line segments) at equal intervals along the axis.

The LINE statement can also be used

```
10 SCREEN 0,0,0
20                              REM  Program to draw a line graph
30 DIM A(10)
40                              REM  Input the data
50 FOR I=1 TO 10
60 PRINT "POINT";I;
70 INPUT A(I)
80 IF A(I)>10 OR A(I)<0 THEN BEEP : GOTO 60
90 NEXT I
100                             REM  Now set up the screen
110 SCREEN 1
120 KEY OFF
130                             REM Draw the axes
140 LINE (25,10) - (25,180)
150 LINE (25,180) - (300,180)
160                             REM Axis ticks
170 FOR I=1 TO 10
180 LINE (25,180-I*17) - (20,180-I*17)
190 LINE (25+I*25,180) - (25+I*25,185)
200 NEXT I
210                             REM Draw the line - first the first point
220 PSET (50,180-A(1)*17)
230                             REM now the rest
240 FOR I=2 TO 10
250 LINE - (25+I*25,180-A(I)*17)
260 NEXT I
270                             REM And wait:
280 IF INKEY$="" THEN GOTO 280
```

Fig 3

to draw the actual bars of a bar chart (lines 220 to 240) using the BF parameter introduced earlier. The rest of the program in Fig 2 is fairly simple: it asks for 10 numbers (with values between 0 and 10) and produces a bar chart based on them.

Line 30 sets the screen to mode 0, which clears any old graphics so that the data can be entered more easily.

Lines 60 to 100 input the data and load it into the array, checking for out-of-range values. Lines 150 to 200 draw the axis (the vertical one having 10 ticks corresponding to the values 1, 2, 3, and so on, in the input data).

Lines 220 to 240 do the real work of the program, drawing the bars onto the screen using the LINE statement with a BF at the end to draw the bars. Line 260 sits and waits for a key to be pressed so that you can look at the bar chart before the 'OK' prompt appears.

A limitation of the program in Fig 2 is that only figures between 0 and 10 can be input, which means that you have to know the maximum figure the program is likely to have to accept when you write the program. The alternative is to keep a constant watch on the input and pick up the maximum value as it is entered, and then to 'scale' the whole chart accordingly. The following program segment inputs the data and finds the maximum value, M:

```
30 DIM A(10)
40 M=0
50      REM Input the data — M is the highest value
60 FOR I=1 TO 10
70 PRINT "POINT";I;
80 INPUT A(I)
90 IF A(I)<0THEN BEEP : GOTO 70
100 IF A(I)>M THEN M=A(I)
110 NEXT I
120 M=10/M
```

Line 120 converts M from the maximum value into a 'scaling factor' so that after each value is multiplied by it (as in line 210 below), the maximum any of them can reach is 10.

```
190      REM Draw the blocks
200 FOR I=1 TO 10
210 LINE (I*25,180) — (20+I*25,180-A(I)*17*M),1,BF
220 NEXT I
```

Line graphs are almost as simple as bar charts — again, the LINE statement is used. This time, however, it is used in a slightly different form. You've already seen how these two lines can draw two axes:

```
150 LINE (25,10) — (25,180)
160 LINE (25,180) — (300,180)
```

If you omit the first point on the second statement:

```
150 LINE (25,10) — (25,180)
160 LINE — (300,180)
```

it will still work.

LINE followed by a dash and the coordinates of one point draws a line that starts where the last line finished, in this case at 25,180. Now take a look at lines 240 to 260 of the program in Fig 3, which draws a line graph.

Each successive execution of line 250 will draw a LINE which starts at the end of the previous one, producing a graph that joins one point to the next.

Starting from the end of the previous line is all very well for every case except the first point because there was no previous line to it. That's why line 220 uses the PSET statement (which puts a single dot on the screen) to give the first LINE statement a starting point.

The rest of the program is straightforward, the only major difference between it and the bar chart program being that it has ticks on both axes.

Both types of graph covered so far have been fairly simple, and for variations you can easily add your own 'bells and whistles' such as different width or colour blocks on the bar chart, or annotations.

Pie charts

The next most common type of graphic is the pie chart, but this is not so simple. The program has to deal with the possibility that less than 10 numbers will be fed in. The example program (Fig 4) will do this by asking the user to end the list of numbers with a negative value; the same technique could also be adapted for line and bar charts, the only problem being the automatic adjustment of the width of the bars and the spacing of the line points to accommodate the different number of inputs.

The next problem is the shape of the chart — after all, with the bar chart and line graph the LINE statement does most of the work. But the use of the CIRCLE statement to draw the outside of the pie chart produces the problems of circle-squashing mentioned earlier.

Pie charts must have their pie 'slices' filled in in different colours. There is really only one way to do this, and that is to use the PAINT statement.

To use a PAINT statement you give it a starting point, a colour to paint in and a border colour. PAINT starts from the starting point and fills in around it, stopping only when it finds the border colour. PAINT can fill in an area (surrounded by the border colour) of almost any shape.

To fill in the slices of the pie you have to make sure that they are drawn round in a border colour, and then give PAINT a starting point which you are sure is inside the slice.

The program in Fig 4a is not complex. Lines 50 to 130 take in the data, setting N to the number of points (when line 90 jumps out of the loop, N will be set to the last value of I for which data was input) and T to the total value so far, which is used to scale the input so that it makes one complete pie.

Line 170 sets A which is the 'squash ratio', the ratio that Basic uses in the CIRCLE command to make it look circular on the screen. If you are using a Basic other than the one this article covers (Basic-A), then you may have to alter line 170 to give a different value for A. You will be able to tell that A is the wrong value because the straight lines along the edges of the pie slices will not stop at the edge of the circle.

Lines 190 and 200 draw the circle and the first straight line (which is at the three o'clock position).

Lines 230 to 290 draw the pie slices, or at least, the straight line that defines the clockwise edge of the slice. Note that the last pie slice is not drawn (see line 230): this is because the last slice will just be the space left in the pie after the other slices have been drawn.

Line 240 keeps a running total of how far around the circle you are, using T to scale the values in order that the total will be 6.283 or twice pi. For the mathematically-minded, R is the angle in radians from the horizontal for each line, and will reach twice pi for the full circle. The non-mathematically minded can use the method shown as a 'black box'.

Line 250 draws the line along the edge of the slice. It starts at the centre of the circle (150,000) and goes to a point which is calculated from the coordinates of the centre, the radius of the circle (which is 70), the value of R (which goes from 0 to 6.283 to go all the way round the circle), and A.

Line 260 chooses a colour: it uses colours in the sequence 1, 2, 3, 0, 1, . . . finishing on a 0 for the last slice.

Line 280 does the painting, starting at a point which is halfway between the centre and the outside of the circle (which is why the radius of 70 in line 250 has been replaced by 35 here) and *just* anti-clockwise of the edge of the slice (which is why R in line 250 has been replaced by R-0.1 here).

With very thin slices this may cause PAINT to start painting in the previous slice, but this does not cause problems as the colours chosen are arbitrary. If you jazz up the program to include, say, a key to what the colours mean, then you may have to be more careful: for example, reducing the 0.1 to something smaller and not filling in very small slices.

As the slices have not been colour-coded in this example, you will need a way of identifying them. The program segment shown in Fig 4b, when MERGEd with that in Fig 4a, will put a number beside each slice.

The heart of the segment is the subroutine that starts at line 450. This puts a string at a particular position on the screen, the position being given in terms of the coordinates used for LINE, CIRCLE, and so on, effectively coordinating the graphics and text.

The part of the program that calls the routine calculates a position for the string (lines 360, 370), sets the string to a representation of the number required (line 340) and then calls the routine to print the string on the screen.

Basic has two powerful commands which allow you to alter the 'dimensions' of the screen (as far as your program is concerned) and which may simplify your programming a little.

VIEW lets you limit the part of the screen onto which graphics can be drawn. 'VIEW (20,30) — (100,100)' will shift the top-left of the picture down to (20,30) so that a point which would previously have appeared at (40,40) now appears at (60,70). At the same time, it will prevent graphics from appearing anywhere except in the rectangle from (20,30) to (100,100), effectively limiting the size of the screen's graphics area.

VIEW SCREEN does much the same except that the points on the screen are not shifted. 'VIEW SCREEN (20,30) — (100,100)' only has the effect of limiting the graphics to the rectangle, so the point (40,40) would still appear at (40,40) but the point (10,10) would not appear at all.

WINDOW is more useful — it lets you redefine the measurements of the screen. For example, 'WINDOW (0,0) — (1,2)' will make the screen appear (to your program) as one unit wide and two units high, so the point (0.5,1) would be in the middle. Also, the screen is 'inverted' so that (0,0) will be at the bottom-left of the screen; the screen coordinates now correspond to the conventional Cartesian system (x increases as you go up, y increases as you go to the right). WINDOW SCREEN does the same as WINDOW except that there is no inversion.

```
10 SCREEN 0,0,0
20                              REM Program to produce a pie chart
30                              REM First, input the data:
40 DIM A(10)
50 PRINT "INPUT A NEGATIVE NUMBER AFTER YOUR LAST SLICE"
60 FOR I=1 TO 10
70 PRINT "SLICE";I;
80 INPUT A(I)
90 IF A(I)<0 THEN GOTO 150
100 T=T+A(I)
110                             REM N is the number of slices:
120 N=I
130 NEXT I
140                             REM Now set the screen
150 SCREEN 1 : KEY OFF
160                             REM A is the 'squash' ratio:
170 A=5/6
180                             REM Draw the circle:
190 CIRCLE (150,100),70,3
200 LINE (150,100) - (220,100)
210                             REM R totals how far round we are:
220 R=0
230 FOR I=1 TO N-1
240 R=R+A(I)/T*6.283
250 LINE (150,100) - (150+COS(R)*70, 100+SIN(R)*70*A)
260 C=I-INT(I/4)*4
270                             REM Now fill in the slice:
280 PAINT (150+COS(R-.1)*35, 100+SIN(R-.1)*35*A),C,3
290 NEXT I
300                             REM And wait:
310 IF INKEY$="" THEN GOTO 310
```

Fig 4a

```
300                             REM Now add the annotations
310 R=0
320 FOR I=1 TO N
330 DR=A(I)/T*6.283
340 S$=STR$(I)
350                             REM Work out the positions
360 X=150+COS(R+DR/2)*85
370 Y=100+SIN(R+DR/2)*85*A
380                             REM Use the subroutine to print them
390 GOSUB 450
400 R=R+DR
410 NEXT I
420                             REM And wait:
430 IF INKEY$="" GOTO 430
440 END
450                             REM Subroutine to print a string
460                             REM S$ at a position (X,Y) on
470                             REM the mode 1 screen
480 XC=X/320*40
490 YC=Y/200*25
500 LOCATE YC,XC
510 PRINT S$
520 RETURN
```

Fig 4b

Implementations

One option is to use graphics in presentations with a monitor set up so that the audience can see it. If you do take this route it is a good idea to be able to call up the graphics-drawing programs in any order, so write down the program names with a brief description of what they are.

Another possibility is to use one of the very good screen cameras available. These generally take an RGB input and produce standard colour 35mm slides. If you have access to a graphics printer (or, even better, a colour graphics printer) then you can copy the contents of your screen by using the PrtSc key.

Business graphics are definitely here to stay. There's no better method for presenting statistics in an eye-catching way, as you will discover for yourself by using these routines. END

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CHECKOUT

Demon modem

The Demon multi-mode modem seems to be excellent value, but it has yet to receive BABT approval. Ralph Peters goes online to test its many facilities.

Notwithstanding with the way prices have been falling, the arrival of the Demon multi-mode modem at £50 (excluding VAT) is a remarkable event, especially when it has auto-answer and auto-dial facilities.

The Demon is surprisingly light (it weighs less than a pound), partly due to the fact that it has a separate power supply built into the mains plug. It gives the impression of having been 'built to a price': the case appears to be glued together, and there's no apparent way in.

The modem's front panel has three push-button switches and five LEDs. One of the switches is used to select CCITT (European) or Bell (US) modem frequencies. The other two are for auto-answer use.

Four of the LEDs on the front panel indicate the chosen baud rate (300 originate, 300 answer, 1200/75 originate and 1200/75 answer), the fifth is labelled 'carrier'. There are no data or modem online indicators.

The rear has no sockets but has three cables coming from it; these are the power, telephone and RS232 connections. The telephone cable has one of the new-style plugs and there is no socket for a telephone on the back of the modem, so you will need a double adaptor if you want to plug it in at the same time as the telephone. This is not strictly necessary as the modem can be instructed to dial the numbers itself, but I prefer to dial the number myself so I can hear whether the phone at the other end is engaged or if it is answered by a modem tone.

The Demon is almost completely dependent on the software in the computer (in this case, the Zromm) — changing baud rate, switching on and offline and dialling are all controlled in this way.

For this reason it is difficult to separate the two but I have done so for this review, cross-referencing where necessary for clarity.

The modem

The modem weighs 15ozs and measures 6ins × 10ins × 2ins. The case is a beige plastic. The first Demon that I received had suffered in transit — the back panel had been dislodged, probably by the power supply. As a result, the power cable was no longer anchored and one of the leads had pulled away inside the case.

Everything appeared to be glued together (the back panel was certainly glued into position). Gaining access to carry out any repair work would be difficult, and would probably mean causing significant damage to the case.

There are very few controls on the modem, the main work being done by the Zromm. The technical notes that accompany the modem are very brief. When I first read about the Demon (or Unicom as it was then called) and saw the features described, I assumed that the control would be from the BBC Micro's user port. This provides several control signals which could be used for switching on and offline, dialling, and selecting the baud rate. However, the only connection to the computer is to the RS232 port. The Beeb is not noted for having a full range of signals, and all the control is done by pulsing the RTS line.

The secret is in the length of the pulses. Short pulses (100 microseconds) step the baud rate. A pulse of about 300 microseconds will reset the baud rate to its default (1200 receive, 75 transmit). Pulses of more than 1000 microseconds cause a relay to pulse the line, which is used to dial telephone numbers. The manual doesn't tell you how to use this, but just states that care must be taken to ensure the correct pulse duration and inter-digit delays. If RTS is held high, the modem goes online.

It should be possible to use the modem with other computers provided you are capable of writing your own software, but it didn't work with the standard terminal programs. There may be problems in the signals communicated to the micro by the modem, but the documentation gives no details of these. Nor does it specify the connections on the RS232 plug:

these are the same as for the BBC Micro, except that the CTS pin is used for carrier detect. The manufacturer intends to produce software for other micros such as the Commodore 64, Amstrad, and IBM PC compatibles, but these are unlikely to be available before early autumn. However, one Commodore 64 user already reports success with the modem.

The Zromm

The software for the review model was in ROM, called the 'Demon Zromm'. Installation instructions are provided which are adequate — most BBC Micro owners will be familiar with installing ROMs. There are certain restrictions regarding the ROM sockets that the Zromm will work in, but these are explained in the installation instructions.

Having fitted the Zromm and powered up, the message 'Demon Zromm 1.0' appears on the screen as confirmation that it is present. Unfortunately *HELP doesn't produce a list of the available commands as it does with, for example, the DFS ROM (that would apparently occupy too much program space).

The ROM provides 23 commands. There are three basic terminal modes: a simple dumb terminal mode (with limited facilities); a smart terminal mode; and a Prestel mode.

Modes

Using the software to access bulletin boards or Prestel is basically simple: you set the baud rate and then type '*TERMINAL' or '*PRESTEL' followed by a telephone number. The number is dialled and when the remote system answers, the modem is switched online and you proceed from there. '*PRESTEL' automatically sets the baud rate, selects Prestel mode, and dials 618 (which is the Prestel access number in many areas) and '*PSS', which does the same for PSS except that it dials the Slough PSS phone number, but it will be of limited use to most PSS subscribers. With all these options you can store your name or account number in function key 11, and the information will automatically be transmitted to the system when requested.

If you prefer to dial the phone number to determine whether the number is engaged, or if a voice answers, then the terminal modes are more difficult to use. You can use the Zromm to dial the number, but you then have to issue three commands to go online. The first is the baud rate selection, which can be done before you dial. The next two are '*ON' to put the modem online, and '*TERMINAL' or '*PRESTEL' to select the terminal mode. This is rather clumsy and, with some systems, you have to be fairly quick or you may lose the connection. You could use the function keys which, although used by the Zromm, are still available to the user by pressing SHIFT/function key.

*CHAT mode is a very simple terminal program but does have the advantage of allowing full graphics to be sent from Beeb to Beeb. The *TERMINAL mode filters out graphic data.

There are a number of other commands provided by the Zromm that enable the modem to automatically answer the telephone and carry out a number of other tasks. These include *ANSWER, *DETECT, *CARRIER, *HOST, and *TIMEOUT. They work by returning errors to Basic which can then be trapped by an ON ERROR GOTO statement in a Basic program. For example, the *ANSWER command generates a code of 60 and the message 'Rrrring!'.

Drawbacks

Although the modem and software combination generally work well, there are one or two areas where there are drawbacks. There is no online indicator on the modem, so there is no way of telling whether it is online or not. There is a *STATUS command which should tell you (it also shows the selected baud rate, answer and detect status), but I found this to be unreliable (possibly due to hardware problems). The safest thing to do is to type '*OFF' each time you finish online. Accidentally leaving the modem online could result in you continuing to pay telephone charges, so an online indicator on the modem would help.

Another omission is a method of selecting parity and word length. Apparently the Zromm uses eight bits/no parity in *TERMINAL mode, and seven bits, even parity in *PRESTEL mode. Problems might arise if you use *TERMINAL with a system that tests what you send for parity (most don't). Most smart terminal software allows you to reset word length, and so on, but in practice I had no problems.

The worst omission is the ability to spool to tape. The manual states that the modem will go offline if you try to spool with tape as the filing system; this is due to the way the BBC Micro's RS232 and cassette interfaces are set up, the same circuitry being used for both. The option to spool to a memory buffer and then to dump the buffer to tape after going offline could be provided. Also, you ought to be able to load the buffer from tape before going online, and then send it to the remote system during the online session.

The omission of these facilities means that tape users cannot prepare messages offline, or download or upload software. The software is only of real use if you have disks.

Documentation

The documentation that came with the review modem was provisional and just about adequate (the bulk of it is concerned with the software — the hardware section is very brief) and the software section mentions commands that are not described. However, it is still a lot better than some so-called 'final' documentation that I have seen.

The software section lists the commands in alphabetical order, which I found confusing. It would have been better to group them by function — the terminal commands in one place, and the ones that you would only need to use in connection with auto-answer and running a bulletin board in another.

Conclusion

The Demon and Zromm are very aggressively priced. To use the Demon with computers other than the BBC Micro, you will either have to wait for the software to be written or write your own. I have doubts about the standard of construction, the possibility of repairing the modem and back-up support from the manufacturers. The lack of spooling to (and from) tape makes the Zromm of doubtful benefit to tape-based users. With the exception of the auto-baud detect and the BBS-type commands, and the other reservations previously mentioned, the software is very well constructed and simple to use. It is apparently possible to use it with other modems such as the Nightingale and the WS2000. It is significantly cheaper than Commstar, for example, but this offers more terminal features, especially for tape users.

The Demon's main drawback at present is that it doesn't have BABT approval, and it is illegal to connect it to British Telecom phone lines. As the law stands, the Demon cannot be recommended unless, and until, an approved version is produced, except for those who want to use it on private lines or who wish to export it to a country where different regulations apply. The manufacturer takes the position that it can sell plenty of Demons without approval, so why should it go through the hassle (and expense) of getting it approved. It would almost certainly mean changes in design (perhaps leading to increased cost). Part of the problem is the law that allows something to be sold, but not used. It isn't just illegal to use guns, it's illegal to sell them, too.

Modem manufacturers who go through the BABT procedure have a legitimate grumble when it is so easy for other companies to flout the spirit, if not the letter, of the law. Paradoxically, it can be argued that part of the benefit to the user of BABT approval is exactly the cost and procedural hassle. A company that has the will and financial stability to go through the legal procedure is more likely to be able to support its products in the long-term.

Thanks to Data Exchange in Birkenhead for providing the BBC and disk drives used for the review.

Prices (including VAT and p&p): Demon £61, Zromm £24.

Demon Products Ltd, Lex House, 3-6 Alfred Place, London WC1. Tel: (01) 930 3619.

END

SCREENTEST

Sycero

Kathy Lang looks at System C's Sycero, a powerful and flexible program generator which is ideally suited to software developers.

Sycero bills itself as the businessman's program builder, so I thought it would be interesting to see how a program generator with a host of file-handling facilities compares with more conventional data management systems as a tool for the average business user. The major advantage claimed is that you get far more power for your money, without any increase in the difficulty of use.

Sycero is menu-driven, so you can construct a program entirely on a question-and-answer plus options basis. The main menu is shown in Fig 1. When a program is constructed, you must generate it using a menu option; this results in the production of Basic which you can inspect with your Basic interpreter if you wish. The generated program is then run, either from within Sycero or direct from the operating system. You don't need Sycero present to run generated programs, and no royalties are charged on such programs.

The major difference between a program generator of this type and a conventional system is that you have two levels of building blocks to construct. In a data management system the basic features of file maintenance, reporting, and so on, are already there; all you have to do is set up file, screen and report formats and handle them with the modules already provided. In Sycero, you must create these modules (as programs) for yourself, but the package gives help with creating the main types of program needed in most data management applications.

Five standard types of program are available: file maintenance, enquiry, posting, report and menu. In the first three, a powerful facility for processing displays enables you to carry out a variety of tasks such as validation, and if necessary to include the full gamut of Sycero commands. In addition, you can write complete Sycero programs yourself using the Batch facility, which effectively gives you the full power of Basic plus indexed file-handling in a reasonably palatable form. For novices, however, it is possible to create quite powerful systems without using the batch features at all.

Sycero is produced by a British company, System C, which, in addition to sales in this country, is currently engaged in substantial contracts with suppliers in Germany and Spain.

Constraints

The major limitations are set out in Fig 2. For most people, these limits will cause no problems. Areas of difficulty could be the maximum length of text fields, and the restriction in file maintenance programs to a single key for retrieving files when editing. Dates may be in either British or American numeric format. Validation is adequate at the level supplied — for example, type is checked, and you can force the operator to enter a field value — but can be much more powerful if you exploit the screen processing features.

File creation and indexing

Sycero permits four different types of file organisation: sequential, random (stored by record number), indexed and transaction. Random and indexed files can have extensions associated with them to improve the efficiency of file-handling, and to permit sets of linked records larger than the limit imposed on record length for a single file. Transaction files are associated with indexed files in such a way to establish a master/slave relationship between the two files. For example, in a stock control file you might have a single entry for each item of stock in the main file, with a transaction entry for each order for stock items; these would then be kept in order by the stock code item in the transaction file so that a complete set of transactions could be retrieved together.

```
Date                         SYCERO                          Time
01/01/84                                                     12:00:00
                          SYCERO - 1.01

   1  System configuration             8  Program definition
   2  Initialisation                   9  Generate a program

   3  System-file-field definitions   10  Creatr a "live" data file
   4  Screen definition               11  Run a generated program
   5  Screen processing               12  Utilities

   6  Report definition               13  End session
   7  Report processing

                 Please select your option  ►  ◄

                             Please confirm your option (Y/N)  ► Y ◄
      Ensure SYCERO  Disk 2 is in the right hand drive and a data disk in the left
```

Fig 1 The Sycero main menu

Maximum file size	NS
Max record size (ch)	5000
Max no fields	100
Max field size	78
Max digits	14
Max prime key length	111
Special disk format?	N
File size fixed?	Y
Link to ASCII files?	Y
Data types	N,C,D,Array
Fixed rec structure?	Y
Fixed record length stored?	Y
Amend rec structure?	CO
Link data files?	Y
No data files open	NS
No sort fields	14+
No keys	14
Max key length (chars, fields)	111,UL
Subsidiary indexes kept up-to-date?	UTD
Data validation	G
Screen formatting	P
Unique keys	OP
Report formatting	P
Store calculated data	IN,BA
Totals & statistics	Y,T+ST
Store selecn criteria	N
Combining criteria	A
>1 criterion/field?	Y
Wild code selection?	SW
Browsing methods	AK
Interaction methods	M,C,FT
Reference Manual+	***
Tutorial Guide+	**
Reference Card+	N
Online Help+	*
Hot-line?	P

Fig 2 Features and constraints

Each index uses a key which may be formed from one or more fields. Every indexed file has up to 14 keys which are used to determine the order in which the file may be retrieved during enquiry, or printed in reports, as there is no physical sorting as such within Sycero. Primary keys may be unique or duplicate, but Sycero automatically allows duplicate values for all other keys.

The first step in setting up a Sycero system is to define the parameters such as printer page size, and then to define the files and fields you need for the system. For each field you enter name, type, length and extra parameters where necessary, such as the number of digits after the decimal point for numeric fields. Types of field include character (letters only, letters and digits, or digits in character format only), numeric (which may be used in calculations), date and array. Arrays may be one or two-dimensional and are useful for storing groups of variables of the same length and type, such as the four lines of an address. You then define the keys to be used to access the file, if any, and the links, if any, to other files. As links are established, so are the paths used to link the files. Links between transaction and master files are a special case in Sycero, since the posting program type is provided to facilitate their creation and updating of transactions and the aggregation of data from transaction records onto the corresponding master record.

Once a file has been set up, if you change your mind and decide, say, to alter the definition of index keys, you must write a batch program to carry out the task. The same procedure is needed if you find that your initial specification of the number of records to be stored in the file is inadequate; the file must be copied, and you have to write your own routine to do it. In either case, there is a helpful utility which permits the old file definition to be copied for modification before the data is copied across.

If there are calculated fields in the file, these are not defined during file creation but as part of the screen definition process. This means that you have greater control over calculation than is often possible.

The next phase is to create one or more screen definitions in which the fields from your files are laid out appropriately.

Data input and updating

Sycero allows you to create file maintenance programs to permit the entry and amendment of records, using a standard Sycero program type. Alternatively, you can use the batch facilities to provide more flexible processing should this be needed. File maintenance programs are created using an option from the main menu. When this option is invoked, Sycero asks you which files are to be used, and the names of the screens with their associated processing definitions.

The possible ways of putting together screens and processing are varied. Within the basic file maintenance option, records are always retrieved for maintenance by the primary key. Partial entry of this key is allowed — Jo will find records about Jones, Johnson and Jonas — and once a particular record has been accessed, you can browse forwards or backwards in the file on order by primary key. Screens for file maintenance may include data from more than one file, but in normal circumstances only one file will be updated in one file maintenance program generated by Sycero (although experienced users can get round this if they need to, or use the batch facility instead).

In addition to interactive updating, you can, of course, use a sequence of commands in a batch program to update records as a group.

Screen display

Sycero's facilities for creating display areas on the VDU screen are powerful and flexible. Screen displays are created using a paint-a-screen approach; text and field markers are entered, and the positioning of each field is shown by entering a control character and the name of the field. I've deliberately used the term 'screen display' rather than 'screen' because the output produced by several screen descriptions can be displayed on one physical screen at a time. In fact, 'screen' in Sycero actually means 'the display of one or more records from one or more files', since a screen is a processing entity rather than a physical object. Screen displays may contain either a single record, or a set of records in what is known as a 'page display'; this is usually used for enquiry programs to facilitate, for example, the display of several related records together, perhaps one per line or with each record spanning two or three screen lines.

Display and processing in screen-handling use screen line numbers to locate individual items for display. Within a screen, using screen processing, you have seven processing options: display of help messages; evaluation of the data entered; display of error messages when incorrect data is entered; warning messages (as error messages, but processing of that particular field entry is allowed — this is used to warn of unusual values rather than definitely incorrect entries) conditions (which arrange for entry of specified fields to be skipped if appropriate, for example to avoid asking for spouse's age if the person is unmarried); and statement processing. Statements may be processed either before or after screen entry, and this facility has a wide range of uses. Such statements may be written in Sycero's own command language, in Basic, or both.

Printed reports

As with screen displays you first create a format for a report, then arrange for Sycero to generate a report-processing program. Report layouts are also drawn using paint-a-screen techniques. Report processing statements may be of three kinds — conditions, and statements before and after printing. These work in a similar way to the corresponding processing statements in screen display. The Sycero report generator provides the ability to total up to 40 fields as part of the report, and to have up to 10 levels of sub-totals. Reports may consist of header and footer lines, total lines, and body lines which contain the detail of the report.

Selection and sorting

When browsing through records on the screen using an enquiry program, you can access records via any one key or, for random files, via the record number. When a record has been retrieved you can browse through the file, forwards or backwards. Other than by using the batch features, there did not seem to be any way to set up searches which did not use indexes. There is, however, on enquiry processing an option to exclude records which meet certain criteria. This facility can be used, for instance, to suppress printing of the detail of records if you simply want totals displayed on the screen. For reports, you can set up a maximum of five conditions which must all be met before a record will be included in the report; these conditions are entered when the report program is run. You can apply a number of tests to individual fields, including the ability to use wild codes to represent one character or a group of characters.

Reports can be printed in order on any key field; this is the only form of reordering Sycero provides — there are no sorting facilities. This would not be a major drawback were it not that to re-index a file using different keys, you must copy it with a batch program written for the purpose. There is an example program in the manual which you could adapt, but it would still have to be done. This seems to be a high price to pay to occasionally get out reports in an order you had not originally envisaged.

Calculation

The screen processing facilities allow you to specify calculations to be performed either before or after fields are displayed or entered; this permits a wide degree of flexibility in this area. A powerful range of calculating functions is provided — the usual range of arithmetic and comparison operators, string-handling functions which provide the equivalent of Basic's Left$, Right$ and Mid$ in a simplified form, and the ability to sum numeric arrays. You can also process the system date, although I could not find a way to get at the time of day. Date arithmetic is handled correctly — all dates are stored internally in Julian format, and you can either access this or the current display format for the date. If you really want to go to town, any of the Basic string and numeric functions can be included, using the conventional Basic syntax. Sycero also provides the ability to use one file as a reference for another, giving a 'table look-up' facility which in some circumstances can replace the need for calculation.

Multiple files

Links between files are of two kinds: those between indexed and transaction files, and those between random or indexed files and other indexed files. You can link random files to indexed files by storing the record number of the linked random record in the indexed file, thus permitting one-to-many processing by allowing several indexed records to be linked to the same indexed record. Transaction-master links are also one-to-many. However, within the basic Sycero facilities many-to-many links did not seem to be possible. Where two indexed files are linked by a field which can have duplicate values, when the link is made to retrieve the appropriate record in the second file, only the first record which matches is retrieved. You could use the batch facilities to process linkages of the many-to-many kind if necessary.

Links with outside

Sycero sequential files use the DIF[tm] format created by Software Arts for spreadsheets and used by popular programs such as VisiCalc and SuperCalc, so it would be possible to import and export files in that format. Alternatively, the internal formats used for the other forms of file are shown in the *Reference Manual*. For the Benchmark I was able to create a file in Sycero's random format through a Basic program, and then write a short Sycero batch program to copy it to an indexed file I had previously created. The reverse process would permit export of Sycero data to other programs. For export, you could simply add some Basic statements to a generated Sycero enquiry or report program to send the output to a file in whatever format you wished.

Tailoring

The tailoring features of Sycero are extremely extensive, to the point where you can include Basic statements within programs before or after generation. Sycero provides several levels of sophistication in its tailoring facilities. Inexperienced users could combine the various program types provided, including the very powerful screen processing together with the facilities for generating menus automatically, to produce quite powerful and flexible systems. Such systems could exceed in power all but the most sophisticated data management packages now available, although not those packages which provide their own command languages and permit full interaction between records, including the handling of many-to-many relationships.

When setting up screen processing and when generating the five types of

Package	**Cost (£)**	**Summary**
Sensible Solution	565	Powerful multi-user, multi-file system based on central data dictionary which holds all record definitions. Menu-driven for beginners but no default formats, so lots of work to do to get started. Tailoring powerful but tedious to implement.
Knowledge-Man	450/545/850	Powerful data management system, few software limits on processing. Spreadsheet included, word processing and business graphics as add-ons, all loosely integrated. Features for experienced users and system developers excellent, rather complex for novices.
Sycero	595	Powerful and flexible program generator with good facilities for screen-handling and processing; powerful command language; ability to incorporate Basic statements if desired. Rather complex for novices: better for software developers.
The Complete Manager	530/130	Three-level package with top level as run-time system for third level. Full system is command-driven: has multi-user, multi-file facilities, up to 10 keys per file kept up-to-date, macros with parameter substitution, operating system commands and paths.
dBaseIII	495	More advanced version of popular dBaseII package. Allows max 10 files open at once, which can be interrelated as you wish on a DIY basis. Flexible indexing. Command based: can store sets of commands to get close to programming. Only on IBM PC and clones.

Fig 3 Comparison of similar data management packages

programs provided, you can include any Sycero commands at a variety of entry points. For example, in addition to any processing statements attached to individual screens, a file maintenance program can include commands to be processed before and after records are amended, added to and deleted from a file. (Such commands might be used to carry out tasks which did not directly interact with screen display or which were specific to this particular type of file maintenance, rather than to every use of the screen format in question.)

Where the user requires features which are not available through the five program types provided, batch programs can be constructed using any of Sycero's extensive range of commands. Basic statements can also be used where necessary. For the application where most of the work is straightforward, the true programming aspect could be confined to a few small areas of the system, rather than the whole system being programmed in Basic or the language in use.

Housekeeping

Files can be deleted within Sycero; file, screen and report definitions can be copied. DOS commands can be executed from within Sycero, but this facility is not available to generated programs. Programs must go through a generation phase before being run; this is usually automatic unless previously unidentified errors are found. Generated programs can be run within Sycero, either in their full mode of running or in a test mode. Once tested, programs can be run independently of Sycero. The manual does not explain how to do this, but an extra typed sheet supplied with the package gives the necessary information.

To run the programs you need two files supplied with Sycero. System C does not charge you for the privilege of using these on other systems, so there are no royalties to pay to software developers who write systems for sale using Sycero.

User image

Sycero is a menu-driven system. Every part of the package can be run using menus, but there are times when an experienced user will find this rather tedious especially as in many cases you can find yourself pressing the Exit key many times to work back up through the levels of menu.

In some parts of the package, extensive use is made of special key sequences and of function keys. As the manual has been written to be applicable to all the systems on which Sycero runs, these keys are referred to by generic names, and, in the absence of a keyboard template, the strain on the memory can be considerable. (*The Installation and Configuration Guide* does give details of the generally applicable key sequences, but it is not as easy to use as a template would be, nor does it cover the use of function keys or the Apricot microscreen. These references are all embedded within the *Reference Manual*.)

Documentation

The system comes with two main manuals. The *Reference Manual* covers the full range of Sycero facilities in a reasonably comprehensible way, but it would have been much better to have a more extensive introduction to the overall approach. The *Example Manual* takes the user through two complete, worked examples, and should be a very effective way of learning about the system. Unfortunately it has 36 pages of *errata*: many of these contain only one error and often this is simply a typo, but not always, so you would have quite a bit of work to do to get started with the example and I doubt if many would have the patience required.

System C provides support for the package through an unusual route: buyers are offered an annual maintenance contract for £185, which includes a modem and a subscription to BT Gold. This means you can use the mailbox system to communicate with the software support people — an imaginative move which should be cheaper for most people than a maintenance contract plus telephone charges.

Conclusion

Sycero is a powerful and flexible program generator which should perhaps appeal more to system developers than ordinary users. I suspect that many people will be wary of its approach simply because it obviously has a lot of power and capacity.

There are some areas which novices will find particularly difficult — the need to copy your files if they exceed their initial size specification, and to write a routine for the purpose, even if it can be done by adapting an example in the manual, is a real disadvantage. There are also some surprising gaps in the functionality of the five predefined program types. The difficulties produced by creating a report in an unusual order is one obvious example, and the barriers to creating linked files where many-to-many relationships are possible is another.

I see Sycero as being of most interest to people who need a powerful application which can be almost completely programmed in Sycero with the addition of a small number of Basic statements. For this type of work, it should prove a considerable aid to productivity. END

BM1	Time to add one new record	3secs
BM2	Time to select record by primary key	5secs
BM3	Time to select record by secondary key	5secs
BM4	Time to access 20 records from 1000 sequentially on three-character field (same field as in BM2 key)	NT
BM5	Time to access record using wild code	5secs
BM6	Time to index 1000 records on three-character field	35min 30secs*
BM7	Time to sort 1000 records on five-character field	NP
BM8	Time to calculate on one field per record and store result in record	36mins 15secs*
BM9	Time to total three fields over 1000 records	9mins 35secs*
BM10	Time to add one new field to each of 1000 records	33mins 45secs*

Time to import a file of 1000 records: 32mins 15secs

Notes: NT=Not tested NP=Not possible +=including scrolling. Where two times are given, first is access to first record, second is access to each subsequent record. *=estimated from time to process 200 records.

Benchmark times recorded on :Apricot/H

Summary

Supplier	System C
Tel	(0622) 55142
Cost (£)	595
Systems	PC,MS
Version reviewed	1.08
Type	S,E
Features	Program generator — permitting the setting up of a variety of systems based on file-handling. Powerful screen-handling and processing, adequate report generation, good keyed access to single or linked files including transaction processing.
Drawbacks	Rather cumbersome ordering and selection facilities. Limited ability to relate linked files within basic system.
Ease of use	Quite difficult for novices to learn about and use. Could be tedious for expert users, but should save time.

Primitive Logo

Harvey Mellar looks at Logo operations, variables, arithmetic and co-ordinate geometry, and presents a 'cat-and-mouse' program to illustrate the facts.

Some Logo primitives have an effect, and are called 'commands', whereas others simply return a value and have no effect — these are called 'operations'. FORWARD is a command: it causes the turtle to move on the screen. HEADING, on the other hand, is an operation: it returns the value of the turtle's heading, but does not cause anything to 'happen'. In order to find out what the turtle's heading is, we must give the value returned by HEADING as the input to a command, as for example in PRINT HEADING; PRINT is a command that causes the value of its input to be displayed on the screen. It follows from this that the first procedure or primitive on a line must be a command, otherwise a value would be returned without anything to 'use' it.

All the procedures discussed in the previous article (*PCW*, June) were commands; they had an effect, but they did not return a value. To get a procedure to return a value, we use the primitive OUTPUT. As a very simple example, here is a procedure that returns the square of its input:

```
TO SQR :A
  OUTPUT :A * :A
END
```

To find the square of 6.7, we type PRINT SQR 6.7.

A procedure stops execution and returns control to the procedure that called it (or to the top level) as soon as it executes an OUTPUT. The next example illustrates this; it is an operation to calculate the absolute value of its input.

```
TO ABS :X
  IF :X < 0 THEN OUTPUT ( 0 - :X )
  OUTPUT :X
END
```

If :X is less than 0 then the first OUTPUT is obeyed; Logo then stops obeying this procedure and returns control to the next higher level. Otherwise, Logo goes on and obeys the second OUTPUT.

What I am calling an 'operation' in Logo is usually called a 'function' in other languages. One feature of a function is that it returns a single value, but in Logo that single value can be a list structure of any degree of complexity.

Lisp is a language which works purely in terms of functions, whereas you must include the word OUTPUT to make your Logo procedures into functions. Despite its origins in Lisp, Logo departs from it in one of its most fundamental features and so remains a 'procedural' rather than a 'functional' language. There is dispute in the Logo community about the correctness of this approach, and one company, TLC, (The Lisp Company) is producing versions of Logo which are 'functional'.

The majority of Logo primitives (and all procedures) are prefix in form: that is, the procedure is followed by its inputs, as in FORWARD 20. However, there are also a small group of 'infix' operations which are used because of their familiarity. 4 + 5 is an example: the + is an infix operation, so called because it is written between its inputs.

'. . . in Logo that single value can be a list structure of any degree of complexity.'

Some versions of Logo also include prefix forms for these operations, so 4 + 5 can also be written as SUM 4 5.

Calculations

Logo might not be your first choice of language for number-crunching applications, but it does have a basic set of arithmetic and trignometrical functions much the same as those you would expect to find in Basic.

Operations enable us to write neat definitions for mathematical problems. Here's a procedure that returns the distance between two points:

```
TO DISTANCE :X1 :Y1 :X2 :Y2
  OUTPUT ( SQRT ( SQR ( :X1 - :X2 ) )
  +   ( SQR ( :Y1 - :Y2 ) )
END
```

To find the distance between the points (50,60) and (90,70), type PRINT DISTANCE 50 60 90 70. DISTANCE uses the primitive operation SQRT as well as the procedure SQR.

It is worth looking closely at the way brackets are used here. The brackets in (:X1 – :X2) ensure that the subtraction is done before any squaring; they include the operation and its operands, which is the standard approach in many languages. When brackets are used with prefix primitives or procedures, they include the procedure name together with its inputs, so you write (SQR :X) or (SQR (:X1 – :X2)). This is in contrast to the situation in Pascal and Basic where it is just the arguments (the inputs) that are bracketed together.

Many mathematical applications require the generation of random numbers, and Logo uses a primitive RANDOM for this task. RANDOM takes an integer input – n – and returns a random integer between 0 and n–1. To get the turtle to make a random right turn of between 0 and 89 degrees, put:

RIGHT RANDOM 90

As a slightly more complex example, the following makes a random right turn between –90 and +90 degrees:

RIGHT ((RANDOM 181) – 90)

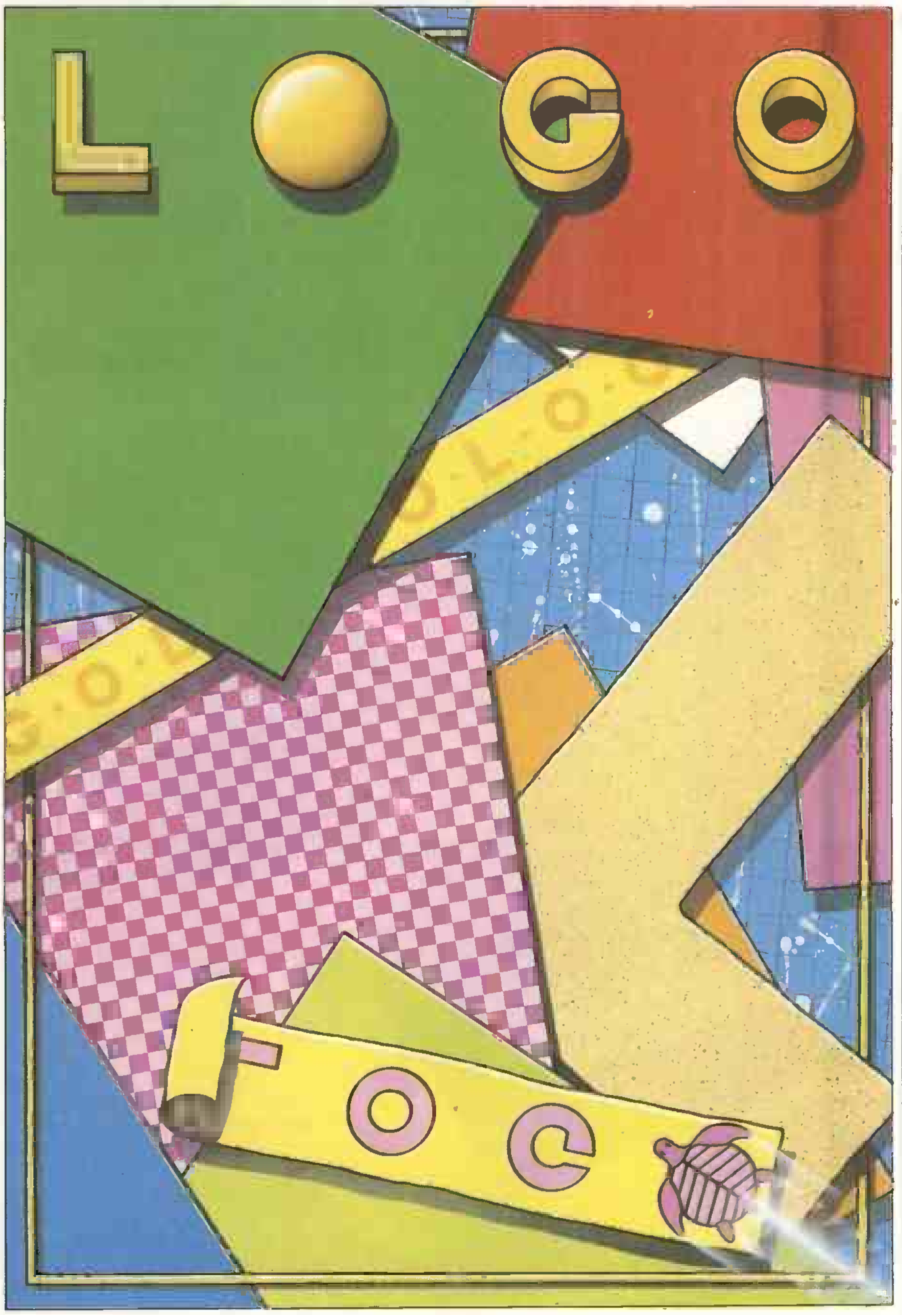
Co-ordinate geometry

In order to make use of the DISTANCE procedure that has been defined, you need a way of dealing with co-ordinate geometry (that is — the usual school geometry in terms of x and y co-ordinates).

The geometry looked at in the previous article was 'turtle geometry', which is defined in terms of FORWARD and RIGHT and is a 'relative' geometry in that everything is measured with respect to the turtle's present position. This form of geometry has great importance — it offers a number of new insights into geometry, and is better suited to solving certain kinds of problems than is co-ordinate geometry. However, there are problems for which co-ordinate geometry is the better way of expressing a solution.

Logo has a number of primitives for dealing with co-ordinate geometry. The origin of the co-ordinate system is taken to be at the centre of the screen and you can set the position of the turtle with SETX, SETY or SETXY. SETX and SETY take one input, the value of the x or y co-ordinates respectively. SETXY takes two inputs. If the pen is down, the turtle will draw a line as it moves from its old position to the new. The heading can be set with SETH. These primitives are commands.

There are a corresponding set of operations that return values. HEADING has already been mentioned; XCOR returns the value of the turtle's x co-ordinate; and YCOR its y co-ordinate.



Variables

The only variables seen so far have been 'local' variables in the form of inputs to procedures. These variables are preserved as long as the procedure that uses them is still active, but disappear as soon as it is completed.

It is sometimes useful to have variables that can be shared by a number of procedures and that do not disappear after the procedures have finished running. Such variables are usually called global variables, and in many versions of Basic all variables are global.

To create a global variable you use the primitive MAKE. For example, MAKE "XPREY 5 assigns the value 5 to the variable named XPREY. To find the value of the variable, you could type PRINT :XPREY.

A point to bear in mind when using variables in Logo is that they are not 'typed' so there is no distinction, for example between numeric variables and string variables, as there is in Basic. You can say MAKE "XPREY 3, then later MAKE "XPREY "THREE or MAKE "XPREY [1 2 3].

In the last article I discussed, and have now introduced, another punctuation mark,". These symbols are very important in Logo for there are three different ways of using words, and these symbols are used to differentiate these uses:

XPREY (with no preceding punctuation) is a call to a procedure (or a primitive) named XPREY; it causes the procedure to be obeyed.

"XPREY with preceding quotes (but not following) is the word XPREY itself. This could be the name of a variable, the name of a procedure or simply a 'word' (the same as a 'string' in Basic).

:XPREY with preceding colon is the value associated with the name XPREY; it is the contents of a 'box' whose name is XPREY.

MAKE "XPREY :XPREY + 1 increases the value of the variable XPREY by 1. At first sight this notation seems unnecessarily complicated, but the idea behind the notation is that the two different uses of XPREY should be clearly distinguished. In Basic, the statement LET XPREY = XPREY + 1 uses XPREY in one place as the value of the variable and in the other as the name of the variable. This is a source of potential confusion that Logo tries to avoid.

The colon notation in :XPREY is a shorthand for the fuller Logo syntax of THING "XPREY. THING is an operation which returns the value associated with a variable name. A colon can be used in place of THING if they are followed by the actual variable name.

To show how THING works, consider these examples:

MAKE "OTHERNAME "ROSE
MAKE "ROSE "SWEET

Then PRINT :ROSE prints SWEET

PRINT :OTHERNAME prints ROSE

PRINT THING :OTHERNAME prints the value associated with :OTHERNAME, in other words the value associated with "ROSE — that is, it prints SWEET.

This in itself is often a useful feature, but it is made even more useful by the fact that you can create variable names during the running of a procedure. To make a word, you use the primitive WORD which takes two inputs and outputs the word formed by putting these together: WORD "X "PREY outputs XPREY. You could also write THING WORD "X "PREY in place of :XPREY. This facility becomes useful if one of the inputs is a variable, for example:

```
TO FINDX :ANIMAL
  PRINT WORD "X :ANIMAL
END
```

FIND X "PREY prints the contents of XPREY while FINDX "PREDATOR prints the contents of XPREDATOR.

How does Logo organise its memory to hold procedures and variables? The memory is described as a 'workspace' and is composed of 'nodes'. Procedure and variable definitions use up nodes. As procedures run workspace is used up, and from time to time Logo must stop, examine its workspace, decide which parts are still needed and free the rest of the memory for reuse — this process is known as garbage collection. Logo will hesitate for a second or so from time to time as it performs a garbage collection. Most Logos have commands which will enable you to see how many nodes you have free at any time, and to force garbage collections so that they do not occur during time-critical parts of programs.

You can save the whole workspace to disk (or tape) and reload it later. In this way, procedures and global variables are saved together as one file. There are a variety of commands to organise the workspace, for deleting procedures and variables, and listing names of procedures and variables. In some

Illustration by Mark Watkinson

systems you can 'package' groups of procedures and 'bury' them so that their definitions can't be accessed.

The exact commands used vary slightly from version to version, but the important idea to grasp is that of the workspace as it is a different concept to a program in Basic.

The hunt

You can put all these ideas together in a program to investigate how a predator chases its prey. This example is adapted from Abelson and diSessa's excellent book, *Turtle Geometry* (MIT Press 1981).

The predator has a rudimentary sense of smell. The smell of his prey gets stronger as he gets closer, and weaker as he gets further away. If he finds the smell getting weaker, he turns right through a given angle. The prey, on the other hand, moves at random in an attempt to throw off any attack. Amazingly, with this crude attack strategy the predator usually gets his prey, but then the prey is not too intelligent either! This is a powerful example of the value of feedback: a simple mechanism with feedback will often succeed in the long-run.

The program has to control two animals at once:

```
TO DO
  INIT
  EXECUTE.TOGETHER
END
```

INIT sets the original position of the two animals and ensures the pen is up. DISTANCE.LAST.TIME is a global variable that will be used to keep track of the distance between the two animals.

```
TO INIT
  PENUP
  MAKE "XPREY 0
  MAKE "YPREY 0
  MAKE "HPREY 0
  MAKE "XPREDATOR ( – 100 )
  MAKE "YPREDATOR ( – 100 )
  MAKE "HPREDATOR 0
  MAKE "DISTANCE.LAST.TIME 100
END
```

EXECUTE.TOGETHER causes two processes, a prey movement and then a predator movement, to occur 'simultaneously' (actually one after the other in small steps). The procedure also checks if the two animals are close enough together for the predator to grab its prey, and if so it stops.

PREY.STEP and PREDATOR.STEP each require two inputs, one giving the length of each step and the other giving the angle through which the animal turns on each step.

```
TO EXECUTE.TOGETHER
  PREY.STEP 4 40
  PREDATOR.STEP 10 50
  IF DISTANCE.TO.PREY < 10 THEN
    STOP
  EXECUTE.TOGETHER
END
```

(Note: DISTANCE.TO.PREY is an operation and so returns a value that can then be compared with 10.)

The prey moves forward its step-length and then makes a random turn. As the same turtle is being used for both animals, you need to restore the turtle to the place it was last at when it was tracing the path of the prey before making the move, and save the new position before leaving the procedure.

```
TO PREY.STEP :SPEED :TURN
  RESTORE.STATE "PREY
  MOVE :SPEED
  RIGHT (RANDOM 2 * :TURN )
– :TURN
  SAVE.STATE "PREY
END
```

The predator makes a right turn only if the smell is getting weaker. The other details of this procedure are similar to that for the prey.

```
TO PREDATOR.STEP :SPEED :TURN
  RESTORE.STATE "PREDATOR
  MOVE :SPEED
  IF SMELL = "WEAKER THEN RIGHT
    :TURN
  SAVE.STATE "PREDATOR
END
```

The two procedures for saving and restoring the state of the turtle make use of the ability to create variable names during program execution.

```
TO SAVE.STATE :ANIMAL
  MAKE ( WORD "X :ANIMAL ) XCOR
  MAKE (WORD "Y :ANIMAL ) YCOR
  MAKE ( WORD "H :ANIMAL )
    HEADING
END

TO RESTORE.STATE :ANIMAL
  SETX THING ( WORD "X :ANIMAL)
  SETY THING (WORD "Y :ANIMAL)
  SETH THING (WORD "H :ANIMAL )
END
```

You have to use MOVE rather than FORWARD so that lines are only drawn when one animal or the other moves, and not when the turtle swaps from one to the other.

```
TO MOVE :X
  PD
  FD :X
  PU
END
```

DISTANCE.TO.PREY is an operation which outputs the distance between the two animals.

```
TO DISTANCE.TO.PREY
  OUTPUT SQRT ( ( SQR ( :XPREY –
    :XPREDATOR ) ) + ( SQR ( :XPREY
    – :YPREDATOR ) ) )
END
```

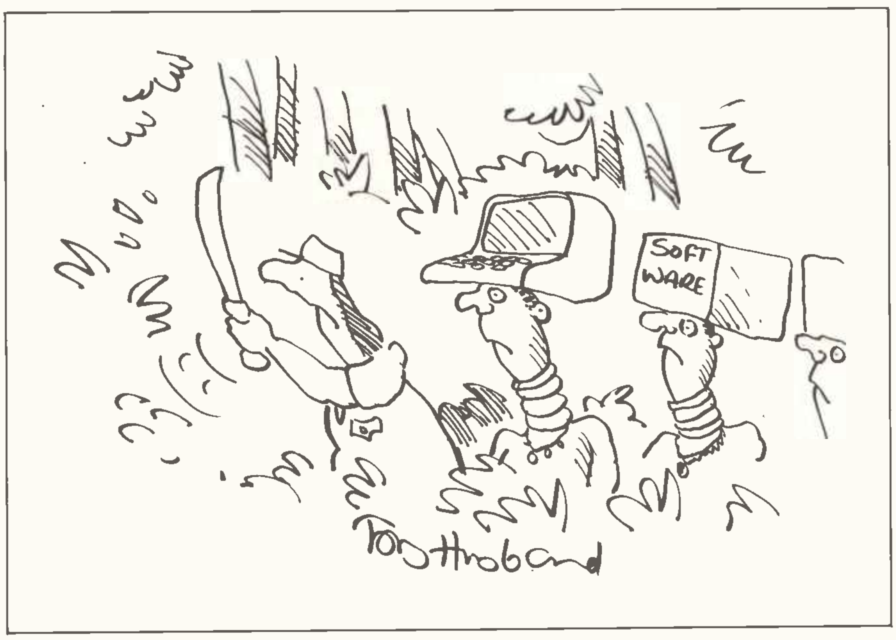
SMELL is another operation. It uses the operation DISTANCE.TO.PREY to determine whether the prey is closer or further away, and the global variable DISTANCE.LAST.TIME to keep a record of the distance.

The fact that a procedure stops when an OUTPUT is obeyed is rather inconvenient here, and to simplify the programming I have used an alternative form of the conditional test. TEST evaluates the expression on that line and returns TRUE or FALSE. This value is then used by any following IFTRUE or IFFALSE statements.

```
TO SMELL
  TEST DISTANCE.TO.PREY > :DIS-
    TANCE.LAST.TIME
  IFTRUE OUTPUT "WEAKER
  IFFALSE OUTPUT "STRONGER
END
```

This program illustrates one of the uses to which Logo is well suited. You have a very simple model of a predator's behaviour, but you can now refine one part of the program (PREDATOR.STEP) in an attempt to get a more efficient predator, or devise avoidance strategies for the prey, run the programs and see what happens. It is this ability to easily alter the model that separates this type of program from a simple simulation.

This is part two of a six-part series. END



TJ'S WORKSHOP

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.

ORIC SOFTWARE TIP

This simple and short machine code routine is designed to stop the cursor flashing. Why you would want to do this is arguable, but I find it a little distracting and occasionally annoying!

It works by re-vectoring the fast interrupt vector located at #229 to the start of the machine code (in this case#400, but the code is relocatable to any area in memory where it is safe from being overwritten by Basic).

The code continually stores zero at location #0274. A ROM-based routine uses the timer at #0274/#0275 to decide how long has elapsed between the cursor having been flashed on and off. When zero is reached, the cursor is flashed on. Therefore, as this routine continually zeros the timer, the cursor is permanently on.

Flashing can be restored to normal by entering DOKE#229, #EC03 as a direct command.

J M Wright

Assembler listing

```
#400    PHA :TXA:          (Preserve registers)
        PHA: TYA: PHA
#405    LDA £#00           (Load accumulator with zero)
#407    STA#0274           (Store Acc @#0274)
#409    PLA: TAY: PLA:     (Re-instate registers)
        TAX: PLA
#40E    JMP#EC03           (Jump to interrupt handler)
```

Basic listing

```
10      FOR I=0 TO 17
20      READ D$ :D=VAL(""+D)
30      POKE#400+I,D
40      NEXT I
50      DOKE#229,#400
60      DATA 48,8A,48,98,48,A9,00,8D,74,02
70      DATA 68,A8,68,AA,68,4C,03,EC
```

MZ-80K REVERSE VIDEO

Here is a modification to the Sharp MZ-80K based on an article in a user club magazine for reverse video. The original article only gave total screen reversal, but by the addition of just two ICs, it is possible to have reverse video characters anywhere on the screen as on the Commodore Pet.

Although the modification is fairly simple, it should not be undertaken by anyone with doubts about his capabilities.

The two ICs required are: 1) 2102 1k memory chip; and 2) 74LS74. Also required are a small piece of Veroboard and some thin connecting wire.

1) Remove the main PCB and lay it component-side down.
2) Follow the track from pin 9-IC29(74LS165) to the solder connection and link to pin 11-IC26(74LS86).
3) Cut the track going to pin 9-IC29.
4) Link pin 9-IC29 to pin 12-IC26.
5) Link pin 13-IC26 to pin 5-new 74LS74.
6) Link pin 3-new 74LS74 to pin 1-IC29.
7) Link pin 2-new 74LS74 to pin 12-new 2102.
8) Link pin 11-new 2102 to pin 9-IC2(74LS74).
9) Link pin 4-IC23(74LS02) to pin 11-IC2.
10) Link pin 6-IC23 to pin 6-IC30(74LS42).
11) Link pin 12-IC2 to pin A25 on the I/O connector.
12) Locate pin 1-IC24(74LS00), locate the solder connection on the sixth track up from pin 1-IC24 and link to pin 5-IC23.
13) Connect a 4K7 resistor from pin 10-IC2 to pin 14-IC2.
14) Locate the two solder connections between pin 14-IC2 and pin 1-IC1(555) (note that they are very close together). Connect a link from pin 13-IC2 to the solder connection nearest to pin 14-IC2.
15) Link pin 1.
16) Link pin 7-new 74LS74 to pin 9 new 2102.
17) Link the following connections from the Veroboard to IC42(2114):

New 2102	IC42
PIN 1	PIN 1
PIN 2	PIN 2
PIN 3	PIN 10
PIN 4	PIN 6
PIN 5	PIN 7
PIN 6	PIN 4
PIN 7	PIN 3
PIN 8	PIN 5
PIN 9	PIN 9
PIN 10	PIN 18
PIN 13	PIN 8
PIN 14	PIN 15
PIN 15	PIN 16
PIN 16	PIN 17

The modification is complete. Using Basic, POKE 57364, 1 for reverse video and POKE 57364,0 for normal video.

To use in a program:

```
10 POKE 57364,1
20 PRINT 'SHARP';
30 POKE 57364,0
40 PRINT 'MZ-80K'
```

This will print 'Sharp' in reverse video and 'MZ-80K' in normal video.

Howard Winwood

AUTOMATIC SEARCH-AND-REPLACE

Wordwise 1 was an excellent word processor for the BBC Micro, one of the few at any price which gave a running word count. Its successor, Wordwise+, is even better, and the feature of a programming language makes it unbeatable for many of the actions that I need. One of these is automatic search-and-replace.

The search-and-replace of Wordwise 1 was something which required quite a lot of typing, and when a large number of replacements had to be made, to conform with a publisher's house style, for example, this was tedious. By using the new programmable Wordwise+, the search-and-replace of a list of items can be made automatic. The list of items is typed into Wordwise+ with the old item followed by the new item, for example:

machie
machine
Z-80
Z80 (and so on),

and this list is saved under whatever file name you like, such as CORLST.

The search-and-replace program listed here is then loaded into one of the segments, and the file CORLST is loaded into SEG.5. With the text in the main section of memory, activating the program will carry out the search-and-replace action on all the listed items. The machine beeps twice when the program is finished.

The only thing to watch for is that a space should be placed after each complete word when the list is being compiled. If this is not done, there is a possibility of an endless loop forming. If, for example, you have items **wil** and **will** in the list, with no space following **wil**, then the first **wil** in the text is replaced by **will**, and the 'wil' part of 'will' is then replaced by 'will', and so on. The result in this example is to fill the memory with a set of letters 'l'.

On another Wordwise+ topic, has anyone successfully used PDOC when the PSF$ command was in place in a print header? I found it difficult enough to get the PSF$ command to work at all, and when it was used with the PDOC program, it caused the output to take one page from each file. It also produced the error messages 'Too many files' and 'CPIT error', which are not documented in the Wordwise+ manual.

There are no problems when the command is used with files that are not being printed with PDOC.

Ian Sinclair

```
SELECT SEGMENT 5
CURSOR TOP
.LAB1
A$=GLT$
IF A$="" THEN GOTO LAB2
B$=GLT$
SELECT TEXT
CURSOR TOP
REPEAT
REPLACE A$,B$
UNTIL EOT
SELECT SEGMENT 5
GOTO LAB1
.LAB2
SELECT TEXT
CURSOR TOP
DISPLAY
```

LYNX ROUTINES

Here are some short routines for the Lynx. They can be stored at 6343H (this is within the cassette file name buffer, and is safe if the file name is restricted to less than 51 characters). The routine in Fig 1 starts the cassette motor. To run this routine call 6343H; to stop the cassette press S.

To wait for a key to be pressed and to print it, use the routine in Fig 2. This has the advantage over a Basic program that it will also print control characters (for example CNTL-G = BELL).

The routine in Fig 3 will beep every time an error message is generated (very useful when in auto mode and when you are not always looking at the screen). Also, it does not destroy any pointers to other routines.

These routines can all be placed in memory by entering MONITOR and using the M command. When you are satisfied it is working correctly, it can then be saved on tape by using the D command. As an example, the beep routine is saved with:
D 6343 6357 6343 'BEEP'

This can then be loaded with MLOAD 'BEEP', and will automatically run and beep whenever an error is produced.

R W Toms

6343 : START	CD F2 0C	CALL MOTON	
6346	CD BD 09	CALL KEYDVR	
6349	FE 53	CP 'S'	Check to see if S is pressed, if not jump to start
634B	20 F6	JR NZ	
634D	CD FB 0C	CALL MOTOFF	Stop motor
6350	C9	RET	

Fig 1

6343 START	CD BD 09	CALL KEYDVR	Get chr
6346	B7	OR A	
6347	28 FA	JR Z	Jump to start if no key has been pressed
6349	CF	RST 8	Call display routine
634A	18 F7	JR	Jump to start

Fig 2

6343	21 88 62	LD HL, ERRAM	Address called during error

Fig 3

Fig 3 continued

6346	3E C3	LDA,C3	Load into ERRAM a jump to beep routine
6348	77	LD(HL),A	
6349	23	INC HL	
634A	3E 52	LDA,52	
634C	77	LD(HL),A	
634D	23	INC HL	
634E	3E 63	LDA,63	
6350	77	LD(HL),A	
6351	C9	RET	
6352	F5	PUSH AF	
6353	3E 07	LDA,07	Load A with 07 (BEEP)
6355	CF	RST 8	Call display routine
6356	F1	POP AF	
6357	C9	RET	

UCSD PASCAL PROCEDURES

Pascal assumes that writing onto a VDU will follow the same pattern as writing to a line printer. While an equivalent of such commands in Basic as the MTX's CSR (X,Y) or the PRINT AT (X,Y) of some other micros is rarely essential, it is occasionally useful and cannot be implemented using Pascal's field-width parameter.

UCSD Pascal provides a GOTOXY (X,Y=INTEGER) procedure. This procedure will GOTOXY (X,Y) for any micro which uses the standard ASCII teleprinter control codes for VDU formatting. (CHR (26) (ASCII 'SUB') homes the cursor to the start of the current page, and CHR (25) (ASCII 'EM') advances the print cursor one position without printing a space.

B L Houghton

```
PROCEDURE GOTOXY(X,Y:INTEGER);

  (Places print position/cursor at)
  (Cartesian coordinates supplied.)
  (Note that error-trapping should)
  (be outside this PROCEDURE,so    )
  (that alternate text windows,    )
  (screen modes,etc.may be handled)
  (Assumes that micro uses ASCII   )
  (contol characters as VDU format)
  [commands.                       )

VAR A:INTEGER;
BEGIN
  IF (X>=0) AND (Y>=0) THEN
    BEGIN
     WRITE(CHR(26));
     FOR A:=1 TO Y DO WRITELN;
      FOR A:=1 TO X DO WRITE(CHR(25))
    END
END;
```

COMMODORE DISK DIRECTORY

Here is a tape and listing of a disk directory subroutine for a Commodore 64, which allows the user to read a disk directory without destroying a program in memory.

To add it to programs, type it in and save it as a separate program as usual.

Now load the program it is to be added to (ensure this contains line numbers below 60000). Type in direct mode:
POKE 43, PEEK(45)-2
POKE 44, PEEK (46)
NEW
LOAD "NAME OF DISC ROUTINE",8
POKE 43,1
POKE 44,8

Remember to press RETURN after each statement. The routine and your program will now be merged.

I Learmouth

```
60000 OPEN1,8,0:CLOSE1:IFST=-128THEN60200
60010 OPEN1,8,0,"$0"
60020 GET#1,A$,B$
```

```
60030 GET#1,A$,B$
60040 GET#1,A$,B$
60050 M=0
60055 R$="■"
60060 IFA$<>""THENM=ASC(A$)
60070 IFB$<>""THENM=M+ASC(B$)*256
60080 PRINT"■"MID$(STR$(M),2);TAB(5);"■";
60090 GET#1,B$:IFST<>0THEN60160
60100 IFB$<>CHR$(34)THEN60090
60105 GET#1,B$:IFB$<>CHR$(34)THENPRINTR$+B$;:GOTO60105
60110 GET#1,B$:IFB$=CHR$(32)THEN60110
60120 PRINTTAB(27);:M$=""
60130 M$=M$+B$:GET#1,B$:IFB$<>""THEN60130
60140 PRINT"■",LEFT$(M$,3)
60150 IFST=0THEN60030
60160 PRINT"BLOCKS FREE":CLOSE1
60170 END
60200 PRINT"■DEVICE NOT PRESENT"
```

UNROLLING LOOPS IN BASIC

What is the fastest way, in Basic, of summing the N elements of a one-dimensional array X? I suspect most programmers would opt for the simple, tight loop embodied in line 510 of the accompanying program. There is, however, a faster method, based on the idea of 'unrolling' a loop. This technique consists of replicating the contents of the loop one or more times and making the appropriate adjustments to the loop counter. The aim is to decrease the overall execution time of the loop by reducing the overheads of incrementing the loop variable, testing for the end of the loop, and branching back to the start of the loop.

Line 630 of the program contains a loop unrolled to a depth of three. Other moduli are possible, and some experimentation is required to find the most suitable value of M for a particular application and a given computer. If a higher value of M is to be used, extra terms should be added in line 630 so that each time through the loop, M consecutive terms of the array X are summed.

Line 620 is a clean-up loop which deals with any elements remaining after the N elements of X have been divided into groups of three. The table in Fig 1 gives some timings obtained on the Commodore Pet using the listed program. The unrolled loop provides a useful speed increase for N greater than about 10, although it is marginally slower than the standard method for smaller N due to its start-up overhead. I would expect similar speed increases to be obtained for the other popular micros.

This technique is well worth considering if you need to squeeze the last ounce of performance out of your Basic interpreter!

Reference: JJ Dongarra and AR Hinds (1979), *Unrolling loops in Fortran, Software Practice and Experience*, vol 9, 219-226.

Nick Higham

N	Time for standard method (Jiffies)	Speed-up ratio
10	5	1.2
15	7	1.0
25	12	.917
100	45	.844
500	221	.855
1000	439	.838

Fig 1

```
10 REM UNROLLING LOOPS
15 REM IN: PET BASIC
20 REM EXAMPLE: SUMMING X(1),...,X(N)
30 REM BY: NICK HIGHAM
40
100 REM VARIABLES ARE 'FASTER' THAN CONSTANTS:
105 M=3:P=1:Q=2
110 INPUT N
120 DIM X(N):FORI=1TON:X(I)=I:NEXT
130
200 T=TI:GOSUB500:T1=TI-T:PRINTT1,S
210 T=TI:GOSUB600:T2=TI-T:PRINTT2,S
220 PRINT"SPEED-UP RATIO:"T2/T1:END
230
500 REM STANDARD METHOD
505 S=0
510 FORI=1TON:S=S+X(I):NEXT
520 RETURN
```

```
530
600 REM UNROLLED LOOP : MODULUS M=3
605 S=0
610 R=N-INT(N/M)*M
620 IF R>0 THENFORI=1TOR:S=S+X(I):NEXT
630 IF R<N THENFORI=R+1TONSTEPM:S=S+X(I)+X(I+P)+X(I+Q):NEXT
640 RETURN
READY.
```

BBC LISP

Acornsoft Lisp has, like many small-scale Lisp systems, no provision for loading and saving separate functions. These functions will do that. For example, to save the function FLATTEN use (FSAVE 'FLATTEN); to recall it, use (FLOAD 'FLATTEN).

The function FLATTEN is described in the Lisp user guide. It works by storing the definitions as an ASCII file on disk or tape, and will work on the BBC A BBC B and Electron. You can use those functions to build up a whole library of LISP definitions without the whole Lisp-environment.

FSAVE and FLOAD won't work with functions implemented in machine code. ADDHEAD is used in the definition of FSAVE , so don't forget to type in ADDHEAD.

Dreesen Jos

```
(DEFUN
   FSAVE
   (M (LW))
   (*
      (IMPLODE
         (CONS
            (QUOTE SPOOL)
            (CONS BLANK (EXPLODE M)))))
   (SETQ LW LINEWIDTH)
   (SETQ LINEWIDTH 130)
   (SPRINT (ADDHEAD M))
   (PRINC CR)
   (SETQ LINEWIDTH LW)
   (* (QUOTE SPOOL)))


(DEFUN
   FLOAD
   (M)
   (*
      (IMPLODE
         (CONS
            (QUOTE EXEC)
            (CONS BLANK (EXPLODE M))))))


(DEFUN
   ADDHEAD
   (L)
   (CONS
      (QUOTE DEFUN)
      (CONS L (CDR (EVAL L)))))
```

BBC BREAKS

The effects of the BREAK key and CTRL BREAK can be easily harnessed using the *FX247 command; this redirects the Break vector to a user's own routine. Certain protocols must be observed, and the operating system has to be allowed to reset variables.

The OS checks the break vector twice, and it is best to intercept the vector the second time. During the first check, the OS enters with carry clear and the second with carry set. To tell the OS the address of the user's routine, *X248 and *FX249 are used (low byte, high byte respectively). The demonstration program

shows the theory in practice.
10 MODE 7:REM Intercept break
20 FOR PASS=0 TO 3 STEP 3
30 P%=&C00
40 [OPT PASS
50 BCS START /Check if second access of the vector
60 RTS
70 .START
80 CLI /Re-enable interrupts
90 LDX #&00 /Print string
100 .LOOP /Onscreen
110 LDA string,X
120 JSR &FFE3
130 INX
140 CMP #&0D
150 BNE LOOP
160 JSR &FFE3
170 RTS
180 .string
190]
200 $P%="The Soup Dragon's dropped a Clanger"
210 P%=P%+LEN($P%)+1
220 NEXT PASS
230 *FX247,76
240 *FX248,00
250 *FX249,12
260 PRINT CHR$(129) "PRESS BREAK!!"

Beeb disks may be protected by setting the directory option to the 'teletext conceal' character. Type in PRINT CHR$(&98);"*" [return], then type in *DIR. Use the cursor keys to copy the invisible character before the '*'. When it is copied correctly, the copy cursor disappears. Now press RETURN. Any files saved while this directory is set will not be visible when the directory is set back to normal. To see the filenames, this procedure must be repeated — a boot file could do it automatically.

To give simple protection in a basic program by hiding any important lines using CHR$)42) ('*'), make a REM statement at the end of the lines to be hidden. This REM statement should be made up of the number of asterisk characters required to hide what goes before it (don't forget to include the REM itself).

Now fit into your program these lines:

1 TEST=FALSE:FOR X=PAGE TO TOP STEP 1
2 IF ?X=&F4 THEN TEST=TRUE
3 IF ?X=&0D THE TEST=FALSE
4 IF ?X=42 AND TEST=TRUE THEN ?X=&7F
5 NEXT X
6 END

Run the routine with GOTO 1 and then DEL.1.6. When the program is listed, the REMs will have been filled with CHR$(&7F) (the delete character) which will cause the characters before the REM to be deleted from the screen when the program is listed (that is, the parts of lines that you don't want visible).

It is possible to redefine the copy cursor by storing the new ACSII code at address &366.

Stephen D Jamieson

NEWBRAIN CAPS LOCK

Using the NewBrain default screen, capitals lock can be achieved by either using POKE43,1 or Control/1. But if a series of pages are opened, this is not possible; the solution is shown in this program.

Line 160 traps the graphics/L key input and the subroutine sets L at either 0 or 1. The punch line is 1030, which alternately sets CAPS LOCK and normal with each consecutive graphics/L keystroke.

PM Stevenson

```
100 REM*set keyboard and screen*
110 kb=55:sc=99:REM*allocate streams
120 CLOSE#kb:OPEN#kb,5:REM*open keyboard device 5 with stream #55
130 CLOSE#sc:OPEN#sc,0,sc,"s24":REM*open screen 40 * 24 on stream #99
140 PUT#sc,22,1,3,6:REM*place cursor on screen #99 at x=1 y=3
150 GET#kb,a:REM*read key entry
160 IFa=140THENGOSUB1000:GOTO150:REM*trap graphics/L = Little/Large Lock
170 PUT#sc,a:REM*print key entry to screen
180 GOTO150:REM*for next key entry
1000 REM*capitals lock sub routine
1010 l=l+1:REM*increment by count of 1
1020 IFl>1THENl=0:REM*ensure either 0 or 1
1030 PUT#kb,l:REM*set keyboard mode to 0 = normal / 1 = CAPITALS LOCK
1040 RET
```

IBM PC # REDEFINITION

Something like "GWBASIC LPT_INIS" included in an autoexec can make spreadsheet automatic pounding considerably more useful.

Will Roberts

```
10      'Epson FX 80/100 printer £s and #s redefine. For IBM PC or Compatables
20 ON ERROR GOTO 280
30 CLS
40 LOCATE 10,24:PRINT"Printer inisalization program."
50 LOCATE 12,8
60 PRINT"This redefines the £ sign and the # to be the same as the screen."
70 READ N                            '  If no WHILE/WHEND then change 80 & 110 to:
80 WHILE N<>-1                       '  IF N=-1 THEN GOTO 120
90 LPRINT CHR$(N);
100 READ N
110 WEND                             GOTO 80
120 ON ERROR GOTO 0
130 LOCATE 20,23
140 PRINT"Printer inisalization done with."
150 SYSTEM  '                        This could be system, return, stop, or .
160         '                        Move rom chars. into ram
170 DATA 27,58,0,0,0
180         '                        Use ram chars.
190 DATA 27,37,1,0
200         '                        Define 35 as #
210 DATA 27,38,0,35,35,140,40,40,254,254,40,40,254,254,40,40,0
220         '                        Define 156 as £
230 DATA 27,38,0,156,156,139,18,18,126,146,18,128,2,128,66,0,0
240         '                        Let chars. 128-159 & 255 be printed
250 DATA 27,54
260         '                        End of data flag
270 DATA -1
280 IF (ERR=24)OR(ERR=25)OR(ERR=27) THEN LOCATE 20,24:PRINT"THE PRINTER IS PLAYI
NG DEAD.":BEEP
290 LOCATE 22,26:PRINT"HIT A KEY TO TRY AGAIN."
300 RESTORE '                                  -Start again!
310 DEF SEG :POKE 106,0 '                      -Emptys the keyboard buffer
320 IF INKEY$ <>"" THEN RESUME 10 ELSE GOTO 320
```

AMSTRAD LVAR

This short utility for the Amstrad will print out all the variables and their current values used in a Basic program. Put a break point where the bug occurs and type GOTO 65500. The program should be MERGEd in from tape or disk rather than loaded in.

This routine uses a few variables of its own which should be avoided in your Basic program. These are LV,LVS, LVL and LVS$.

J W Jack

```
65500 '-----------------------------------------------

65501 '- LVAR. - J.W.Jack - 1985.

65502 DEF FNlv(x)=PEEK(x)+256*PEEK(x+1) :lv=0 :lvs=FNlv(44679)-17

65503 FOR lvl=FNlv(44677) TO lvs-16

65504 IF PEEK(lvl)>0 THEN GOSUB 65508

65505 NEXT

65506 lvs=lvs-16  :  POKE  44679,lvs-INT(lvs/256)*256  :  POKE
44680,INT(lvs/256)

65507 END

65508 '- Label.

65509 lvl$=""

65510 IF PEEK(lvl)>128 THEN lvl$=lvl$+CHR$(PEEK(lvl)-128) :  GOTO
65511 ELSE lvl$=lvl$+CHR$(PEEK(lvl)): lvl=lvl+1 : GOTO 65510

65511 PRINT lvl$;

65512 '- Type & Value.

65513 lvl=lvl+1

65514  IF PEEK(lvl)=1 THEN PRINT"% = ";FNlv(lvl+1)  :  lvl=lvl+3:
RETURN

65515  IF  PEEK(lvl)=2  THEN  PRINT"$  =  ";CHR$(34);  :FOR
lvg=FNlv(lvl+2)  TO  FNlv(lvl+2)+PEEK(lvl+1)-1  :  PRINT
CHR$(PEEK(lvg));:NEXT  :PRINT  CHR$(34)  :  lvl=lvl+PEEK(lvl+1):
RETURN

65516  IF  PEEK(lvl)=4  THEN  FOR  lvg=1  TO  5:POKE
lvs+lvg,PEEK(lvl+lvg) :NEXT :PRINT " = ";lv :lvl=lvl+6 :RETURN

65517 lvl=lvl+2 : PRINT" is a FuNction." : RETURN

65518 '-----------------------------------------------------
```

ATARI CLOCK

This listing is for all Ataris, and is a real-time clock which is accurate to about 10 seconds a day.

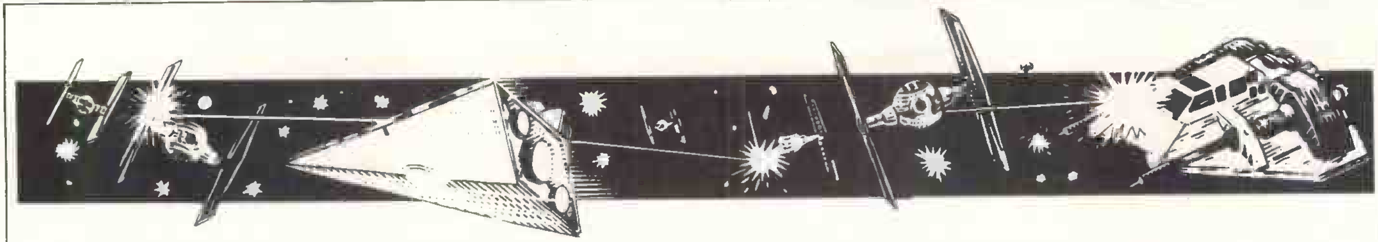
When run it provides a 12-hour digital clock in the top right-hand corner of the screen.

The program is interrupt-driven, leaving normal operations unaffected, and updates the time by looking at the Atari's 50Hz clock.

It is affected by scrolling or clearing the screen, but will reappear in the same place after one second.

Mauro Maestranzi

```
9000 GRAPHICS 0:? "REAL TIME CLOCK":? :? "BY MAURO MAESTRANZI":? :? "TIME IS IN
HH:MM:SS FORMAT"
9010 TRAP 9030
9020 FOR A=1 TO 300:READ M:POKE A+1535,M:NEXT A
9030 ? :? "ENTER TIME: ";USR(1536)
9060 DATA 162,0,32,199,6,24,42,42,42,42,141,255,6,32,199,6,24,109,255,6,157,240,
6,232,224,3,240,11,169,58,141,251,2,32
9070 DATA 208,6,76,2,6,173,49,2,133,205,173,40,2,24,105,63,133,204,144,2,230,205
,169,0,141,14,212,169,79,141,36,2,169,6
9080 DATA 141,37,2,169,64,141,14,212,76,0,160,162,0,202,208,253,240,14,162,0,173
,243,6,105,1,141,243,6
9090 DATA 201,80,144,96,142,243,6,173,242,6,105,0,141,242,6,201,96,144,35,142,24
2,6,173,241,6,105,0,141,241,6,201,96
9100 DATA 144,20,142,241,6,173,240,6,105,0,141,240,6,201,10,144,5,169,1,141,240,
6,173,221,6,208,41,24,162,2,160,0,189
9110 DATA 240,6,72,41,15,9,16,145,204,104,136,106,106,106,106,41,15,9,16,145,204
,136,169,26,145,204,136,202,16,225,200
9120 DATA 169,0,145,204,76,98,228,142,254,6,32,226,246,174,254,6,142,254,6,32,17
0,246,41,15,234,174,254,6,96,0,0,0,0,0,0
9130 DATA 0
```



Grand Prix-style motor racing, hassle from intergalactic muggers, and an impression of the end of the world nuclear-style — take a trip with Stephen Applebaum through this month's selection of great games for the BBC, Commodore 64, Spectrum and Atari.

Grand Prix

Title: Revs
Computer: BBC B
Supplier: Acornsoft
Format: Cassette, disk
Price: £14.95/£17.65

Aviator and Elite are hard acts to follow but Acornsoft has done it again with Revs, a full-colour motor racing game which looks set to emulate the success of its predecessors.

Revs' scenario is not new. Atari had the idea some years ago with Pole Position, but whereas the latter provided a good, fun arcade game, it never captured the exhilaration of sitting behind the wheel of a powerful racing car hurtling around a Grand Prix circuit at break-neck speeds.

Revs, on the other hand, straddles the boundary between pure arcade and simulation, treading the same path cut by Aviator, the first of Acornsoft's classic trio. The action is so accurate, you can almost feel the wind gushing from the television as you motor your way around the Silverstone track.

Before getting down to the serious business of racing, a practice section gives you a chance to get the feel of the car's controls. Most new players will be thankful for this option — the manual is not kidding when it says: 'You will need to practise a great deal to master the skills of a formula 3 driver.' Even getting the car running is difficult, but once started you soon find yourself motoring along quite happily until the first bend when you skid off the track and brake, putting the car into an uncontrollable spin. Crashing results in a rather disappointing lattice-work pattern being drawn across your field of view.

When you feel you are confident enough to race, a state I never reached, you can be ambitious and embark on your first time trial. To be competent to race, the manual suggests that you should consistently complete a circuit in under 1.40 minutes. Most drivers won't manage this for quite a while, so there are three classes of race: novice, amateur and professional.

The novice class can be entered by anyone because rescue crews are on constant alert to help with the aftermath of a pile-up. The amateur and professional classes cannot be entered immediately, both requiring a qualifying time.

Racing is difficult and takes a lot of concentration. Not only do you have to deal with the perils of coping with your own car, but also make sure that you don't bump into anyone else. Even the slightest knock can send you careering onto the grass, only to be man-handled back onto the track by the rescue services.

I would not normally rave about a motor racing game — there are far too many of them — but Revs has something different to offer. The graphics surpass even the excellent Aviator, achieving a stunning authenticity that will be difficult to match in the future.

Revenge is mine

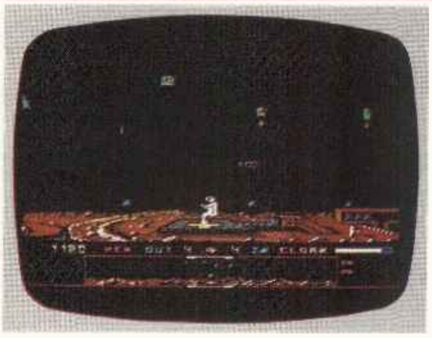
Title: Bounty Bob Strikes Back
Computer: Commodore 64
Supplier: US Gold
Format: Cassette
Price: £9.95

Bounty Bob Strikes Back is the long-awaited follow-up to Miner 2049er, the program which provided the inspiration for games such as Manic Miner and Jet Set Willy (you should have already guessed that Bounty Bob Strikes Back is a ladders and levels game).

Like its predecessor it is set inside a mine, but unfortunately things have changed for the worst since Bob's first visit. Whereas the mine was previously inhabited by friendly, furry animals, it is now overrun with radioactive mutants, the result of a metamorphosis the animals have experienced due to their food having been contaminated with waste dumped by the evil Yukon Yohan. Contact with any of the beasties is fatal, so you, as Bounty Bob, have your work cut out if you are to secure the mine and defeat Yukon Yohan.

As you bounce around the mine's various levels, you collect pieces of equipment which lower the radiation level, allowing you to wreak revenge on the mutants. But you must be quick because the radiation level soon rises again. Getting around the mine involves jumping between ledges and climbing ladders; there are often shortcuts with various kinds of lift, but I found them difficult to use. So much so, in fact, I was not able to get past the second of the game's 25 screens.

Anyone who enjoyed Miner 2049er will find Bounty Bob Strikes Back an absolute joy. It's a game which makes Jet Set Willy look almost prehistoric.



'I got the blues...'

Title: Dropzone
Computer: Atari
Supplier: US Gold
Format: Cassette
Price: £9.95

Dropzone is another minor classic from US Gold. This time you are not down a mine or flying over Moscow but gliding over the surface of a planet, testing out your new jet pack. Noticing several blue creatures having difficulty landing, you decide to help by taking them to the dropzone.

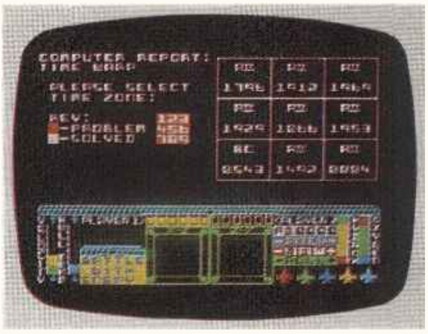
Unbeknown to you, they were having rather more trouble than just manoeuvring, and were in fact being pursued by a horde of intergalactic muggers. Fortunately you are carrying three smart bombs, a laser and a cloak, so you are not exactly defenceless.

Defender fans will love Dropzone because the playing technique is exactly the same — you zoom over the planet's surface, blasting away at the ever-increasing number of attackers. Your normal mode of defence would be to use a laser, but when the going gets tough smart bombs, each of which destroys everything within a set radius, become the only viable method. The ambiguously-named cloak also comes in handy, making you invisible for a limited period.

Although Dropzone is virtually a rewrite of Defender, the quality of its graphics and sound make it far superior.

The planet's surface, for example, is much closer to an imagined lunar landscape, while the explosion caused by your man being hit by an enemy projectile is the nearest I have yet seen to a firework. The sound is also excellent, with realistic explosions and an enticing whistle coming from either the blue creatures or the enemy — I couldn't tell which.

I often find arcade games all much of a muchness, but Dropzone's riveting action really got the adrenalin flowing. This is one game I will return to again and again.



Across the miles

Title: Starion
Computer: Spectrum 48k
Supplier: Melbourne House
Format: Cassette
Price: £7.95

When Elite appeared on the BBC it was hailed as being truly innovative, thanks mainly to its superb graphics. Who, then, would have thought that a game sporting 3D wire-frame graphics, more detailed and fast-moving than those on the BBC, would appear on the Spectrum as a game called Starion from Melbourne House?

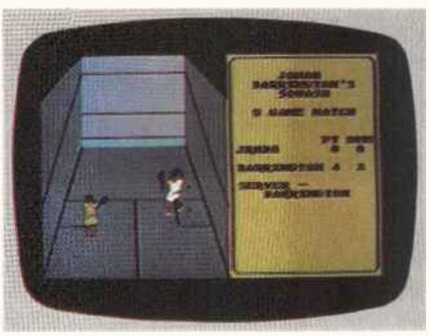
Starion is one of those rare games which mixes good, old-fashioned arcade action with brain-teasing puzzles. Players require not only physical skills, but mental dexterity as well. Starion achieves this by having a scenario so outlandish, it makes even the C5 travelling 15 miles on a single recharge seem plausible.

You are told that time-travelling aliens have managed to rearrange history, putting the universe at risk of total collapse. Only by going back through time, destroying the aliens and capturing their historical booty, can the cosmos be returned to order.

Trouble is, the cargo is shared between several ships in each time zone, coming in the form of single letters. The only solution, therefore, is to fly to a time zone, capture the letters and form a word from them. Generally, the word will be an answer to a question posed in one of the other time zones, so not only do you have to be able to decipher the answer, but know your history too. The obvious answer is not always the right one so a little lateral thinking is needed.

Working out the anagrams is a small but extremely important part of the game. For the most part, you can zap away at aliens to your heart's content, but unless the anagrams are successfully completed, Starion can become extremely boring, developing into little more than a souped-up Space Raiders.

On the whole, Starion is an excellent game which, although not as complex as Elite, is a milestone in Spectrum programming in its own right.



Sport for all

Title: Jonah Barrington's Squash
Computer: Commodore 64, Spectrum 48k
Supplier: New Generation Software
Format: Cassette
Price: £7.95

You would think that squash, the agrophobic's version of tennis, would be a difficult game to simulate on a computer. But Jonah Barrington's Squash, from New Generation Software, admirably captures the atmosphere of the sport, including its little idiosyncrasies.

Versions are available for the Commodore 64 and Spectrum, although both differ dramatically due to the pros and cons of the machines. The major difference is in the success of something the game's writers call 'Reprosound', which allows New Generation Software to digitise virtually any sound and incorporate it into a program without the use of any hardware add-ons.

In this case, Jonah Barrington's voice has been written into the program to call scores, lets, and so on. For obvious reasons, this can be appreciated more on the Commodore 64, being reduced to little more than a hiss on the Spectrum. The graphics are also better on the 64.

Jonah Barrington's Squash can be played by one or two players. I recommend the former for beginners because, unless both players have had plenty of practice, the game can become very tedious as both successively miss the ball.

If you know anything about the game, you will be familiar with the grading system used to indicate the speed of a ball. For example, a novice would usually play with a slow ball, identified by a red spot, while a professional would usually play with a yellow ball. There are four levels of difficulty, all of which are included in the program.

Something that will be of most use to

the Spectrum owner is the ability to customise the controls. This facility enables the user to set the up, down, left and right controls for a joystick, allowing the use of almost any interface.

During play, the display features a view from the rear of the court as if you were looking through a glass wall. By moving the joystick you are able to move your man around the court, as well as control his racquet arm. In this respect the Spectrum version is similar to Psion's Match Play.

Jonah Barrington's Squash is one of the best sport simulations I have seen on any home micro. The graphics are excellent, as is the sound, especially on the Commodore.

It's a pity that Spectrum owners won't be able to hear Reprdsound at its best, due to the limited Spectrum sound.

The shape of things to come?

Title: Theatre Europe
Computer: Commodore 64 (as reviewed), versions planned for the Amstrad CPC 464, Atari, MSX
Supplier: PSS
Format: Cassette, disk
Price: £9.95/£12.95

As if we didn't have enough to worry about, PSS' latest offering speculates over what could happen in the first 30 days of a war in Europe, a time-span long enough to cover the beginning of hostilities to the end of civilisation.

As the opening music runs its course, you are asked to select a side and whether or not 'action screens' are to be used (the latter are arcade sequences). That done, let battle commence!

The game begins on day one at DEFCON 5 — a military term indicating the likelihood of making a nuclear attack: if the condition reaches DEFCON 1, it means the button has been pressed and the missiles are flying. Which direction they take is for you to decide.

Like most war games, the major part of Theatre Europe takes place on a map. Armies are represented by circles, blue for NATO and red for the Warsaw Pact, and each can be identified by the use of a cursor. Individual armies can be moved via the cursor, with the limitation that those deployed in the mountains can only move every other go.

Following the movement phase comes the attack phase, which involves much the same procedure as that already described except that both an allied and opposing army are selected. If the action screens option is chosen, the ensuing skirmish is depicted by a graphic sequence showing enemy tanks, jets and helicopters attacking your position in wonderful 3D. You can fire back and, depending on how many of the enemy are destroyed, you receive a bonus (or penalty). After a set length of time, the display switches back to the map screen.

Last but not least is an air phase, during which air units can be assigned to special missions. Level one can be played without employing this phase, but this slows the game down. Special missions include launching a strategic chemical or nuclear attack, or just firing off all your missiles at once.

Before a nuclear attack can begin, you must know the codeword that initiates a launch. This is given on a map supplied with the program, although a more interesting way of getting it is to phone a number flashed up onscreen. When dialled, you get a taped message in the form of a simulated news broadcast telling of a breakdown in arms limitation talks and a build-up of Soviet tanks on the East German border. Suddenly, the message breaks off and a woman's voice gives the code.

While the missiles are in flight, their path is depicted on the map screen. If the strike was an all-out one, the 'other side' is quick to retaliate, firing off all its warheads. As the missiles near their target the display switches to show a city, while an impressively accurate siren sounds to warn of the attack. Very soon, the city is rocking under the effects of the explosion. Of course, the inevitable mushroom-shaped cloud is quick to follow, rising high above what is left of the devastated skyline.

When all the major cities have been destroyed, a feeble message, 'Civilisation as we know it has been destroyed' appears; the world ending with more of a whimper than a bang.

A little dodgy, maybe...

Title: Minder
Computer: Spectrum (as reviewed), MSX, Amstrad, Memotech and Commodore 64
Supplier: Dk'tronics
Format: Cassette
Price: £9.95

Minder is another attempt to take a successful TV program or film and turn it into a game. The problem with this idea is that the writers feel the game will be a success merely because of the reputation of the product on which it is based, the result being a program of little substance and limited appeal. Minder does not fall into this category, although it does have its faults.

As Arthur Daley, you are your own worst enemy in this simple game of buying and selling, the aim of which is to finish a 14-day trading period with more money than when you started. Only thing is, many of the goods you have stocked up in your warehouse are stolen, putting you under the close scrutiny of Sgt Chisholm, the local bobby, as well as making them difficult to get rid of.

Help is at hand in the form of Terry, who will deliver and collect goods as well as act as your minder — at a price, of course. Apart from being a general dogsbody, he will also get you out of any tight corners. For example, if frustration leads you to swear at one of the other characters, you will find yourself in hospital and several trading days down unless Terry's on hand to dissuade your attacker.

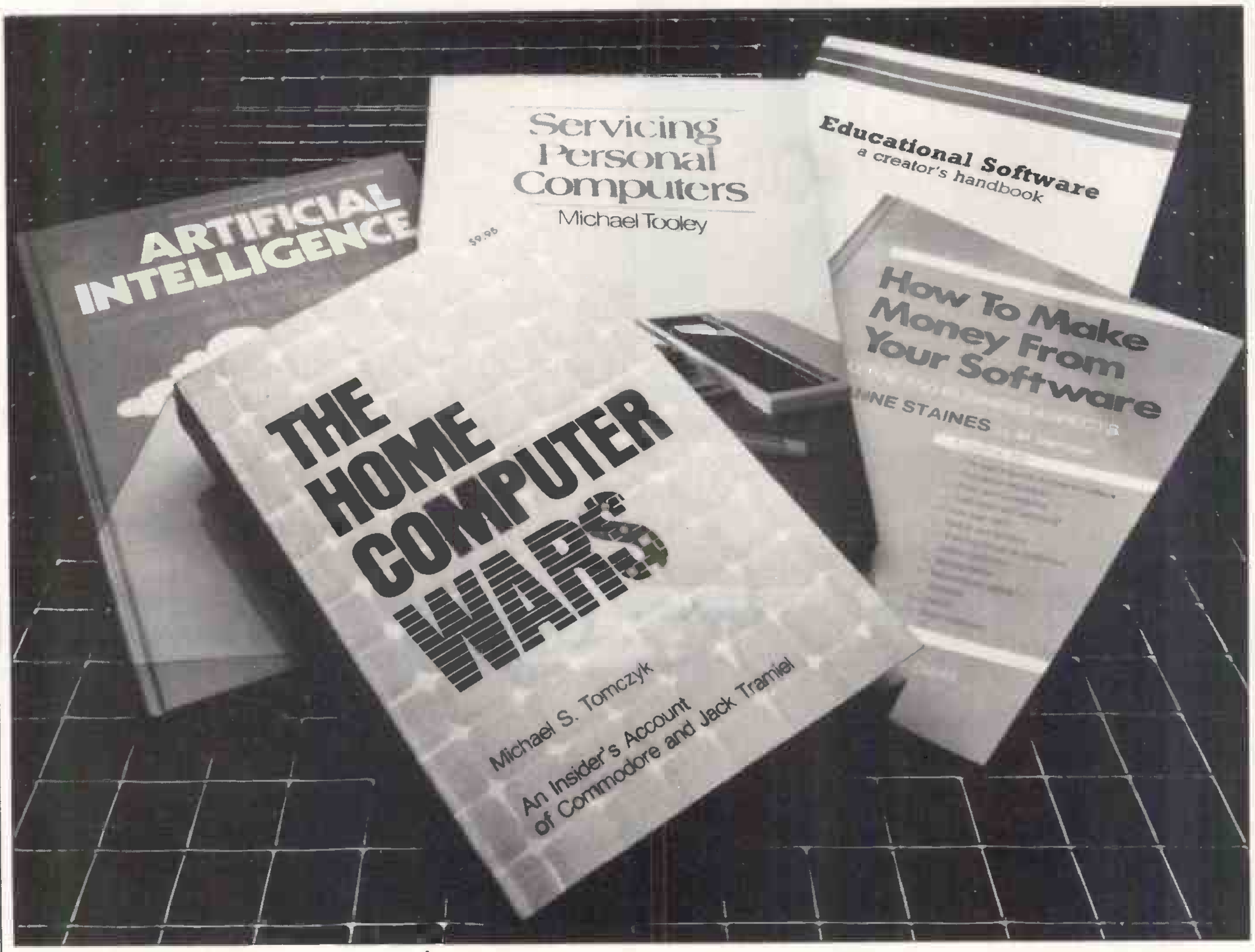
The number of locations that can be visited are limited to Terry's flat, the Winchester Club, the lock-up (warehouse) and several dealers' premises. Driving between locations involves a Ghostbusters-like sequence where your car motors through the streets between trading sites.

One of Minder's most powerful features is its ability to allow a two-way conversation between the player and any of the characters in the game. Unlike programs such as Valhalla and The Hobbit, Minder really gives the impression that its characters are intelligent, or at least it does most of the time. I found some of the characters to be a little shaky in their trading technique, sometimes accepting a lower price for goods than that which I had offered. Even so, I didn't manage to finish the game with a profit.

Minder is by no means perfect, but it does offer an interesting alternative to alien-bashing or adventuring. END

BIBLIOFILE

In this month's book selection, David Taylor warns against DIY micro maintenance and throws himself into the trenches to avoid the computer wars. Read on . . .



War of words: inside Atari

Title: The Home Computer Wars
Author: Michael S Tomczyk
Publisher: Computei Books
Price: $9.95

This book, if I might just sum up, is a stinker. Ostensibly it's the 'inside' story of how Jack Tramiel (for four years the author's boss) founded Commodore, fought off arch-rival Atari, then quit Commodore, retired, went round the world, came back and bought up Atari. But the person we get to know, alas, isn't so much the irrespressible Tramiel as the insufferable Tomczyk. He's not a shy man, still less a modest one. Mad as a hatter is how I'd describe Mr Tomczyk.

His obsessively gee-whiz story is dedicated 'to all the people who said I'd never make it, because they're the ones who made me try the hardest,' among them Tomczyk's Mrs 'for making me feel like a genius when I felt like a shlub' and his mother 'for giving up her singing career so I could be a writer.'

The next thing I knew, begins writer Tomczyk, *I was sitting in a foxhole with a bunch of smiling young geniuses. I poked my head out of the trench to see what was going on and a floppy diskette came whirring by. I ducked and it missed me by inches. Somebody handed me a chip and yelled 'Start Computing!' That's the kind of war it was.*

For this Mom gave up singing?

Wait, here's Jack Tramiel. *His large dark brown eyes were set deep beneath thick wiry brows and tended to bulge slightly . . . When he spoke his lips curled, twisting and contouring into a thousand shapes and portraying a thousand emotions . . . Sometimes he looked and moved like an Asian bear . . . I guess you could say he had a schizophrenic face. It matched his moods, but then we were all rather schizoid at Commodore. You had to be. It was war.*

And this, I imagine, must be shell-shock. There are a further 300 pages in this vein.

Tramiel was himself a survivor of the Nazi holocaust and apparently ever after saw his business in terms of war — his men as tough troops, fighting off the Japanese, slashing prices to conquer the home front — not to mention more prosaic analogies: 'Business is like sex: you have to be involved.'

Tomczyk is a Vietnam veteran and asserts that he was as a result battle-hardened for the rigours of corporate in-fighting, back-stabbing and character assassination which, we're repeatedly told, were the norm at Commodore.

Maybe so, but Tomczyk's holy-smoke narrative style parodies all attempts to get any interesting insight. You're left incredulous right enough, not so much at the way things were (and presumably still are) with Tramiel, but by the fact that one of his acolytes can produce such gunk.

Not, as you may have gathered, recommended.

Curiosity kills

Title: Servicing Personal Computers
Author: Michael Tooley
Publisher: Newnes Technical
Price: £17.95

My advice to those about to take a computer to bits is — *don't*. Unless you see diagnostic fault-finding as your life's work (in which case thorough training would not come amiss), to tinker with bewilderingly complex and delicate microelectronic innards is about as prudent as taking up brain surgery part-time.

Still, the insatiably curious and itchy-fingered Mr Tooley is clearly not a man easily dissuaded. Before you can say 'Blimey, I think my 8-bit tri-state bidirectional data bus must be on the blink' he's got the lid off and is in, up to his elbows in splintered chips with his logic analyser, oscilloscope, test prods, digital frequency meter, set of jeweller's screwdrivers, junior hacksaw and trusty pair of snipe-nose (half-round) pliers.

With dogged precision, Mr Tooley then sets about locating and correcting numberless malfunctions, glitches and bugs; stripping down disk drives, probing the CPU, gutting his monitor, the printer scattered in a thousand pieces on the bench.

It's all very well, very detailed, sometimes absurdly comprehensive ('The bench should be constructed from a substantial piece of timber') and it is, I suppose, quite absorbing for insomniacs or for those with their pin-outs out.

But I soon came across an intractable fault in Mister Fixit Tooley's own operating system. It is, of course, that while most of us can lay hands on a junior hacksaw or, at a pinch, a pair of snipe-nose (half-round) pliers, the toolbox which contains a logic analyser or oscilloscope is not so easy to locate. And I'd imagine it costs about the same as tossing your kaput computer into the nearest skip and buying half a dozen replacements.

Proceed with utmost caution, I say again, if ever you're tempted to tackle DIY computer repairs. If you're already well-versed in electronic troubleshooting, then this is a useful and unusual book. If, on the other hand, changing torch batteries is nearer your handyman mark, you might think about a service contract instead.

Do nothing until you read this

Title: How To Make Money From Your Software — legal and business aspects
Author: Anne Staines
Publisher: ESC Publishing (Oxford)
Price: £6.75

Anne Staines is a barrister and her brief in this slim, explicitly-titled paperback is to *précis* the legal mumbo-jumbo surrounding software protection, to suggest sound marketing strategies, and to advise upon setting up and financing a small company.

Good software, she points out, isn't half in demand and *should* — but by no means necessarily *will* — make a bob or two for its author.

Here the typical pitfalls are identified and more street-smart approaches explained; if not in exhaustive detail then at any rate in a brisk, lucid and authoritative vein that serves as an excellent introduction to the software-writing tyro. The assumption — and it's a fair one — is that however brilliant at inventing or coding programs such tyros may be, they might well be commercially naive.

Making money from software is a tantalising proposition but one fraught with difficulties and injustice. Should you contemplate giving it a go, this book describes the basics of what is involved and does it very well.

The blackboard jungle

Title: Educational Software — a creator's handbook
Editors: Ken Alexander and Diana Blanchard
Publisher: Microelectronics Education Programme
Price: £25

Notwithstanding that such luxuries as pencils, rubbers and exercise books are harder and harder to come by, so disaffected teachers complain, every school must have its computers. Mrs Thatcher says they must, so that's that.

Schools have to decide what to do with the things: whether to concentrate upon computer studies *per se* or to regard the machines primarily as high-tech teaching aids, running software custom-tailored towards enhancement of the general education process all the way from A is for Apple (or Atari) to sixth-form studies.

It was with the latter, more desirable approach in mind that the Government nearly five years ago established the Microelectronics Education Programme (MEP), and charged it with bringing together educational specialists and software writers with a view to pooling their talents, ideas and needs.

This book is a distillation of what's been learned to date and is set to become the standard reference for pioneers in software's blackboard jungle. It fillets the subject under six major headings: origination and design, coding, field trialling, software support, publication and software evaluation. Plough through that lot and any teacher should have an insight into what software developers need to know about education, and the software developers in turn should have a better handle on what teachers expect of them.

It's tough going, too much infested with jargon in both camps, but it is a useful and encouraging picture which in the end emerges. Britain's programme of computerising schools has an international reputation for solid achievement, and this book combines the field experience of those who have themselves achieved it.

Specialised, perhaps, but a stimulating read for anyone with a smidgin of vocation to have computers teach kids to do much more than program or play games.

An insomniac's dream

Title: Artificial Intelligence — applications to logical reasoning and historical research
Author: Richard Ennals
Publisher: Ellis Horwood
Price: Not known

If this work has a fault it's that so much of it is incomprehensible. It has been many years in the making, its intensely academic author says, and I fear it could be many years in the reading, too.

It's tricky for a start to grasp precisely what it's meant to be about — supposedly artifical intelligence (currently a fashionable and therefore brisk-selling subject), but apparently about AI as applied to teaching history with the help of computers.

To that end the role of logic programming is explored, intelligent information retrieval systems are examined, models proposed and the fifth generation of computing invoked. The mind-stretching benefits of Prolog are much in evidence, as are such mind-boggling asides as Jean Piaget's doctoral work on the classification of molluscs, Beatrice Henin's study of leasehold agreements in 17th-century Marseilles, a soil (or bird) identification program using CHIMP, the nature of archaeological knowledge, obscure Roman wine vessels, and a computer-aided analysis of the calorie count of a typical French tomato salad.

Heady stuff, you'll agree, and strictly for humourless boffins steeped in cracking what, if anything, is meant by what, whether and why.

More research work may yet be needed to establish what proportion of students can stay awake. END

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.

EPSON SCREEN DUMPS

The request in *PCW*, February for the shortest screen dump routine in each popular code produced a hefty response in Z80 and 6502, with one 8066 routine but no 6809 or 68000 code!

The screen dump problem is that most screen formats treat each byte of data as a horizontal sequence of dots. Epson dot-matrix printers, on the other hand, expect each byte of bit-image data to encode a vertical strip of eight dots. The solution is to take a column of eight screen bytes (one eight by eight dot-matrix, often corresponding to an alphanumeric character) and twist it around, or transpose it. Every routine seems to use a different variation on this basic transposition method.

Z80 DUMP

Z80 code poured in and ranged in length from a very sophisticated 570-byte program from Ted Hayes of Northampton which dumps various formats in different print densities, to this 80-byte DUMP80 from John Kerr of Glasgow.

John makes a good attempt at generality by inputting the line and character-width counts, and the screen/start address, rather than having them programmed in. To cut down on byte use, the character width doubles as displacement to the next vertically adjacent screen byte, and its (assumed zero) high-order byte is used to effect a one-byte ADD Cy. Unfortunately, this generality is spoilt by DUMP80 setting an 80-dot margin whatever the screen width.

DATASHEET 1

```
:
:= DUMP80     Dump bit mapped screen to Epson standard printer.
:
:JOB          To produce a normal-density Bit Image screen dump
:             from a memory mapped screen to an Epson dot matrix
:             printer (or other printer accepting Epson control
:             codes), with a 4/3" left margin (centering a 320
:             dot wide dump on standard 241 mm paper).
:ACTION       For each screen line of 8 dot rows:
:             [ Set 8/72" line spacing.
:               Set normal density bit image mode.
:               Output data number = 8 × characters + 80.
:               Output 80 zero bit images for 4/3" margin.
:               For count of characters per line:
:               [ For bit count of 8:
:                 [ Save screen pointer.
:                   For line rows count of 8:
:                   [ Rotate screen byte left 1 bit.
:                     Shift output bit left into accumulator.
:                     Address screen one dot row higher. ]
:                   Restore screen pointer.
:                   Output bit image. ]
:                 Address next character. ]
:               Output carriage-return.
:               Address next line, 1st dot row, 1st byte. ]
:
:CPU          Z80
:HARDWARE     Screen RAM. The screen memory mapping must be such
:             that every bit controls one pixel and each
:             successive row of displayed bytes follows
:             contiguously from the last (no undisplayed
:             margins).
:             Epson standard (FX, MX or RX) printer. Must be set
:             to line-feed automatically on carriage-return.
:SOFTWARE     PRNTER - Epson printer driver, should preserve all
:             register contents.
:
:INPUT        HL addresses first byte of screen RAM (low memory).
:             BC = screen lines (vertical dots ÷ 8).
:             DE = screen line width (horizontal dots ÷ 8).
:               (BC and DE assumed less than 256)
:OUTPUT       HL addresses last byte + 1 of screen RAM.
:             BC = 0. DE unchanged. AF changed.
:ERRORS       Single line dump of entire screen will occur unless
:             the printer automatically line-feeds on 0DH code.
:             Unchecked use of D as a zero value.
:
:REG USE      AF BC DE HL
:STACK USE    4 + PRNTER stack use.
:RAM USE      None.
:LENGTH       80
:CYCLES       Not given.
:
:CLASS 2      -discreet       *interruptable    *promable
:-**---       -reentrant      -relocatable      -robust
:
:
DUMP80 PUSH HL          :Save HL and use to address     E5
       LD   HL,STRING   :Epson code sequences.          21 lo hi
       LD   B,5         :Count 5 codes.                 06 05
ESCSEQ LD   A(HL)       :initialise printer to          7E
       CALL PRNTER      :8/72" line feed and select     CD lo hi
       INC  HL          :normal density bit image       23
       DJNZ ESCSEQ      :mode.                          10 F9
:
       LD   H,D         :Calculate bita data bytes      62
       LD   L,E         :for one line of dump.          6B
       ADD  HL,HL       :Number of data bytes is        29
       ADD  HL,HL       :screen character width × 8     29
       ADD  HL,HL       :+ 80 for left margin.          29
       LD   A,L         :Get screen horizontal dots     7D
       LD   B,80        :+ margin dots as low order     06 50
       ADD  A,B         :byte to send to printer.       80
       CALL PRNTER      :Send no. of data low byte.     CD lo hi
       LD   A,H         :Get high order byte (with      7C
       ADC  A,D         :any carry from margin add)     8A
       CALL PRNTER      :and send to printer.           CD lo hi
:
       SUB  A           :Clear A for sending nulls.     97
MARGIN CALL PRNTER      :Send 80 zero bytes to          CD lo hi
       DJNZ MARGIN      :printer for left margin.       10 FB
       LD   B,E         :Set B = screen byte width.     43
       POP  HL          :Restore screen pointer.        E1
:
SQUARE PUSH BC          :Save char. & line counts.      C5
       LD   C,8         :Count 8 horizontal bits.       0E 08
:
COLUMN PUSH HL          :Save screen pointer.           E5
       LD   B,8         :Count 8 vertical bits.         06 08
:
ONEDOT RLC  (HL)        :Rotate screen byte, rotate     CB 06
       ADC  A,A         :next bit into A, repeat        8F
       ADD  HL,DE       :for 8 vertically adjacent      19
       DJNZ ONEDOT      :bytes of screen RAM.           10 FA
:
       POP  HL          :Restore screen pointer.        E1
       CALL PRNTER      :Output bit data byte.          CD lo hi
       DEC  C           :Repeat for 8 bits in each      0D
       JR   NZ,COLUMN   :of 8 bytes.                    20 F0
:
       INC  HL          :Address next column byte       23
       POP  BC          :and repeat for full width      C1
       DJNZ SQUARE      :of screen.                     10 E9
:
       LD   A,0DH       :Output carriage-return         3E 0D
       CALL PRNTER      :ready for next line.           CD lo hi
:
       LD   B,7         :Screen pointer is at start     06 07
NEWROW ADD  HL,DE       :of 2nd dot row, move to        19
       DJNZ NEWROW      :1st dot row of next line.      10 FD
:
       DEC  C           :Repeat full operation          0D
       JR   NZ,DUMP80   :for each character line        20 B6
       RET              :of screen, then exit.          C9
:
:...Code sequences to set 8/72" line spacing and select normal
:...density bit image mode (60 dots per inch). Bit image mode
:...sequence must be followed by 2-byte value (low order byte
:...first) giving number of bit data bytes to follow.
STRING DEFB 1BH,41H,8   :ESC A 8 (line space).          1B 41 08
       DEFB 1BH,4BH     :ESC K (bit image mode).        1B 4B
:
```

6502 DUMP

The shortest 6502 code at 87 bytes from W Anderton of Hampton, had to be disqualified for relying on a couple of absent subroutines to do much of the work. This is a pity since Mr Anderton, with tongue firmly in cheek, named his routine PRINTER and sent his print data straight to his Apple's memory-mapped peripheral device.

The one shown here, DUMP65 from Matthew Dunn of Manchester, is not quite as versatile as John Kerr's DUMP80. The 40-character width is encoded in the routine. The number of lines to dump, however, is variable because Matthew wrote the routine to dump screens in several of his Atari's graphics modes (for example, modes 3,5,7,7+) where bit-pairs are grouped to define colour and thus take up differing amounts of memory. ATARIB provides an entry to DUMP65 from Atari Basic.

DATASHEET 2

```
:
:= DUMP65       Dump bit mapped screen to Epson standard printer.
:> ATARIB       Entry to DUMP65 from Atari Basic.
:
:JOB            To produce a normal-density Bit Image screen dump
:               from a memory mapped screen to an Epson dot matrix
:               printer (or other printer accepting Epson control
:               codes), with a 1" left margin.
:ACTION         Set 8/72" line spacing.
:               For each screen line:
:               [ Output 10 character spaces for 1" margin.
:                 Clear character index.
:                 Set normal density bit image mode: 320 bit data.
:                 For screen characters 0 to line-end:
:                 [ For count of 8 dot rows:
:                   [ Copy current dot row byte to accumulator.
:                     For bit data store bytes 0 to 7:
:                     [ Shift accumulator left 1 bit.
:                       Rotate bit left into current store byte. ]
:                     Address next higher dot row. ]
:                   For bit data store bytes 0 to 7:
:                   [ Output bit data store byte. ]
:                   Index next character. ]
:                 Output carriage-return. ]
:
:CPU            6502
:HARDWARE       Atari computer for entry at ATARIB.
:               Screen RAM. The screen memory mapping must be such
:               that every bit controls one pixel and each
:               successive row of displayed bytes follows
:               contiguously from the last (no undisplayed
:               margins).
:               Epson standard (FX, MX or RX) printer. Must be set
:               to line-feed automatically on carriage-return.
:SOFTWARE       PRNTER - Epson printer driver, should preserve all
:               register contents.
:
:INPUT          M0 = number of screen lines (dot rows ÷ 8).
:               M2,3 Addresses 1st byte of screen memory.
:OUTPUT         P, A, X, Y and M0 to MB are changed.
:ERRORS         Single line dump of entire screen will occur unless
:               the printer automatically line-feeds on $0D code.
:REG USE        P A X Y
:STACK USE      4 + PRNTER stack use.
:RAM USE        M0 to MB
:LENGTH         125 (+ 16 for ATARIB entry).
:CYCLES         Not given.
:
:CLASS 2        -discreet        *interruptable      *promable
:------         -reentrant       *relocatable        -robust
:
:
:...ATARI assignment of storage. Note DATA is any eight
:...consecutive bytes (pp in code field is page number).
LINCNT  =       $CD             := SUBSET M0
COUNT   =       $CE             := SUBSET M1
LINPNT  =       $CB             := SUBSET M2
DATA    =       lo hi           :Address of any free eight bytes.

:...ATARI BASIC entry. DUMP65 origin at $0610.
ATARIB PLA                      :For DUMP65 exit to BASIC.    68
       LDA      $58             :Copy screen start address    A5 58
       STA      LINPNT          :(low order byte first)       85 CB
       LDA      $59             :from $0058 & $0059           A5 59
       STA      LNPNT+1         :to $00CB & $00CC.            85 CC
       LDA      #24             :Set 24 line count            A9 18
       STA      LINCNT          :in $00CD.                    85 CD
       JMP      DUMP65          :Jump to DUMP65.              4C 10 06
:
:
:...SUBSET assignment of values and pseudo-register storage.
:...Note DATA is in page zero (pp in code field = 00).
WIDTH   =       40              :Bytes per screen line (dots ÷ 8 ).
LINCNT  =       M0              :Stored number of lines (rows ÷ 8).
COUNT   =       M1              :Store for 8-byte count.
LINPNT  =       M2              :Stored screen RAM pointer.
DATA    =       M4              :8-byte store for transposed bit data.
:
DUMP65 LDA      #$1B            :Send sequence ESC A 8        A9 1B
       JSR      PRNTER          :to printer to set            20 lo hi
       LDA      #$41            :line spacing to              A9 41
       JSR      PRNTER          :8/72".                       20 lo hi
       LDA      #8              :                             A9 08
       JSR      PRNTER          :                             20 lo hi
:
DUMP   LDY      #10             :Count 10 spaces.             A0 0A
CENTRE LDA      #32             :Send 10 spaces to give a     A9 20
       JSR      PRNTER          :1" margin to each line       20 lo hi
       DEY                      :(smaller if printer is in    88
       BNE      CENTRE          :elite or condensed mode).    D0 F8
:
       LDA      #$1B            :Send ESC K sequence to set   A9 1B
       JSR      PRNTER          :normal density bit image     20 lo hi
       LDA      #$4B            :mode, then the two-byte      A9 4B
       JSR      PRNTER          :number of bit data (320)     20 lo hi
       LDA      #$40            :to follow, with low          A9 40
       JSR      PRNTER          :order byte first.            20 lo hi
       LDA      #1              :                             A9 01
       JSR      PRNTER          :                             20 lo hi
       BEQ      LINEST          :Jump to start, skipping      F0 08
       BNE      LINEST          :pointer restore.             D0 06
:
NXTBLK PLA                      :Restore saved pointer to     68
       STA      LINPNT+1        :first byte on top row        85 M3
       PLA                      :of each screen line of       68
       STA      LINPNT          :8 dot rows.                  85 M2
:
LINEST LDA      #8              :Set count for 8 bytes        A9 08
       STA      COUNT           :vertical on screen.          85 M1
       LDA      LINPNT          :Save pointer to first        A5 M2
       PHA                      :byte on top row of           48
       LDA      LINPNT+1        :each screen line of          A5 M3
       PHA                      :8 dot rows.                  48
:
NSHIFT LDA      (LINPNT),Y      :Get next byte.               B1 M2
       LDX      #0              :Index bit data store.        A2 00
:
SHIFT  ROL      A               :Rotate 8 bits from byte      2A
       ROL      DATA,X          :into the 8 separate bytes    3E M4 zz
       INX                      :of bit data store, results   E8
       CPX      #8              :in a transposition from      E0 08
       BNE      SHIFT           :horizontal to vertical.      D0 F7
:
       CLC                      :Prepare to add, no carry.    18
       LDA      LINPNT          :Add screen byte width to     A5 M2
       ADC      #WIDTH          :pointer so it addresses      69 28
       STA      LINPNT          :1st byte of next dot row.    85 M2
       LDA      LINPNT+1        :(After 8 additions, it       A5 M3
       ADC      #0              :will address 1st byte of     69 00
       STA      LINPNT+1        :top row of next line.)       85 M3
:
       DEC      COUNT           :Repeat for 8 vertically      C6 M1
       BNE      NSHIFT          :stacked screen bytes.        D0 E2
:
       LDX      #0              :Then index bit data store    A2 00
SNDBLK LDA      DATA,X          :and send transposed bit      BD M4 zz
       JSR      PRNTER          :data to printer.             20 lo hi
       INX                      :This is one 8 x 8 dot        E8
       CPX      #8              :matrix.                      E0 08
       BNE      SNDBLK          :                             D0 F5
:
       INY                      :Repeat for number of bytes   C8
       CPY      #WIDTH          :across screen width.         C0 28
       BNE      NXTBLK          :                             D0 C0
:
       PLA                      :Discard saved pointer to     68
       PLA                      :last line of 8 rows.         68
       LDA      #$0D            :Send carriage-return         A9 0D
       JSR      PRNTER          :to printer.                  20 lo hi
       DEC      LINCNT          :Count off one line dumped    C6 M0
       BNE      DUMP            :and repeat for all lines.    D0 93
       RTS                      :Then exit, dump done.        60
```

8086 DUMP

DUMP86 by Dave Stanford of Kinross was the only 8086 (8088) routine submitted. It is quite compact at 137 bytes — the machine codes of the 16-bit and 32-bit processors are generally one or two bytes longer than those of 8-bit processors.

This routine is among the very few I received which bothers to reset line spacing to ⅙in. One thing it doesn't do is to ensure that the dump starts with the print head in the left-hand column.

All parameters are programmed into DUMP86, which makes it the least adaptable of the three DUMP routines. The only variability is that the extra segment (ES) can be set to any 16-byte boundary before entry. Consequently, the routine can be used to dump practically any area of memory and can cope with multi-screen environments.

DATASHEET 3

```
:
:= DUMP86       Dump bit mapped screen to Epson standard printer.
:
:JOB            To produce a normal-density Bit Image screen dump
:               from a memory mapped screen to an Epson dot matrix
:               printer (or other printer accepting Epson control
:               codes), with a 4/3" left margin (centering a 320
:               dot wide dump on standard 241 mm paper).
:
:ACTION         Address screen 2nd line, 1st dot row, 1st byte.
:               Set 8/72" line spacing.
:               For count of 24 lines:
:               [ Set normal density bit image mode: 400 bit data.
:                 Output 80 zero bit images for 4/3" margin.
:                 For count of 40 characters per line:
:                 [ For temporary store bytes 7 to 0:
:                   [ Address screen one dot row higher.
:                     Copy byte to temporary store. ]
:                   For bit image count of 8:
:                   [ For temporary store bytes 7 to 0:
:                     [ Rotate temporary store byte left 1 bit.
:                       Rotate bit left into accumulator. ]
:                     Output bit image. ]
:                   Address screen 8 dot rows + 1 byte higher. ]
:                 Output carriage-return.
:                 Address next line, 1st dot row, 1st byte. ]
:               Set 1/6" line spacing.
:
:CPU            8086 (8088)
:HARDWARE       Screen RAM. The screen memory mapping must be such
:               that every bit controls one pixel and each
:               successive row of displayed bytes follows
:               contiguously from the last (no undisplayed
:               margins).
:               Epson standard (FX, MX or RX) printer. Must be set
:               to line-feed automatically on carriage-return.
:SOFTWARE       PRNTER - Epson printer driver, should preserve all
:               register contents. Must be in the same Code Segment
:               as DUMP86.
:
:INPUT          ES = screen segment (actual address of screen RAM
:               first byte divided by 16 - screen RAM must begin on
:               a 16-byte boundary).
:OUTPUT         Flags, AL, BX, CX, DI and TMP changed.
:               All other registers and memory unaltered.
:ERRORS         Single line dump of entire screen will occur unless
:               the printer automatically line-feeds on 0DH code.
:REG USE        F AL BX CX DI ES
:STACK USE      6 + PRNTER stack use.
:RAM USE        TMP - 8 bytes temporary storage (directly addressed
:               as a CS offset).
:LENGTH         129 (plus 8-byte TMP store).
:CYCLES         Not given.
:
:CLASS 2        -discreet        *interruptable      *promable
:-**-*-         -reentrant       *relocatable        -robust
```

```
:
TMP     DB      0,0,0,0         :Storage for 8 bytes read   00 00 00 00
        DB      0,0,0,0         :from screen RAM.           00 00 00 00
:
DUMP86  MOV     BX,0140H        :Index 1st byte, 2nd line   BB 40 01
                                :for width subtraction.
        MOV     AL,1BH          :Send ESC A 8 sequence      B0 1B
        CALL    PRNTER          :to printer to set          E8 lo hi
        MOV     AL,41H          :8/72" line feed.           B0 41
        CALL    PRNTER          :                           E8 lo hi
        MOV     AL,08H          :                           B0 08
        CALL    PRNTER          :                           E8 lo hi
        MOV     CX,0018H        :Count of 24 lines.         B9 18 00
:
NEWLIN  PUSH    CX              :Save line count.           51
        MOV     AL,1BH          :Send ESC K sequence        B0 1B
        CALL    PRNTER          :to printer to set          E8 lo hi
        MOV     AL,4BH          :normal density bit         B0 4B
        CALL    PRNTER          :image mode, then number    E8 lo hi
        MOV     AL,90H          :of bit image data to       B0 90
        CALL    PRNTER          :follow (400), sending      E8 lo hi
        MOV     AL,01H          :low order byte first.      B0 01
        CALL    PRNTER          :                           E8 lo hi
:
        MOV     AL,00H          :Clear for margin spaces.   B0 00
        MOV     CX,0050H        :Count for 80 zero bytes.   B9 50 00
MARGIN  CALL    PRNTER          :Send 80 zero bytes out to  E8 lo hi
        LOOP    MARGIN          :effect 4/3" left margin.   E2 FB
:
        MOV     CX,0028H        :Count of 40 characters.    B9 28 00
NXTCH   PUSH    CX              :Save character count.      51
        MOV     DI,0007H        :Index temporary store.     BF 07 00
:
NXTDTA  SUB     BX,0028H        :Index next dot row.        83 EB 28
        SEG     ES              :Screen segment override,   26
        MOV     AL,[BX]         :get screen byte.           8A 07
        SEG     CS              :Code segment override,     2E
        MOV     [DI+TMP],AL     :store byte.                88 85 lo hi
        DEC     DI              :Repeat for 8 vertically    4F
        JNS     NXTDTA          :stacked screen bytes.      79 F2
:
        MOV     CX,0008H        :Bit count (8 per byte).    B9 08 00
NXTIMG  MOV     DI,0007H        :Index temporary store.     BF 07 00
:
NXTBIT  SEG     CS              :Loop, getting next         2E
        SHL     B,[DI+TMP]      :single bit from each of    D0 A5 lo hi
        RCR     AL              :8 stored bytes into AL     D0 D8
        DEC     DI              :in the correct order,      4F
        JNS     NXTBIT          :forming transposed data.   79 F6
:
        CALL    PRNTER          :Send bit data, repeat      E8 lo hi
        LOOP    NXTIMG          :until 8 bit images sent.   E2 EE
:
        ADD     BX,0141H        :Index next character.      81 C3 41 01
        POP     CX              :Restore character count,   59
        LOOP    NXTCH           :repeat for full line.      E2 D2
:
        MOV     AL,0DH          :Send carriage-return       B0 0D
        CALL    PRNTER          :to printer.                E8 lo hi
        ADD     BX,0118H        :Index next screen line.    81 C3 18 01
        POP     CX              :Restore line count,        59
        LOOP    NEWLIN          :repeat for all lines.      E2 A4
:
        MOV     AL,1BH          :Send ESC A 12 sequence     B0 1B
        CALL    PRNTER          :to printer to reset        E8 lo hi
        MOV     AL,41H          :linefeed to 1/6".          B0 41
        CALL    PRNTER          :                           E8 lo hi
        MOV     AL,0CH          :                           B0 0C
        CALL    PRNTER          :                           E8 lo hi
        RET     L               :Exit (restore CS:PC).      CB
:
```

6502 BIT ROTATION

BITROT from David Heale of Bolton wasn't submitted in response to the screen dump challenge. The concept, however, fits in neatly with the requirements for converting horizontal bit-images to a vertical format.

The routine rotates an 8-bit by 8-bit matrix stored in eight contiguous pages — zero bytes anticlockwise by 90°. The difference between a transposed matrix and a rotated one (as far as screen dumps are concerned) is the order in which the resultant bytes are output — the rotation must be sent out last byte first.

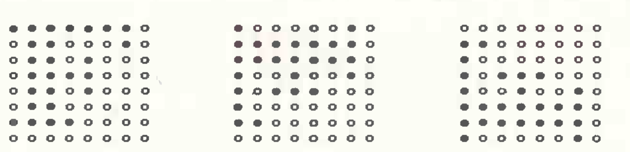
Fig 1 shows (b) transposed and (c) rotated versions alongside an original matrix (a) for the letter 'F'.

Fig 2 gives a short subroutine for sending out the rotated matrix result of BITROT as bit-image data. You will have to write your own routine to transfer blocks of data to SRC, and call BITROT and SENDRM.

BITROT reminds me of the safety officer who wore three belts and two pairs of braces. It clears all the destination bytes initially, which is an unnecessary operation as they are all going to be shifted out. Each destination bit is then cleared again before the source bit is copied to it in an 8-byte operation which involves saving A on stack — another unnecessary operation as the LSR DST instruction has already accomplished that task.

Despite its shortcomings, BITROT is a useful routine that ought to find a place in anyone's subroutine library.

END



(a) Original (b) Transposed (c) Rotated

Fig 1

```
:
:...Send rotated 8 × 8 matrix (character) to printer.
SENDRM  LDY     #8              :Index / count DST bytes.       A0 08
SENDLP  LDA     SPARE,Y         :Get next DST byte from end     B9 LF 00
        JSR     PRNTER          :sent out to printer.           20 lo hi
        DEY                     :Repeat for all eight bytes     88
        BNE     SENDLP          :of rotated 8 × 8 matrix.       D0 F7
        RTS                     :Then exit.                     60
:
```

Fig 2

DATASHEET 4

```
:
:= BITROT       Rotate an 8 × 8 bit matrix.
:
:JOB            To rotate an 8 × 8 bit matrix stored as eight
:               contiguous bytes in page zero by 90 degrees,
:               storing the result simularly.
:ACTION         Clear destination area.
:               For count of 8:
:               [ For each source byte (7 to 0):
:                 [ Shift destination byte 0 right by 1 bit.
:                   Copy most significant bit (msb)
:                   from current source byte
:                   to destination byte 0. ]
:                 For each source byte (7 to 0):
:                 [ Rotate current source byte left by 1 bit. ]
:                 Rotate destination area upwards by 1 byte. ]
:
:CPU            6502
:HARDWARE       None.
:SOFTWARE       None.
:
:INPUT          8-byte source matrix in M8 to MF.
:OUTPUT         8-byte result matrix in M0 to M7.
:               P, A, X, Y, M8 to MF and one page zero byte
:               immediately below M0 (designated 'LF') are changed.
:ERRORS         Indexing error if either source or destination page
:               zero blocks 'wraparound' zero page memory.
:REG USE        P A X Y
:STACK USE      1
:RAM USE        'LF', M0 to MF
:LENGTH         69
:CYCLES         Not given.
:
:CLASS 2        -discreet       *interruptable      *promable
:-**-*-         -reentrant      *relocatable        -robust
:
:
SPARE   =       LF              :Store for rotated destination byte.
DST     =       M0              :8-byte store for rotated matrix.
SRC     =       M8              :8-byte stored source matrix.
:
BITROT  LDA     #0              :Clear for clearing DST.        A9 00
        LDY     #8              :Index / count 8-byte DST.      A0 08
CLRDST  STA     SPARE,Y         :Clear 8-byte destination       99 LF 00
        DEY                     :page zero for rotated          88
        BNE     CLRDST          :result.                        DO FA
:
        LDX     #8              :Count for 8 DST bytes.         A2 08
OUTLP   LDY     #8              :Index / count SRC bytes.       A0 08
:
INLP    LSR     DST             :Clear for next SRC bit.        46 M0
        LDA     SRC-1,Y         :Get next source byte and       B9 M7 00
        AND     #$80            :select only next bit.          29 80
        PHA                     :Save next bit while            48
        LDA     DST             :re-clearing msb of DST         A5 M0
        AND     #$7F            :byte ready for next SRC        29 7F
        STA     DST             :bit.                           85 M0
        PLA                     :Restore next SRC bit and       68
        ORA     DST             :merge with DST byte,           05 M0
        STA     DST             :store back to DST.             85 M0
        DEY                     :Repeat for single bit from     88
        BNE     INLOOP          :each of 8 SRC bytes.           D0 EA
:
        DEX                     :Count DST byte completed       CA
        BEQ     BREND           :and exit if all done.          F0 1D
:
        LDY     #8              :Index / count SRC bytes.       A0 08
ROTSRC  LDA     SRC-1,Y         :Shift all source bytes         B9 M7 00
        ROL     A               :up by 1 bit, bringing          2A
        STA     SRC-1,Y         :next bit of each into          99 M7 00
        DEY                     :the msb ready for transfer     88
        BNE     ROTSRC          :to destination byte.           D0 F6
:
        LDA     DST+7           :Move last DST byte to          A5 M7
        STA     SPARE           :SPARE for DST rotation.        85 LF
        LDY     #8              :Index / count DST bytes.       A0 08
ROTDST  LDA     SPARE-1,Y       :Shift all DST bytes up         B9 LE 00
        STA     SPARE,Y         :higher in memory by one        99 LF 00
        DEY                     :byte, bringing next DST        88
        BNE     ROTDST          :byte ready for SRC bits.       D0 F7
:
        BEQ     OUTLP           :Go get next result byte.       F0 C8
:
BREND   RTS                     :Exit, matrix rotated.          60
:
```

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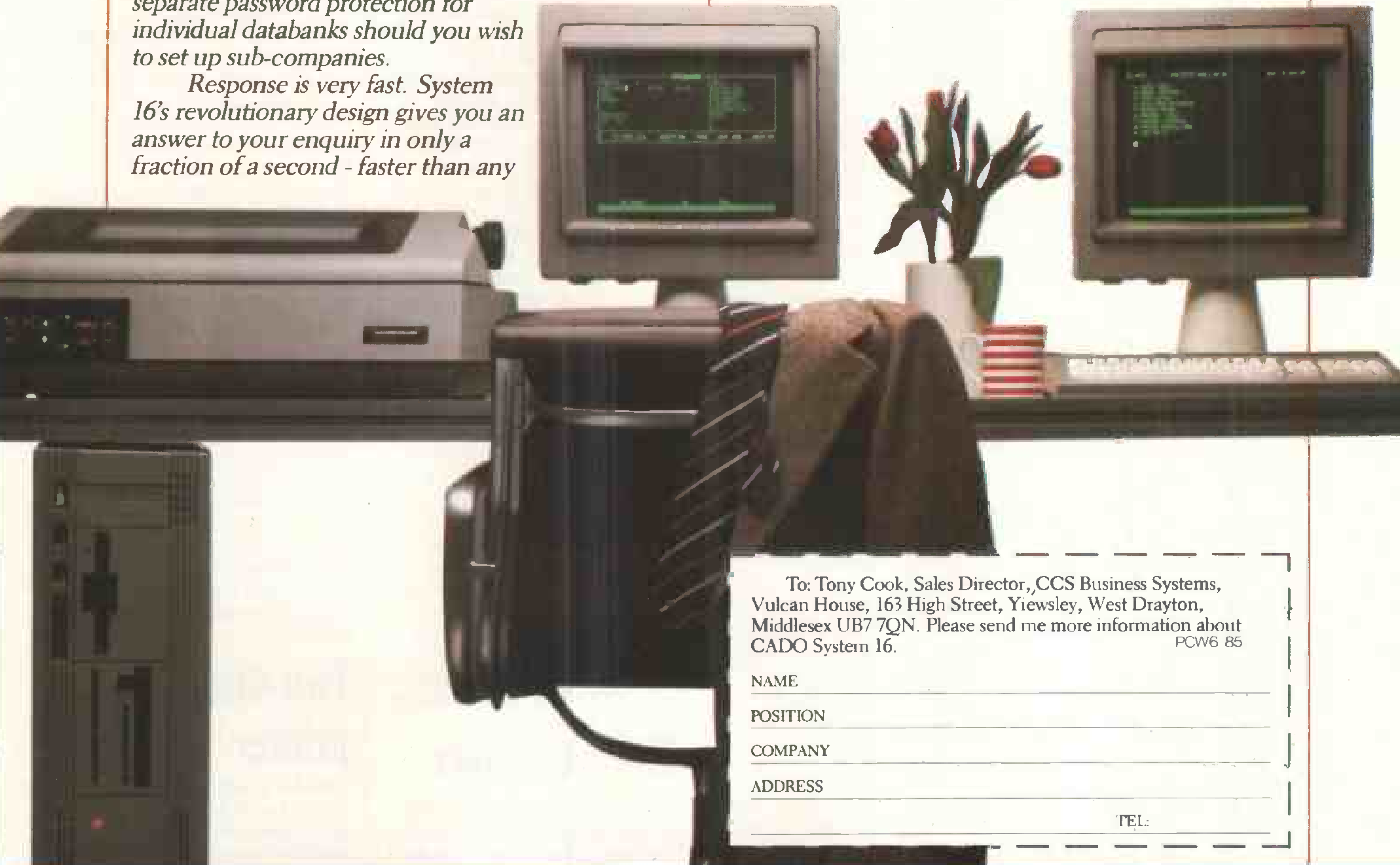

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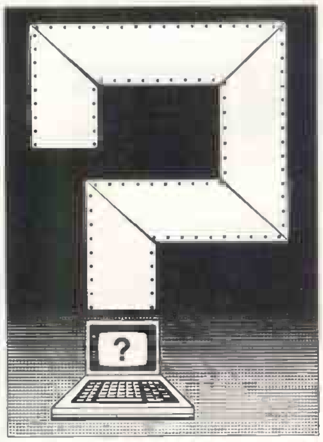


Getting started

I am a complete novice interested in learning how a computer works, but unfortunately neither the 'computer experts' or the public libraries have been able to provide any adequate material — it is either too brief or too complicated.

Can you suggest any books, magazines or organisations I could consult?
RD Thomas, Otford, Kent

A book called *The Mighty Micro* by Christopher Evans (Coronet) should fire your imagination; it gives a good, enthusiastic beginner's guide to computing. But you won't thoroughly appreciate micros until you get the chance to use one, preferably with someone around to help.

Go along to your local computer club and pick the brains of people there. You will soon find people willing to explain and demonstrate things (they probably knew as little as you a few months previously). New hobbies always seem complex at first until the techniques fall into place.

You can find the address of your local computer club from the Association of Computer Clubs — see the ACC News section on page 230.

Buy a cheap computer (perhaps second hand) as soon as possible: 'finding out' is preferable to 'learning', and this is especially true of computing. The Sinclair ZX81 and Spectrum are the best-documented machines for the beginner, but the model doesn't matter too much if there's someone to guide you at first.

Chips, mysterious chips

I have read several texts on the Z800 processor, which is said to be a direct upgrade from the Z80, but I cannot find any information on its actual application: pin-out diagrams, instruction set or schematics. Can you help?
Darren Brown, Keighley, West Yorkshire

The Z800 'super-Z80' was announced by Zilog in 1981, at about the time its rivals Intel announced the IAPX range of plug-compatible processors, 'super' versions of the 8086 processor. The IAPX chips have since appeared, but the Z800 is nowhere to be seen. It promised the most exciting specification of all, with a clock speed of 17MHz — eight times faster than the standard Z80 of the day — and a plethora of useful extra instructions for memory addressing and fast arithmetic.

At the time, I wrote to Zilog for further information and heard nothing. More recent enquiries also drew a blank. Until Zilog comes up with more details I will continue to think that the Z800 is nothing more than a figment of a marketing manager's imagination.

A conventional NMOS processor could not run at 17MHz unless there were major advances in semiconductor design. It is possible to increase processor throughput to some extent simply by running the same design at a higher speed — witness the Z80B, a 50 per cent faster version of the Z80A, and the 6809E, which is a fast 6809. But this trick won't work forever — after a while a fundamental re-think is needed. A 17MHz Z80, with extra instructions, would have to be quite a different beast from the normal version. One of the biggest problems would be simply keeping such a chip supplied with current and cool air.

If the chip worked at all, it couldn't just be plugged into the Z80 socket — it would need a new clock signal. More importantly, it is unlikely that the memory and peripheral chips for a 4MHz Z80A would be able to work at 17MHz unless they were exposed to the same radical re-design. Hardware compatibility is not likely to be great.

The Z80 is probably the most idiosyncratic processor ever produced. With its hundreds of *ad hoc* extra instructions bolted onto the specification of Intel's 8080, it would be extremely hard to design an efficient new chip which supported them all. Even assuming Zilog solves all these problems, it is usually about two years between the appearance of sample chips and full availability. We haven't even seen sample Z800s yet.

You might consider getting in touch with Hitachi, as it recently announced a 'super-Z80' chip rather like the Z800. The Hitachi HD64180's specification looks good. The chip supports all the Z80 instructions plus a few new ones including an 8×8-bit multiply. It is a low-power CMOS chip yet it runs fast, at 6MHz.

Unlike the Z80 the HD64180 uses internal 'pipelines', which means that it can manipulate memory at the same time as internal results are calculated. This is the technique used on the 6502 and 6809 to give high throughput at a low clock speed, and it improves performance considerably. The Hitachi chip also has extra hardware, including built-in serial ports, timers and memory controllers.

The real test will come when samples are delivered and users try to wire the HD64180 into a Z80 socket. Then we'll discover all the incompatibilities that weren't mentioned on the data sheet.

DIY cable box

Having some experience of electronics, is it practicable for me to construct a cable junction box along one of the following lines:
(a) Parallel connections throughout, leaving it to common sense to power up only one computer at a time?
(b) A simple diode matrix to connect lines from each computer to the printer bus?
(c) Using multiway wafer switches?
(d) Using electronic data selectors and/or bilateral switches to make and break each connection?

10 active lines need to be switched: STROBE, BUSY, and eight data lines. Which system do you recommend?
AJ Clarke, London EC2

I'm impressed — you've all but answered the question yourself. Answer (c) is the briefest and seems to me the most sensible, although the others might work too. Answer (a) is fraught with danger, even if you *do* believe in common sense, since even an inactive computer might interfere with the signal on its way to the printer. Answer (b) is nice in theory but might require some trial-and-error to get right. A faulty diode could cause all sorts of problems. The same goes for answer (d), which smacks of complexity for its own sake.

Answer (c) is easy to build (once you've got the right switch) and easy to check by eye if something goes wrong. The only thing to watch for is that the switch has contacts which break the first connection before they make the second.

Commercial switchboxes are expensively made by hand — the fairly low demand is spread between many small manufacturers. The price is what the market can bear — as long as a switchbox is cheaper than a second printer, it will be seen as economically viable by those who lack the knowledge, or the confidence, to build their own. Remember that many such boxes also incorporate serial-to-parallel converters or buffers.

Two-faced printer

I need a good, reliable printer which has a daisywheel (or more than one) at each end of the shaft on which they move (some other means of automatically changing daisywheels would do). This is to enable the printer to be used to produce the master material for offset printing of scientific text in which it is a convention that the names of species are printed in italics.
JH Atkinson, Dyfed

A year ago Diablo made a printer capable of changing its own daisywheels in mid-document — the Diablo ECS. This is rather hard to obtain as the distributors refuse to lend demonstration models to dealers. In turn, the dealers are reluctant to buy expensive hardware on the off-chance that they will be able to sell it. The Byte Shop chain quote an approximate price of £2300 for the ECS, which is a very high price when you consider that reliable, good-quality daisywheel printers such as the Juki 6300 retail for under £400. The Juki comes with the Courier typeface, but you can use many other faces including an italic one called 'Joan Italic 10/12'.

The snag with standard daisywheel printers is that you have to change typefaces by hand. However, most of them support a 'shadow' or 'bold' print which can be used to obtain a contrasting face without a change of wheel; this could be used for species names if you consider that a differential of £900 is a high price to pay to conform with convention.

Alternatively, if you're (very) confident about wielding a scalpel, you could print out the italic text in a separate run and glue words over the top of the main (non-italic) draft before printing. This is fiddly but it can give good results; any competent offset printing firm should be able to remove the shadows caused by the montage of individual words. You should use good-quality paper for the overlays, and make sure that you use the same pitch (character spacing) when printing the italics and the body of the text.

Another possibility would be to use one of the new high-resolution dot-matrix printers. These 'dual mode' printers allow fast printing in normal dot-matrix styles, or slower 'near letter-quality' printing where extra densely-packed dots are used so that it's hard to tell that characters are made up from individual dots. They can support almost any typeface by assembling characters from dots, although special 'driver' software may be needed. In particular, look at NLQ driver packages for the Epson range, the new Anadex printers, and printers designed for use with Apple's Macintosh system.

You might consider word processing a document as usual and having it typeset automatically: some firms can set type directly from popular micro disks. The price is generally far less than that for traditional typesetting, and the chance of typographic errors is reduced as the information does not have to be retyped by the typesetting machine operator. You specify changes of typeface with simple control sequences in your document. Your printers should be able to put you in touch with such 'budget typesetting' firms.

Operating systems explained

I have used home micros for some time and recently came across the 'business micro', an altogether different proposition. As part of my course at Teeside Polytechnic I am using an ACT Sirius, and I am becoming more and more confused about operating systems.

If a program is either CP/M-86 or MS-DOS, does it mean that it is usable on other systems which use either CP/M-86 or MS-DOS? For example, I use a Cobol compiler provided by the college which happens to work with MS-DOS. Can it be used on other MS-DOS machines?

I can't imagine that manufacturers have made machines compatible to the extent that software is directly transportable, but I get the feeling that I'm missing something.

John Masterman, Hemlington, Cleveland

Most home computers are deliberately made incompatible with one another as this encourages hardware purchasers to buy peripherals and programs from the original manufacturer. It also means that makers can cut costs by using the latest design tricks in new machines.

Home computers are sold on the strength of features such as price, graphics or sound; differing design requirements make the machines mutually incompatible. There's no reason why micros should be made and sold in this way since the differences have little real significance to users. However, it makes life easy for advertising agencies, which can compare computer models rather than try to answer the more difficult question of why anyone should want a computer in the first place.

The marketing situation is different where business computers are concerned. These machines cost more and generally sell in much smaller numbers. The programs are complex, hard to write and expensive as most of them are only of use to a small proportion of computer owners. Almost anyone can find a use for a Space Invaders game, but few people would be interested in a Cobol compiler or a hotel booking package.

It is vital that complex programs run on as many different types of computer as possible, both from the point of view of a new machine's manufacturer who can't afford to translate all the complex and esoteric software available for other machines, and the software house launching a new product which would like it to run on as many different computers as possible as it will only sell a small number of copies on each one.

This need for compatibility is greater than the need for specific features, since the average business user is less concerned with sound effects and colour than with the availability of a package broadly suited to his or her needs. But the manufacturers can't produce identical machines: that would make their products indistinguishable and thus impossible to advertise distinctively.

The solution is to build them differently but to include a program which provides essential services in a standard way regardless of the hardware details. This program would translate 'primitive requests', in a standard format, into actions giving fixed results regardless of the hardware being used. Primitive requests might do such things as print a character, open a disk file, and so on. The program, or 'operating system', translates these generalised requests into specific operations which vary according to the hardware being used.

Most of the operating system is just concerned with distinguishing between requests, so it can be identical on every machine. Individual sections within the operating system may differ, reflecting hardware differences between the computers. These are the only sections which must be rewritten when a manufacturer launches a new machine; other programs should work as they will call the appropriate operating system routine rather than try to communicate directly with the hardware.

As long as software houses use these request codes to perform machine-specific operations, their programs will run on any computer with the correct operating system. The snag is that the translation of these request codes slows down the programs which use them. The request codes must be standard for all computers, so they might not provide control over hardware which is not available on all machines. For example, CP/M does not have a generalised facility to read a character at a given position on the display, so it's hard to write a screen editor such as those for many home computers.

These restrictions tempt programmers to communicate directly with the hardware, running the risk of making their software incompatible with some machines. Parts of the program which do not interact with specific hardware are written in machine code; this code will run on any computer with the appropriate processor.

The first popular operating system was CP/M, which contained request codes to perform input and output in programs written for the Z80 or 8080 processors. CP/M was not originally written for sale — it was rudimentary and inefficient for many purposes (the primitive requests were not well thought out) but it did work, and in the early days of computing that was enough.

CP/M-86 is a development of CP/M which provides standardised input and output facilities for programs written in machine code for the Intel 8086 and similar processors. These are used in most new business machines.

MS-DOS is a competitor — a similar but incompatible program. It only caught on because IBM used it in its Personal Computer. Like CP/M, MS-DOS is rudimentary but it works. It was based upon an experimental system called QDOS, standing for Quick and Dirty Operating System!

Operating system requests are slow and inflexible compared with machine-specific routines. In business programming the advantage of compatibility between computer models more than outweighs these snags; it is more important that programs are available than that they run quickly or take full advantage of special hardware.

Unfortunately we can't answer questions on an individual basis, so please don't send a SAE with your query. END

Miracle modem

Peter Tootill unveils Miracle Technology's new modem and issues a plea for free telephone lines for BBS operators.

A new modem from Miracle Technology (which produced the first multimode modem at a price the home user could afford) can be expected to be an interesting event and indeed the WS3000 has a number of novel features.

The base model (approximately £250) has V.21, V.23, auto-answer (including ring-back method) and auto-dial as standard. It also has speed buffering to enable computers which cannot handle split baud rates (that is the V.23 type 1200/75 Prestel standard) to use it at the same speed in both directions. The modem will still talk to the phone line at the two speeds. Other features will be available as optional extras.

The method of autodialling will be compatible with the system first used by an American modem manufacturer called Hayes. The Hayes 'Smartmodem' protocols are now a very popular and widely used standard among other modem manufacturers in the US. So people with US computers will be able to use standard US software to control the autodial feature.

The optional extras will include: a V.22/V.22bis module giving 1200 and 2400 bits/sec full duplex operation as well as the basic 300/300 and 1200/75 modes; battery backed RAM to store up to 64 phone numbers; battery power for portable use; security key switch; password security. (Under this system the caller will give the modem his password when it answers the phone and then hang up. The modem will then check to see if he is an authorised user and if so the modem will ring him back in order to establish the call. This will make it very difficult for hackers, as they will not only have to have a password for the system, but also to be calling from the right telephone! This is the type of security that certain financial institutions are looking for before they will put their systems on-line.)

The V.22/V.22bis option (although initially expected to be pricey at £250 or so) is a very interesting development. V.23 is OK when you use a bulletin board or Prestel as long as *it* is talking to *you*, but it is no good if you want to unload anything more than a very short message. Imagine sending even a short program to a BBS at seven-and-a-half bytes per second! V.22 is also compatible with US Bell 212a standard that many American BBSS use as well as the basic 300 bits/sec Bell 103. This means that people with V.22 modems can call US bulletin boards. 2400/2400 modems for use on ordinary phone lines are beginning to appear in the US as well, and I would expect that they will operate with V.22bis systems as this is the way things have been developing in recent years.

The prices are expected to be around £250 for the basic modem and as much again for the V.22/V.22bis module. While this is not cheap — even a basic V.22 modem will set you back around £500 at present. A V.21/V.22 type would be nearer £800, and no other V21/22/23 ones are available, as far as I know. Prices for the other options were not known at the time of writing. BABT approval has been applied for, and Miracle Technology is optimistic about getting it soon. Presumably, if it is using the same production facilities as for its existing modem (now approved) there will not be quite so much involved in the process. The company also hopes to get approval with the Bell standards enabled, as one or two modems with Bell frequencies were accepted by BT before the BABT became responsible for the procedure. For further details contact Miracle Technology tel: Ipswich (0473) 50304.

Lines for free

It has always seemed a bit unfair to me that I should have to pay BT for the privilege of having a second telephone line so that I can run my bulletin board for 24 hours a day, and still have a telephone available for ordinary calls. Especially when you think just how much revenue it gets from the system. I recently did a spot check for a 24 hour period and had fifty-eight calls, with a total of around 800 units. If this is typical, then BT is getting about £40 a day from people calling my system. One day's calls would more than cover the rental on the line for a whole quarter! This is an annual rate of nearly £15,000! BT must really love BBS operators. In my opinion BT should at least provide a free line and modem to people prepared to run a BBS. Most commercial organisations would do this — and give you commission on revenue generated as well.

If you are running a BBS (or thinking of starting one) and want to follow this matter up with BT, the person to speak to is called the 'call marketing (or call stimulation) duty' at your local telephone manager's office. These are the people who deal with the 'Guideline' services (such as weather forecasts, gardening hints, recipe of the day, and so on). BT may not be too keen on lots of BBSs in one area, of course, but it is well worth trying. If you have problems, try asking for the marketing manager, he is the person who is ultimately responsible for getting more people to use telephones. I would think that BBSs are especially good from BT's point of view, as the heavy use tends to be out of peak hours when the lines are very much under used.

If BT won't play ball you can always threaten to stop running your system — that would put an end to shareholders' dividends.

New bulletin boards

The number of BBSs that have started recently is enormous. I have had great difficulty keeping up and checking out the new numbers that I have been given. At the last count there were nearly thirty 24 hour systems and as many part-time ones. The list of numbers is as up to date as possible, but as always please let me know of any changes on Liverpool Mailbox. END

UK free networks

Bulletin Board	Phone Number	Notes
Aberdeen ITEC	(0224) 641585	V.23
BABBS-Bath	(0225) 23276	300/300 baud rate; 9pm-8am weekdays, 9pm-noon weekends; Atari-based system, ring-back system
BABBS-Felixstowe	(0394) 276306	300/300 baud rate; 24 hours daily; Apple users' group
BABBS TWO-Basildon	(0268) 778956	300/300 baud rate; 24 hours daily; Apple users' group with special area for queries to Apple UK
Basildon ITeC	(0268) 22177	Prestel type service
	(0268) 25122	Atari based 300 baud. 24 hour
BASUE	(01) 373 6337	24 hour
Blandford Board TBBS	(0258) 54494)	300/300 baud rate; 24 hours daily
CABB TBBS	(01) 631 3076	300/300 baud rate; 24 hours daily + 1200/75
CBBS SW	(0392) 53116	300/300 baud rate; 24 hours daily
CBBS Surrey (Woking)	(04862) 25174	1200/75 and 300/300 baud rates; 24 hours daily; jokes, jobs, reviews, news
Chatham (Kent)	(0634) 815805	6pm/9am daily + weekends 7 bits, even parity; sales and wants — cars, houses, computers
CNOL Lancaster TBBS	(0524) 60399	300/300 baud rate; 24 hours daily; Clinical Notes Online service, mainly for medical users; works in conjunction with a database on the Datastar network
Computers Incorporated Newcastle (CBBS)	(0207) 543555	300/300 baud rate; 24 hours daily; primarily business-oriented
Forum 80 Hull	(0482) 859169	300/300 baud rate; 5-11.30pm weekdays, noon-11.30pm Sundays, Bell 103 standard, midnight-8am daily; international electronic mail, library for up/downloading
Forum 80 SPA	(0926) 39871	300/300 baud rate; 11pm-midnight daily; TRS-80 and Genie users' group
Forum 80 Wembley	(01) 902 2546	300/300 baud rate; 7-10pm weekdays, midday-10pm weekdays; electronic mail, library for down loading; ring and ask for Forum 80
Fido Compulink	(06286) 63571	24 hour
Fido Fastnet	(051) 260 5607	10pm-8am BELL 103/212a tones only at present
Fido Fore TBBS	(01) 301 4110	Fido 1am-8am
Hackney BBS	(01) 985 3322	V.23 Password: PUBLIC
Hamnet Hull	(0482) 497150	300/300 baud rate; 6pm-8am daily
Livingstone, Scotland	(0506) 38526	Atari, 24 hours daily
London Underground	(01) 863 0198	24 hours V.21/V.23 (Viewdata coming soon) BBC Based (colour for BBC users)
Liverpool Mailbox TBBS	(051) 4288924	300/300 baud rate; 24 hours daily; sponsored by INMAC; electronic mail, program downloading, TRS-80 information; messages for *PCW* can be left on the board and will normally be read by us within 24 hours
Mactel (Nottingham)	(0602) 289783	V.21/V.23 Macintosh users 24 hours daily
Mailbox-80 W Midlands Stourport TBBS	(0384) 635336	300/300 baud rate; 6pm-8am daily
Manchester Open Bulletin Board TBBS	(061) 7368449	300/300 baud rate; 24 hours daily + 1200/75
Marctel	(01) 346 7156	10am-10pm daily (24 hour coming, watch for announcement on Marctel) BBC based system (FBBS) with colour for Commstar users
MBBS-Mitcham	(01) 648 0018	300/300 baud rate; 24 hours; BBC-based system with jokes, graffiti, electronic mail, and Atari and BBC sections
MG-Net CBBS London	(01) 399 2136	300/300 baud rate; 5-10pm Sunday; electronic mail, program downloading
Microweb Manchester TBBS	(061) 4564157	300/300 baud rate; 24 hours daily; *Micro User* magazine, mainly for BBC users
NBBBS-North Birmingham TBBS	(0827) 288810	300/300 baud rate; 24 hours daily
NBBS-E BBC Micro	(0692) 630186	BBC Based 24 hours daily
NBBS Lutterworth	(04555) 4798	Mon-Fri 8pm-11pm; Sat 9pm-10pm; Sun 9am-12.30pm
NKABBS	(0795) 842324	9.30pm-midnight
OBBS Manchester	(061) 4271596	300/300 baud rate; weekdays except 7pm-9pm, weekends except 10am-10pm
Octopus RAS	(0272) 421198 (Bristol)	6pm-8.30am V21 using public domain Octopus software
PIP-Sheffield TBBS	(0742) 667983	300/300 baud rate; 24 hours daily. Bell 9pm-8.00am
REACT UK	(0376) 518818	24 hours. Mainly Dragon
SABBS Glasgow	(0698) 884804	Atari, 24 hours daily
SBBS Southern	(0923) 676644 (Watford)	11pm-8.30am daily; BBC based V.21/V.23
Southern BBS	(0243) 511077	300/300 baud rate; 8pm-2am daily; ring-back system (dial the number, let phone ring once, and then ring back); messages, downloading
Stoke ITEC	(0782) 265078	300/300 baud rate; 24 hours daily; remote CP/M system
Teletrieve (CTC)	(0484) 657299	6pm-8am
TBBS London	(01) 348 9400	300/300 baud rate; 9am-7pm daily
TYNESIDE BBS	(091) 251 4271	V.21 BBC based
VISA	(01) 958 7098	8am-11pm daily V23 Prestel type
WABBS-Worthing	(0903) 42013	300/300 baud rate; 24 hours daily; ring-back system (dial the number, let phone ring once, and then ring back); Atari-based

UK subscriber commercial/business systems

Bulletin Board	Phone Number	Notes
Comet	(0527) 28515	Message handling system: Details from Istel Ltd, Grosvenor House, Prospect Hill, Redditch, Worcs
Micronet 800	(01) 278 3143	Prestel database information for micro users. Details from Micronet 800, 8 Herbal Hill, London EC1R 5EJ
Prestel	Freefone 100 Prestel sales	Subscribers only
Telecom Gold	(01) 403 6777	All information from Sales Admin, 60-68 St Thomas Street, London SE1 3QU

TRANSACTION FILE

Your chance to buy, sell or swap equipment.

● LISA IMB, ×2 Profiles Imagewriter, Macworks, LisaCalc, Write, Calc, Com, full 7/7 software, Multiplan, MacWrite. Cost over £9,000, will accept £5,590. Tel: 01-749 6528.

● COMMODORE 8032; plus 8050 double disk drives, plus 4023 printer, Superscipt word processor, Petcress, Adventure game. Cables etc. £1,500 ono. Tel: Bordon (Hants) 4261.

● TANDY MODEL III, 48K twin disk drives, RS-232 built in. Lots of disk based software, £650 ono. Also Anderson Jacobson 300 baud acoustic coupler. Almost new, £150. Tel: (0584) 810015.

● TI99/4A. Little used, Extended Base, mini memory, assembler, editor, manual, Parsec, cassette lead, books, technical data, £150. No splitting. Tel: (0240) 74899 (Chalfont St Giles), (eves).

● Dpage Eurosystem Sirius I, prototype board, with quick connect tool and wire, £25. Also an AP products TC40 test clip, £15. Tel: Bordon (04203) 7194. Alan Kay.

● SHARP MZ80A. Dual disk drives, Z80 Serial and Parallel I/O cards, CP-M, FDOS, disk-Basic, XForth, C. All manuals. Complete, £500 ono. Tel: 01-736 3678.

● WANTED. *PCW* before February 1980. Also does anybody want a dead Compukit UK101. C. O'Neill, 123 Downs Road, Coulsdon, Surrey, CR3 1AD.

● APPLE II Monitor, dual disk drives, language card, Z80 card, Pkaso printer card, Saturn 128k disk emulator, 80 column, lots of software, £950 the lot. May split. Tel: (0227) 452061 (Canterbury).

● NEWBRAIN AD. Fitted with latest ROM set, users manual, 2 cassette leads, V24 lead, £125. O/S software manual, £15. Tel: Farnborough (0252) 540633.

● SANYO MBC 555. 2 x 800k drives. 256k RAM, RS 232C port c/w, WordStar, SpellStar, Mailmerge, CalcStar, DataStar, ReportStar. Cost £1,550, will accept £900 ono the lot. Tel: Quidenham (095387) 491 after 6pm please.

● APPLE IIE. Two disk drives, monitor grappler plus interface and Riteman printer. Hardly used. Lots of programs, DBase, VisiCalc, w/p etc. £1,200 ono wanted. Contact Norman on 01-935 3323 (day).

● WANTED. Apple III SOS reference manual, SOS Driver Writers Guide, A-III 128k add on, Serial card III, A III modem eliminator. Tel: Bedford (0234) 65997 (eves).

● SINCLAIR QL. Usual extras. (Unwanted Xmas gift). Plus printer cable, 4 extra empty cartridges, magazines, manual. Also Commodore computer game. Both still boxed. Worth £475 new. Bargain £320. Tel: Upper Warlingham (08832) 3834.

● TORCH ZEP100 Z80 board for BBC Micro. Only 3 months old, includes Perfect word processor, spreadsheet, BBC Basic (Z80). In addition Turbo Pascal will also be included, £275 ono. Tel: Reading 789150.

● COMMODORE 4040 dual disk drive. Hardly used, £200 ono. Tel: 031-447 2011 ext 442 or 031-447 6027, Mr Chick.

● APPLE II+. Apple monitor and disk drive, language card (64k total), AppleWriter II word processor, paddles, all manuals. Virtually unused, £475. Tel: Bourne End 25895 (eves).

● APPLE software. Apple Multiplan, Murder by the Dozen, Crypt of Medea, £100 ono. Tel: Byfleet 41045.

● FREE SOFTWARE with my 2x8in Shugart disk drives, 64k cased Ohio superboard, 610 expansion, 64 character screen, Rs232, 1200 baud cassette, 2× power supplies, software in ROM's, manuals, £600 ono. Tel: Chorley (02572) 72955 (eves).

● BBC MODEL B. 40/80 track drive, DFS, Wordwise, Prestel acoustic coupler with software, joystick, games magazines, books, manuals, light pen, £500 for the lot. Tel: Richard on (Norwich) 57087.

● VIDEO GENIE system 48k. Including computer, expansion unit, disk drives 2×35T, (Tandy) monitor, £260. Offers for individual items considered. Also Aculab floppytape unit for above. Tel: (0294) 64144 (Ayrshire), (eves).

● SHARP PC1500, CE150 printer/cassette interfce, CE161 16k RAM, Casio FX702P, FP-10 printer, FA-2 cassette interface. Any offers for any part. Tel: Richard on Norwich 57087.

● SINCLAIR SPECTRUM disk interface, cable, documentation, utility disk. Never been used, £55. Tel: (0946) 812523.

● CUMMANA CSX200, 80 track, single-sided disk drive. Little used, with handbook, cables and formatting disk, for BBC Micro, £120. Tel: Plymouth (0752) 46489 (eves, weekends).

● FOR MZ80K, SP1002, SP5025 Source listings, ZEN, Sharpsoft, Forth and disassembler, assorted games. Offers? Tel: 021-373 9546 (eves).

● COMMODORE SX-64 portable, (includes disk drive and colour monitor). CBM-64 compatible 1520 plotter, £500 original software, accessories. As new, £650 ono (for quick sale). Tel: (0392) 54188 (8pm-9pm Weds/Thurs).

● NASCOM 2 with 48k, additional hardware, software, Centronics 501 printer, dual Memorex disk drives, Televideo 912 terminal. Clearing out prior to working abroad. Tel: Wokingham (0734) 793152 (after 7pm).

● LEARN TO PROGRAMME in machine coded. Full O/U course with manuals and computer. Exchange BBC Z80 board or Dual 80T disk drive or £250. Tel: Godalming 22699.

● TRS-80 colour computer 32k. With leads, manuals, programming course on cassette, cassette leads, joysticks and various games. Tel: (061) 941 1161 (nights), (061) 980 8015 (days).

● APPLE II+ 64k. Two disk drives, colour monitor, Serial interface, clock, Eprom programmer, Pascal and Logo. Many books and manuals, etc. £700 ono the lot. Tel: (0978) 840629.

● ATR 8000 CP/M add-on for Atari computers. Permits connection of standard peripherals, includes CP/M and MyDos operating systems. Free software utilites £600 value. Brand new, £295. Tel: Luton (0582) 32752.

● BBC computer. With disk chip, Microvitec colour monitor, Inforunner h/speed printer, Twilstar 80 track d/sided disk drive. Eight disks. Unwanted prize — unused! Retail £1,300. Offers around £950. Tel: Mellor 2476 (eves).

● COMMODORE SX64 portable for sale, having gone 16-bit. Software includes: Easystock, Future Finance, Games, Zork III, Beach-Head. Together with 30 unused disks, joystick, books, £500. Contact Mike Fielding, (0222) 551019 (eves).

● APRICOT PC. Twin 720k disks, 256k RAM, 12 inch monitor, SuperWriter, SuperCalc, SuperPlanner, Parallel printer cable, 10 disks, dust cover, 6 months old, little use, as new, £1,300 ono. Tel: 01-635 67458.

● NASCOM 2. 64k RAM, IO board and AVC colour board. Fitted in Kenilworth case. Full documentation for hardware and software. Offers. Tel: Hitchin (0462) 814029 (after 6pm).

● SHARP MZ-80B dual-disk system, 64k user RAM, 16k Hi-Res graphics RAM, P6 printer, built-in tape back-up, CP/M, WordStar, SpellStar, Mailmerge, MBasic, SuperCalc, etc. Luxury computing at £1250 ono. Tel: Bournemouth 427553 (eves).

● TANDY TRS-80 Model III 48k. Twin built-in drives. VisiCalc, TRS-80 line printer VIII. All in first class condition, £395 ono. Tel: (0765) 4612.

● CROMEMCO Z2 system. ADM monitor/keyboard, 48k CPU, PFD577 twin 8in drives, teletype printer, Basic DBMS etc. May split, offers? Collectors item! Tel: Soper on 01-580 7265 (days).

● TRS-80 MODEL I Level 2 Expansion interface 48k. Lowercase and Hi-Res mod's. Disk drive, Smaldos, word processor, assembler, Pascal, games. All on special desk, £300 or offers. Tel: Harlow 28218.

● CUMMANA 800k dual disk drive. With PSU and 40/80 track switch. Acorn 1.2 DFS, Wordwise, graphics ROM and Disc Doctor original ROMs and £3000 of software. Sell for only £450. Tel: Harpenden 69152.

● SONY MSX Hitbit micro. Together with all leads and manuals and over £60 of software. Total value over £350, sell for only £200. Tel: Harpenden 69152 for details.

● VIDEO GENIE 64k. Built-in cassette, green screen, masses of software, literature, etc, £75. Serial interface +2k buffer. Fits in Epson MX80 or MX100 printers, £25. Tel: Mantell (Hants) (096) 278 619.

● CBM64 software. Disks — Vizawrite, Infomast, £50 ono for both. Tapes — Mailshot, Kensington, Valhalla also Quickshot I joystick, offers. All above is new. Apple Silentype without card, £90. Tel: Guildford (0483) 60102.

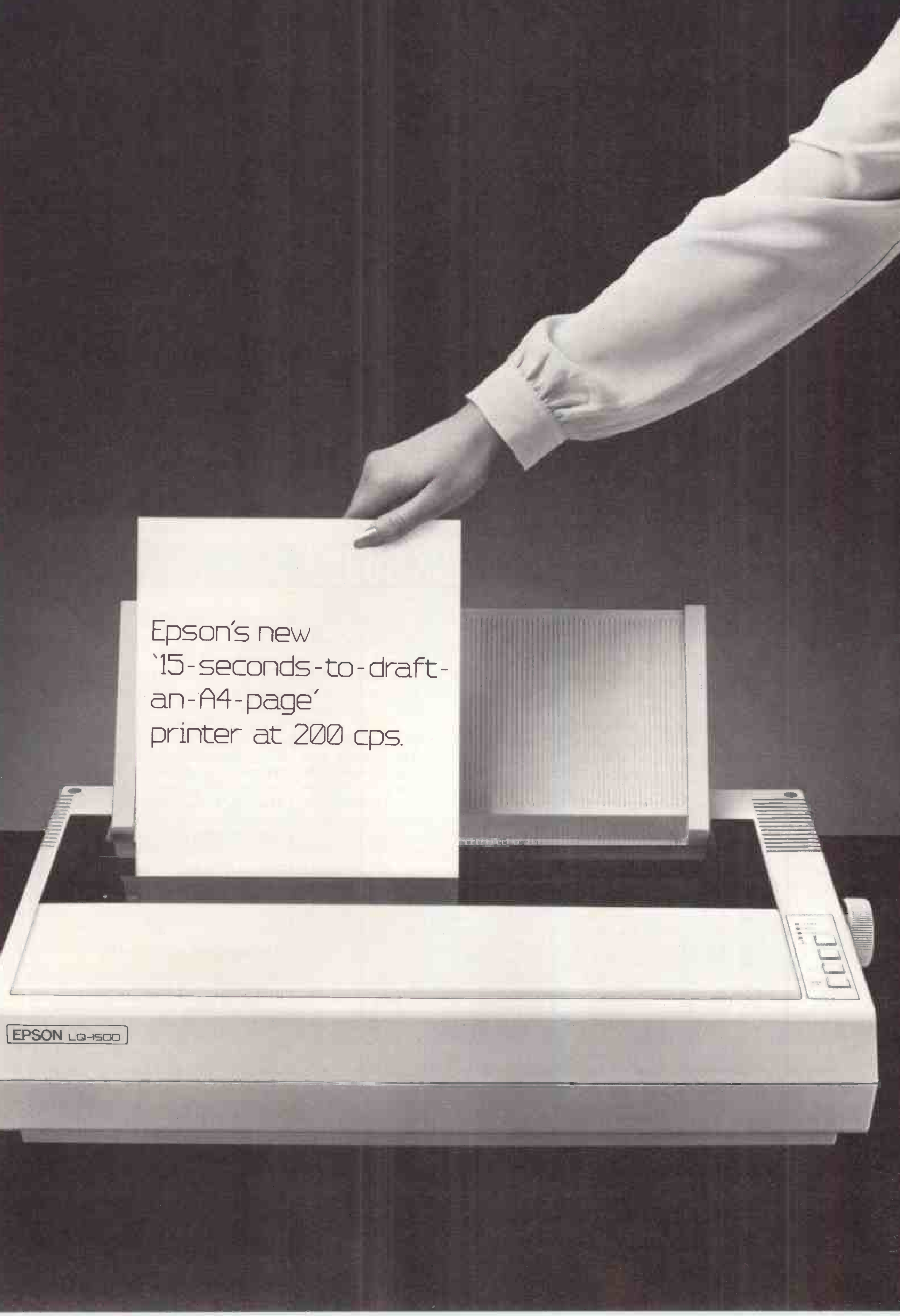
● APRICOT-PC. 2× double density 1.4MB plus monitor. Complete with manuals, software and SuperCalc 3. Six months old, cost new £2,300. Accept £1,500. Tel: Slough (0753) 23649.

● APRICOT 256k computer. 2×720k drives, 12in monitor

TRANSACTION FILE ADVERTISEMENT FORM

All Transaction File ads must be submitted by readers on this form or a photocopy 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 your completed 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.


Epson's new
'15-seconds-to-draft-
an-A4-page'
printer at 200 cps.
EPSON LQ-1500

TRANSACTION FILE

LEISURE LINES

Brain-teasers from J J Clessa

Quickie

I know a young man whose mother is older than his grandmother. How can this be?

Prize Puzzle

The idea for this month's puzzle comes from Roy Newham of Nottingham.

A roll of cloth 60ins wide has to be cut into a number of lengths so that each length and each diagonal is always an exact different number of inches. No measurement (except the width) is ever repeated.

How long is the roll?

Answers please, on postcards only (letters are automatically disqualified) to *PCW* Prize Puzzle, July Leisure Lines, VNU Business Publications, VNU House, 32-34 Broadwick Street, London W1A 2HG. Entries to arrive not later than 31 July 1985.

April Prize Puzzle

This wasn't too difficult a problem, although about 10 per cent of the 180 entries had the wrong solution. The correct answer is 300, 325, 351, which are the smallest three consecutive triangular numbers whose product is a perfect square.

The winning entry came from SJ Mudd of Brentwood, Essex. Congratulations, your prize is on its way.

Thank you to all those who directed me to prime number tables which do not include unity — it seems there are some in existence.

NUMBERS COUNT

Mike Mudge considers the 'Numeri Idonei' of Leonhard Euler and awards a prize in the field of triperfect numbers.

Among the extensive correspondence and papers of Leonhard Euler (1707-1783) there are various strictly arithmetical theorems for which Euler does not have a proof and which he does not even state precisely. Included in these are references to the sequence: d=1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, 16, 18, 21, . . . 1320, 1365, 1848, containing 65 terms up to this point.

These numbers all have the following property:

If d=ab and if a number n can be expressed *uniquely* in the form $n=ax^2+by^2$ where ax and by are coprime (that is, ax and by have no common factor other than unity), then either n is *prime* or it is *twice* a prime or it is a *power* of 2. Any odd number that can be written uniquely in this form must be a prime.

Euler calls these d 'Numeri Idonei' because they can be used for primality tests. For example, d=57=3.19 yields the prime number 1000003 because this can be uniquely written $19.8^2+3.577^2$ where 19.8=152 and 3.577=1731 coprime.

For example, d=1848=1.1848 yields the prime number 18518809 with the unique representation $197^2+1848.100^2$ where 197 and 184.100 are coprime.

It is still unknown whether Euler's 65 Numeri Idonei are the only such numbers. Euler only proved that cases d=1, 2, 3 have the required property.

Problem Obtain the full listing of 65 Numeri Idonei less than or equal to 1848. Attempt to find further such numbers.

Generate sub-tables of prime numbers from each of these d-values, and compare their union with a complete table of prime numbers or with an implementation of a sieve technique for the determination of all prime numbers up to the required maximum value.

Readers are invited to submit their program listing, output and hardware details together with their conclusions relating to this problem to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Nr Wolverhampton, Staffs WV4 5NF. Tel: (0902) 892141. A suitable prize will be awarded to the 'best' entry received by 1 October 1985. Criteria will include accuracy, originality and efficiency, not necessarily in that order.

Please note that submissions can only be returned if a suitable stamped addressed envelope is included. Expanded reviews of previous problems, together with, subject to the approval of the contributor, copies of detailed programs from the prize-winning entry may also be requested.

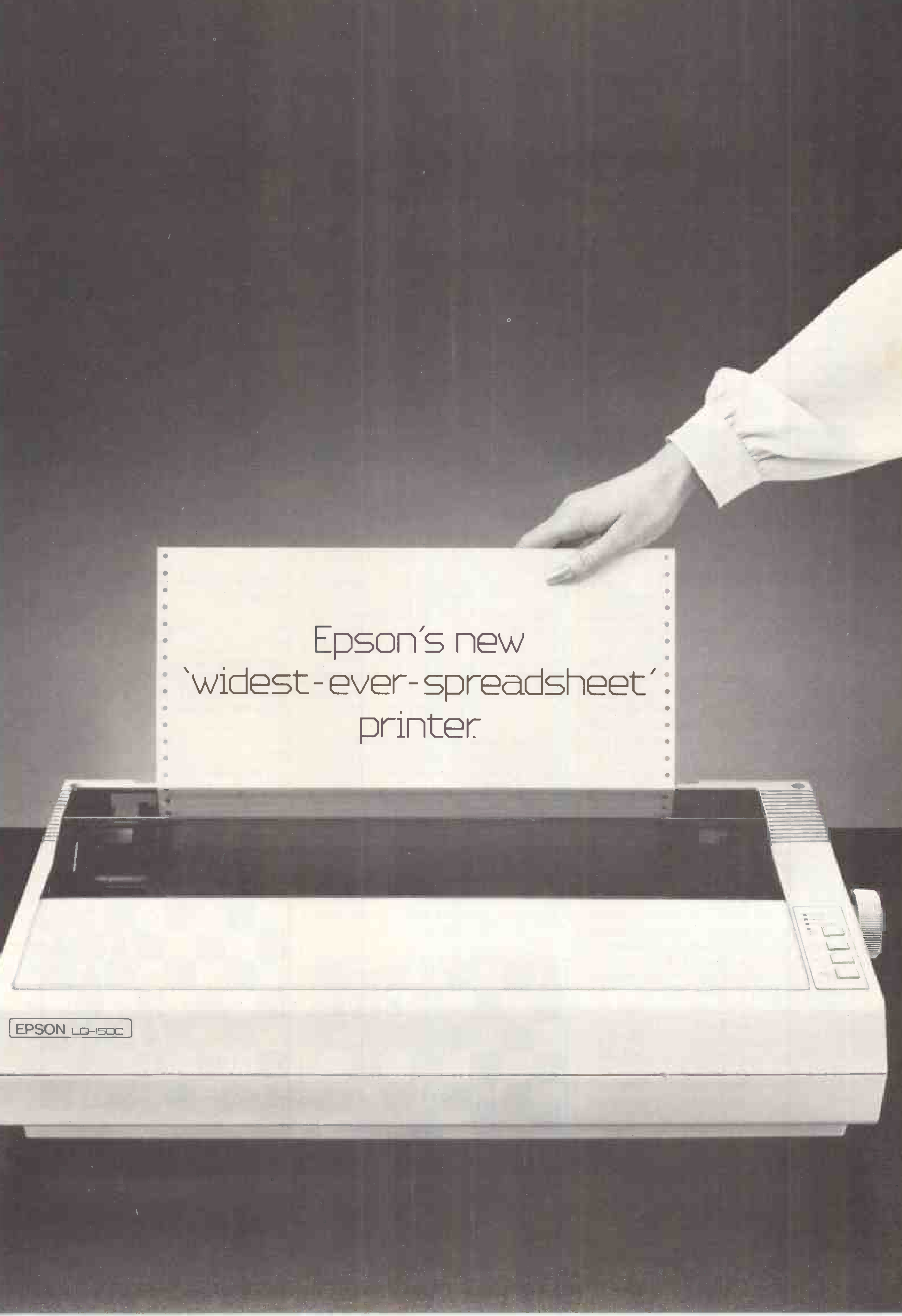
Prize-winner January

Congruent numbers The response to this problem was very disappointing, probably due to its underlying mathematical nature. Substantive contributions were received from 'regulars' including Gareth Suggett, 31 Harrow Road, Worthing BN11 4RB and Richard F Tindall of 26 Poplar Close, Great Shelford, Cambridge. Readers interested in pursuing this problem further may contact the above or Robin Merson, 2 Vine Close, Wrecclesham, Farnham, Surrey GU10 4TE, who has been working in this area for years.

Relevant references include *Unsolved Problems in Number Theory* by RK Guy (Springer 1981) and the paper by Ronald Alter, *The Congruent Number Problem*, American Mathematical Monthly Vol 87, 1980, pp43-45.

Triperfect numbers

Dave Arnold of Buxton, Derbyshire was examining T_7 as published in *PCW* May on his Video Genie and found 'it appeared to be OK when I checked the sum of divisors, but on further examination 301, 541 and 901 are composite and the number is not therefore triperfect'. Exchanges of correspondence between RF Tindall and D Arnold took the search for T_7 up in stages to $2^{60}-1$ without success. For this enterprise and collaborative effort Dave Arnold is nominated as this month's prizewinner; an award in the area of congruent numbers may be considered in the future if further results are forthcoming.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WRITING FOR PCW

Your chance to contribute to the magazine.

We're offering readers a chance to get rich (well, at least richer) and to influence what's published in the magazine — by writing for it. We welcome approaches from would-be writers, including those who have never appeared in print before. It's often users with practical experience who have the most interesting things to say, so don't worry if your prose is less than perfect, we can take care of the polishing.

If you have an idea for a feature write, with a brief synopsis, outlining the proposed structure and content. If your article is already written, then send it in for consideration. Remember to put your name and address on both the covering letter and the manuscript — along with a daytime phone number if possible. Manuscripts should be typed or printed out (dot matrix output is fine), in double-line spacing with ample margins top and bottom and on each side.

Any accompanying program listings should be supplied on disk or cassette, ideally with a printout as well. We'll try to return all submissions sent in with a suitable sae, but make sure you keep a copy of everything you submit as well for reference.

Bear in mind that it's worth taking a look at the Back Issues advertisement to see what sort of things we have already published — after all there's no point in reinventing the wheel. And please be sure to tell us if you've contacted another magazine (perish the thought): it would be very awkward if the same article appeared elsewhere. Frankly, we're more likely to accept something which has been offered exclusively to us.

Finally, we do pay for published work — the rate is £65 per 1000 words, and payment usually follows about four-six weeks after publication.

MICROCHESS

Computer thrashes human at the Third Commonwealth Chess Championship. Kevin O'Connell records the first-round upset.

The Third Commonwealth Chess Championship was held this year in London's Dockland. The event was sponsored by the Hong Kong chess computer manufacturer, Novag.

The tournament was won by the reigning champion, Kevin Spraggett of Canada, ahead of the pre-tournament favourites John Nunn and Murray Chandler, both of England and ranked respectively ninth and sixteenth in the world.

One of the perks of sponsoring the event is that Novag is permitted to enter a couple of chess computers. Having micros play in this class of tournament is still rather like trying to rewrite Shakespeare's first folio using a roomful of monkeys seated at word processors, but every so often a chimp does produce a usable scene. That was certainly the case in the following game, the sensation of the first round, in which the Novag defeated a master-strength human rated 2210.

White: A J Stebbings. Black: Novag Monster. King's Indian Defence.

1	d2–d4	Ng8–f6
2	c2–c4	g7–g6
3	Nb1–c3	Bf8–g7
4	e2–24	d7–d6
5	f2–f3	O–O
6	Bc1–e3	Nb8–c6
7	Qd1–d2	Rf8–e8
8	Ng1–e2	Ra8–b8
9	Ne2–c1	e7–e5
10	Nc1–b3	Nc6xd4

(10...e5xd4 is more common, followed by 11 Nb3xd4 d6–d5!, freeing Black's game: for example, 12 c4xd5 Nf6xd5 13 Nc3xd5 Nc6xd4 14 Be3xd4 Qd8xd5.)

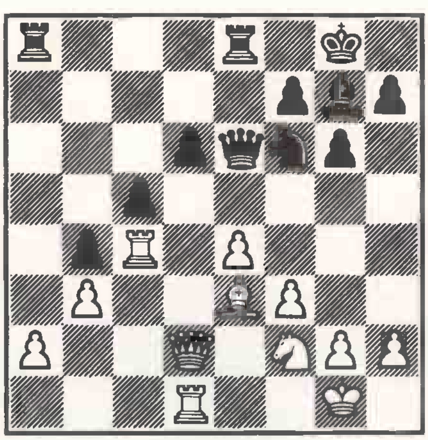
11	Nb3xd4	e5xd4
12	Be3xd4	a7–a6

(Not now 12...d6–d5 13 Bd4xf6 and 14 c4xd5.)

13	Bf1–e2	Bc8–d7
14	O–O	b7–b5
15	c4xb5	a6xb5
16	Ra1–c1	c7–c5
17	Bd4–e3	b5–b4
18	Nc3–d1	

(White would like to put the knight on d5, but cannot do so since that would lose a pawn (18...Nf6xd5 19 Qd2xd5 Bd7–e6, followed by a capture on a2 or b2) or even worse (18...Nf6xd5 19 e4xd5 Re8xe3 20 Qd2xe3 Bg7–d4, winning the queen).)

18	...	Bd7–e6
19	Be2–c4	Be6xc4
20	Rc1xc4	Rb8–a8
21	b2xb3	Qd8–d7
22	Nd1–f2	Qd7–e6
23	Rf1–d1	



White is already looking vulnerable

(White cannot prevent the freeing 23...d6–d5.)

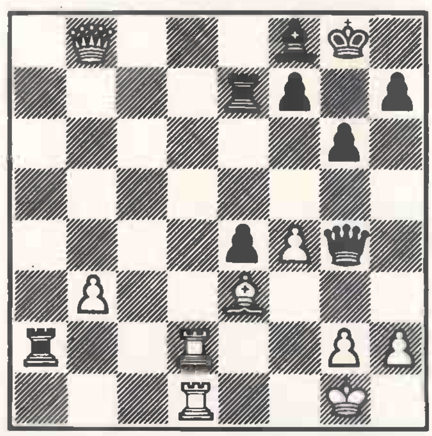
23	...	d6–d5
24	Rc4xc5	d5xe4
25	f3–f4	

(Exchanging on e4 would be much worse, for example 25 f3xe4 Nf6xe4 26 Nf2xe4 Qe6xe4 27 Be3–f2 Bg7–c3, and White is in trouble.)

25	...	Nf6–g4
26	Nf2xg4	Qe6xg4
27	Rc5–d5	Re8–e7

(The point of this move is quite deep. By getting the rook off the back rank, Black prepares his material-winning manoeuvre at moves 30–32.)

28	Qd2xb4	Ra8xa2
29	Qb4–b8+	Bg7–f8
30	Rd5–d2	



Black is gaining a material advantage

30	...	Re7–d7
31	h2–h3	

(White has very little choice. 31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MICROCHESS

Rd2xa2 fails to 31 ... Rd7xd1 + 32 Kg1–f2 Qg4–h4+ and 33g2–g3 Qh 4xh2 mate or 33 Kf2–e2 Qh2–e1 mate.)

32 ... Qg4xd1+
32 Rd2xd1 Rd7xd1+
33 Kg1–h2 Ra2–a5

(To stop 34 Be3–c5.)

34 b3–b4 Ra5–d5
35 Be3–c5 Rd5–d8
36 Qb8–b7 Bf8xc5
37 b4xc5

(Black has a small but clear material advantage. However, White's passed c-pawn could be very dangerous.)

37 ... Rd1–c1
38 Qb7xe4

(Of course White would like to keep his c-pawn, but if 38 c5–c6 then 38...e4–e3 39 c6–c7 Rd8–e8 and if 39 Qb7–b5 Re8–c8 ensures that it disappears.)

38 ... Rd8–c8
39 f4–f5 Rc1xc5
40 f5–f6?

(Now Black gets a greater advantage. After 40 f5xg6, my money would have been on a draw.)

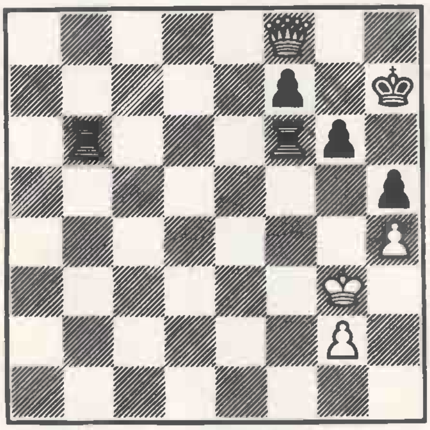
40 ... Rc5–c6
41 Qe4–e7 Rc6–e6
42 Qe7–d7 Rc8–f8
43 Qd7–d4 Rf8–b8
44 h3–h4

(or 44 g2–g4 g6–g5 and the f-pawn rapidly falls).

44 ... h7–h5
45 Kh2–g3 Rb8–b6
46 Qd4–d8+ Kg8–h7
47 Qd8–f8

(The days have long done when such a last-gasp effort could prove successful against a chess computer.)

47 ... Re6xf6



The end is nigh . . . Novag Monster has now only to avoid stalemate

(Not only that, but Novag Monster now demonstrates the technique to win this ending.)

48 Kg3–h3 Rb6–b3+
49 Kh3–h2 Rf6–f4
50 Qf8–e7 Rf4–f2
51 Qe7–d8 Rb3–b4
52 Kh2–g1 Rb4–b2
53 Kg1–h1

(Another 'hopeful'. Now 53...Rf2xg2? would allow 54 Qd8–h8+! Kh7xh8 stalemate.)

53 ... Rb2–c2
54 Qd8–b8 Rc2–a2
55 Qb8–d8 Ra2–b2
56 Qd8–d4

(Still coveting the h8 square.)

56 ... Rf2–e2
57 Qd4–d8 Rb2–d2
58 Qd8–c8 Rd2–d4

(Grinding down White's resistance. Now 59 g–g3 allows 59...Rd4–d1 mate while 59 Qc8–h3 Rd4–d1+ 60 Kh1–h2 Rd1–d2, and Black picks up the g-pawn.)

59 Kh1–g1 Rd4xh4
60 Qc8–d8 Rh4–g4
61 Kg1–h1 Rg4–f4

(Black still has to beware of the stalemate possibility.)

62 Qd8–c8 Rf4–h4+
63 Kh1–g1 Rh4–g4
64 Kg1–h1 Rg4–f4
65 Qc8–d8 Rf4–f1+
66 Kh1–h2 f7–f5
67 Qd8–f6 Rf1–f2
68 Kh2–h1 Re2–d2

(Olé.)

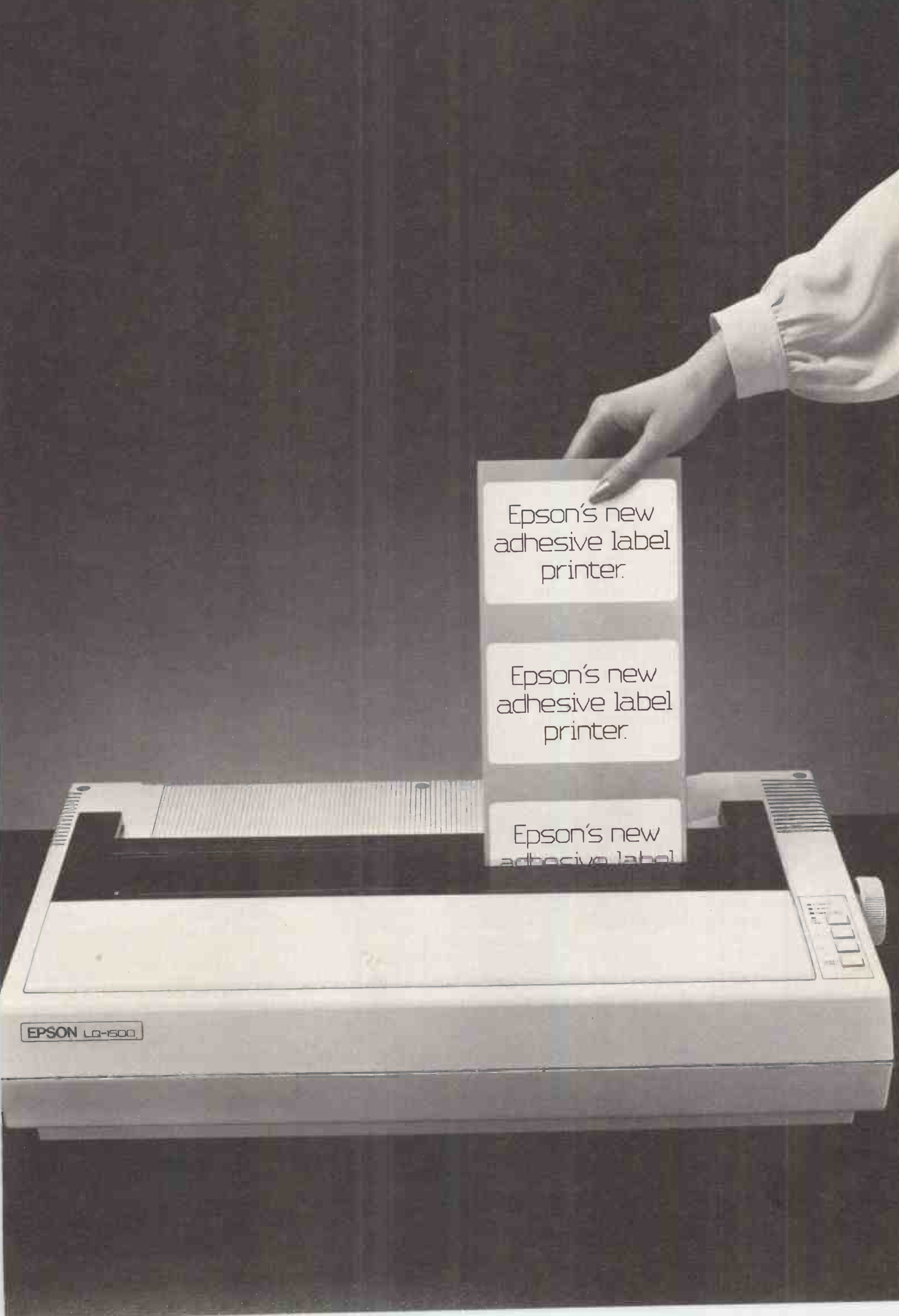
69 Qf6–f8 Rf2–e2
70 Qf8–f6 Kh7–h6
71 Qf6–f8+ Kh6–g5
72 Qf8–g7 h5–h4
73 Qg7–h8 Rd2–d1+
74 Kh1–h2 Re2–e1

(0–1 (White resigns))

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, and so on.

London	(Kensington Exbn Centre), Engineering Software Exbn & Conf (ENGSOFT). Contact: Computational Mechanics Centre, (042129) 3223	18-20 June
London	(Olympia), Computers in Manufacturing Exbn. Contact: Independent Exbns Ltd, (01) 891 3426	25-27 June
London	(Wembley Conf Centre), Networks Exbn. Contact: Online Conf Ltd, (01) 868 4466	25-27 June
London	(Barbican), The Construction Industry Computer Fair. Contact: RIBA, (01) 836 2973	25-27 June
London	(Olympia), PC User Show. Contact: EMAP Int Exbn, (01) 837 3699	2-4 July
London	(Royal Lancaster), Computers In Personnel Exbn & Conf. Contact: Peter Mirrington Exbns, (0277) 232030	9-11 July
London	(Wembley Conf Centre), Silicon Design Exbn. Contact: Project Presentations Ltd, (01) 242 3621	9-11 July
USA	(Chicago), National Computer Conference & Exbn. Contact: American Federation of Information Processing Societies Inc, 1899 Preston White Drive, Reston, VA22091	15-18 July
London	(Olympia), First European Programmable Controller Event. Contact: Evan Steadman Services Ltd, (0799) 26699	16-18 July
London	(Barbican), Personal Computer World Show. Contact: Montbuild Ltd, (01) 486 1951	4-8 Sept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ACC NEWS

The ACC is interested in branching out into the realm of 16-bit computers. If this, or a club in eastern England interests you, read on

The Association of Computer Clubs (ACC) is a democratically run, non-profit association of the computer clubs and user groups within the UK. Its attention is primarily focused on clubs that are run on a democratic basis, although the master list of UK computer clubs contains a number that are run as small businesses.

ACC services

The ACC provides a number of services to affiliated computer clubs (this costs £7.50-£30 a year depending on club size) including free insurance against public liability risks, a scheme for cheaply insuring computer equipment during club meetings, and various forms of publicity and advice. At present, roughly one-third of the clubs have chosen to affiliate in the 15 months that the scheme has been running. The Association also runs a service to put members of the public in touch with their local computer clubs. To take advantage of this, please write to John Bone (at the address below) so that he can pass it on to the enquiry office.

The Association is particularly interested in expanding its activities among clubs working in the 16-bit area. At the last committee meeting, the unanimous view was that hobby computing would follow business computing into 16-bits, and probably Intel 8086 and modified MS-DOS in particular. What couldn't be agreed was how soon this move would occur. The Department of Education has since annnounced that its next educational micro standard will be 8086/MS-DOS. Does this mean that schools will teach Lotus 1-2-3?

If you are involved in a club interested in 16-bit computing, or are thinking of starting one, let the ACC know. Special interests are Apricot, Sirius, IBM PC, Olivetti M24 (and other compatibles), ACT F1 and Portable, RML Nimbus, MS-DOS and Lotus 1-2-3. I get many requests from people wishing to meet other Apricot users, but apart from a business group called the Apricot & Sirius Users' Club, I have no other information.

The ACC is intending to move its administration on to 16-bit machines as soon as an enterprising manufacturer of MS-DOS/PC-DOS machines realises how much excellent publicity could be gained by lending one to the Association. This would include having the machine proudly displayed on the ACC stand at computer shows, and crediting the lender on the hundreds of database enquiries sent out. Anyone interested?

Club news

This month's selection focuses on the East of England, ranging from Lincolnshire through Cambridgeshire to Essex.

I continue to receive information from the Lincolnshire Microprocessor Society and the related Lincoln Computer Club. The Society has provided some financial backing to the Lincoln Club, which holds regular meetings on the first and third Wednesday of each month at The Cardinal's Hat, 268 High Street, Lincoln. To find out more about either group, contact Douglas Griffiths who is secretary of both on Lincoln 680578 or at 659 Newark Road, Swallowbeck, Lincoln LN6 8SA. One interesting facility offered by the Society is a number of computer systems which are available to members on hire terms. This would allow members to 'try out' their prospective purchases with more time and less pressure than in a shop, and is a thoroughly welcome initiative.

Dr Rupert Francis writes to me about a computer club for hospital staff around Boston, Lincolnshire. Membership is restricted to employees of the South Lincolnshire Health Authority, and it meets at the Pilgrim Hospital, Sibsey Road, Boston, Lincs PE21 9QS on the second Tuesday of the month at 5.30pm and the fourth Wednesday at 7pm. For more information, write to Dr Francis at the Pilgrim Hospital.

John Goodwin is the secretary of the Boston Acorn Computer Users' Club. It meets on the third Wednesday of each month at Fishtoft Social Club, Church Green Road, Fishtoft, Boston. It is planning to hold a 'kids' corner' feature with a competition and a prize for the child getting the top score of the night. The club is also interested in the educational use of computers and the development of speech synthesis interfaces. For more information, contact John Goodwin on Boston 51710 or write to him at 245 Church Green Road, Fishtoft, Boston, Lincs PE21 0RP.

Moving down to Peterborough, I hear from Paul Bywater. He is now the secretary of the Commodore Users' Club at Peterborough, replacing Tony Scott. If you are interested in Commodore computing in the area, please contact Paul Bywater on Peterborough 210948 or at 13 Tatwin Drive, Crowland, Peterborough PE6 0AE.

I have received a copy of the Cambridge Computer Town newsletter. The man behind it is Bob Waixel of 4 Manhattan Drive, Cambridge CB4 1JL (or call (0223) 61319). The Computer Town has been helped by Cambridgeshire libraries with the use of the lending library on the first floor of the Central Library, Lion Yard, Cambridge, for the meetings, and by Boots Computer Department which has lent TV sets. The next few meetings will be on Saturdays 13 July, 28 September, 19 October, 7 December and a date to be advised in November. Equipment available includes BBCs, Spectrums and a Commodore SX64 portable. A variety of software is also on show.

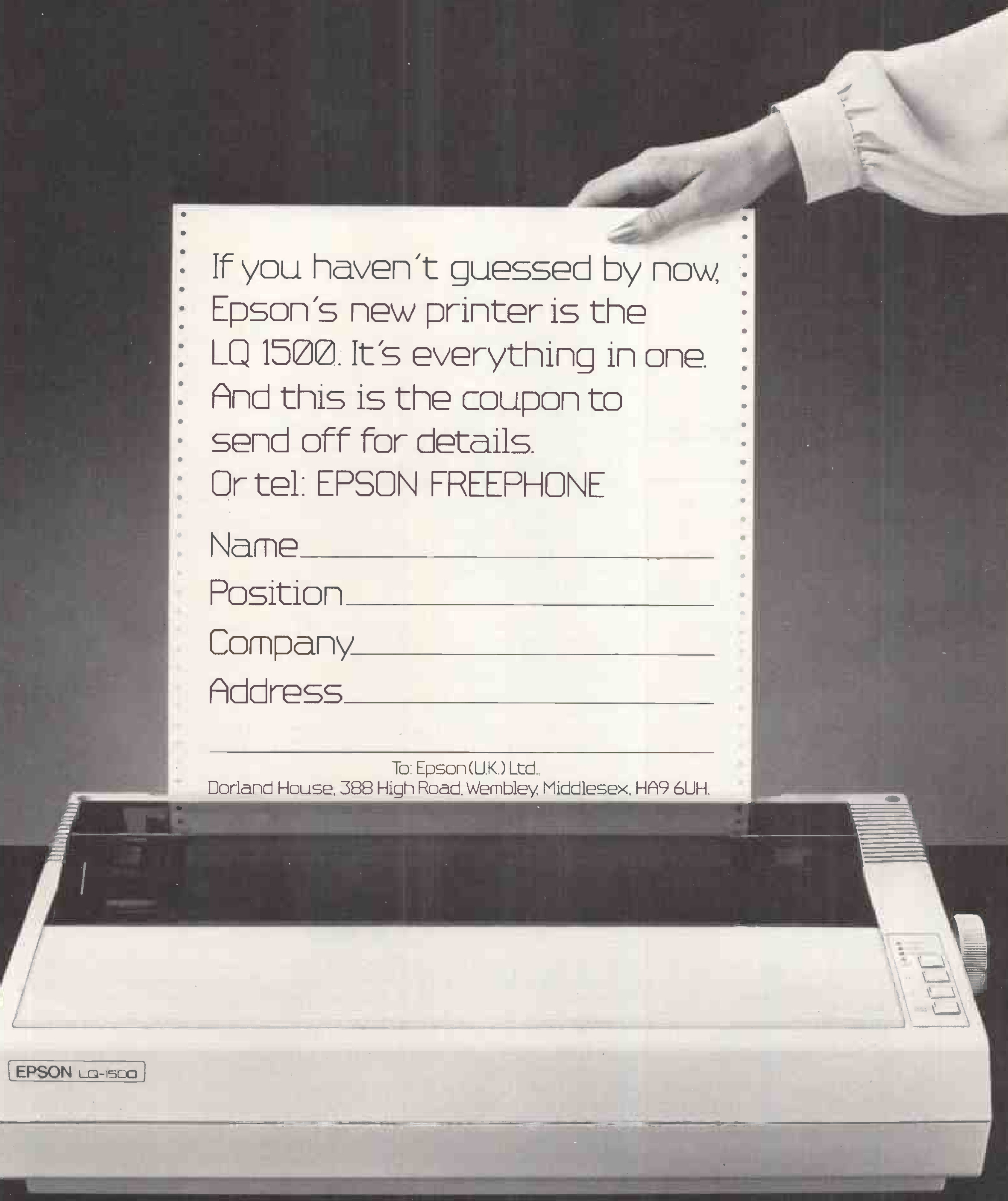
MJ Osborne of 25 Oak Avenue, S Wootton, King's Lynn, Norfolk PE30 3JQ writes to tell me of the King's Lynn ZX Users' Group. The club is running very successfully, with 23 members at the last count, but please note Mr Osborne's new address as he has recently moved.

Allan Potten has written from 14 Foxmead, Rivenhall End, Witham, Essex CM8 3HD to remind me about his ComputerTown which serves Colchester and the surrounding area. The members own a variety of equipment, mainly the popular micros, but also a variety of home-made, adapted second-hand and 'own design' equipment, some of which has been marketed. Write to Allan for the details

John Murphy tells me of a club which meets on Thursdays at 7.30pm in the Gallery Room at the Blue Boar Hotel in Maldon. Activities include a regular programming course for beginners, general interest meetings and a small group dedicated to game-writing. For more information write to John at The Computer Group, Oaklea, Goldhanger Road, Maldon CM9 7QU.

For a mention in this column or to notify the ACC of a new or existing club: Rupert Steele, 12 Philbeach Gardens, London SW5 9DY, or call (01) 370 0601.

For any other enquiry, including the address of your local club: John Bone, ACC chairman, 2 Claremont Place, Gateshead, Tyne & Wear NE8 1TL, or call (091 477) 0036. END



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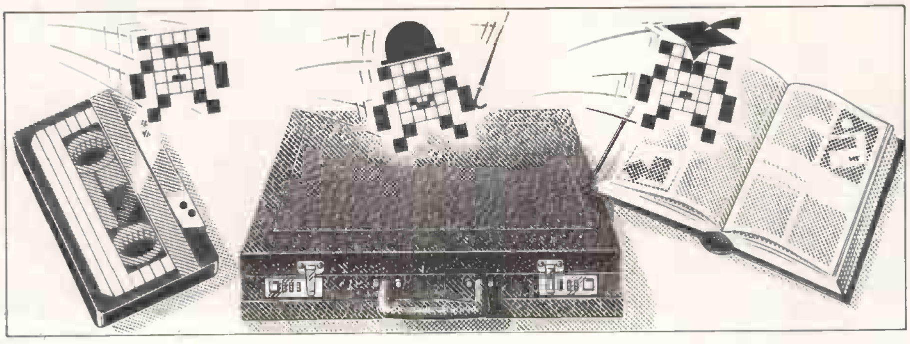
PROGRAM FILE



Nick Walker selects the best of readers' programs — for details on submitting your own, see the end of this section.

In *PCW* May I published a Commodore 64 utility to make disk access commands friendly. This month's utitlity, Turbo-DOS, make the disk drive operate six to seven times faster. Recently the turbo-load programs for cassettes have led to Commodore 64 cassettes loading quicker than disks, but Turbo-DOS redresses the balance and will even work with some commercial software. As an example of the power of this program I loaded a small Basic program using the normal method which took 26 seconds — using Turbo-DOS, it took under four seconds.

The utility theme is continued this month with Spectrum Speech, a program that will take any sound presented to the ear socket (that is, from a microphone or cassette) and digitise it. The sound can then be edited in memory if required and played back through the Spectrum's speaker. Don't expect too much when playing voice back: the best effects come from other sounds. Other utilities this month include a professional-quality communications program for the Epson HX-20, a QL program that enhances the quality of graphs printed from Easel, and a program compressor written in Microsoft Basic.

For the BBC, there is a game called Revenge of the Flying Bunnies — despite its title it is a very good game. For the Sirius there is a bank accounting program.

Games
Scientific/mathematic
Business
Toolkit/utilities
Educational/Computer Aided Learning

Program of the Month
Commodore 64
Turbo-DOS
by Kietil Nass

It's pretty sickening being the proud owner of a 1541 disk drive and discovering that the new fast loader cassettes can load a program faster than the disk drive. This program redresses the balance, allowing the 1541 to operate up to seven times faster.

The listing creates a machine code file containing Turbo-DOS. Type in the listing as shown and save it, then type RUN; any errors in the data statements will be detected by the checksums within the program. After correcting all errors, the program will generate the machine code program called TURBO-LOAD 64 on disk. Whenever you want to use Turbo-DOS just insert the disk, type LOAD "TURBOLOAD 64", 8 and then RUN. All further disk access will be at the new high speed. That's all you need to know to use the program, but for those who are interested the following explains how the program works.

The program fools the disk into thinking it's an RS232 device instead of a 3600 baud serial device. As with most RS232 devices the baud rate is then user-selectable, and in Turbo-DOS is selected to operate at 15200 baud (it can be taken to 19600 baud, but at this rate load errors start to creep in). The fast load system will work on any program that uses the normal LOAD vectors, and unlike most toolkit programs this one uses no user memory. After initialisation the program puts itself under the kernel at \$C000 to \$D000. This leaves the normal 38911 Basic bytes free and a 4k block at \$C000–\$D000, giving plenty of room for any extras.

PROGRAM FILE

TURBOLOAD 64 — THE FAST LOADING O.S

REQUIREMENTS: A COMMODORE 64 COMPUTER WITH A 1541 DISK DRIVE CONNECTED
PLEASE NOTE THAT ALL THAT 'REM'S CAN BE OMITTED WHEN TYPING IT IN.

```
10 REM** [illegible] **]
20 DATA11,8,192,7,158,51,50,51,56,0,0,0,32,47,243,169,226,162,248,133,167,-219
30 DATA134,168,169,0,162,3,133,169,134,170,169,8,32,12,237,169,111,32,185,-149
40 DATA237,169,77,32,221,237,169,45,32,221,237,169,87,32,221,237,160,0,165,-188
50 DATA169,32,221,237,165,170,32,221,237,169,30,32,221,237,177,167,32,221,-210
60 DATA237,200,192,30,144,246,32,254,237,24,165,167,105,30,133,167,144,3,-206
70 DATA230,168,24,165,169,166,170,105,30,133,169,144,2,230,170,224,5,144,-144
80 DATA173,201,0,144,169,169,8,32,12,237,169,111,32,185,237,169,77,32,221,-74
90 DATA237,169,45,32,221,237,169,69,32,221,237,169,139,32,221,237,169,4,-80
100 DATA32,221,237,169,11,141,17,208,32,251,237,234,234,76,46,240,169,11,-6
110 DATA141,0,221,44,0,221,16,251,169,3,141,0,221,162,5,202,234,208,252,162,-93
120 DATA4,173,0,221,42,42,102,176,106,102,176,234,202,208,242,165,176,73,-140
130 DATA255,96,32,82,239,201,255,240,248,160,0,169,11,141,0,221,44,0,221,-55
140 DATA16,251,169,3,141,0,221,162,7,202,208,253,173,0,221,42,42,102,176,-85
150 DATA106,102,176,234,234,173,0,221,42,42,102,176,106,102,176,234,234,173,-73
160 DATA0,221,42,42,102,176,106,102,176,234,234,173,0,221,42,42,102,176,106,-249
170 DATA102,176,165,176,73,255,153,166,251,200,208,180,96,120,169,1,133,167,-231
180 DATA160,255,32,124,239,192,255,240,64,162,2,165,167,240,2,162,4,173,166,-244
190 DATA251,208,7,238,167,251,173,167,251,44,169,0,133,168,189,166,251,145,-162
200 DATA174,230,174,208,2,230,175,232,228,168,208,240,162,0,134,167,173,166,-255
210 DATA251,208,198,169,53,133,1,169,27,141,17,208,169,64,133,144,24,96,169,-70
220 DATA53,133,1,169,27,141,17,208,234,169,29,56,96,160,0,185,66,240,153,-89
230 DATA48,1,200,192,31,208,245,32,210,239,76,48,1,234,8,72,169,0,168,89,-223
240 DATA0,160,200,208,250,201,128,240,4,169,55,133,1,166,174,164,175,104,-228
250 DATA40,88,96,221,16,173,240,34,173,161,2,74,176,250,173,1,221,41,253,-129
260 DATA141,1,221,173,1,221,41,4,240,249,169,144,24,76,59,239,173,161,2,41,-76
270 DATA18,240,243,24,96,173,151,2,172,156,2,204,155,2,240,11,41,247,141,-14
280 DATA151,2,177,247,238,156,2,96,9,8,141,151,2,169,0,96,72,173,161,2,240,-245
290 DATA17,173,161,2,41,3,208,249,169,16,141,13,221,169,0,141,161,2,104,96,-39
300 DATA165,0,41,6,201,2,240,3,76,158,253,234,169,5,133,9,162,90,134,75,162,-14
310 DATA0,169,82,133,36,32,86,245,80,254,184,173,1,28,197,36,240,9,198,75,-210
320 DATA208,239,169,10,76,105,249,80,254,184,173,1,28,149,37,232,224,7,208,-73
330 DATA243,32,151,244,165,22,69,23,69,24,69,25,69,26,240,7,198,9,208,192,-37
340 DATA76,30,244,165,24,197,6,240,3,76,11,244,133,34,169,6,133,49,76,60,-184
350 DATA4,165,18,166,19,133,22,134,23,165,6,133,24,165,7,133,25,169,0,69,-44
360 DATA22,69,23,69,24,69,25,133,26,32,52,249,162,90,32,86,245,160,0,80,254,-110
370 DATA184,173,1,28,217,36,0,240,6,202,208,237,76,81,245,200,192,8,208,234,-216
380 DATA32,86,245,80,254,184,173,1,28,145,48,200,208,245,160,186,80,254,184,-233
390 DATA173,1,28,153,0,1,200,208,244,32,224,248,165,56,197,71,240,3,76,246,-6
400 DATA244,32,233,245,197,58,240,3,76,2,245,160,0,169,85,32,82,4,185,0,6,-250
410 DATA133,119,44,0,24,16,251,169,16,141,0,24,44,0,24,48,251,162,0,138,102,-170
420 DATA119,42,42,102,119,42,42,141,0,24,138,102,119,42,42,102,119,42,42,-141
430 DATA141,0,24,138,102,119,42,42,102,119,42,42,141,0,24,138,102,119,42,-199
440 DATA42,102,119,42,42,141,0,24,162,2,202,208,253,169,15,141,0,24,200,208,-48
450 DATA173,234,234,234,234,234,234,234,173,0,28,9,8,141,0,28,173,0,6,208,-25
460 DATA3,76,158,253,197,24,208,249,133,6,173,1,6,133,7,76,101,3,133,119,-11
470 DATA44,0,24,16,251,169,16,141,0,24,44,0,24,48,251,162,4,169,0,102,119,-72
480 DATA42,42,102,119,42,42,141,0,24,202,208,240,234,234,234,234,234,234,-48
490 DATA169,15,141,0,24,96,96,133,0,88,165,0,48,252,120,96,120,234,234,234,-217
500 DATA234,234,234,165,24,141,0,6,133,6,165,25,141,1,6,133,7,169,4,133,120,-33
510 DATA169,226,32,130,4,201,2,144,51,160,0,132,120,164,120,185,219,254,240,-249
520 DATA18,88,32,118,214,120,169,226,32,130,4,201,2,144,26,230,120,208,231,-9
530 DATA169,192,32,130,4,169,226,32,130,4,201,2,144,8,169,255,32,82,4,76,-13
540 DATA34,235,173,0,6,240,248,197,24,240,196,173,0,6,133,6,173,1,6,133,7,-183
550 DATA76,160,4,234,234,234,234,160,0,185,25,244,153,48,1,200,192,31,208,-63
560 DATA245,76,48,1,169,0,168,89,0,160,200,208,250,201,128,240,7,169,55,133,-243
570 DATA1,76,1,245,76,48,244,160,0,177,187,201,36,240,242,169,1,133,167,169,-13
580 DATA0,133,144,165,167,32,12,237,169,111,32,185,237,165,144,16,11,230,-142
590 DATA167,165,167,201,16,208,230,76,187,238,165,167,201,8,240,239,160,0,-19
600 DATA185,122,244,240,6,32,210,255,200,208,245,32,225,255,208,251,238,234,-62
610 DATA234,234,234,76,187,238,234,13,89,79,85,32,72,65,86,69,32,77,79,82,-249
620 DATA69,32,84,72,65,78,32,49,32,68,69,86,73,67,69,32,79,78,45,76,73,78,-126
625 DATA69,13,0,-82
630 DATA0,0,0,120,169,55,133,1,160,0,132,3,169,160,133,4,177,3,145,3,230,-5
640 DATA3,208,248,230,4,208,244,169,229,141,214,253,169,76,141,114,254,141,-230
650 DATA249,244,169,188,141,115,254,169,254,141,116,254,169,9,141,250,244,-35
660 DATA169,244,141,251,244,169,18,133,3,169,10,133,4,169,226,133,5,169,248,-78
670 DATA133,6,177,3,145,5,200,208,249,230,4,230,6,165,6,201,250,208,239,169,-18
680 DATA16,162,8,133,3,134,4,169,187,162,238,133,5,134,6,177,3,145,5,200,-232
690 DATA208,249,230,4,230,6,165,6,201,240,208,239,185,67,13,153,95,228,200,-111
700 DATA192,80,208,245,160,0,185,12,12,153,9,244,200,192,148,208,245,169,-102
710 DATA53,133,1,76,248,252,234,234,0,32,66,89,84,69,83,32,70,82,69,69,13,-197
720 DATA0,0,0,0,0,0,0,147,67,66,77,32,83,85,80,69,82,32,68,79,83,13,79,46,-164
730 DATA83,32,49,46,48,13,40,67,41,32,49,57,56,52,32,72,69,76,77,83,77,65,-192
740 DATA78,32,83,79,70,84,87,65,82,69,32,67,79,82,80,46,13,0,129,72,32,0,-81
750 DATA0,0,0,0,0,0,0,0,0,0,0,49,54,53,44,49,55,54,44,48,55,51,44,50,-138
760 DATA53,53,44,48,57,32,32,32,32,32,42,80,82,71,32,32,0,223,13,1,0,32,32,-31
770 DATA32,34,70,65,83,84,46,83,80,69,67,73,65,76,34,32,32,32,32,32,80,82,-3
780 DATA71,32,32,0,255,13,6,0,32,32,32,34,72,69,76,77,83,77,65,78,32,84,85,-57
790 DATA82,66,79,68,73,34,32,80,82,71,32,32,0,29,14,241,0,66,76,79,67,75,-98
800 DATA83,32,70,82,69,69,46,32,32,32,32,32,32,32,32,32,32,32,32,0,0,0,-99
810 DATA44,55,-99,-999
820 GOSUB960
830 GOSUB1270
840 GOSUB1160
850 REM** [illegible] **]
860 RESTORE:OPEN1,8,3,"@:TURBOLOAD 64,P,W":PRINT#1,CHR$(1);CHR$(8);
870 PRINT"NOW GENERATING THE TURBOLOAD FILE"
880 READA:IFA<0GOTO900
890 PRINT#1,CHR$(A);:GOTO880
900 IFA<>-999GOTO880
910 PRINT#1:CLOSE1:SAVE"@:TURBO.GEN",8
920 GOSUB1420
930 REM** [illegible] **]
940 LOAD"TURBOLOAD 64",8
950 REM** [illegible] **]
960 PRINT"]        ***TURBOLOAD GENERATOR***"
970 ALLCHECK=0:FORLINE=0TO79
980 CHECK=0
990 READITEM:IFITEM<0GOTO1030
1000 CHECK=CHECK+ITEM:CODE=CODE+1
1010 ALLCHECK=ALLCHECK+SUM+CHECK
1020 GOTO990
1030 SUM=ABS(ITEM):IFSUM=999THENRETURN
1040 IFSUM<>(CHECK AND255)GOTO1090
1050 PRINT"[illegible]READING DATA FROM LINE";PEEK(63)+256*PEEK(64)
1060 NEXT LINE
```

```
1070 IF ALLCHECK<>197778OGOTO1140
1080 RETURN
1090 PRINT"XX?DATA ERROR IN LINE    ";PEEK(63)+256*PEEK(64)
1100 PRINT"GENERATED CHECKSUM     ";CHAND255
1110 PRINT"SHOULD HAVE BEEN       ";SUM
1120 ER$="L↘"+STR$(PEEK(63)+256*PEEK(64))+CHR$(13)+"RUN":FORI=1TOLEN(ER$)
1130 POKE630+I,ASC(MID$(ER$,I,1)):NEXT:POKE198,LEN(ER$):END
1140 PRINT"UNRECOVERABLE ERROR. CHECK YOUR DATA-     STATEMENTS CAREFULLY":END
1150 REM:[illegible]
1160 OPEN8,8,0,"$0:!£$%&"
1170 FORI=1TO8:GET#8,X$:NEXT
1180 GET#8,X$:IFX$<>""GOTO1180
1190 GET#8,X$:GET#8,X$
1200 GET#8,X$:GET#8,Y$
1210 X=LEN(X$):IFXTHENX=ASC(X$)
1220 Y=LEN(Y$):IFYTHENY=ASC(Y$)
1230 L=X+Y*256:IFL>50THENPRINT"YOU HAVE"L" BLOCKS FREE ON THE DISK":RETURN
1240 PRINT"NOT SUFFICIENT SPACE ON YOUR DISK"
1250 INPUT"INSERT ANOTHER DISK AND HIT 'RETURN'";X$:GOTO830
1260 REM:[illegible]
1270 OPEN15,8,15,"I"
1280 INPUT#15,EN:IFEN=0THENCLOSE15:RETURN
1290 IFEN<>21THENPRINT"YOU HAVE A FAULTY DISK INSERTED":GOTO1250
1300 PRINT"YOUR DISK IS NOT FORMATTED"
1310 PRINT"DO YOU WANT ME TO FORMAT IT (Y/N)":POKE198,0
1320 GETA$:IFA$="N"ORA$="Y"GOTO1340
1330 GOTO1320
1340 IFA$="N"GOTO1250
1350 INPUT"ENTER NEW DISK NAME";NAME$:IFLEN(NAME$)>16GOTO1350
1360 INPUT"ENTER NEW ID-CODE";ID$:IFLEN(ID$)>2GOTO1360
1370 PRINT#15;"NEW0:"+NAME$+","+ID$:CLOSE15
1380 FORI=1TO10:OPEN15,8,15,"I"
1390 INPUT#15,EN:IFEN<>0THENPRINT"YOU HAVE A FAULTY DISK":GOTO1250
1400 CLOSE15:NEXT:RETURN
1410 REM:[illegible]
1420 PRINT"DO YOU WANT TO PROTECT THE TURBOLOAD      FILE  (Y/N) ?":POKE198,0
1430 GETA$:IFA$="N"ORA$="Y"GOTO1450
1440 GOTO1430
1450 IFA$="N"THENRETURN
1460 FORAD=828TO1006:READDA:POKEAD,DA:NEXT
1470 F$="TURBOLOAD 64"
1480 POKE679,1:FORI=1TOLEN(F$):POKE683+I,ASC(MID$(F$,I,1)):NEXT
1490 POKE700,0:OPEN15,8,15:OPEN2,8,2,"#":T=18:S=1
1500 PRINT#15,"U1";2;0;T;S:SYS828:A=PEEK(252):IFAGOTO1530
1510 T=PEEK(681):S=PEEK(682):IFTGOTO1500
1520 PRINT"THE FILE IS NOT ON THE DISK":PRINT"UNRECOVERABLE ERRORR. TRY AGAIN":E
ND
1530 IF(AAND64)THENPRINT"THE FILE IS ALREADY LOCKED.":STOP
1540 P=PEEK(255):PRINT#15,"U1";2;0;T;S:PRINT#15,"B-P";2;P:PRINT#2,CHR$(AOR64);
1550 PRINT#15,"B-P 2 0":PRINT#15,"U2";2;0;T;S
1560 PRINT"THE FILE IS NOW PROPERLY LOCKED":RETURN
1570 REM:[illegible]
1580 REM:[illegible]
1590 REM:[illegible]
1600 DATA169,0,141,168,2,133,253,162,2,32,198,255,32
1610 DATA228,255,141,169,2,32,228,255,141,170,2,230,253
1620 DATA230,253,32,228,255,133,252,165,253,133,255,32,228
1630 DATA255,32,228,255,230,253,230,253,160,0,32,228,255
1640 DATA230,253,153,189,2,200,24,192,16,144,242,160,243
1650 DATA32,228,255,230,253,165,144,240,3,141,168,2,200
1660 DATA208,241,165,252,208,7,173,168,2,208,22,240,191
1670 DATA165,140,240,3,32,199,3,173,167,2,240,3,32
1680 DATA175,3,173,168,2,240,171,32,204,255,96,160,0
1690 DATA185,172,2,240,8,217,189,2,208,7,200,208,243
1700 DATA238,168,2,96,169,0,133,252
1710 DATA96,160,0,185,189,2,240,6,32,210,255,200,208
1720 DATA245,165,252,41,64,240,10,169,144,32,210,255,169,60,32,210,255,169
1730 DATA13,32,210,255,169,144,32,210,255,96

READY.
```

Spectrum Speech
by Philip Kirkpatrick

This program will take any outside sound (including speech) and record it into the Spectrum's memory. Once in memory, the sound can be speeded up and rearranged as required by the user.

To use this program, type in the first listing and save to cassette with the command SAVE "speech" LINE 3. Then type CLEAR 32767:NEW and type in the second listing with the command SAVE "sc"CODE 65279,100.

To run the program type CLEAR 32767:NEW:LOAD ""; the program will automatically load the machine code. After loading you will be presented with a menu of eight different options:

1) Sample sound — this will allow you to record any sound entered via the ear port into the Spectrum memory.
2) Change parameters — allows you to lengthen, shorten or change the speed of the recording in memory.
3) Play sound.
4) Save sound — saves the sound in memory to tape.
5) Load sound — loads previously stored sound.
6) Name sound — adds a single letter label to sound.
7) Program sequence — allows you to create a sequence from previously defined labels.
8) Run sequence — executes the sequence created.

```
LIST
   1 REM *** PUBLIC SPEECH (C)1985 *
   2 REM *** BY P.KIRKPATRICK ******
   3 PRINT AT 10,9;BRIGHT 1;FLASH 1;"Code is Loading"
   5 LOAD ""CODE
   6 DIM F$(50):DIM E(50):DIM B(50):LET C=0
```

PROGRAM FILE

```
7 LET S$=""
8 LET S=32768:LET F=65024:LET P=8
9 CLS
10 PRINT AT 0,10;"Public Speech"
20 PRINT AT 0,10:OVER 1;"_____________":REM 13 UNDERLINE CHARS
30 PRINT AT 2,0;"OPTIONS-"
40 PRINT AT 4,0;"1....Sample Sound"
50 PRINT AT 6,0;"2....Change Parameters"
60 PRINT AT 8,0;"3....Play Sound"
70 PRINT AT 10,0;"4....Save Sound"
80 PRINT AT 12,0;"5....Load Sound"
85 PRINT AT 14,0;"6....Name Sound"
87 PRINT AT 16,0;"7....Program Sequence"
88 PRINT AT 18,0;"8....Run Sequence"
90 LET A$=INKEY$
100 IF A$="1" THEN CLS:GOSUB 1000:CLS:GOTO 10
110 IF A$="2" THEN CLS:GOSUB 1500:CLS:GOTO 10
120 IF A$="3" THEN CLS:GOSUB 2000:CLS:GOTO 10
130 IF A$="4" THEN CLS:GOSUB 2500:CLS:GOTO 10
140 IF A$="5" THEN CLS:GOSUB 3000:CLS:GOTO 10
150 IF A$="6" THEN CLS:GOSUB 3500:CLS:GOTO 10
160 IF A$="7" THEN CLS:GOSUB 3600:CLS:GOTO 10
170 IF A$="8" THEN CLS:GOSUB 3650:CLS:GOTO 10
180 GOTO 90
1000 INPUT"Press ENTER to Sample ";LINE A$
1010 RANDOMIZE USR 65280
1020 RETURN
1500 PRINT AT 0,8;"Alterations Menu"
1510 PRINT AT 0,8;OVER 1;"________________":REM 16 UNDERLINE CHARS
1520 PRINT AT 2,0;"OPTIONS-"
1530 PRINT AT 4,0;"1....Change Start Address"
1540 PRINT AT 6,0;"2....Change Last Address"
1550 PRINT AT 8,0;"3....Change Speed"
1560 LET A$=INKEY$
1570 IF A$="1" THEN CLS:GOSUB 1620:CLS:GOTO 1500
1580 IF A$="2" THEN CLS:GOSUB 1680:CLS:GOTO 1500
1590 IF A$="3" THEN CLS:GOSUB 1740:CLS:GOTO 1500
1600 IF A$=CHR$ 13 THEN RETURN
1610 GOTO 1560
1620 PRINT AT 0,0;"Current Start Address ";S
1630 INPUT"ENTER New Start Address ";S
1640 IF S>=F OR S<32768 THEN GOTO 1630
1650 LET H=INT (S/256):LET L=S-(H*256)
1660 POKE 65310,L:POKE 65311,H
1670 RETURN
1680 PRINT AT 0,0;"Current Last Address ";F
1690 INPUT"ENTER New Last Address ";F
1700 LET N=INT(F/256)
1710 IF N>254 OR N<128 THEN GOTO 1690
1720 POKE 65335,N
1730 RETURN
1740 PRINT AT 0,0;"Current Speed ";P
1750 INPUT"ENTER New Speed ";P
1760 IF P<1 OR P>15 THEN GOTO 1750
1770 POKE 65313,P
1780 RETURN
2000 INPUT"Press ENTER for Sound ";LINE A$
2010 RANDOMIZE USR 65308
2020 IF INKEY$=CHR$ 13 THEN RETURN
2030 GOTO 2010
2500 INPUT"ENTER Name of File ";LINE N$
2502 IF N$="" THEN GOTO 2500
2510 SAVE N$ CODE 32767,32512
2520 RETURN
3000 INPUT"ENTER Name of File ";LINE N$
3002 IF N$="" THEN GOTO 3000
3010 LOAD N$ CODE
3020 RETURN
3500 LET C=C+1:IF C>50 THEN PRINT AT10, ;"[illegible] Full":PAUSE 0:RETURN
3505 PRINT AT 10,8;"Press Letter Name"
3510 PAUSE 0:LET A$=INKEY$
3515 IF A$="/" THEN GOTO 3505
3520 PRINT AT 21,6;A$;"= Name of This [illegible]"
3530 LET F$(C)=A$:LET E(C)=F:LET B(C)=S
3540 RANDOMIZE USR 65308
3550 RETURN
3600 PRINT AT 0,0;"Program-";S$
3601 INPUT"Re-Program? ";LINE E$
3602 IF E$="" OR E$="n" THEN RETURN
3603 INPUT"ENTER Pause Length Reqd. ";M
3605 IF M<1 OR M>20 THEN GOTO 3600
3610 PRINT AT 10,0;"Program Sequence Now"
3615 LET S$=""
3620 INPUT LINE S$
3625 IF S$="" THEN GOTO 3620
3630 RETURN
3650 IF S$="" THEN RETURN
3655 FOR L=1 TO LEN S$
3660 IF S$(L)="/" THEN PAUSE M:NEXT L
3670 FOR K=1 TO LEN F$
3680 IF F$(K)=S$(L) THEN GOTO 3710
3690 NEXT K
3700 GOTO 3750
3710 POKE 65311,INT (B(K)/256)
3715 LET W=PEEK 65311
3720 POKE 65310,B(K)-(W*256)
3730 POKE 65335,INT (E(K)/256)
3740 RANDOMIZE USR 65308
3750 NEXT L
3760 LET F=PEEK 65335*256
3770 LET S=W*256+PEEK 65310
3780 RETURN
```

```
10 FOR a=65280 TO 65339
20 READ v:POKE a,v
30 NEXT a
40 DATA 243,33,0,128,6,8,219,254,203,119,32,2,203,254,203,62,16,244,203,
14,35,124,254,254,32,234,251,201,243,33,0,128,6,8,203,70,40,4,62,0,211,
254,62,255,211,254,203,6,16,240,203,6,35,124,254,254,32,230,251,201
```

Epson HX-20 HX-Modem

by Wico Ypma

HX-Modem is a communications program for the Epson HX-20, allowing you to use the HX-20 as a smart terminal. For transfer of files it employs the Ward Christensen (or XModem) protocol. This protocol is very popular among CP/M systems, so you can not only transfer files from HX-20 to HX-20 but also to CP/M machines (including the Epson PX-8 and QX-10).

When you run the program the terminal machine code section will load into memory as a file called HX-Modem, and some Basic will be left called SetModem. Select HX-Modem from the menu to enter terminal mode or SetModem to configure communication conditions.

HX-Modem

In this mode the PF-keys have the following functions:

PF-1 — local Echo ON/OFF
PF-2 — automatic LF after CR during transmission ON/OFF
PF-3 — filter during transmission ON/OFF
PF-4 — send the file in the RAM file area
PF-5 — return to MENU
PF-6 — disable left/right scrolling ON/OFF
PF-7 — automatic LF after CR during receive ON/OFF
PF 8 — filter during receive ON/OFF
PF-9 — receive a file in the RAM file area
PF-0 — return to MENU

The filter function filters out non-ASCII symbols and control codes, and converts the delete (ASCII 8) into the more general (ASCII 127) code.

SetModem

The SetModem section of the program has three options:

1) Allows you to change the RS232 handshaking conditions and the amount of memory reserved for the screen file and file buffer.
2) Handles saving and loading of text to tape in text or ASCII-Basic format.
3) Loads a text or ASCII-Basic file from tape and stores it in the file buffer ready for transmission.

```
T
X
100 'HX-Modem V3.1  1985 BY J.W.Ypma"
110 CLS:PRINT"  HANG ON A SECOND"
120 MEMSET &HEA8+81*24
130 FOR I=&HA40 TO &HEA6:READ A:POKE I,A:NEXT
140 TITLE "SetModem"
150 EXEC&HA40:A$="DELETE 1-999"+CHR$(13)+"EXEC&HDFFD"+CHR$(13)
160 A=VARPTR(A$):POKE&H916,&HFE:POKE&H917,PEEK(A+1):POKE&H918,PEEK(A+2)
170 END
180 DATA 206,1,60,60,238,2,140,255,255,39,5,24,56,24,32,243,56,204,186,65,237,0
190 DATA 204,10,92,237,2,57,186,65,255,255,10,116,72,88,45,77,111,100,101,109
200 DATA 32,32,86,51,46,49,32,87,89,0,206,14,77,198,7,166,0,167,7,8,90,38,248
210 DATA 206,14,84,189,255,94,206,14,86,189,255,94,134,255,183,14,55,183,14,57
220 DATA 183,14,59,183,14,58,79,183,14,56,204,253,40,189,255,136,134,1,189,255
230 DATA 133,254,255,220,204,1,4,189,255,130,189,255,157,37,93,39,94,189,255
240 DATA 154,129,254,38,19,192,241,37,83,193,10,36,79,88,206,11,114,58,238,0
250 DATA 173,0,32,68,246,14,57,39,34,129,13,39,30,129,32,44,26,129,8,39,7,54
260 DATA 189,255,79,50,32,44,246,14,55,39,3,189,255,79,134,127,189,255,118,32
270 DATA 29,189,255,118,246,14,55,39,5,54,189,255,79,50,129,13,38,12,246,14,56
280 DATA 39,7,134,10,32,230,126,14,43,254,255,216,236,0,39,148,189,255,121,246
290 DATA 14,59,39,34,129,127,46,136,45,4,134,8,32,24,129,127,39,57,44,52,129,32
300 DATA 44,14,129,7,39,31,45,42,129,13,46,38,129,11,39,29,54,189,255,79,50,246
310 DATA 14,58,38,3,126,10,179,129,13,38,17,134,10,32,235,204,10,2,189,255,100
320 DATA 32,5,134,10,189,255,79,126,10,179,134,8,32,215,11,141,11,152,11,163,13
330 DATA 87,14,43,11,174,11,195,11,206,11,217,14,43,76,198,1,189,255,100,57,182
340 DATA 14,55,67,183,14,55,132,15,32,238,182,14,56,67,183,14,56,132,15,32,227
350 DATA 182,14,57,67,183,14,57,132,15,32,216,182,2,128,133,1,39,7,122,2,128
360 DATA 134,0,32,202,124,2,128,134,15,32,195,182,14,58,67,183,14,58,132,15,32
370 DATA 184,182,14,59,67,183,14,59,132,15,32,173,198,0,189,255,73,198,19,206
380 DATA 14,91,189,255,73,198,10,206,14,111,189,255,73,198,10,206,14,122,189
390 DATA 255,73,79,183,14,73,183,14,71,183,14,70,189,13,67,189,13,47,252,1,44
400 DATA 253,14,64,179,4,254,253,14,62,134,21,189,255,118,204,160,0,253,14,68
410 DATA 189,13,12,182,14,75,39,3,126,12,181,182,14,74,129,1,38,122,189,12,254
420 DATA 182,14,74,183,14,71,189,12,254,182,14,74,187,14,71,76,38,113,182,14,71
430 DATA 176,14,70,38,3,126,12,231,74,38,99,79,183,14,72,198,128,247,14,76,254
440 DATA 14,62,255,14,60,189,12,254,182,14,74,254,14,60,167,0,8,188,14,64,44,67
450 DATA 255,14,60,187,14,72,183,14,72,122,14,76,38,225,141,124,182,14,74,177
460 DATA 14,72,38,43,182,14,70,76,183,14,70,189,13,47,79,183,14,73,189,13,67
470 DATA 254,14,60,255,14,62,134,6,189,255,118,126,12,23,129,4,38,8,134,6,189
480 DATA 255,118,126,12,197,182,14,73,76,183,14,73,54,189,13,67,50,129,10,45,12
490 DATA 198,0,189,255,73,204,10,2,189,255,100,57,141,3,126,12,18,189,12,241
500 DATA 204,5,0,253,14,68,141,29,182,14,75,39,240,57,141,237,134,6,189,255,118
510 DATA 126,12,23,254,255,216,236,0,39,5,189,255,121,32,244,57,204,16,0,253,14
520 DATA 68,189,255,157,36,3,126,255,37,127,14,75,254,255,216,236,0,38,18,198
530 DATA 25,90,46,253,254,14,68,9,255,14,68,38,235,115,14,75,57,189,255,121,183
540 DATA 14,74,57,182,14,70,22,79,206,14,135,189,255,40,214,6,206,14,133,189
550 DATA 255,73,57,182,14,73,22,79,206,14,142,189,255,40,198,6,206,14,140,189
560 DATA 255,73,57,198,0,189,255,73,198,19,206,14,147,189,255,73,198,10,206,14
570 DATA 111,189,255,73,198,10,206,14,122,189,255,73,127,14,73,189,13,67,252,1
580 DATA 44,179,4,254,253,14,62,206,14,66,227,0,253,14,64,134,1,183,14,70,189
590 DATA 13,47,254,14,62,134,1,189,255,118,182,14,70,189,255,118,67,189,255,118
600 DATA 198,128,247,14,76,79,183,14,72,166,0,189,255,118,187,14,72,183,14,72,8
610 DATA 122,14,76,38,239,182,14,72,189,255,118,60,204,160,0,253,14,68,189,13
620 DATA 12,182,14,74,129,6,39,22,56,189,12,214,124,14,73,182,14,73,54,189,13
630 DATA 67,50,129,10,45,170,126,12,197,56,255,14,62,124,14,70,188,14,64,44,14
640 DATA 182,14,70,189,13,47,127,14,73,189,13,67,32,141,134,4,189,255,118,189
650 DATA 12,254,182,14,74,129,6,38,3,126,12,197,124,14,73,189,13,67,189,12,214
660 DATA 182,14,73,129,10,45,222,126,12,197,189,255,127,79,189,255,133,56,126
670 DATA 255,37,57,255,0,255,0,255,78,128,67,0,66,240,2,240,14,214,7,29,70,0,6
680 DATA 0,0,132,34,135,79,23,14,167,132,34,135,0,23,14,167,0,0,32,32,72,88,45
690 DATA 77,111,100,101,109,32,82,101,99,101,105,118,101,0,1,32,32,83,69,67,84
700 DATA 79,82,58,0,2,32,32,69,82,82,79,82,83,58,9,1,48,48,48,48,48,9,2,48,48
710 DATA 48,48,48,0,0,32,32,72,88,45,77,111,100,101,109,32,83,101,110,100,32,32
```

```
720 DATA 32
1000 'SetModem FOR HX-Modem V-3.1:29/04/85:BY J.W.YPMA
1010 WIDTH 21,20,1:POKE&H27C,0:ON ERROR GOTO 1540
1020 CLS:PRINT"*  Set-Modem V3.1  *"
1030 PRINT"1 SET CONDITIONS":PRINT"2 SAVE/LOAD FILE":PRINT"3 MENU";
1040 A=VAL(INPUT$(1)):ON A GOTO 1060,2000,1050:GOTO 1040
1050 EXEC&HDFFD
1060 CLS:F=PEEK(&H4FE)*256+PEEK(&H4FF)
1070 PRINT"AVAILABLE MEMORY FOR":PRINTUSING"FILES : ##### Bytes";F
1080 PRINT:PRINT"1:O.K.    2:CHANGE";
1090 K$=INPUT$(1):IF K$="1" THEN 1110
1100 CLS:PRINT"REQUIRED MEMORY FOR":INPUT"FILES :",F:CLEAR 200,F:GOTO1060
1110 CLS:PRINT"AVAILABLE MEMORY FOR"
1120 M=PEEK(&H136)*256+PEEK(&H137)-&HEA5
1130 COL=PEEK(&HE50)+1:LIN=PEEK(&HE51)+1
1140 PRINTUSING"SCREEN:  ### COLUMNS";COL:PRINTUSING"         ### LINES";LIN
1150 PRINT"1:O.K.    2:CHANGE";
1160 K$=INPUT$(1):IF K$="1" THEN 1210 ELSE IF K$<>"2" THEN PRINTK$:GOTO 1160
1170 CLS:PRINT"INPUT NUMBER OF":INPUT"COLUMNS   : ",COL:INPUT"LINES     : ",LIN
1180 POKE &HE50,(COL-1):POKE&HE51,(LIN-1)
1190 M=&HEA6+LIN*(COL+1):MEMSET M
1200 GOTO 1110
1210 CLS:PRINT"*  Set-Modem V31  *"
1220 A=PEEK(&HAA0):B=PEEK(&HAA1)
1230 PRINT"WORDLENGTH:    ";B AND &H0F;"BIT"
1240 PRINTUSING"BIT RATE  : #### BPS";2^((B AND &HF0)/16-1)*150
1250 PRINT"STOP BITS :    ";A AND &H03;"BIT"
1260 CD=A AND 4:PRINT"CD         : ";:IF CD THEN PRINT"NO CHECK" ELSE PRINT"   CHECK"
1270 RTS=A AND 8:PRINT"RTS        :       ";:IF RTS THEN PRINT" ON" ELSE PRINT"OFF"
1280 CTS=A AND 32:PRINT"CTS        : ";:IF CTS THEN PRINT"NO CHECK" ELSE PRINT"   CHECK"
1290 DSR=A AND 16:PRINT"DSR        : ";:IF DSR THEN PRINT"NO CHECK" ELSE PRINT"   CHECK"
1300 PAR=(A AND &HC0)/64:PRINT"PARITY     : ";
1310 IF PAR=0 THEN PRINT"    EVEN" ELSE IF PAR=1 THEN PRINT"     ODD" ELSE PRINT"NO CHECK"
1320 PRINT:PRINT"1:O.K.    2:CHANGE";
1330 K$=INPUT$(1):IF K$="1" THEN 1000
1340 IF K$<>"2" THEN PRINTK$;:GOTO 1330
1350 CLS:PRINT"WORDLENGTH":PRINT"1: 7 BIT":PRINT"2: B BIT"
1360 W$=INPUT$(1):IF W$="1" THEN WL=7 ELSE IF W$="2" THEN WL=8 ELSE 1350
1370 CLS:PRINT"BIT RATE":PRINT"1:  300   4: 2400":PRINT"2:  600   5: 4800":PRINT"3: 1200";
1380 BR=VAL(INPUT$(1)):IF BR<1 OR BR>5 THEN 1370 ELSE BR=BR+1
1390 POKE &HAA1,(BR*16+WL)
1400 CLS:PRINT"STOP BITS":PRINT"1: 1 BIT":PRINT"2: 2 BIT"
1410 S$=INPUT$(1):IF S$="1" THEN SB=1 ELSE IF S$="2" THEN SB=2 ELSE 1400
1420 CLS:PRINT"CARRIER DETECT":PRINT"1: CHECK":PRINT"2: NO CHECK"
1430 T$=INPUT$(1):IF T$="1" THEN CD=0 ELSE IF T$="2" THEN CD=1 ELSE 1420
1440 CLS:PRINT"REQUEST TO SEND":PRINT"1: ON":PRINT"2: OFF"
1450 R$=INPUT$(1):IF R$="1" THEN RTS=1 ELSE IF R$="2" THEN RST=0 ELSE 1440
1460 CLS:PRINT"CLEAR TO SEND":PRINT"1: CHECK":PRINT"2: NO CHECK"
1470 C$=INPUT$(1):IF C$="1" THEN CTS=0 ELSE IF C$="2" THEN CTS=1 ELSE 1480
1480 CLS:PRINT"DATA SET READY":PRINT"1: CHECK":PRINT"2: NO CHECK"
1490 D$=INPUT$(1):IF D$="1" THEN DSR=0 ELSE IF D$="2" THEN DSR=1 ELSE 1460
1500 CLS:PRINT"PARITY CHECK":PRINT"1: EVEN":PRINT"2:  ODD":PRINT"3: NONE";
1510 P$=INPUT$(1):IF P$="1" THEN P=0 ELSE IF P$="2" THEN P=1 ELSE P=2
1520 POKE&HAA0,(SB+4*CD+8*RTS+16*DSR+32*CTS+64*P)
1530 GOTO1210
1540 CLS:IF ERR=7 OR ERR=9 THEN PRINT"  MEMORY OVERFLOW" ELSE PRINT"  UNDEFINED ERROR"
1550 PRINT:PRINT"       ENTER CR";:A$=INPUT$(1):RUN
2000 CLS:PRINT"*  Set-Modem V3.1  *":PRINT"1 SAVE SCREEN":PRINT"2 SAVE FILE":PPINT"3 LOAD FILE";
2010 A=VAL(INPUT$(1)):ON A GOTO 2020,2100,2190:GOTO2010
2020 CLS:PRINT"**  SAVE SCREEN  **"
2030 GOSUB2270:OPEN"O",#1,"CAS0:"+A$+".ASC"
2040 COL=PEEK(&HE50):LIN=PEEK(&HE51):D=&HEA7
2050 FOR I=0 TO LIN:A$=""
2060  FOR J=0 TO COL
2070  A$=A$+CHR$(PEEK(D+J+I*(COL+1)))
2080  NEXT J:PRINT#1,A$
2090 NEXT I:CLOSE#1:GOTO1000
2100 CLS:PRINT" **  SAVE FILE  **":GOSUB 2270
2110 OPEN"O",#1,"CAS0:"+A$+".ASC":M=PEEK(&H12C)*256+PEEK(&H12D)
2120 M=M-PEEK(&H4FE)*256-PEEK(&H4FF):L=PEEK(&HE3C)*256+PEEK(&H23D)-M
2130 POKE&HE42,(L\256):POKE&HE43,(L MOD256)
2140 L=PEEK(&HE42)*256+PEEK(&HE43):DEFFIL 1,0:I=0:B$=CHR$(13)+CHR$(10):A$=""
2150 GET% I,I$:A$=A$+I$:I=I+1:IF I>L THEN 2180
2160 IF RIGHT$(A$,1)<>CHR$(13) THEN 2150 ELSE PRINT#1,LEFT$(A$,LEN(A$)-1):A$=""
2170 GET% I+1,I$:IF I$=CHR$(10) THEN I=I+1:GOTO2150 ELSE GOTO 2150
2180 PRINT#1,A$:CLOSE#1:GOTO1000
2190 CLS:PRINT"**   LOAD FILE   **":GOSUB 2270
2200 OPEN"I",#1,"CAS0:"+A$+".*":DEFFIL 1,0:L=0:CLS:PRINT"  LOADING "A$
2210 IF EOF(1) THEN 2250
2220 INPUT#1,B$:FOR I=1 TO LEN(B$)
2230 PUT% L,MID$(B$,I,1):L=L+1:NEXT
2240 PUT% L,CHR$(13):PUT% L+1,CHR$(10):L=L+2:GOTO 2210
2250 POKE &HE42,(L\256):POKE&HE43,(L MOD256):FOR I=L TO L+127:PUT% I,CHR$(0):NEXT
2260 CLOSE#1:GOTO1000
2270 INPUT"FILE NAME:",A$:A$=LEFT$(A$,8)
2280 PRINT"TAPE-COUNT:"TAPCNT"
2290 PRINT"IN POSITION? (Y/N)";
2300 B$=INPUT$(1):IF B$<>"Y" AND B$<>"y" THEN 2280
2310 RETURN
```

Microsoft Basic Compressor

by Bjorn Taale Sandberg

One of the sad consequences of Basic being an interpreted language is the amount of memory the source code consumes. This often makes it necessary to go through the program, removing comments and compressing statements from a well-tested bit to make room for more. This compressor program takes a Basic program stored on disk as an ASCII file, removes all comments, and appends lines to the end of preceding lines wherever possible. The resulting program is considerably shorter and usually faster.

Lines referred to in any GOTO, GOSUB, RESUME, RESTORE, THEN or DELETE statements are not touched. Whenever a line consisting entirely of a comment cannot be removed because it is the destination for a jump, the comment is removed and replaced by 'JTR (jump to remark).

PROGRAM FILE

```
10 DIM GT(5000) :TGT%=0:PASS=1:GOSUB 140
20 PRINT"Input file opened !"
30 GOSUB 680
40 PRINT"Line numbers logged !":PRINT
50 GOSUB 750
60 PRINT"Line numbers sorted !";PRINT
70 OPEN"I",#1,RF$
80 OPEN"O",#2,OF$
90 PASS=2
100 PRINT"Ready for pass 2 -> Compression & comment deletion.":PRINT
110 GOSUB 680
120 PRINT;PRINT"Process complete:";RF$;" -> ";OF$:PRINT:PRINT
130 END
140 'JTR
150 ON ERROR GOTO 250
160 PRINT:PRINT
170 INPUT"Input BASIC ASCII file ";RF$
180 IF RF$="" THEN END
190 FILES RF$:ON ERROR GOTO 0
200 OPEN"I",#1,RF$
210 INPUT"Output BASIC ASCII file ";OF$
220 IF OF$="" THEN END
230 OPEN"O",#2,OF$
240 RETURN
250 RESUME 260
260 ON ERROR GOTO 0
270 PRINT"No such file exist !!!!!!!"
280 GOTO 150
290 'JTR
300 LW$=""
310 TSV$=I$
320 IF INSTR(I$,CHR$(34))>0 THEN GOSUB 890:GT(TGT%)=VAL(RW$):TGT%=TGT%+1:I$=TSV$
:GOTO 340
330 IF INSTR(I$,"IF ")>0  THEN GOSUB 890:GT(TGT%)=VAL(RW$):TGT%=TGT%+1:I$=TSV$
340 GOSUB 890
350 IF VAL(RW$)>0 THEN 380
360 IF RW$="," THEN 390
370 LW$=RW$:GOTO 390
380 IF LW$="THEN" OR LW$="RESTORE" OR LW$="GOTO" OR LW$="GOSUB" OR LW$="RESUME"
OR LW$="DELETE" THEN GT(TGT%)=VAL(RW$):TGT%=TGT%+1
390 IF I$="" THEN RETURN
400 GOTO 340
410 'JTR
420 S$=I$ :GOSUB 890 :LNR=VAL(RW$):I$=S$:SS1$=RW$:GOSUB 790
430 IF FEIL% THEN 490
440 GOSUB 570:IF (VAL(I$)>0) AND (ABS(LOG(VAL(I$)+1)*.434294482#-LEN(I$))<4) THE
N I$=I$+"'JTR"
450 IF OP$<>"" THEN PRINT#2,OP$
460 PRINT#2,I$
470 OP$="":I$=""
480 RETURN
490 GOSUB 890:ES$=RW$
500 GOSUB 570
510 IF I$="" THEN RETURN
520 IF OP$="" THEN OP$=ES$+I$:RETURN
530 IF LEN(OP$)+LEN(I$)>250 THEN 550
540 OP$=OP$+":"+I$:RETURN
550 PRINT#2,OP$
560 OP$=ES$+I$:RETURN
570 R$=""
580 C$=RIGHT$(I$,1)
590 R$=C$+R$:I$=LEFT$(I$,LEN(I$)-1)
600 IF C$=CHR$(34) THEN I$=I$+R$:RETURN
610 IF C$="'" THEN 660
620 IF I$="" THEN I$=R$:RETURN
630 IF C$<>"M" THEN 580
640 IF (RIGHT$(I$,3)=" RE") OR (RIGHT$(I$,3)=":RE") THEN I$=LEFT$(I$,LEN(I$)-3):
RETURN
650 GOTO 580
660 IF I$=SPACE$(LEN(I$)) THEN I$="":RETURN
670 RETURN
680 'JTR
690 WHILE NOT(EOF(1)):LINE INPUT#1,I$:PRINT I$
700     IF PASS=1 THEN GOSUB 290 ELSE GOSUB 410
710 WEND
720 PRINT"End of input file reached !"
730 IF PASS=2 AND OP$<>"" THEN PRINT#2,OP$
740 CLOSE#1:CLOSE#2:RETURN
750 FOR Q1%=0 TO TGT%-1
760   FOR Q2%=Q1%+1 TO TGT%
770       IF GT(Q2%)<GT(Q1%) THEN SWAP GT(Q1%),GT(Q2%)
780   NEXT:NEXT:RETURN
790 FEIL%=(0=1)
800 TP%=TGT%:BU%=0:CU%=(TP%+BU%)Ø2
810 IF LNR=GT(CU%) THEN RETURN
820 IF GT(CU%)<LNR THEN 860
830 TP%=CU%:CU%=(TP%+BU%)Ø2
840 IF TP%-BU%=1 THEN 880
850 GOTO 810
860 BU%=CU%:CU%=(TP%+BU%)Ø2
870 GOTO 840
880 IF LNR=GT(CU%) OR LNR=GT(BU%) OR LNR=GT(TP%) THEN RETURN ELSE FEIL%=(0=0):RE
TURN
890 'JTR
900 W$=""
910 IF I$="" THEN RW$="":RETURN
920 C$=LEFT$(I$,1)
930 I$=MID$(I$,2)
940 IF C$=CHR$(34) THEN 980
950 IF INSTR("';,:#*+-/()=><^Ø",C$)<>0 THEN 980
960 IF C$=" " THEN RW$=W$:RETURN
970 W$=W$+C$:GOTO 920
980 IF W$<>"" THEN I$=C$+I$:RW$=W$:RETURN
990 RW$=C$:RETURN
```

QL Shading

by Kees Truijens

QL Easel is probably the best of the Psion Xchange suite, offering an excellent way to draw graphs, but any serious user will eventually want to see the graphs in hard copy. If you try to print an Easel graph, it soon becomes apparent how much the program relies on colour graphics, making black and white printout impossible to decipher. The routines presented here offer a solution by replacing red and green with shaded black and white.

To use the procedure, dump the Easel picture in a microdrive file using the PRINT command with the S (screen dump) option. Then load the program shown in listing 1 and type 'shade_init', load the picture with the LBYTES command and type 'shade_all'.

Although the routines have been designed to work with four-colour Easel screens, they will work with any screen. Try shaded pictures with stippled colours or pictures in eight-colour mode. The program in listing 2 produces sample charts of all the combinations of four foreground colours, four background colours and four stipple patterns to allow you to test the shading program.

The resulting picture can be plotted on a graphics printer with the help of an appropriate screen-dump program. Listing 3 shows an example screen-dump program for the IDS Microprism, but should be of value to anyone who has not yet obtained or written a screen-dump program.

```
20000 DEFine PROCedure shade(x_start,y_start,x_stop,y_stop,green_mask,red_mask)
20010 REMark (c) Kees Truijens / Kees van der Wal  nov 84  vers 1.2
20020 REMark first run procedure "shade_init" once
20030 REMark input parameters:
20040 REMark shade_start = start adress of machine code returned by        proc "s
hade_init"
20050 REMark x_start,y_start = upper left corner of affected area          (pixel
coordinates)
20060 REMark x_stop, y_stop  = lower right corner etc.
20070 REMark red_mask, green_mask (0 - 255) determine shade pattern
20080 REMark Try values 17,51,119,85 etc.
20090 IF x_start<0 OR x_start>512 OR y_start<0 OR y_start>256 OR x_stop<x_start OR
 x_stop>512 OR y_stop<y_start OR y_stop>256 OR red_mask<0 OR red_mask>255 OR green
_mask<0 OR green_mask>255 THEN PRINT#0;'Bad parameters for procedure "shade".':RET
urn
20100 CALL shade_start,green_mask,red_mask, 131072+(x_start DIV 8)*2 + y_start*128
, (x_stop-x_start) DIV 8, y_stop-y_start
20110 END DEFine shade
20120 REMark ****************************************************
20130 DEFine PROCedure shade_all
20140 shade 0,0,512,256,17,17
20150 END DEFine shade_all
20160 REMark ****************************************************
20170 DEFine PROCedure shade_init
20180 LOCal sign, word, address, checksum
20190 LET shade_start=RESPR(64)
20200 LET checksum=0: sign=1
20210 RESTORE
20220 FOR address=shade_start TO shade_start+58 STEP 2
20230   READ word
20240   POKE_W address,word
20250   LET checksum=checksum+sign*word+1
20260   sign=-sign
20270 END FOR address
20280 IF checksum <> 14565 THEN PRINT#0;'Erroneous data in proc shade_init.':RETur
n
20290 PRINT "Machine code for 'shade' and"\"'shade_all' is loaded."\\
20300 PRINT "It's start address is assigned"\"to the variable 'shade_start'."\\
20310 PRINT "The present value of"\"'shade_start' is: ";shade_start\\
20320 PRINT "Assign this value again"\"to 'shade_start' after a"
20330 PRINT "'CLEAR', 'NEW' or 'LOAD' command."
20340 DATA 8259              :REMark MOVEA.1 D3,A0
20350 DATA 8776              :REMark MOVEA.L A0,A1
20360 DATA 9732              :REMark MOVE.1  D4,D3
20970 DATA 24620             :REMark BRA.s   +44
20380 DATA 24600             :REMark BRA.s   +24
20390 DATA -20216            :REMark CMPM.b  (A0)+,(A0)+
20400 DATA 26388             :REMark BEQ.s   +20
20410 DATA 7712              :REMark MOVE:b  -(A0),D7
20420 DATA 7200              :REMark MOVE.b  -(A0),D6
20430 DATA 4103              :REMark MOVE.b  D7,D0
20440 DATA -16378            :REMark AND.b   D6,D0
20450 DATA -13311            :REMark AND.b   D1,D6
20460 DATA -12798            :REMark AND.b   D2,D7
20470 DATA -32762            :REMark OR.b    D6,D0
20480 DATA -32761            :REMark OR.b    D7,D0
20490 DATA 4288              :REMark MOVE.b  D0,(A0)+
20500 DATA 4288              :REMark MOVE.b  D0,(A0)+
20510 DATA 20940, -26        :REMark DBF     D4,-26
20520 DATA 10243             :REMark MOVE.1  D3,D4
20530 DATA -11268, 0, 128    :REMark ADDA.1  #128,A1
20540 DATA 8265              :REMark MOVEA.1 A1,A0
20550 DATA -7399             :REMark ROL.b   #1,D1
20560 DATA -7654             :REMark ROR.b   #1,D2
20570 DATA 20941, -46        :REMark DBF     D5,-46
20580 DATA 28672             :REMark MOVEQ   #0,D0
20590 DATA 20085             :REMark RTS
20600 END DEFine shade_init
```

Listing 1

Listing 2

```
100 REMark sample of shade patterns
110 REMark (c) Kees Truijens/Kees van de Wal, dec 1984
120 REMark first run procedure shade_init once
130 MODE 4
140 WINDOW 512,224,0,0:WINDOW#0,512,32,0,224:PAPER 0:PAPER#0,0:CLS:CLS#0
150 palette 17,17
160 REPeat loop
170   green_mask=RND(1 TO 255):red_mask=RND(1 TO 255)
180   palette green_mask,red_mask
190 END REPeat loop
200 REMark ***************************************************
210 DEFine PROCedure palette (green_mask,red_mask)
220 LOCal col1,col2,stip,x,y
230 CLS:CLS#0
240 FOR stip=0 TO 3
250   x=0:y=stip*56
260   FOR col1=1 TO 7 STEP 2
270     FOR col2=1 TO 7 STEP 2
280       BLOCK 32,56,x,y,col1,col2,stip
290       x=x+32
300     END FOR col2
310   END FOR col1
320 END FOR stip
330 CLS#0:PRINT#0,"green_mask= ";green_mask\"red_mask=   ";red_mask
340 shade 0,0,512,224,green_mask,red_mask
350 PAUSE 250
360 END DEFine palette
```

Listing 3

```
100 CLS
110 INPUT "Give filename:" ! name$
120 WINDOW 512,256,0,0
130 CLS
140 LBYTES name$,131072
150 shade_all
160 OPEN#9,ser1
170 PRINT#9,FILL$(CHR$(13),8):REMark 8 blank lines
180 PRINT#9,CHR$(3);:REMark enter graphic mode
190 FOR j=1 TO 73
200 FOR i=131583 TO 163840 STEP 128
210 a=PEEK(i)
220 IF a=3 THEN PRINT#9,CHR$(3);:REMark '3' is graphic code, not a graphic escape
230 PRINT#9,CHR$(a);
240 END FOR i
250 PRINT#9,CHR$(3);CHR$(14);:REMark graphic Linefeed
260 PAN 7
270 END FOR j
280 PRINT#9,CHR$(3);CHR$(2);FILL$(CHR$(13),8):REMark leave graphic mode
290 CLOSE#9
```

BBC Revenge of the Flying Bunnies

by Simon Pithers

Not only is the title of this game totally ridiculous, the game itself is equally silly but it is challenging and well finished. You are an alien stealing carrot juice from a carrot patch which is guarded by four flying rabbits. Three of the rabbits are fairly harmless but one of the rabbits is a killer.

Revenge of the Flying Bunnies runs on a BBC Model B, full instructions are included in the program and it really is worth typing in, honest.

```
>LIST
   10 REM ******************
   20 REM * REVENGE OF THE *
   30 REM * FLYING BUNNIES *
   40 REM * By S.C.Pithers *
   50 REM * (c) 1985 v.5.4 *
   60 REM ******************
   70 REM
   80
   90
  100
  110 *TV 0,1
  120 MODE 2
  130 VDU 19,8,6;0;19,9,4;0;
  140 ENVELOPE 1,1,50,40,40,120,120,120,120,10,10,10,120,120
  150 ENVELOPE 2,1,10,30,70,10,10,10,40,10,0,10,80,80
  160 ENVELOPE 3,2,6,0,0,255,0,0,126,0,0,-126,126,126
  170 VDU 23;8202;0;0;0;
  180 VDU 23,224,0,24,60,60,60,28,24,24
  190 VDU 23,225,60,0,0,0,0,0,0,0
  200 VDU 23,226,24,60,102,195,255,126,0,0
  210 VDU 23,227,0,0,24,60,0,0,36,102
  220 VDU 23,228,24,24,24,60,62,62,28,119
  230 VDU 23,229,102,195,129,16,0,0,0,0
  240 VDU 23,230,129,195,102,8,0,0,0,0
  250 VDU 23,0,11,0,0,0,0,0,0,0
  260 CHAN=0
  270 left=-98
```

```
 280 right=-67
 290 up=-73
 300 down=-105
 310 DIM D%(7)
 320 FOR X=1 TO 7
 330   D%(X)=X
 340   NEXT
 350 C%=0
 360 GCOL 0,135:CLG
 370 GCOL 0,9
 380 FOR X=1 TO 50 STEP 4
 390   MOVE X,0:DRAW X,1024:MOVE 0,X:DRAW 1280,X
 400   MOVE 1280-X,0:DRAW 1280-X,1024
 410   MOVE 0,1024-X:DRAW 1280,1024-X
 420   NEXT
 430 COLOUR 0
 440 PROCD("REVENGE OF",3,4,1,99)
 450 PROCD("THE",7,8,-1,99)
 460 PROCD("FLYING BUNNIES",2,12,1,99)
 470 PROCD("By Simon Pithers",1,18,7,8)
 480 PROCD("(C) 1985",5,22,0,8)
 490 T=TIME:REPEAT
 500   FOR I%=0 TO 150:NEXT
 510   IF C%<6 C%=C%+1 ELSE C%=1
 520   VDU 19,1,D%(C%);0;
 530   VDU 19,2,D%((C%) MOD 6+1);0;
 540   VDU 19,3,D%((C%+1) MOD 6+1);0;
 550   VDU 19,4,D%((C%+2) MOD 6+1);0;
 560   VDU 19,5,D%((C%+3) MOD 6+1);0;
 570   VDU 19,6,D%((C%+4) MOD 6+1);0;
 580   UNTIL (TIME-T>800)
 590 COLOUR 0
 600 MODE 7
 610 PROCINST
 620 MODE 2
 630 S=24:RS=8:LE=1:SC=0
 640 CN=10:RC=1:LI=5:SS=3
 650 VDU 23;8202;0;0;0;
 660 PROCbegin
 670 END
 680
 690
 700 REM The Procedures start here.....
 710
 720
 730 DEF PROCD(A$,H%,V%,DR%,CL%)
 740 A%=&A:X%=&72:Y%=0:D=&72
 750 G%=0
 760 FOR I%=1 TO LEN A$
 770   B$=MID$(A$,I%,1)
 780   ?D=ASC B$:CALL &FFF1:G%=G%+1:IF G%=7 G%=1
 790   VDU 23,235,D?1,D?1,D?2,D?2,D?3,D?3,D?4,D?4
 800   VDU 23,236,D?5,D?5,D?6,D?6,D?7,D?7,D?8,D?8
 810   IF DR%=1 COLOUR G% ELSE COLOUR 7-G%
 820   IF CL%<>99 COLOUR CL%
 830   PRINT TAB(H%+I%,V%);CHR$235;TAB(H%+I%,V%+1);CHR$236
 840   NEXT
 850 ENDPROC
 860
 870
 880
 890 DEF PROCINST
 900 CLS
 910 PRINT TAB(2,1);CHR$157;CHR$129;CHR$141;"Revenge of the flying rabbits."+CH
R$156
 920 PRINT TAB(2,2);CHR$157;CHR$129;CHR$141;"Revenge of the flying rabbits."+CH
R$156
 930 PRINT
 940 PRINT" You are an innocent little alien who"
 950 PRINT"by accident lands on a carrot patch."
 960 PRINT"But this is no ordinary patch, it is"
 970 PRINT"guarded by four rabbits who have sworn"
 980 PRINT"revenge for the death of there prize"
 990 PRINT"carrot which took them 2000 years to"
1000 PRINT"grow."
1010 PRINT" Anyway, your stuck in the middle of"
1020 PRINT"the rabbit patch and you have to get"
1030 PRINT"carrot juice by sitting on top of a"
1040 PRINT"carrot and you will automatically suck"
1050 PRINT"the juice out, but the rabbits are"
1060 PRINT"constantly chasing you. Three of the"
1070 PRINT"rabbits arn't that dangerous but one"
1080 PRINT"of them is a real killer, the others"
1090 PRINT"jump on you to stop you sucking"
1100 PRINT"the juice.You may also use a supersuck"
1110 PRINT"which allows you to suck alot of juice"
1120 PRINT"3 times whilst playing."
1130 PRINT
1140 PRINT"     Press any key to continue."
1150 A=GET
1160 CLS
1170 PRINT TAB(2,1);CHR$157;CHR$129;CHR$141;"Revenge of the flying rabbits."+CH
R$156
1180 PRINT TAB(2,2);CHR$157;CHR$129;CHR$141;"Revenge of the flying rabbits."+CH
R$156
1190 PRINT
1200 PRINT" Your keys are:"
1210 PRINT
1220 PRINT" Z=left             X=right"
1230 PRINT" :=up               /=down"
1240 PRINT" S=supersuck"
1250 PRINT" Escape=Super Suicide"
1260 PRINT
1270 PRINT" Super suicide is for when you feel"
1280 PRINT" that your close to death and this"
1290 PRINT" will drain all your carrot juice and"
1300 PRINT" energy and lifes and will also kill"
1310 PRINT" all the rabbits and give you many"
1320 PRINT" points. But Only Use In An Emergency."
1330 PRINT
1340 INPUT "Do you wish to change key controls to   A=up  Z=down  <=left  >=rig
ht ";W$
1350 IF W$="Y" OR W$="YES" THEN CHAN=1
1360 IF CHAN=1 THEN left=-103:right=-104:up=-66:down=-98
1370 PRINT
1380 PRINT"   PRESS ANY KEY TO START"
1390 A=GET
1400 ENDPROC
1410
1420
1430
```

PROGRAM FILE

```
 1440 DEF PROCbegin
 1450 ERS=20-LE
 1460 A%=10:X%=ERS:CALL&FFF4
 1470 A%=9:X%=ERS:CALL&FFF4
 1480 IF SC>(LE*10000) THEN SS=SS+1
 1490 CLS
 1500 GCOL0,5
 1510 MOVE 0,80
 1520 DRAW 1280,80
 1530 RX1%=20:RY1%=150
 1540 RX2%=20:RY2%=1000
 1550 RX3%=1200:RY3%=150
 1560 RX4%=1200:RY4%=1000
 1570 COLOUR6
 1580 PRINTTAB(0,30);"CARROT JUICE"
 1590 FORX=&7D80 TO &7E00 STEP 4
 1600   !X=&13131313
 1610   NEXT
 1620 CJU%=X
 1630 A$=CHR$(18)+CHR$(3)+CHR$(1)+CHR$(224)+CHR$(8)+CHR$(18)+CHR$(3)+CHR$(2)+CHR
$(225)
 1640 B$=CHR$(18)+CHR$(3)+CHR$(4)+CHR$(226)+CHR$(8)+CHR$(18)+CHR$(3)+CHR$(6)+CHR
$(227)
 1650 R$=CHR$(18)+CHR$(3)+CHR$(RC)+CHR$(228)+CHR$(8)+CHR$(18)+CHR$(3)+CHR$(8)+CH
R$(229)+CHR$(8)+CHR$(18)+CHR$(3)+CHR$(15)+CHR$(230)
 1660 COLOUR2:PRINTTAB(1,0);"LEVEL=";LE
 1670 COLOUR6:PRINTTAB(1,2);"Superdrain=";SS
 1680 COLOUR3:PRINTTAB(1,1);"SCORE=";SC
 1690 ON ERROR PROCSUPERDE
 1700 VDU5
 1710 MOVE RX1%,RY1%:PRINTR$
 1720 MOVE RX2%,RY2%:PRINTR$
 1730 MOVE RX3%,RY3%:PRINTR$
 1740 MOVE RX4%,RY4%:PRINTR$
 1750 IFLI=1 GOTO1770
 1760 MOVE 800,70:FORX=1TOLI-1:PRINTB$;:NEXT
 1770 FOR X=1 TO CN
 1780   MOVE RND(1200)+40,RND(800)+130
 1790   PRINTA$
 1800   NEXT
 1810 VDU4
 1820 MX%=640:MY%=512
 1830 VDU5:MOVE MX%,MY%:PRINTB$:VDU4
 1840 REPEAT
 1850   IF INKEY left PROCA:MX%=MX%-S:PROCSB:PROCA
 1860   IF INKEY right PROCA:MX%=MX%+S:PROCSB:PROCA
 1870   IF INKEY up PROCA:MY%=MY%+S:PROCSB:PROCA
 1880   IF INKEY down PROCA:MY%=MY%-S:PROCSB:PROCA
 1890   IF INKEY-82 PROCSUPER
 1900   PROCCH:PROCMR:SOUND2,2,1,2
 1910   PROCMAR
 1920   CJU%=CJU%-1:?CJU%=0
 1930   IF CJU%<=&7D80 PROCEND
 1940   UNTILFALSE
 1950 ENDPROC
 1960
 1970
 1980
 1990 DEF PROCA
 2000 VDU5:MOVEMX%,MY%:PRINTB$:VDU4
 2010 ENDPROC
 2020
 2030
 2040
 2050 DEF PROCJ
 2060 !CJU%=&13131313:CJU%!4=&13131313
 2070 CJU%=CJU%+8:SC=SC+8:PROCSC
 2080 IF CJU%>=&8000 PROCWIN:GOTO1490
 2090 SOUND1,1,CJU%,1
 2100 ENDPROC
 2110
 2120
 2130
 2140 DEF PROCCH
 2150 IF POINT(MX%+32,MY%-45)=1 OR POINT(MX%+28,MY%-45)=1 OR POINT(MX%+36,MY%-45
)=1 PROCJ
 2160 ENDPROC
 2170
 2180
 2190
 2200 DEF PROCMR
 2210 VDU5
 2220 MOVERX1%,RY1%:PRINTR$
 2230 IF RX1%<MX% THEN RX1%=RX1%+RS ELSE RX1%=RX1%-RS
 2240 IF RY1%<MY% THEN RY1%=RY1%+RS ELSE RY1%=RY1%-RS
 2250 MOVERX1%,RY1%:PRINTR$
 2260 MOVERX2%,RY2%:PRINTR$
 2270 IF RX2%<MX% THEN RX2%=RX2%+RS ELSE RX2%=RX2%-RS
 2280 IF RY2%<MY% THEN RY2%=RY2%+RS ELSE RY2%=RY2%-RS
 2290 MOVERX2%,RY2%:PRINTR$
 2300 MOVERX3%,RY3%:PRINTR$
 2310 IF RX3%<MX% THEN RX3%=RX3%+RS ELSE RX3%=RX3%-RS
 2320 IF RY3%<MY% THEN RY3%=RY3%+4 ELSE RY3%=RY3%-4
 2330 MOVERX3%,RY3%:PRINTR$
 2340 MOVERX4%,RY4%:PRINTR$
 2350 IF RX4%<MX% THEN RX4%=RX4%+RS ELSE RX4%=RX4%-RS
 2360 IF RY4%<MY% THEN RY4%=RY4%+4 ELSE RY4%=RY4%-RS
 2370 MOVERX4%,RY4%:PRINTR$
 2380 VDU4
 2390 ENDPROC
 2400
 2410
 2420
 2430 DEF PROCMAR
 2440 IF MX%=RX1% AND MY%=RY1% PROCEND
 2450 IF MX%=RX2% AND MY%=RY2% PROCEND
 2460 IF MX%=RX3% AND MY%=RY3% PROCEND
 2470 IF RX4%+LE>MX% AND RX4%-LE<MX% AND RY4%+LE>MY% AND RY4%-LE<MY% PROCEND
 2480 ENDPROC
 2490
 2500
 2510
 2520 DEF PROCEND
 2530 SOUND1,-15,10,20
 2540 LI=LI-1:IF LI=0 PROCDEAD
 2550 GOTO1440
 2560 ENDPROC
 2570
 2580
 2590
 2600 DEF PROCWIN
```

```
2610 SOUND1,3,4,50
2620 SOUND2,3,4,50
2630 SOUND3,3,4,50
2640 S=S+2:RS=RS+3
2650 SC=SC+(LE*1000)
2660 CLG:VDU4
2670 PROCD("BONUS",2,10,LE MOD 6,99)
2680 QN$=STR$(LE*1000)
2690 PROCD(QN$,8,10,LE MOD 6,99)
2700 PROCWAIT(200):CLG
2710 LE=LE+1
2720 C=C+2
2730 RC=RC+1
2740 IF RC=8 RC=0
2750 ENDPROC
2760
2770
2780
2790 DEFPROCSC
2800 COLOUR3
2810 PRINTTAB(1,1);"SCORE=";SC
2820 ENDPROC
2830
2840
2850
2860 DEF PROCSUPER
2870 IF SS=0 ENDPROC
2880 IF POINT(MX%+32,MY%-45)<>1 OR POINT(MX%+28,MY%-45)<>1 OR POINT(MX%+36,MY%-
45)<>1 ENDPROC
2890 VDU19,0,8;0;
2900 A%=9:X%=1:CALL&FFF4
2910 A%=10:X%=1:CALL&FFF4
2920 FORQ=CJU% TO CJU%+128 STEP 2
2930   ?Q=&13:Q?1=&13
2940   SOUND1,1,CJU%,1
2950   CJU%=CJU%+2:SC=SC+4:PROCSC
2960   NEXT
2970 VDU19,0,0;0;
2980 SS=SS-1
2990 A%=10:X%=ERS:CALL&FFF4
3000 A%=9:X%=ERS:CALL&FFF4
3010 COLOUR6:PRINTTAB(1,2);"Superdrain=";SS
3020 ENDPROC
3030
3040
3050
3060 DEF PROCWAIT(W%)
3070 TIME=0
3080 REPEATUNTILTIME>=W%
3090 ENDPROC
3100
3110
3120
3130 DEFPROCDEAD
3140 CLG
3150 VDU19,1,2;0;19,2,5;0;19,3,6;0;4
3160 COLOUR1
3170 PRINT'
3180 PRINT"  The rabbits have"
3190 PRINT"    there revenge"
3200 PRINT'
3210 COLOUR2
3220 PRINT"    You scored:"
3230 PRINT"    ";SC
3240 SOUND1,1,100,40
3250 SOUND2,2,100,40
3260 SOUND3,3,100,40
3270 PRINT
3280 COLOUR3
3290 PRINT"   PRESS 'Y' TO"
3300 PRINT"    PLAY AGAIN."
3310 A$=GET$:IFA$="Y" RUN
3320 END
3330 ENDPROC
3340
3350
3360
3370 DEF PROCSB
3380 IF MX%<20 MX%=MX%+S
3390 IF MX%>1250 MX%=MX%-S
3400 IF MY%<140 MY%=MY%+S
3410 IF MY%>1000 MY%=MY%-S
3420 ENDPROC
3430
3440
3450
3460 DEF PROCSUPERDE
3470 *FX15,0
3480 ON ERROR ENDPROC
3490 PROCMR
3500 PROCDETUNE
3510 VDU4
3520 *FX9,1
3530 *FX10,1
3540 MX%=MX%+16
3550 MY%=MY%-8
3560 MOVE MX%,MY%
3570 GCOL 0,9
3580 DRAW RX1%,RY1%
3590 SC=SC+1000:PROCSC
3600 SOUND1,3,50,10
3610 PROCWAIT(40)
3620 MOVE MX%,MY%
3630 GCOL 0,10
3640 DRAW RX2%,RY2%
3650 SC=SC+1000:PROCSC
3660 SOUND1,3,100,10
3670 PROCWAIT(40)
3680 MOVE MX%,MY%
3690 GCOL 0,11
3700 DRAW RX3%,RY3%
3710 SC=SC+1000:PROCSC
3720 SOUND1,3,150,10
3730 PROCWAIT(40)
3740 MOVE MX%,MY%
3750 GCOL 0,12
3760 DRAW RX4%,RY4%
3770 SC=SC+1000:PROCSC
3780 SOUND1,3,200,10
3790 PROCWAIT(40)
3800 S=255
```

```
3810 FORX=CJU% TO &7D80 STEP-4
3820    !X=&00000000
3830    SC=SC+100:PROCSC
3840    SOUND1,-15,S,1
3850    S=S-1
3860    NEXT
3870 PROCWAIT(60)
3880 FORX=1TO7
3890    VDU19,X,7+X;0;
3900    NEXT
3910 PROCWAIT(150)
3920 CLS
3930 PROCDEAD
3940 END
3950 ENDPROC
3960
3970
3980
3990 DEF PROCDETUNE
4000 RESTORE 4150
4010 REPEAT
4020    READ P,D
4030    SOUND1,-15,P,D
4040    SOUND2,-15,P,D
4050    SOUND3,-15,P,D
4060    SOUND1,0,0,1
4070    SOUND2,0,0,1
4080    SOUND3,0,0,1
4090    UNTIL P=0 AND D=0
4100 PROCWAIT(50)
4110 ENDPROC
4120
4130
4140
4150 DATA 89,15,89,10,89,5,89,15
4160 DATA 101,10,97,5,97,10,89,5
4170 DATA 89,10,85,5,89,10,0,0
>
```

BBC Spooler

By Mark Clegg

This program sets up drivers in a sideways RAM to allocate a larger printer buffer than that catered for by the BBC's operating system. Once installed, the program will remain until the RAM is erased or the computer is turned off.

The driver is fully compatible with MOS calls in that the buffer may be purged/examined and used in the normal way, and a buffer-full event will also be generated (if the event is enabled) when appropriate.

Up to 15.25k may be used as a buffer, the exact amount available being dependent on the size of the RAM installed. The program is configured for the size of RAM chip by setting the variable 'RAMTOP' on line 90 to the appropriate value — &BB for a 2k chip, &90 for 4k (that is, the high byte of the next address after the RAM).

The installation section of the program assumes that the RAM will be located in ROM socket 'F', and that any write operations to the sideways ROM area will automatically select this ROM (as with the ATPL ROM expansion board). The code actually placed in the ROM is, however, independent of the ROM socket used, so modification for use in different sockets should be no great problem.

To produce a working driver for your BBC Micro, run the following program which assembles the required code together with a ROM installation routine. The code produced is saved to disk as the binary file PSPOOL. The printer spooler can then be set up by issuing the command '*PSPOOL' (best utilised from within a !BOOT file).

```
 10 REM ****************************************
 20 REM *****             RAMSPOOL        *****
 30 REM ****************************************
 40 REM ***** A program allocating paged RAM *****
 50 REM ***** space  to the  printer  buffer *****
 60 REM ***** A maximum of 15.5K can be used *****
 70 REM ****************************************
 80
 90 ramtop=&88 : REM Amount of ram available +&8000 (High byte)
100 OSBYTE=&FFF4 : OSNEWL=&FFE7 : OSWRCH=&FFEE
110 FOR pass%=4 TO 7 STEP 3
120   P%=&1900 : O%=&3200
130   [ OPT pass%
140   .instal LDA &2B0 \ Check spooler not already installed
150   CMP £&81 : BNE start : RTS : .start
160   SEI
170   LDA £(data DIV 256) : STA &F9 \ Install spooler in paged RAM
180   LDA £(data MOD 256) : STA &F8 : LDY £0 : LDA £&80
190   STA &FB : STY &FA
200   .instl3 LDA (&F8),Y : STA (&FA),Y : INC &F8 : BNE instl1 : INC &F9
210   .instl1 INC &FA : BNE instl2 : INC &FB
220   .instl2 LDA &FB : CMP £&83 : BNE instl3
230   LDA &F4 : PHA : LDA £&F : STA &F4 : STA &FE30 : JSR boot
240   PLA : STA &F4 : STA &FE30 : LDA £&81 : STA &2B0 : CLI : RTS
250   .data
```

```
260   ] : P%=&8000 : VDU12 : [ OPT pass%
270   \ ***********************************
280   \ *****         RAMSPOOL        *****
290   \ ***********************************
300   \ ***** A  program  to  allocate *****
310   \ ***** paged  RAM  to  form  an *****
320   \ ***** extended  printer buffer *****
330   \ ***** up to a maximum of 15.5K *****
340   \ ***********************************
350   JMP 0 : JMP sentry
360   EQUB &81 \ ROM Type.
370   EQUB cright \ Copyright offset pointer.
380   EQUB &01 \ Version number.
390   EQUS "Ram Spool"
400   .cright EQUB &00 \ Copyright message.
410   EQUS "(C) M.C. 1984."
420   EQUB &00
430   .hlpmsg \ Printed by '*HELP'
440   EQUS "Printer Spooler V1.0 (1.5K)"
450   EQUB &D:EQUB &A
460   .sentry CMP £&09 \ Test type of service requested.
470   BEQ help \ Help expansion
480   CMP £3 \ or
490   BEQ boot \ Auto boot
500   RTS
510   .help   PHA \ Check for specific help.
520   TYA : PHA
530   .help1  LDA (&F2),Y \ Is rest of command line empty ?
540   CMP £&20:BNE help2:INY:JMP help1
550   .help2  CMP £&0D:BEQ dohelp
560   .help4  PLA:TAY:PLA:RTS
570   .dohelp JSR OSNEWL \ Type out ROM's name.
580   LDY £&00
590   .help3  LDA hlpmsg,Y
600   JSR OSWRCH
610   INY
620   CMP £&0A
630   BNE help3
640   JMP help4
650   .boot   PHA \ Auto boot.
660   TYA:PHA:TXA:PHA
670   LDY £0
680   .boot1  LDA hlpmsg,Y: JSR OSWRCH: INY: CMP £&A: BNE boot1
690   JSR OSNEWL
700
710   .ramspl LDA &22A \ Save old values of vectors
720   STA insold : LDA &22B : STA insold+1 : LDA &22C : STA remold
730   LDA &22D : STA remold+1 : LDA &22E : STA prgold : LDA &22F
740   STA prgold+1
750
760   LDA £&A8 \ Obtain address of extended
770   LDX £0 \ vector space
780   LDY £&FF : JSR OSBYTE : STX &F2 : STY &F3
790
800   LDY £&3F \ Set up the three extended vectors
810   LDA £(insbuf MOD 256) : STA (&F2),Y \ INSV,REMV and CNPV
820   INY : LDA £(insbuf DIV 256) : STA (&F2),Y : INY
830   LDA &F4 : STA (&F2),Y : INY : LDA £(rembuf MOD 256) : STA (&F2),Y
840   INY : LDA £(rembuf DIV 256) : STA (&F2),Y : INY : LDA &F4 : STA (&F2),Y
850   INY : LDA £(cnprge MOD 256) : STA (&F2),Y : INY :LDA £(cnprge DIV 256)
860   STA (&F2),Y : INY : LDA &F4 : STA (&F2),Y
870
880   SEI \ Set up the vectors to point
890   LDA £&FF \ to the extended vector workspace
900   STA &22B : STA &22D : STA &22F : LDA £&3F : STA &22A : LDA £&42
910   STA &22C : LDA £&45 : STA &22E : CLI : LDX £3 : LDA £&40 : PHA : PLP
920   JSR cnprge : PLA : TAX : PLA : TAY : PLA : RTS
930
940   .cnprge SEI \ Purge buffer / determine free space
950   PHP : CPX £3 : BEQ purge : PLP : CLI : JMP (prgold)
960   .purge  BVS purge1 \ Purge or buffer count ?
970   BCS romlft \ Buffer space remaining ?
980   SEI : LDX buflen \ Number of characters in buffer
990   LDY buflen+1 : PLP : CLI : RTS
1000
1010  .romlft SEC \ Return anmount of space left
1020  LDA bufmax \ in buffer
1030  SBC buflen : TAX : LDA bufmax+1 : SBC buflen+1
1040  TAY : PLP : CLI : RTS
1050
1060  .purge1 LDA £&83 \ Purger buffer contents
1070  STA bufend+1 : STA buftop+1 : LDA £(ramtop-&83) : STA bufmax+1
1080  LDA £0 : STA bufend : STA buftop : STA bufmax : STA buflen : STA buflen+
1
1090  PLP : CLI : RTS
1100
1110  .insbuf PHP \ Insert character into buffer
1120  SEI : CPX £3 : BEQ insbf1 : PLP : JMP (insold)
1130  .insbf1 TAX \ Printer buffer selected
1140  LDA buflen : CMP bufmax : BNE insbf2 : LDA buflen+1 : CMP bufmax+1
1150  BNE insbf2 : TXA : LDX £3 : PLP : SEC : RTS
1160  .insbf2 LDA bufend \ Buffer not full so insert char
1170  STA &FA : LDA bufend+1 : STA &FB : LDY £0 : TXA : STA (&FA),Y
1180  INC buflen : BNE insbf3 : INC buflen+1
1190  .insbf3 INC bufend : BNE insbf4 : INC bufend+1 : LDA bufend+1
1200  CMP £ramtop : BNE insbf4 : LDA £&83 : STA bufend+1
1210  .insbf4 TXA : LDX £3 : PLP : CLC : RTS
1220
1230  .rembuf PHP \ Remove character from buffer
1240  SEI : CPX £3 : BEQ rembf1 : PLP : JMP (remold)
1250  .rembf1 LDA buflen : ORA buflen+1 : BNE rembf2 : PLP : SEC : RTS
1260  .rembf2 LDA buftop : STA &FA : LDA buftop+1 : STA &FB : LDY £0
1270  LDA (&FA),Y : BVC rembf3
1280  PLP \ Examine only
1290  CLC : RTS
1300  .rembf3 PHA : SEC : LDA buflen : SBC £1 : STA buflen : BCS rembf4
1310  DEC buflen+1
1320  .rembf4 INC buftop : BNE rembf5 : INC buftop+1 : LDA buftop+1
1330  CMP £ramtop : BNE rembf5 : LDA £&83 : STA buftop+1
1340  .rembf5 LDA buflen : ORA buflen+1 : BNE rembf6 : LDA £0 : TAY : LDX £3
1350  JSR &E494 \ Generate event
1360  .rembf6 PLA : LDX £3 : PLP : CLC : RTS
1370
1380  .insold EQUW 0
1390  .remold EQUW 0
1400  .prgold EQUW 0
1410  .buftop EQUW 0
1420  .bufend EQUW 0
1430  .buflen EQUW 0
1440  .bufmax EQUW 0
1450  ]
1460  NEXT
1470 *SAVE"PSPOOL" 3200 +300 1900 1900
```

Sirius Bank Account

by Jim McCartney

Sirius Bank Account is a bank account reconciliation program which is suitable for quite a large business and follows sound accounting practice. This application is rarely included in accounting suites, and some unfortunate clerk ends up doing it by hand. It runs on any Sirius plus an Epson MX or FX printer.

After typing in the program, make a copy onto another disk and keep the original as a master. Instructions for the use of the system are shown before the actual program listing.

```
1. Instructions for use.

1.1     Switch computer and printer on.  Put Master disk in
Drive A and Copy Disk in Drive B. Use blank formatted disk
for copy first time.

1.2     Enter the date and time as requested. Select from
MENU and Function Keys.

1.3     The system consists of two files, one for the
transactions advised to you by the Bank (statement) and one
for your own chequebook transactions (Company)

2. Operating Procedure

2.1     Entering Transactions.

2.1.1   Enter DATE in format DDMMYY e.g. 060384 for 6th March
1984.
2.1.2   Enter REFERENCE as up to 6 digits plus up to 2
letters. The following are examples: 1234, 1234PL, 123456,
123456NL. The last 2 characters are for source identification
only and do not affect the sorting e.g PL = purchase ledger,
WA = wages. Otherwise the reference is the cheque number. You
will have to number lodgements yourself.
2.1.3   Enter the Debit Amount in the normal way. Enter
Credit Amounts as minus quantities, NOT in brackets !
i.e.    -12345.67       not       (12345.67)
Do not attempt to use commas e.g. 12,345.67 will not work.
2.1.4   To backspace within an entry, use backspace arrow  <-
The computer will accept the entry only up to the cursor
position.
2.1.5   To go back to a previous entry, use ESC and retype
the entry when you get there.
2.1.6   If the cursor is at the start of an entry or item
which you wish to leave just as it is, press <RETURN> or
<ENTER>
2.1.7   ESC will enable you to scroll up the column of
entries. Use SCROLL to scroll down. Hold this key down to go
some distance. Hold down REP and ESC to scroll up some
distance.

2.2     Special Function Keys.
        These are to speed up data entry. Attach adhesive
labels with the following legend to the keys to remind you
what they do.

KEY 1   REP DATE            After you press this, the transaction
date will be automatically repeated until you use CANCEL or
ESC. It does not work if you are editing previous entries,
only for new data.
KEY 2   REP DATE, INC REFNC      As above, but the REFERENCE
is automatically increased by 1 for each entry.
KEY 3   CANCEL              Cancels the above.
KEY 4   MENU                Returns you to the MENU
KEY 5   FIRST               Takes you to no.1 on the transaction
list
KEY 6   LAST                Takes you to the end of the
transaction list
KEY 7   RECORD NO.          Type in the number you want on the
transaction list, then <RETURN>. This will take you directly.
KEY 8   SEARCH REF          Searches the current list for all
occurences of a transaction reference, and displays the
records on the screen.
KEY 9   SEARCH AMOUNT   Searches the current list for all
occurrences of a particular amount of money, and displays the
records on the screen.


3. Other MENU functions

3.1     Sort and Reconcile.
        This operation is completely automatic, but the
machine will display what it is doing from time to time. The
operations are as follows:

3.1.1   Sort:               Records are read from disk A: into
memory in batches of 1000 at a time, and sorted in ASCII
order, as necessary. The batches are written to disk B: and
then merged back to a single file on A: If there are any
duplicated references, these are printed out, and you are
referred back to correct them.

3.1.2   Reconcile:          If identical records (apart from the
date) are found on both files, they are eliminated.
If records are found on each file which have the same
reference but different money amounts, they are retained, and
later printed out as disparate records.

3.1.3   Reports:            When reconciliation is complete, you
```

```
get a printout of all remaining Bank transactions, and a
total of the unreconciled debits on each side, with the net
amount outstanding.  Credits are shown as negative.

3.1.4   Copy:           The reconciled files are on disk B:,
so these are finally copied back to disk A: and disk A: is
then copied back in its entirety to disk B:.

This all proceeds automatically; you only have to press any
key to restart the system at the end of it all.

3.2     Print Transaction List
        Will list Bank or Company Transactions, completely or
in selected ranges.

3.3     Add and Display Totals and Balances
        Shows the numbers of Bank and Company transactions or
file, and the current totals.

3.4     Copy Master Disk.
        Do this after you have entered all the transactions,

and before you start Sort & Reconcile. This way, if there is
a system failure, you will not have to do it all again. The
computer will remind you in any case.

3.5     Amend Balances
        This is used only to initiate the system with
balances brought forward, or to correct a false balance. The
balances must be the same.

3.6     END
        Use this when you want to finish work for the moment.
Don't just switch off in the middle or you may corrupt you
data disks.
```

```
A>
100  `*****************************************************************
102  '* BANK4.BAS program    bv J McCartnev     18th Februarv 1984     *
103  `* For Sirius 1.2 or 2.4 and Epson MX or FX printer, parallel.   *
104  '* In MSBASIC under MSDOS 1.25, compiled MS-BASIC compiler 5.32 *
105  '* If running under interpreter the AUTOEXEC.BAT must be          *
106  `* swapped for INTERP.BAT - see seperate listings of these.       *
107  `* Drops out to SYSTEM at 36490 (end of Reconcile) and 50050      *
108  '* (to DCOPY). Essential files for compiled version are:          *
109  '* COMMAND.COM, DCOPY.COM, BANK.EXE, BASRUN.EXE, AUTOEXEC.BAT.   *
110  '* Generated files are: BANK.CTL, BANK.DAT, COMPANY.DAT, on A>   *
111  '* Temp files are: BANKREC.DAT, COMPREC.DAT & CHECK.OUT on B>    *
113  '*****************************************************************


114  ON ERROR GOTO 60000
115  DIM A%(1000).B£(1000).C£(1000),I%(1000):
     DIM L%(7),V%(7).H%(7),LL£(7),UL£(7),TF%(7),DP%(7),WN$(7),IN$(7):
     DIM A$(8).B$(8),C$(8).F$(8),N%(8)
116  DEF FND$(DD%) = RIGHT$("0"+ MID$(STR$(DD% MOD C%),2),2)
      + "-" + RIGHT$("0"+ MID$(STR$((DD%\C%-1) MOD 12+1),2),2)
      + "-" + MID$(STR$(1980 + (DD%\C%-1)\12),2)
     'convert integer date to DD-MM-YYYY for display
119  GOTO 20000


120  IF RIGHT$(DATE$,4) <> "1980" THEN
     DD$=MID$(DATE$,4,2)+LEFT$(DATE$,2)+RIGHT$(DATE$,2):
     GOTO 130
122  PRINT CL$CD$CD$CD$CD$CD$CD$CD$
124  INPUT"Please enter the date in the format DDMMYY : ", DD$
130  GOSUB 700
152  IF DD%=0 THEN M$=
     "That was an incorrect date or format. Please try again.":
     GOSUB 310:PRINT BE$: GOTO 122
154  SDAT$ = FND$(DD%): SDAT%=DD%
158  DATE$ = MID$(STR$((SDAT%\C%-1) MOD 12 + 1),2)
     + "-" + MID$(STR$(SDAT% MOD C%).2)
     + "-" + MID$(STR$(1980 + (SDAT%\C%-1)\12).2)
     'this is in American format MM-DD-YYYY
160  PRINT SDAT$: GOSUB 320


161  IF TIME$ > "08:30:00" THEN 184
162  PRINT HM$CD$CD$CD$CD$CD$CD$CD$CD$CD$CD$
164  INPUT"Please enter the time in the format HHMM (24 hrs) : ",TT$
166  IF LEN(TT$)<>4 THEN 178
168  IF VAL(LEFT$(TT$.2)) > 23 THEN 178
170  IF VAL(RIGHT$(TT$,2)) > 59 THEN 178
172  TIME$ = LEFT$(TT$.2) + ":" + RIGHT$(TT$,2)
174  GOTO 180
178  M$="That was an incorrect time or format. Please try again.":
     GOSUB 310:PRINT BE$:GOTO 162
180  PRINT TIME$
182  FOR J%=1 TO 1000: NEXT
184  RETURN
200  '*********************** UTILITY SUBROUTINES ******************
290  V% = V%(J%)+LN% : H% = H%(J%) : 'screen field position
300  PRINT E$"Y"CHR$(V%+31)CHR$(H%+31)::RETURN
     'position cursor


310  M%=(74-LEN(M$))\2:M$=SPACE$(M%)+M$+SPACE$(M%):
     PRINT E$"Y8£"RV$M$NO$HM$:RETURN
320  PRINT E$"Y8!"SPACE$(78)HM$:RETURN
     'message write and delete
330  PRINT BE$::GOSUB 310: FOR J=1 TO 2000: NEXT: RETURN
     'bleep. & message.


400  Q£=VAL(Q$)
401  DP%=DP%(J%): LE%=L%(J%)
402  TP = 10^DP%: Q£ = FIX(Q£ * TP + .5*SGN(Q£))/TP  'round to DP% places
405  Q$ = MID$(STR$(Q£).2)
410  K%=INSTR(Q$.".")： D% = LEN(Q$)-K%
415  IF K% > 0 AND D% > DP% THEN Q$=LEFT$(Q$.K%+DP%): GOTO 435
417  IF K%=0 AND DP%=0 THEN 435
420  IF K% = 0 THEN Q$ = Q$ + "." + LEFT$(Z$.2): GOTO 435
```

PROGRAM FILE

```
430     Q$ = Q$ + LEFT$(Z$.(DP%-D%))
435     IF Q£ < 0 THEN Q$="-" + Q$
440     IF LEN(Q$) < LE% THEN Q$=SPACE$(LE%-LEN(Q$)) + Q$
450     RETURN
        'return a number rounded and justified in DP% decimals as Q$.


550     ON Q%-240 GOTO 552,554,556,558,560.562.564,566.568: RETURN
552     F1% = 1: RETURN          'repeat date
554     F1% = 2: RETURN          'repeat date and increment reference
556     F1% = 0: RETURN          'cancel the above !
558     F1% = 3: RETURN          'return to MENU
560     F1% = 4: RETURN          'start of file
562     F1% = 5: RETURN          'end of file
564     F1% = 6: RETURN          'select record
566     F1% = 7: RETURN          'search keys
568     F1% = 8: RETURN          'search amounts


600     M$=OK$:GOSUB 310
602     PRINT NC$
605     Q$=INPUT$(1)
610     IF ASC(Q$) > 96 THEN Q$=CHR$(ASC(Q$)-32)
620     IF Q$ <> "Y" AND Q$ <> "N" THEN 600
630     GOSUB 320:PRINT CU$::RETURN
        'get (Y/N) reply, taking care of lower case


700     IF LEN(DD$)<>6 THEN 820
710     Q1%=VAL(LEFT$(DD$.2))
720     Q2%=VAL(MID$(DD$,3,2))
730     Q3%=VAL(RIGHT$(DD$,2))
740     IF Q1%<1 OR Q1%>31 THEN 820
750     IF Q2%<1 OR Q2%>12 THEN 820
760     IF Q3%<80 THEN 820
770     IF (Q2%=2 OR Q2%=4 OR Q2%=6 OR Q2%=9 OR Q2%=11) AND Q1%=31 THEN 820
780     IF Q2%=2 AND Q1%=30 THEN 820
790     IF Q2%=2 AND Q1%=29 AND (Q3% MOD 4 > 0) THEN 820
800     DD% = Q1% + Q2%*C% + (Q3%-80)*C%*12
810     GOTO 830
820     DD% = 0
830     RETURN
        'validate date in DDMMYY and return integer date.


850     OPEN "R".£1,FI$,21:
        FIELD £1, 2 AS W1$, 8 AS W2$, 11 AS W3$:
        FIELD £1, 21 AS WW$: RETURN
860     OPEN "R",£F%,FI$,21:
        FIELD£F%, 2 AS A$(F%), 8 AS B$(F%), 11 AS C$(F%):
        FIELD£F%, 21 AS F$(F%):
        RETURN

999     '************************* PROCEDURE SUBROUTINES *********************

1000    '********************** Sub Input a Field ******************
1010    DEF SEG
1020    J%=SF%
1030    IF J%<SF% THEN J%=SF%
1040    GOSUB 290                                        'field posn.
1045    L%=0
1048    A$=""
1050    Q$ = INPUT$(1)
1055    Q% = ASC(Q$)
1057    IF Q%>31 AND Q%<128 THEN 1085
1058    IF Q%<241 THEN 1062     ELSE GOSUB 550
1059    IF F1%<3  THEN 1050
1060    IF F1%=3  THEN IN$(1)="":IN$(2)="":IN$(3)="":
        IF R%>N%  THEN PRINT DL$: RETURN  ELSE RETURN   'clear the record
1061    IF F1%>3  THEN RETURN
        'implement Function keys. ----->> 30040 ----->> 30130 ff.


1062    IF L%=0 THEN 1070
1063    IF Q%=13 THEN 1100                          'mid field control chars.
1064    IF Q%=27 THEN 1040
1065    IF Q%=8  THEN L%=L%-1:PRINT Q$;: A$=LEFT$(A$,L%): GOTO 1050
1066    GOTO 1050


1070    IF Q%=13 THEN Q$=IN$(J%): L%=LEN(Q$): GOTO 1120
                                                    'start field control chars.
1071    IF Q%=8  THEN 1045
1072    IF J%=1  THEN 1075
1073    IF Q%=27 THEN J%=J%-1: GOTO 1030
1074    GOTO 1050


1075    IF Q%=27 THEN F1%=0: GOTO 1078              'start record control chars.
1076    IF Q%=10 THEN F1%=0: GOTO 1081
1077    GOTO 1050

1078    IF R%=1 THEN 1080
1079    PRINT SD$DL$:: R%=R%-1: LN%=LN%-1: IF LN%=0 THEN LN%=1
1080    GOSUB 3000: GOTO 1020
        'read and display the next record up or down the file.


1081    IF R%>=N%+1 THEN R%=N%+1: GOTO 1083
1082    PRINT CD$;: R%=R%+1: LN%=LN%+1: IF LN%=25 THEN LN%=24
1083    GOSUB 3000: GOTO 1020


1085    IF Q% > 96 THEN Q%=Q%-32: Q$=CHR$(Q%)              'normal characters
1088    PRINT Q$::A$=A$+Q$
1090    L%=L%+1
1095    IF L% < L%(J%) THEN 1050                           'get next character

1096    Q$=INPUT$(1)                                       'at end of field
1097    Q%=ASC(Q$):IF Q%=13 OR Q%=27 OR Q%=8 OR Q%=10 THEN 1062
1098    IF Q%>240 THEN GOSUB 550:
        IF F1%=3 THEN IN$(1)="":IN$(2)="":IN$(3)="": PRINT DL$: RETURN
1099    GOTO 1096                    'dump further input until control character
```

```
1100   Q$=LEFT$(A$,L%)
1120   IF INSTR(BL$,Q$) <> 0 THEN Q$="":Q%=0:GOTO 1180
             'null it if only blanks
1180   ON TF%(J%) GOTO 1200,1200,1400,1500,1600
       'check the data is within limits

1200   GOSUB 400
1205   IF J%=3 AND Q£=0 THEN
       M$="Zero entries will be eliminated during sorting !": GOSUB 330
1210   IF ABS(Q£) < LL£(J%) OR Q£ > UL£(J%) THEN 1900 ELSE 2000
       'floating point numbers


1400 : 'not used
1500 : 'not used


1600   IF J%=2  OR J%=6 THEN 1630
1610   DD$=LEFT$(Q$,6): GOSUB 700: IF DD%=0 THEN 1900
1620   GOSUB 320: GOSUB 290: PRINT HI$FND$(DD%)LO$;: GOTO 2025
1630   Q=VAL(Q$): IF Q<LL£(J%) OR Q>UL£(J%) OR Q<>INT(Q) THEN 1900
1640   IF LEN(Q$) > LEN(STR$(Q))-1 THEN QX$=MID$(Q$,LEN(STR$(Q)))
                                    ELSE QX$=""
1650   Q$ = LEFT$(Q$,LEN(STR$(Q))-1) + SPACE$(9 - LEN(STR$(Q)) - LEN(QX$))
       + QX$:  GOTO 2000


1900   PRINT BE$;:M$=WN$(J%):GOSUB 310
       'display warning
1920   GOSUB 300:GOTO 1045


2000   GOSUB 320         'clear any warning string
2005   GOSUB 290
2010   PRINT HI$Q$LO$;
2025   IN$(J%) = Q$
2100   IF J%<EF% THEN J%=J%+1: GOTO 1030
2105   IF J%>3 THEN RETURN
2110   LSET W1$ = MKI$(DD%):
       LSET W2$ = IN$(2):
       LSET W3$ = IN$(3):
       PUT£1, R%                         'file it
2200   RETURN


2999   '******************** Read & display or print a record
3000   GET£1,R%:
       DAT$ = FND$(CVI(W1$)):
       IN$(2) = W2$:
       IN$(3) = W3$
3010   IN$(1) = LEFT$(DAT$,2) + MID$(DAT$,4,2) + RIGHT$(DAT$,2)
3012   IF MP%=1 OR MP%=2 OR MU%=6 THEN 3040
3015   H%=22: V%=LN%: GOSUB 300: PRINT HI$R%LO$;
3020   J%=1: GOSUB 290: PRINT DAT$;:
       J%=2: GOSUB 290: PRINT IN$(J%);:
       J%=3: GOSUB 290: PRINT IN$(J%):
       IF LN%=24 THEN LN%=23: J%=1: GOSUB 290
3030   RETURN

3040   LPRINT USING PF$;R%;DAT$;W2$;VAL(W3$): RETURN


3099   '******************** File control record
3100   TI%=VAL(TIME$)*60 + VAL(MID$(TIME$,4))
3110   LSET C1$ = MKI$(BR%):
       LSET C2$ = MKD$(BX£):
       LSET C3$ = MKD$(BT£):
       LSET C4$ = MKI$(CR%):
       LSET C5$ = MKD$(CX£):
       LSET C6$ = MKD$(CT£):
       LSET C7$ = MKI$(SDAT%):
       LSET C8$ = MKI$(TI%):
       PUT£8,1: RETURN


3199   '****************** Read Control Record
3200   GET £8,1:
       BR% = CVI(C1$):
       BX£ = CVD(C2$):
       BT£ = CVD(C3$):
       CR% = CVI(C4$):
       CX£ = CVD(C5$):
       CT£ = CVD(C6$):
       DD% = CVI(C7$):
       TI% = CVI(C8$):
       RETURN


4000   '************************* Total transactions & balances
4010   FOR K% = 1 TO 2
4020   CR£=0: DR£=0
4030   IF FG%=0 THEN IF K%=1 THEN N%=BR%: FI$="a:bank.dat"
                             ELSE N%=CR%: FI$="a:company.dat"
4040   IF FG%=1 THEN IF K%=1 THEN N%=BR%: FI$="b:bankrec.dat"
                             ELSE N%=CR%: FI$="b:comprec.dat"
4045   GOSUB 850
4060   FOR J%=1 TO N%
4070   GET£1, J%

4080   IF VAL(W3$) < 0 THEN CR£=CR£ + VAL(W3$)
                       ELSE DR£=DR£ + VAL(W3$)
4090   NEXT J%
4100   IF K%=1 THEN BT£=CR£+DR£: BC£=CR£: BD£=DR£:
               ELSE CT£=CR£+DR£: CC£=CR£: CD£=DR£
4105   CLOSE£1
4110   NEXT K%
4130   RETURN


20000  '**************************** DATA DIVISION **************************
20010  OK$="Are you sure that this is right ? (Y/N)"
20015  A$=""
20017  COPY$="TAKE A COPY OF YOUR MAIN DISK BEFORE PROCEEDING !"
20020  E$=CHR$(27):CL$=E$+"E":HM$=E$+"H":RV$=E$+"p":NO$=E$+"q":CD$=E$+"B":
```

PROGRAM FILE

```
      SD$=E$+"I":HI$=E$+"(":LO$=E$+")":BE$=CHR$(7):SC$=E$+"J":PRINT E$"x1"C.$
20021 'escape, clear. home. reverse. normal. cursor down.
      scroll down. bright, dim. bell. clear to end. enable line 25.
20030 KX$=E$+"}":KE$=E$+"{":CH$=E$+"+":NC$=E$+"x5":CU$=E$+"y5":DL$=E$+"]":
      LF$=CHR$(10):FF$=CHR$(12):CO$=CHR$(15):CX$=CHR$(18):SP$=E$+"N"+CHR$(6)
20031 'disable keyboard,enable kb..clear bright.no cursor.cursor on.del line.
      PRINTER line feed. form feed. condensed. normal, skip perforation.
20035 Z1%=1:Z2%=2:C%=100: Z$="000000": DO%=0
20045 T% = 1000         'record block to sort


21000 OPEN "R",£6."b:check.out",1                 'make sure copy is in
21010 CLOSE £6
21020 OPEN "R",£8,"b:BANK.CTL".40
21025 FIELD £8.         2 AS C1$, 8 AS C2$, 8 AS C3$, 2 AS C4$, 8 AS C5$.
                        8 AS C6$, 2 AS C7$, 2 AS C8$
21030 GOSUB 3200: D2£=DD%: D2£=D2£ * 10000 + TI%       'date/time on copy
21035 CLOSE£8

21040 OPEN "R",£8,"a:BANK.CTL",40
21050 FIELD £8,         2 AS C1$, 8 AS C2$, 8 AS C3$, 2 AS C4$, 8 AS C5$.
                        8 AS C6$, 2 AS C7$. 2 AS C8$
      'bank recs, bank bal. sum bank trx, compamy recs, company bal.
       sum comp trx, system date, time. Balances b/f. no trx.
21052 GOSUB 3200: D1£=DD%: D1£=D1£ * 10000 + TI%       'date/time on master
21054 IF D1£ < D2£ THEN M$ =
      "You have an old copy disk in the master drive. Is this OK? (Y/N)":
      GOSUB 310: GOSUB 602: IF Q$="N" THEN 21500
21056 IF D1£ = D2£ THEN M$ =
      "The copy disk is the same as the master. Is this OK? (Y/N)":
      GOSUB 310: GOSUB 602: IF Q$="N" THEN 21500
21060 GOSUB 120: GOSUB 3100
      'get system date,time, write control rec.
21070 F1%=0                        'function flag
21080 LN%=1                        'screen line pointer
21090 PF$=SPACE$(10)+"£££££     \         \     \         \ £££££££££..££"
21095 PF2$=SPACE$(15)+"££££     \         \     \         \  £££££££££..££":
      PF2$=PF2$+PF2$
21100 PH1$=SPACE$(10)+"LIST OF  BANK  TRANSACTIONS ON  \        \  AT   " +
      "\   \  HRS."
21110 PH2$=SPACE$(10)+"LIST OF COMPANY TRANSACTIONS ON  \       \  AT   " +
      "\   \  HRS."
21130 PH3$=SPACE$(8)+"DUPLICATED  BANK  TRANSACTIONS  ON  \        \  AT   " +
      "\   \  HRS."
21140 PH4$=SPACE$(8)+"DUPLICATED COMPANY TRANSACTIONS ON  \        \  AT   " +

      "\   \  HRS."
21150 PH5$=SPACE$(12)+"DISPARATE  TRANSACTIONS  ON  \        \  AT   " +
      "\   \  HRS."
21160 PH6$=SPACE$(8)+"UNRECONCILED BANK TRANSACTIONS  ON  \        \  AT   " +
      "\   \  HRS."
21170 PH7$=SPACE$(8)+"BANK RECONCILIATION STATEMENT  ON  \        \  AT   " +
      "\   \  HRS."
21180 PT$="£££££££££..££"
21190 GOTO 22010


21500 M$="Please change your disks and press any key to re-start.":
      GOSUB 310
21510 Q$=INPUT$(1)
21520 CLOSE: GOTO 21000



22000 '********************** Data Dictionary
22010 DATA 6,0,30.6,6.5,0,"Invalid date !"
22020 DATA 8,0,42.1,999999,5,0,"Must be whole number 1 to 999999 !"
22030 DATA 11.0,53,0,99999999.99,2.2."£0 to £99999999.99 please !"
22040 DATA 11.16,36,0,99999999.99.2.2,""
22050 DATA 11,19,36,0,99999999.99,2,2,""
22060 DATA 8,0,42,1.999999,5,0,"Must be whole number 1 to 999999 !"
22070 DATA 11,0,53,0.99999999.99,2,2."£0 to £99999999.99 please !"
22080 FOR J%=1 TO 7: READ L%(J%).V%(J%),H%(J%),LL£(J%),UL£(J%).TF%(J%).
      DP%(J%).WN$(J%):
      NEXT              'read input parameters.


25000 '************************** MENU **************************************
25010 PRINT CL$CU$;:  GOSUB 320: MU%=0
25020 PRINT SPC(22)RV$"     BANK RECONCILIATION PROGRAM     "NO$
25030 PRINT CD$SPC(32)"By Jim McCartney
25040 PRINT SPC(34)"February 1985
25050 PRINT CD$SPC(17)RV$" 1 "NO$TAB(36)"Enter Bank transactions
25060 PRINT CD$SPC(17)RV$" 2 "NO$TAB(36)"Enter Company transactions
25062 PRINT CD$SPC(17)RV$" 3 "NO$TAB(36)"Print transaction lists
25064 PRINT CD$SPC(17)RV$" 4 "NO$TAB(36)"Add & display totals & balances
25066 PRINT CD$SPC(17)RV$" 5 "NO$TAB(36)"Copy Master Disk
25070 PRINT CD$SPC(17)RV$" 6 "NO$TAB(36)"Sort and Reconcile transactions
25082 PRINT CD$SPC(17)RV$" 7 "NO$TAB(36)"Amend balances
25095 PRINT CD$SPC(17)RV$" 8 "NO$TAB(36)"END.
25100 PRINT CD$SPC(17)"Please select your option and "RV$"ENTER"NO$" or "RV$"R
ETURN"NO$"  ";
25120 INPUT " ",Q$
25130 Q% = VAL(Q$):IF Q%<1 OR Q%>8 OR Q%<>VAL(Q$)
      THEN M$=" ENTER   1 TO 8, PLEASE !!":
      GOSUB 330: GOTO 25010

25150 MU%=Q%
25200 ON MU% GOTO 30010,30010.40010,45010,50010.35010,42010,55010


30000 '**************************** INPUT DATA ****************************
30010 IF MU%=1 THEN FI$ = "a:bank.dat"          : N%=BR%:
               ELSE FI$ = "a:company.dat"       : N%=CR%
30015 SF%=1:EF%=3                           'start & end data fields
30020 GOSUB 850                             'open the file

30021 F1% = 0                               'reset function keys
30022 R% = N% + 1                           'first unused record
30025 PRINT CL$: GOSUB 320
30026 IF MU%=1 THEN PRINT SPC(30)RV$"BANK TRANSACTIONS"NO$CD$
               ELSE PRINT SPC(28)RV$"COMPANY TRANSACTIONS"NO$CD$
30027 PRINT HI$SPC(20)"Record"SPC(3)"Date"SPC(8)"Reference"SPC(7)"Amount"LO$:
      LN%=5
30029 'F F1% = 4 THEN F1% = 0: GOSUB 3000                  (from 30140)
```

```
30030 WHILE F1%<3                                     'General input procedure
30032        H%=22: V%=LN%: GOSUB 300: PRINT HI$R%LO$         'record no
30035        GOSUB 1010                                       'input sub
30040        IF F1%>=3 THEN 30120
30050        IF R%<N% THEN R%=R%+1: LN%=LN%+1: GOSUB 3000: GOTO 30120
30060        N%=R%: R%=R%+1: IF MU%=1 THEN BR%=N%
                         ELSE CR%=N%              'update record no.
30065        IF N% = 6000 THEN F1%=4: GOTO 30120
30066        IF N% > 5980 THEN M$="Only space for"+STR$(6000-N%)+
             " more records !": GOSUB 330
30070        ON F1% GOTO 30090,30100
30080        IN$(1)="":IN$(2)="":IN$(3)="": GOTO 30110
30090        IN$(2)="": IN$(3)="": GOTO 30110
30100        IN$(3)="": IN$(2)=RIGHT$(MID$(STR$(VAL(IN$(2))+1),2),6)
             + SPACE$(6-LEN(RIGHT$(MID$(STR$(VAL(IN$(2))+1),2),6)))
             + RIGHT$(IN$(2),2)                    'inc reference
30110        LN%=LN%+1: IF LN%=24 THEN PRINT: PRINT :LN%=23
30120 WEND
30125 IN$(1)="":IN$(2)="":IN$(3)=""
30130 IF F1% = 3 THEN GOSUB 3100: CLOSE£1: GOTO 25010          'write
control record & exit to menu
30140 IF F1% = 4 THEN R%=1: GOTO 30025                'goto start of file
30150 IF F1% = 5 THEN 30021                           'goto end of file

30160 IF F1% <> 6 THEN 30170                   'get a record from mid-file
30162 V%=LN%: H%=13: GOSUB 300:
      PRINT DL$HI$"Record: "LO$;: INPUT"",Q$: Q%=VAL(Q$)
30163 IF Q%<1 OR Q%>N%
      THEN    M$ = "Invalid Record Number!": GOSUB 330: GOSUB 320:
      GOTO 30165
      ELSE    R% = Q%
30165 GOSUB 300: PRINT DL$
30168 GOSUB 3000: F1%=0: GOTO 30030


30170 IF F1% <> 7 THEN 30300                   'search for a kev reference
30180 LN%=5: V%=LN%: H%=21: GOSUB 300: PRINT SC$HI$"Search for  :"LO$
30185 RF%=0: SE%=0: SF%=6: EF%=6: GOSUB 1010          'input search kev
30190 SE=VAL(IN$(6))
30200 FOR R%=1 TO N%:
          GET£1,R%
30210     IF SE=VAL(W2$) THEN LN%=LN%+1: GOSUB 3000: SE%=SE%+1: RF%=R%
30220 NEXT R%
30240 GOTO 30500


30290 'F1%=8 by default                        search for an amount ££.pp.
30300 LN%=5: V%=LN%: H%=21: GOSUB 300: PRINT SC$HI$"Search for  :"LO$
30310 RF%=0: SE%=0: SF%=7: EF%=7: GOSUB 1010          'input search ££.pp
30320 SE£=VAL(IN$(7))
30330 FOR R%=1 TO N%:
          GET£1,R%
30340     IF SE£=VAL(W3$) THEN LN%=LN%+1: GOSUB 3000: SE%=SE%+1: RF%=R%
30350 NEXT R%

30500 PRINT :PRINT SPC(20);"Number of records found:               ":SE%
30510 M$="Press a kev to continue.": GOSUB 310
30520 Q$=INPUT$(1): SF%=1: EF%=3
30530 IF SE%=0 THEN 30021
30540 R%=RF%: F1%=0: GOSUB 300: PRINT SC$:
      GOSUB 320: GOSUB 3000: GOTO 30030


35000 '******************************** SORT and RECONCILE ********************
35010 PRINT CL$NC$CD$SPC(29)RV$" SORT AND RECONCILE "NO$
35011 M$="RETURN to contine: ESC for Menu": GOSUB 310
35012 V%=5:H%=16
35014 GOSUB 300:PRINT BE$RV$COPY$NO$HM$
35018 Q$=INPUT$(1): IF Q$<>CHR$(13) AND Q$<>CHR$(27) THEN 35014
35019 GOSUB 320:IF Q$=CHR$(27) THEN 25010
35020 PRINT CD$CD$CD$CD$CD$CD$"To run this program you must have the printer o
n line and have a formatted
35022   PRINT CD$ "          Copy disk in drive B. Please check that you
have don e these.
35030 GOSUB 310
35040 Q$=INPUT$(1)
35050 IF Q$=E$ THEN 25010
35060 IF ASC(Q$)<>13 THEN 35040
35065 M$="PLEASE TURN THE PRINTER ON!": GOSUB 310: LPRINT: GOSUB 320
35070 OPEN "R",£6,"b:check.out",1
35080 CLOSE£6: PRINT CL$KX$    'keyboard disabled
35082 FOR MS% = 1 TO 2          '*************** START MAIN LOOP
35085 FI$="a:source.dat"
35090 IF MS%=1 THEN NAME "a:bank.dat"    AS FI$: NR%=BR%:
               ELSE NAME "a:company.dat"  AS FI$: NR%=CR%
35091 GOSUB 850                          'open source
35092 W%=NR%: F%=1
35095 PRINT CD$;:
      IF MS%=1 THEN PRINT"          Sorting Bank Transactions......"
               ELSE PRINT"          Sorting Company Transactions..."


35100 WHILE W%>0
35101         'read source file 1000 records at a time, sort them if
              necessary, and write them to merge files £2 to £7 on drive B:
              allowing up to 6000 records on either source file.
35110         IF W%>T% THEN N%=T%: W%=W%-T%
                    ELSE N%=W%:  W%=0
35120         F%=F%+1: S%=(F%-2)*T%    'logical file no., record no.
35125         PRINT "           Batch";F%-1
35130         FI$="b:merge"+MID$(STR$(F%),2)+".dat" : GOSUB 860
35140         FOR J% = 1 TO N%:
                   GET£1,J%+S%:
                   A%(J%) = CVI(W1$):
                   B£(J%) = CVD(W2$):
                   C£(J%) = VAL(W3$):
                   I%(J%) = J%:

               NEXT J%                       'read 1000 recs. to arrays

35150          C = VAL(MKD$(B£(1)))      'sort on numeric part of string
35160          FOR J% = 1 TO N%-Z1%     'insertion index sort, skip at 35180
```

PROGRAM FILE

```
35170                   R = VAL(MKD$(B£(J%+Z1%)))
35180                   IF C <= R THEN C=R: GOTO 35290
35190                   U%=J%: L%=1: FL%=1
35200                   WHILE U% >= L% AND FL%=1          'binary search
35210                           R%=(U%+L%)\Z2%: X=VAL(MKD$(B£(I%(R%))))
35220                           IF R<X THEN U%=R%-Z1%: GOTO 35250
35230                           IF R>X THEN L%=R%+Z1%:R%=L%: GOTO 35250
35240                           IF R=X THEN FL%=0
35250                   WEND
35260                   RF%= I%(J%+1)                     'free record
35270                   FOR K%=J% TO R% STEP -Z1%:
                                I%(K%+Z1%)=I%(K%):
                        NEXT K%
35275                   IF R%=0 THEN R%=1         'for first record
35280                   I%(R%)=RF%                        'insertion
35290           NEXT J%

35295           N%(F%)=N%                   'no of recs. in merge file
35296           NUL% = 0                    'number of null records this batch


35300           FOR J%=1 TO N%:
                IF C£(I%(J%))=0 THEN NUL%=NUL%+1: GOTO 35304
                'throw out null records & keep count
35301                   Q£=C£(I%(J%)):DP%=2:LE%=11:GOSUB 402
                        'convert number back to string
35302                   LSET A$(F%) = MKI$(A%(I%(J%))):
                        LSET B$(F%) = MKD$(B£(I%(J%))):
                        LSET C$(F%) = Q$:
                        PUT£F%,J%-NUL%
35304           NEXT J%                     'write the merge file


35306           N%(F%)=N%(F%)-NUL%: NR%=NR%-NUL%          'count nulls out
35310           NF%=F%                      'no. of files
35330   WEND
35340   CLOSE£1


35350   LSET W2$ = STRING$(8,0)
35400   IF MS%=1 THEN FI$="a:bank.dat"
             ELSE FI$="a:company.dat"
35402   PRINT"          Merging......
35410   GOSUB 850                                 'open object file on A:
35415   A%=1                                      'array store for duplicates
35420   FOR F%=2 TO NF%:
                GET£F%,1:
        NEXT                                      '1st rec in each merge file
35430   FOR J%=1 TO NR%
35440           C = 999999!
35450           FOR F%=2 TO NF%
35460                   IF C>VAL(B$(F%)) AND LOC(F%)<=N%(F%)
                                THEN C=VAL(B$(F%)): MF%=F%       'get minimum
35470           NEXT F%
35480           IF C<>VAL(W2$) THEN 35510         'key not duplicated
35490                   A%(A%) = CVI(W1$):
                      B£(A%) = CVD(W2$):
                      C£(A%) = VAL(W3$):
                      I%(A%)=J%-Z1%:
                      A%=A%+Z1%                   'store first duplicate
35500                 A%(A%) = CVI(A$(MF%)):
                      B£(A%) = CVD(B$(MF%)):
                      C£(A%) = VAL(C$(MF%)):
                      I%(A%)=J%:
                      A%=A%+Z1%                   'store second duplicate
35510         LSET WW$=F$(MF%):
              PUT£1,J%                            'write to object file
35520         GET£MF%, LOC(MF%)+Z1%               'bring forward the next record
35530 NEXT J%
35540 CLOSE£1:CLOSE£2:CLOSE£3:CLOSE£4:CLOSE£5:CLOSE£6:CLOSE£7
35550 KILL "a:source.dat"
35560 KILL "b:merge?.dat"


35562 IF MS%=1 THEN BR%=NR%
          ELSE CR%=NR%
35564 GOSUB 3100                        'write control record


35570 IF A%=1 THEN 35710
35575 DO%=1
35580 PRINT CD$"          Printing Duplicate Keys......
35590 LPRINT E$"N"CHR$(6): LPRINT E$"E"
35600 IF MS%=1 THEN LPRINT USING PH3$;SDAT$;TIME$
          ELSE LPRINT USING PH4$;SDAT$;TIME$
35610 LPRINT E$"F": LPRINT CHR$(15): LPRINT
35620 FOR J%=1 TO A%-1 STEP 2:
          LPRINT USING PF2$;I%(J%);FND$(A%(J%));MKD$(B£(J%));C£(J%);
          I%(J%+1);FND$(A%(J%+1));MKD$(B£(J%+1));C£(J%+1):
      NEXT J%
35630 LPRINT CHR$(18): LPRINT CHR$(12)
35710 NEXT MS%        '*****************  END MAIN LOOP



35730 IF DO%=0 THEN 35800 ELSE DO%=0
35750 PRINT CD$"          You must get rid of  duplicates before you can get a
reconciliation !
35760 PRINT CD$"          Press any key to go back to MENU, for editing.
35765 PRINT KE$                   'keyboard enabled
35770 M$="Press a key, please !": GOSUB 310
35780 Q$=INPUT$(1)
35790 GOTO 25010

35800 PRINT CD$"          Totalling.........
35810 GOSUB 3200                  'read control record
35820 GOSUB 4010                  'add up trx.
35830 BB£ = BT£ + BX£: CB£ = CT£ + CX£


36000 '**************** Reconciliation
36005 PRINT CD$"          Reconciling.......
36010 FI$ = "a:bank.dat":  ' F%=1: GOSUB 860
36020 FI$ = "a:company.dat": F%=2: GOSUB 860
36030 FI$ = "b:bankrec.dat": F%=3: GOSUB 860
36040 FI$ = "b:comprec.dat": F%=4: GOSUB 860
```

PROGRAM FILE

```
36050  R1%=1:R2%=1:R3%=1:R4%=1:A%=1
36060  WHILE R1% <= BR% AND R2% <= CR%
36061           'reconciliation is done by taking a record from each file and
                comparing. If they are the same, they are discarded; otherwise
                the lower key of the two is passed on. If keys are the same but
36062           'amounts differ, they are passed on but copied to the arrays
                for printout.
36070           GET£1, R1%: GET£2,R2%
36080           IF VAL(B$(1))=VAL(B$(2)) AND C$(1)=C$(2) THEN
                        R1%=R1%+1: R2%=R2%+1: GOTO 36130
36090           IF VAL(B$(1)) <> VAL(B$(2)) THEN 36120
36100                   A%(A%) = CVI(A$(1)):
                        B£(A%) = CVD(B$(1)):
                        C£(A%) = VAL(C$(1)):
                        I%(A%) = R3%:
                        A%=A%+Z1%                   'store bank disparate
36110                   A%(A%) = CVI(A$(2)):
                        B£(A%) = CVD(B$(2)):
                        C£(A%) = VAL(C$(2)):
                        I%(A%) = R4%:
                        A%=A%+Z1%                   'store comp.disparate
36120           IF VAL(B$(1)) >= VAL(B$(2))
                                THEN  LSET F$(4) = F$(2): PUT£4. R4%:
                                      R2%=R2%+1: R4%=R4%+1
                                ELSE  LSET F$(3) = F$(1): PUT£3. R3%:
                                      R1%=R1%+1: R3%=R3%+1
                'pass on the lower key
36130  WEND

36140  IF R1% > BR% THEN  FOR  J%=R2% TO CR%:
                               GET£2,J%: LSET F$(4)=F$(2): PUT£4,R4%:
                               R4%=R4%+1:
                          NEXT J%
36150  IF R2% > CR% THEN  FOR  J%=R1% TO BR%:
                               GET£1,J%: LSET F$(3)=F$(1): PUT£3,R3%:
                               R3%=R3%+1:
                          NEXT J%
36151  'if one file runs out, pass the rest of the other one.

36152  BR%=R3%-1: CR%=R4%-1
36153  CLOSE£1:CLOSE£2:CLOSE£3:CLOSE£4:CLOSE£5:CLOSE£6:CLOSE£7:
       PRINT CD$"          Totalling.........
36154  FG%=1: GOSUB 4010: FG%=0              'add up trx.; flag for b: files
36156  BX£ = BB£ - BT£: CX£ = CB£ - CT£
36158  GOSUB 3100                 'write control record
36170  KILL "a:bank.dat"
36180  KILL "a:company.dat"
36205  PRINT CD$"          Printing Reports.....
36210  IF A%=1 THEN 36285       'no disparate keys


36230  LPRINT E$"N"CHR$(6): LPRINT E$"E"
36240  LPRINT USING PH5$;SDAT$;TIME$
36250  LPRINT: LPRINT SPC(20)"BANK"SPC(35)"COMPANY"
36260   LPRINT E$"F": LPRINT CHR$(15): LPRINT
36270   FOR J%=1 TO A%-1 STEP 2:
              LPRINT USING PF2$;I%(J%);FND$(A%(J%));MKD$(B£(J%));C£(J%);
              I%(J%+1);FND$(A%(J%+1));MKD$(B£(J%+1));C£(J%+1):
        NEXT J%
36280   LPRINT CHR$(18): LPRINT CHR$(12)


36285   IF BR%=0 THEN 36400
36290   FI$="b:bankrec.dat": GOSUB 850  'print unreconciled bank trx.
36300   LPRINT E$"E"
36310   LPRINT USING PH6$;SDAT$;TIME$
36320   LPRINT: LPRINT E$"F"
36330   FOR R%=1 TO BR%: GOSUB 3000
36340   NEXT R%
36350   LPRINT CHR$(12)
36360   CLOSE£1


36400   LPRINT E$"E"                    'print reconciliation statment
36410   LPRINT USING PH7$;SDAT$;TIME$
36420   LPRINT E$"F": LPRINT:LPRINT:LPRINT
36430   LPRINT, USING "Total Bank Balance           ££££££££,.££";BB£
36432   LPRINT
36434   LPRINT, USING "Unreconciled Company Debits  ££££££££,.££";CD£
36436   LPRINT
36438   LPRINT, USING "Unreconciled Company Credits ££££££££,.££";CC£
36440   LPRINT,          "                          -------------"
36442   LPRINT, USING "Adjusted Bank Balance        ££££££££,.££";BB£+CT£
36444   LPRINT:LPRINT:LPRINT
36446   LPRINT, USING "Total Company Balance        ££££££££,.££";CB£
36448   LPRINT
36450   LPRINT, USING "Unreconciled Bank Debits     ££££££££,.££":BD£
36452   LPRINT
36454   LPRINT, USING "Unreconciled Bank Credits    ££££££££,.££":BC£
36456   LPRINT,          "                          -------------"
36458   LPRINT, USING "Adjusted Company Balance     ££££££££,.££";CB£+BT£
36480   LPRINT CHR$(12)
36485   PRINT CD$CD$"          Copying back transaction files and making
 Copy dis k....
36487   CLOSE
36488   PRINT KE$                  'keyboard enabled
36490   RESET:SYSTEM


40000   '******************************** PRINTOUTS **************************
40010   PRINT CL$;:      GOSUB 320: MP%=0
40020   PRINT CD$CD$CD$CD$SPC(21)RV$"           PRINTOUT MENU           "NO$
40030   PRINT CD$SPC(17)RV$" 1 "NO$TAB(36)"Bank transactions
40040   PRINT CD$SPC(17)RV$" 2 "NO$TAB(36)"Company transactions
40055   PRINT CD$SPC(17)RV$" 3 "NO$TAB(36)"Return to menu
40060   PRINT CD$SPC(17)"Please select your option and "RV$"ENTER"NO$" or
 "RV$"R ETURN"NO$"   ";
40080   INPUT " ",Q$
40090   Q% = VAL(Q$):IF Q%<1 OR Q%>3 THEN M$=" ENTER   1 TO 3, PLEASE !!":
        GOSUB 330: GOTO 40020
40100   MP%=Q%: ON MP% GOTO 40105,40105,25010
```

PROGRAM FILE

```
40105   IF MP%=1 THEN FI$ = "a:bank.dat"        : N%=BR%:
                 ELSE FI$ = "a:company.dat"     : N%=CR%
40106   GOSUB 850                              'open the file

40110   PRINT CL$CD$CD$CD$CD$CD$CD$SPC(17)RV$" Start and end (RETURN for all): "
NO$
40120   PRINT CD$CD$SPC(17);:INPUT"START AT : ",Q$
40130   IF Q$="" THEN PS%=1:PF%=N%:PRINT CL$CD$CD$CD$CD$SPC(27)RV$"  Printing al
l records "NO$:GOTO 40170
40135   PS%=VAL(Q$): IF PS%<1 THEN M$="Please enter a number!":
        GOSUB 330: GOTO 40110
40137   IF PS%>N% THEN PS%=N%
40140   PRINT CD$SPC(17);:INPUT"FINISH AT : ",Q$:IF Q$="" THEN 40110
40145   PF%=VAL Q$): IF PF%<1 THEN M$="Please enter a number!":
        GOSUB 330: GOTO 40110
40147   IF PF%>N% THEN PF%=N%
40160   PRINT CL$CD$CD$CD$CD$SPC(26)RV$" Printing from "PS%" to "PF%" "NO$
40170   M$="Press ESC + RPT to stop print":GOSUB 310

40175   LPRINT E$"N"CHR$(6)                    'skip perforations
40176   LPRINT E$"E"                           'emphasised print
40180   IF MP%=1 THEN LPRINT USING PH1$;SDAT$;TIME$
                 ELSE LPRINT USING PH2$;SDAT$;TIME$
40190   LPRINT: LPRINT E$"F"                   'normal print
40200   FOR R%=PS% TO PF%: GOSUB 3000
40202   Q$=INKEY$: IF Q$=E$ THEN R%=PF%
40205   NEXT R%
40210   LPRINT E$CHR$(12)                      'form feed
41000   CLOSE£1: GOTO 40010

42000   '********************** Amend Balances  **************************
42010   PRINT CL$CD$CD$SPC(32)RV$" AMEND BALANCES "NO$
42020   PRINT CD$CD$"This program lets you change existing Bank or
Company balances. The figure
42030   PRINT CD$"which is changed is the reconciled balance brought
forward. If you want to see
42040   PRINT CD$"how this is made up. refer to the TOTALS AND BALANCES
option on the Menu first.
42050   PRINT CD$CD$SPC(22)"RECONCILED BALANCES BROUGHT FORWARD;
42060   PRINT CD$CD$SPC(25)"BANK     :
42070   PRINT CD$CD$SPC(25)"COMPANY :
42080   PRINT CD$CD$CD$SPC(27)"(Minus means Credit)
42090   M$="<RETURN> will accept and file the data without any change.":
        GOSUB 310
42100   SF%=4: EF%=5: LN%=0
42110   Q£=BX£: J%=4: GOSUB 401: IN$(J%)=Q$: GOSUB 290: PRINT IN$(J%)
42120   Q£=CX£: J%=5: GOSUB 401: IN$(J%)=Q$: GOSUB 290: PRINT IN$(J%)
42130   GOSUB 1010
42140   GOSUB 600: IF Q$="N" THEN 42090
42145   BX£=VAL(IN$(4)): CX£=VAL(IN$(5))
42150   GOSUB 3100
42160   GOTO 25010
45000   '*********************** DISPLAY TOTALS & BALANCES *****************
45010   PRINT CL$CD$CD$CD$"          Totalling.........
45020   GOSUB 3200             'read control record
45022   GOSUB 4010             'add up trx.
45024   BB£ = BT£ + BX£: CB£ = CT£ + CX£
45026   GOSUB 3100             'write control record
45030   PRINT CL$CD$SPC(30)RV$" TOTALS AND BALANCES "NO$

45040   PRINT CD$SPC(20)"Date:                                 ";SDAT$
45050   PRINT CD$CD$SPC(20)"Number of Bank Transactions     ";:
        PRINT USING "          ££££";BR%
45060   PRINT     SPC(20)"Unreconciled Bank Debits        ";:
        PRINT USING PT$;BD£
45061   PRINT     SPC(20)"Unreconciled Bank Credits       ";:
        PRINT USING PT$;BC£
45062   PRINT     SPC(20)"Subtotal                        ";:
        PRINT USING PT$;BT£
45063   PRINT CD$SPC(20)"Reconciled balance b/forward    ";:
        PRINT USING PT$;BX£
45064   PRINT     SPC(20)"Total Bank balance              ";:
        PRINT USING PT$;BB£
45070   PRINT CD$CD$SPC(20)"Number of Company Transactions  ";:
        PRINT USING "          ££££";CR%
45080   PRINT     SPC(20)"Unreconciled Company Debits     ";:
        PRINT USING PT$;CD£
45081   PRINT     SPC(20)"Unreconciled Company Credits    ";:
        PRINT USING PT$;CC£
45082   PRINT     SPC(20)"Subtotal                        ";:
        PRINT USING PT$;CT£
45083   PRINT CD$SPC(20)"Reconciled balance b/forward    ";:
        PRINT USING PT$;CX£
45084   PRINT     SPC(20)"Total Company Balance           ";:
        PRINT USING PT$;CB£
45090   M$="Press a key for MENU": GOSUB 310
45100   Q$=INPUT$(1): GOTO 25010

50000   '************************  COPY ****************************
50010   PRINT CL$"Proceeding with copying program........
50020   GOSUB 3100: CLOSE
50030   OPEN "R",£6,"b:check.out",1
50040   RESET
50050   SYSTEM

55000   '*********************** END *******************************
55010   GOSUB 3100
55015   RESET
55020   PRINT CL$"Finished Bank Reconciliation Program at ";TIME$:
        PRINT CD$"You may now remove your disks and switch off."CD$
55040   GOTO 55040
        'hang here to prevent return to DOS

60000   '********************** ERROR TRAP ****************************
60015   PRINT BE$
60020   IF (ERR=57 OR ERR=72) AND (ERL=21000 OR ERL=35070 OR ERL=50030) THEN
        M$ = "Copy Disk absent or unformatted or door open."
```

```
        + " Press a key when ready":
        GOSUB 310: Q$=INPUT$(1): GOSUB 320: RUN
60030   M$="ERROR MESSAGE: ERROR "+STR$(ERR)+" AT LINE "+STR$(ERL)+
        ". FILES SAVED."
60040   GOSUB 310: GOSUB 3100: END
        'file control record before closing down!
```

BBC LSTFMT

by M Elliot

This program is designed to break multi-statement program lines into several single-statement lines. Note that when typing in programs, it is advisable (though not necessary) to turn off the facility by pressing BREAK or by typing ?&20E=?oldv:?20F=?-(oldv+1).

Running the program twice will cause the machine to 'Hang up', but pressing BREAK will rectify this and cancel the effect.

```
 10 FOR PASS%=1 TO 2
 20 P%=&D01
 30 [OPT PASS%
 40 .START
   :SEI
 50 LDA &20E
 60 STA oldv
 70 LDA &20F
 80 STA oldv+1
 90 LDA #int MOD 256
100 STA &20E
110 LDA #int DIV 256
120 STA &20F
130 LDA #0
   :STA&70
140 CLI
150 RTS
160 .int PHA
   :CMP #34
   :BNE abc
   :LDA #1
   :EOR &70
   :STA &70
   :JMP not
170 .abc CMP #58
180 BNE not
190 LDA #1
   :CMP &70
   :BEQ not
200 LDA #13
   :JSR &FFEE
   :LDA #10
   :JSR &FFEE
   :LDA #32
   :JSR&FFEE
   :JSR&FFEE
   :JSR&FFEE
   :JSR&FFEE
   :JSR&FFEE
210 .not PLA
   :JMP (oldv)
220 .oldv BRK
   :BRK
230 ]
240 NEXT
250 CALL START
```

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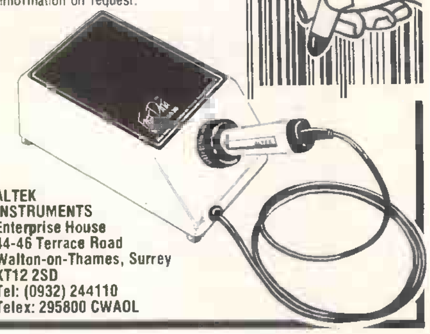

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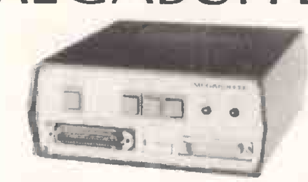

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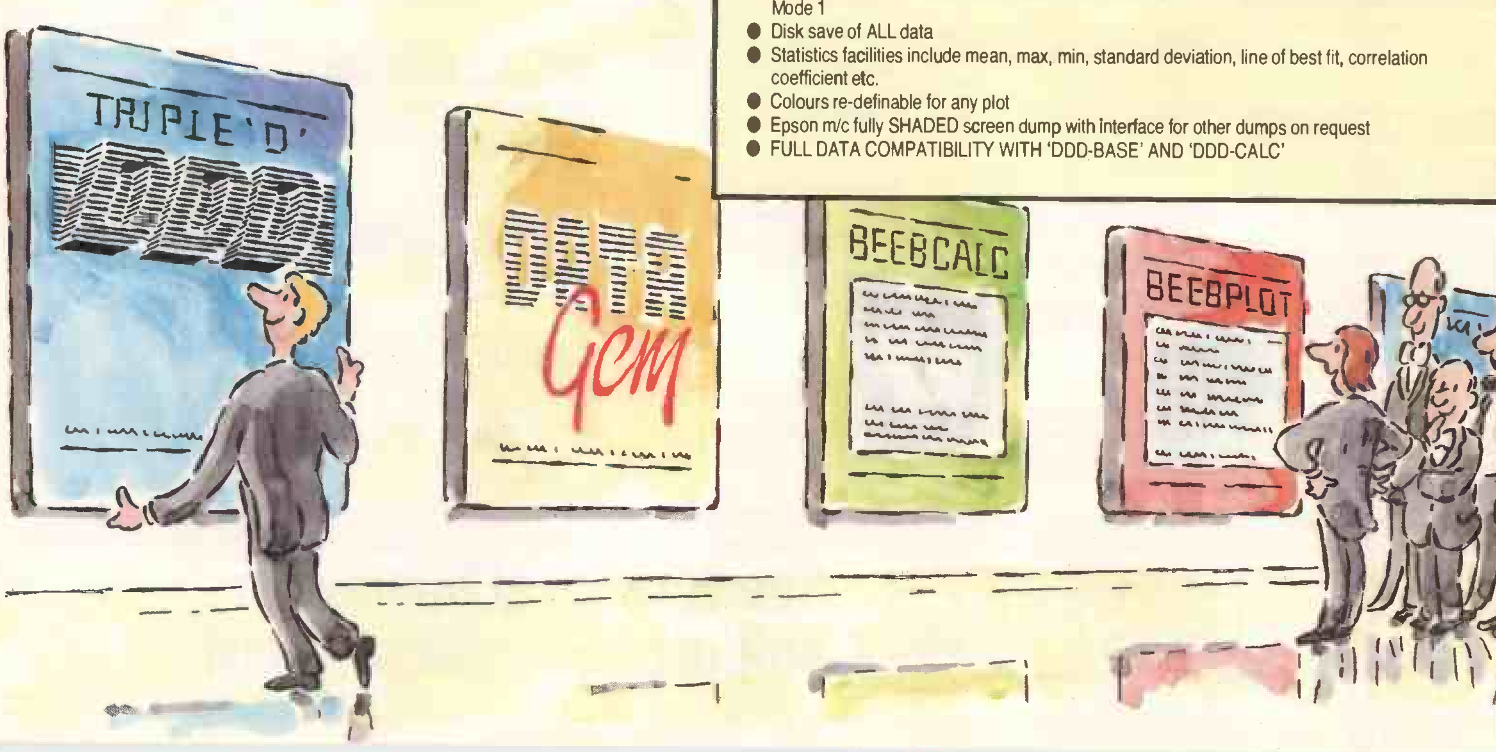

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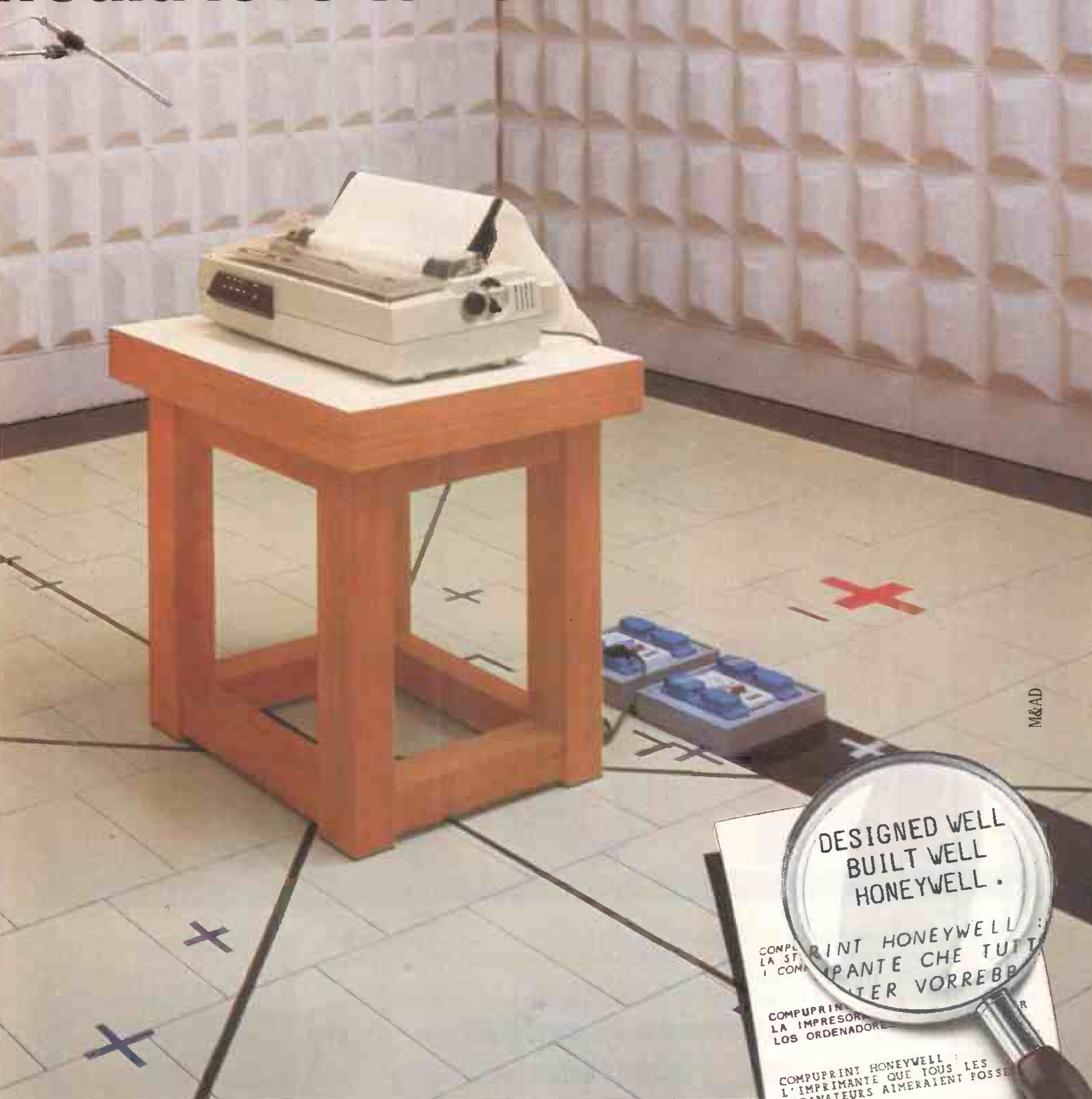

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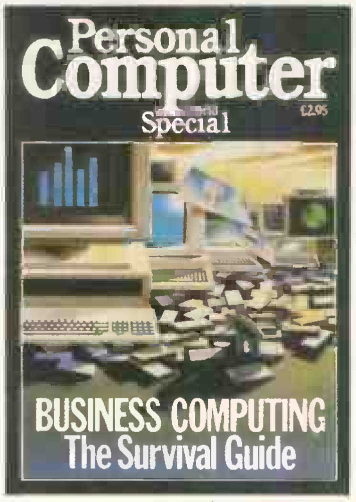

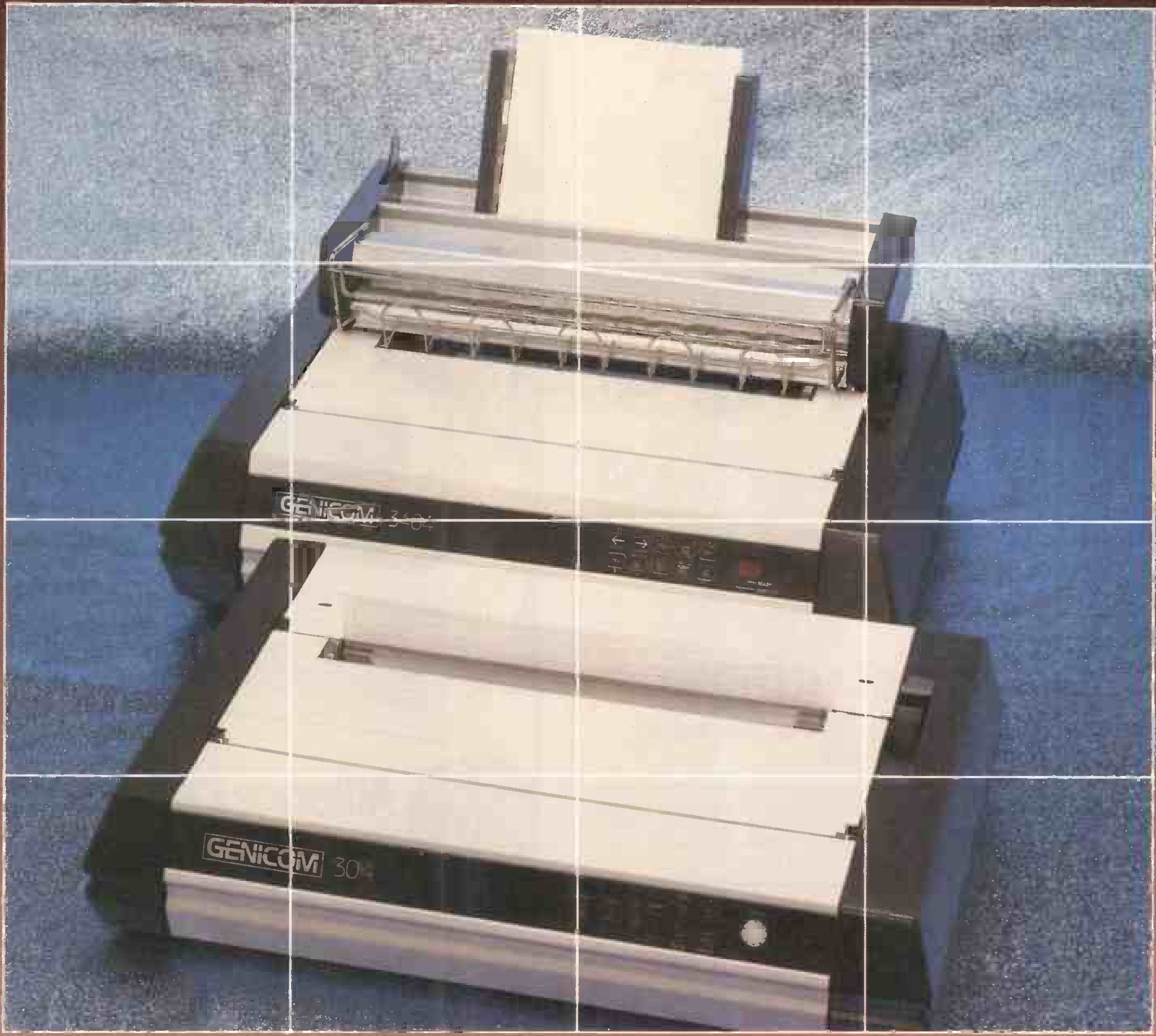
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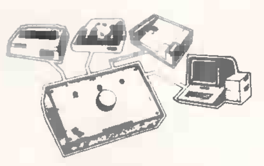

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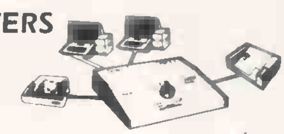

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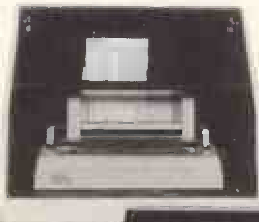

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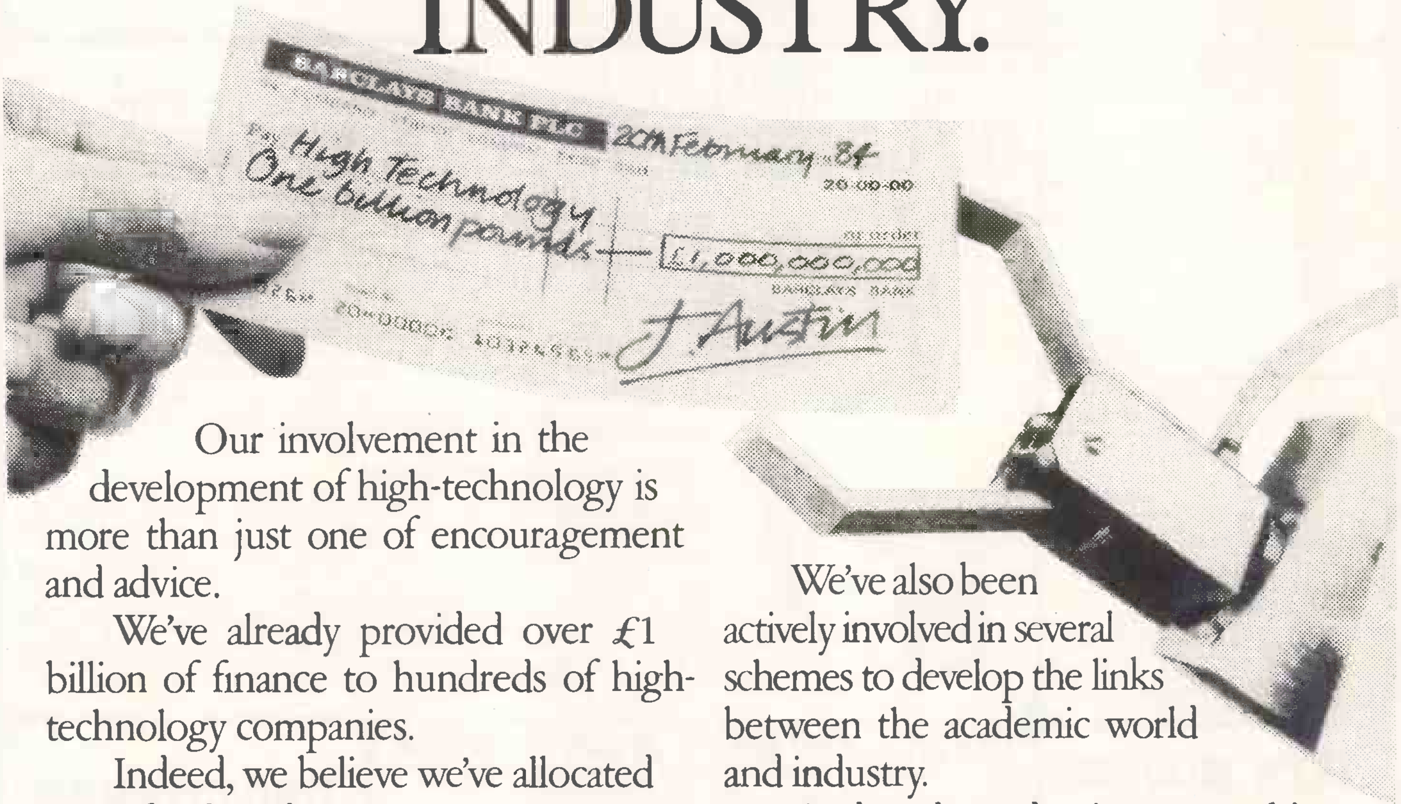

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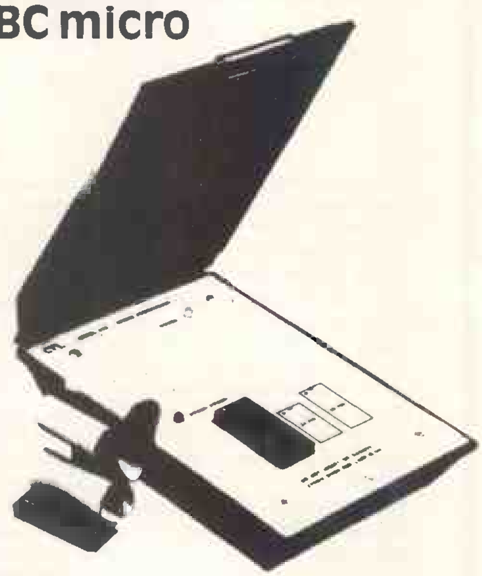

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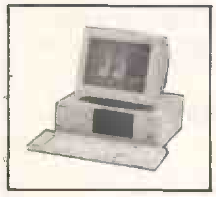

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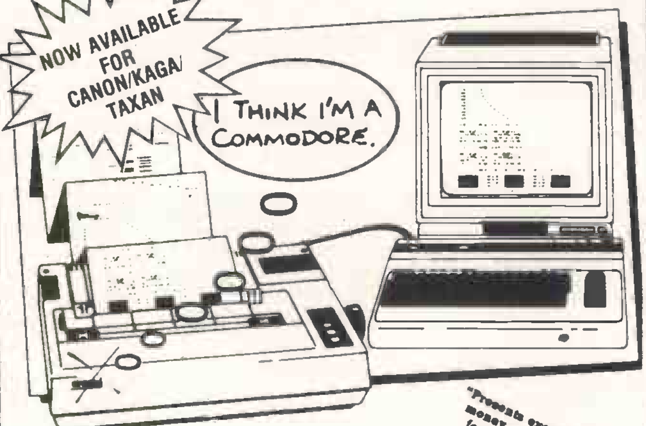

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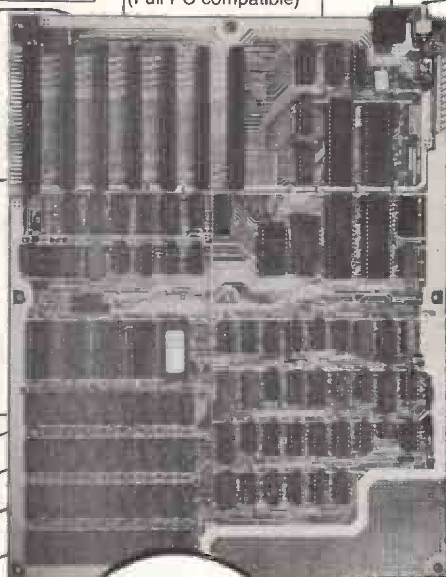

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Acclaimed for its exciting, up to the minute coverage of the latest computer innovations, Thames Television's Database presents a spectacular 'first' in a great new series this summer.

The most recent advance in software transmission is Visicode. Quite simply, it utilises rapid light pulses to transfer software to a micro, via a light pen attached to a monitor screen. Database will be using this revolutionary system to transmit software for an intriguing quiz and a super adventure game; you'll be able to decode the light pulses on your television set with a light pen circuit you buy or construct yourself.

That's not all ITV's very own computer programme has to offer. Presenters Tony Bastable and Jane Ashton will be taking a close look at further developments, from the role of micros in the Health Service and the latest cellular radio networks, to their uses in helping the disabled, making music and computer 'hacking'. Each week, there'll also be general advice on buying micros plus reviews of hardware and software in the home from Dr. Mike Thorne. Amongst other special features will be coverage of the British Micro Computing Awards Ceremony, which this year is to be co-sponsored by Thames Television.

Whether you're new to the game or an old hand, make sure you're up to date on news and events in the fast moving micro world: don't miss Database, starting Thursday June 20. Programme times vary according to regions, so check your local press for details.

The Database Mailbox

If you have a micro connected to Prestel, why not call the Database office direct with your comments, ideas and suggestions. The Database Mailbox can be found on Prestel Page 7776.

And if you own a teletext television set, check out the latest news in the Database Newsletter on Oracle Page 159. You'll also find the Database Bulletin Board on Oracle Page 159.

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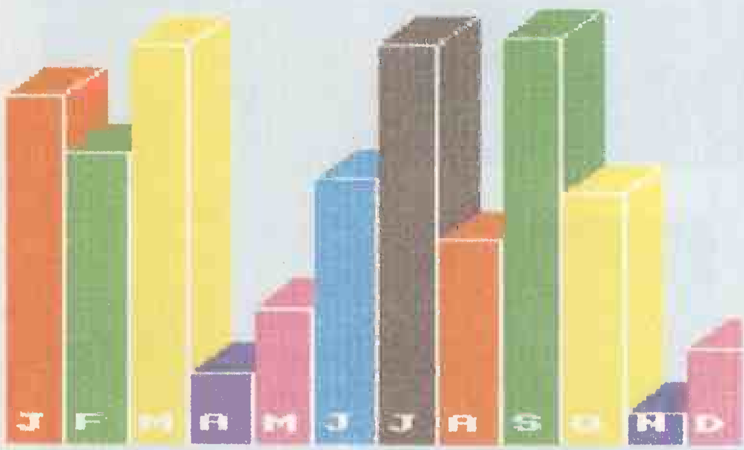

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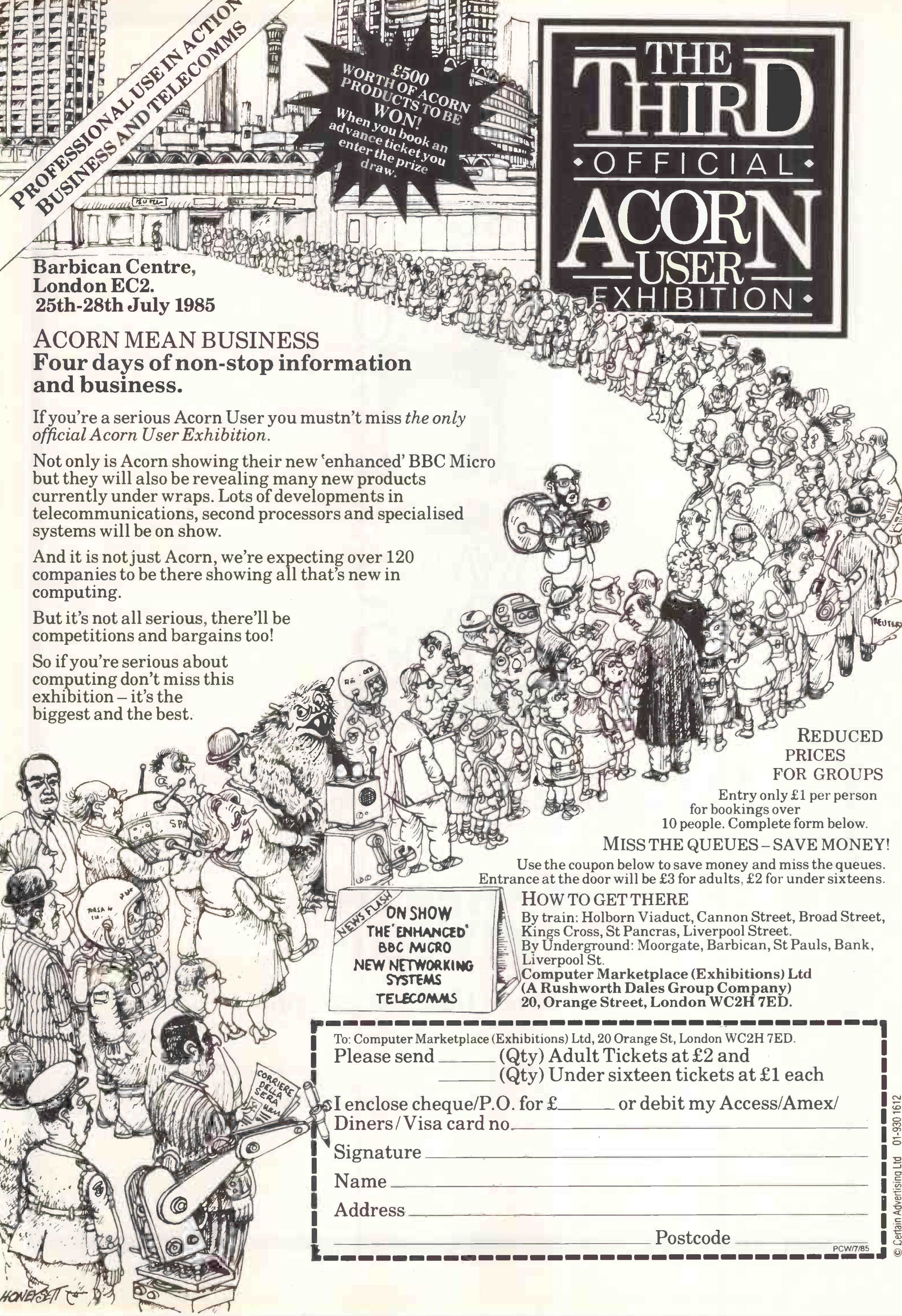

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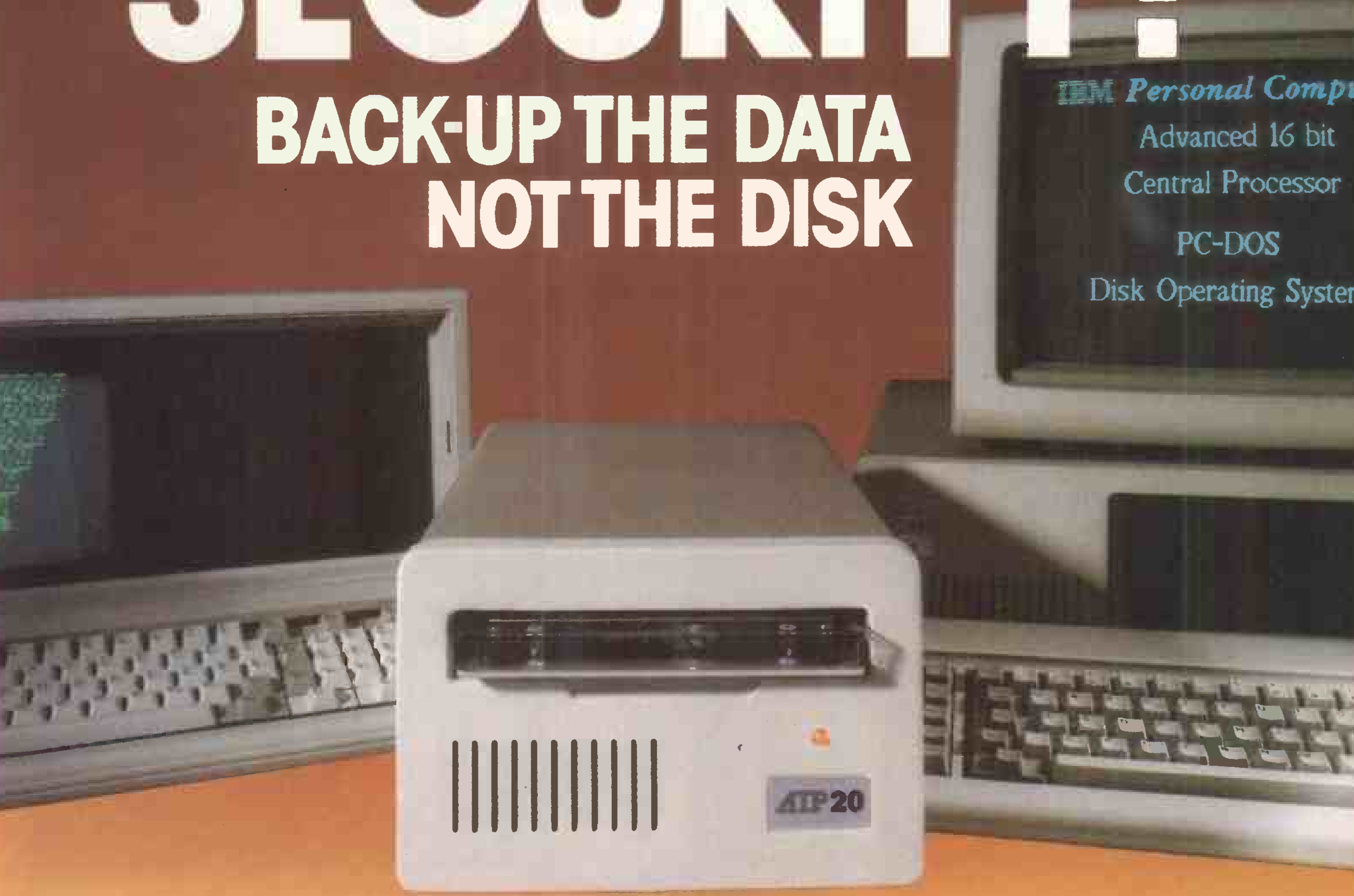

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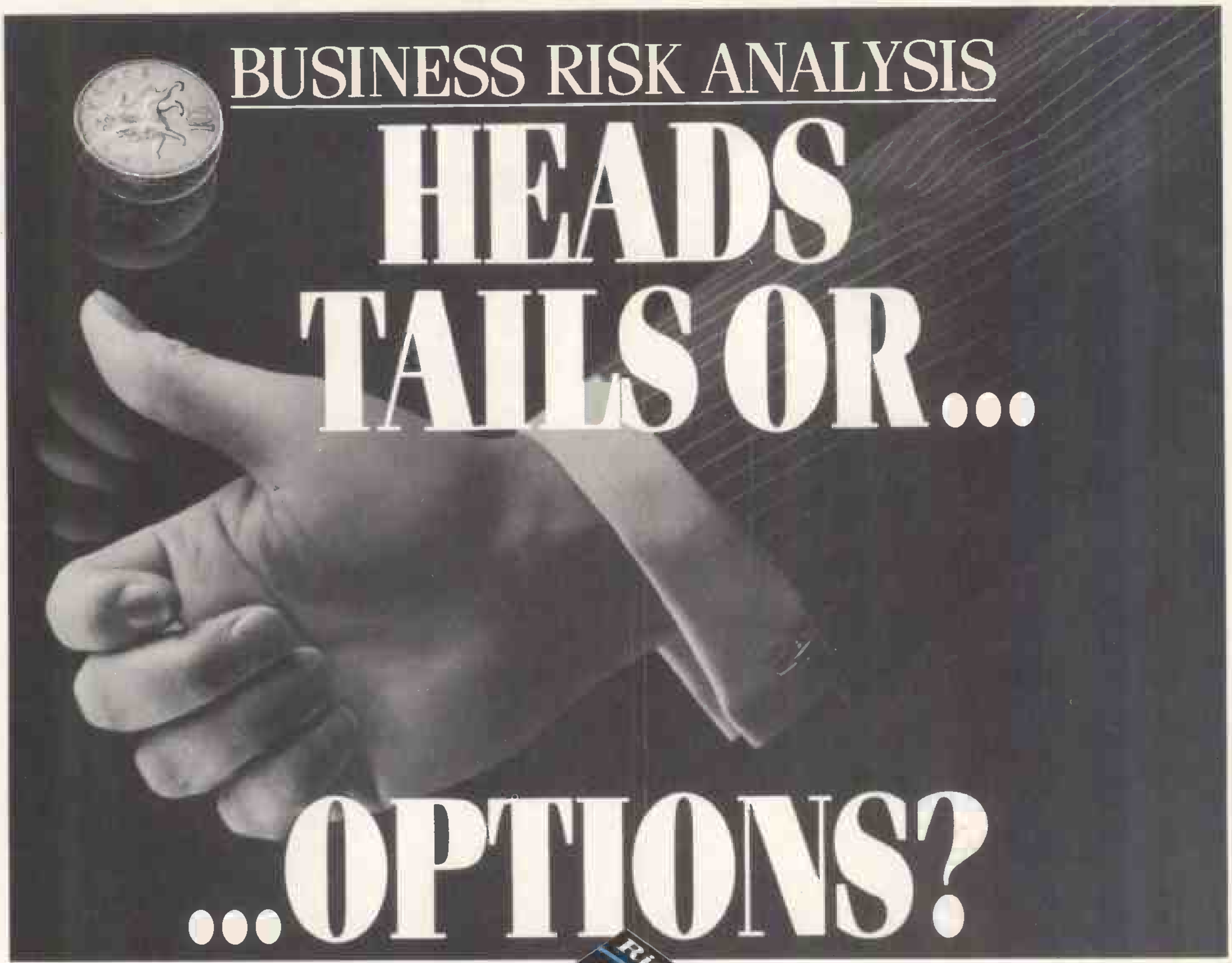

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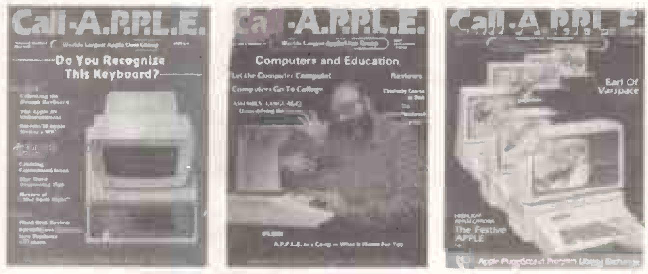

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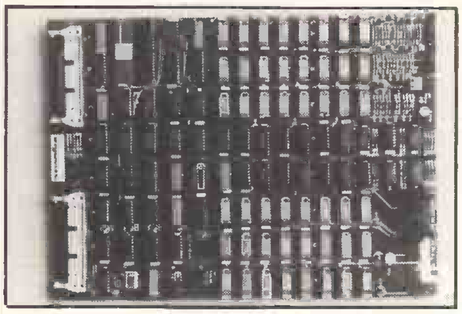

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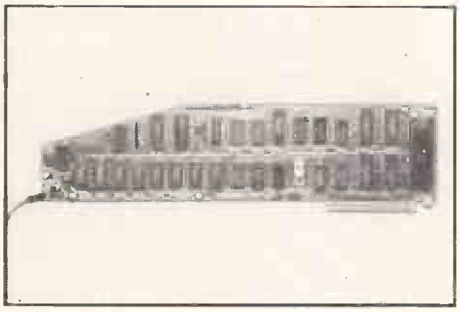

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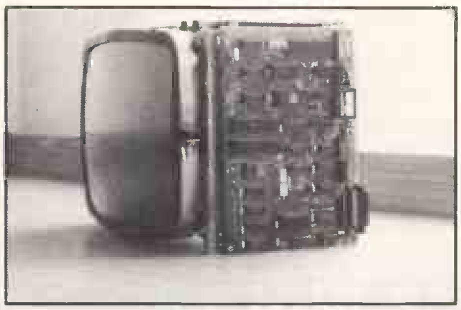

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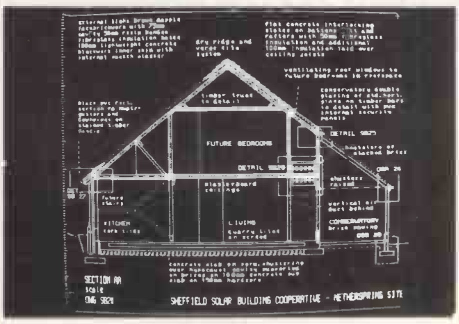

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CHIP CHAT

Happy landings: not that we want to make you nervous about flying off for your summer holidays, but there are some interesting ads in a recent issue of *Computair*, 'the journal of the Royal Air Force Personal Computer Association'. For the Atari there's Attack of the Mutant Camels (a 'slick megablast'), and for the BBC there's Free Fall ('all your crew members are dead') and Aviator ('score points by successfully flying under a bridge and between skyscrapers'). Presumably these games will at least allow the pilots to get such manoeuvres out of their systems before they leave the runway.

Can-can('t): regular readers will recall earlier stories about IBM's 100 per cent club for successful salesmen. The latest rumour concerns one manager who thought his troops deserved a special reward — dancing girls. IBM disagreed and demoted him.

Foot-loose: would you believe that 'the demographics of runners and computer users are similar'? We wouldn't, but Adidas and Puma do — both companies are planning running shoes with built-in chips. Run round the block, connect the shoe to your micro on return, and you can find out how far you've run, how many calories you've lost along the way and how long you've been gone. They may be smart shoes but it sounds like a dumb move to us.

Walking back to happiness: the highest figure we've heard for company cars that have had to be turned in or toned down at Acorn is 40. But there's no truth in suggestions that some executives have replaced their upmarket models with lower-slung C5s.

Who'll mind the minder?: someone at DK'Tronics needs to be kept away from the company's headed notepaper. We received a 'news release' explaining how the managing director punched a man he thought was having an affair with his wife, accompanied by local newspaper reports that he was going to 'sell up the business and move back to Great Yarmouth' — life, we assume, being better all round in Great Yarmouth. Not true, says DK'Tronics, at least as far as the move goes. All this from the company that brought you Minder as a software spin-off to the TV series. Dive for cover if it releases a version of Apocalypse.

There is a future for the C5 after all — as a gimmick for promoting rival manufacturers' products. A Hampshire-based ACT dealer called ADACS is behind this scheme which involves giving away C5s with Apricot Xis. The catch is that the lucky purchasers have to keep the Apricot advertisements on their new vehicles for at least three months, so if you're down in the New Forest and see a C5 covered in Apricot stickers heading towards you, you'll know who to blame.

We know that vertical marketing (that is, packaging systems for specific types of users) is all the rage, but the farming market is already beginning to get a bit crowded, judging by the number of photographs we receive of cows muzzling up to micros.

Shown here is the latest to arrive on our desks courtesy of Quanta Learning Systems, which is producing the training manual for a farmers' information service. Quanta's caption points to the advantages of getting 'hooves-on experience. . . down on the farm'. Can you do better? Send your suggestions on the back of a postcard to ChipChat, PCW, 32-34 Broadwick Street, London W1A 2HG, to reach us by the end of July.

Make sure you include your name and address as well in case you win the £10 prize, which goes to Peter Day of Camberley for his April entry. That photograph featured Sir Clive introducing Lord Stockton to the delights of the Spectrum. Peter's suggestion had the noble Lord asking: 'These keys are too fiddly for my aged fingers — why don't you produce a mouse for it?' Sir Clive's response was 'But I do — the C5'.

Bohdan Buciak of Hackney came in a close second with Sir Clive explaining: 'We're going to sell a lot of these in Russia', to which Lord Stockton enquires: 'Is that why there's no ESCAPE key?'

Muddier: the game you've always wanted to play but have never been able to log on to, MUD, has been adopted by British Telecom. Due to be unveiled at the September *PCW* Show, this expanded version will initially be available on a London-based Vax system handling up to 100 players. A pack to get you going will cost £20 — the good news is that the pack includes your first few hours on MUD, so the fact that you're likely to die quickly at first shouldn't be too offputting. The bad news is that it will be twice as big as Essex University's original version - all the more room to kill you in.

Technically speaking: always keen to keep abreast of modern technology, we're pleased to pass on news of a parallel-processing machine called the Butterfly. If it takes off it'll need to corner the market for 68000 chips — there's 128 of them inside each machine. And who will get to use all that processing power? You guessed — the military.

Losing friends and influencing people: IBM's announcement in the States of bundled PC software went down like the proverbial lead ballon. There were even rumbles that it might well be anti-competitive under American law. Ah well, at least that would make the lawyers happy - but no-one else.

SOB: 'You'll have to convince me that the voracious little son of a bitch won't eat my copy', says an American TV newsman cautious about micros. We know the feeling — feeding time in this office sometimes seems to come round about the same time our deadlines do.

Brain drain: Tatung's new TCS-6000, a multi-user 16-bit machine from the company which brought you (well, some of you) the Einstein, comes with a promise: it guarantees to 'catapult your office productivity and efficiency to a dazzling new height'. If that doesn't sound painful enough, try this Lightning repartee from the distributor of the same name: 'Looking at the Einstein, it's obvious that Albert would have approved of his namesake — it would have made working out his theories relatively easier. . . END

ven in today's high tech world, for most of us, the written word is still he least expensive means of sending and receiving information. If you wn a microcomputer the chances are that sooner or later you are robably going to need a printer in order to get into print.

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