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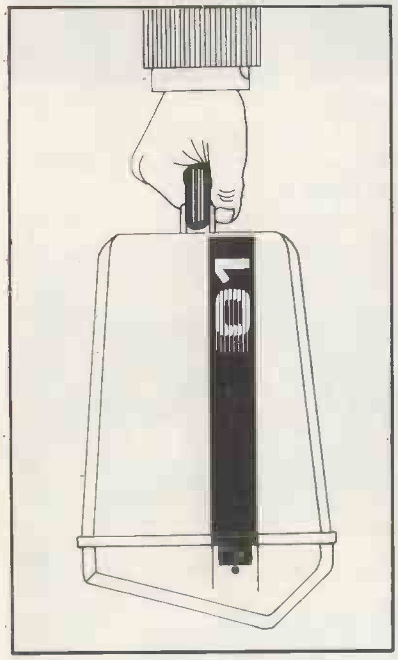
Osborne 1



Portability

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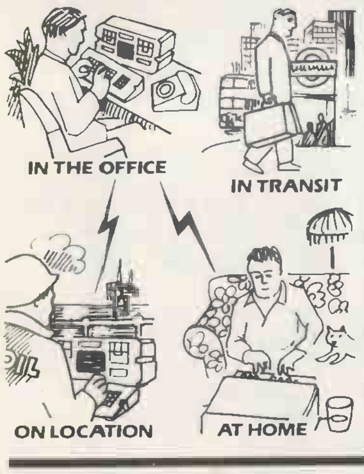

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Price

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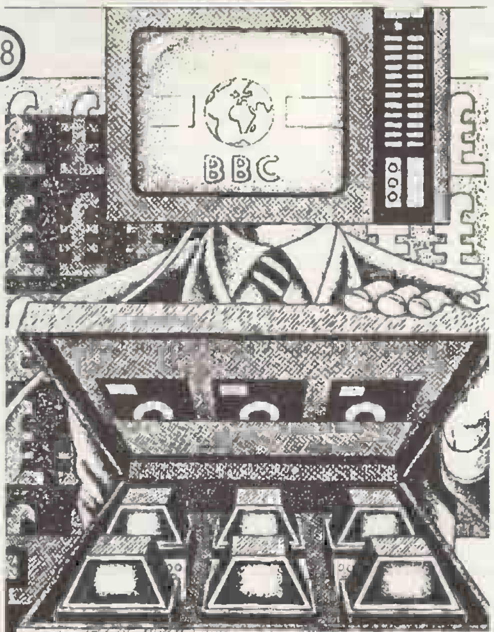

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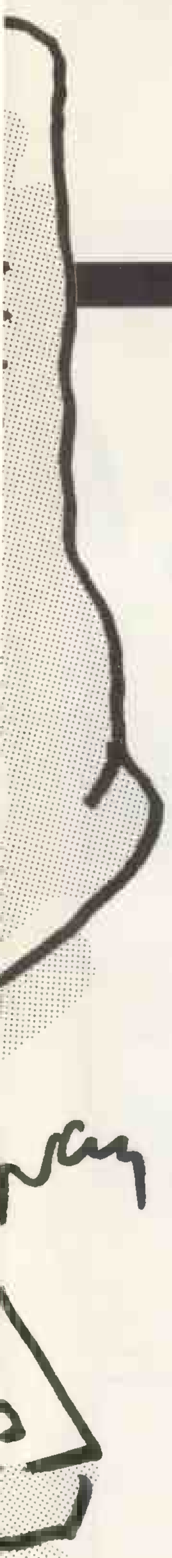

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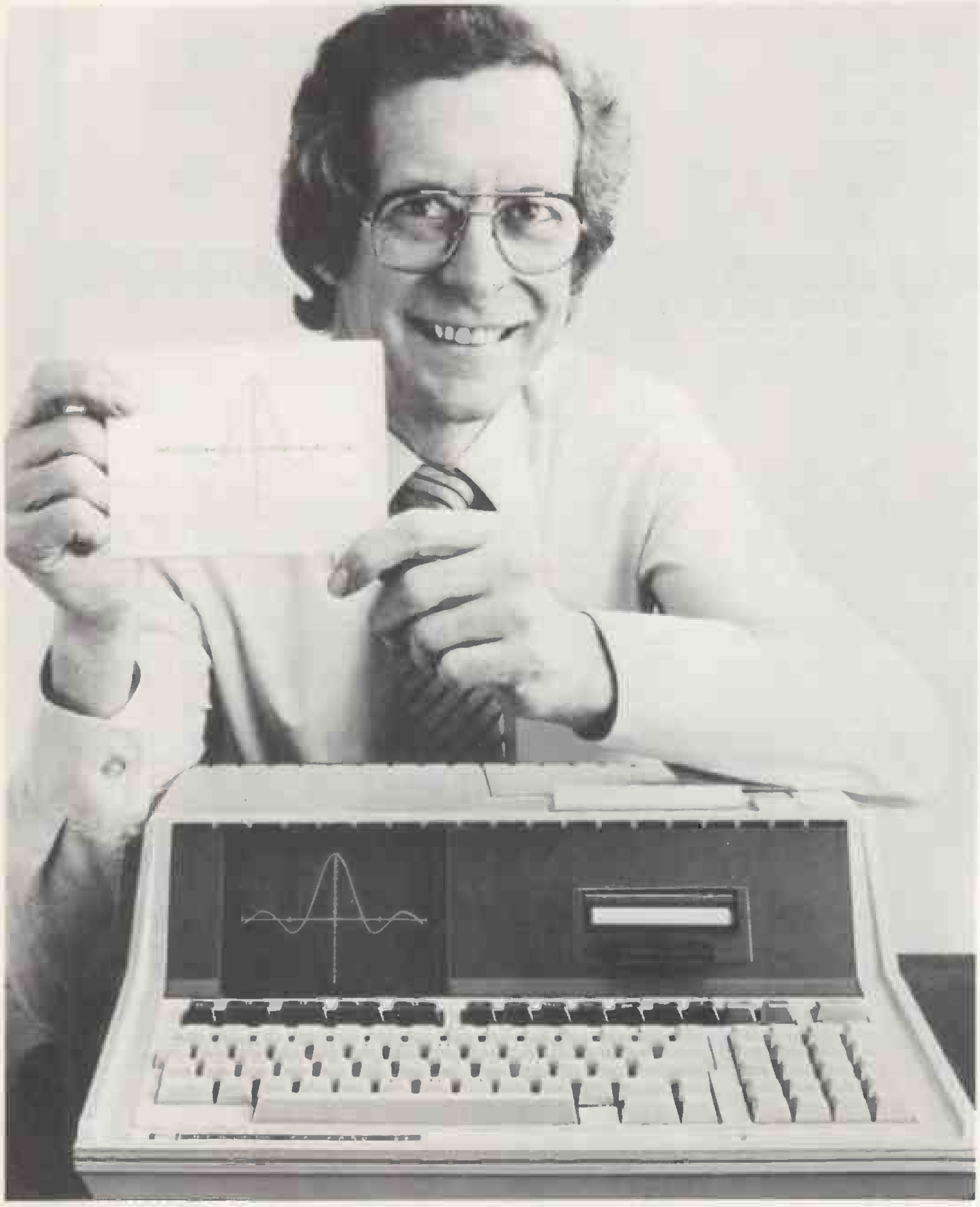

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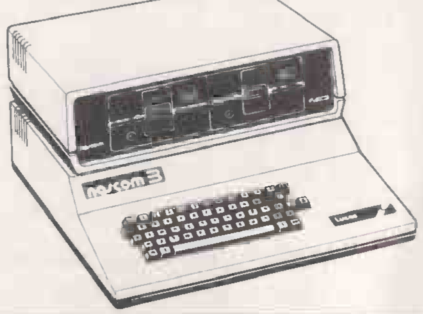

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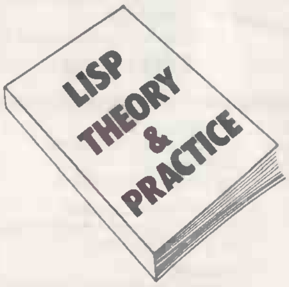

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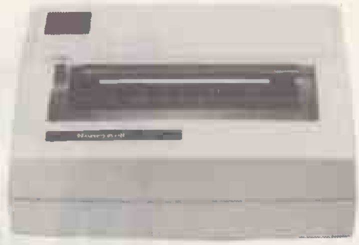


NON-STOP TECHNOLOGY

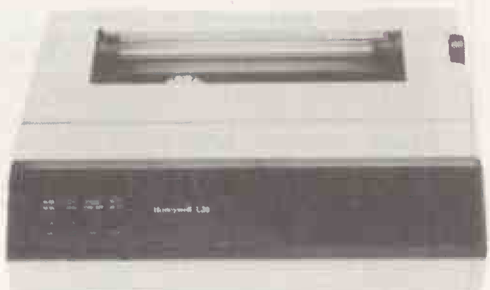
Honeywell Information Systems Italia is a reality in the world of printers and is out to prove it. Today marks the birth of a second generation of matrix printers created, designed and produced in Europe to meet European demands. Printers characterised by intelligent engineering, total reliability, safety and completeness.

NON-STOP INNOVATION

To supplement those small printers already operational, such as the L11 and S11 80-column series and the larger L31 and S31 132-column series capable of linking with all parallel or serial interface systems, which have been recently updated, Honeywell Information Systems Italia proudly announces the birth of the L32, R32 and L38. These new printers go to enrich an already glittering range of products. They are designed for a professional public, those very people who demand always higher standards of product quality, work continuity, operational simplicity and enhanced speed.

NON-STOP PERFORMANCE

The new L32 and R32 printers provided with a 9 needle matrix head, operate at 150 characters per second on 132 columns. The L32 parallel interface printer furnishes such an outstanding print quality that is characteristic of the whole range of Honeywell products. The serial interface R32, is equipped with special software to automatically interpret programmer's commands to realize even the most complicated graphics. The L38, on the other hand, employs the latest 14 needle matrix head technology and is capable of printing 400 characters per second. Such performance does not imply that the equipment is functioning at its operational limits: in fact, its ability to print over a billion characters without adjustments proves the level of technological advance reached. Honeywell printers: a complete range of customer designed printers, capable of silent, safe and reliable performance. Day after day.



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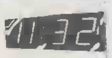

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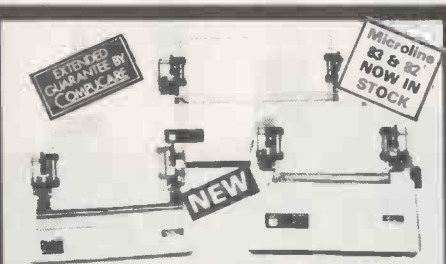

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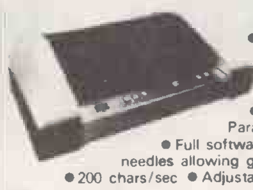

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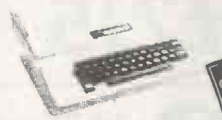

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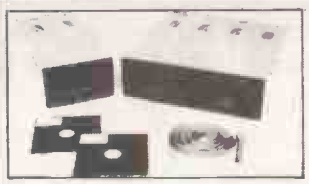

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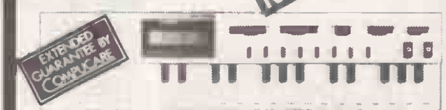

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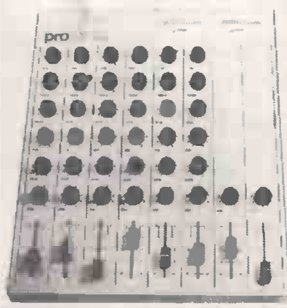

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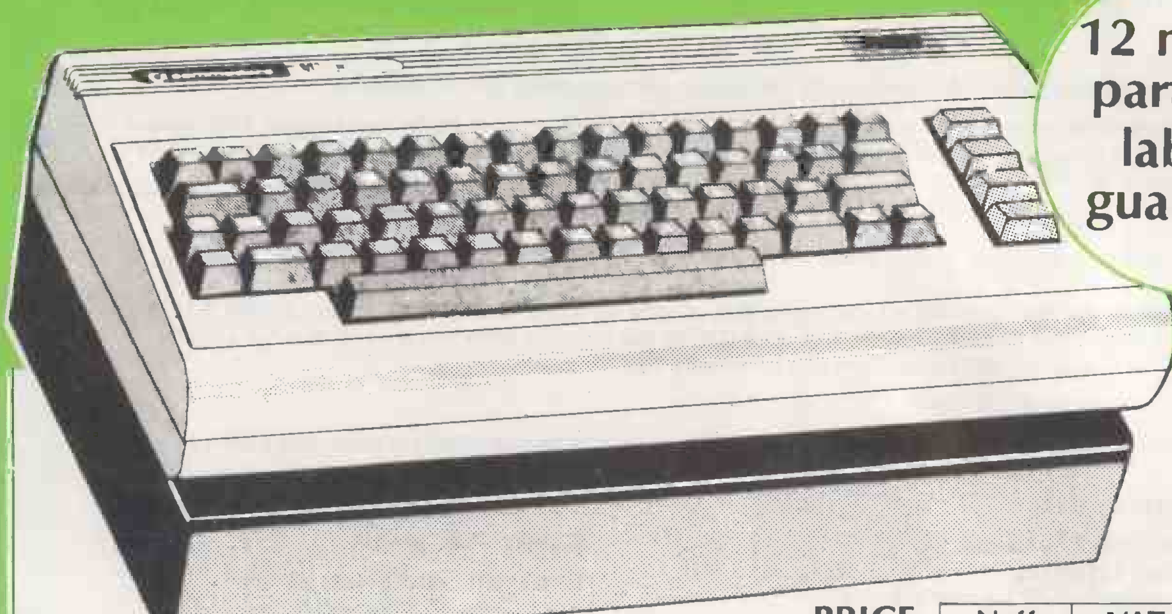

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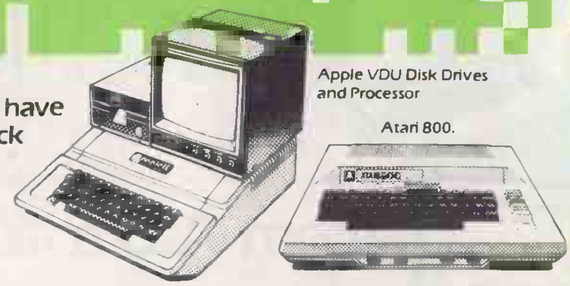

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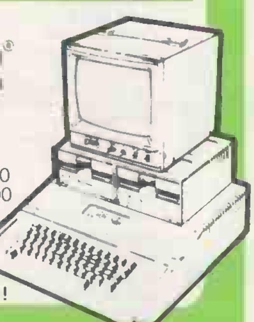

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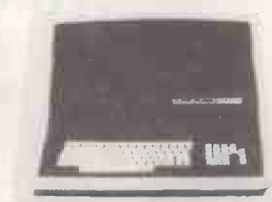

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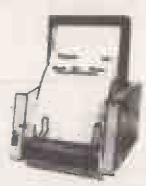

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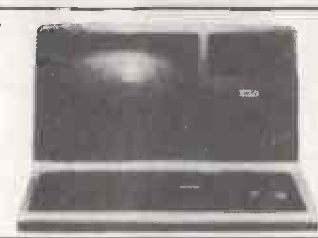

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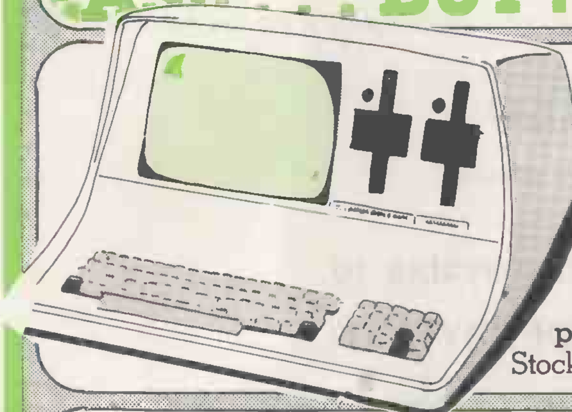

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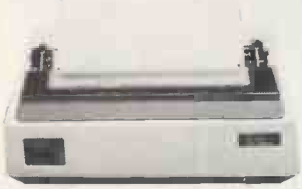

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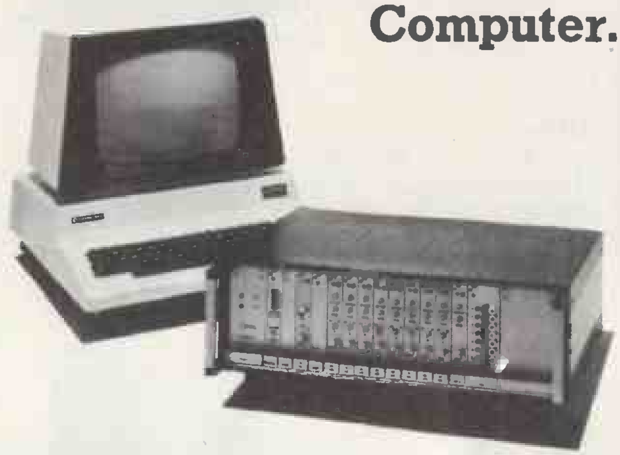

The MICROLINK interface has been designed for use in laboratory environments where acquisition and processing of data from a variety of sources is required. MICROLINK is a modular system consisting of a mainframe incorporating the IEEE-488 interface and a power supply, and a cabinet holding upto 17 modules–this means that the interface can be configured for your precise requirements.

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Edited by Guy Kewney

Still no software theft protection

Copyright for programs is as necessary as copyright for LP records, and just because copyright by itself has failed to end breaches of the law in music doesn't mean that it is useless. So I fully support the Council for Educational Technology in 'deploring the delay on copyright reform'.

The CET is referring to a recent Green Paper — a publication released by a Govenment for discussion, before a White Paper can be produced — on reform of the copyright laws.

I notice also that the Computing Services Association has produced its own suggestions on protection of software, a narrower field than the broad desire of the CET to know where it stands on technology and training. These suggestions include the laughable idea that, while copyright of programs 'at the high end of the market is necessary, at the low end it is not really possible'.

This is almost exactly the reverse of the real situation. Copyright of giant programs running on giant machines is hardly ever in question. For a start, the number of people around to rip off a piece of software is very small compared with the number of micro users. Second, anybody who is suspected of having obtained software unlawfully (if that's the right word) can be investigated and normally can be charged with theft rather than copying.

In the small program market, however, thousands of illicit copies of a program can be produced by a pirate operator, and there is nothing in law to stop him.

There should be.

Monopolise your micro

Derek Tidman, who tried to become famous as the man who was going to take on Tandy Corporation, now wishes to become famous for a version of Monopoly on the ZX81.

It looks like fun to me, at £8 it isn't really very expensive, and it only has one drawback: it doesn't allow cheating.

This is, surely, contrary to the spirit of the game! Whenever I was being beaten at Monopoly, my school friend Manfred would always make sure that he didn't collect rent above and beyond my means, once he had forced me to sell all my hotels and mortgage key property. There was no altruism in this: he merely wanted to amass more money so that he could end the game with a bigger total. His aim, I think, was to break the bank as well as the other players.

On the Work Force (Tidman's company) version, the computer ensures, automatically, that all rents are paid.

Details from Tidman at Work Force on (0582) 418577.

Shop floor PET

Put a PET computer into a factory and you can't get your program loaded because the dust jams either tape cassette or disk drives. This discovery prompted Greenwich Instruments to produce a plug-in chip which will automatically start running any program in one of its original inventions, the Instant ROM.

The Instant ROM is a memory chip which pretends to be read-only but is actually loadable with a program. The program is kept live with a very small battery while you plug it into the PET. And the new G-ROM E makes sure that when the power is switched on, the PET starts running the program in the Instant ROM rather than starting Basic.

And since this was developed for shop-floor applications, I suppose I'm safe in recommending factory managers to get in touch on 01-318 1510.

Cheaper

The distributor for the new TeleVideo CP/M microcomputers, Encotel, is justifying its recent appointment by telling anybody who cares to listen that the machines are cheaper than a Superbrain with the same specification. It's doing such a great job that it is probably well worth while telling everybody that Midlectron is the other official distributor.

Other European distributors are Metrologie in France, Microcomp in Italy, Data Dynamics in Spain, IDS in Eire, and Data Metrix in Finland.

Details from Televideo itself in Sunnyvale at 1170 Morse Avenue, tel (408) 745 7760.

CP/M utilities

Programmers using CP/M systems need all the tools they can get to help them manage the beast — so I try to mention everything, whether or not it is any good. The list of CP/M utilities mentioned in a new catalogue from Gram Business Systems of Maidstone is definitely worth noting under this heading even though each program costs either just over or just under £50, so they aren't over-cheap.

Diskreviver is for getting into disks which either accidentally or on purpose have been erased or damaged, and recovering as much as possible.

Diskorganiser tidies up the mess of files that builds up on any floppy disk with time, as bits of files are written into the gaps between the gaps left by old files that are now deleted.

Disklene looks for grotty bits of the surface, collects them all into a single, indexed file, and makes sure that you don't try to use them. Theoretically, this allows you to use disks with holes in them, though I'd be nervous about that, since the chances are that the holes are due to old age and more will follow swiftly. Still, with hard disks, you can't just junk one or two surfaces with a carefree 'oh, well, another £2 down the drain', can you?

Disked2 actually looks at the disk itself, rather than the data picked up by CP/M, and tells you what bits are recorded. It also lets you change things — providing you know what you're doing — so that you can recover

This Japanese plotter costs £2000 and is apparently capable of doing complicated bar charts with a minimum of input. Distributor Trident claims that an 11-year-old schoolboy mastered its operation in under one hour and didn't need an extra microcomputer to drive it. It can draw on those transparent acetate sheets which people use for lectures, and also it can store these pictures on ultra-mini disks, 3¼ inches in diameter. What it can't do (yet) is get its data from your computer if you are handicapped by having one already. Details from Trident's publicity office on 01-493 7535.

ruined files. Disklog is used to create complex 'submit' files, says Gram — it makes sure that all characters going through the terminal get written to disk. This could be program output, or just typed text, or terminal input.

Finally, Diskspool sets up a queue of files for spooling to a 'list' device (usually a printer) and is claimed to be 'an extremely useful program which enhances the performance of many business and scientific software packages.' Details from Gram on Maidstone 679595.

Another IEEE interface

Whenever somebody announces a product which they say is 'supported by over 150 instrument manufacturers worldwide', as Personal Computers recently said about yet another add-on for the Apple, providing yet another IEEE-488 bus outlet, I am reminded of the French usage of the word 'support' — meaning 'tolerate'. Sometimes I don't think I can 'support' any more IEEE-488 bus announcements. This isn't because I don't like Personal Computers, or the IEEE 488 universal bus. It's just because I really can't think of a different way to introduce it to new readers. So I'm stuck with the old 'if you want to connect your micro to some lab instrument, you probably need it, and this gives it to an Apple II.' Ask Mike Sterland for details on 01-626 8121.

PET power

Did you ever wonder why the instruction LIST, on a microcomputer with Basic, prints out all the instructions in the program starting at the top and finishing at the bottom?

The answer is that when Basic was invented it was a teaching language. Micros weren't invented and you had to use terminals. The terminals that schools and colleges could get were teletypewriters, which went 'clank clank clank' very slowly and printed characters on paper. When they got to the end of the line, the computer told them to move the paper up, and move the print head to the side of the paper again.

Micros, however, have video screens. Basic pretends that it is PRINTing on paper but actually it is just moving characters into a section of memory which can be seen on the screen in the form of letters.

Nonetheless, Basic interpreters are still written the old way, in the strange belief that when you reach the end of the paper it must move up a line, and your print head must go to the side again. I'm glad to see the first signs of sanity, in a program called Power for the Commodore PET. This owes its origin to a man called Jim Butterfield, a Canadian expert and PET freak who obviously doesn't regard tradition as an excuse for stupidity.

Power enhances PET Basic in a lot of ways including many of those listed in the story on Level 9's package for Nascom — tracing, renumbering lines — plus single stepping and defining keys as Basic keywords (like Sinclair does).

What I like about it, however, is that it uses the cursor keys in LIST, so that you can look up and down the program — just as though you had a micro which could look at any part of memory, not a piece of paper which you had already dirtied the top half of.

Power costs £49 plus VAT (about £57) from Professional Software, 153 High Street, Potters Bar, Herts EN6 5BB, phone (0707) 42184.

Manuals written

The reason David Neill thinks that he, as a consultant, can write a better user manual than the man who wrote any program could do himself, is simple: 'The people who conceive and develop a system know it too well. They tend to take the level of understanding of their audience too much for granted. Either that, or they regard writing the manual as a chore, a necessary evil to be dispensed with as rapidly as possible.'

In a sense, the idea of manual writing as a chore is right, says Neill, 'because experts are most profitably employed at doing what they are good at.'

In his case, he is most profitably employed testing your CP/M software on his Superbrain, or coming round to your place and trying it on your own CP/M machine and then generating WordStar disks with his usual manuals, or suggestions for manuals.

David Neill is at Chiltern Cottage, Hough Lane, Wilmslow, Cheshire SK9 2LQ.

Big and fast

The largest Vector Graphic system (which I recently noted a fellow journalist complain uses no vector displays and no graphics) is the one using the fast version of the Z80 micro — the Z80B which runs at 6 MHz, three times the speed of the standard part which nobody uses any more in computers.

Its big plus is a big disk with 32 megabytes, plus print spooling and despooling. Oh, all right, that involves printing things fast onto a disk, rather than slowly onto paper and doing the paper printing work later, without holding up the program that was generating the text or output. It used to be called spooling because it got printed onto a spool of tape.

Despooling is of no use unless you can do it either on a different machine, or on your own machine without interfering with what you are doing. Almarc, which is supplying the 5032 system, says that the multi-tasking operating enhancements to CP/M can cope with this. The standard disclaimer always applies — in that enhancements make for non-standard software. But Almarc says that the programs which won't run under its version of CP/M are 'very few'.

Almarc is on Nottingham (0602) 52657 or High Wycombe 23804.

Clever spool

A printer can run a lot faster if it always has the next character waiting for it to print, and a computer can get on with something else if it isn't waiting for the printer to finish the previous character. An 'intelligent buffer' (not an intellectual but unworldly fool of riper years) is a device which can receive a whole batch of characters and control commands from the computer, and store them, and pass them on whenever they are needed to the printer.

Such a buffer is now marketed at around £250 by Digital Design and Development in London (better known as 3D). The device isn't really designed for the amateur but if you can follow the manual it will allow you to connect most computers to most printers, whether they are serial interface or parallel interface devices, just by setting the control switches.

The company says that it can be connected to an Apple II but, since the Apple needs an extra card to connect it to a printer anyway, that would seem like

See 'Big and fast'.

two stages of inconvenience. So 3D has agreed that if anybody wants 25 or more, it will adapt the Universal Buffer to plug directly into the Apple, thus providing both serial and parallel interfaces together.

In the meantime, the device plugs into PET, Superbrain and 3D's own 3D09 micro.

Details from Digital Design and Development at 18/19 Warren Street, London W1P 5DB, or phone 01-387 7388.

Efficient file

You want a red-haired, Buddhist actor with one leg, over 70. If he's in the Superfile database, you will find him, quickly.

Superfile is Peter Laurie's latest Southdata software product and it stores data, he says, according to how it sounds. It also stores data without restrictions on the size or type of information fields: 'You don't have to decide, for instance, that surnames must be 20 characters long or less. Superfile will accept a Japanese name like Ko without wasting space, or an English Arbuthnot-Willoughby-Altrincham without truncation.'

With a hard disk of (I guess) 10 megabytes, you can store 15,000 documents, each containing 100 words or figures, under CP/M. Price is £175, or you can buy a cheap demonstration disk for £15 which I sincerely hope Southdata will refund on purchase of the real system.

Details from Southdata at 10 Barley Mow Passage, London W4 4PH, or phone 01-994 6477.

Fully integrated

'Integrated' software should mean a set of programs that all do different things but don't need the chore of loading and running each one each time you need it. Nor should there be any problem collecting the information produced by the program that monitors sales, for instance, in preparation of the invoices — they should 'feed' each other automatically.

Possibly the most

See 'Video Link'.

ambitious attempt to integrate office software is the one launched by the Bristol Software Factory for the big Commodore 8096, called the Silicon Office.

This product, costing a mere £800 (gulp) appeared quite some time ago — at the time of the last PET Show in fact — and there were a few problems, mainly to do with its extreme newness and some changes to the 8096 computer which Commodore had improved since supplying an early model to the Bristol Software Factory.

Now, I'm told, it is working beautifully and I can happily inform purchasers that it is safe to use. Details on (0272) 277135.

Video link

Once upon a time, there was a little computer called a Sony Responder, which could turn a video cassette recorder on and off, and find the right place in the film, and rewind or forward wind, and could respond to buttons pressed on its little keyboard.

It was used as a teaching device, like this: it played a tape until it found a mark saying where to stop, and then it printed a little message on the screen, asking you to press button a, b, c and so on. And the film was cleverly arranged so that, just before stopping, it would ask you three questions (or more), and the correct answer was button a, or button b or whatever.

The trouble with this device was fairly trivial — it couldn't display the question once the film stopped. So you needed a bit of paper to remember the question before you could work out which button to push. This seemed a silly omission to me, and I said so at the time.

You will therefore expect me to be pleased at the arrival of a machine which can put messages on the screen — not only when it stops the tape, but while the tape is running, and either on top of the film, or instead of the film. This machine is not supplied by Sony, but by a BP subsidiary called Scicon.

And, indeed, the addition of a bit more software to do this is welcome, but whereas the Sony cost under £2000 (including a video tape machine) the Scicon Cavis (Computer Audio Visual Instruction System) costs well over £10,000. Scicon says it isn't after the mass market — I believe it. Details on (0908) 565656.

Bananas

The winner of our 'Just-for-the-hell-of-it' competition was Charles Horth of High Wycombe, Bucks. Congratulations, Mr Horth, you should have received your prize by the time this appears.

Our thanks to the *thousands* of people who entered. The correct answer, which most people got, was: 'Phoebe this has got to stop it's driving me bananas'. This appeared in the 'Patterns' logo at the top of page 91 of our December '81 edition.

EATing chilli

You can bet that if our own phone authority, British Telecom, devised a system of using micros to see if we were really using our phones, it would keep quiet about it. Not, however, in Mexico.

In that country ('one of the fastest growing economies in the world'), the old fashioned system of having an exchange worker eavesdrop on your conversation is being replaced by having a micro do it.

Apparently, the motives are of the highest. According to an article in *R & D Mexico* (a public relations magazine, it seems, sent out by Mexican authorities), the eavesdropping was originally the only way that the phone company, Telmex, could tell whether the connection had been made okay. Now, equipment called Traffic Analysis Equipment (EAT in Spanish) monitors it instead — checking to see if the switches are properly on and whether the voltages show that conversation is going ahead.

Telmex hopes to be able to sell this $ 23,000 micro to other countries.

32-bit scorn

We can all share the scorn of the commentator who said recently that there was no real need to get prematurely overheated at the prospect of the Motorola 68000 chip appearing in micros, because most of them seemed to be machines which shared this powerful chip's processing ability around several users, giving each of them less service than they'd get on one Z80-based CP/M system.

However, there are odd exceptions to this general rule. So, while we wait for the 68000 price to drop to where people like Apple and Osborne and Commodore include it in their sub £1000 systems (next year, late), one or two specialist machines have been noted. The MicroAPL machine costs around £20,000 for a system capable of being shared by eight users. For that, they get a million internal memory characters (a megabyte of memory), 36 megabytes of disk memory, 17 megabytes of tape memory on cartridges and the language APL, which is A Programming Language.

Fill her up

The main advantage of increasing the data storage capacity of any machine is not normally that you can run longer programs, but that they become more powerful. Power, in a program to read phone numbers from an index, for example, is much greater if there are twice as many numbers available.

However, in the case of the portable Osborne 1, the news that the Osborne 2 will have 200 kbytes rather than 100 per disk, means (to me) that it may become

Although it looks like the lady has her thumb sellotaped to five disks for the photograph, those neatly arranged Verbatim labels illustrate what the product actually does — it makes it easy to look through your box of floppies. The word from Willis Computer Supplies is: 'It has 10 sections, each with an ingenious, patented lift mechanism which enables disks to be displayed, five at a time, with just thumb and forefinger control for ease of selection.' It looks nice and so you would probably expect it to be expensive. Probably it is, since Willis hasn't told me the price and that's always a bad sign. Details from Willis at PO Box 10, South Mill Road, Bishop's Stortford, Herts, or phone agent Peter Slade on (0702) 586877.

possible to run SpellStar with WordStar. That is, the machine will have room for a program that examines the words stored by WordStar, to see if they are English words.

At the moment, Osborne users have to use Spellguard. I've used it, and with a vocabulary of 10,000 words, (a lot, really) it misses so many of my common usages that I spend longer using it than I would going through the file myself.

Spellguard, unlike SpellStar, can't run together with WordStar. This means that while you are letting it look for words like 'wordslike', you can't see where they occur in the text. And when it comes up with a word like FDR and asks you if you want that marked on the file as a mistake, it probably never occurs to you that it's the postcode for the ex-directory company of which you have no other record, and which you have now corrupted into FD[. Also, it is quite useless (as are all mistyping checkers) at spotting the occurrence of the word 'world' instead of ward. It's spelled right and the fact that it makes no sense in the paragraph means nothing to the program.

But at least with a program that works 'on screen', you do get to see the text again and stand a bit of a chance of spotting these errors one more time through.

So, if SpellStar lives up to its reputation as having a bigger vocabulary, working on screen and running with WordStar, then the extra 100,000 characters on an Osborne disk will be worth it. Providing SpellStar is available, that is.

For those people who use the other major free (with the Osborne) program, Supercalc, the extra data storage will mean almost nothing, of course — with Supercalc, it's the internal electronic memory size that matters.

UK DR agent

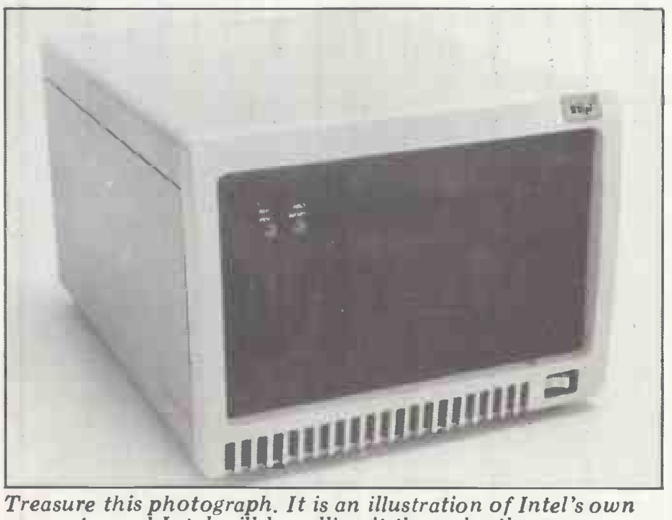
Nice people though they are at Vector International, it doesn't help matters when you want to ask questions about the world's most successful operating system, CP/M, and find that you have to call a phone number in Belgium. And until now, that was the official European contact point for Digital Research, which produced CP/M.

Now, in the UK, the bunch to contact are the people in Southampton, at Xitan systems. Apparently the deal was signed at the Microsystems 82 Show in Fulham in February. It's nice to know that something happened at that otherwise totally boring show, where almost the only new product of interest was a big micro called the IMP, based on the standard S100 bus with the 68000 processor. When that is available, I'll write a bit more about it.

At least it saves me from having to report that the most significant development of the show was my laryngitis, a disability which caused an immoderate amount of quite unnecessary giggling from staid industry figures. Xitan is on (0703) 38740.

Nascom Basic extension

Suppose I were to list the 37 extra Basic statements that Nascom users can get by buying the Extension Basic program from Level 9 computing: would you read the list?



Treasure this photograph. It is an illustration of Intel's own computer and Intel will be selling it through other distributors, most of whom will put their own labels on it and rename it the Other Distributor Special. You will see it on obscure stands at exhibitions and now, at least, you will know what it really is — a system built round the 16-bit 8086 and incorporating the Ethernet network. You will see it again. Details from Rapid Recall on (0494) 26271.

To really illustrate the usefulness of the non-glare filters it sells, SGL International should have taken this 'before and after' picture with the usual office fluorescent lighting reflected in the glass. This is a US product, available in New Jersey from the export division, on (609) 429 7400.

No, because the Editor would delete most of it as taking up too much room on the page. Also, most of you have probably heard so little about Nascom for the last two years that you've forgotten what a popular machine it became at its peak.

So, to summarise: you get essential editing commands such as AUTO, which saves you having to type in line numbers when writing programs, and EDIT, which lets you change the line.

You get debugging help with commands such as DEC and HEX, which convert numbers like A3 to 163 and back, and XREF — which is only useful if you really understand it.

The really nice extras, for my book, are GET and INKEY, which let the programmer ask questions like 'Do you want to continue?' and respond to the 'Y' without waiting for the untrained user to press Return.

I also like the idea of the command FIND, which can even find keywords — so you can look through somebody else's program, for instance, and find the next time he uses GOSUB 9000 or POKE 32,254. That would be particularly useful when you change a jump from GOTO 6000 to GOTO 7000, and can't remember if (and where) you did that jump before. You do get a RENUMBER command, which can sort out a lot of that sort of problem.

Purists will be glad to see 'structured' programming features — things like REPEAT...UNTIL and WHILE...WEND.

And finally, screen handling statements such as VDU, PRINT AT, WRAP, COPY, and LINE should save an awful amount of mucking about with complicated PRINT statements.

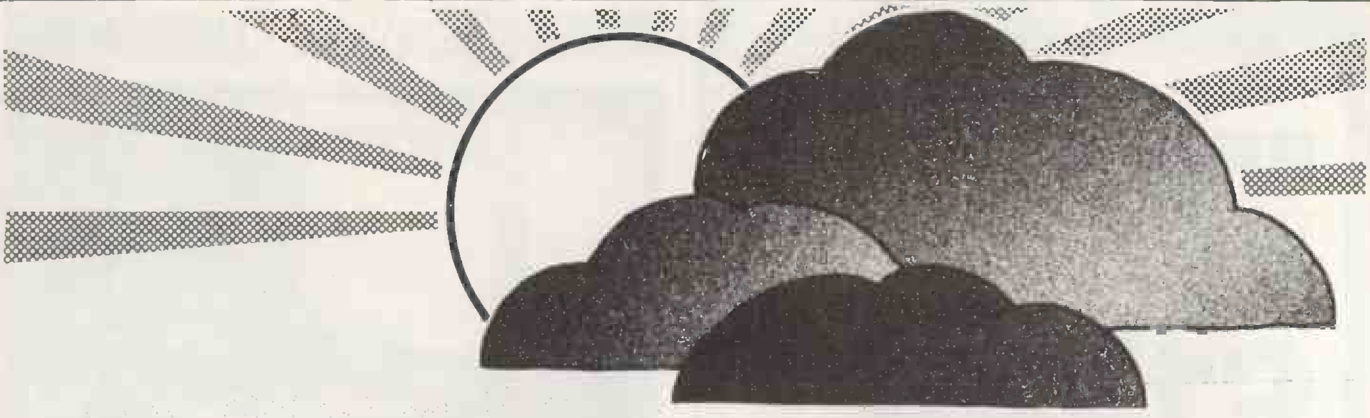
Level 9 warns that Extension Basic won't run with D-BUG or other toolkits 'as these can conflict with EB — but you won't need to'. At £25 in ROM or £15 on cassette, it sounds good value to me. You get the ROM chip for only £12 if you bought the cassette version first.

Details, catalogues and so on from Level 9 Computing, 229 Huchenden Road, High Wycombe, Bucks, phone (0494) 26871.

Showtime

My delight at getting the news that Jim Alty of Liverpool University and Martin Healey of University College, Cardiff, will speak at the 1982 Micro Show on 11-13 May is only slightly modified by the patronising tone of voice in which the organiser, Online, refers to 'other shows which concentrate on the toys and games market'. Alty is possibly the most powerful academic figure in both orthodox mainframe work and new Microprocessor developments, sitting on or advising several official steering committees in Government and education. Healey is no less well known, and also sits on the board of a real British micro-mini system company, Future Technology. Both are well worth listening to.

Contrary to what you may think, I don't glory in the relative success of the show that this magazine runs each year (the *PCW* Show, which does include a section on toys and games as well as a section on business applications). The Online Show I actually have a slight proprietary feeling about, having helped set up the first one four years ago. And it irks me seeing it restricted to a 'formula' — especially a silly one like 'business good, games bad' — which assumes business users don't need games, and games users don't



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NEWSPRINT

Philips now has 'improved software' and 'lower prices' on its P2000 micro system, bringing the price of a word processing setup with a daisywheel printer down to around £3900 instead of £4500. Quite how good the software may be is difficult to judge, given that the new word processing package has a list of 'extra features' which read like the standard features of most word processors. And I don't recall Philips describing the software as 'primitive' last time. But, clearly, it must have been. Details from publicity agent Jackie Murphy on 01-636 6561.

have businesses.

I would have thought it was obvious that anybody who can afford £500-plus for a computer just to play games on is likely to be fairly senior, as businessmen go. And for an awful lot of business users, the story of how they 'decided to automate the office, and first performed an evaluation scenario', etc, etc, is sheer self-aggrandisement.

What actually happened was that they wanted to play Space Invaders, and invented the office application to justify buying a toy. Only then did they find that the toy was really as useful as they were going to pretend.

Having blown its lead in the market by going for 'the businessman' in the past, Online is now repairing the restriction but this time is aiming at the data processing professional. The logic of this (I imagine) is that Online conferences are well known in the professional computing world and that its publicity will be best directed through its normal outlets to that sort of person. In fact, the show will be of great interest to the average games player and business user, though you'd never guess from the advance publicity.

Anyway, the show is at the Wembley Conference Centre, and you might just have time to get there, if you run. Online is on (09274) 28211.

Disk substitute

When you consider that a complete 64 kbytes of memory can be plugged into a Sinclair ZX81 computer for only £79 (courtesy of Memotech in Oxford, tel 0865-722102), then you realise that there must be something special about Processes Ltd and its 32 kbyte board costing £170 or so.

The special feature of this memory (for Nascom and Gemini computers) is the fact that it faithfully keeps all 32,000-odd characters of data in it, even after you pull the plug on the system, for up to 1000 hours.

According to the company, the system 'compares in price with conventional floppy disk storage systems' but that isn't quite accurate. A disk costing £300 and offering 100 kbytes of storage is not a disk but a disk drive, capable of using any one of a thousand disks. Comparing prices is about as useful as comparing the cost of a musical box which plays one tune with a hi-fi which can play hundreds.

Nonetheless, it is an interesting measure of how cheap 'expensive CMOS' memory is getting that the company can make even this comparison.

Details from Leon Opit at Processes Ltd on Clitheroe (0200) 27890.

Up and down

The hard part of building a super-microprocessor is not the impossible task of merely getting the circuit on a chip and working.

The really hard part is getting all the other special and wonderful 'peripheral' chips — memory management, disk controller, communications and networking, and so on — designed at about the same time, and working reasonably soon thereafter.

It has taken Motorola

all the resources it can muster to get its 68000 superchip working and word now starts to reach me that the vital memory management chip has at last been produced in a functioning form and that people building 68000 systems can get their hands on at least one, to test.

Motorola has absorbed the lesson, at any rate. It has just announced 'joint support' for the 68000 family of chips, together with two other chip makers, Signetics and Mostek. Some 15 huge chips are to be designed and built — some actually processors in their own right, others providing special extra abilities for control or processing applications.

Most significant is the decision to go small as well as big. Whereas Intel has made a killing with the 8-bit (that is, smaller and cheaper) version of its 16-bit 8086 micro by selling it to IBM, Sirius and the Japanese, Motorola's 16-bit 68000 has no 'baby brother' to scout out markets. This mistake is now being rectified. A giant 32-bit version is also planned.

The 8-bit version, the 68008, is supposed to be introduced this year, but don't ask me to hold any bets on the subject of when. You certainly won't be buying systems with this chip inside much before the fifth or sixth quarter. Details from Motorola on 01-352 0041.

Final word

Last instalment of the WordStar manipulation saga, I hope, comes in the form of a letter from James Mowbray, who is professor of Immunopathology at St Mary's Hospital, London.

This user shares my frustration in being unable to use WordStar's search functions to find the end of a paragraph, but he has noted something which makes it possible. That is, almost all WordStar paragraphs end with a full stop, then a carriage return. Almost all the times you get a full stop then a carriage return, you find you are at the end of a paragraph, too.

Apart from adding that you also need to watch out for paragraphs ending with a quotation mark or question mark or exclamation mark, that system works amazingly well. And what I like about it is that it uses actual patterns of behaviour as its rule basis, not a blind hexadecimal search.

Naughty notes

Great care is called for in this mini-review of a software program, because I'm well aware that many of my readers are quite prone to complain if this column strays from industry and hardware news, and some of them regard anything, er, well, rude (shall we say?) as offensive.

The program I have been playing with is one I found at the last Compec show, innocently ranged among the Apple disk with programming utilities on the one hand, and the Space Invaders games on the other, on the SBD stand. It was the title that caught my eye: Soft Porn Adventure.

Normally, adventure games are based on the popular Dungeons and Dragons fantasy. Usually, in D & D, one player invents a world of magic, treasure and danger and the others pretend to roam around in it, searching for the treasures and trying to avoid his traps. Normally, the computer is entrusted with the job of recording the world and the

Yes, the Chable is only a monitor, but then again it is only £70. Don't count on your local store having it, or even wanting to have it — after all, they make more money on the sale of a Kaga at twice the price. Details and availability information from Frank Chable, 3A Commercial Street, Batley, W Yorks WF17 5HJ.

treasures and, while it can't be anything like as inventive as a human dungeon master, it can give you a frustrating time trying to work out how to climb a beanstalk which isn't tall enough to reach the mystery cave, or how to outwit a troll who steals treasure.

Normal Adventure games are also rather prudish. Reference (in times of stress) to profanity are normally greeted by a perfunctory search through the vocabulary, followed by a cool 'I don't understand that word.' One or two really rude words are greeted by the chiding 'None of that, now.'

In Softporn Adventure, however, unprintable epithets have dangerous consequences. Worse, you have to avoid unconscious use of American slang. If you don't know what meanings the word 'eat' can have in the USA I'm certainly not going to explain here, but while it is safe to eat (say) a box of chocolates, or a magic box of pills, you do have to curb your impulse to eat things just to find out what happens.

What fascinated me about the game was its appeal for women. The basic sales pitch printed on the disk box says that 'you are about to fulfil your erotic fantasy' but then goes on to explain that instead of treasure, you are searching for fascinating women. I expected the females in my office to be deeply offended, but their fascination with the plastic females of the game exceeded that of the men in the office, possibly because of the total impossibility of their ever doing anything like this in real life. Anyway, at £18 or so it was worth the money for the fairly low to mid level humour.

Soft Porn Adventure itself is unlikely to shock you, of course, but sometimes it might shock your mother. Or your young son.

I had thought this was a rare aberration — apparently not. For $ 9.95, the Bourbon Street press in New Orleans will send you a year's subscription to a magazine called, in a simple, straightforward way that almost appeals, *The Dirty Book*, which regularly and rather disgustingly reviews rude software.

Some of the contents of the magazine are amusing. Most are not, and some would be regarded as offensive in the pages of *Men Only*, so don't order it if you're at all unsure of your level of squeamishness. SBD is at 15 Jocelyn Road, Richmond TW9 2TJ, tel 01-948 0461. *The Dirty Book* is quarterly from Bourbon Street Press, 3225 Danny Park, New Orleans, LA 70002.

Talking Atom

Giving the Acorn Apple a voice and a handle, RP Shillito of Clacton-on-Sea has announced a sound generator and an eight-way joystick for the machine.

Shillito says that the joysticks plug into one of the sound generator ports and up to six joysticks can be used simultaneously with the largest sound generator model. Otherwise, joysticks can be plugged into a port adaptor.

Flexible they may be: dirt cheap they aren't. The

Some day in the not too distant future, your office — or even a corner of your living room — could look vaguely like this. Right now, though, you'll have to look inside a development laboratory to find this sort of set-up. It's Intel's latest development system, for the Ethernet local area network, and it links up Intellec development modules to let them share common peripherals such as hard disks and printers. Don't bother to try and buy one for your business; it's designed for companies producing their own Ethernet products, which is a good sign, for when a development system appears for any given new product, it generally means that basic hardware/software problems have been solved and that people are actually going to get to work on it and produce something you can go out and buy.

actual joystick, a 'high quality one' he says, costs £15, while a joystick port adaptor is £20 and a power supply is £45.

Chris Curry, boss of Acorn, was heading off to Hong Kong last time I saw him, looking for cheap paddles and joysticks for Atom and BBC micro. But I still can't tell you how he plans to solve the problem of where to plug them in, because the expansion bus on the back of the Atom can't read paddles all by itself.

In the meantime, RP Shillito is at 5 Ingarfield Road, Holland on Sea, Clacton-on-Sea, Essex, CO15 5XA.

Contract out on micro makers

The Government is to revise its list of approved micro suppliers and has asked micro manufacturers to bid for contracts.

Back at the start of '81 the Government's Central Computer and Telecommunications Agency (CCTA) produced a list of nine approved companies, only three of which were British. Government departments wanting micros were limited to the products of these nine — although one of the British companies subsequently went out of business. Other British micro makers who weren't on the list were understandably piqued at being denied access to a large and lucrative market.

The original contracts ran for a year but have now been extended for a further 10 months, something which displeases the 'outsiders' even more as they'll have been cut off from the Government market for two years by the time the new contracts are awarded.

The CCTA has asked would-be suppliers to tender for contracts to supply machines in three categories. Category A is for low-cost, general purpose micros costing up to £2500 with twin floppy disks; Category B is for general purpose micros with twin floppy disks costing up to £6000 or with hard disks costing up to £12,000, with 'large amounts of memory', multi-user capability, interchangeable media capability, networking, graphics, standard operating system and 'ergonomic design'. The final category is for microcomputer systems costing up to £5000 which are 'more suited for small scientific applications'.

The CCTA intends to shortlist up to 40 companies by June and to award contracts by the end of 1982.

Code cramming

If Tolstoy was alive today and busily writing *War and Peace*, he'd probably be using a word processor. And he'd probably be worrying about getting it all onto his machine's disk. Cramming text onto a disk is always a problem when you're processing lots of words, and until now the only way to increase disk capacity has been firstly to use both sides of the disk, then use more tracks on each side, then pack the information more tightly onto each track. Eventually you reach the point where current technology simply can't squeeze anything more onto a disk, and that's where you have to stop.

Now, though, a University of Keele research fellow, Dr Dennis Andrews, has found a way to reduce the amount of disk storage space needed for text by up to 60 percent. He's done this with a very clever coding technique which compresses ASCII text files to about 40 percent of their original size. And he's marketing the program which does this, called E40, via a company set up for the purpose, Keele Codes Ltd.

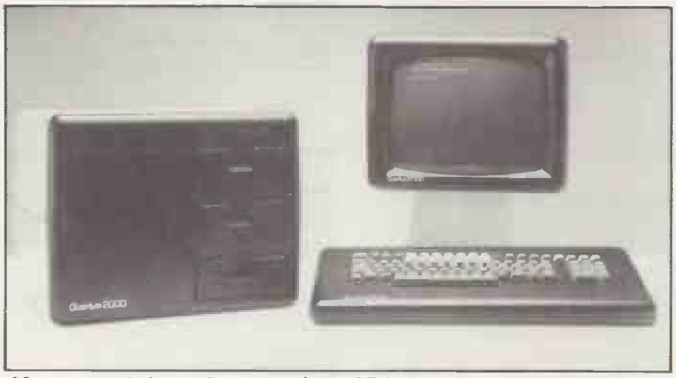
E40 encodes (and, of course, decodes) all 256 ASCII characters and versions will be available to run under CP/M and, later, 6502-based machines such as the Apple III and the BBC Computer; the CP/M package includes a utility allowing file transfer through a serial port — compressed text could be transmitted more quickly and cheaply through a communications system than normal text.

Exactly how E40 works is, not surprisingly, secret for the moment (presumably the curious CP/M user could have a good go at working it out with the aid of DDT). All that Andrews will say about it is that it's 'a serial code based on the statistical properties of English. It takes advantage of the large redundancy in written language.'

This means, of course, that the 40 percent mark is only obtainable with English text, so Tolstoy wouldn't have found it so useful — foreign language texts are compressed down to about 60-75 percent of original size, although versions which will achieve the 40 percent level are being worked on — 'all languages should compress down to about 40 percent,' says Andrews.

No prices have yet been announced for E40...but watch this space!
Peter Rodwell

In case you didn't recognise her, this is round-the-world yachtsperson Clare Francis with her new word processor, a DEC LSI running LEX II. Okay, so it's not a micro but it's interesting to see that more and more media persons — scriptwriters, journalists, authors, etc — are taking to technology and WP in particular as they get to hear how much easier it is than playing around with typewriters, Tippex, rubbers and the like. Clare is using her word processor to write her first novel as well as TV scripts. It was supplied by Key Computers of Poole, Dorset (tel Poole 83422).



More proof that a bog-standard CP/M system price is settling down at the £2000 mark comes from Quantum, a company which has ordered £250,000 worth of Gemini Multiboard systems, around which to build its Quantum 2000 at £2250. For the price you get three floppies with 2.4 megabytes of storage and a pretty screen, which isn't the world's greatest bargain but is reasonable value for money until the Sirius shows its paces (that'll cost only £100 extra and offer much more power), or the IBM personal machine arrives 'officially'. Details from Gemini on (02403) 28321.

This rather smart monitor is the Low Complexity Colour Display from Microvitec and has been approved by the BBC for use with the BBC Computer. The one shown is the 14in model, but there's also a 20in version; both are available in standard and high resolution versions, too. No indication about cost in the press release, though, and that's usually not a good sign. Check it out with Microvitec on (0274) 390011.

Peter Rodwell airs a few home truths about the micro business.

SHATTERING A FEW MYTHS

I wish I had a BBC Computer for each time I've been told how lucky I am to be able to spend all day every day playing with all the latest micros; I'd have made my fortune as a black-market racketeer by now.

From conversations with and letters from readers, I gather that life here in the *PCW* ivory tower is widely and enviously regarded as one long playtime, a sort of computerist's Utopia where we sit surrounded by every conceivable system, each forced into our reluctant hands by generous manufacturers for us to keep for as long as we wish. Occasionally, goes the myth, we force ourselves away from the keyboard for long enough to dispense words of wisdom by letter or telephone to those unable to find their way through the micro jungle, advising them on exactly which machine they should buy.

The reality is somewhat different. In fact those visitors who manage to reach the inner sanctum of our office, once they've got over the initial shock of just how incredibly untidy it is (we operate an open plan, free-format filing system here), are surprised to note a distinct absence of objects technological, particularly computers. In fact the only things we have which come anywhere near being hi-tech are the electronic telephones, the golfball typewriter and the coffee maker.

One would be excused for thinking that at the very least we would need and use word processors, but this isn't the case. Most of what you read in *PCW* comes from outside contributors or is written by ourselves on our own machines at home. It would be utterly counter-productive for us to retype it all into a word processor before editing it — we use low-tech biros instead. Although we could probably find uses for computers around the office, we haven't actually gone that route for a number of reasons, not the least of which is that, were we actually sitting surrounded by micros, we might be tempted to spend our time playing with them, time we can ill afford to waste: the mechanics of producing a monthly magazine the size of *PCW* are far more complex than many people realise and the business keeps the three of us extremely busy for a good 95 percent of our time. The other five percent is spent on planning and admin, which is why we're so bad at answering letters and why, if you ring us during the monthly panic known as press week, we're likely to sound more than a little curt.

Another reason why we're not surrounded by micros is that many manufacturers are strangely reluctant to part with their products. Now if I was a micro manufacturer with a new product to sell, the first thing I'd want is to have the thing Benchtested by *PCW* — okay, I'm biased, but *PCW* is the country's biggest-selling micro magazine (we outsell our nearest rival by over 15,000 copies a month in the UK) and, provided I knew my product was a good one, I'd jump at the chance of four or five pages of free publicity.

Generally speaking, when we're planning an issue, we'll draw up a list of four or five machines which we want to Benchtest and try to fix up all of them. In most cases, this involves ringing the supplier and asking to borrow one for three weeks at least — we insist that our Benchtesters spend a minimum of 35 man-hours with each system before they start to write about it and, as they all do the Benchtesting in their spare time, this means that three weeks is very much a minimum. We have crammed that 35 hours into shorter periods: our former Editor, David Tebbutt, reduced himself to the edge of collapse last year by spending 24 hours non-stop bashing away at the Osborne 1 and then almost immediately afterwards flying to Florida for two days to test the IBM Personal Computer!

Reactions to these requests vary surprisingly. A few suppliers jump at the chance, organise a machine and get it to us immediately (or at least fix a delivery date and keep to it), together with all the necessary documentation and software. Others, having deluged us with press releases and invites to the launch, admit eventually that they've only got one prototype and they need that for demonstrations — couldn't we just come into the showroom for a demo and write about it from that? Even more annoying are the ones who agree and then do nothing. A variation on this last one happens when a company's public relations person starts pestering us with letters and phone calls, asking us to test their wonderful new machine yet when we agree there's a sudden silence and the machine fails to materialise.

....many manufacturers are strangely reluctant to part with their products.

All this is why we arrange four or five tests every month, for we know that only a couple of the machines are likely to actually appear. If we *really* want a particular machine, we'll make such a pest of ourselves that we win in the end.

This naivety among micro suppliers extends into the sordid commercial realms of advertising, too. Unlike one or two other magazines, we keep a very definite separation between the editorial and the advertisement departments. We most certainly do not make it a condition of a Benchtest that the supplier advertises with us and neither do we test a product because the supplier is an advertiser. In fact I'm frequently unaware whether a given company advertises with us or not as the first I see of the ads, when I bother to look at them at all, is when the magazine arrives from the printer. Sometimes we will work in the opposite way — the advertisement salespeople are told what is going into the next issue and they may contact the supplier of any equipment being tested and try and sell ad space to them, but the test will be printed regardless of whether he buys space or not.

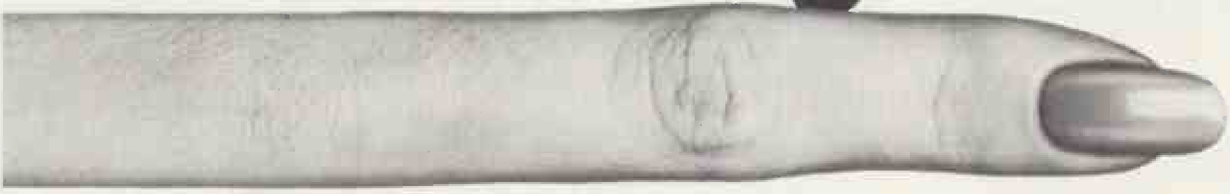
We maintain this policy rigidly because we believe our readers are intelligent enough to notice when a magazine bases its editorial content around its advertisers and because to pander to our advertisers would destroy the credibility we have built up over the years. Maybe it sounds a bit pious, but we think it's a principle worth sticking to.

After seeing the spec, reading the Benchtest and playing with the prototype for a couple of evenings, I was strongly tempted to scrape up the cash to buy a BBC Computer. Buying a Sirius has scotched that one for the moment, especially since the price rise (necessary, so it's rumoured, to give Acorn a profit on the beast) and in any case I would be purple with fury by now were I among the 12,000 or more who are still waiting for their BBC Computers. The trouble with a monthly magazine like *PCW* is that, by the time we hit the streets, any comment we make on a fast-changing situation like that surrounding the BBC fiasco is likely to be totally out of date. But machines are being delivered, albeit slowly, for I've had several conversations recently with people who have *actually received their BBC Computers!*

This business of announcing a machine, gathering massive backlogs of orders and then delaying on delivery is, it seems, endemic to the micro industry. It's an industry still in its adolescence, where the competition is cut-throat, the technology is progressing at a dizzying pace and in which many engineers and programmers suddenly find themselves running a wildly successful company with unbelievable growth rates which, because of their lack of managerial skills and experience, they simply can't control.

This is no consolation to the customer, of course, especially when, as has happened with the Sinclair ZX81 and the BBC Computer, the customer is likely to be a newcomer to the micro world and expects it to function with the well-oiled regularity of the more established industries. Hopefully, the BBC mess will eventually sort itself out, as the ZX81 and Acorn Atom backlogs did, and hopefully this will be the last time we see it happening on this scale — but I rather doubt it somehow. END

Now you can do all accounting with...



without...

Banks Statement

SAY IT AGAIN, KEN

Martin Banks listens to a Minister — and hears something interesting!

To start at the beginning, it should first be observed that I have a healthy distrust of politicians. I tend to feel that by and large they are third-rate nonentities who have found a cute way of earning a living by exercising their vocal cords. There is, after all, ample evidence shown nightly on TV or heard on radio that this is so.

You just have to listen to Prime Minister's Question Time to know that a chimpanzees' tea party is far better behaved. But, then again, Parliament is there to lead us and it becomes easy to see where football hooligans get their basic training. It becomes fascinating to watch how more than 600 scintillating intellects and dazzling egos become meek and obedient lemmings in the face of the Party 'Whips' (I've always been deeply suspicious about the significance of that word).

But — and it is only an occasional but — sometimes one of those Parliamentary-type people seems to say something that is not only relevant, topical and newsworthy but also approximately sensible.

It happened recently in London. It was at a seminar and exhibition organised by the British Microcomputer Manufacturers Group for senior civil servants and the like from Whitehall, just around the corner from where the event was staged. The speaker was one Kenneth Baker, our Minister of Information Technology. He had been invited along to make the 'official' opening address by David Broad, chairman of the recently formed and increasingly active BMMG. I say 'official', for Baker was actually second or third speaker of the day, having already 'officially opened' something else before arriving at the BMMG show.

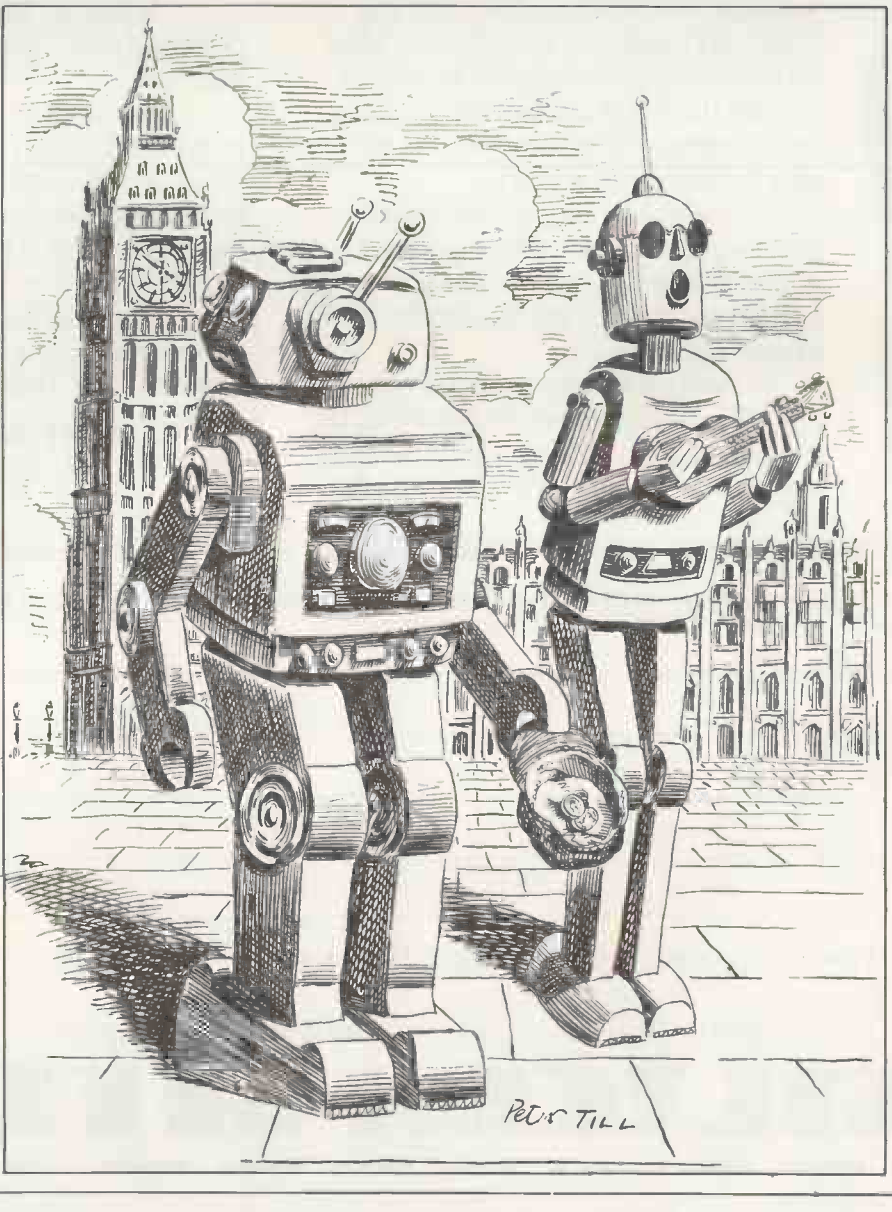
600 scintillating intellects and dazzling egos become meek and obedient lemmings

As with so many of these occasions (like the one earlier in the morning) the Minister began by intoning the standard mantra of Information Technology, together with some optional anomalies. For those fortunate enough to have never have heard of it, the mantra follows the pattern of how important IT is; how the performance of microelectronics brings the benefits of IT everywhere; how the Government is doing all sorts of wonderful things for the industry, the user and its own ratings by sponsoring things like Information Technology Year, the IT and Micro Awareness programmes and the Micros in Schools scheme; how it is important that children leave school in the sublime state of keyboard literacy; how there are to be 100 IT centres based on the excellent model of Notting Dale in West London; and how there will be funds made available for a national network of microcomputer centres like the one being run by the National Computing Centre.

Sitting at the back of the hall, I started to feel that I could chant the mantra along with the Hon Ken, and began to muse on whether this was the shortest route to Nirvana. I began to wonder what it would be like if I got there.

And then the Minister was suddenly off on a new tack, one that was quite interesting. It was also one that was not without its irony, for he gave the distinct impression that he felt sure he was speaking to an audience of BMMG members and similar people 'from the Industry'. Instead, of course, he was talking to civil servants. The new tack he followed was to tell the audience about what his advice to the civil service on Government purchasing policy would do for them. Some of them seemed to wonder as well. The advice, however, was interesting, not only for what was said but also for the fact that there was an underlying smidgen of understanding running through it; understanding of how the business works and what it is about. But, then again, the Minister used to work in the computer industry. Some Ministers have a live experience of their portfolios that extends to having fathers who were good on a pushbike.

Baker took as his thesis the fact that the public sector has a responsibility to harness its purchasing power to help the small but flourishing microcomputer



industry in this country. That purchasing power should be used to help the industry come up with internationally competitive products. It was very important, he stressed, for both the industry and the public sector purchasers to think in international terms.

So far so good, though this was an expression of a view that hardly showed a true spark of originality, given the overall complexion of the current Government. He went on, however, to explain how he felt the civil service would be able to achieve this.

First, he felt that the message itself was beginning to get through. This, of course, had been shown last year when the CCTA selected some 'manufacturers' of microcomputer systems as the only ones Government departments could purchase with approval. Most of them were actually distributors or OEMs for US-manufactured kits — much to the chagrin of the many British companies already in business, who found themselves to all intents and purposes excluded from a lucrative marketplace. This led directly to the formation of the BMMG which Baker was addressing.

He obviously felt that things had progressed since then, for he said that the message that was getting through was 'think British'. This was not a Buy British policy, however, he said. What he wanted to see the public sectors doing was thinking in terms of involving the British manufacturers at the time they were actually formulating their requirements. This, he said, was the only way for the public sector to approach the introduction of new technology. Asking them to do two things at once is also the best way I know of giving civil servants a head crash, but no matter.

As a politician, it could have been justifiably argued that the Minister had said enough to satisfy honour and could retire to the sanctity of the H of P, just down the road from the event, but no — on he went.

Some Ministers have a live experience of their portfolios that extends to having fathers who were good on a pushbike

The customers — in this case his real but unsuspected audience of civil servants — were now being urged to meet with the manufacturers as early as possible in any equipment design or purchasing cycle. In this way, he hoped that the customers would find out what the industry had available or was capable of producing, and the industry would be able to tell the customers why what they wanted was totally impractical as a viable product. He stressed that this would mean the customers (civil servants) would effectively have to change years of traditional assessment practices and look at a potential new product from a performance point of view, rather than detail design.

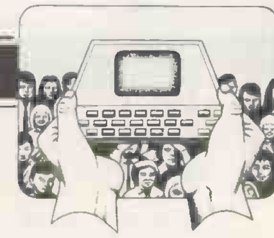
He sounded very much like a man from the computer industry who has seen things from the other side when he said that the public sector must avoid its usual practice of over-specifying a system. This was a tendency, he added, that produces equipment that is usually totally unsaleable anywhere else in the world.

The wounds of experience seemed to show through again when he said that the public sector was now being pushed into telling manufacturers why they didn't get the business. He is currently trying to establish a system for this. Though it might bruise a few egos to be told that a product is actually deficient in some respect, it should do the product and the company no harm to be told. It could do some good, especially for some systems.

Despite the irony of the mistaken audience, Baker's remarks struck at an important area for the short-term future of both the UK microcomputer industry and the public sector. It is an area that offers enormous sales potential and could be the making of many British companies which can't be said to have made it as yet. It could also be the making of the public sector, that oft-maligned group that is continually castigated for its inefficiency. Concerted and enlightened purchasing policies that brought in microcomputer systems that had been engineered to do the job, but not over-engineered and consequently emasculated, could do wonders for such a tarnished image. It could also do wonders with the work.

Maybe, if the public sector actually did get its act together, as the Hon Ken suggested, it could help other manufacturers join 'Uncle' Clive Sinclair in blowing high-growth raspberries at the world. END

CTUK!NEWS



David Tebbutt brings you the latest update.

You may be reflecting as you read this news that not a lot has happened since I last wrote. You'd be right since the Editor insisted on my submitting this copy two weeks earlier than usual.

I had a nice letter from John Kilburn from Shawfield Norden Community Middle School in Rochdale. I gave John a brief mention last month. This month he has written to give some details of what he's doing. ComputerTown Rochdale runs from 6 to 9.30 pm every Monday night in the school. The main attendees are sixth-formers, although a fair number of adults come along as well. On their best night about 12 machines and 20 visitors turned up. The machine population comprises Apples, PETs, VICs, Sharps, Tandys, Ataris, ZX81s, Superboards and UK101s. John also arranged a micro show in which local traders brought along their own machines and demonstrated them.

Talking of local traders and micro shows, one of the library staff at South Ruislip has elected 15 May to be a Computer Day. A sort of open day will be held, with computers in profusion being available for the public to see and, providing demand isn't too high, use as well. The Show will be divided into at least three sections: Business, Education and Leisure. A number of local firms have been approached, as well as the schools and Eastcote ComputerTown. The day promises to be a very good one with something there for everyone.

One of the things we have learned from running ComputerTowns is that adults come along but go away again when they see hordes of children at the machines. This is a great shame but quite understandable. It may be that the open day approach will be more successful from this point of view. More news on this in the July issue.

Starting next month we're planning to include a 'Spotlight on ComputerTown...' in CTUK News. It will comprise a suitable photograph of the ComputerTown in action, with brief biographical notes and a list of the key volunteers. We have got the first two 'Towns lined up but we'd like to hear from your 'Town as soon as possible if you'd like to be featured. We feel that volunteers get precious little recognition and this is just one small way of redressing the balance.

John Bone wrote to me from Gateshead ComputerTown to say that the BBC dropped by recently while preparing background notes for a series later this year. They crawled all over ComputerTown, interviewed the volunteers and seemed very impressed by the work being done by John and his friends.

This same John was one of the mainstays of the ComputerTown stand at the *PCW* Show last year. This year he will be coordinating the ComputerTown section of the show. It takes lots of people to man such a stand, so please write or call John to volunteer your help for a few hours. Given enough volunteers, no one should have to put in more than a few hours. The show is 9-12 September at the Barbican Centre in London. You'll find John's address at the back of the magazine. His phone number is 0632 770036.

The man who organised last year's ComputerTown stand is Mike Baker. Unfortunately Mike's work has taken him away from ComputerTown (temporarily, we hope) and Chris Cooper has taken his place at ComputerTown Hanwell. Thanks for all your efforts, Mike, and good luck with the new job. If you live in the Hanwell area, Chris would love to hear from you. I understand he would be very grateful for some extra help. See the CTUK Centres at the back of this issue for his address.

Here's an interesting thought, courtesy of a recent visitor to ComputerTown Eastcote: 'Why not place all war games in the past so that people consider the killing as something which used to happen rather than as something which will always happen?'

Alan Waring wrote to me to correct a few mistaken impressions I may have given in the March News: CT Guildhall is run on behalf of the City of London Staff Association, not the employer. In fact the 'Town's official title is CoLSA Computer Club and, in general, it is not open to the outside public. He also tells me that as far as he knows no one actually uses ZX-81s or Tandys in their offices. These are used at home. Glad to set the record straight, Alan.

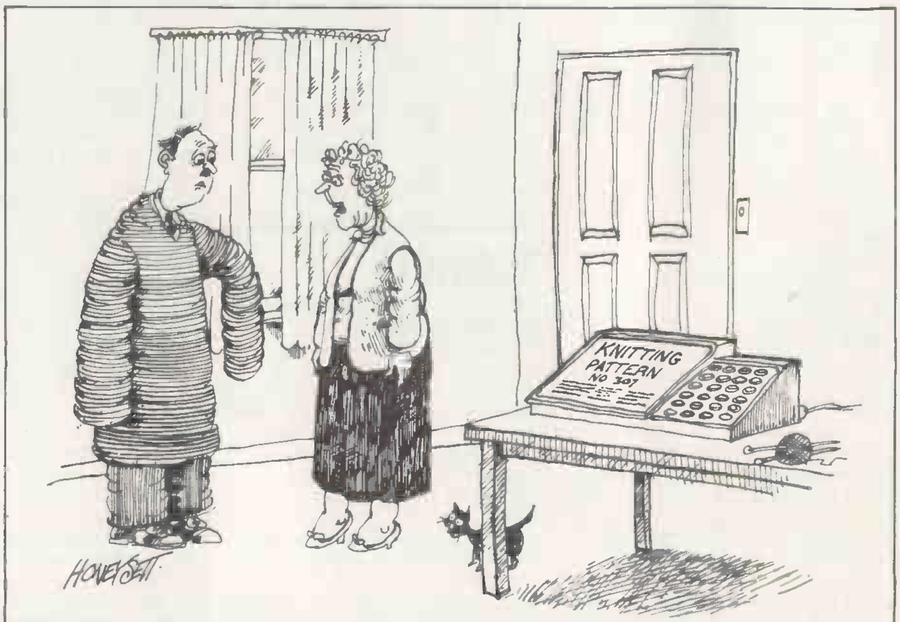
It looks as if another ComputerTown will be starting in Hayling Island. Details are vague but it does seem that, like Guildhall and Renold before that, this will be for a company's employees.

And that's about the end of the news this month, apart from the list of 'Towns from which we've received letters:

London (SW2, NW1 and SE15), Leicester (two letters), Rickmansworth, Peterborough, Luton, Nailsea, Rugby, BFPO33, Stanmore, Glasgow and Walton on Thames. The sharp-eyed among you may have noticed a steep increase in the number of letters from Walton-on-Thames recently. The fact is that the same person wrote twice. And I thought *my* memory was bad!

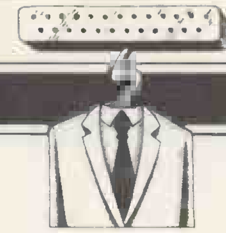
In a couple of days' time I'm off on my annual pilgrimage to Silicon Valley. Rumour has it that Liza Loop, the new technical coordinator of CTUSA, has some interesting ideas to discuss. Lots of news from there and here next month. Keep those letters flowing — and why not start your own 'Town? It really is quite easy and need only take up a few hours each month. I look forward to hearing from you.

ComputerTown UK! is an ever-growing network of computer literacy centres, where members of the public are given free access to microcomputers, courtesy of those willing to volunteer their time and equipment. ComputerTowns might be found anywhere: in a church hall, a library or maybe in a school after hours. The emphasis is on making computing enjoyable and non-threatening and, because Computer Town is entirely non-commercial, overt axe-grinding of any sort is banned. Guidelines are available for those interested in setting up their own 'Towns: Write to CTUK!, 7 Collins Drive, Eastcote, Middlesex HA4 9EL and remember to enclose a large SAE (A4 would be fine) for your reply. Please don't try to telephone *PCW* for information because this project is entirely a spare-time activity.



'There must have have been a malfunction in the computer.'

COMMUNICATIONS



PCW welcomes corespondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Please note that we are unable to give advice about the purchase of computers or other hardware/software -- these questions must be addressed to Sheridan Williams (see 'Computer Answers' page). Address letters to: 'Communications', *Personal Computer World*, 14 Rathbone Place, London W1P 1DE.

Save the ZX

In December's *PCW* you published a letter from Brett McBain ('Disgusted of Kent') about his problems with his ZX81. I was surprised to find that his problems were exactly like mine. Hence I concluded that my ZX81 was faulty as it had not SAVEd any programs in the six months I had had the machine. My conclusion was reinforced when a few days later I met someone who had a ZX81 which worked (!) — it SAVEd and LOADed programs with my tape recorder (hence demonstrating that my tape recorder, a Ferguson 3T07, was a good mate for the ZX81).

I have since got Sinclair Research Limited to replace my ZX81 and am pleased to report that my new ZX81 performs as per its advertisements.

I had a problem getting a reply to my letter as I had written to the repairs department (Dept FM). I have since been informed that Dept FM does not handle correspondence. So I suggest that frustrated ZX81 owners address their mail to the Sales Manager, Sinclair Research Limited, 6 King's Parade, Cambridge CB2 1SN.
S M Parmar, Leicester

Happy returns I

W E Thomson of Aldeburgh may assure himself that some interpreters treat RETURN sensibly. For example, even the crummy old-ROM interpreter for the PET saves both a line number and an absolute address for a GOSUB, and so does RETURN without searching. Probably any interpreter that allows multi-statement lines will do the same, but it is easy enough to check.

Enter this program:

```
1 GOTO 200
2 RETURN
200 T=TI:FORJ=OTO999:
    GOSUB2
210 NEXT:PRINT TI-T
220 END
```

This uses the TIme facility of the PET — with other machines you may have to print something before and after the loop and use a stopwatch. On the PET you get either 133 or 132. Now change line 2 to GOTO 210 and GOSUB 2 in line 210 to GOTO 2 and run again; on the PET you get 164 or 165. Now comes the crunch: fill lines 100-199 with REMs, thus:

```
100 REM
101 REM
102 REM
. . . .
. . . .
199 REM
```

Run to get 540 and show that GOTO does search; change back to GOSUB and RETURN to get 133 or 132 again, thus showing that RETURN does not search.

If you have to print and use a stopwatch you will probably need to go more than a thousand times round the loop.
Dr E H Porter, Glasgow

Happy returns II

In answer to W E Thompson's letter (in the March issue), my UK101 version of Microsoft Basic (therefore all Microsoft's?) *does* do what he suggested:

1. A 'GOSUB' stacks the line number of the GOSUB *and* the memory location of the next instruction.
2. A 'FOR' also does this, and also stacks the STEP value for the loop, the limit value, the count direction (+ve or —ve), and the loop-variable's name; with obvious speed improvements!

Better still would be to also stack the memory address of the variable's value, but this is not done, perhaps because then each FOR would stack 18 bytes!

The interpreter also has a line number search trick for 'GOTO'/'GOSUB' — if the high byte of the line to be found is greater than the current, the search starts from the current line rather than the first line.
Ian Cull, Welling, Kent

Submit!

There is a simple solution to the problem posed by Barbara Sanders (Computer Answers — March '82). It does not require manipulation of the BIOS or any other form of programming and provides the facility requested (unlike the solution provided by Sheridan Williams).

The answer is to use the CP/M SUBMIT command as follows:

1. Generate a file (say called 'FILE') with ED or MBASIC and insert a record — MBASIC DATES.
2. Rename the above file using REN.SUB=FILE — thus creating a file with no name but an extension of .SUB.
3. Rename the SUBMIT. COM file in a similar fashion — eg REN DATES.COM=SUBMIT.COM

When the command DATE is typed, the file DATE.COM (ie, SUBMIT) will be loaded and executed and will search the directory for a SUBmit file with no name (since none was given on the command line). The command(s) in the SUBmit file will then be executed in the normal way.
S G Jenkins, Bristol

The problem was 'how do I create a file DATES.COM so that by switching on, inserting the disk and typing DATES, the program DATES.BAS will be run'—Ed.

Please continue not to POKE

I was interested to read the discussions in both Communications and Computer Answers in the February edition of your magazine as to whether or not you could PEEK and POKE the BBC microcomputer, and whether or not it aids the 'advanced programmer'. In fact, Sheridan Williams gave the answer which was closest to the truth by saying that it has byte and word indirection like the Atom.

But, a word of warning. . . When a new computer comes on the market, the 'advanced programmers' start POKEing around inside and come up with all sorts of inside information which the manual doesn't tell you about that enables you to cut a few corners by PEEKing and POKEing. I have been guilty of doing just that on the Atom, but with the BBC machine, because of the way in which it is designed, you will soon come unstuck.

In any case there should be no need to POKE because, within the 16k of the machine operating system, Acorn has provided dozens of CALLs which should enable you to do almost anything you want to — including interfacing to all sorts of external devices.

One of the main reasons that Acorn advises us not to POKE around too much (I don't really think they are trying to hide anything, but you may disagree) is because of the 'Tube' — a high-speed interface to a second processor. If you work through the given calls, then all your programs will work on the second processor without being re-written. 'But I don't want to use a second processor,' you say. Don't bank on it! At the rate at which this technology changes everything comes much sooner than anyone expects.

Listen, all you 'advanced programmers'! Don't waste your time POKEing around. The BBC machine has so many facilities within its operating system that it will take you all your time to sort those out and write articles explaining them to others. Then by the time you've sorted all that lot out you'll find yourself wanting to use a second processor, and the good habit you've developed of using calls instead of POKEs, will mean that ALL your programs will run on the second processor and you will have proved who really is an 'advanced programmer'!
Paul Beverley, Norwich City College.

Another ZX maths bug?

I read with interest N Angell's 'Graphplot' program for the ZX81. It works on a similar basis to my own graph program, and I wonder if any users will discover that they cannot enter "x**2" without getting an error code at line 130. On my ZX81, x^2 has to be entered as x times x ("x*x"). I thought at first that this was something to do with the VAL command, because it does do a few unexpected things, eg, VAL " " will give an error code. After experimenting, however, I also discovered that VAL "—4**2" gave a result of —16 and that VAL "(—4)**2" gave an error code. Using PRINT instead of VAL and omitting the quotes gave the same results.

Being one of apparently few who informed Sinclair of the original ROM fault, I wonder if this is another, as it seems a strange thing to be built in. Incidentally, I tried my original ROM (the faulty one) with similar results. Can anybody enlighten me?

By the way, anybody who thinks they can expand their 16k ZX81 to 17k by adding a 2k RAM chip should be reminded that many RAM packs cut off the internal 1k chip altogether.
Jonathan Empson, Hemel Hempstead

Factors freak

Please could one of your readers with a home computer factorise:
152935181602313076038627650947764336561473047712553495266976441932790520242781319315289386279233234140382741982183956525343383529990056038266487484839 with or without the help of APL?
D Hunter
Saffron Walden, Essex

More to the point, can anyone suggest why he wants to factorise it? — Ed.

Electronic democracy

I was interested in Ian Lloyd's article on electronic democracy in the March *PCW*; he asked for readers' comments, and I would be pleased if you could pass these on.

Many of the objections to voting by a cable television system (such as, should every viewer vote — and when?) apply equally to the polling-booth system, and could be solved similarly, or ignored. After all, nothing stops people who haven't listened to all the arguments from voting at present! The voting period could extend over a length of time to avoid clashes with other commitments. Other difficulties could be overcome by hardware — eg, 'button-pushing parties' could be stopped by monitoring the cable inputs to check that no more than the number of persons registered to vote on a particular viewer did so during the time allotted to a voting session.

Statistical criteria should be applied to the result. At present, say, a 55 percent with a 70 percent turnout could carry a vote — this is quite unacceptable. It would be reasonable to validate the decision only if the majority were greater than some margin of error — that margin being greater the less the total percentage response. If the vote were indecisive, the government would proceed on the basis of its own judgement.

A vote by 'all the people, all the time, on every issue' would not be necessary. I envisage a system in which a government would contract to follow a broad declared policy, and have a free hand within that. Its decisions would be publicised, and put to general vote only if a significant majority of either the public or the government itself required this.

Parliamentary democracy would certainly have to alter a great deal. By its very nature, such an electronic system would deal directly with numbers and percentages of voters, not constituencies; Parliament would have to shift to a proportional representation system to follow suit. I think this is a good reason why present politicians should fear the adoption of such technology.

The statement that 'most people, on most issues, most of the time, don't want to be bothered' I found depressing. It is probably true, but I believe the apathy comes of being steeped in a tradition where most of the time, on most issues, most of the people have little freedom of choice. Government is, to most people, something which just happens willy-nilly. I think the point about needing a responsive government is most important; if people had a choice more often than once every five years, if they knew that a government would be accountable to them if its actions strayed from the policy declared in its election promises, and if they could see the results of their decisions make real changes in the world, I think that they would take a greater interest in politics; and naturally become better informed and capable of making responsible decisions.
R G Girvan, Edgbaston

What use are they?

Each month you publish a page of basic information for the beginner. May I suggest that in addition to, or alternating with, this page you publish a list of uses for the microcomputer, rigidly excluding games and commercial programs.

From personal experience I know that potential buyers are deterred by the apparently limited home uses. After all, not everyone runs his/her own business or wants to own a £400+ TV games player. But both articles and advertising in computer magazines suggest that professional and amateur programmers concentrate on those markets.

Back copies of your magazine (and your competitors!) should provide a data base which would-be buyers could use to justify their purchase to themselves and others.

Perhaps you might consider extending the idea to provide new directions for existing users who have run out of steam. A column into which ideas (way out, half-baked or full-blown) could be thrown may provide the base for a wide range of general interest programs.

Changing the subject, is there a rule of thumb which will allow you to estimate whether a given program will fit into a given number of kilobytes?
J White, Stafford

PCW is always looking for general interest programs for home users but we suspect that, in the end, most home users buy their machine in order to learn about computers — this is the principal justification for the purchase. As to your last query, there is no single rule, if your Basic stores programs as ASCII characters then you can count the number of characters in the program and add five bytes for every line to get a rough byte count. If your Basic stores programs in token form then you count one byte for each reserved word, not for each character in the word. But you have to know how your interpreter works. ZX81 and PET Basics for example use single byte tokens.

Programmers' co-op

I have recently been involved in a short-lived business reviewing packages for the shortened accounting market.

This work has revealed two areas where commercial packages require to be improved.

a. Testing of software against realistic volumes of user-generated data.

b. Packages are designed by programmers remote from actual implementation of the packages.

These points are related to inadequate practical research, inadequate documentation of the details, and designs which cannot be influenced by the eventual user (who represents the only real market for all the packages on sale).

I propose to set up a programmers' cooperative program designers/authors and end users. The cooperative will ensure adequate standards of design, test and documentation and will provide a market place for business contacts.

The programmers will be recruited on agreement with existing programmers, eventually cornering most areas of the country and most commercially available hardware.

The cooperative will encourage employment for inexperienced programmers to enable development within a responsible and controlled training background.

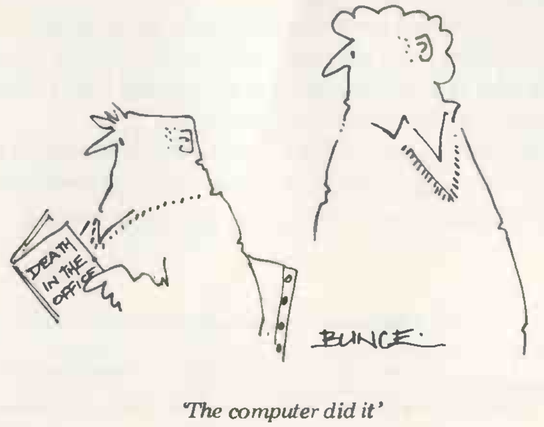
From my personal studies in program development it has been apparent that standards of writing are varied according to the main background of the author. If an author has a large-scale computer background then program writing will involve detailed planning, dry running (desk checking) and extensive written work.

If, on the other hand, an author has small-scale experience then planning is likely to be less detailed and development of the program(s) relies on machine running for the majority of the work load.

Turning to the end user, the choice of systems is bewildering to new computer users. One difficulty lies in the contact with computer 'professionals'. If a large supplier is involved then contact is likely to be with salesmen relatively ignorant of program development. If a small supplier of software is involved then the experience of those involved is likely to be quite restricted.

Therefore the user will regard with favour a business which combines direct contact with programmer(s) of a specifically relevant background within a support group drawing on a wide variety of experience.
K Tomory CA, 45 Moness Drive, Glasgow

Would any interested parties please contact Mr Tomory, not PCW — Ed.



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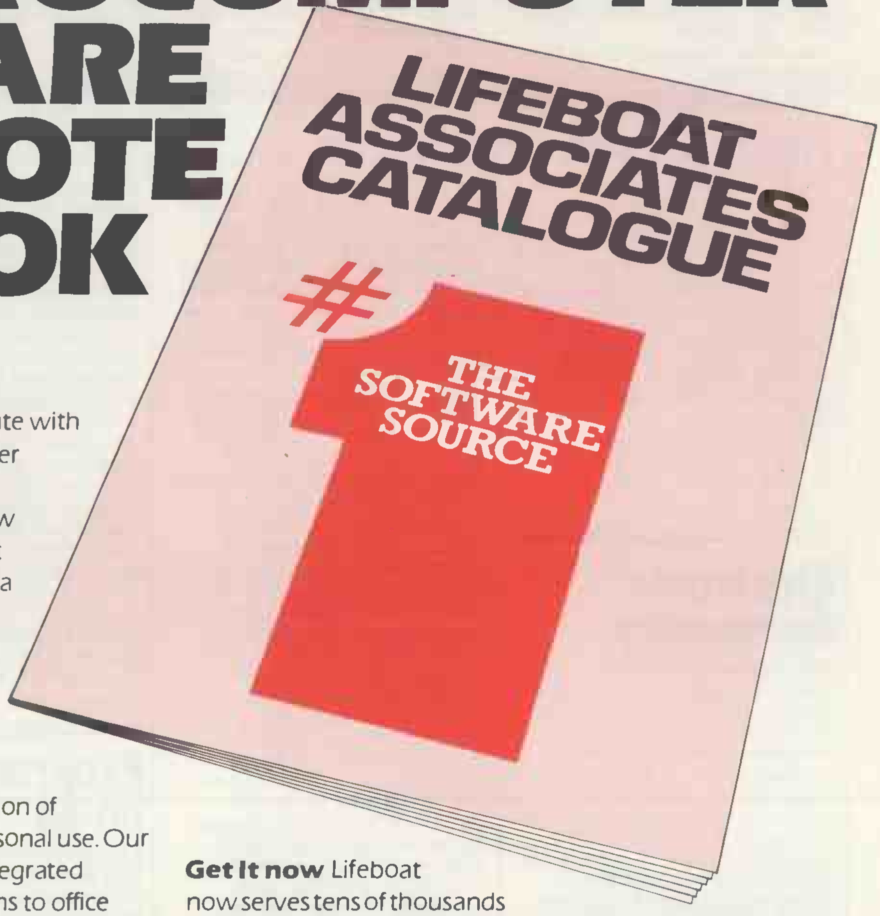

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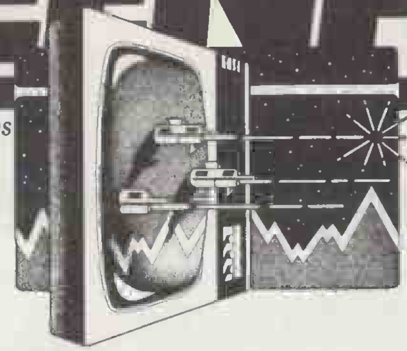
SCREENPLAY



This month Dick Olney reviews games for the TRS-80 Model I.

The games I've been looking at this month all run on the well-established Tandy TRS-80 microcomputer. I was supplied with a basic Model I carrying 16k of RAM (it uses the Z80 processor) and including a CTR-80A cassette deck. This configuration would cost £399 (inc VAT) and plugs into a domestic television. The TRS-80 was an early entrant in the micro scene and has built up a considerable share of the market. It is a fully expandable and versatile machine and, though the lack of colour or high resolution graphics severely limits its capacity as a games unit, it has built up a considerable stock of this type of software.

Tandy has more recently brought out its colour computer, which I shall be looking at later on in the year, but on the Model I the graphics-oriented games are necessarily much less sophisticated than on the machines I have previously reviewed. Many of the games include simple sound effects which can be directed through a standard hi-fi system or — as in my case — you can use a mini-amplifier box which costs £7.49. I have looked at a varied assortment of games which I believe is fairly representative of the vast selection available.

GAME: Pyramid of Doom
SUPPLIER: Adventure International
PRICE: £12.50

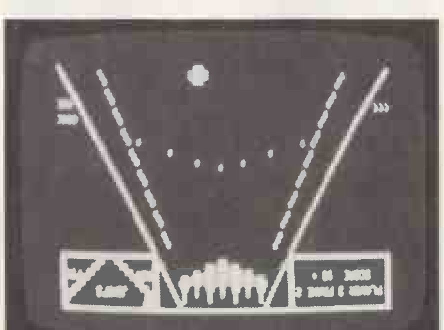
This is a standard Adventure game set (as the name suggests) in and around an ancient pyramid. I have to admit it took me five hours even to get inside the pyramid, though the frustration of this served mainly to increase the satisfaction of my eventual success. Most of the objects and rooms inside the pyramid are much as you'd expect (a notable exception being the giant oyster!), though there are plenty of original problems for you to wrap your mind around. I would have expected a slightly more extensive configuration for the money and the 'astral guide' is a bit ingratiating and humourless compared with others I've seen, but nevertheless this is a well designed program from what must be considered an expert in the field. The package gives an 'average completion time' of one month. I've no idea of exactly how this is arrived at — but either way its an exaggeration, I would think about 50 hours' continuous play is nearer the truth.

PRESENTATION: ****
COMPLEXITY: *****
VALUE FOR MONEY: ***

GAME: Dancing Demon
SUPPLIER: Tandy
PRICE: £6.95

More of an entertainment than a game really — but unusual enough to demand a mention. Using simple alphabetic codes, you develop dance routines for a character looking more like a friendly alien than a demon, who inhabits a simple stage (the graphics are basic but effective). Fundamental tunes are superimposed on the performance, again using an alphabetic code (which is simple once you get used to typing 'A' for 'C' and 'B' for 'C#' etc). All in all you have 25 notes and 26 different stops to concoct a string of 248 action/note elements, and its quite easy to create all sorts of bizarre results (hence giving your support to the 'Inane uses for new technology' lobby!). This one looks like it was originally written for sales demonstrations and later marketed to prevent salesmen giving it away with the machine. It does inspire overwhelming desires to give demonstrations to friends (neighbours, traffic wardens, cats — well anybody really!) and this, along with its novelty value, probably makes it worth the seven quid; although I'm sure I'd get heartily sick of it before very long.

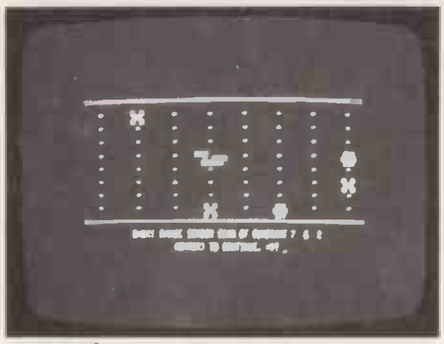
USE OF GRAPHICS: ****
PRESENTATION: *****
ADDICTIVE QUALITY: **
VALUE FOR MONEY: ****



GAME: Tenpins
SUPPLIER: Molinerx
PRICE: £9.50

As you might expect, this program simulates ten-pin bowling. Given a view up the alley towards the pins, you line up a ball (actually a sort of chunky cross shape) on the base line using the arrow keys, and bowl it with the space bar. The manual claims that the force you exert can be increased by holding down the space bar longer, but I found that this had minimal effect. Once moving, the balls direction can be further modified and as it nears its target you can give it a limited amount of spin. Scoring is standard — each game consists of ten two-ball frames — and up to four players can take part. I was surprised that there is no facility for getting players' initials on the scoreboard since this is such a common and simple feature on games of this type and always adds to the fun, somehow. The graphics and sound are both as good as you can expect on this machine but the game itself is rather uninspired, both in design and execution.

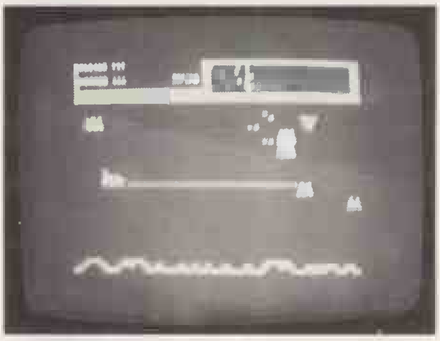
USE OF GRAPHICS: ****
PRESENTATION: **
VALUE FOR MONEY: **



GAME: Invasion Force
SUPPLIER: Tandy
PRICE: £11.95

Tandy's version of Star Trek combines all the standard features with limited real time action and rather poorly designed graphics. Status reports, long and short range sensor scans and power distribution are all displayed at the same time on a rather overcrowded screen — nice idea, but my feeling is that it makes the game less interesting. The battleground is a two-dimensional 10 x 10 matrix of 100 quadrants, and the object is simply to destroy as many 'Jovians' as possible. The standard beam and projectile weaponry (here referred to as 'Masers' and 'Triton' missiles) are complemented by 'Antimatter' pods and an experimental ray which — if you're lucky — can be used to destroy groups of enemy craft. One other interesting feature is the ability to control the power distribution between *all* the major ship's functions — thus making the most economical use of your energy. Movement and battle happen in real time, but because of the design I'm not sure that the game is necessarily enhanced by this attribute. All in all, if you want a game of this genre (which is undoubtedly the case), then you can probably do better than this one.

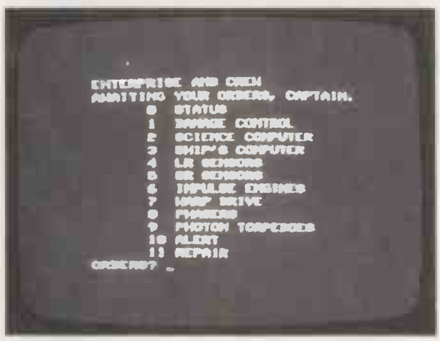
USE OF GRAPHICS: ***
PRESENTATION: **
RESPONSE SPEED: **
VALUE FOR MONEY: **



GAME: Defend
SUPPLIER: Molimerx
PRICE: £14.95

This is a real-time arcade type game with some similarities to both Defender (see March issue) and Scramble — this month's Arcade ace. You fly a jet-like craft moving at a steady horizontal speed (well, in fact everything else moves and you stay still!), using the arrow keys. Mostly this involves controlling vertical displacement, since moving horizontally across the screen is of little use (you generally need to be as far back as possible from the approaching objects) and does not provide acceleration or the ability to actually reverse motion. Each phase of the game is in three parts. Firstly you must fight off hordes of alien craft (which mindlessly fire missiles), then navigate a meteor storm, and finally wend your way through a rocky tunnel. In the first part of the game a forward-firing beam is controlled by the space bar and 'smart bombs' are activated by the '@' key. The latter destroy all aliens on the screen, though their remains will still obliterate you if you collide with them, giving the facility limited value. The response time, graphics and sound effects are all quite good but, if anything, the game is rather too easy. Admittedly I've had considerable practice with Defender, but I'm sure that most players would quickly tire of the tasks involved, particularly the tunnel.

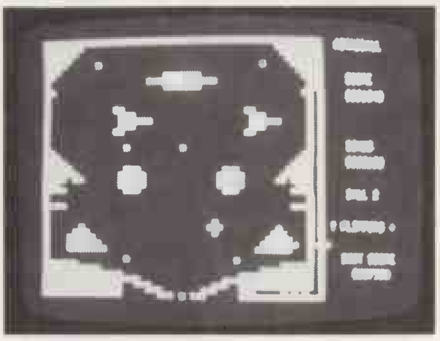
USE OF GRAPHICS: *****
PRESENTATION: ****
RESPONSE TIME: ****
ADDICTIVE QUALITY: **
VALUE FOR MONEY: ****



GAME: Star Trek 3.5
SUPPLIER: Adventure International
PRICE: £9.50

The latest version of the old favourite. Your mission is to explore all 'M-type' planets in a section of the galaxy divided into 192 quadrants, killing any Klingons you might meet on the way. The galaxy is conceived as three-dimensional, thus giving an 8x8x3 matrix. All of the standard Star Trek features are included — short and long range scan, computer facilities, warp and impulse engines, phasers and photon torpedoes. You also have an option for 'alert stations', which in fact determines the power given to the deflector shields. The long range scan representation of a three-dimensional galaxy is confusing to begin with, as are the headings you use with the impulse engines (running zero through nine anticlockwise, where zero is west). Still, there's plenty for both novice and expert to get their teeth into with good graphics and limited sound effects. If you use a TRS-80 and don't yet own one of the many versions of this game available I'd recommend this one — well worth the money.

USE OF GRAPHICS: *****
PRESENTATION: ******
VALUE FOR MONEY: *******



GAME: Astroball
SUPPLIER: Molimerx
PRICE: £13.77

Astroball is a pinball simulator with standard flippers operated by two of the arrow keys. Despite the limitations of the machine's graphics, the screen layout is well designed and has all the types of targets and obstacles you'd expect on a pinball machine, including side lanes. The response time is more than adequate, and quite high scores can be obtained, especially as it's always possible to get extra balls. Five skill levels are provided to vary the speed of the game. Even high resolution colour machines, however, can never really capture the full attraction of a mechanical pinball and — although, of course, few people actually have such machines in their homes — it's one of those games that I just don't feel computers do very well. Only real pinball addicts would want to buy this and then (despite this particular game's many assets) I suspect they'd find it a poor substitute for the real thing.

USE OF GRAPHICS: *****
PRESENTATION: ***
RESPONSE TIME: *****
VALUE FOR MONEY: ***

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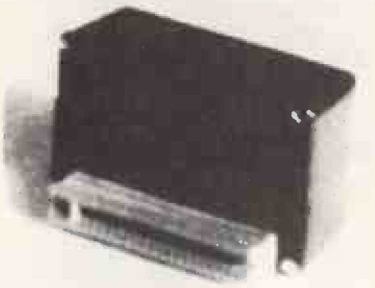

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BACKGROUND ON/OFF
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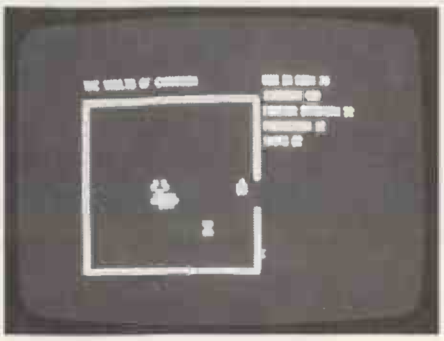

GAME: Vaults of Cymarron
SUPPLIER: The Software House
PRICE: £20

As the name suggests, this is an adventure game — but with a difference in that much of it is graphics-oriented real time action with sound effects. The instruction manual, though clearly produced on a low budget, gives an amusing background to the game with illustrations that look like they belong in a 'head bangers' broadsheet. The game starts on the pleasure planet 'Babylonia' where, having sampled 'many of the grosser forms of self indulgence' available there, you find yourself heavily in debt (apparently exacerbated by the massive inflation rate). You are presented with a simple menu representing the planet's 'Presto' information service. Using this you discover the size of your debt and are made an offer by the 'Cred Mutual Assoc' allowing you to pay it off by retrieving some of the valuable artefacts contained in the Vaults of Cymarron (the remains of an ancient shopping precinct). You are allowed a limited amount of cash with which to purchase supplies from the pawnbroker, where a certain amount of bargaining takes place. Your choice of supplies is critical to the main part of the game, and above all it's essential to buy plenty of food. After visiting the pawnbroker you go on to the spaceport from where — having chosen the direction from which you will enter the vaults — you set off for Cymarron. At this point the second part of the program is loaded in from the cassette.

After choosing a skill level (which determines the strength of the monsters) you are eventually plunged into the first room. Commands are entered using single keys such as 'L' for look and 'F' for fight, covering a fairly standard range of adventure vocabulary. All of the rooms are square with up to four exits and contain various obstacles, monsters (only ever one per room) and useful or valuable artefacts. You move your character with the arrow keys and can fire missiles with the space bar (assuming you bought a gun and needle pak from the pawnbrokers). I would suggest that you save the game as soon as possible after entering the vaults, since otherwise if you get killed quickly you'll have to go through all the prelininaries again, which can be very irritating.

The vaults are quite extensive, so there's plenty to explore, though the game does rather lack variety. It is of course not as cerebral as your average Adventure game, and hence much less demanding; but the real-time action makes it less predictable the second time around, perhaps giving it a more lasting attraction. Vaults of Cymarron is nicely presented and well designed, if a little pricey.

USE OF GRAPHICS: ****
PRESENTATION: *****
RESPONSE TIME: ****
VALUE FOR MONEY: ***

Conclusion.

Undoubtedly the best offerings available for the TRS-80 are the classic adventure and Star Trek variants, of which there are many. These are rather more serious games than the arcade type real-time affairs and, as a result, tend to be aimed at a more adult audience. Nevertheless, many of the latter are available for this machine and, though of course not nearly as impressive as their high resolution colour counterparts, they tend also to be comparatively inexpensive. This is obviously not a machine one would buy for its games alone, but it still has plenty to offer the prospective 'screenplayer'. Next month I shall be amusing myself with Commodore's colourful gamey machine, the VIC-20.

The Adventure International software reviewed this month was supplied by Calisto computers of Birmingham.

ARCADE ACE

At first sight Scramble bears some similarity to our first Arcade Ace, Defender (see March issue) but the principles are, in fact, quite different. You control a craft moving at a steady horizontal speed over a colourful landscape which presents a variety of different obstacles and hazards. A simple joystick is used to position the craft on the screen, providing quite good manoeuvrability — though, unlike Defender, you cannot reverse or accelerate. The idea is to penetrate the various defenses, destroying as much as possible along the way, in order to eliminate a key figure at the end of your journey.

The game is quite simple to start with. You travel across mountaineous terrain scattered with ground-to-air missiles (which are constantly being fired at you), fuel dumps and other installations. These can be destroyed using a 'machine gun' firing volleys ahead of you, or with bombs which will fall to the ground slightly ahead of your firing position. It is essential to destroy as many fuel dumps as possible at this stage since this adds to your own fuel supply; and if you run out of fuel you're dead. As you progress, other obstacles appear — starting with a series of bobbing fireballs which you must either shoot down or attempt to navigate past. Eventually the area you have to fly in decreases in size until you find yourself in a maze containing completely vertical stretches which are very difficult to negotiate. At the end of this is your goal — a sort of robot-like figure — and if you destroy this the mission starts all over again.

This game relies much more on flying ability than destructiveness, and it takes some time to learn how to use the horizontal movement properly. The graphics are very colourful (though rather lacking in crispness in comparison with some of the game's contemporaries) and there's a wide selection of unusual sound effects. Although Scramble is not a particularly fast game, there's certainly plenty to keep you occupied. The game enjoys a high popularity and although it's now disappearing from the arcades it can be found in many pubs and cafes.

THE RISE AND RISE OF THE COMPUTER BORE

By Alan Waring

In 1973-74, I recall *The Sunday Times* publishing a feature article entitled 'The Rise of the Flim-Flam Man' or something to that effect. For those of you who don't know what a flim-flam man is, project into your mind's eye a door-to-door brush salesman with one foot in the door telling you that his particular brand of brush can be used for everything from brushing your toilet to cleaning your teeth (and probably both) because the bristles are made of superpolyputthekettleon; as he tells you that the special cobalt-molybdenum case-hardened widgets reduce fuel consumption by at least 40 percent; or yet again, to think of a highly implausible situation, the guy in your local computer store who insists that you will need a 64k machine with Z80, CP/M, dual disk drive and dot matrix printer for playing 'space invaders' with the kids at home.

Flim-flammers are characterised by the tendency to spout jargon and important-sounding technical terms as a means of impressing, as well as intimidating, their unfortunate victims. You, dear reader, no doubt know the flim-flam man by a more vernacular term

How does one fight off this growing army of nelly-know-alls and smart-alecks?

that is far too coarse for me to use here, but it rhymes with 'pull bitter' because the flim-flammer talks a right load of OBS!

This article, however, is not really about the computer store shark type of flim-flam man (whoops! sorry, flim-flam person). It is, rather, about a more recent phenomenon spawned by the micro boom — a phenomenon that usually lives on the user/enthusiast side of the fence. This breed of flim-flammers (let's call 'em FF for short) exhibits a number of general characteristics.

They are political animals whose *raison d'etre* is to score points over others: they have a tendency to buttonhole and eyeball.

They avidly read the computer magazines (*surely there is only one? — Ed)* in order to pick up the latest piece of jargon or tit-bit in order to keep 'one up'.

They sometimes concentrate on minute detail in a narrow field of interest, but often one finds a versatile FF willing to take on all comers.

They patronise those waterholes where they are likely to find suitable prey, eg, computer literacy projects, ComputerTowns, computer clubs.

They prefer to select their prey from among the organisers of such meetings on the basis that scoring points at that level should at the very least impress the natives.

The above characteristics are detectable through the various strategies adopted by the FF fraternity (alias Computerbores because they bore me stiff). For example, *The Frontal Assault:* 'I want you to tell me how to code the ZX81 in assembly' (sic); *The Infiltration Method:* 'Hmmm, A nice little program you've written. Tell me can you alter the clock on this machine to make it run faster?' (Faster than what? Who the hell cares anyway unless you are a hardware designer?); *The Great-Bores-of-Today Commentator:* 'Now he's pressing RUN. Notice the superb display on the green screen, the forty-by-twenty-five pixel array is really magnificent isn't it? And those characters with their true descenders! Look at those moving graphics! What's the memory map like on this machine?' (Aaarrrggghhh!!); *The Goodly Advice:* 'If I were you I would have written it in machine code' (Great if you know how to program in machine code, but otherwise deadly boring and tedious); and *The Man of Influence:* 'Right, now phone up Jim Smith at the computer store, go in and see him and mention my name. If you have any trouble, I'll sort him out.' (When you suggest that perhaps *he* would like to go and see Jim Smith in view of their great friendship, our dictator backs off at a million miles an hour with excuses about not wanting to abuse their friendship. Some friendship!)

Computerbores (or CBs — not to be confused with the airwaves variety) are thus a flourishing breed. They come in all shapes and sizes, even down to young bluebottles of the tender age of 12. The question facing the nation is: how does one fight off this growing army of nelly-know-alls, and smart alecks?

My own empirical method centres on a little bit of reverse psychology: 'Great! You are just the man we're looking for to take over the job of secretary/publicity man/organiser (take your pick). It only takes up three evenings a week but to a man of your calibre it will be a pushover, a piece of cake.' This tactic works on most people because, as armchair computer experts, the last thing they want is the responsibility of actually organising anything. Perish the thought! I mean, if they were

'If I were you I would have written it in machine code'

to be doing anything constructive they would become some other FF's prey. No, organising computer meetings, etc, is for the mugs.

However, I detect the first signs of a particularly virulent and resistant FF strain developing which I have presumptuously dubbed 'spp Computerbore flimflamiensis, var khutzpahdikh' because not only is he a pain in the posterior he also possesses a confounded cheek. You know the type: knows all there is to know but at the same time criticises your humble club/Town/group for not providing him with instant help with his business problems — he expects a free consultancy service from you!

Well, I've had a good old scratch at a few character types and if I've drawn blood in the process — tough. The Computerbore shall not flourish and shall not inherit the earth. The flim-flammers shall be cast low. Yea verily! OBS! CBFF TTFN.

'I still think it's a bit of a risk, leaving it on the doorstep all day.'

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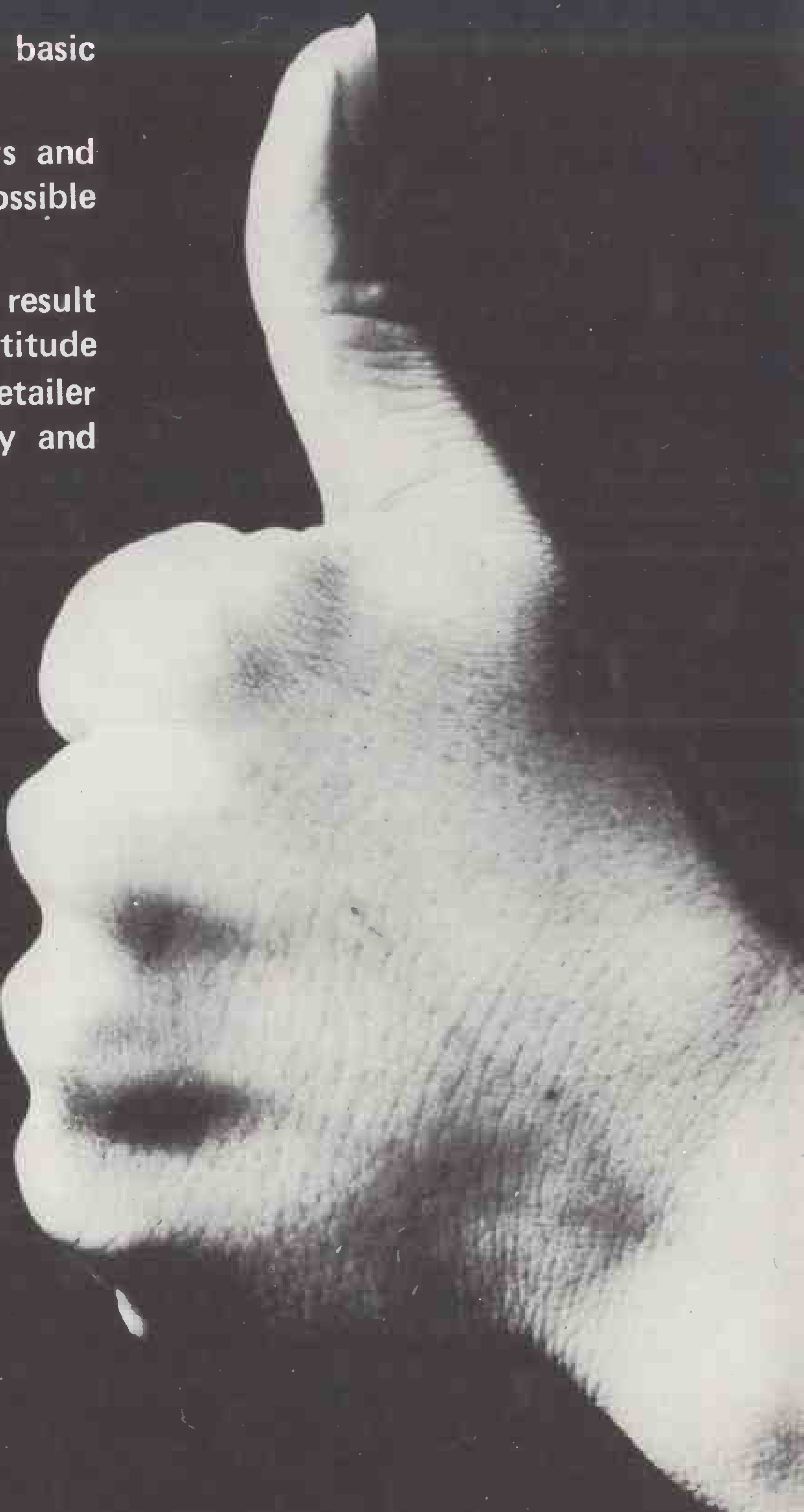

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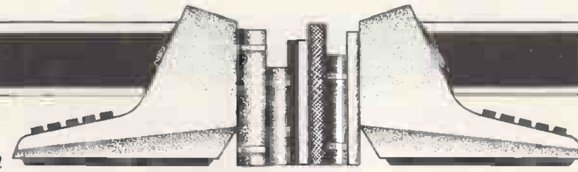
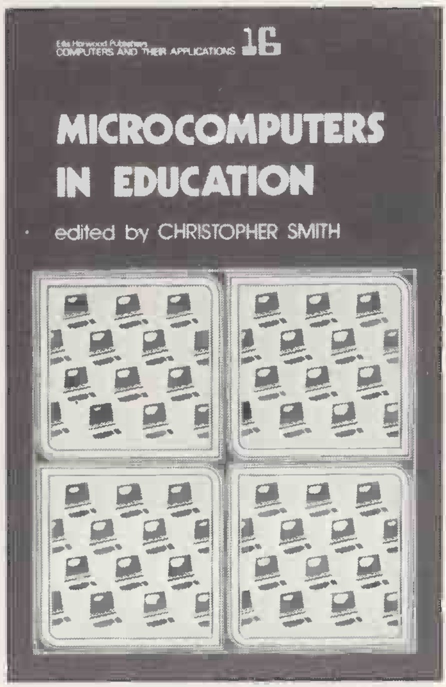


The use of computers in education forms the backbone of Malcolm Peltu's look at microliterature this month.

School chip overkill?



Microcomputers have already begun to infiltrate classrooms, where techno-enthusiasts welcome them as the advance guard which will revolutionise the world. Fortunately, there are also people who are more concerned about the quality of education than the quantity of computing.

Questions are being raised, quite rightly, about the current full-throttle race into what I call COT — Computer Obsessed Training. COT starts with the uncontroversial assumption that computers are now an intrinsic part of society and therefore the nature and uses of computers should be an essential part of school curricula.

COT then leaps onto CAT (Computer Assisted Training) and makes elaborate claims about the value of computers as teachers. Super-COT then brings in even more trendy technologies, like video cassettes and disks for interactive video teaching, to give further impetus to the computing bandwagon.

To be anti-COT is different from being anti-computer. The aim is to try to put computers in their rightful place — as a means to an end. The end is whatever people choose, rather than what the technological drive dictates.

Microcomputers in Education, edited by Christopher Smith, is a spotty contribution to the debate about the role of CAT and other computers-in-education topics. It has a few brightly shining spots among its 17 contributors but much of the rest is disappointing and the whole book lacks coherence.

Sparkling contributions come from Bob Lewis of St Martin's College, Lancaster and a joint effort from Peter Goodyear and Annette Barnard of Aston University. Lewis used to be director of the pioneering Schools Council Project on Computers in the Curriculum and was a Reader in Computer Assisted Education at Chelsea (College, not Football Club). He summarises the anti-COT view succinctly: 'However quickly the technology develops, the real benefits will only accrue if we concern ourselves with its educational values.'

The key words here are *educational values*. Computers should be introduced into an educational environment to improve or assist with learning opportunities. Computer technologists may know how to write CAT or CAL (Computer Assisted Learning) programs. But, as Lewis points out, 'Designers and authors of CAL materials should be first and foremost experienced teachers of the discipline; say, biology or geography.'

This fundamental fact needs stressing because it is so often forgotten by COT-blinkered computerists. That is why there is so much poor educational software — because the technological cart is put before the educational horse. As Lewis explains, 'CAL materials are developed to add to the resources in the coverage of various curriculae. It is the teachers of those curricula who know what kind of resources are likely to prove of value to students in the field.'

The question of trying to define 'educational values' is explored in any depth in the book only by Goodyear and Barnard. Their contribution is made under the title 'Microcomputers and Special Education', although they discuss much broader educational questions than the use of computers to assist physically or mentally handicapped students.

In particular, they provide a timely warning about the direction being taken by the Government's Microelectronics Education Programme (MEP) They accept that the £9 million being spent on MEP, coupled with the Department of Industry's scheme to get a computer in every secondary school, will be of 'considerable assistance to teachers and Local Authority advisers active in educational computing'.

But they warn that the MEP could 'ossify current practices' and could block out 'child-centred' developments in educational computing. They also fear that, after the initial burst of enthusiasm for computing by many teachers, there could be a backlash if the reality fails to meet the promises made 'in a spate of evangelising books, articles and television programmes which made many a bold claim for the powers of the microcomputer'.

Goodyear and Barnard believe that the stimulus provided by MEP makes the prospects for extending current work 'look good'. But in order to determine which current work should be supported, they say the MEP has been forced to create a well-defined 'legitimating framework' as the basis for evaluating projects. Once fixed, however, they fear it may not be sufficiently responsive to meet changing educational and technical needs. This, they say, will lead to an ossifying of the 'current orthodoxy.'

In particular, they are worried that this ossification will occur at a time when most educational computing is what they call teacher-centred — that is, 'it takes as its model the activities of a classroom teacher — presenting information, testing, supervising drill-and-practice, keeping marks'.

They would like to see a shift towards a more child-centred approach: 'This takes as its model the child as a naturally able and insatiable learner and attempts to develop combinations of software and hardware which allow the child to use the computer as a powerful tool with which to explore and manipulate the world.'

Goodyear and Barnard fear that current teacher-centred approaches, reinforced by MEP, have been established just in time to create a barrier to more child-oriented developments. 'The dangers of this creeping orthodoxy containing an extremely conservative view of educational computing, need to be identified and resisted,' they proclaim.

Having expended a great deal of scarce time and energy in installing and learning about computing and getting computers installed, they think that many teachers may feel that 'some respite, and perhaps a little respect' is needed.

This pause, against the background of over-ambitious promises, could mean, they say, that 'in the day-to-day routine of the classroom it is too easy for demoralisation to set in, and for the currently affordable microcomputing systems to constrain our imagination.'

Unfortunately, these important themes introduced by Lewis, Goodyear and Barnard are hardly investigated in the rest of the book. I have given their views prominence because I believe they are the hard sinews around which a book entitled *Microcomputers in Education* should have been built.

In fact, the book is a lightly edited collection of conference papers, most of which were given at a PET Education Conference. This means there is an undue emphasis on PET systems and that many of the contributions read more like outlines of presentations than solid material designed for a book.

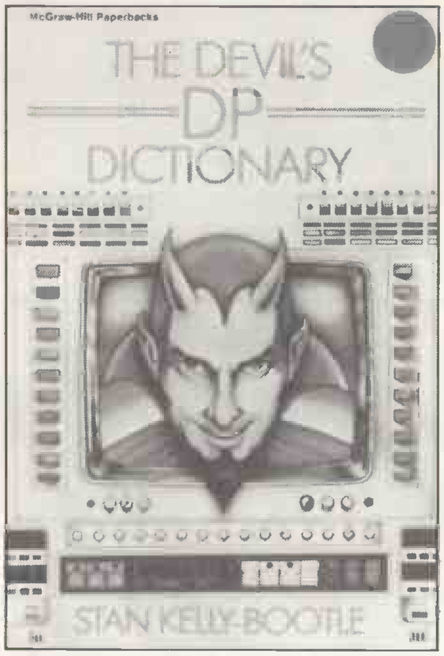
It was a conference when CBM was plugging Borge Christensen's Comal language and there is an interesting paper in the book by Christensen on Comal. Another Comalite, Roy Atherton, also offers a useful discussion of some detailed standards that could be developed for Basic and Comal.

But a sign of the scrappy organisation of the book is that two other chapters in the part on languages are really about computer graphics. An interesting background summary of

CAI (Computer Assisted Instruction — yet another variation of CAT and CAL) appears in Chapter 9, which is primarily about the PET CAI system. Such a background piece should have come at the beginning.

In short, the book is structured around the contributions — rather than trying to draw out the main concepts, background, developments, etc, into a more logical and thorough structure. There is, however, a sufficient variety of material in the book, including some case studies, to make it of some interest to those already 'into' educational computing. But I found it frustrating in its bittiness and in the way it allowed crucial questions to be raised without any real attempt to provide responses that would assist non-technologists to keep control over the technology and to provide some useful restraints on the COT rockers.

Got alotta Bootle



Stan Kelly-Bootle is a one-off, like most Liverpudlians. He is a court jester to the computer industry, a folk singer, a song writer (for the likes of Cilla Black and Judy Collins), a performing comedian — and an experienced computer professional with a track record leading back into the mists of the early 1950s.

His *Devil's DP Dictionary* is as unique and multi-faceted as Stan the Man himself. It isn't really a dictionary, although it is organised as an alphabetical sequence of word definitions. It is more a series of hit-and-miss jokes, observations, witticisms and asides, all steeped in the wry wisdom distilled from Bootle's computing experience.

Although structured like a dictionary the book can be dipped into and read at random. You are unlikely to use it to look up a reference to explain a word you do not know. For example, a program is described as 'A programme written in a lower-level language, such as American English; a sequence of detectable and undetectable errors aimed at coaxing some form of response from the system . . .' plus more quirky remarks. In addition to these 'one-liner' joke definitions, Kelly-Bootle inserts longer anecdotes, shaggy dog stories, poems and other bits, bytes and pieces. This format means that, like a 'Monty Python' programme, there are many items that go on too long or miss the funny bone, but there is sufficient original, sparky material to make the whole thing enjoyable and memorable.

In addition to computer terms, Kelly-Bootle frequently bursts out into a general love of word play, for example, there is an entry for *aibohphobia* which is said to be a 'fear of palindromes'. Not to mention *autoeroticism*, which is the 'computer generation of best-selling novels'. A fragment of a novel produced by the Playgol package is presented, with lines like: 'What a doll. A PhD in statistics, and she knew all the standard deviations . . . plus a few not in the textbook.'

Then there is the *algorasms*: 'A sudden, short-lived moment of pleasure enjoyed by the programmer (and, for all we know, by the system) when the final kludge rings the bell.' I could go on quoting until the Ks come home.

It's that kind of a book. One which prompts you to nudge someone and say, 'look here, isn't this great?' It is quite likely, however, that one person's joke will be another's yawn. Kelly-Bootle has many 'in-jokes' for old computer hacks and a variety of historical and cultural references, so reactions to particular items will vary.

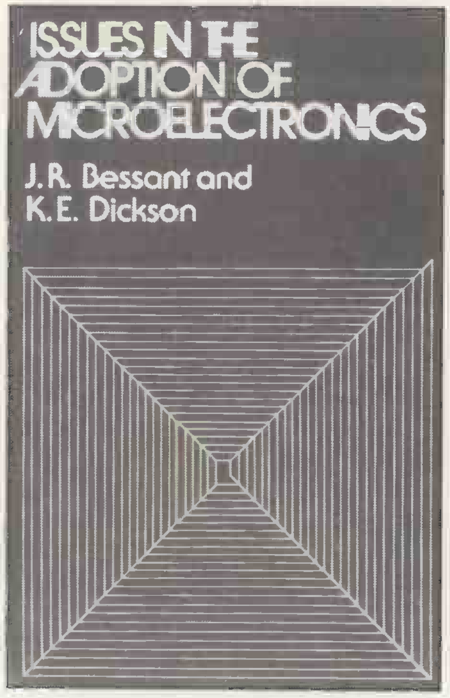
The mix, however, is so good that virtually anyone connected with computers will find something to laugh at; and even some enlightment every now and again. If it was closer to Christmas, I would recommend the *Devil's Dictionary* as the ideal stocking filler for the computerist you love most. Don't wait that long. Here, for the first time, is a computer book that is sheer fun and enjoyment. Buy it as a present for a friend. Or get one yourself if you are feeling overwhelmed by too much computer science. (*Computer Science*, according to Kelly-Bootle is 'a study akin to numerology and astrology, but lacking the precision of the former and the success of the latter.')

Going deeper

We are well into IT82 — Information Technology Year. Although the focus of government attention is mainly on the industrial and business uses of the technology, public awareness was really triggered a few years ago by fears about the social and employment impact of 'The Chip'.

This led initially to a flood of generalisations. The chip would create/destroy jobs. The chip opened the prospective of a utopian Leisure Society would lead to the end of civilisation as we know it. And many, many more instant judgements and prognostications.

There is now emerging a growing body of evidence to enable the debate to be taken beyond generalisations. The issues are far more complex and subtle than the straightforward 'number games' arguments about the levels of employment or unemployment that will



be created by the technology.

The Technology Policy Unit at Aston University has been the focus of much research work in the impact of new technology. Two of its leading researchers, John Bessant and Keith Dickson, have collected together some of their evidence into a practical and important new book, *Issues in the Adoption of Microelectronics*.

They aim to move the general debate to look at more specific aspects of why the adoption of new technology is assisted or hampered, and provide much interesting information, with case studies, of what happens when technology is introduced. Their focus is mainly on manufacturing industry, although much of the book would apply to any application area.

Inevitably, perhaps, many of their conclusions are themselves generalisations, like the need to 'involve all relevant groups at all levels in the organisation' or ensuring that 'there is top management commitment to projects involving microelectronics.' But at least their discussion and evidence is sufficiently detailed to enable the general principles to be adapted to particular applications.

The value of the book lies in the way key issues are opened up and explored in a systematic way. Bessant and Dickson admit that there is still insufficient real evidence on what is actually taking place in most firms. Their approach, with its emphasis on practical guidelines, means that, as more real results emerge, they can be evaluated within a coherent conceptual framework.

Another publication which tries to move the micro debate into more detailed examinations is *Beyond Gener-*

alisations: Issues in the New Technology Debate. This is essentially a collection of edited papers from a series of seminars organised by an informal group of people (including myself). With the resources at our disposal, the results were inevitably patchy and it took a long time to get the papers together.

The issues investigated in most depth are ones like whether or not small firms will be the employment saviour of the 'Information age', the scope and effect of unemployment, and whether policies like work-sharing and shorter working time are effective ways of sharing out available work.

There are many gaps in the book; many areas that need more study and other areas that are touched on only briefly, like the impact on civil liberties and the quality of life.

Beyond Generalisations' main purpose, however, is to try to identify the issues and the generalisations clearly, and to illustrate that many glib solutions may have substantial drawbacks. At only £2, it could be a useful starting point for educational courses on the subjects and for researchers, policy makers and others looking for questions rather than answers.

Now, agIT prop

Much of the output on TV about information technology has been propaganda for the technology. Programme after programme has spelt out the technical wizardry of new systems, the benefits for improving productivity and an underlying philosophy which I call 'technological rape.'

The essence of technological rape is similar to Margaret Thatcher's economic TINA (There Is No Alternative). Technological progress is presented, consciously or unconsciously, as an unstoppable force with no alternative. Just lie back, and hope the pain will be bearable and that, when the hurting stops, the sun will shine again.

The BBC computer literacy programme, which I reviewed last month, does start to raise questions about the negative consequences of technology, but these are pinpricks against the general background of pro-technology gush, much of it from the BBC.

At last, there is a film which argues against technological rape and for a more democratic, people-oriented approach. *New Technology — Whose Progress?* from Education Media is a polemical 'left wing' film; but at least it makes no bones about its propaganda stance, unlike the pro-technology films which often purport to be objective and 'value-free'.

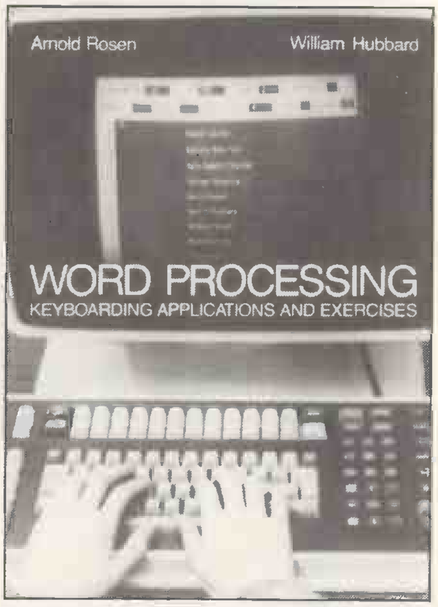
In 35 minutes it manages to be entertaining and informative. It uses film from manufacturers and TV to illustrate the attitudes of management and the media (which are often close). The film makers' views of the 'establishment' attitude is summarised by an IBM vice-president whom they quote as saying, 'People will adapt nicely to office systems if their arms are broken, and we're in the twisting stage now.'

The film also explores ways in which people, mainly through trades unions, can become involved in shaping the way technology is being used rather than being shaped by it.

The film deserves to be shown on broadcast TV. It has more depth than most TV programmes about technology and it at least argues a different point of view to the norm. Channel 4 may provide an outlet. But in the meantime its main showings will be to trade union groups, in education, or to others willing to hire or buy the film or video.

As with *Beyond Generalisations* (reviewed elsewhere), the best use of the film is as a starting point for further discussion and investigation. If Education Media can get the money together, they may make further films. I hope they do. In the interests of democracy it is dangerous if the 'alternative view' is starved through lack of funds and outlets to reach a mass audience.

Wrong recipe



As the use of word processors spreads, there is a growing need for books which assist the training of secretarial staff to operate the new systems. In *Word Processing-Keyboard Application and Exercises*, Arnold Rosen and William Hubbard claim to be providing appropriate 'hands-on' operator training in an easy-to-learn format.

Unfortunately, the book is disappointing. As a secretarial teacher new to word processing, I was expecting much more assistance. The glossary was useful but the introductory material failed to tell me much more than I have already learnt from reading manufacturers' sales brochures.

Too much of the tutorial material for the student relies on referring to the operator's manual of the machine being used. It is a bit like reading a recipe book which tells you to make home-made pie by using ready-made pastry and a can of pie filling.

The book is meant to be aimed at 'a bright student of word processing. . . capable of making intelligent decisions'. Yet it is often too simplistic (like telling the student to first switch the system on). Much of the material presented seems to serve as a reminder to the student of things that should have been learned well in advance of being given a hands-on lesson.

In conjunction with other books on te subject, *Word Processing* could perform a useful function in providing practical exercises as part of a course. Its format makes the information easy to learn and it avoids confusing or irrelevant information. But, as the book is meant to be used in conjunction with a manufacturer's manual, it would be redundant if the supplier provides a good publication and hands-on training support.

I hope that other authors and publishers will tackle this subject in a way which will be of more benefit in a traditional secretarial training environment.

Johanna Flood

Sharp points

Software Secrets by Graham Beech is a book of Sharp tips. Although many of the ideas and techniques discussed are applicable to any system, all the code is for the Sharp MZ-80K and therefore of most interest to Sharp users.

The full title expresses its scope — input, output and data storage techniques. The chapter titles summarise the techniques covered — screen I/O, interacting with programs, simple computer graphics, file handling fundamentals, sequential files and direct access files.

There is very little general discussion on the techniques before Beech leaps in, coding feet first. That is why Sharp users will find it of much more benefit than will users of other systems.

By working through the examples, the reader will be armed with practical experience of a variety of useful techniques. However, the book would have been valuable to a wider audience if Beech had stood back from the Sharp end of things to discuss general concepts and theory before charging into code.

This month's Bookfare included:
Microcomputers in Education edited by ICH Smith (Ellis Howood/John Wiley, £16.50)
The Devil's DP Dictionary by Sean Kelly-Bootle (McGraw-Hill, £3.95).
Issues in the Adoption of Microelectronics by J R Bessant and D E Dickson (Frances Pinter, £14.25).
Beyond Generalisations: Issues in the New Technology Debate edited by Colin Hines, Peter Bennett, Malcolm Peltu and Jennie Popay (Earth Resources Research and Polytechnic of the South Bank Town Planning Department, £2.00 — available from the Poly's Town Planning Department, Wandsworth Road, London SW8 2JZ).
New Technology — Whose Progress? a film by Education Media, 2 Ridgemount, Ridge Road, London NW2 (film — £400 purchase, £17 to hire; video — £100 purchase, £13 to hire).
Word Processing — keyboard application and exercises by Arnold Rosen and William Hubbard (John Wiley, £12.55).
Software Secrets — input, output and data storage techniques by Graham Beech (Sigma Technical Press/John Wiley, £5.95).

PCW SUBSET

Alan Tootill presents more useful assembler-language routines. This is your chance to help build a library of general-purpose routines, documented to the standards we have developed together in this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another. PCW will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to 'Sub Set', PCW, *14 Rathbone Place, London W1P 1DE.*

Our first item this month is not a Datasheet but an idea, from Richard Ryder of Macclesfield. Although described for the Video Genie/TRS-80, with characters made up from the standard 2 x 3 pixels, the idea can be implemented on any machine, with whole character positions in place of pixels, if necessary.

This is how Richard describes the idea and implements it for the Video Genie in Z80 code: suppose one wants to display a space-ship with a revolving centre. The sequence of events to do this can be split up into six steps as in Figure 1.

The example shown is for a ship four characters long, but this could be reduced or extended to personal choice — the principle remains the same (eg, to produce an image with flapping wings simply change the first and last characters to produce a 'flapping' appearance).

If a counter is used ranging from 0 - 5 (for the example shown), then by printing the six combinations in quick succession, the ship will appear to revolve. Once the count reaches 5, simply reset to 0 and repeat the sequence. Using this technique, some quite interesting results are obtained.

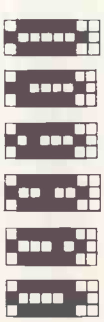
The appropriate routine to produce the revolving space-ship described is shown in Listing 1. Initially, HL is loaded with the address of a byte containing the count, with the next two bytes containing the position on the screen to display the ship.

```
DRALIEN:  LD    HL,nnnn      ; Load counter addr in HL
          PUSH  HL           ; Save it
          LD    A,(HL)       ; Get counter into A
          INC   HL           ; Point HL to screen pos'n addr
          LD    E,(HL)       ; Get screen pos'n
          INC   HL           ;  into
          LD    D,(HL)       ;  DE
          EX    DE,HL        ; Put screen pos'n into HL
          OR    A            ; Is count = 0?
          JR    Z,N1
          LD    (HL),+166    ; No, then print graphics 166
          JR    N2
N1:       LD    (HL),+174    ; Yes, then print graphics 174
N2:       INC   HL           ; Incr screen pos'n
          OR    A            ; Is count = 0?
          JR    Z,N3
          CP    3            ; Or is count >=3?
          JR    C,N4
N3:       LD    (HL),+179    ; Yes, then print graphics 179
          JR    N5
N4:       LD    B,1
          CALL  IN1          ; No, then print graphics 187
                             ;  or 183
N5:       INC   HL           ; Next screen pos'n
          CP    3            ; Is count >=3?
          JR    C,N6
          CP    5            ; Or is count = 5?
          JR    NZ,N7
N6:       LD    (HL),+179    ; Yes, then print graphics 179
N7:       LD    B,3
          CALL  IN1          ; No then print graphics 187
                             ;  or 183
N8:       INC   HL           ; Next screen pos'n
          LD    (HL),+132    ; Print graphics 132
          INC   A            ; Incr pointer
          CP    6            ; Is count >5?
          JR    C,N9
          XOR   A            ; Yes so reset count to 0
N9:       POP   HL           ; Get counter addr into HL
          LD    (HL),A       ; Save new counter
          RET
;
IN1:      SUB   B            ; Subroutine decides
          JR    Z,IN2        ;  whether
          LD    (HL),+187    ;  to print 187
          JR    IN3
IN2:      LD    (HL),+183    ;  or 183
IN3:      ADD   A,B
          RET
```

Listing 1

Fig 1

counter		ASCII code (for Video Genie)
5		166,179,179,132
0		174,179,179,132
1		166,183,179,132
2		166,187,179,132
3		166,179,183,132
4		166,179,187,132



To produce a reasonable effect, the routine should be called from within a loop, which includes a suitable delay, eg:

```
LOOP:  CALL DRALIEN    ; draw ship.
       LD BC, + 5000
LP1:   DEC  BC         ; do delay.
       LD  A,B
       OR  C
       JR  NZ, LP1
       JR  LOOP        ; repeat.
```

That is Richard's idea and, to satisfy myself that it could be implemented on any microcomputer, I produced the revolving space-ship effect on a standard Nascom. I used whole characters instead of pixels, with shape tables and Dave Barrow's DIFA and DRAW routines, which were printed in the March '82 issue.

6502 relative call

In the early pioneering days of this series (October 1980 and January 1981) we implemented and perfected relative calling routines for the Z80 processor. Our first Datasheet this month, from Gavin Every of Woking, gives a relative call routine for the 6502 processor. This is offered not only for you to perfect but also to test. (You guessed it! I am still waiting for my BBC Computer.)

Datasheet

```
;= RLTVL - Relative call
;/CLASS: 1 (if interrupt routines save M0, M1)
;/TIME CRITICAL?: No
;/DESCRIPTION: Causes a call to the address formed by
;/             adding the displacement, given in the byte
;/             following JSR RLTVL instruction to the
;/             address of the next byte following the
;/             displacement byte
;/ACTION: S=S-2
;/        Save all registers and M0, M1 (lo, hi)
;/        Return addr = return addr + 1 (on stack)
;/        New jump addr = return addr+disp+1
;/        Restore M0, M1 and registers
;/        Jump to calculated addr
;/SUBr DEPENDENCE: None
;/INTERFACES: None
;/INPUT: The byte following the JSR RLTVL instruction
;/       holds the signed displacement
;/OUTPUT: The program counter is set to the addr of the
;/        displaced routine to be executed
;/REGs USED: None
;/STACK USE: 8
;/LENGTH: 67
;/TIME STATES: 131 to 139
;/PROCESSOR: 6502
;
RLTVL: PHP                ; Room for calculated      08
       PHP                ;  jump addr               08
       PHP                ; Save                     08
       PHA                ;  all                     48
       TXA                ;  the                     8A
       PHA                ;  registers               48
       TYA                ;  on                      98
       PHA                ;  the stack               48
       LDA   M1           ; Save                     A5 ZZ
       PHA                ;  working                 48
       LDA   M0           ;  space                   A5 ZZ
       PHA                ;  on stack                48
       CLD                ; Need binary mode         D8
       TSX                ; X=stack pointer          BA
       INC   $0109,X      ; Incr return              FE 09 01
       BNE   RL1          ;  address - ie, skip      D0 03
       INC   $010A,X      ;  displacement byte       FE 0A 01
RL1:   LDA   $0109,X      ; Move address             BD 09 01
       STA   M0           ;  of displacement         85 ZZ
       LDY   $010A,X      ;  byte to zero page       BC 0A 01
       STY   M1           ;  and Y= hi byte          84 ZZ
       LDX   #0           ;                          A2 00
       LDA   (M0,X)       ; Load displacement byte   A1 ZZ
       BPL   RL2          ; If negative              10 01
       DEY                ;  then decr hi jump byte  88
RL2:   SEC                ; Add 1 plus               38
       ADC   M0           ;  displacement            65 ZZ
       BCC   RL3          ;  to jump addr            90 01
       INY                ;                          C8
RL3:   TSX                ; X=stack pointer          BA
       STA   $0107,X      ; Store jump addr lo       9D 07 01
       TYA                ;                          98
       STA   $0108,X      ; Store jump addr hi       9D 08 01
       PLA                ; Recover                  68
       STA   M0           ;  zero                    85 ZZ
       PLA                ;  page                    68
       STA   M1           ;  bytes                   85 ZZ
       PLA                ;  and                     68
       TAY                ;  registers               A8
       PLA                ;  from                    68
       TAX                ;  stack                   AA
       PLA                ;  and                     68
       RTI                ;  jump to subroutine      40
```

Z80 bubble sort

Here is an interesting sort from John Hardman of Welling. What makes it interesting is that it can sort strings of specified length from within larger blocks of memory. It can therefore be used to sort multi-dimensional arrays. John uses the routine himself for sorting athletics teams into the order of their scores — the lowest score wins.

Datasheet

```
;=BSORT - Bubble sort
;/CLASS: 2 (registers not saved & references to absolute
;/       addresses)
;/TIME CRITICAL?: No
;/DESCRIPTION: Sorts strings of any length into ascending
;/             order from within larger blocks of memory
;/             if required, on either one or two-byte keys.
;/ACTION: Set number of comparisons to go = number of
;/        strings less one
;/        Zeroise string switch indicator
;/        Compare each set of adjacent strings
;/        Switch strings whenever 1st string pair>2nd string
;/        pair and set switch indicator
;/        Decrease the number of comparisons to go by 1
;/        Repeat until a complete pass made without switching
;/        any strings
;/SUBr DEPENDENCE: None
;/INTERFACES: 18 bytes of directly addressed RAM, used for
;/            input parameters or working storage and a
;/            further block of RAM, the length of one string
;/            to be sorted, used for temporary storage
;/INPUT: The area of RAM to be sorted.
;/       The following parameters set in RAM before the
;/       routine is entered:
;/       NUMBR: 2 bytes - the number of strings to be sorted
;/       START: 2 bytes - the addr of the 1st char of the 1st
;/                        string to be sorted
;/       DISPL: 2 bytes - the difference between the addresses
;/                        of the 1st char of two consecutive
;/                        strings
;/       TEMP:  2 bytes - the addr of STRST to hold 1 string
;/       LENTH: 2 bytes - the no of chars in the string to
;/                        be sorted
;/       POSTN: 2 bytes - the pos'n in the string, numbering
;/                        from the 1st string byte as 1, of the
;/                        1st sort key byte.  With a 2-byte key,
;/                        the 1st byte is the high order byte.
;/       BIT:   1 byte  - Set to 8 for a 1-byte sort key, else
;/                        a 2-byte sort ket is assumed
;/OUTPUT: The area of RAM sorted
;/        Other input unchanged
;/REGs USED: AF, HL, DE, BC
;/STACK USE: 2
;/LENGTH: 161
;/PROCESSOR: Z80
;
STRST:  DEFS   nn          ; When nn=no of chars in a string
NUMBR:  DEFS   2
START:  DEFS   2
DISPL:  DEFS   2
TEMP:   DEFS   2
LENTH:  DEFS   2
POSTN:  DEFS   2
BIT:    DEFS   1
TOGO:   DEFS   2                ; Holds no of strings still
                                ;  to be compared
FLAG:   DEFS   1                ; Set when an exchange of strings
                                ;  made
ADDR:   DEFS   2                ; Addr of 1st sort key currently
                                ;  being processed
BSORT:  LD     HL,(NUMBR)       ; Set no of comparisons    2A YY YY
        DEC    HL               ;  to go=no of strings     2B
        LD     (TOGO),HL        ;  less 1                  22 YY YY
        SUB    A                ; Zeroise string           97
        LD     (FLAG),A         ;  switch indicator        32 YY YY
        LD     HL,(START)       ; Get addr                 2A YY YY
        LD     DE,(POSTN)       ;  of 1st string sort      ED 5B YY YY
        ADD    HL,DE            ;  key into                19
        DEC    HL               ;  HL and                  2B
        LD     (ADDR),HL        ;  store it                22 YY YY
BS4:    LD     D,(HL)           ; Get first byte           56
        INC    HL               ;  of 1st sort key         23
        LD     E,(HL)           ;  and next byte           5E
        DEC    HL               ;  into DE                 2B
        LD     A,(BIT)          ; If one-byte              3A YY YY
        CP     8                ;  sort key                FE 08
        JR     NZ,BS1           ;  indicated,              20 02
        LD     E,+0             ;  zero E reg              1E 00
BS1:    LD     BC,(DISPL)       ; Get addr of next string  ED 4B YY YY
        ADD    HL,BC            ;  sort key into HL        09
        LD     B,(HL)           ; Get first byte           46
        INC    HL               ;  of second sort key      23
        LD     C,(HL)           ;  and next byte           4E
        DEC    HL               ;  into BC                 2B
        CP     8                ; If one-byte sort         FE 08
        JR     NZ,BS2           ;  indicated,              20 02
        LD     C,+0             ;  zero C reg              0E 00
BS2:    LD     HL,(ADDR)        ; Get 1st string sort key  2A YY YY
        LD     A,B              ; Compare adjacent         78
        CP     D                ;  strings and if          BA
        JP     M,BS5            ;  1st string key          FA YY YY
        JR     NZ,BS6           ;  less than or            20 42
        LD     A,C              ;  equal to                79
        CP     E                ;  2nd string key,         BB
        JP     P,BS6            ;  jump                    F2 YY YY
BS5:    LD     DE,(POSTN)       ; Else adjust addr         ED 5B YY YY
        AND    A                ;  in HL to                A7
        SBC    HL,DE            ;  start of                ED 52
        INC    HL               ;  1st string              23
        LD     DE,(TEMP)        ; Get addr of STRST in DE  ED 5B YY YY
        LD     BC,(LENTH)       ; Get string length in BC  ED 4B YY YY
        LDIR                    ; Move 1st string to temp  ED B0
        LD     DE,(LENTH)       ;  store, point HL back    ED 5B YY YY
        AND    A                ;  to start of 1st         A7
        SBC    HL,DE            ;  string and              ED 52
        PUSH   HL               ;  save it on stack        E5
        LD     DE,(DISPL)       ; Get start of 2nd         ED 5B YY YY
        ADD    HL,DE            ;  string into HL          19
        POP    DE               ; Get start of 1st string  D1
        LD     BC,(LENTH)       ; Get string length in BC  ED 4B YY YY
        LDIR                    ; Move 2nd string to 1st   ED B0
        LD     DE,(LENTH)       ;  string place, point HL  ED 5B YY YY
        AND    A                ;  back to                 A7
        SBC    HL,DE            ;  start of                ED 52
        PUSH   HL               ;  2nd string and          E5
        POP    DE               ;  put it in DE            D1
        LD     HL,(TEMP)        ; Get addr of STRST in HL  2A YY YY
        LD     BC,(LENTH)       ; Get string length in BC  ED 4B YY YY
        LDIR                    ; Move 1st string to 2nd   ED B0
        LD     A,+1             ;  string place, set indic 3E 01
        LD     A,(FLAG)         ;  to show strings switched 32 YY YY
BS6:    LD     DE,(DISPL)       ; Store addr               ED 5B YY YY
        LD     HL,(ADDR)        ;  of next                 2A YY YY
        ADD    HL,DE            ;  sort key                19
        LD     (ADDR),HL        ;  in ADDR                 22 YY YY
        LD     DE,(TOGO)        ; Reduce the number of     ED 5B YY YY
        DEC    DE               ;  comparisons to go by 1  1B
        LD     (TOGO),DE        ; If the number of         ED 53 YY YY
        LD     A,D              ;  comps to go <>0         7A
        OR     E                ;  jump to compare next    B3
        JP     NZ,BS4           ;  pair of strings         C2 YY YY
        LD     A,(FLAG)         ; Else if strings exchanged 3A YY YY
        CP     1                ;  jump back to start      FE 01
        JP     Z,BSORT          ;  of next pass            CA YY YY
        RET                     ; If no strings exchanged  C9
```

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*, 14 Rathbone Place, London W1P 1DE. *Please keep your contributions as concise as possible. We will pay £10 for any tips we publish*

TRANSIENT CP/M BIOS PATCHING

If your CP/M BIOS does not implement the I/O byte, there can be problems when you wish to use an 'alternative' printer or other peripheral (perhaps your own printer has a parallel interface, but you have borrowed a daisy-wheel using RS-232 serial). There may be a suitable routine in the BIOS which you can access by simply patching the jump table, but you may find that a different driver routine is needed. The cleanest solution is to modify the BIOS (using SYSGEN, etc), but I have discovered the disadvantages of having a collection of disks containing variable operating systems. This short program shows how you can patch a special driver over the one existing in memory (make sure you don't overwrite anything important!), but by changing addresses it can install the code any where you wish (providing you also patch the jump table). All sorts of frills could be added, but this is just to give you an idea. For instance, it might be useful to install a large driver at the top of the TPA, but as I haven't tried this, I shall say no more.

Steve Withers

```
         ORG    100H
         MVI    B, 15          ; Number of bytes to be installed
         LXI    H, CODE        ; Address of code to be installed
         LXI    D, 0D25DH      ; Address of destination for code
LOOP:    MOV    A, M           ; Get a byte
         STAX   D              ; Put into BIOS
         INX    H              ; Bump both. . .
         INX    D              ; . . . Pointers
         DCR    B              ; Decrement byte count
         JNZ    LOOP           ; Repeat until finished

; This is where you may need to change the appropriate address
; field in the jump table if you are not overwriting the
; existing routine.
                               ;
         RET                   ; Back to CP/M
CODE:    IN     6              ; Code to be installed
         ANI    1              ;        this is my normal driver
         JNZ    0D25DH         ; Code is not relocated, so you
         MOV    A,C            ;        must know where it is going
         OUT    0
         MVI    A,20H
         OUT    6
         RET
         END
```

ZX81 POINT

When moving a character on the ZX81 display using PRINT AT, it can be useful to know whether any other character is being printed over, for instance, a moving missile in a space invaders type game. This can be done by PEEKing the system variable held at 16398 and 16399, which is the present address of the cursor in the display file. When this has been found it can be PEEKed to give the character code of the character at the present screen position, as in Listing 1.

A useful routine which can be derived from this is a point routine, similar to the POINT(X,Y) in TRS-80 Basic. This says whether a point has been plotted by giving a 1 if X,Y has been plotted, 0 if it has not, as in Listing 2.

By the way, in the Sinclair manual, character code 135 is shown as an inverse square with the bottom right quarter missing; code 135 is in fact inverse of this character.

Andrew Esmond

```
1000 REM ROUTINE TO FIND CHARACTER AT THE
     PRESENT SCREEN POSITION
1010 PRINT AT X,Y;
1020 REM X & Y ARE THE CO-ORDINATES TO BE
     TESTED
1030 REM THE SEMICOLON STOPS THE CURSOR
     MOVING TO A NEW LINE
1040 LET P=PEEK(PEEK 16398+256*PEEK 16399)
1050 REM P CONTAINS THE CHARACTER CODE OF
     THE PRESENT SCREEN POSITION SET BY X
     & Y
1060 REM REST OF PROGRAM
```

Listing 1

```
1000 REM POINT (X,Y) ROUTINE. X & Y ARE
     THE CO-ORDINATES
1010 LET P=0
1020 REM P IS THE VARIABLE IN WHICH THE
     POINT'S CONDITION IS RETURNED
1030 LET X1=INT(X/2)
1040 LET Y1=21-INT(Y/2)
1050 PRINT AT Y1,X1;
1060 REM X1 & Y1 ARE THE PRINT EQUIVALENTS
     OF THE PLOTTING CO-ORDS X & Y
1070 IF PEEK(PEEK 16398+256*PEEK 16399) THEN
     LET P=1
1080 REM P NOW CONTAINS THE CONDITION OF X,Y
1090 REM REST OF PROGRAM
```

Listing 2

UK 101 POWER-ON RESET

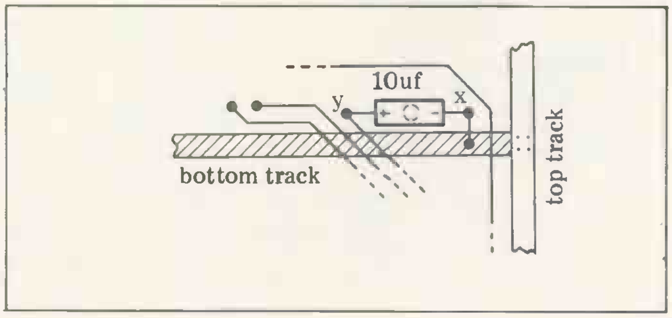
This simple one-component modification lets UK101 (and perhaps Superboard) users have a power-on reset. Once fitted the computer will no longer display 'garbage' on the screen when first plugged in.

The only component required is a 10uF capacitor connected from ground to pin 40 of the 6502, ie, the reset. This capacitor acts to hold the reset pin down to ground for a fraction of a second, thus resetting the computer.

To fit the capacitor to the board carry out the following steps. The diagram refers to an area just behind the keyboard on the right-side of the PCB.

1. Drill the PCB at the point X on the diagram.
2. Solder the capacitor (observing the correct polarity) to point Y.
3. Scrape off the insulator on the bottom track near to point X.
4. Bend the capacitor's wire to the track and solder.

A B Davis



TJ's WORKSHOP

ZX81 STRING ARRAYS

ZX-81 owners who use string arrays will be aware that they have one major limitation. In a 10,20 array, for example, each of the 10 strings is padded out with spaces to the full 20 characters. While this does make true alphabetical sorting simple, it carries with it the disadvantage that the true length of the original string is now disguised. Any attempt to use such strings as part of a block of text will result in a string followed by a number of unwanted spaces. It is, of course, possible to examine each string character by character to determine its true length but this can be very time-consuming.

A more elegant solution is to include a string length indicator (SLI) as part of every string to be placed in an array. This can be achieved as follows (where A$ is a string about to be stored):

LET A$=CHR$ (LEN A$+1) +A$

Provided the original string was less than 255 characters, it now has an SLI in position one, recording its true length.

An array of such strings can be sorted alphabetically by comparing only the characters after the SLI, eg, A$(X,2 TO) but it is now also possible to sort by string length simply by comparing the whole string, including its SLI.

To use the stored strings within a block of text, simply use the following instruction, which will return the original string stripped of its SLI and any padding:

PRINT A$(X,2 TO CODE A$(X,1))

It is also possible to use this technique when storing data in long strings. Provided that individual items within the whole are less than 255 characters, an SLI at the beginning of each item provides most of the benefits of a pointer array, allowing a fast scan along the data without the necessity to search for special separator characters.

David Lawrence

ZX81 READ AND RESTORE

The ZX81 manual describes the function of the READ data and RESTORE statements found in most Basics and explains how to overcome their absence on the ZX81. However, the method used isn't entirely satisfactory as RUN destroys all the variables. The statements may easily be emulated using existing commands as in the listing here.

Lines 10 and 20 DIMension the array and initialise the pointer N. The variable A$ in line 30 contains the data items, separated by commas — note that the last item *must* also end with a comma. Lines 40 and 70 control the loop, which is determined by the size of the array to be loaded. The subroutine called by line 50 initialises the intermediary B$ and increments and pointer N. The data is then loaded into the array A by line 60, converting it to numerics using VAL.

A major advantage of this routine over previous methods is that the data items are not limited to a fixed number of characters. Also, because the data is held as a string, it may be mixed numeric and alpha with suitable amendments to lines 10 and 60. Several arrays may be loaded by extending A$ and using lines 40 to 70. The pointer N holds the current position in the data string and therefore the RESTORE function consists simply of setting N to zero.

S Towers

```
  10 DIM A(6)
  20 LET N=0
  30 LET A$="ITEM1,ITEM2,.......ITEMn,"
  40 FOR M=1 TO 6
  50 GOSUB 1000
  60 LET A(M)=VAL B$
  70 NEXT M
   .
   .
1000 LET B$=""
1010 LET N=N+1
1020 IF A$(N)="," THEN RETURN
1030 LET B$=B$+A$(N)
1040 GOTO 1010
```

PET EPROM MOD

I would refer to the item 'EPROM Programmer for PET' in the February 1982 *PCW*, as some of the advice given differs from that given in the Intel 1979 Component Data Catalog.

The circuit diagram in Fig 3 shows V_{PP} as 26 volts whereas Intel gives the DC programming characteristics for V_{PP} as 25±1 volt; note that care must be taken when switching V_{PP} to prevent overshoot exceeding this maximum specification.

The sequencing of the application of the voltages to the 2716 is the reverse of that quoted by Intel, which states 'V_{cc} must be applied simultaneously or before V_{PP} and be removed simultaneously or after V_{PP}.'

Intel also states the 2716 must not be inserted into or removed from a board with V_{PP} at 25±1 volt.

It is appreciated that other manufacturers may have 2716s with slightly different characteristics, and I would suggest that a check on the data sheet is advisable.

The problem can be overcome by rearranging the switching as shown in Fig 1. The second switch in the V_{PP} line is provided in case the two poles of S1 do not make simultaneously.

It would appear that the circuit could be easily modified to program Intel 2732s (but not 2532s as the pin out differs from that of the 2716). To do this it is necessary to make use of the spare address output D of IC 6 as A11 and provide a double pole two way switch and a condenser of 0.1 microfarad from V_{PP} to ground. The addresses in the machine code program will need to be modified. The suggested arrangement is shown in Fig 2.

For anyone thinking of building the circuit it could be worth considering reducing the chip count by replacing the three 7493s with one 4040, a 12 stage ripple-carry binary counter, and the two 6T26 with an octal bus transceiver such as the Intel 8286 or the 74LS242/3.

J H Whittaker

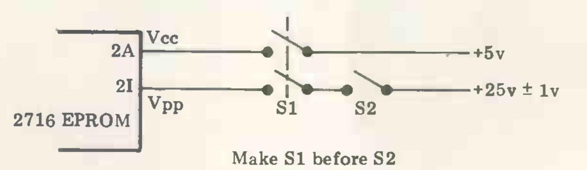


Figure 1 Modified switching for EPROM Programmer for PET

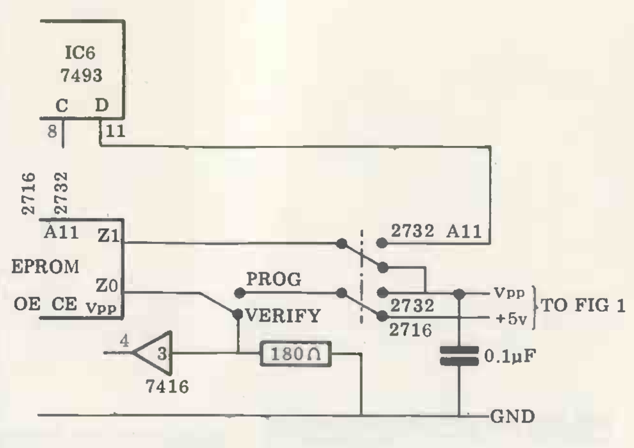


Figure 2 Modification for EPROM Programmer for PET to cater for 2716 & 2732 (not 2532).

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dBASE II: A DATA MANAGEMENT SYSTEM UNDER CP/M

Kathy Lang continues her series of database reviews

dBaseII gives users of CP/M systems the ability to store, process and access data in a wide variety of ways. It has a clean, well-constructed user image, making it unusually easy to learn and use even its most powerful facilities. The authors call it a relational data base management system but, strictly speaking, it is a 'file management system with data base connections'. While the term 'data base' is increasingly being used to mean the same as 'file of data', I don't find this a very helpful trend, so I shall stick to the word 'file' when I'm talking about a single file of information which need not be connected with any other data file. 'Data Base' will in these articles continue to be reserved for a system in which the data is stored in one or more files which are interconnected in such a way that the end user (as distinct from the data base administrator) does not need to know which physical file contains the data he needs to access.

dBaseII stores data in sequential fixed record length files, and must be given information about the record structure for the file. This information is stored in the first physical record of the file, so there is no need for a separate record definition file, and hence no danger of getting the two out of step (for instance by deleting the record definition file by mistake). dBaseII can handle two files of data at once, but not more. Each data file may have one or more indexes for fast access and for updating; these indexes are of equal status, that is, dBaseII regards as the primary index which ever index is invoked first on a particular access of the file. If the user wishes it, he can arrange for all indexes to a particular file to be kept up to date automatically when data is being updated, a distinct improvement on other data management packages. Keys used to construct indexes do not have to be unique but the rapid access commands work better if they are.

dBaseII has a variety of ways of updating, accessing and displaying the data, making it one of the most flexible packages on the market. It originates in America and is distributed and supported in this country by Encotel Systems Ltd of Croydon, who supplied my review copy.

Constraints

Records stored in dBaseII files must all have the same structure and be of fixed length, with the maximum length 1000 characters. No record may contain more than 32 fields, which could be a serious limitation in some applications; a field may contain up to 254 characters. Data items may be numbers, character strings or logical variables (ie, taking the value True or False); no special 'date' type exists, so dates must be stored as numbers in year/month/day order to sort correctly. Arithmetic in dBaseII is performed to an accuracy of 10 digits; numeric values may be treated as integers or real numbers, but for length calculations each digit occupies the same space as a character.

Index keys may be constructed from several data fields, but may not be more than 100 characters long altogether. When defining the record structure, data items must be named; these names may be up to 10 characters long. Commands may be invoked from the keyboard, or stored in files and called in with one instruction; command files may include statements invoking other command files, and you may have up to 16 command files open at a time. One or two data files may be in use together. When calculating dBaseII allows the user to store, in memory or on file, up to 64 variables for intermediate results; these may be up to 254 characters long, provided the total space used for temporary variables does not exceed 1536 characters.

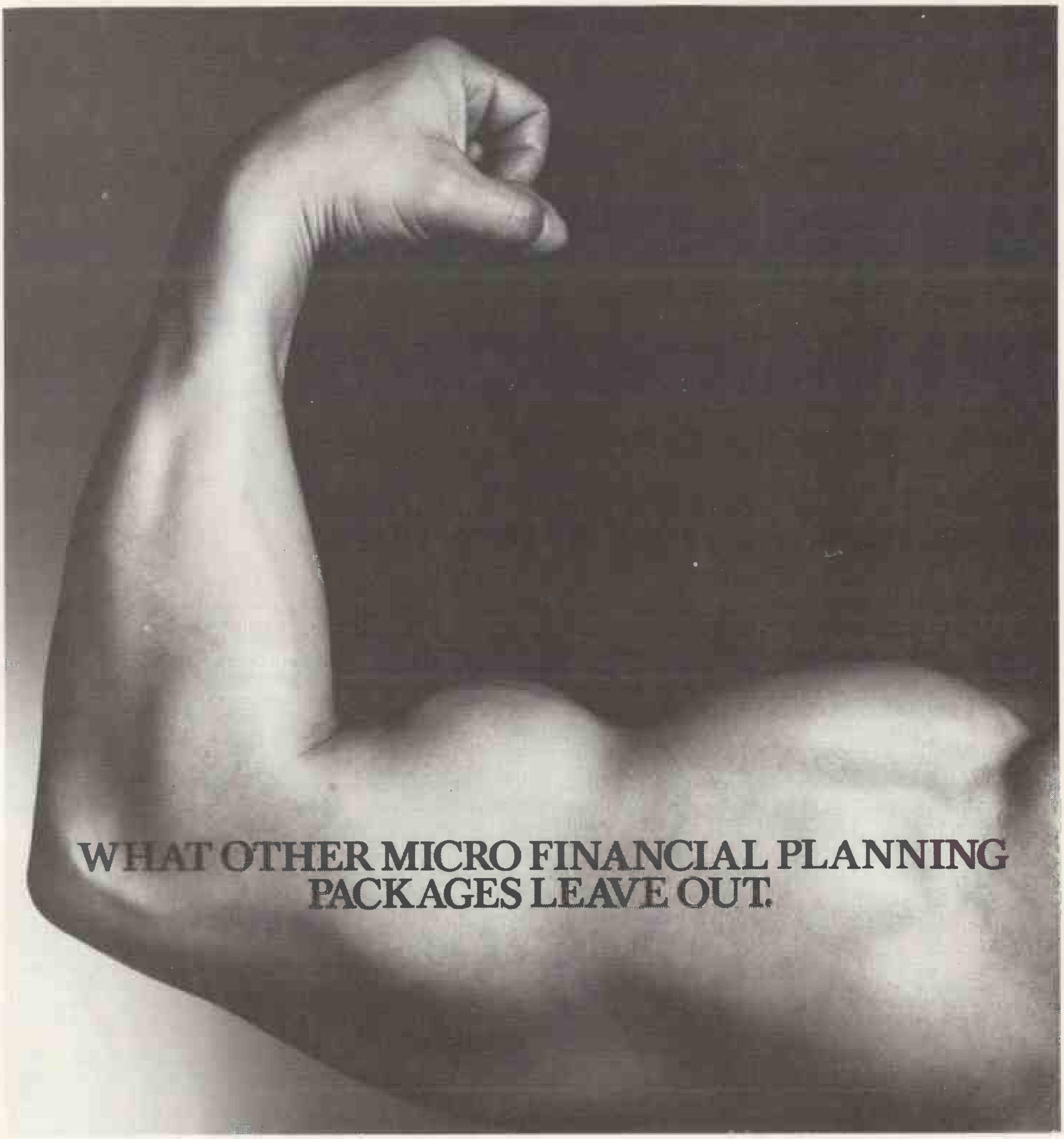
Data input and editing

Creating a data file is a two part process: the CREATE command allows the user to specify the structure of each record and then to input the data using this structure. Records are displayed with a named field on each line, with the type shown and a delimiter used to show how long the field may be. Formatted screens to allow more sophisticated displays can be set up using a set of commands giving full control over the screen format.

Once created, data may be edited using an EDIT command; this involves specifying the record to be edited by a variety of methods and then using simple screen editing to amend the record displayed. The screen editing uses the same conventions as the popular word processing package Wordstar — CTRL-E for moving up a line, CTRL-D for moving right a character and so on. It would be nicer to be able to use the terminal's own cursor keys, but at least the Wordstar convention will already be familiar to many dBaseII users. Records may be deleted in EDIT mode but not added; addition is done with INSERT within the data file and APPEND at the end.

Multiple changes are possible too: the REPLACE command lets you, for instance, increase by 10 percent all prices which have not been changed for at least six months, while CHANGE allows you to display each record in a group turn, to allow fields named in the command to be modified without having to specify a record key each time. For all these commands, and all other dBaseII commands which can operate over a range of records, the user can specify the range of operation by record numbers, by relative position ('the next five records') or by characteristics of one or more fields — see the section on Selection later.

One useful feature, which makes online updating safer to use is that records are not actually deleted when you tell dBaseII to delete them — you can 'undelete' them again, provided you have not issued the PACK command, when the records marked for deletion are expunged. Deleted records which have not been expunged can be displayed (they are shown marked with an asterisk) but will not be copied, sorted or appended to another file.



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dBASE II

Until a file has data in it, the data structure can be edited without hindrance. Once the file contains data, editing the structure would destroy the data. So dBaseII makes it possible to set up a new, modified data structure and copy data into it. The data may be from an existing dBaseII file, or from an external file in a variety of formats. This makes it possible to add fields to an existing data file which can have data added later, or to create a data file which is a subset of another, as well as to import data files written by other software. In each case, the operation takes just three or four simple commands, which use the standard dBaseII structure.

It is also possible to use two dBaseII data files in conjunction to modify data. One file may be updated by another, with the user specifying the key to be used to match the files. Or, using a similar technique, two data files can be merged to form a third.

Displaying data

Two kinds of command are used to show data on the screen. The user can either choose which record to show and display it all in one command, or locate the chosen record(s) and then display them. This gives greater control over location and display. Using these commands, you can display a set of records matching particular criteria, either as a list or one at a time, move around in the file using the range specifiers or such position identifiers as Top, Bottom or Skip. You can display a whole record, or just selected fields.

The 'selection only' commands can either use the index currently selected for the file, or use fields for which you haven't created an index, although the latter is, of course, slower. Where several records match a specification, dBaseII displays the first and permits you to 'continue' through the rest one at a time. The command which is normally used for printing reports can also display on the screen, so that you can show summaries on the screen too. Some of the commands used to display data from files can also be used to display information from memory, so you can carry out calculations on the current data file and display the results.

Reporting

The REPORT command allows the user to create layout specifications for summaries on either screen or printer. These specifications are stored for subsequent use but cannot be edited. Reports are laid out with fields listed across the page. Column and row headings are allowed but all specification of rows and columns is, as with all the packages I've reviewed so far, in absolute terms — line 3, column 42 etc — so you have to do a lot of counting to make sure the spacing is all right and a lot more each time you change the layout. Records may be selected according to specified criteria and there are some powerful calculating facilities. There is no provision for letting column headings take their names from the field names used in the record definition and the calculation facilities fall short of creating sub-totals when specified fields change. More sophisticated reporting features, such as formatted field display using pictures — a bit like the PRINT USING command in Basic — and subtotalling when fields change, are available through the use of command files (ie, rather than through the REPORT command in its standard form). I wasn't able to make a full test of the report feature, as it didn't work properly on my version of the package.

Selection sets

Nearly all the commands for file access can be modified with a selection parameter. For instance, if you want to select only people over 40 years old from a file containing age as a field, and show on the screen the name, age and sex of people in those records on the screen, you can give the command 'DISPLAY FOR AGE 40 NAME, AGE, SEX' and the relevant records will be listed, 15 at a time. So you don't have to decide in advance which fields you will want to select on, and set up a selection criteria file; you just add a FOR parameter to the display, location, reporting and other commands. Brackets can be used in conditions to ensure the correct order of evaluation and you can use the logical operators AND, OR and NOT as well as the usual comparison operators. Comparisons involving strings may also use an operator which searches within strings as well as comparing complete fields.

Sorting records

In dBaseII, indexing is used to carry out the kinds of operation which in other packages often involve both indexing and sorting, and I was able to do all my tests without using SORT except as a straight benchmark. So it is little hardship that sorting is a rather cumbersome difficult operation in dBaseII; you can sort on only one field at a time, so sorts on multiple fields involve sorting on each field in turn, starting with the least significant. You can sort on parts of fields and in ascending or descending order. I couldn't discover how to get dBaseII to ask the user to change disks, so I was limited also to sorting within a single disk, as dBaseII takes up most of one disk. However, this isn't really a problem, since when a file is opened in conjunction with an index, it is accessed in the order indicated by that index. So if you wanted a file displayed in a particular order, you would index it using the desired ordering fields as keys.

Any field or combination of fields can be used in an index up to a total length of 100 characters. The only other limitation is that this access technique must use the order in which the index was constructed. For instance, if a file was indexed by age, years of education and salary, records could be found by specifying age, age and years of education or all three, but not by years of education and salary alone. A slightly irritating feature of INDEX is that you can only index on character variables, so numeric items must be converted with the STR function. This is specified in the INDEX command, but the specification must include the length of the numeric item, even if you want to use the full length of the field as given in the record definition. So the instruction to carry out the indexing example just suggested could look like this:

INDEX ON STR(AGE,3) +
STR(LENGTHED,2) +
STR(SALARY,5,2)

When you bring a data file into use, you can specify up to seven indexes to be used with it. Only one will be used to provide the keys for accessing data, but all those specified will automatically be kept up to date when data is changed. This is an unusual and powerful facility, and the integration of updating and indexing makes it much easier to ensure that indexes and data stay in step.

Calculations

The user can perform calculations using data fields, items typed in from the keyboard and constants freely intermixed, using the normal arithmetic operators and brackets to ensure correct ordering. Items can be counted, as well as totalled. Results can be stored in memory variables or in data fields in files, and can be 'one-off' single results or a series resulting from a calculation performed once for every record in the file. Memory variables are referred to by name. Calculations stored in memory can be saved on a separate file for continued use. You can also create a file which consists entirely of aggregates; for instance, if your employees work on several jobs at a time, you can record the job information on a 'session' basis, and then ask dBaseII to create a new file consisting of one record for each job containing the totals of time spent, resources used etc.

Security

This is probably the weakest area in the package. You can of course build protection into command files through which operators invoke dBaseII but the package itself provides no facilities through the ordinary commands to prevent unauthorised access to data. All transactions may be logged, either in the usual fashion on the printer, or on a disk file.

Tailoring

Any command which can be executed from the keyboard may instead be put in a command file for later execution. Other commands, particularly looping instructions, may only be used from

dBASE II

command files. The instructions look Basic-like at first but have more structure than is common in Basic. For instance, the IF statement must have a matching ENDIF, so you are allowed to nest these pairs. There is a limited form of GOTO, but only to jump to the end of a DO . . . WHILE loop — so it's basically 'no GOTO' programming without being obsessive about it, which I personally feel is about the right balance. There are also commands to allow flexible input from and display to the terminal, and fancy layout on the printer; one form of the input commands makes it easy to build menus. I found the command files easy to construct and use, and flexible in their application, though not quite as powerful as those of FMS-80. One helpful feature typical of the consistency found almost everywhere in dBaseII is that throughout, the commands fields are referred to by the names they are given in the record definition.

Stability and reliability

dBaseII has been in use for some time in this country and in the States. The previous release reportedly had some bugs in it; the latest release, which I tested. had a couple of glitches that I discovered. I didn't lose any data, or come close to it, but I did have trouble using the REPORT feature, nor could I get the command for editing command files to work properly. Encotel assures me, however, that a revised version with the REPORT bugs corrected is on its way from the States and will be forwarded to end users.

User image

As distributed, dBaseII is not a menu-driven package, which means that the user must know the form of at least the simplest commands before he can get started. To some extent, it is a matter of taste whether you prefer menu-driven or user-initiated systems. Personally, I like to have the choice and in dBaseII you only have the option to construct menus — they aren't provided. However, the format of the commands was almost entirely internally consistent, and most operations only required two or three commands. For instance, to find particular records you simply issue one command to tell dBaseII which file to use, and another to specify the keys, and to limit the scope of the search and the display of variables. So I would expect a user with some motivation to find it pretty easy to use. This is largely confirmed by reports from two users, one who had a particular application in mind and became a fluent user in a few days, largely self-taught, and another who got hold of it 'to try it out' and never got very far.

The documentation comes in two parts. The first was written by an experienced user and provides a good, well-paced introduction yet goes right through to the most complex commands. The second part is a reference manual written by the software designer, but is of a much higher standard than usual. I thought the two-level approach a good idea which worked well but it's a pity there is no index for either part, only a list of commands and the pages on which they are described.

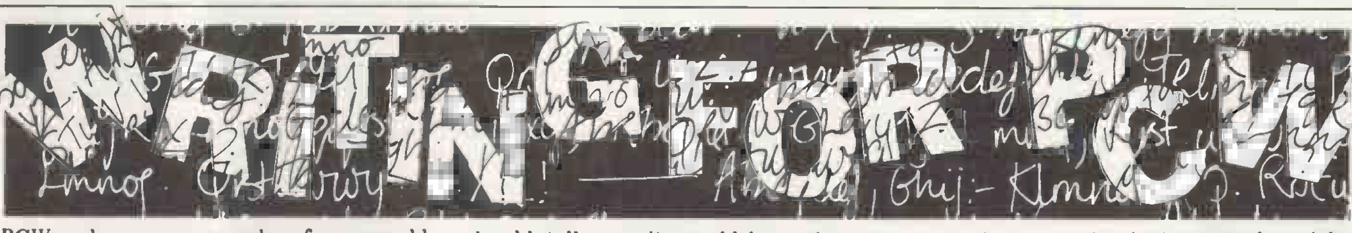
There are of course some sillies, though I had to work harder to find some than with previous packages I've seen. I don't like the use of the word QUIT to indicate normal ending of a session, especially when the keys CTRL-Q are used to abort in an EDIT command. Even the tutorial manual starts with 'how to install dBaseII for your terminal', including prompts such as 'are you going to use hex or decimal to specify . . .' at a stage when the user is hardly likely to know the difference. I feel that installation information should be in an appendix and no user should buy software from a dealer who is unable or unwilling to install it, unless the user is experienced enough to find and make sense of the appendix. And please, when are software writers going to make it easy to specify dates in the format preferred by the user, which is not necessarily that of the country of origin of the software?

dBaseII costs £375 for the complete package, and it needs a standard CP/M system with a minimum of 48k to run it.

Conclusions

dBaseII is a powerful and flexible data management system, with a well-designed and consistent user interface. Its strengths and weaknesses reflect an approach typical of good software engineers. Among its strengths are the clear command design, which makes it possible to deduce the formats of commands you haven't used before from the familiar ones, which avoids the hierarchy problems of menu systems while remaining easy to use, and which uses the same format for the 'programming' commands so that the user's growth path is smooth and logical. The selection facilities are good and well integrated, the calculation facilities are excellent (even brackets are supported, not to mention real numbers) and the feature which allows you to request automatic updating of all indexes is invaluable.

On the other hand, the reporting features are more limited than those of more commercially oriented packages, unless one devises command files to construct more fancy reports. The lack of any protection against unauthorised access to files, in the software as provided, could be a problem in some settings. But if you can cope with the limitation of 32 fields per record, and a maximum of two data files in use at any one time, I think you would find dBaseII a powerful and flexible package on which to build a data management system.



PCW welcomes approaches from would-be writers, even those who may never have appeared in print before. In this game it is often those with practical experience who have important things to say so we don't mind too much if their prose is less than perfect. Providing that submissions have a sensible structure and follow a logical sequence, we can take care of the polishing. Here are some tips:

If the article is already written, simply send it in, making sure that your name, address and 'phone number appear on both the article and the covering letter. If you have submitted the same work to other magazines you should tell us — it would be embarrassing (to say the least) if the same article appeared in more than one.

If you have an idea for an article or a series, write us a letter outlining your ideas. A one or two page synopsis giving the proposed structure, sequence and content will give us a sound basis for discussion. Please give us a daytime 'phone number if possible.

If you have nothing specific in mind but feel qualified to conduct case studies, Benchtests or whatever then drop us a line saying what you'd like to do and why you think you're qualified to do it. We're not particularly looking for strings of academic qualifications — experience carries just as much weight.

Dick Pountain is always on the look-out for interesting calculator features and we wouldn't mind seeing one or two readers getting on their soapboxes but remember: even articles such as this need a structure.

Reading *PCW* will give you a good idea of the style we prefer. You may notice that we try to avoid pomposity at one extreme and flippancy at the other (except in 'Chip Chat', that is).

Finally, have a look through back issue indexes and try not to re-invent any wheels. Oh, we almost forgot — *PCW* does pay for all published work.

BENCHTEST
PERSONAL COMPUTER

HITACHI PEACH

First IBM, now Hitachi: the mainframe manufacturers are moving into micros fast. Stephen Withers reports from Australia on Hitachi's personal computer, due for release here soon.

As Hitachi chose to call its new micro the 'MB-6890 Personal Computer Basic Master Level 3', it was inevitable that an alternative would be coined by the marketing people — hence it has become known as the Peach. Hitachi has included as standard equipment features which are often classed as extras, especially in lower-priced computers.

Hardware

Externally, the only unusual feature of the Peach is the row of five function keys along the top of the keyboard, although closer inspection reveals a number of things that suggest care has been taken in its design. To begin with, the 'Break' key is shielded to prevent accidental depression, and the four rarely used controls (power, volume, mode and reset) lie beneath a flip-up cover, contributing to a clean appearance without sacrificing convenience of operation.

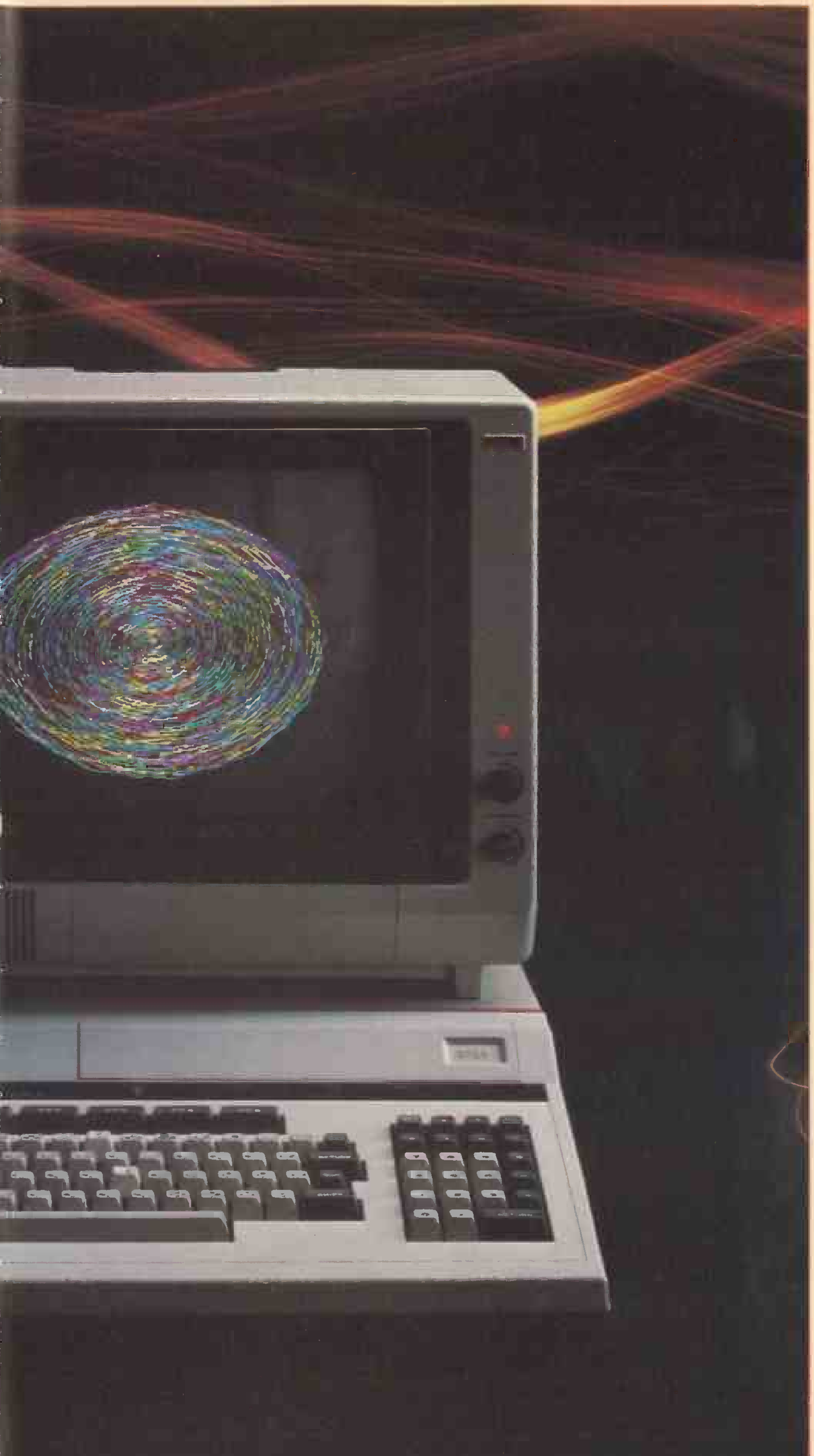
The main keyboard is arranged in the conventional manner, with a secondary pad providing not only numeric keys but also arithmetic operators, cursor control, question mark, return, insert/delete and home/clear screen keys. Of these, only home/clear screen is not duplicated on the main board. The keyboard itself is pleasant to use, the keytops having a matt surface which prevents reflections obscuring the legends. As the review machine had been produced to Japanese specifications, the keys were marked with both Roman and Katakana characters but this would not normally be the case. A type-ahead buffer is provided, making it practically impossible to enter characters faster than the computer can process them, even during disk operations. All keys auto-repeat when held down and the internal speaker gives audible feedback (thankfully, this can be avoided by turning the volume control to its minimum setting).

Katakana characters may also be displayed on the screen, although it would be possible to use an alternative character generator to suit a particular application (I believe a 2732 EPROM is compatible). A number of graphic characters are also provided, including the playing card suits and a handful of Chinese symbols. In an alternative mode, Hiragana characters replace the Katakana and graphic items.

One of the features of the Hiragana script is its smooth curves (so the manual tells me), and to achieve this an interlaced video signal is used giving an 8 x 16 character matrix, instead of the 8 x 8 in non-interlaced mode. This also gives a more solid appearance to other characters. Hitachi warns that the interlaced display can flicker unless a long-persistence monitor (which it offers) is used. Since the colour monitor supplied was of that type, I cannot offer a comparison but I did notice slight instability with white on black text in 80-column mode. A side-effect is that the image takes so long to fade that it can become distracting when scrolling. On the subject of scrolling, this operation is considerably slower when high resolution modes are selected due to the greater amount of information that must be moved around the screen refresh RAM (text and graphics exist on a single plane).

Apart from these minor snags, the monitor gave a very bright and clear display in all modes, and fits neatly on top of the Peach. When using the machine for long periods I found it necessary to turn down the brightness and contrast, although at normal viewing distances (eg, for games, or when in 40-column mode) the display's vividness was a positive feature. A black and white video signal is provided through a phono socket on the back panel and an adaptor to allow the use of a colour TV is an option.

There are two aspects to the display mode: the number of text columns and the graphics resolution. Either 40 or 80 columns may be selected and high or low resolution graphics. The precise resolution depends on the chosen text mode: low resolution is 80x100 (40 column) or 160x100 (80 column), while high resolution is 320x100 or 640x100. Not surprisingly, the more information to be displayed the more RAM is needed for the refresh memory. Fortunately, the display memory is variable — if a mode is selected which requires less than the maximum amount of RAM, the user may choose between releasing the balance for storage of Basic programs and variables, or having several display phases. If the latter option is



taken, the phase actually displayed is selected by a simple Basic statement. I should explain that the colour of each graphic pixel is not independently selectable. What happens is that for each row the pixels falling within a character position all appear in the colour of the one most recently drawn. I find such a restriction greatly reduces the usefulness of a high resolution graphic display but it is regrettably common.

The default display mode is set by a block of switches on the main board. One selects 40 or 80 columns, and another determines the graphics resolution. Other switches are used to select Basic or terminal mode; interlaced or non-interlaced displays; whether Hiragana codes are to be converted to Katakana before printing; between half or full duplex and 7- or 8-bit word length (applies to terminal mode only); and whether or not the bottom row of the screen is to be used to label the function keys. All of these settings may be overridden by various Basic commands. The Mode switch on the front panel is normally used to override the setting of the internal switch determining the number of columns but, by changing the position of a jumper clip, the Mode switch can be used to select between interlace/non-interlace or Basic/terminal mode. Similar jumpers are used to select Baud rates and handshaking for the built-in RS232 interface.

In addition to the serial port, a Centronics-style printer interface is included as standard equipment along with the cassette and light pen interfaces.

The standard amount of dynamic memory fitted to the Peach is also the maximum amount that can be fitted to the main board. Two additional RAM cards can be plugged into the Peach, each carrying 16k, but, as these overlap the ROMs, only 8k can be used with Basic. The ROM-disabling circuits associated with the memory expansion connectors allow the use of these boards as 'language cards' which could be loaded with alternative system software from disk.

A row of six edge connectors runs along the rear of the main board, a la Apple, allowing for such expansion as the disk controller and other I/O devices. Another nice detail is that the back panel adjacent to these connectors is made up of six blanking plates, any of which may be replaced with sockets for connection to external devices.

By now, you are probably wondering what processor is used in the Peach, although the MB-6890 designation does provide a clue. In fact it is a 6809, manufactured under licence by Hitachi. Unless a proprietary operating system is added (such as Flex), this will not impinge on the user as the facilities for working in machine code are minimal.

The disk subsystem supplied for this text consisted of a controller card plugged into the first expansion connector, plus a cabinet containing two single density, single sided 5¼in drives and a power supply, plus a very quiet fan to keep the whole thing cool. This makes the package bulkier than normal for minifloppies — I have seen two 8in drives in a case of similar dimensions. There is a 40-second time-out on the drive motors (a positive feature), but head loading and unloading is noisy, and the unusual design of the drive doors makes disk insertion and removal difficult compared to the Shugart pattern. Each drive has an unexciting 80k capacity, of which 8k are reserved for system use. Quite clearly, many potential users will opt for the higher capacity disk systems that are available,

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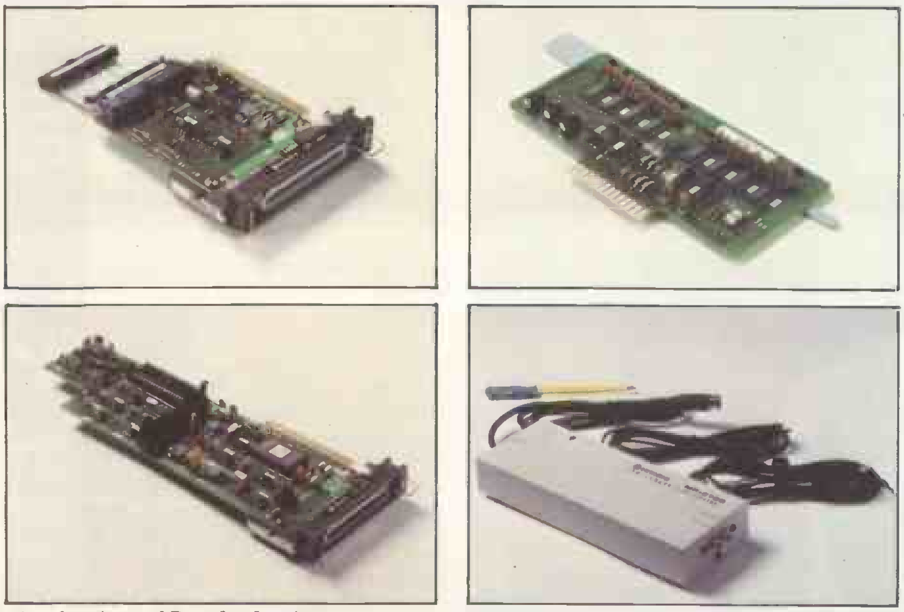


A selection of Peach plug-ins.

Japanese characters may be removed for UK market.

perhaps waiting for the arrival of the promised hard disk.

Software

As is so often the case, the resident Basic interpreter was written by Microsoft and includes the usual features plus a number of extensions to support the hardware capabilities of the Peach, including a screen editor. When used with a cassette recorder, the interpreter is completely resident in ROM but when disks are added additional features are loaded into RAM, occupying approximately 4400 bytes.

Perhaps the most significant feature of this Basic is that it provides a simple mechanism for handling interrupts generated by the function keys, RS232 interface, or the (optional) light pen. The interrupt handlers themselves are simply written as normal subroutines, and the extended form of the RETURN statement (which allows the programmer to specify the line number from which execution is to continue) makes life even easier. To aid the description, I will outline the statements used with input to the built-in communications port, although those for the light pen and function keys are similar.

Interrupts are enabled with the COM (0) ON statement and disabled with COM(0) OFF. It is even possible to arrange for the interrupt action to be suspended with COM (0) STOP, in which case an incoming character will have no immediate effect but when the next COM(0) ON statement is executed the interrupt will be processed. It is also necessary to establish which subroutine is to be used as the interrupt handler and this is achieved with ON COM(0) GOSUB [linenumber]. Such statements may be used in several places within a program in order to vary the effect of an interrupt according to the context in which it occurs.

The graphics commands are less powerful than those provided in the extended Basic used in the TRS-80 Color

This is what a Peach looks like after it has exploded!

Computer. Functions are provided to draw and delete points, lines, and rectangles, and PAINT may be used to colour in an outline.

There are some other commands relating the display that are worth mentioning. Cursor addressing is achieved with LOCATE, which can also alter the appearance of the cursor between solid, blinking, fast blinking, and invisible. The number of characters displayed per line, the graphics resolution and page are all software selectable, although certain combinations are incompatible with particular system settings (whether established with the switches mentioned above or the NEW ON command). CONSOLE allows the size and position of the scroll window to be specified (whole lines only, however), as well as enabling or disabling the display on the bottom line of the strings assigned to the function keys. A nice touch is that this display changes to show the effective functions when the shift key is pressed.

Any string of 15 or fewer characters may be assigned to each function key, and then when one is pressed the effect is as if that string had been typed in manually. In order to enter direct commands with one keystroke, a carriage return should be added to the command before assigning it to the function key (eg, KEY 1, 'LIST' + CHR$(13)). The system powers up with a reasonable set of key assignments but when programming I preferred to specify my own, including the common Basic keywords like FOR, NEXT, and GOSUB. This use of the function keys is quite separate from that involving interrupts.

The interpreter allows the assignment of files to all devices (except the light pen). Names have been allocated to each device and provision has been made for future expansion — for example KYBD: is the keyboard, COMO: the built-in RS232 interface, and LPT2: the third (and currently non-existent) printer interface. Disk drives are 0: to 3:, 0: being the default device for Disk Basic. The significance of this is that when sequential files are used input and output can be easily switched between devices by changing the device parameter of the OPEN statement. A possible use during program debugging is to assign what would normally be a disk file to the keyboard and screen, allowing easy examination of the information being transferred. The ability to choose between (say) a dot-matrix and a daisy-wheel printer at run time might also be useful. Once files have been opened, the variants of INPUT and PRINT (eg, PRINT USING) may be used regardless of the device. Device names may also be used with the LIST command, providing an additional flexibility.

A feature of this Basic which is not often found is INPUT WAIT which allows a period between 1 and 255 seconds to be specified, after which the interpreter skips to a given line number if the input has not been completed. This would allow additional prompts to be supplied if no response occurs within a certain period.

One limitation of the Peach in the area of input/output concerns random-access files, in that record sizes are fixed at 128 bytes. This is not always a convenient size, and so particularly careful file design may be necessary (note that the *PCW* disk tests require 256 byte records, and I had to reduce this to 128 for this Benchtest). This leads to another possible difficulty: the highest acceptable record number is 624 — reasonable for Hitachi's single density minifloppies, but unnecessarily restrictive when other, higher capacity drives are used. Hopefully patches to overcome the problem will be supplied with such drives.

Since the Peach is a 'no-DOS' system, extra keywords are provided to allow read/write access to disk sectors. These are DSKI and DSK0$, respectively transferring 128 bytes between character strings and disk sectors.

A very rudimentary machine code monitor is included, allowing the contents of memory and the 6809 registers to be displayed and altered, and a fourth command allows the execution of routines in memory. The linkage between Basic and machine code is adequately documented and machine code programs and subroutines may of course be saved on cassette or disk.

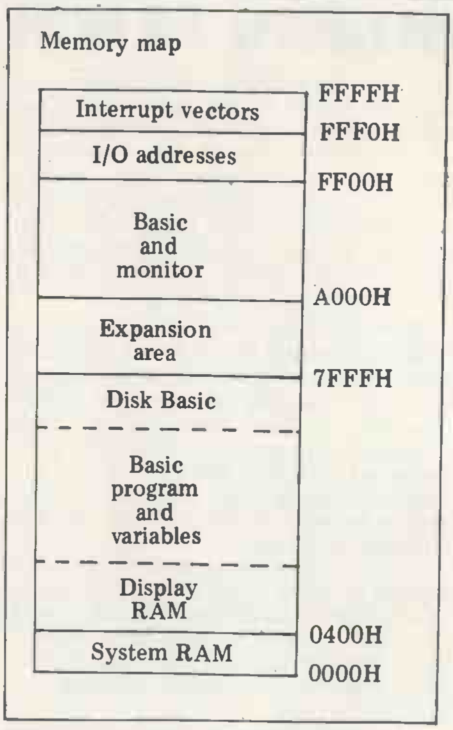
The final significant feature of the system software is that the Peach may be used as an RS232 terminal simply by entering the command TERM, with optional qualifiers to specify the baud rate, word length, parity, number of stop bits and whether half or full duplex mode is to be used.

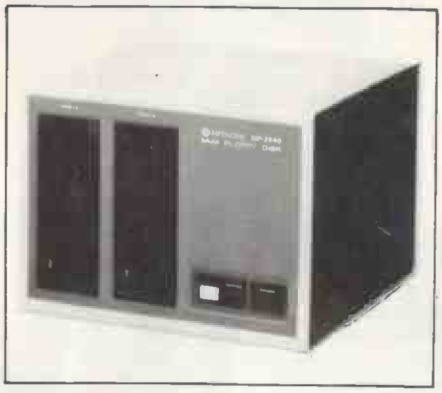
A point I should mention is that if you see a demonstration of the Peach featuring a fruit machine game with very high speed graphics or playing music, take a look at the programs and you will see that this involves sneaky bits of machine coding that may not be available to Joe Public.

Applications software is not being offered by Hitachi. Instead arrangements are being made with software houses (primarily Australian) for the development of English-language programs. A financial package, a Visicalc-style program, and a word processor have already appeared and one dealer claims to offer 'over 150 games, (and) 30 graphics packages'. It seems likely that many of these will accompany the Peach when it is introduced to the British and American markets.

The only item supplied with the review system was the Hi-Writer word processing program. Written in Basic with some machine code (presumably for speed), it seems to offer the usual facilities plus some extras like form letter/mailing list merging and the generation of tables of contents and indices (although not in the initial release). Although the program normally carries out all formatting at print time, a nice touch is that it is possible to switch the display into formatted mode, where colours are used to indicate the various print modes (eg, red for underlined text). It is not feasible to enter text in this mode, as there is no guarantee that it will all be visible (that depends on the margin settings) and because the display of characters can get a long way out of step with key depressions while the system maintains the format of the page. Even allowing for the newness of the program, I was not particularly impressed by it.

In order to gain access to other programming languages, an operating system must be added. Flex has already been mentioned — another possibility





Twin disk drive unit.

is OS-9. This is a Unix-like system, with multi-tasking and multi-user capabilities. Languages available include Pascal, Cobol and Fortran, as well as an assembler and debugger. I was only able to examine the manuals, but OS-9 appears to be a very powerful system.

Documentation

Oh dear . . . you remember those instruction leaflets that used to come with goods manufactured in the Far East ('depress the button most fully' and that kind of thing)? Well, that's what came with the Peach. In fact some of the manuals supplied with the review system were actually printed in Japanese as it was one of the first five units brought into the country.

To be fair, some explanation should be made. Apparently, what happened was that Microsoft (naturally) wrote the Basic manuals in American-English and these were then translated into Japanese. Unfortunately, Hitachi mislaid the originals and had to re-translate back into English. This led to such gems as: 'Color codes of 8 and over correspond to 0 through 7, and they are in the contrast of the character colour and background color.' What this actually means is that there is a simple way of obtaining the colour equivalent of inverse video, without having to specify both background and foreground colours.

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One improvement that would be very easy to make is the provision of an index, or better still, the rearrangement of the descriptions of Basic keywords into alphabetical order. The existing scheme gathers together instructions with related functions (eg, graphic commands, printer control instructions), which makes reference to the manual particularly time-consuming.

Now the good news. The reason that Hitachi launched the Peach in Australia before it did so in Britain or the US was to ensure that any problem like dodgy manuals or hardware glitches were thoroughly ironed out. Since my criticisms are aimed at the phrasing of the manuals, rather than their content, all should be well by the time you see the machine in Europe.

As the present manuals are so difficult to read (and the number of typographical errors adds to the problem), it is hard to criticise them from any other angle. I think most of the necessary information is in there, it just needs ferreting out and deciphering.

Hardware details are contained in the service manual, which includes a full set of circuit diagrams and fault-finding flowcharts, as well as a description of the function of each subsystem. Unfortunately this appears to have been translated by the same person as the Basic manuals — enough said?

Expansion

The design of the Peach allows for a considerable degree of expansion. As already explained, one or two 16k RAM cards can be plugged into the main board, although going beyond a total of 40k of RAM in this way means disabling the Basic ROMs. If the OS-9 operating system is employed, it is possible to utilise Australian-made bank-switching cards giving a maximum memory size of one megabyte, although these plug into the 'peripheral' slots, rather than the memory expansion connectors.

A selection of disk controllers are available. Both 5¼in and 8in drives are catered for, with double sided/double density versions from non-Hitachi sources. Hard disk and streaming tape units are promised for the near future.

If the comparatively small range of Peach software is considered inadequate, it is possible to fit a Z80 processor card in order to run CP/M software.

Prices

(Australian dollars, excluding sales tax)

Peach	1495
RGB Monitor	1149
Disk controller	175
Twin s/s s/d 5¼in disk drives	1495
16k RAM Card	129

For comparison, a 32k Apple with RS232 and Centronics interfaces, clock, numeric keypad and other accessories to equal the specification of the Peach would cost around $A3000. $A1 = 58p (on 5/3/82).

Conclusions

The Peach is basically a very nice machine, with system software to match. There are a few areas which could be improved (more graphics commands would be useful) but compromises are always necessary. It is being aggressively marketed in Australia with a relatively low price, but this might not be the case in the UK.

Hitachi seems to feel it is the ideal microcomputer for all purposes but I am sure we have all heard that line before. For business and commercial use, appropriate software is the key and at this stage it is not available in any quantity for this machine. The larger capacity disks are likely to be needed for such applications. Educational users may find the graphics an attractive feature, and the reasonably 'standard' Basic is another plus point. The additional costs involved in running other languages could be offputting to scientific and technical users, especially when the result is unlikely to support the graphic and other features of the computer. This leaves the home/hobbyist market, and I have yet to find a computer in this price range being used for bona fide domestic applications (maybe I don't move in sufficiently affluent circles) — perhaps in the USA things are different. It would be a nice machine to own but, as before, there is a dearth of software.

If Hitachi's plans come to fruition, most of my criticisms will not apply when the Peach appears in Europe. Once the documentation is improved and the software gap filled, the Peach should attract many potential buyers. As for the future, it is worth remembering that Hitachi is likely to be the first manufacturer to produce 256k RAMs in quantity: if its agreement with Motorola also covers the 68000, who knows what the next year or two will bring?

Basic Benchmarks

BM	Time
1	2.0
2	11.0
3	26.0
4	26.0
5	27.0
6	46.0
7	78.0
8	10.0

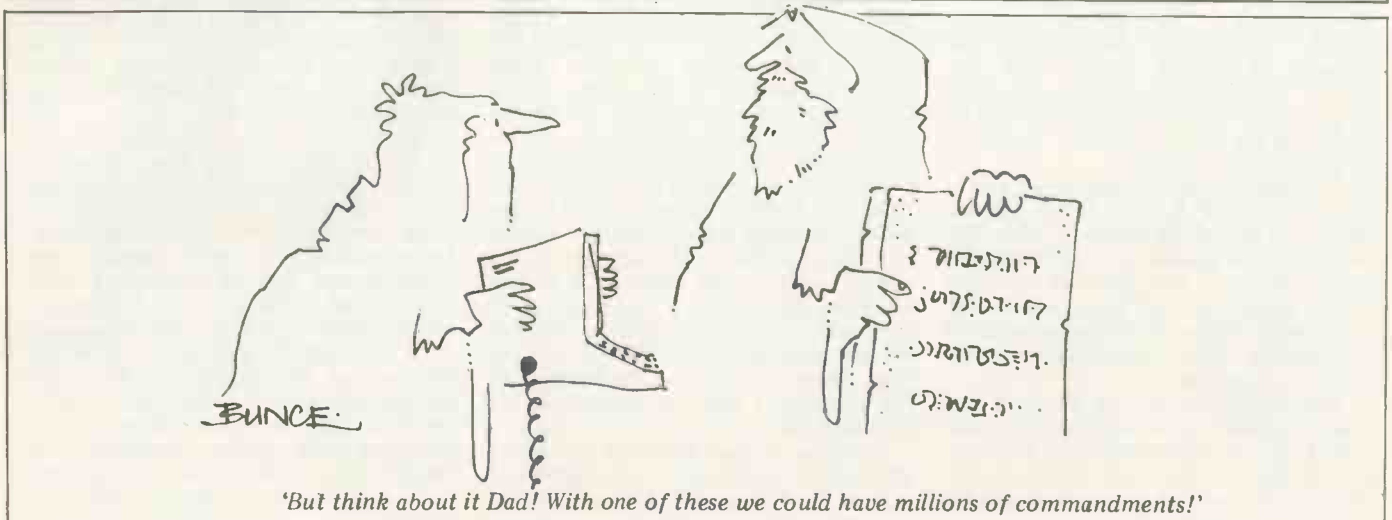
Disk Benchmarks

1	1.0
2	7.0
3	18.0
4	9.0
5	17.0

All timings in seconds. For an explanation and listing of the Benchmark programs, see PCW Vol 4 No 11, November 1981.

Technical specifications

CPU:	HD6809P
RAM:	32k dynamic
ROM:	24k
Disks:	Optional, maximum 4 drives, 80k per drive (single sided, single density).
Cassette:	600 baud (cassette recorder optional)
Serial Port:	RS232, bidirectional
Parallel Port:	Centronics style.
Screen:	25 rows of 40 or 80 characters. Graphics resolution up to 640x200. Light pen interface included (light pen optional).
Keyboard:	87 key
Languages:	Level 3 Basic (others available)



'But think about it Dad! With one of these we could have millions of commandments!'

GETTING TO THE ROOTS

Bev Mason presents a compact equation solving routine in Basic.

Many of us spend years at school learning how to solve algebraic and trigonometric equations in all their simple, simultaneous and quadratic varieties. The examples from the text books always seem to have the most beautifully simple integer solutions. Yet, when we enter the hard world to earn a living, the equations we are called upon to solve, those of us, that is, who chose to follow engineering and similar professions, are invariably monstrosities. By monstrosities I mean something like, for example:
$\mathrm{Sin}(3x^5 - 2x^3 + x^2 - 15) = 4x^2 - (x^2 + 3)^{1/2} - 5$; an example, by the way that is pure invention.

Such expressions can be tackled by methods of trial and error, or successive approximations, which tend to be very tedious exercises, particularly if a high degree of accuracy is required. Another method is to plot the graph of the function $y = f(x)$, where $f(x)$ is obtained by manipulating the original equation so that everything lies on one side of the equals sign, thus:
$\mathrm{Sin}(3x^5 - 2x^3 + x^2 - 15) - 4x^2 + (x^2 + 3)^{1/2} + 5 = 0 = y = f(x)$

By calculating y for various values of x and plotting the graph of y against x we can find the value, or values, of x for which y = 0. Such values are the required solutions. They are the values of x where the graph line crosses the x axis.

When it comes to tedium, this medium lacks nothing, and the accuracy leaves much to be desired. Fortunately, it is a simple matter to program a computer to calculate y values by the score ready for plotting. About three program lines would be needed. It seems an obvious next step to let the computer plot the graph and determine where the line crosses the x axis. However, this is not as simple as it appears. Microsoft Basic, which has been used for the program at the end of the article, has a POINT function which will 'look' at any graphic block on the screen and return a signal if that block has been 'lit'. By looking in turn at each block along the x axis one could soon determine the value, if any, at which the graph touched it. One would have to refrain from plotting the x axis itself, of course, otherwise all the blocks would be lit.

There are several reasons why this will not work. The Video-Genie, for which the program was written, has 128 graphic blocks across the screen. Many micros have less. Therefore, the value of x where the graph touches the x axis can be no more accurate than 1/128 of the distance or difference between the smallest and the largest plotted values of x. If the answer is required to an accuracy of (say) four places of decimals and it is known only that it lies between (say) 0 and 100, one would have to use a program something like this:

```
10  P=0:    Q=0.0127
20  FOR X = P TO Q  STEP 0.0001
30  Y = F(X)
. . . . . . . . . . .
100 NEXT X
. . . . . . . . . . .
150 P=Q: Q=0.0127 + Q: IF X<100 GOTO 20
```

The missing lines would include the instructions for clearing the screen, plotting the graph, and the POINT function, etc. But why use the latter function? Why not include a test such as if Y=0 PRINT X, X being the required answer? The reason is that computers have a limited accuracy. When the correct value of x is reached in the loop the calculated value of y is unlikely to be *exactly* 0. It *may* be zero, but one cannot guarantee it.

Also, the step of 0.0001 in x may be too large. One value of x may yield a negative y while the next value yields a positive y; the graph shooting through zero in between. As there would be no graph point actually plotted on the x axis, the POINT function would not work either. One could perhaps overcome this obstacle by testing each value of y to see if a change of sign occurred. If a change occurred between x1 and x2, these values could then be used to replace the original values of 0 and 100, in effect magnifying the significant part of the graph. The process could be repeated as often as required. There would still be no guarantee that y would ever exactly equal zero or that a point would be plotted on the x axis. However, an answer could be calculated to any required degree of accuracy. A version of this system is used in the final program.

If the answer were around the 50 mark, the program above would have to calculate y about half a million times, a time-consuming exercise. And it could still miss the answer! Between two successive values of x, the graph might touch the x axis and hurry away again without changing sign, or it might cross the axis and cross back again. In the latter case, two answers would be missed.

A further difficulty arises with the scale of y. There can be any calculated value for y, of course, but the computer can only vary the plotted points in unit steps. It must therefore round the calculated values to fit in with the chosen scale. If y approaches zero gradually, many values could be rounded to zero and plotted along the x axis, producing false answers.

All of these difficulties can be overcome, and doubtless have been, by using a sufficiently complex program to produce answers automatically. However, the program which follows is relatively short and simple and is capable of solving equations to any degree of accuracy within the capabilities of the particular computer used. It does require attention from the operator.

The program

It is assumed that the operator, knowing the source of the equation, will be able to estimate the lowest and highest values of x within which the solution lies. This is not essential but it shortens the procedure. These values should be typed in, at lines 10 and 20, during the RUN. Before RUNning, however, line 110 must be edited and f(x) replaced with the function to be solved.

Lines 30 and 40 draw the x axis on the screen. As mentioned above, the Video-Genie display is 128 blocks wide, hence N = 0 to 127. The display is 48 blocks from top to bottom and the origin of the plot is in the top left hand corner, ie, x values are plotted from left to right and y values from top to bottom. A line across the centre of the screen, the x axis, occurs therefore at y = 23.

Lines 50 and 60 divide the x axis into four equal segments, putting five 'pips' under the line.

Lines 65 to 90 assign values to the pips. The lowest value chosen for x is printed under the left hand pip. The values under the remaining pips increase equally, until the highest value of x is printed under the right hand pip. The values are printed at the bottom of the screen, rather than immediately under the axis, to avoid obliteration by the graph points. The semi-colon in line 90 prevents scrolling each time a number is printed.

The x axis is divided into only four segments so that the five numbers do not overlap. The Video Genie display is 64 characters wide so that five twelve-digit numbers, including the sign, can be printed with a space between. The number of segments could be increased by printing the numbers alternately on two lines, allowing them to overlap. In practice, the four segments seem to be adequate.

Lines 95 to 140 calculate the y values and plot the points. Line 95 sets the interval between the x values, the smallest interval possible with the Video-Genie being 1/128 of the span. Plotting 128 points is time-consuming. Increasing the space between points reduces the time but increases the chance that the y value may cross the x axis and return without being registered. The interval must of course relate to the divisions on the x axis. An interval of 1/26 of the span has been chosen as a suitable compromise.

If the value of y lies outside the range of −24 to 23, the graph point will lie outside the display and the RUN will end on an error. Line 120 checks the y value and repeatedly divides by 20 until the value is acceptable.

As described above, when the value of y approaches zero the points tend to be plotted along the x axis itself, making it impossible to detect the correct answer. Line 125 detects y values close to zero and repeatedly magnifies them by 20, making it easy to identify the crossing point. If y should equal zero, of course, its value is unaffected.

Because of the distortion introduced by lines 120 and 125, the resulting graph bears no resemblance to the graph of the function. This is not significant, as we are concerned only with zero values of y.

Line 130 plots the points in the display. It would normally be SET(X,Y). However, if X were to be used instead of N all the 27 points would be plotted in the left hand quarter of the screen. Using N, and increasing it by four each time, spreads the points so that they occupy the correct positions relative to the scale. The plot has to use 23-Y instead of Y in order to shift zero y from the top left corner of the display down to the x axis.

Lines 150 to 170 hold the display until the operator is ready to continue, which he does by pressing any key and entering new values on either side of the point where the graph crosses the axis. The graph remains on display while he is doing this. The process is continued until a sufficiently accurate value of x can be read off. If the process is carried on long enough, the interval between XL and XH becomes so small that the computer cannot divide it (without going into double precision arithmetic) and identical figures will appear at two or more points along the axis. This does not affect the result.

Pushing the computer to the limits of its accuracy can produce other strange effects. When the difference D in line 65 becomes very small, the increment S in line 100 becomes virtually zero, or is rounded down to zero, so that the loop becomes endless. The plot would go off the screen and the computer would stop on an error. To avoid this, N is tested in line 140 and the program exits from the loop if N exceeds 127.

In entering the lowest and highest values, XL and XH, it should be realised that the computer will calculate and plot Y for 25 values of X between these limits. If XL is negative and XH positive, it is possible that one of the 25 values could be exactly zero. It is vital therefore to inspect the equation for elements which could result in division by zero, or become infinite, such as cotangent x. Where such elements are obvious it is better to enter the positive and negative values as separate exercises, avoiding zero, eg, rather than enter XL = −10, XH = 15, enter XL = −10, XH = −0.00001 and XL = 0.00001, XH = 15.

Even where there are no obvious divisions by zero, this fault can still occur. A trivial example would be 1/(x−1) which would trip out at x = 1. Also, similar difficulties can be encountered in the ROM programs for calculating trigonometric functions or logs, etc. In these cases the difficulty can usually be overcome quite simply by making slight alterations to the values of XL or XH or both. If this does not work, the interval between XL and XH will have to be subdivided and separate entries made.

Further difficulties can be encountered with negative numbers when the expression contains fractional powers, roots and logs, etc. Nevertheless, it is usually possible to obtain at least one solution, any missing solutions being complex numbers which cannot in any case be evaluated by this graphical method.

The Video-Genie will provide answers to six significant figures without recourse to its double precision arithmetic facility, as is illustrated by the following two examples.

A monstrous solution

Before solving the monstrosity invented in the first paragraph, let us try a more homely example:

$6x^5 - 4x^4 + 3x^2 - 8x - 10 = 0$

Because the highest power of x is five, there will be five solutions. Complex roots always occur in pairs so that there must be at least one real answer. The possibilities are one real and four complex, three real and two complex, or all real. Two or more real roots may be equal. In practical applications, the operator will have some idea of the range of values within which the solution will lie. This is not so with this theoretical example, so we try (say) −100 and +100 for XL and XH respectively.

The screen shows that the plot crosses the x axis at a point just higher than zero. We therefore re-enter XL and XH with values 0 and 10 and see that the crossing point lies between 0 and 2, which values we enter next. The narrowing down process continues fairly rapidly with the following pairs of values (this is an actual example) (1.25, 1.4), (1.37, 1.38), (1.377, 1.3775), (1.37705, 1.37708), and we read the answer 1.37707.

To solve the original equation we edit Line 110 to read Y = SIN(*X^5−2*X^3+X^2−15)−4*X^2+SQR(X^2+3)+5. (Note that X^5 means X raised to the fifth power.) Again, we have no idea where the solution lies, so we try −100 and 100 and note that the plot crosses the axis twice, at a little less than zero and a little more than zero. In order to get a little closer we enter −10 to 10 followed by −2.5 to 2.5. At this point we can see that the crossing points are about −1.25 and +1.25. Dealing with the negative value first we enter (−1.2, −1.2), (−1.285, −1.275), (−1.281 −1.28), (−1.2805, −1.2804), (−1.28046, −1.28044) and find the first solution −1.28045.

To find the positive solution we enter 1.2 to 1.3 and find with this increased magnification that there are in fact two crossing points at approximately 1.25 and 1.29. Continuing as above, we enter another four pairs of numbers, finishing with 1.24708 and 1.24712. We read the second solution as 1.247115, where the final 5 is estimated from the scale.

A further four pairs of numbers ending with 1.29437 and 1.29439 give the third solution as 1.29438.

If on entering the original values of −100 and 100 the plot did not cross the x axis, there are the following three possibilities. The range of values covered was not sufficiently extensive. The range was too great, allowing the Y value to cross and re-cross the axis between the plotted points. All the solutions are complex. A small amount of trial and error is indicated.

```
10   INPUT "LOWEST VALUE OF X"; XL
20   INPUT "HIGHEST VALUE OF X"; XH
30   CLS: FOR N = 0 to 127
40   SET (N,23): NEXT
50   FOR N = 1 TO 105 STEP 26
60   SET(N,24): NEXT
65   D = XH-XL
70   FOR N = 0 TO 4
80   X(N) = XL+N*D/4
90   PRINT @ 960+13*N, X(N);: NEXT
95   S = D/26: N = 1
100  FOR X = XL TO XH STEP S
110  Y = f(X)
120  IF Y>23 OR Y<-24 Y = Y/20: GOTO 120
125  IF Y<1 AND Y>-1 Y = 20*Y: GOTO 125
130  SET(N,23-Y)
140  N = N+4: IF N<128 THEN NEXT
150  PRINT @ 0, "PRESS ANY KEY TO CONTINUE"
160  A$ = INKEY$: IF A$ = "" GOTO 160
170 GOTO 10
```

The program requires about 0.5K of memory.

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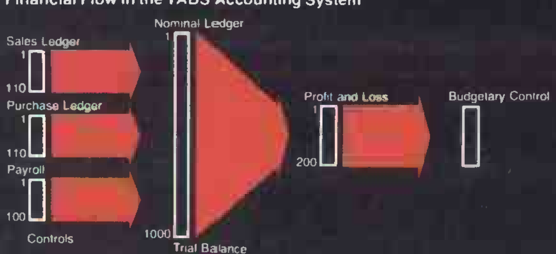

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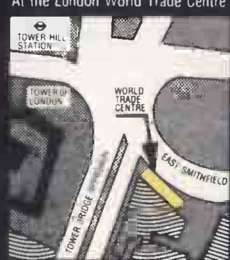

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APPLE III

Apple II was a very hard act to follow. It may not be the biggest-selling micro (the ZX81 has pipped that title), but it's certainly the best-known and possibly the best-loved micro so far. It has put its inventors at the head of a multi-million dollar company and made the US stock market take microcomputing very seriously indeed. In fact, the US micro industry is growing more and more to rival the music business for the rapidity with which fortunes are made from smash hit product; surely it will not be long before *InfoWorld* (our industry's *Billboard*) begins to publish a software Hot 100.

Apple's problem, then, was the perennial one of following up a hit single. With so much to live up to, it was almost inevitable that the critics would express disappointment at anything which fell short of the miraculous, and when a premature launch in 1980 revealed a crop of hardware problems the word went out that Apple III is a loser. Having finally got my hands on the relaunched model, I can appreciate the industry's difficulty in enthusing over Apple III but I can't agree with the assessment. The machine's virtues are of a subtle rather than revolutionary kind; the hardware is recognisably a gradual development from Apple II rather than a leap into the 16-bit maelstrom, but the operating environment is a considerable advance on current personal computer standards. It appears to have been influenced more by the latest trends in computer science than by the commercial and business sectors and, like its illustrious predecessor, it has the potential to fill a broad range of applications rather than being a single-purpose machine.

Hardware

The Apple III is based around a single 6502B processor (2 MHz), with Apple-designed support circuitry to allow extended memory addressing. The standard machine comes with 128k of RAM which can be expanded on the main board to 256k without using up any of the expansion slots. Only 4k of ROM are present, containing a bootstrap loader and diagnostic routines, as the system is entirely disk-based.

To a casual glance the computer may look like an integrated unit; in fact, the monitor is separate but cleverly styled into a unified line. The computer unit is a little larger than Apple II, and includes a single 5in disk drive and a non-detachable keyboard. A truly massive alloy casting provides the main frame for this unit, with only a top cover and keyboard fascia being fabricated in regulation Apple beige plastic. This mass of metal is not merely to provide structural rigidity — its main function is to act as a heat sink, since no fan is fitted, and its secondary purpose is to shield RF emissions. The rear face has heavy finning cast into it; after half an hour of use the whole body becomes lukewarm but it never exceeds this temperature, even when left on overnight.

The rear of the case also displays seven assorted I/O ports; a disk drive interface, two joystick ports (A and B), an RS232 port, and outputs for monochrome and colour video and audio to an external amplifier. Joystick port A also doubles as an output to the Silentype printer. The RS232 port has programmable baud rate and handshake protocols.

Access to the internals is easy since the top case removes via two ¼-turn aircraft-type fasteners but, once inside, little is revealed as the electronics are buried at the bottom of a very full enclosure. The main board fills the whole case bottom and the RAM inhabits a piggy-back board under the keyboard section. By virtue of using 64k RAMs, all the 256k of expansion memory can fit on the piggy-back board; access for maintenance is, in fact, performed from underneath the case and Apple issues a strong warning that this is out of bounds to users. The only free space inside the case is devoted to the four Apple II-style 50-pin expansion slots provided for peripheral cards, including the Profile hard disk controller.

The on-board disk drive is a 5in 143k single sided, double density unit like the Apple II units, and up to three external drives may be daisychained via the interface socket. The 5Mb Profile hard disk does not use this socket and four of these could be supported in addition, the only strain being imposed upon your bank account.

Monitor III is a 12in green screen monochrome monitor with a maximum resolution of 560x192 and the ability to display a 16-step grey scale (see photograph) which allows the colour graphics facilities to be used. The unit I tested was made by Hitachi, though the Apple literature refers to it as the Sanyo monitor; presumably Sanyo makes them too. It sits neatly on top of the computer case though it has its own power cable and on-off switch and connects to the video socket via a coax cable. The display is sharp, steady and legible in most lighting conditions, thanks to a non-glare filter on the screen and a contrast control on the front panel. To obtain a colour display you have to supply your own colour monitor.

The keyboard has 74 keys, 13 on a separate numeric pad, and is a considerable improvement over the Apple II in having four cursor control keys and the reset safely tucked away in a recess in the top edge of the unit. The keys are nicely shaped and have a positive feel, but it is by no means a luxuriously equipped keyboard by current standards, lacking as it does a delete/rubout, clear/home and other editing keys and the now mandatory row of programmable function keys. Instead, Apple has chosen a different route; the whole keyboard is software defined and its layout is stored in a file in the operating system. Two special keys marked with an open and a solid Apple symbol act as modifying keys in addition to SHIFT, CONTROL and ESCape. By preparing alternative layout files, the functions of the various keys can be altered under program control if desired; or, more practically, an azerty layout for continental European users can be provided. In the standard layout all keys auto-repeat at 11 chars/sec when held down; if the 'closed Apple' key is also depressed this speeds up to 33 chars/sec.

A very superior feature of the keyboard is the type-ahead buffer which accepts up to 128 characters when the computer is too busy to process them. This allows you to type at full speed to programs whose slowness would normally force you to wait for a prompt. Type-ahead input is terminated by the first carriage return. My main complaint about the keyboard is that the cursor keys are set lower than the rest and in an 'L' shape at the bottom right hand corner, which makes the backspace unreachable when touch-typing.

One curious, if trivial, fact emerged during the test. Apple III is a very quiet computer since it has no fan and, during the still of the night, I noticed that it makes a noise while it is processing! It emits a very faint buzz *only* while a program is running; it starts with RUN and stops when the prompt returns to the screen. I like to imagine that it is the sound of bits being crunched, but no one so far as satisfactorily explained what device is responsible.

Software

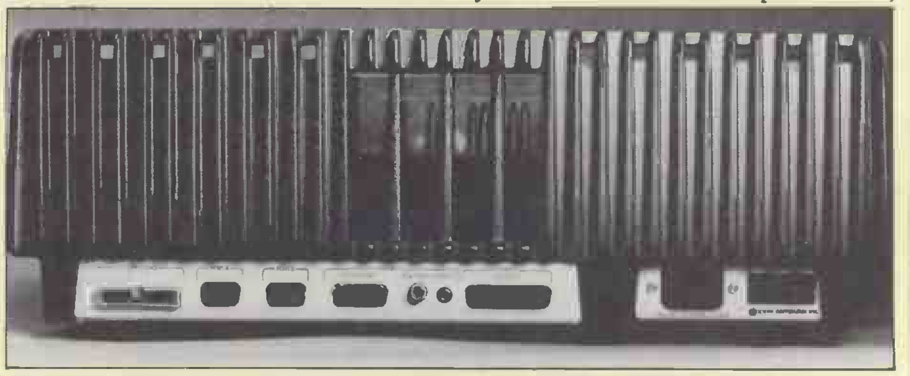
The story of Apple III is very much the story of its operating system, SOS (for Sophisticated Operating System, not Save Our Souls). Rather than follow the herd and opt for CP/M on its second machine, Apple decided to write its own system and I suspect it is from this that much of the adverse reaction has arisen. (Incidentally a Z80 Softcard is planned by Microsoft to allow CP/M to be run.) Leaving aside the commercial wisdom of the decision, I can report that SOS is much more rational and graceful in operation than CP/M, though it is no less intimidating to an end-user.

The design of SOS is heavily influenced by UCSD Pascal and by Unix; the philosophy of SOS is to provide a completely uniform environment for all the languages and all the devices supported by Apple III.

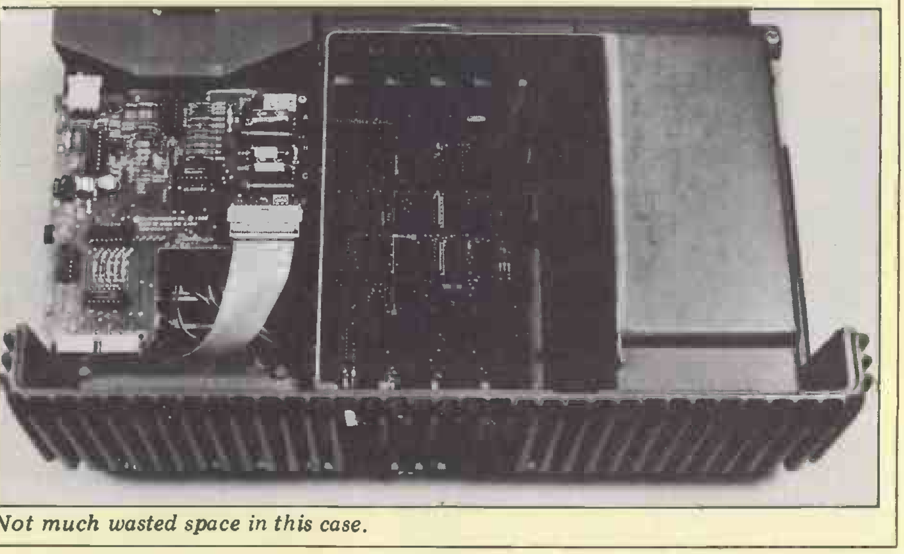
The legacy of Unix is the concept of hierarchical directories. Files may be organised under sub-, sub-sub-directories and so on to any depth necessary. For instance, a customer Smith's file may sit on a volume called ACCOUNTS under a main directory heading PURCHASE in a sub-directory called CARPETS. To inspect Smith's file you would specify the 'pathname' /ACCOUNTS/PURCHASE/CARPETS/SMITH which leads you down a unique path in the branching tree of files. A volume may have 51 main directory entries and 1663 files per sub-directory, which ought to be enough. At first sight it appears as if a lot of typing is necessary (file and directory names can have up to 15 characters). However, a facility called the PREFIX can save a lot of effort. By setting the PREFIX to /ACCOUNTS/PURCHASE/CARPETS/ you can access any customer file in this directory by merely typing the name, eg, JONES. On the other hand, if you set the PREFIX to /ACCOUNTS/PURCHASE/ then you could look at customers of other goods by typing FURNITURE/HIGGINS or DRAPERY/WILSON. In other words, you can focus in on an area of your files where you are currently working. Of course, any file in another part of the system can be accessed at any time by typing its full pathname. This arrangement means that, to SOS, it is of no consequence whether you are using a 140k floppy or a 5Mb winchester — all SOS wants to know is the pathname. The advantage of this system will only really emerge on large storage devices like Profile where the file structure just 'grows' into the available space by using extra directory levels.

The legacy of UCSD is that all devices attached to the Apple III are treated as files. SOS recognises 'character' devices such as printers, the keyboard and the VDU and 'block' devices which are floppy or hard disk units. Block devices have a volume name as well as a device name; for example, the built-in floppy drive is device .D1 but the volume name attaches to the disk in the drive, eg, ACCOUNTS. When specifying the pathname of a file, either the device or the volume name may begin it. Unlike CP/M, SOS automatically logs the volume name of a disk in a drive and so it will search all the drives present for a named volume; it can also prompt you to put a named volume into a certain drive. If you move a volume to another drive, SOS still finds it, which removes the source of a lot of annoying BDOS ERRORS and reboots under CP/M. While on this subject, SOS has over 60 error messages which are in comprehensible English; for example, 'Invalid Pathname' or 'Interpreter File not found' or 'Disk drive not present/not configured'. More important still, SOS invariably fails gracefully when these errors are encountered and allows you to try again in a correct manner without a reboot. The boot ROM performs RAM, ROM and various other hardware tests on power-up and can display certain diagnostic messages in the event of failure.

SOS is composed of three modules, all of which must be present on a bootable disk. The system is always booted from .D1, the built-in drive. SOS.KERNEL contains the nuts and bolts interface to the computer, including the management of the paged memory. SOS.INTERP contains a Pascal p-code interpreter (most of the system software is in compiled Pascal)



Not a toaster peripheral but the rear of Apple III.



Not much wasted space in this case.

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APPLE III

plus the appropriate language interpreter (eg, Basic), while SOS.DRIVER contains a selection of device driver programs to drive peripheral devices. This latter module can be configured to the user's needs by one of the utility programs and is roughly equivalent to CP/M's BIOS. These three modules typically occupy over 60k, which isn't disastrous with 128k of RAM to play with as you usually have around 50k left for its application programs. However, it reduces the available space on a floppy to less than 80k for a boot disk, which leads to inconveniently large numbers of disks being handled. For serious business use, the Profile would be almost obligatory. Another consequence of the obesity of SOS and the anorexia of Apple floppies is that the System Utilities cannot inhabit a work disk as they can under CP/M. The Utilities disk is filled to within a block of its 140k capacity. Whenever formatting, copying, file management or system configuration is required this disk must be inserted and booted. All the utilities operate through similarly formatted screen menus and I have to admit that they are superbly designed. The top part of the screen contains instructions from SOS plus a menu of options or files to be worked on, one of which is highlighted in reverse field. To choose an option, either type in a single initial letter or use the ↑ cursor key to move the highlight and press return. The bottom of the screen contains your instructions to SOS which initially are set to defaults which SOS thinks are what you most likely wish to do, such as Copy from .D1 to .D2. You can edit these lines to what you want with full use of insert and delete; if you use menu options the names are typed for you by SOS; if you get in a mess you can restore the defaults with a single keystroke.

The main menu offers the options of Device Handling, File Handling or System Configuration. Device Handling leads to a menu offering disk formatting, volume copying (ie, backing-up) and listing devices (and volumes) in the system which in turn lead to further menus. At any point you can go deeper by pressing return to accept the default/edited line or retreat using ESC to the previous menu level. The Filer offers listing of directories, creating new directories, copying, renaming and deleting files, file protection status and setting the time and date (all SOS files are automatically date-stamped with a creation date and date-last-modified).

System Configuration consists of choosing which device drivers you need on a particular boot disk and forming a new SOS.DRIVER file for it. A new SOS system is then generated and put onto the disk. In addition, certain device parameters can be set up, such as for a new type of printer. The standard drivers are .CONSOLE, which is always required, .PRINTER or .SILENTYPE, .GRAFIX, to allow use of the hi-res graphics, .RS232 and .AUDIO for the sound generating facility. The four floppy disk drivers are built into SOS. KERNEL. A driver may be made inactive, in which case it is still there on a disk but is not loaded on bootup; you could have two drivers for different printers and activate the appropriate one when required. Drivers for new peripherals will be supplied on a disk when you buy the device.

The level of help and error trapping throughout these utilities makes them fast and enjoyable to use and puts to shame any other single user personal computer operating system I've had dealings with. A quite inexperienced user can set up a new system configuration with ease, given the driver programs.

SOS may be interrogated from within the various languages by system calls to discover the status of devices or to change parameters like the size of the type-ahead buffer or the screen display width or scrolling area. Such calls are usually optional, however, as the job can be done through invokable modules. A nice touch is that a formatted disk can be scanned and the numbers of bad sectors listed, which allows uncorrupted files to be moved to a good disk.

The principal disadvantages I found in SOS are that a frightening number of different file types are supported (14, if you include UNKNWN!) and that, despite the provision of PREFIX, it is still more wordy than most rivals and gives you lots of typing practice. For instance, to list a program under Basic on the printer involves OPEN#1 AS OUTPUT .SILENTYPE: OUTPUT#1: LIST by dint of its regarding the printer as a file.

Basic

The Basic provided for Apple III is *not* Applesoft but a new Business Basic (though Applesoft programs can be run in emulation mode: see later). This is quite like Microsoft V 5.0 but with a number of interesting extra features.

To my great disappointment, the editing facilities are little better than those on Apple II: to edit a program line you have to press ESC to enter edit mode, move cursor to the line, leave edit mode, retype the line using → and then overtype the alterations. There is no insert facility. The manual suggests that you may wish to use the Pascal text editor to write Basic programs and I fully concur. No AUTO line numbering is provided but DELete is and RENUMbering is available through one of the Invokable Modules (see later). Tracing is possible via TRACE/NOTRACE.

Control structures are normal, with the addition of a (single line) IF. . . THEN. . . ELSE but not WHILE. . . WEND, and the very useful ON KBD GOSUB or GOTO, which allows branching on any key being pressed. KBD is a system variable which holds the ASCII value of the last key pressed. This is a deferred command — ie, the program continues executing past the line containing it until a key is pressed; consequently, it must be reset before it can be used again. Similar structures are ON ERROR. . . for error trapping and ON EOF. . . for reading files.

Variable names can have up to 64 characters, all significant, and four types are supported. Reals have 6-digit mantissas and a range of $10^{\pm 38}$ stored in five bytes, Integers have the suffix % and a range ±32768 stored in three bytes, while Long Integers hold 19 digits, the suffix & and occupy nine bytes. The significance of long integers (a borrowing from UCSD Pascal) for business programs is that all calculations can be done in pence using them and all rounding errors are thus avoided.

Strings have the usual $ suffix and the string functions INSTR$ and SUB$ for substring searching are included as well as the more usual ones. Arrays of any number of dimensions are allowed.

Formatting of displayed output is performed by an extremely powerful PRINT USING statement which uses the additional statement IMAGE to hold a string of 'specs', eg:

```
100 IMAGE 6A,5#,#.6Z4E
200 PRINT USING 100 . . .
```

The various letters and symbols in the IMAGE line specify left or right justification, centering, number of characters in a field, spaces, carriage returns, leading zeros, asterisk fill, and even the insertion of literals into the formatted output. For purely numeric output, fixed point, scientific and engineering formats can be specified as well.

CATALOG [pathname] will list directories or sub-directories and files without having to enter SOS. Both random and sequential files are supported using OPEN#, CLOSE#, CREATE, INPUT# and PRINT#; a nice facility is TYP which returns the type of the next data item to be read.

Interfacing with machine language is rather unorthodox in Business Basic as there are no PEEK, POKE, CALL or USR facilities. Instead, external functions and procedures are supplied as 'Invokable Modules' which are stored on disk and loaded by the statement INVOKE [name]. Once loaded, the various functions in the module can be used from a Basic program by PERFORM [procedure name] or EXFN [function name]. The hi-res graphics reside in such a module called BGRAF. INV as does the renumbering program RENUMBER.INV. Other modules include READCRT, which reads the contents of a screen location, DOWNLOAD, which loads a new character set, and REQUEST and VOLUMES, which list devices statuses and volumes present. Included in REQUEST are procedures FILREAD and FILWRITE, which read or write a specified number of bytes directly from a file. When invoked in a program, the module procedures usually require a list of parameters which can be constants, variables or addresses of variables. The first time I invoked RENUMBER and tried to use it I discovered that it took about eight parameters of different types and hastily concluded that it was a real pain to use. Eventually I discovered, however, that each of the supplied modules has two supplementary files, e g. READCRT and READCRT.DOC; the DOC file being a text explaining how to use the package and the other being a version in Basic which can be run from the keyboard rather than invoked in a program, and which is invariably menu-driven. None of this is explained in the manuals, probably because the modules were introduced late and are self-documenting once you know about them!

All of the .INV modules have the filetype PASCOD, which indicates that

APPLE III

they are in p-code, although the manuals imply that they are in Assembler.

Pascal

I really should have discussed the Pascal before the Basic; only tradition prevented me. In many ways, Apple III is a Pascal machine in that the operating system uses many Pascal-like features and is partly written in Pascal, and even the Basic has many features imported from Pascal. In particular, the system of Invokable Modules means that many facilities such as the graphics are shared by both languages.

The version of Pascal adopted is UCSD Pascal 2.1 and, not presuming to be an expert in the system, I can do little more than describe its non-standard features. This was, in fact, my first encounter with UCSD and I was surprised to find the environment much less severe than I had feared; not much harder in fact than an interpreted language. The system has three main levels, the command level, the editor and the filer. At each level the top line of the screen displays a menu of available commands, only the first letter of which need be typed. From command menu you get into the editor, which is very easy to use. It is a screen-oriented affair with insert and delete and the capability to copy large chunks of text via a buffer which holds deleted text. It also assists with the indenting of program text by remembering the margin spacing. Once your source program is ready it is stored in your workfile, you return to command level and hit C for compile, whereupon your program is compiled to p-code. When you run the p-code file it is interpreted into 6502 machine code. The Compiler feeds you with information on the size of the compiled code and any errors encountered. The filer offers the same file management facilities as the SOS Filer, which is in fact just a tarted-up version of it. Also included in the system is a macro assembler and a library of pre-compiled units which can be linked into or called from programs. The system is supplied on three disks, but creating a work disk with a sensible amount of space requires juggling the components around and creating a two-stage boot system with SOS on a separate disk.

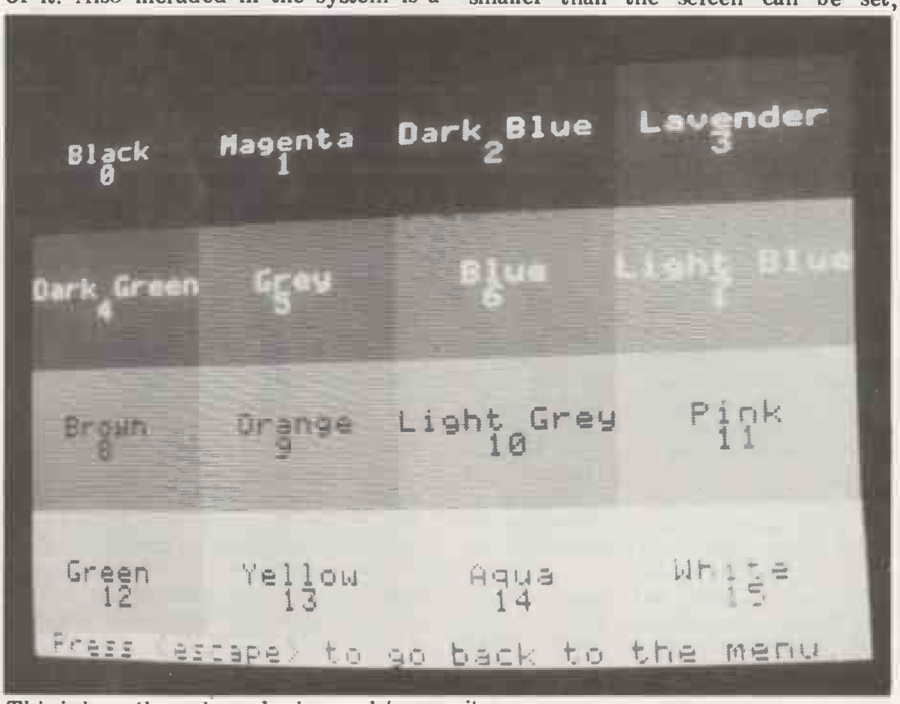
Apple III Pascal has some extensions to UCSD 2.1; in particular the floating point maths is upgraded to meet the IEEE standard. Unfortunately, I was unable to run the *PCW* Benchmark 'maths' because the SIN and EXP functions are not in the main language but in library units called REALMODES and TRANSCEND. After adding a USES statement to link these modules, the compiler kept insisting that they were not in the library and, as performing a library map showed no sign of them, I gave up.

Other additions to the standard include the datatypes Wordstream and Bytestream, which effectively allow the creation of arrays whose size is defined at runtime, Treesearch, which performs a fast search for an eight-character name in an alphabetically ordered binary tree and a group of byte-level routines to fill, move and search blocks of memory. Also added is an 'Otherwise' clause for the Case statement.

Graphics

The simplest of Apple III's graphic modes is the text mode, which is the normal operating mode. Even in this mode there are a number of options. Four different character sets are stored on disk and can be loaded by the module DOWNLOAD.INV. Two of the fonts, APPLE (the style used for the company logo) and BYTE are so fancy that they render text virtually unreadable, but ROMAN, which has square serifs, is rather pleasant.

Three different text modes are available, namely 0, which is 40 character/line, black and white; 1, which is 40 char colour; and 2, which is 80 char black and white and is normally set on boot-up. These can be selected from Basic or by system calls. A scrolling area smaller than the screen can be set, cleared or reset either from Basic or by sending an ESC code to the console driver.



This is how the colours look on a b/w monitor.

The high resolution graphics are obtained through the invokable module BGRAF.INV (PGRAF Unit in Pascal), which contains a variety of routines to draw lines, set colours, fill areas and define shapes. To use the graphics the driver must be first opened with OPEN#1, .GRAFIX, then BGRAF.INV is INVOked and then the various instructions can be PERFORMed.

Four graphics modes are available: 280x192 in restricted colour or monochrome; 560x192 in black and white only; and 140x192 in 16 colours. On the Monitor III the colour modes show in shades of grey. Each mode uses two buffers so that two separate screens can be drawn and displayed alternately, allowing animation effects. The graphics routines work fast enough to produce reasonable effects, as witnessed by the galloping horses in the demo package. GRAFIXMODE selects a mode and buffer to display, while GRAFIXON switches from text to graphics mode and displays the buffer. TEXT returns to text mode. Text can be freely mixed with graphics, using either the current system character set or a user-defined one.

Two sorts of plotting command are available, those which use absolute screen coordinates (DOTAT, LINETO, MOVETO) and those which plot relative to the last point plotted (DOTREL, LINEREL, MOVEREL). The latter would make implementation of Turtle graphics a snap.

A very sophisticated system exists for colour control. As well as defining the background colour and 'pencolor' (ie, the colour plotted), it is possible to define relationships between colours which overlay one another. The command SETCTAB (%11,%8,%9) means 'wherever pink is placed over brown make the result show as orange', which is invaluable for drawing maps or circuit layouts, as well as being a lot of fun. Also, by using the so-called 'transfer options', a bewildering variety of Boolean operations can be performed between back and foreground colours, eg [NOT foreground] XOR background. If you can fathom them, these allow figures to be transparent or opaque and give many other effects.

The shape-defining routine is surprisingly crude by comparison; it sets up a bit map of the shape represented in a (decimal) integer array and allows it to be placed anywhere on the screen (but not scaled or rotated). It is a real pig to use as the principal command, DRAWIMAGE, takes six parameters, one of them an array address. A related routine NEWFONT is used to define character sets; I wish you the best of luck but I'll stick to Sirius's EDOT, thank you.

Finally, GLOAD and GSAVE allow you to preserve screen images as disk files (type .FOTO) and reshow them later.

Apple II emulation

Apple III can be persuaded to think it's an Apple II to run the vast number of programs which have been produced over the years for the earlier machine.

On booting the emulation disk, a menu is displayed which allows certain limited configuration options to be chosen. The default is a 48k Apple II Plus with 16-sector disk, Applesoft Basic and a serial card, but you could choose Integer Basic and set various printer parameters to suit the program you wish to run.

There are some limitations to the emulation: no programs which require support from a language card can be run and hi-res colour graphics cannot be displayed on an RGB monitor. Pascal programs written for Apple II can be recompiled on the III as it can read the source disks. Another problem is that the keyboards produce some different codes; a table in the manual shows where unexpected results may occur.

This feature should be very attractive to Apple II owners who wish to upgrade and already have an extensive software library, and it makes a lot of commercial sense in the US where an ocean of Apple II software exists.

Documentation

To call this documentation comprehensive would be an understatement. I had no fewer than eight manuals: Owner's Guide, Standard Device Drivers Manual, Business Basic vols I & II, Pascal Introduction Filer and Editor, Pascal Programmer's Manual vols I & II, and Pascal Program Preparation Tools. All are well-written in a friendly but authoritative style and are nicely produced in spiral binders. Just about everything you want to know is in there somewhere. The only exception I know of is that the Basic invokable modules apart from BGRAF are not covered. However, it is often the case (as with the Apple II manuals) that you don't know which volume to look in. . . Each book has a good index but an overall index would be a great help with a library of this size in which some subjects like SOS are spread among different volumes.

There is, in addition, an SOS System Reference Manual, presumably for professional programmers, which I didn't have for the test. Given time to become familiar with it, this documentation is as good as any on the market.

Expansion and potential use

The system as tested could have been expanded to 256k RAM, a Profile 5Mb hard disk (and two more outboard floppies) and a Qume daisywheel printer could be substituted for the Silentype for letter-quality work.

A package called Access III allows communication between Apples via the RS232 or use as an intelligent terminal for timesharing and remote database applications.

Word processing is catered for by a completely revamped version of Applewriter which is far superior to the original (chorus of 'it would have to be!'). As well as supporting an 80-column screen and upper and lower case, it has several of the best features of the Pascal editor, including the delete buffer, which allows you to change your mind if you make an incorrect deletion and also to move small chunks of text without the bother of block markers. A Mail List Manager package makes this into a competitive WP system at last.

Technical specifications

Processor:	6502B (2MHz)
Memory:	128k RAM, 4k ROM
Disks:	Twin 143k 5¼in single-sided, double density
Display:	12in green monitor, 560x192 max graphics resolution, 80 or 40 column text. Comp video & RGB outputs
Keyboard:	74-key ASCII with separate numeric keypad
Audio:	2in speaker with 6-bit DAC
I/O:	RS232, twin joystick, Silentype printer
System software:	Apple SOS
Languages:	Basic, UCSD Pascal, Assembler

Visicalc III is an enhanced version of the famous package, with more extensive editing and conditional branch abilities; it can be used in conjunction with a business graphics package which produces bar and pie charts and performs curve fitting and other plots using Visicalc files if desired.

Other languages promised soon are Cis-Cobol, Trans-Forth and the ALD Assembler, while Fortran must follow fairly soon.

As to the question of who will use Apple III, it should appeal to scientists and engineers for its powerful graphics and the tremendous maths capability of UCSD Pascal. The IEEE floating point includes Affine and Projective modes which can handle arithmetic infinities, as well as improved precision and error checking. A Universal Parallel card is available for instrument interfacing, though I can't say whether this is IEEE — 488 compatible.

Forward-looking programmers ought to love it as the SOS/Pascal environment is very good to work in. This bodes well for a future supply of high quality software once the initial bad press has worn off and sales pick up.

In business, the III would make an excellent management tool for planning and forecasting, the same role which the Hewlett-Packard 125 is aimed at; the hard disk and communications would be a bonus here. It's not as certain how useful it will be to the small business, as it offers very little advantage over a CP/M machine. The pool of ready-made business software is not so large, the floppy disk capacity is small and the hard disk is expensive. Also, although I find SOS superior to CP/M, it is every bit as frightening to the inexperienced end-user — if rather more forgiving.

Apple III would make a very rewarding machine for experienced hobbyists but I fear that, at least in the impoverished UK, it is just too expensive.

Basic Benchmarks

BM1	1.7
BM2	7.2
BM3	13.5
BM4	14.5
BM5	16.0
BM6	27.0
BM7	42.5
BM8	7.5

Pascal Benchmarks

magnifier	4.5
forloop	53.0
whileloop	50.0
repeatloop	44.5
literalassign	63.5
memoryaccess	65.0
realarithmetic	70.5
realalgebra	61.5
equalif	82.5
unequalif	81.0
vector	144.5
noparameters	39.0
value	42.5
reference	43.5
maths	—

Prices

Apple III with Monitor III, SOS, Business Basic, Apple II Emulation and Manuals	£2545
Additional floppy drive	£385
Silentype printer	£222
Qume Sprint daisywheel printer	£1640
Profile 5Mb winchester drive	£2256
Pascal	£150
Visicalc	£150
Universal parallel interface	£135

All prices exclude VAT; all products except Qume include one-year warranty.

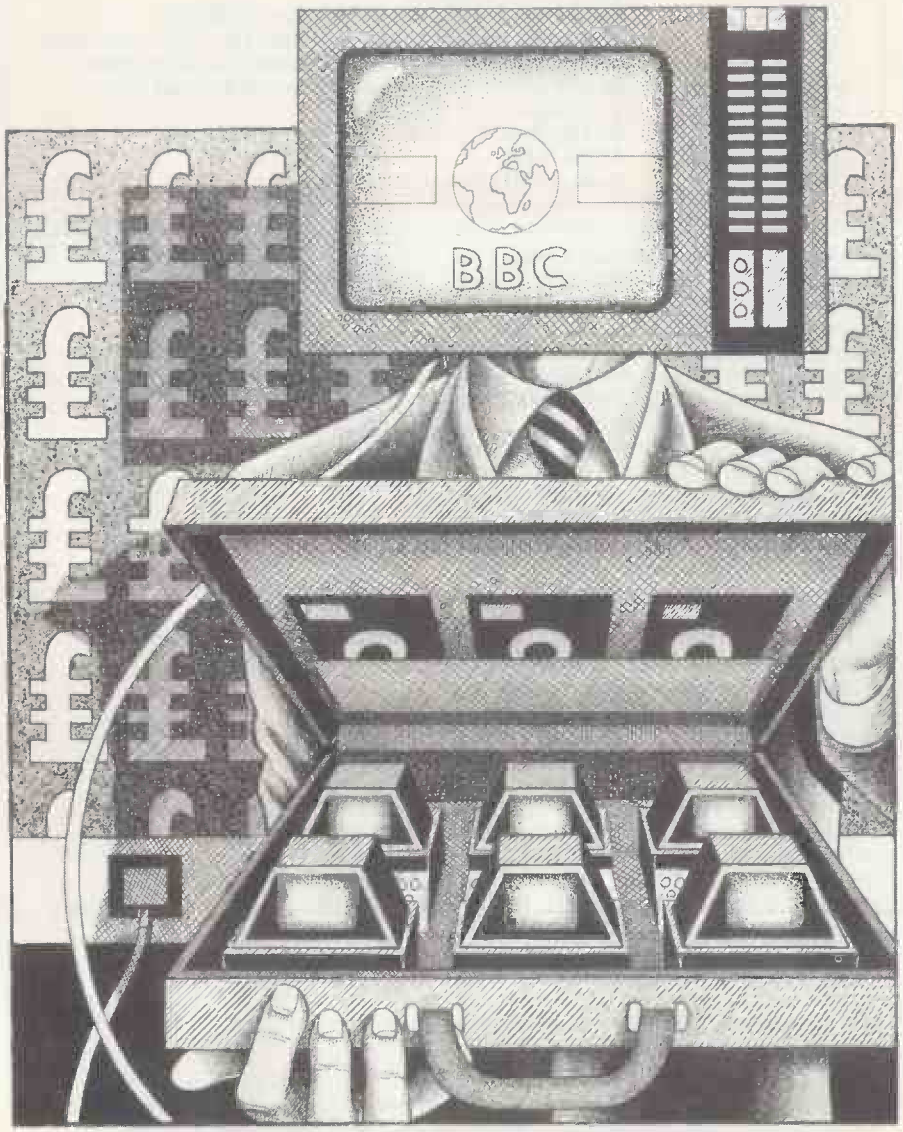
Conclusions

In a recent interview Steven Jobs, one of the Applefathers, expressed the opinion that people who are chasing 16 bits and more memory are in the wrong race; that software design is the key to the future. Certainly Apple III embodies this philosophy in that its processor is a second-generation workhorse and there is little that is startling (though much that is neat) in the hardware design. The voice of the computer scientist has been heard above that of the engineer in the development of the machine. The software environment around the III is more rational and sophisticated than that of its direct competitors and is also flexible enough to accommodate a lot of future hardware developments while maintaining program portability.

Whether or not it is a better buy than Sirius or IBM depends on how well the programmers make use of this sophistication, as neither CP/M nor SOS are really fit to be put in front of the end user. The truly friendly operating system is still in the future; it may be in Apple's future with Lisa.

My thanks to Digitus for the loan of the test machine and to Lasky's for the Pascal system.

END



HAS THE BBC MICROCOMPUTER SENT AUNTIE OFF THE STRAIGHT AND NARROW?

Malcolm Peltu gets on his soapbox to question the validity of the BBC's computer literacy project.

The BBC is now in the commercial sponsorship business. It is also in the computer hardware and software business. I wish it would stick to what we pay our licence fee for, which is making good, *independent* TV and radio programmes.

The BBC hierarchy is apparently proud of its computer literacy project. As a propaganda arm of the Department of Industry and a sponsor of a British computer company, this project also pleases the Government, which is a good move for the Beeb at a time of tight monetary constraint.

I find it appalling, however, that the BBC has moved so blatantly into the competitive commercial computing business.

The sponsorship of the Acorn computer has also seriously distorted the computer literacy project. It has made it seem that computing literacy and programming are synonymous. They are not. Computing literacy should be about understanding how to use, to exploit, to control and to manipulate electronic information systems. Programming techniques are a specialist aspect of the whole.

With unemployment so high, it is particularly disturbing that the BBC should link the project with a microcomputer costing at least £300. This helps to divide the haves from the have nots.

Of course, you can watch the TV *Computer Programme* for free. But the little ad at the end lets it be known that you should really be able to afford a BBC microcomputer to be part of the 'computer age'.

Before looking in more detail at why I object to some key aspects of the literacy project, I want to make it clear why I think it is an important project and why I believe it will be successful in parts.

The BBC has a well deserved reputation world-wide for its independence and quality. When it decides to go in for something in a big way, it provides a golden seal of approval.

ITV has produced a number of excellent programmes on computing, particularly Chris Evans's *The Mighty Micro* (which was a major prime-time breakthrough) and the Thames TV *Living In The Future*. But commercial TV and radio do not have the mechanisms to provide a concerted long-term project. The Open University has also made many even more excellent programmes on the same subject, but they are too tied into OU courses.

It has made it seem that computing literacy and programming are synonymous. They are not.

The Education operations of the Beeb, however, have the ability to plan long term and in-depth. The Continuing Education department, for example, has been responsible for a variety of projects in which the TV programme is the tip of an iceberg. These range from projects to teach maths to schoolchildren to the mass audience *History on Your Doorstep*. In addition to the TV programmes, there are books, enquiry centres, contact with local groups and a variety of other support services.

Their most notable success was the Adult Literacy campaign a few years ago, which set the pattern for the computer literacy project. A vital element in this information network is provided by the Broadcasting Support Services (BSS). In the computer literacy project, the BSS is running a referral service (contactable at PO Box 7, London W3 6XJ).

It has a computer with details of over 3,000 colleges, clubs and special agencies involved in computing. Information can be provided on courses, workshops, advice centres and other ways of satisfying enquiries.

Sheila Innes, head of TV Continuing Education, stresses that all projects are 'broadcast led'. This means that the starting point is the TV programme, which sets the tone and triggers off the whole network of support, and usually includes one or more related publications.

Ever since I first heard of the computer literacy project about two years ago, I have believed that it is an imaginative and exciting idea, provided it was developed solely on this traditional BBC pattern.

I have always believed that all its objectives could be achieved more simply, effectively and honestly without sponsoring a BBC microcomputer. Not only does the micro absorb a great deal of BBC energy and resources but it fundamentally distorts the public face of the project.

The micro absorbs a great deal of BBC energy and resources... it fundamentally distorts the public face of the project

Instead of being broadcast led, the computer literacy project has become computer led. *The Computer Book*, for example, is more of a support for the microcomputer than for the TV programme. The book is oriented towards personal computers and Basic, while *The Computer Programme* has a much broader sweep (see Bookfare).

Press publicity has been focused on the microcomputer for many months. Every twitch and sneeze from Acorn has reverberated, Letters in *PCW*, for example, have claimed that the project would be a success or failure because the BBC micro has this or that feature.

In the hoohah about the computer, the actual TV programme was forced to sneak out in the afternoon and early on Sunday mornings because the BBC wanted to dampen down demand for the microcomputer.

So, we have the ludicrous proposition that a TV programme made for the general public to increase widespread awareness of computing has been scheduled to ensure that as few people as possible watch it until production problems on a commercial computer are ironed out.

Why then has the BBC compromised its independence and entered the commercial computer market? Trying to find out is like trying to catch shifting, whispering sands.

When I first became peripherally involved in the project two years ago, the reason given was that the BBC had to ensure there were sufficient cheap computers to provide hands-on experience for viewers. This was always a nonsense because the problem was already being taken care of by the commercial manufacturers. It will be Clive Sinclair who will be remembered as making the breakthrough in hands-on mass computing, not the BBC or Acorn.

At the early stages, the spec for the computer looked suspiciously tailor-made for Newbury Laboratories' Newbrain. At one point, it really looked as if there would be a Beebrain. When the Newbrain hit production snags, there was a hasty revision of the spec which was equally hastily met by Acorn. Clive Sinclair was given an inadequate chance to tender.

It has been common gossip in the computer business that Acorn put together its prototype at short notice to meet high performance specifications at an unrealistically low price. When the price was hiked up in February, Chris Curry of Acorn admitted this.

The argument about needing hands-on cheap computers died out when the producer of *The Computer Programme*, Paul Kriwaczek, made it clear that the TV programme was designed to be independent of any computer.

Another argument given was that the BBC had to use a microcomputer in the TV programme, and that if it used one from any particular manufacturer the others would complain. This is a non-argument. In any case, there is an ICL computer in the studio. Showing Apples, PETs. ZX81s, Atoms, etc, would be unlikely to rouse the ire of other manufacturers.

Far more legitimate anger has been generated by sponsoring Acorn. Sheila Innes recently summarised the latest reasons (I prefer to call them excuses) for having the microcomputer. The BBC, she said, had to ensure there was modular upward expandable hardware on the market. And it has got into software publishing because the general quality of software is too low.

The Acorn Atom was as modular as the BBC Microcomputer — so why get Acorn to design a new version? And what special magic does the BBC think it has which will enable it to solve the software crisis? Companies like Peachtree are pouring in millions of pounds based on years of experience in order to tackle the commercial micro market. What is the BBC doing in this kind of business?

It was incapable of producing an adequate User Guide for the microcomputer (early users get a provisional copy to be exchanged later). How can it be sure it will develop, test, market and support an adequate range of software?

Its software publishing activities are even more blatantly beyond its charter than the microcomputer. For the first time, BBC Publications will be publishing material produced by non-BBC staff which is not a direct spin-off from a broadcast programme. To argue that, say, a word processing package can be directly related to the *Computer Programme* is sheer hypocrisy. The BBC would not publish a video film on word processing made outside the BBC. Nor would it publish a general book on accounting by an outside author, although it might publish an accounting software package.

The link with the BBC Microcomputer also compromises the BBC's editorial independence on computer matters. Could it really produce objective programmes evaluating or criticising microcomputers?

I am not the only person to dislike the BBC's move into flogging micros. In the audience research carried out by the BBC for the computer literacy project, a majority of the survey agreed with me that it is wrong for the BBC to market the products but right to pursue the rest of the project.

Why did the BBC really get involved with the micro? The wriggling excuses, which have changed rapidly, indicated that the actual reasons need to be hidden. Here are my guesses.

Firstly, the stumble towards the micro was egged on by the arrogance of the computer illiterate tempted by the opportunity to make money. It was obviously felt that a lot of money could be made out of the project by selling the computer, software and the book. They probably will sell a lot of books and computers. The BBC logo is a great advertising symbol. Whether it makes money out of the computer and software will depend on the success of the production and development aims of the operations. But even with the BBC sponsorship, this must be regarded as a risky business.

Secondly, the BBC is acting as an arm of Government industrial policy. The Department of Industry (DoI) has been keen to boost British microcomputer manufacturers. Newbury Laboratories was one prime target. Acorn is another. Hence the sponsorship of the BBC Microcomputer in the DoI Computers in Schools scheme. The DoI obviously saw the BBC project as a chance to create a way of funding industry through the back door (this government does not like direct subsidies, so does it through sponsored user projects).

Sheila Innes admitted that *Managing The Micro*, the first of the computer literacy programmes, was designed to be propaganda. In other words, the aim is to sell, sell, sell the benefits of microcomputers.

...the arrogance of the computer illiterate tempted by the opportunity to make money

This may be legitimate for the DoI. But I would have thought the aim of the Continuing Education department should be to create a *critical* and *realistic* (warts and all) appraisal of the technology and its impact.

If the BBC is to indulge in propaganda, this should be made clear, as in the Continuing Education series on stopping smoking and avoiding accidents in the home.

In summary, therefore, I believe the underlying concepts of the BBC computer literacy project are a golden opportunity to create a flexible network of information exchange and computing awareness. In practice, however, the BBC is misusing its image of quality and independence to peddle particular products in a competitive market which it has no right to be in.

I am afraid that the microcomputer and software publishing tail could strangle the computer literacy dog. END

the 8" Apple

Eicon's dual 8" floppy disk drive system gives the Apple over 2 Megabytes of on-line capacity, enough, for instance, for 15000 items in stock control, or an integrated business system with several thousand accounts.

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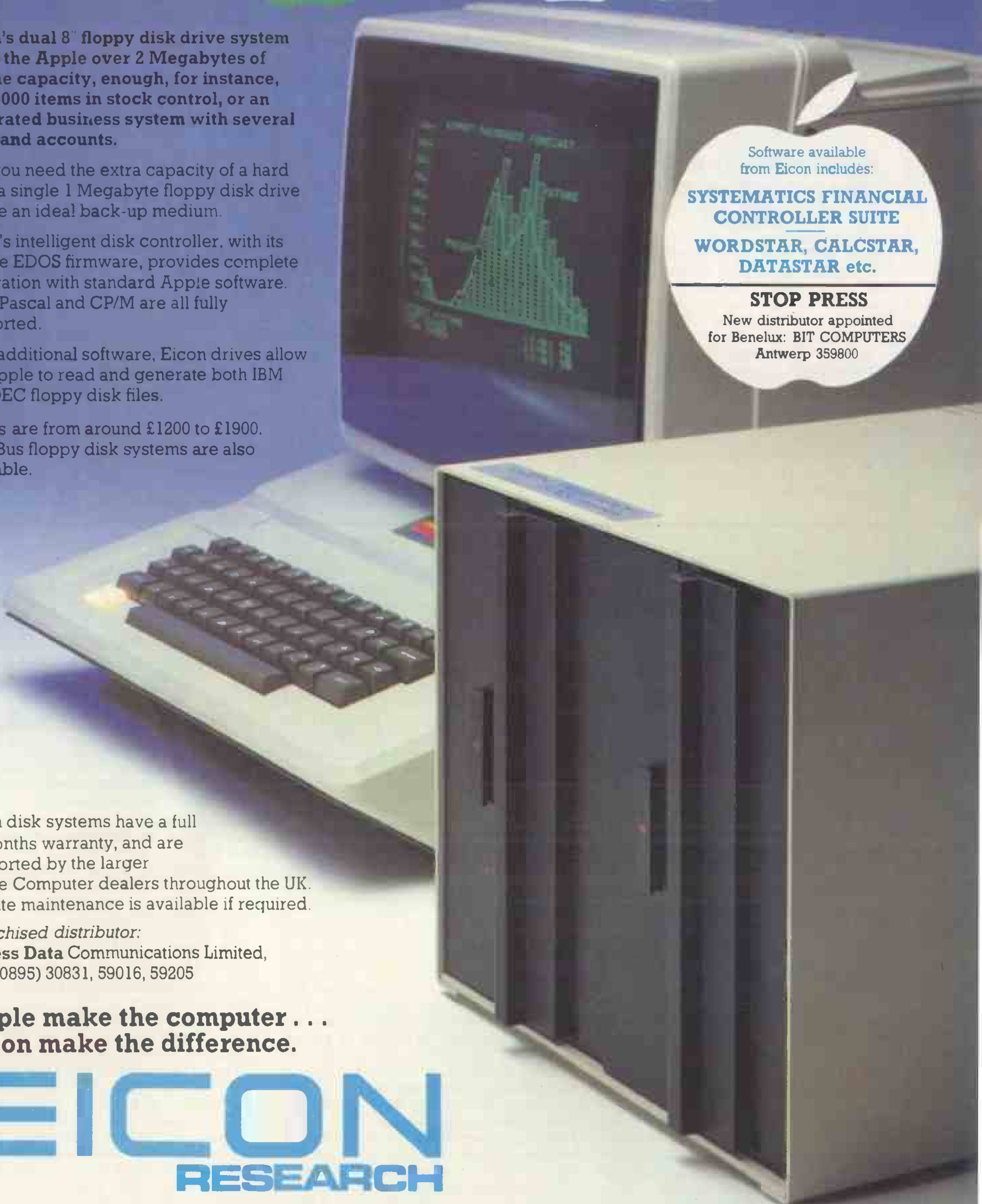
Eicon's intelligent disk controller, with its unique EDOS firmware, provides complete integration with standard Apple software. DOS, Pascal and CP/M are all fully supported.

With additional software, Eicon drives allow the Apple to read and generate both IBM and DEC floppy disk files.

Prices are from around £1200 to £1900. S100 Bus floppy disk systems are also available.



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Eicon disk systems have a full 12 months warranty, and are supported by the larger Apple Computer dealers throughout the UK. On-site maintenance is available if required.

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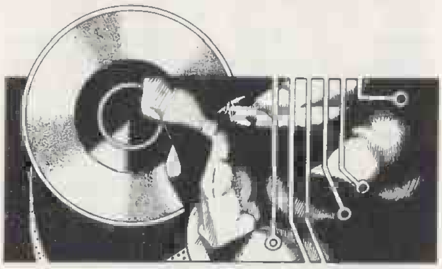

A DP MANAGER'S GUIDE TO MICROS

By Alan Wood of Digitus Ltd.

PART 5 HARDENING ON THE HARDWARE

George Orwell had a vision that we would all be supervised by Big Brother in 1984. The micro industry has a view that we will all be assisted by Little Brother in about the same timescale. DP departments have, subsconsciously at least, been identified as the agents of Big Brother, offering increasingly vast, inflexible and expensive systems with which users are unable or cannot afford to tamper.

The rapid acceptance of a desktop micros in big companies is in part a reaction against mainframe/DP department/Big Brother. The further progress towards Little Brother on all desktops with access to big databases is the likely outcome of revised DP attitudes, the incessant demands of users and the pressure of the new technology. There are conceptually two steps to take the large organisation into the Little Brother era.

Step 1 is the computer literacy programme. For the motor car to become a utility automobile manufacturers had to break the everyman price barrier. And when the barrier was broken, everyman had to learn how to drive. The micro manufacturers have broken every person's computer price barrier. but not every person knows how to 'drive' a computer. A massive programme of, mainly, self-education is well underway. The first wave of cheap microcomputers, as well as doing useful jobs, can be regarded as the main impetus towards computer literacy in companies. The Apples, PETs, Osbornes and SuperBrains are reaching and teaching parts that DP has never penetrated.

Step 2 takes place at what I call the 'computer desk'. The computer desk of the mid-'80s will provide office workers with access to automated filing cabinets, electronic inter-office communication and external databases, be they on the organisation's mainframe or on bureau machines. The computer desk will comprise all the software programs for office, managerial and professional staff and will provide multi access through networked facilities. There will be no practical limit to RAM and add-on store: you will have as many calculators and filing cabinets as you can afford/justify. The computer desk will offer new solutions to cheap mass store (winchester plus video disk) and new solutions to data entry (voice and direct image entry). In conventional computing terms we will be using 16 or 32-bit engines in desk enclosures with 1 to 2 megabytes of RAM. We will have strung fast communication cables and connect points around our buildings on a par with our telephone systems.

No crystal ball is needed to see these two steps towards mass computerisation. What is needed is time. Many of the elements for Step 2 are already with us in the form of raw technology. But they are seldom found altogether in one coherent, reliable and affordable system. And if they were, many organisations would not be ready because they have not even begun the first faltering step towards computer literacy. Some smaller companies who have never previously computerised will get the computer desk first; some large organisations (Unilever, BP, ICI, Allied Breweries) are well into experimental systems.

Standard hardware

DP executives brought up on ICL bread and IBM milk have a craving to shelter in some standard micro house. There is no such house and, with entry costs a fraction of mainframe costs, there is no need to start on an odyssey to find one. Micros range from the small personal computer to the powerful networked facility, and no one company offers a credible range from top to bottom. Your standard, your bridge and your comfort is in software not in hardware. That said, there are some valid pointers to selection of standard hardware.

1. Be prepared to discard cheap experiments. We are surprised by the number of DP executives who have experimented on home computers and are not prepared to discard them in favour of more powerful, better-suited office machines.
2. Be prepared to write off computer literacy computers. You can afford to sprinkle your organisations with Osbornes as education and personal productivity aids. In two to three years they will be homework computers, terminals on networks and education tools. Just be prepared to write them off in that timeframe.
3. Don't get the body of your micro thinking set in an IBM-like straightjacket. Experimentation with several machines is a valid process towards assessing the best and seeing how they develop. Standard software will keep your options open.
4. Don't let your supplier think for you. Frankly, there are far too many developments in technology for any one supplier to have a monopoly — or even a majority. Mainframe suppliers offering micros are late in the field, more expensive and considerably less fleet of foot with new offerings than the specialist micro suppliers.

Microcomputer architecture

Two schools of architecture (the S100 bus and the proprietory/own bus) have been adopted by microcomputer manufacturers. The common operating systems and languages are available on both schools so that the choice you make will not inhibit your software standards.

Many microcomputers use separate printed boards for the processor, memory, interfacing, disk controllers, etc. These boards are connected by means of a bus, the standard one being the S100 bus which simply provides 100 internal connecting points. In a typical single-user microcomputer, about half of those connecting points are used.

The S100 bus has been adopted by the Institute of Electrical and Electronic Engineers (IEEE) and there is now an international standard for the bus. More than 200 manufacturers make products that can be plugged into S100 computers, eg, graphics cards, memory cards, interface cards, Prestel cards. As new technologies develop they frequently appear in S100 form because of the large market for products. The advantage of the S100 Bus can be summarised as: an international hardware standard; access to a variety of cheap add-on and alternative boards; easy to reconfigure from single to multi user; maintenance and fault finding made easy by board replacement.

The disadvantages of the S100 bus stem from its origins as an amateur design. There were flaws in the original design which have been reduced in subsequent implementations. As always, there is a trade-off to be made by adopting a standard. The disadvantages can be summarised thus: it's less reliable than single board architecture and it's less suited to more powerful processors than special-purpose architectures.

FRAMES OF REFERENCE

The S100 standard is especially useful in technical, scientific and educational establishments. The knowledgeable user can get into the machine, change the boards and do his own maintenance. On the other hand, the office user will rely on an engineer and will seldom look under the bonnet of his machine. Nevertheless, ease of maintenance and expansion by board relacement are important factors in selecting office computers. For example, upgrading to a multi-user system is simplified with S100 add-on boards.

Few of the widely used personal computers use the S100 bus, primarily because it is not compact enough and offers more facilities than are required. The following are among the manufacturers using it: Cromemco, Dynabyte, Industrial Micro Systems, Ithaca, Micromation, Transam, Morrow, North Star and Vector Graphics.

Some microcomputer manufacturers have developed their own bus structures, particularly the personal computer vendors. Many put all the essental electronic components of the computer on a single printed circuit board. Although there may be provision for adding special boards, they are basically single board machines.

The primary virtues of the 'own bus' machines are compactness, good reliability record, special purpose design.

Disadvantages compared to S100 architecture are that it's more difficult to diagnose faults and maintain them, they're more difficult to re-configure and there's less choice of hardware add-ons.

The following are some of the machines with their own bus structure: Apple, Altos, Acorn, Atari, PET, Rair, Research Machines, SuperBrain, Sharp, Zilog.

8-bit processors

Two processors dominate the 8-bit microcomputer market — the MOS Technology 6502 and the Zilog Z80. The 6502 is widely used in personal computers. The best-known are the PET and Apple, with Atari a more recent member of the club. CP/M is not available on the 6502 but there are CP/M adaptors for PET (Softbox) and Apple (Softcard) which introduce a Z80 processor for those popular machines.

The Zilog Z80 processor has outsold even the 6502 and is to be found in such machines as the Tandy and the Sinclair at the lower end and just about all the popular office microcomputers. The Z80 incorporates the instruction set of Intel's 8080 and provides a faster processor. CP/M is widely available. All the S100 micros mentioned use the Z80 processor.

A few years ago it was not apparent that the Motorola 6800 and the Intel 8080 would be also-rans in commercial microcomputing. Both these processors are widely used in intelligent controllers and industrial devices. A few computer manufacturers have used them, eg Rair uses an 8085 processor and South West Tech, one of the early micro suppliers, uses the Motorola chip.

16-bit processors

The market for 16-bit processors is a battlefield from which no clear victor has yet emerged.

Intel was first in the field and its 8086/88 processor has been adopted by a number of the existing Z80 suppliers, eg, Altos, Digital Systems, Dynabyte, MicroStar, as well as by some of the new entrants: IBM, Sirius, Convergent Technologies, Future Technology Systems. The 8088 cheap entry point offers only 8-bit external data paths but with 16-bit internal data handling. Available on IBM and the Sirius, it is not much more powerful than the Z80 but it does offer larger internal RAM capability. CP/M-86 is available for the 8086/88.

The Motorola 68000 chip offers a bridge from 16 to 32-bit and is being preferred by the more sophisticated system vendors, particularly those offering Unix. CP/M is not available yet, but a more advanced operating system is needed to take full advantage of the features of the chip and bridge to 32-bit. Manufacturers offering Motorola-based systems include Apollo, Charles River, Codata, Cromemco, Fortune Systems, Pacific Microcomputer, Tandy and Wicat. Apple is rumoured to be working on one also but after the Apple III difficulties it will be careful about premature release.

Zilog, manufacturer of the Z8000, has been one of the first to market a credible Unix system. Its system outperforms the PDP 11/44 and compares favourably with the PDP 11/70 minis, at a fraction of the cost. The Zilog processor has not been widely adopted by other suppliers, Onyx being one of the few Z8000 users.

The 16-bit market is settling down into two dominant streams: Intel for mass 16-bit with a big impetus from IBM and Motorola for the more 'sophisticated' user, particularly spreading Unix and needing an impetus from a volume supplier, eg, Apple, Tandy.

Mixing mainframes and minis with micros

Understandably the mainframe and minicomputer suppliers feel threatened by the advancing hordes of micros. Genghis Khan could not have struck more fear into his enemies than the fright the technology has given the computer corporation executive. They are beginning to respond: some with carefully measured defences, some with ill-equipped ramparts and others by buying off the enemy. Their main hope for success lies in offering a coherent set of systems to their loyal followers.

At first sight, Data General appears to have a coherent set of systems. It made its mark in minis by offering an upward compatible set of software and it has continued this philosophy with cut-down micro versions of its software. The Enterprise and MPT desktop machines are based on the old technology 16-bit microNova and run under MP/OS, a cut-down version of AOS.

Data General introduced the Enterprise in the US with business packages developed by one of its OEMs on the bigger Nova range. The Enterprise has not been a commercial success. The offering is less competitive than the specialist micro suppliers with a lot less software. They may be attractive to some existing users but Data General has not struck the mass market chord. It has so far ignored the cheaper and more powerful new microprocessors, as well as the CP/M software bandwagon. It does not presently offer a bottom end home/personal computer although it could release a Z80 plug-in card to partially rectify the omission.

DEC has been offering microcomputers based on the LSI 11 chip set for some while. The offerings range from a dual 8in floppy system up to a 40 megabyte/8-user PDP 11/23. The LSI 11 has been very successful but is now dated in comparison with the new 16-bit processors. DEC has developed a special 12-bit chip for its personal computer, the DECmate, which is selling in the US through its computer stores to offices, small business and professional users. The DECmate executes existing PDP/8 software but does not access the cheap micro software bank. For those

Establishment versus specialist suppliers

Advantages of establishment micros (eg IBM, HP)

* Security that your supplier is going to stay in business
* Communication links with own mainframe/minis.

Disadvantages of the establishment's micros

* A further tie in to your main vendor.
* A lost pressure point for better service and pricing.
* Much more expensive hardware and software.
* Slow reaction to new low cost technology.
* Less flexibility and fewer options.

Advantages of the specialist micro suppliers

* Keen pricing kept sharp by competition.
* Pursuit of industry standard hardware and software.
* Large and growing bank of inexpensive software.
* Record of innovation.

Disadvantages of specialist micro suppliers

* Only the best will thrive.
* Comms software not so quickly available except for IBM protocols.

who want a CP/M machine, DEC offers a £1500 board that converts the VT100 terminal into a Z80 desktop computer supporting two floppy disks.

One tends to think of a large computer supplier as one company. In truth, because of size, large suppliers operate in divisions and departments. Consequently it is not so surprising that the coherent set of systems often fall short of what you convinced yourself would be offered when you went their way in the first place. Hewlett-Packard's different machines illustrate the point.

It first produced a personal computer, the HP85, of wide appeal to those using its calculators. About twice the price of the equivalent from Apple or PET, this is nevertheless a quality offering. It then announced the HP 125, a CP/M micro at about twice the price of its equivalent from the specialist Z80 suppliers, such as North Star Advantage or SuperBrain but with the ability to connect to HP's larger machines. Next, it announced the HP 9826, a Motorola 68000 desktop machine for technical applications such as graphics. After the 9826 came the HP87, an upgrade of the HP85 with an optional Z80 + CP/M card for £327. Now, if all those machines could talk to each other and later be networked, there might be a coherent strand or an upward compatible set. Of course they are not designed to do so but they are directed to satisfy specific market niches . . . which takes us right back to the specialist micro suppliers, at half the price.

IBM's entry into the personal computer market surprised observers, not because of its technical innovation (its 8088 processor is only half a 16-bit) but because it read, inwardly digested and applied the basic principles on which the micro industry has grown so rapidly.

It offers a low-cost personal computer with upgrades so that you can start learning and working at home. It is selling through retail outlets to reach the mass market as well as directly to its massive user base. It has chosen industry-standard hardware (Intel) and software, such as VisiCalc. And it is encouraging the spread of low cost software through its publishing arm.

What IBM does not offer is much in the way of storage; it has the distinction of providing larger RAM than floppy disk capacities. But surely the inventor of the winchester cannot be far away with its own hard disk. There is also a growing sub-industry marketing add-on goodies for the IBM personal computer. We hardly expect to see a powerful multi-user or networked micro from IBM for some while, although perhaps it will pleasantly surprise us again, and Xenix from Microsoft is a likely multi-user development.

ICL does not yet offer a personal computer, although it has taken on the Black Box as a low-end system and has a development with Sinclair in the pipeline. Above the Rair, it has two very different offerings, the DRS 20 and the Perq. The Perq is a general-purpose computer with its own chip set aimed at the technical user, eg, computer aided design. The DRS 20 is ICL's own offering to the small business and DP department looking for more power than the single-user micro. The industry standard CIS-Cobol is available on the DRS 20, which is a networked product based on the 8085 chip set. ICL's offerings look like a patchwork quilt strung together to cover up its previous omissions. The pricing and the patchwork may deny it its stated goal (leadership in the UK micro market) but its success depends as much on a revision of its marketing approach as it does on a coherent product line.

Like DEC and Data General, Texas Instruments has had an old technology 16-bit micro on the market for some while, the 9900. It also has some novel chips found in its 'speak and spell' devices. Its first personal computer was a disappointment, the pricing and lack of software making it uncompetitive. But it has reduced prices and a new technology 16-bit processor, the 99000, is on the way.

Good news, bad news

: The good news is Cromemco has doubled its disk capacities. :
: The bad news is it forgot to tell its operating system. :

: The good news is Corvus has got a Mirror backup tape for its hard disk. :
: The bad news is you can backup as far as you like but you can't restore :
: from it. :

: The good news is we have got the new improved MP/M-II :
: The bad news is Digital Research has withdrawn it and will release 11.1. :

: The good news is that Microsoft supports MBasic on both CP/M and CP/M-86 :
: The bad news it doesn't support either MP/M or MP/M-86. :

: The good news is we have a CSSN tape backup unit. :
: The bad news is it comes without a casing and is a safety hazard. :

: The good news is that we have just received our first batch of the :
: highly reliable IMI winchester drives. :
: The bad news is they don't work. :

: The good news is that we have received our first newsletter on :
: Processing Technology. :
: The bad news is that it has gone out of business. :

: The good news is that Imsai has not gone out of business. :
: The bad news is that it has just stopped trading for a while. :

Other suppliers

There is not a lot to be said about the other mainframe/mini suppliers' offerings in the micro market.

Burroughs: so far nothing has come from Burroughs except an OEM deal with Convergent Technologies which provides an excellent 16-bit distributed system product.

Honeywell: nothing at the time of writing but surely it can't be far off some response.

NCR: the same as Burroughs — a similar deal with Convergent.

Univac: the same as Honeywell.

Xerox: it withdrew from the mini market but is back with micros. It has Ethernet, the local network architecture; the Star, a very fancy office micro; and the 820, a moderate CP/M machine available through retailers.

Wang: Wang has struck gold in office automation where it stole a march on all the other mini vendors. CP/M is now available on the Wangwriter and it looks a likely contender to bring out a personal computer to fit into its office automation range.

Company confusion

You could be forgiven at this stage if you feel like someone who has been through a *Who's Who* in the computer industry. But it may help to remember that, whatever the colour and shape of the boxes you like, the majority will have the same engines underneath: 6502 and Z80 8-bit, 8086 and M68000 16-bit. You can also proceed knowing that no set supplier offers everything and no existing supplier has a coherent set of systems. Again, the strands of connecting standard software emerge so that if you are building skills in CIS-Cobol, Pascal and Basic, they will provide wide access to different equipment.

The response of the existing computer suppliers to the micro is similar to the response of the mainframe suppliers to minis 10 years ago. It took a long time then for some of them to catch up and now the same pattern is being repeated. It can be summarised as slow, expensive and underpowered. Realistically, you could not expect the existing suppliers to offer the same power for a quarter of the price or to undermine their existing product lines. They have made their response at the lowest end of the micro market. They will not take the lead in powerful network and multi-user machines that make their present offerings redundant on price performance. When they do finally get their response right by buying or emulating the successful micro vendors, eg, IBM, a few new micro names will be firmly entrenched in the minds and on the desks of users.

Microcomputer manufacturers

Space allows for only a brief profile of the more established suppliers, those that have been selling business micros in the UK for more than three years. The comments reflect the author's experience and opinions and should not be regarded as unassailable fact based on exhaustive research.

More than 300,000 Apples have been sold worldwide since this remarkable company first started in 1977. The Apple II is a good personal computer made better by add-ons from indepen-

FRAMES OF REFERENCE

dent vendors, such as packages from Personal Software, hard disks and networking from Corvus and Zynar, and the Z80 card from Microsoft. The Apple III is a disappointment, with poor price performance and so far with little software except in emulation mode.

Altos provides a competitive range of systems from a dual 8in floppy single-user machine to a four-user winchester disk system based on the Z80. More recently it introduced an 8086-based micro. It supports a wide range of industry software including CP/M, MP/M and Oasis operating systems. Its single-board computer has a good reputation for reliability.

The Commodore PET is the most popular personal computer in the UK, though not quite so successful in its home country, the USA. Commodore offers a range of machines and the 8000, 96k PET is a popular option with wide software support, such as Wordcraft, and Silicon Office. The PET is a 6502 machine and CP/M is only available through a Z80 add-on, the Softbox.

Cromemco was one of the early suppliers of heavyweight micros and was the first to offer winchester disks and a Unix look-alike operating system, Cromix. Cromemco ranges from a mini-floppy machine up to a four-user hard disk configuration. It has suffered from poor reliability and an appearance more suited to industrial environments. Although based on the Z80, Cromemco has not, until recently, directly supported CP/M, so that users have had to rely on independent vendors providing CP/M software. Cromemco has announced in the USA a Motorola 68000 machine with Cromix.

Industrial Micro Systems sells a range of S100 microcomputers, and CP/M, MP/M and BOS are available as operating systems. Floppy, winchester and exchangeable disks are options and the hardware has a good reputation for reliability.

Dynabyte provides one of the widest ranges of industry standard hardware and software from a 630k single user micro to a 96 megabyte, four-user station machine with 1, 2, 5, 10, 20 and 40 megabyte options in between. Dynabyte has a good reputation for reliability and support of industry standard software. Its 16-bit micro is based on the Intel 8086 chip.

One of the early manufacturers in the field, North Star, gained an enviable reputation for robustness. It failed to capitalise on its position with little innovation until the appearance of the Advantage, a high quality CP/M personal computer to rival the SuperBrain.

Probably the most popular British business micro is Rair, which also sells in Europe and the US. Adopted by ICL as its 'personal computer', Rair was the first in the field with a mini winchester. The company supports industry standard software and can reasonably be expected to offer a 16-bit implementation on the 8086 in the near future.

The SuperBrain is the popular CP/M personal computer from Intertec. Early machines gained an indifferent reputation for reliability but not enough to stop their growth in popularity. It offers an all-in-one box with VDU, processor, keyboard, twin floppy or 5 megabyte winchester. There is also a shared hard disk facility available from Intertec for the SuperBrain, called the Compustar.

The Tandy Model I is an often-copied (eg, Video Genie) popular home and personal machine with wide software availibility for both TRS DOS and CP/M. It's a low-cost machine with not the best reputation for support. Tandy also produces a business micro, the Model II, and has recently announced a top-range Motorola 68000-based machine.

Vector Graphics started about the same time as North Star but has developed a range well beyond North Star and comparable to Dynabyte. It has a good reputation for reliability and support.

Some new contenders

An analysis of the micro suppliers would not be complete without at least a passing reference to a few of the newer contenders.

Adam Osborne first made his name as a writer and publisher of some of the standard works in microcomputing. He established Osborne Computer Corporation partially in co-operation with the industry standard software manufacturers, Digital Research and Micro-Pro. His portable personal computer costs only £1250 and includes £800 of industry standard software in that price! It is very suitable as a personal work machine and as a terminal to bigger systems.

Sirius is the brainchild of Chuck Peddle, the 6502 and PET designer and is a dead ringer for the IBM personal computer. It is based on the quasi 16-bit 8088 and offers CP/M-86 and industry classics CBasic, MBasic, CIS-Cobol, SuperCalc, and MicroModeller. A flat, soft image, high resolution screen and good graphics are features.

Sharp has been around longer than Osborne or Sirius and offers very well engineered, reliable and attractive personal computers. At first there was little software for the Sharp machines, but the CP/M message has got through and standard packages are available for the very pretty MZ-80B.

A more recent entrant to the UK market, NEC offers a well-engineered system with very attractive colour graphics. It is making an impact in the US and can be expected to penetrate here.

The Triumph Adler Alphatronic is a low cost, attractively designed personal computer. Packaged with a printer, it is one of the cheapest entry point word-processing machines and CP/M availability provides access to other inexpensive software.

Comart, the distributors for North Star and Cromemco, has manufactured its own S100 system, the Communicator. This is a North Star look-alike inside a more attractive casing and provides mini-floppy, mini and 8in winchester disks. Comart was the first in the UK to release and experience the problems with MP/M.

A personal view substantiated by achievement to date is that the best of the micro industry will repeat if not surpass the success of the best in the mini-industry. Similarly, there will be a number of 'second division' micro companies strong in specialist areas. The shifting sands of silicon chips make it impossible to provide a global micro recommendation, which in any case must relate to the needs and status of computing in each organisation.

What's what in processors and bus structures

Microcomputer manufacturer	8-bit processors		16-bit processors		Bus structure	
	Z80	6502	8086	M68000	Own bus	S100
Apple		*		?	*	
Altos	*		*		*	
Comart	*					*
Commodore		*			*	
Cromemco	*			*		*
Dynabyte	*		*			*
IMS	*					*
Intertec	*				*	
Micromation	*					*
North Star	*					*
Osborne	*				*	
Sharp	*				*	
Sirius			*		*	
Tandy	*			*	*	
Vector Graphics	*					*

? = Rumoured but not released

The fifth commandment of microcomputing

The fifth commandment of microcomputing is: *thou shalt not worship at the altar of your main supplier.* IBM is rightly admired for its technical innovation and marketing muscle. But it does not have all the answers; some of the answers it provides are too late; and some of the answers are downright wrong. Mainframe users tell stories about waiting 18 months for announced equipment, only to find it fulfils half its specification. They also tell horror stories about the IBM Series 1 which took several years before it became a good product. Of course there is some risk in going with the specialist micro suppliers but the payoff in price performance, technical advancement and user benefits should amply repay the risk.

END

The new generation that interfaces with most microcomputers

Mannesmann-Tally's new MT100 series of matrix serial printers for microcomputers is now available from local computer shops and suppliers.

MT100 series printers are utterly reliable. They're a new generation of Europrinters made in West Germany with full technical and service back-up from our headquarters here in the UK.

They give high performance at a very reasonable price. Ideal for professional businesses. Or educationists. Or enthusiasts who value the latest technology.

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Main difference is in column width. The MT120 is the 80 columns version whilst the 140 features 132 columns.

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COMPUTER ANSWERS

Send your queries to: Sheridan Williams, 35 St Julian's Road, St Albans, Herts. Please note that Sheridan can no longer answer questions on an individual basis, so please don't send an SAE with your query.

Beeb group

I am waiting for my BBC micro and so, I gather, are many thousands of other people. I would like to obtain information on the machine, to start thinking about how to use it straight away. Is there a user group that I could join, or is there any way in which I can obtain information?
G Williams, Sheffield, J Riggs, Gosport, J Woods, Hampton, and others.

I am becoming overwhelmed by the number of enquirers asking similar questions and late in 1981 I established a user group called BEEBUG, the Independent BBC Micro Users Group. Our first newsletter came out in April and established us as a viable concern. At the time of going to press we had in excess of 1000 members, of whom only 20 percent had actually got machines. We can offer a great deal more than any BBC or Acorn-run group. If you require further details please write enclosing an SAE to BEEBUG, PO Box 50, St Albans, Herts.
SW

Language books

Do you know of any books that you can recommend on the languages C, Algol 68, and Lisp?
D J Danziger, Whitefield, Manchester

I cannot recommend any books in particular, but know of the following:
Computer Language Reference Guide, published by SAMS; this is a guide that covers the most common languages and costs about £7.
C Programming Language, published by Prentice Hall at £13.
Lisp, published by Addison Wesley at about £9.
SW

VIC talk

Is it possible for me to get my VIC to speak?
Philip Richardson, Lindfield, Sussex

If you are thinking of trying to program the sound generator to produce speech, then forget it. Speech in humans is produced as a result of not only sounds from the vocal cords but also movement of the air cavities in the mouth. Electrically, this means passing the sound through a filter whose characteristics are quite complicated and can be varied at a rate and manner which is extremely difficult to follow. The way it is normally achieved these days is to use a dedicated speech synthesis chip. These are designed to be programmed by the computer to produce the desired words.
Ron Geere, ICPUG

RTTY add-on

I read your pages regularly and note that you have had several questions on the subject of RTTY and computers. My son and I have designed PC boards to interface with computer serial ports so we can now offer a complete RTTY interface for either transmit or receiving of RTTY signals. Many people in our area use the PC board mentioned and I would welcome a mention in your column.
J Melvin (G3LIV), 2 Salters Court, Gosforth, Newcastle, Tyne and Wear, tel 843028.

Wow, what a brave person to admit to wanting your name and even phone number in print. You may get swamped with requests. Please let me know how you get on. I always appreciate readers who are willing to help one another.
SW

Brain sort

I find sorting very slow on my SuperBrain. Could you tell me how to speed it up to an acceptable level, using MBasic.
P Harrison, Ham, Richmond

Firstly, use a good algorithm; 'Quicksort' is probably the best. Secondly, compile your program as mentioned in another letter somewhere in this month's 'Answers'. If you compile it and you make maximum use of integer variables, you will improve the speed by a factor of 20. (I have done it); you can sort 1000 numbers in about five seconds.

Another alternative is to buy a package like 'Supersort' which runs under CP/M. This is very versatile indeed and, provided your records are arranged so that the fields are either 'comma delimited' or are 'fixed length', it will sort a file on any field or fields. So you send your data to a file and then sort that using Supersort. You can always link Supersort into a package by using the SUBMIT and XSUB CP/M utilities.
SW

PET port

Where can I purchase a 0.2in edge connector for the PET's user port? Also could you tell me how the contacts are labelled?
William Leung, Harlow, Essex

Try Stack for the edge connector. The contacts are labelled:

1	2	3	4	5	6	7	8	9	10	11	12
A	B	C	D	E	F	H	J	K	L	M	N

Top row is numbered 1 to 12, but note the missing letters in the lower row. G, I, and O are not used to avoid confusion.
Ron Geere, Independent Commodore Products User Group (Formerly IPUG)

Hi-res plot

Is there any way of plotting characters on the Apple hi-res page? If so, how?
G Keen, North Shields

There are a number of ways of using the hi-res page to plot characters, some of which use a set of shape tables. There have been many articles in the British magazines over the past year, and there are more in the American magazines eg, *Call A.P.P.L.E.* They can be slow but are easily programmable and can be used to add labels to graphs, etc. Unless you have had plenty of experience with shape tables, then it is advisable to find one of these articles or to get hold of another ready-made program. One of the first was a program Apple had in the set of disks called 'Contributed Software', which was available free in the USA and at a nominal charge over here a few years ago. Much of it was in Integer Basic. You may find an Apple dealer who knows about it. As it doesn't seem to be available now, so, at risk of being shouted down for advertising the British Apple Systems User Group yet again (PO Box 174, Watford WD2 6NF), you could join us and get hold of it and other similar programs from the library at a nominal cost. Alternatively, you could go to something commercially available, which would be more sophisticated.

One of the best packages commercially available to do this comes from Apple and is called the DOS 3.3 Toolkit. It includes the Apple Assembler for writing machine code programs. There is also the Applesoft Programmer's Assistant, which allows you to renumber and find where variables are in the lines of your program; it also writes the line numbers for you and much more. But the important point is that it contains a hi-resolution character generator (HRCG) which allows you to define your own character sets and edit them. There is also a program to run the HRCG so that you can write your own Basic programs and change into upper and lower case and between different sets, almost letting you use the Apple as a normal typewriter. It does not allow you to use the shift key. You can use it to label graphs, etc, but more exciting is the graphics facility to allow larger characters to be built up by joining others together and then animating them.

The HRCG in the DOS Toolkit is limited to normal size characters and all the text is in white although, with larger groups of shapes, colour does become possible. If you wish to type in text and have large coloured graphics characters, then there is a more sophisticated package called Higher Text, from Synergystic Software. This has some advantages, in that larger (in fact normal and large) character fonts are available, and colour with the larger font, but it is harder to use. It too has an editor, which allows you to modify the fonts provided or to make up your own.
John Sharp, BASUG Secretary

Worth joining?

Can you tell me whether it is usually worth joining a user group? I am mainly thinking of joining the Pascal Users group, although I am thinking of joining a user group for my machine also.
E Bolton, Barnstaple

The answer depends upon what you feel is value for money. You may probably belong to a union without ever stopping to consider whether it constitutes value for money — it is difficult to judge. A user group can only be judged by what it offers and what it has offered

in the past. Most groups (being independent) are able to negotiate on your behalf with the manufacturer/supplier and help you get better services or deals from them. They may also offer discounts on a variety of products from various suppliers. At a minimum they should all offer a means of communication between the club/group organisers and the members. The size of the membership and the interest in the club will determine whether this is a magazine or a simple newsletter.

Most clubs will charge from £5 to £10 per year and you should send for a sample newsletter and a list of services offered.
SW

Monitor or TV?

I am considering buying a 12in or 14in TV for my TRS-80. Would you please explain why I should consider buying a monitor rather than a TV because, as far as I am aware, a monitor is only a TV without sound!
Ian Robertson, London

The main difference you can expect to see between a TV set and a monitor is the quality of the picture. Each line on the screen is drawn by an electron beam which moves along the line in about 40 microseconds. The width of the smallest dot that can be displayed depends on how long it takes the amplifier to brighten the beam and then return it to the dimmer state. As you will realise, it needs an amplifier that will respond in a thousandth of 40 microseconds if you wish to display a thousand dots along the line. This calls for a cycle of response from dark to bright and back at the rate of 25 MHz. So you will see advertisements for monitors that quote their 'bandwidth' as 22MHz, for example. The bandwidth you need depends upon the number of dots you wish to resolve along a line. With a TRS-80 the graphics are fairly coarse so the finest detail you need is on the character display, where you want 8x64 dots for maximum sharpness. This is 512 dots in 40 microseconds and seems to call for a bandwidth of about 12MHz; as a domestic TV usually doesn't have a bandwidth higher than about 6MHz, it is hard to get a good enough picture at 64 characters per line. At 80 characters I don't think anyone would recommend an ordinary television. But I presume you will not want colour for the Tandy so you can choose whether to buy a new monitor (there are some quite cheap ones advertised) or a secondhand one (mine cost £39; it's ex-ICL and I take the risk that if it breaks I may be unable to get anyone to fix it). Mind you — a wide bandwidth alone is not enough. It's no good having an amplifier that can display fine detail if the signal to it gets blurred. In order to make their output simple to connect to a domestic television most micros convert their display output with a UHF modulator so that it will go in through the aerial socket. This does the sharpness of the picture no good at all. The UHF modulator blurs it and the television decoder blurs it some more. It is much better, if the television has what's called a monitor input, to connect the unmodulated signal from the micro to that. Television sets that have this facility are also likely to have the best bandwidth. As it happens, I too am looking for a dual-purpose display and TV to avoid buying one of each and it is more important in my case because I want colour; I have found there are a few (rather expensive) colour TV sets that have a monitor input. I can't yet recommend one, however.
Anthony Camacho

Flying

Is it possible to get a computer to fly 'graphically' through a landscape, or are the mathematics involved too complicated? Would it be possible for the BBC Computer to do this?
Bobby Hesselbo, North Berwick, Scotland

Your question and a number of others seem to have been stimulated by the excellent *Horizon* programme on computer graphics. In principle, the process of displaying a perspective view as the viewpoint is 'flown' through a computer model of a landscape or an architectural model (such as the one of down-town Chicago in the *Horizon* programme) is quite simple. The model is held in store and for each frame of the display the appropriate calculations to convert what would be seen from the viewpoint into a perspective view then have to be done. The skill lies in choosing a way to hold the model which allows the conversion to perspective to be done rapidly enough for the display not to be boring. I think it might be possible for a microcomputer to do this with a fairly simple model, at a very slow speed. The sort of machines that are used to do this commercially are at least 100 times the speed of the common 8-bit micros such as the BBC machine. Until the other day I would have been more discouraging, but I have had an opportunity to see what can be done with a BBC model 'A' — it drew 1000 (admittedly random) lines in 28 seconds! Enough to make the Tandy/PET/Nascom/Appleowners among us go quite green!
Anthony Camacho

What's C?

The January issue of *PCW* contained a reference to a high level language called 'C', devised for writing interpreters. I would be grateful for further information about this language.
D A Gibson, The Berwickshire High School, Duns

'C' is a language developed by Bell Laboratories and is related to Algol, PL/M and Pascal. Like these, it demands the use of structured programming. It is the language in which Bell's operating system Unix was written and may have been specially developed for this purpose. It is much more compact and flexible than, say, Pascal and can perform functions normally done with machine code, or assembler. This makes it particularly useful for writing such things as compilers.

'C' is covered in *Software Tools*, by B W Kernighan and P J Plauger, while a fuller treatment is given in *C Programming Language*, by B W Kernighan and D M Ritchie. A full compiler for 'C' is available to run under CP/M from Lifeboat Associates as the 'Whitesmith' C Compiler, while the same company also offers two versions of a Tiny C. The full versions need 54k and require the use of Plink II to chain between programs and subprograms.
P L McIlmoyle

Language query

I am interested in a language that will load into 32k of memory, for a Z80A and give 10-digit accuracy with some guard digits (say three) and fast numerical routines.

Is there anything available, or can you recommend a book on machine code routines for both integer and floating-point computations?
C E Williams, Cockermouth, Cumbria

You do not mention your type of machine but if you can operate under CP/M, or have a North Star computer you can use North Star Basic, which is available in a number of precisions, up to 14 digits. North Star Basic can be converted to run under CP/M using the SoHo Group's Matchmaker II program. If you have a North Star machine, a special 'floating point arithmetic' S100 board is available which considerably increases the speed of calculation. If you do not mind using a compiler, rather than an interpreter, then CBasic-2 offers a similar 14-digit accuracy and the added speed of compiled programs.

The technique used to increase precision is of general application. This is to hold numbers in binary-coded decimal form, rather than as ordinary binary 'floating point' numbers.

Multiple-precision machine code arithmetic routines are covered in many books. One reference to hand is *How to Program Microcomputers* by W Barden, Jr, published by Sams.
P L McIlmoyle

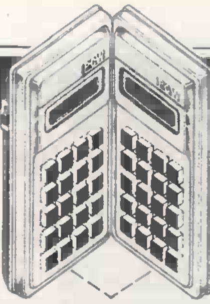
Assemblers wanted

Do you know of any commercial source for a PROM-based assembler for the 68000 or an appropriate assembler listing? Similarly, how about the 6809 and the 6800? Finally, are you aware of any software house which markets 'simulator' software for the 6800 and the 6809?
Dr J A McLean, Napier College, Edinburgh

I am sorry that I cannot help as regards PROM-based assemblers, and would be grateful if any readers could assist here.

As you know, the 68xx(x) range of micro-processors are made by Motorola and in view of the technical depth of your interest I would suggest that you should contact Motorola's UK office at York House, Empire Way, Wembley, Middlesex HA9 0PR, tel 01-902 8836. Motorola does, of course, have assemblers available for the micro-processors you mention. Assemblers for the 6800 and 6809 are also available from Technical Systems Consultants, Box 2570, 1208, Kent Avenue, West Lafayette, Indiana 47906, to work under the Flex operating system. The McGraw-Hill/Osborne books include an assembler language series, with titles on the 6800, 6809, and 68000.

As regards 'simulators', Lifeboat Associates offers cross-assemblers designed to run under CP/M on 8080/Z80-based computers. XASM-09 is for the 6809, and XASM-68 is for the 6800.
P L McIlmoyle



CALCULATOR CORNER

By Dick Pountain

602 IN QUIRK HORROR PROBE!

Spring is in the air and calculators turn quirky. In the space of ten days I have received letters from three readers announcing that the Casio 602p does have a 'quirk' almost a year after I tested it and pronounced it quirk-free. Those with long memories may recall that the selfsame thing happened with the 502; it's almost (but not quite) enough to make one believe in the paranormal.

To summarise the discovery briefly, it is found that an extra 37 characters can be produced in the 602's display — namely those which are normally reserved for the representation of program instructions in the Write Mode. The way in to them depends on the fact that, in a typically economical bit of Casio design, when in Alpha Mode the 602 interprets the same codes that stand for program instructions as Alpha characters. The problem then is to fool the calculator into thinking it's in Alpha Mode when it isn't (or not in Alpha Mode when it is, or something), which turns out to be quite possible.

It's possible because the signals to switch modes are the automatically inserted quotation mark characters ("") which the calculator always expects to find in pairs, delimiting an alpha string. If we can produce an unpaired quotation mark the required hoax will be perpetrated on the operating system.

Readers Tony Smithurst of Manchester and Andrew McLeod of Wimbledon independently discovered two different ways to accomplish this, which have different practical implications. An honourable mention also to Mark Edwards of Stoke Poges who reported a similar method to McLeod's a few days later.

I'll discuss McLeod's method first as it doesn't involve tape operations.

Clear the program registers and input the following program:-

P0 LBL0 "ABCDEFGHIJ" GOTO0

When this is run it displays ABCDEFGHIJ as expected and continues in an endless loop. If you now stop it with HLT the chances are it will stop in Alpha Mode, since Alpha is so slow that this portion of the program occupies most of the loop time. You should see only part of the string and the Alpha annunciator flag lit; if not run and stop till you do. Now clear the display with AC and press BST; you will see that the program is part way into the string, ie, still in Alpha Mode, though since the AC the calculator is not. This establishes the principle of our quirk.

Now clear and enter:-

P0 "XXXXXXXXXXX" LBL0 "B"

Run this and watch the Alpha flag closely; before the XXXXXXXXXXX changes into a B it will wink twice as the program leaves and re-enters Alpha Mode. HLT the program between these winks and the flag stays on; the calculator is locked in Alpha. Now AC and press GOTO 0 which will give you a GO ERROR; clear the error with AC and press BST. You will see the display:-

P0 q" GOTO1 017

Which is somewhat odd as no such instructions are in the program! What is in fact happening is that the calculator is reading the letter B as the instruction GOTO1. Confirm this by checking step 017 in write mode:-

XX" LBL0 "B 017

In other words the calculator uses the same code for alpha character B and instruction GOTO1. If you wish to repeat Andrew McLeod's work you can now map the whole alpha character set onto the instruction set by modifying the program:-

P0 "XXXXXXXXXXXXX" LBL0 "BCDEFGHIJKL... abcde... 0123... */?" to include all the printable characters and then HLT AC GOTO0 AC BST... FST AC BST... FST AC BST... and so on. You will find a variety of error messages besides GO ERROR displayed as the calculator tries to execute each alpha as an instruction (that's why the A was omitted from the list; it is equivalent to GOTO 0 and so puts you in a loop).

This would be of marginal interest if it didn't work in reverse, but it does; program instructions are translated into alpha characters. However there are only 86 displayable alphas but many more instructions (it's not clear how many exactly as it depends on how you count compound instructions). The upshot is that 37 characters can be displayed which are not otherwise available. As an example try out:-
P0 "XXXXXXXXXXX" LBL0 M+12 MR04 cos M+13 MR2 "B" LBL1.
Do the HLT AC GOTO0 AC and you should be rewarded by:

√4 = +/−2

The group of instructions between LBL0 and "B" have been translated into alphas; the "B" LBL1 is put there to allow the program to end in non-Alpha Mode which it does because B translates into GOTO1. A complete translation chart (due to Tony Smithurst) is printed in Fig 1. Logic suggests that there are in fact 128 instructions (a round number in computerese) and that there ought to be 42 extra characters (42 + 86 = 128). Three characters " – and ʸ cannot be produced but that still leaves two missing somewhere. Some alphas map onto more than one instruction (eg, "T" = GSB P3 or MR13) but I've omitted these for clarity; the ambiguity is only in the instruction to alpha direction so that T always gives GSB P3 but either GSB P3 or MR13 will give T. The curious dot patterns which correspond to M00 through M09 are the codes for the seven-segment exponent display expressed in the 5 x 7 dot-matrix of the main display, which garbles them more than somewhat.

How can we use this new-found ability to display % or √ and the rest in programs in order to label outputs? The method, just explained to show you how it works, is not very convenient since it requires a lot of manual intervention. The halt and GOTO0 and clearing can only be done by hand from the keyboard which means you can't use the technique as an output subroutine. This is where Tony Smithurst's contribution comes into the picture.

Tony discovered the 'locked-in-alpha trick' by a different route; namely by stopping the loading of a program from tape in the middle of an alpha-string. The effect is just the same but it opens up the possibility of storing a blank 'skeleton' program on tape, editing into this the expression you wish to display, and then running this as a normal program with no HLT AC GOTO0 AC needed.

Here's how you do it. We wish to output results from a statistics routine in the format x̄ = √ number ± number % where the two numbers are stored in M01 and M02.

Put the following program in P0:

P0 "AAAAAAAAAAAAAA
AAAAAAAAAAAAAA"

Now save it on tape using INV SAVE EXE. Clear the program memories and prepare to load this same program. As soon as the PF 000 appears, to show that the calculator has found the program, hit AC to abort the load. Now switch to Write Mode and inspect the contents of P0. You will find as many 'A's as it had managed to load before the abort and the balance made up of those ⁝ patterns; erase all the 'A's using Clear but leave the dotty bits. Step

GOTO page 191

86 Standard Characters

A	GOTO 0
B	GOTO 1
C	GOTO 2
D	GOTO 3
E	GOTO 4
F	GOTO 5
G	GOTO 6
H	GOTO 7
I	GOTO 8
J	GOTO 9
K	X_D
L	SAC
M	ENG
N	°’”
O	log
P	ln
Q	GSB P0
R	GSB P1
S	GSB P2
T	GSB P3
U	GSB P4
V	GSB P5
W	GSB P6
X	GSB P7
Y	GSB P8
Z	GSB P9
a	M+00
b	M+01
c	M+02
d	M+03
e	M+04
f	M+05
g	M+06
h	M+07
i	M+08
j	M+09
k	x_{DEL}
l	SAC
m	ENG←
n	°’”←
o	10^x
p	e^x
q	LBL0
r	LBL1
s	LBL2
t	LBL3
u	LBL4
v	LBL5
w	LBL6
x	LBL7
y	LBL8
z	LBL9
0	MR00
1	MR01
2	MR02
3	MR03
4	MR04
5	MR05
6	MR06
7	MR07
8	MR08
9	MR09
:	x↔M00
█	x↔M01
?	x↔M02
!	x↔M03
μ	x↔M04
<	x↔M05
>	x↔M06
Σ	x↔M07
(	x↔M08
)	x↔M09
×	+/−
÷	(
+	)
−	sin
=	cos
*	ABS
/	INT
→	FRAC
←	$\sin^{-1}$
□	σ_{n-1}
E	+
π	÷
.	ISZ
,	X

; — continue display function

= Display 'X' — Register function

AR — — Min — — Display memory function

37 New Characters

A	M+10
R	M+11
√	M+12
%	M+13
≥	M+14
σ	M+15
x̄	M+16
²	M+17
⁻¹	M+18
⁻¹	M+19
%	$\cos^{-1}$
←	$\tan^{-1}$
#	cosh
;	sinh
✓	$\cosh^{-1}$
x	$\sinh^{-1}$
ʸ	
"	
”	x≥0
’	x≥F
D	PAUSE
10	IND
L	SAVE
in	LOAD
	MAC
°	x̄
_	
⁝	M—00
⁝	M—01
⁝	M—02
⁝	M—03
⁝	M—04
⁝	M—05
⁝	M—06
⁝	M—07
⁝	M—08
⁝	M—09

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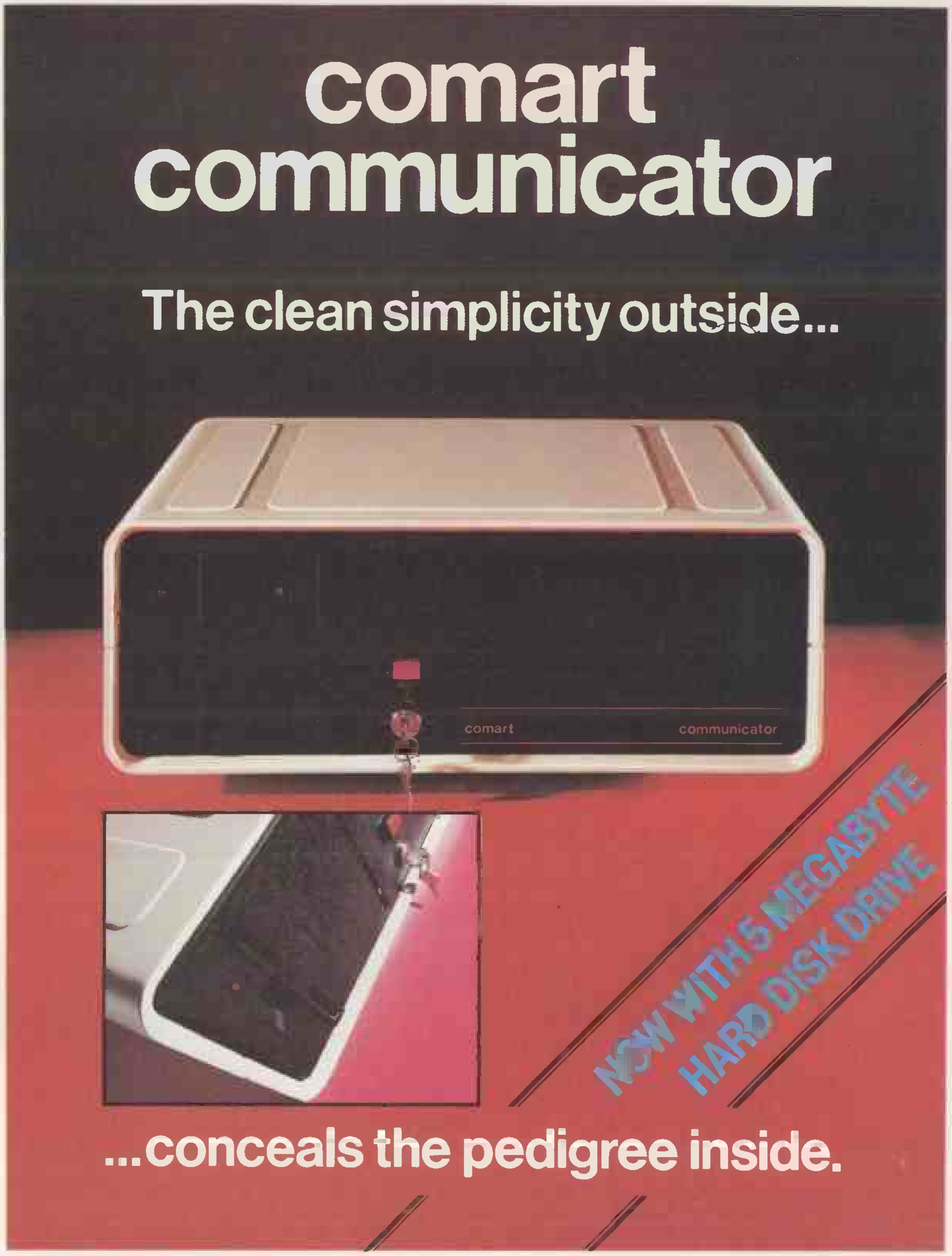

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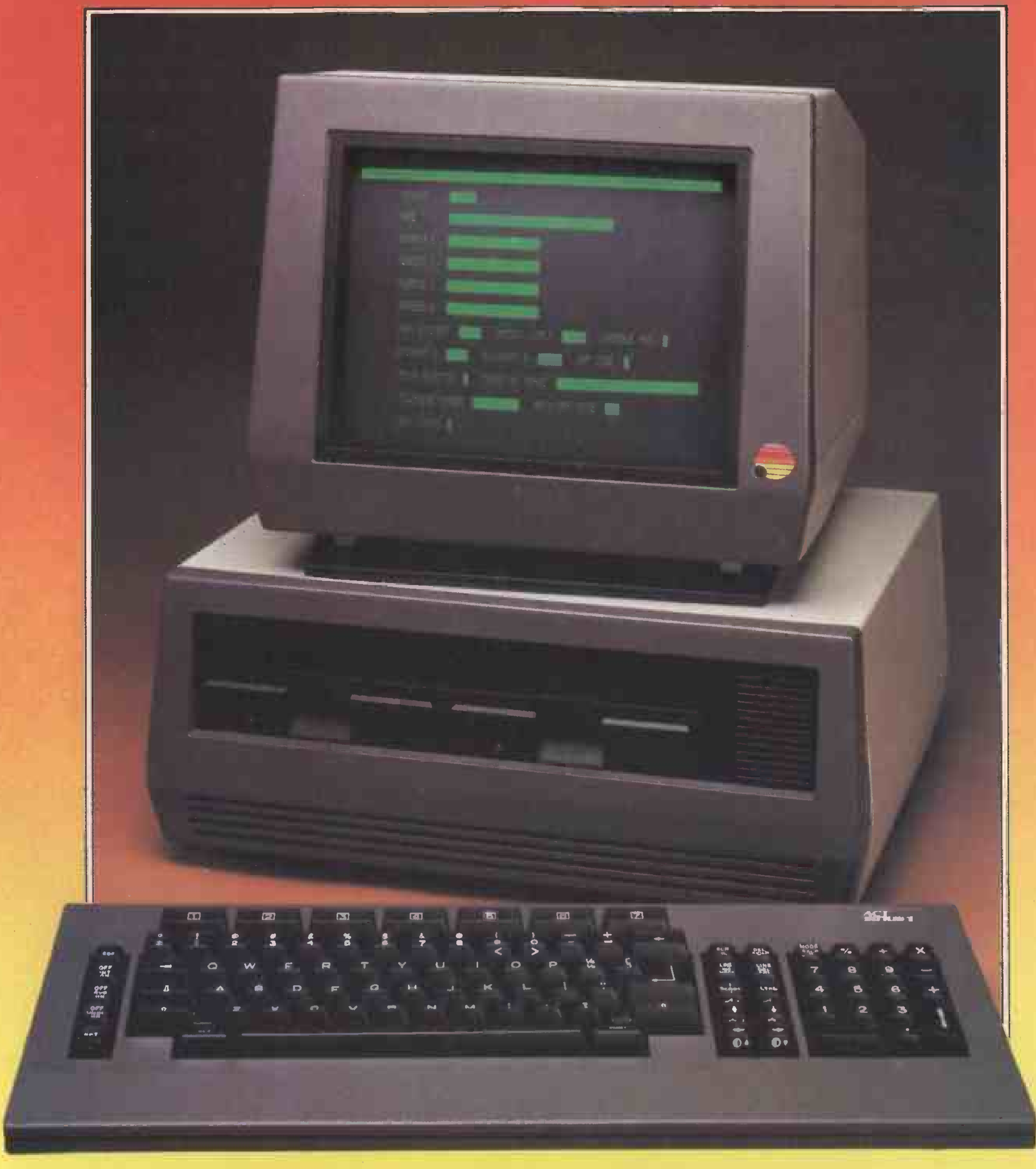

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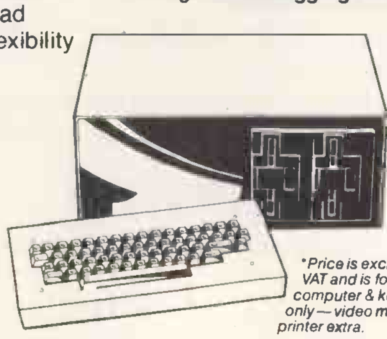

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PASCAL UPDATE

Chris Sadler presents more correspondence and timings for PCW's Pascal Benchmarks

While thanking you for your Econet/ Pascal review, I would like to point out the following errors where it concerned Pascal.

1. There is absolutely no clash between the Pascal and Econet software; the object I sent you was a one-off bodge.

2. The Benchmark timings you publish are rather uncomplimentary as the production system is substantially faster.

The Pascal system is fully available on disk for the System 3/4, and available in limited quantities (ie, I'm having to blow and assemble the EPROM sets myself) as a plug-in for the Atom. It should be fully available sometime soon — meantime I enclose some recent Benchmark times (and also the local mainframe's efforts). Sorry our floating point is a bit slow, but we do calculate to 40 bits of precision.

Paul Farrell, Acorn Computers Ltd

I accept that in the 20-odd Benchtests on which I have collaborated there must have been errors and omissions. There are limits to the amount of checking one can do in a short time, but I like to think that we try to check the bulk of our facts before we publish. In this instance, and since he brought it up, perhaps Mr Farrell will permit me to remind him of the telephone conversation made explicitly to check these points during which he denied all knowledge of the Econet software.

I am pleased, however, to publish the new Acorn Pascal figures as an incentive to manufacturers and software producers who are courageous enough to submit their 'bodges' for a preview. Nevertheless, even Mr Farrell must appreciate that we can only review systems as we find them and not as their designers hope they'll turn out.

You might be interested in the enclosed timings for a couple of Data General Minicomputers. One is a Nova 12/20 using the RDOS single user operating system, the other is an Eclipse 5140 using the AOS operating system with only one user active during the timings.

The Nova system was developed at Lancaster University from the original Zurich p-code compiler. It produces compacted p-code which is interpretively executed. The design sacrifices some execution speed to allow large programs to be run.

In developing the AOS version I have not taken full advantage of the extended instruction set of the Eclipse computer, and the actual code executed for the Benchmarks was virtually identical — the increased performance being due to the improved processor design, particularly noticeable being the introduction of a hardware floating point unit in the Eclipse.

The department is currently considering distributing the AOS version and would like to hear from any interested parties or potential users.

Dick Whiddett, Centre for Computer Studies, University of Birmingham

That floating-point on the Eclipse looks really impressive. It's a shame you couldn't run MATHS as well.

Distasteful as it is for us to blow our own trumpet, the lack of anyone else doing it for us in this country has forced us to do it ourselves. When the Benchmarks first appeared, we ran them on our then current releases of Lucidata Pascal and, apart from a few criticisms which I believe have been covered by others in the months since, were content that at least a comparison Benchmark set existed. We then sat back and awaited the appearance of the first set of data run with our Pascal, submitted naturally by one of the thousands of enthusiastic Lucidata Pascal users world-wide, or at least from one of the many hundreds in the UK. Thus the following issues were not only a shock but also a disappointment, for it showed that no one had even submitted a 68XX based result, let alone one of ours. Shades of the American magazines' saturation coverage of all things 8080 I thought and dug out the old disk labelled PCW-BENCH.

I must emphasise that I do not believe such results to be worth anything at all as a means of comparison unless more information is provided and printed alongside the data. In particular, when an 8-bit micro tries to do floating point arithmetic its performance is very dependent on how many bytes are being used to represent a REAL. Mind you, when it comes to the transcendental functions, it is clear from the results so far published that the choice of algorithm far outweighs any effect of REAL emulation. Lucidata Pascal uses 5-byte REALS, giving about 9 decimal digit precision for REAL arithmetic and all the functions, 2-byte signed INTEGERs, 8-byte ALFAs, 16-byte SETs and 1-byte BOOLEANs, scalars and CHARacters. It will operate on the minimum hardware needed to support the DOS, which in the case of FLEX 2.0 from TSC is 16k + 8k. The run-time system automatically enters a paged mode of execution if there is insufficient memory to hold everything in core. It only requires a single 5in floppy disk drive to compile.

The submitted data were obtained on a 2 MHz GIMIX 6809 with 56k and 9600 baud terminal running FLEX 9.0 and a 1 MHz SWTPc 6800 with 40k and 9600 baud terminal running FLEX 2.0. Versions of Lucidata Pascal are being marketed for Smoke Signal Broadcasting 6800 under DOS68D and Heath H89 under H89 under HDOS. I will attempt to get the Benchmarks run under these systems also.

Finally, as there seems to be a lot of nationalism creeping into editorial material these days: Lucidata (release 1) was conceived and developed in the Netherlands (EEC) three years ago by two British passport carrying persons, Dave Gibby and myself. Does this qualify it to be called 'wholly British'?

Dr Nigel Bennee, Lucidata Ltd

Thank you for your timings. I too have been waiting for 6800 and 6809 figures to emerge. Perhaps you'll get a few more enquiries now.

I enclose my findings with respect to Digital Marketing Inc's Pascal/M. I will be happy for you to make use of this information in PCW provided that they publish my list of small ads, also enclosed, that have been outstanding with them for an obscene length of time.

Jonathan Vickers, Farnborough, Hants

Since your figures have been passed on to me I assume your ads have been aired!

We have recently completed the development of a Pascal compiler, to run on the Z80 under CP/M, which generates native Z80 machine code. The system, called Pro Pascal, will shortly be available. It is a full implementation of the proposed ISO standard, with the exception of conformant array parameters which, as no doubt you know, are currently the subject of intense international disagreement and debate. There are a small number of extensions, the most significant being a facility for separate compilation of program segments.

We have run your PCW Benchmarks on our own equipment (a 4 MHz Clenlo Conqueror system) and obtained the timings shown. To time the first test, we enclosed it within a further 20-fold 'magnifier' loop; for the others we upped the loop count to 30,000, to get more measurable elapsed times, and divided the results by 3.

In addition we enclose the times for the same Pro Pascal object programs executed on a Superbrain. This has a memory-mapped screen with non-transparent refresh. Since 24x80 positions have to be refreshed 50 times a second, this costs 96000 microseconds per second, and the timings are indeed about 10 percent greater. This is yet another hardware variation to be compounded with the one you already take into account (wait states).

Our implementation has a maxint equivalent to a 32-bit value (ie, 2147483647), but recognises subranges that can be accommodated in a 'word' (16 bits) or a byte, and optimises storage and object code accordingly. For the purpose of the Benchmarks, 'integer' was redeclared as a 16-bit

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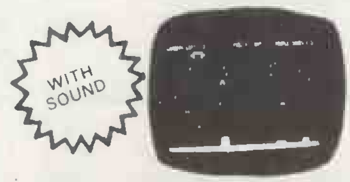

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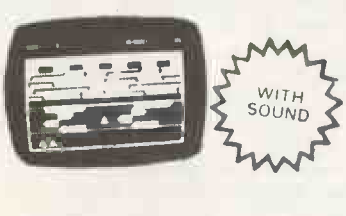

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subrange (ie, TYPE integer — 32767. . . 32767), which is sufficient for the values involved and is a closer equivalent to the other micro implementations (although the timings without this change are not bad).

In the circumstances, we would expect you to look for some independent verification of these timings, and would be happy to provide facilities for yourself or a representative to run any checks you wish to make.

Tony Hetherington and Mike Oakes, Prospero Software

PS: Are you the C Sadler who is joint author of a book on Pascal (pub Springer-Verlag) which was reviewed in die Computer Zeitung?

Your figures certainly are very fast indeed. To answer your question, yes, I am that C Sadler and thank you for telling me where the book is being reviewed. Are you the Prospero Pascal that keeps on mentioning my Benchmarks in your ads?

We would be most grateful to hear if you know of a full UCSD Pascal including units, long integers and strings implemented on North Star/Comart Communicator or any CP/M system. We would also be glad to know of any small computers that do run UCSD Pascal. Thanking you in anticipation.

J O Hodgson, Estate Computer Systems, Sleaford, Lancs

I am grateful to Mr Hodgson for giving me the opportunity to declare an interest — since the last Pascal Benchmarks article appeared I have become the publicity officer for the UCSD p-System User Group (USUS(UK)). To my knowledge, the p-System has been implemented on the following Z80 systems: Altos, Cipher, Cromemco, North Star (Horizon and Advantage), Philips P2000, Research Machines, Superbrain, Tandy TRS-80 and Zenith Z89.

However, anyone with a completely standard CP/M system can buy the 'CP/M Adaptable System' direct from SoftTech and put up their own p-System. Beyond the Z80, there's Apple Pascal (the most popular p-System), the LSI-11 version (the original), TI9900, 8088/8086 (IBM) and the Microengine (which executes p-code directly). I can put readers in contact with somebody — a supplier or a user — for most of the above systems, but please send a stamped addressed envelope.

The editor has agreed to consider publishing a full-length article on the version IV p-System (which runs on all the above bar the Microengine) in the next few months. For details of USUS (UK), contact Malcolm Harper on 0865 58086.

Some time ago you published some times for my Pascal system running your Pascal Benchmarks, together with some encouraging remarks about extending it to support REAL variables. I have now done so, and made a number of other extensions including some improvements to the generated code. I enclose the new timings for the Benchmarks for my own system, which I have labelled Molimerx since they market it and for the UCSD system, both running on the TRS-80 Model I.

Thank you again for the magazine's coverage of Pascal.

T J Bourne, Hemel Hempstead

Thank you for the new timings incorporating REALs — you must have tightened your code up quite a bit. I have taken note of the change in name.

Here are the results of running your Pascal Benchmarks on the various Unix systems at Queen Mary College and on the PERQ. Note that several different compilers were involved, so the figures do not give a measure of raw hardware performance. The PDP11s use the Vrije University Pascal Compiler. The former of these employs software simulated floating point operations (see MATHS, REALALGEBRA and REALARITHMETIC).

In all cases the tests were compiled with optimisation on where applicable. For the Unix systems, the times given are the sums of the 'user' and 'system' times reported by the 'time' command. The 'time' command was calibrated with a stop-watch on a machine with no other load, and was found to yield timings that are 10-20 percent optimisitc.

Prof G Coulouris, Queen Mary College, London

I have been reading your Pascal Benchmarks with interest and enclose a set produced on one of Manchester University's CDC 7600s. As you may know, this machine was (when introduced) the world's most powerful computer, but it has now been superseded by the Cray-1. One of the features of this impressive machine is a very fast hardware floating point unit which contributes to its peak instruction rate of 40 mips (million instructions per second).

A couple of notes about the Benchmarks.

1. To ease the production of the figures (and to save machine resources) I have put all 15 Benchmarks into one program. Also for timing I have used the compiler's built-in parameter-less function CLOCK which returns the total CPU time used so far by the job. In doing this I have allowed for the time to print the results and read the clock. Out of interest, the total time to run all the Benchmarks was 2.745 seconds, of which the compile time was 0.277 seconds and execute time 2.169 seconds, the remainder being machine overheads associated with every job.

2. The machine's speed shows up best in MATHS (10 milliseconds). If the loop were increased to 10,000 to give a more reasonable figure, it is easy to see that it would be faster than all except MAGNIFIER, REALALGEBRA, REALARITHMETIC, FORLOOP and LITERALASSIGN.

	magnifier	forloop	whileloop	repeatloop	literalassign	memoryaccess	realarithmetic	realalgebra	vector	equalif	unequalif	noparameters	value	reference	maths
Type = 6502															
PET TCL	9.5	119	158	168	149	155	164	156	332	240	231	66	75	77	—
Apple UCSD	6.4	74.3	70.9	63.3	88.5	91.0	93.0	83.4	203.3	116.7	115.3	50.2	54.4	55.3	66.0
Atom Acorn	1.8	25.0	59.7	52.8	36.7	36.5	121.0	133.0	102.0	65.5	68.0	10.3	18.0	22.2	115.0
Type = 68XX															
SWTPC 6800 Lucidata	9.0	112.0	164.0	151.4	153.8	170.4	139.5	146.5	316.9	218.8	216.1	34.7	52.6	51.6	103.7
GIMIX 6809 Lucidata	2.5	30.9	51.6	47.5	45.2	51.3	57.3	53.6	101.8	65.8	64.8	10.9	17.4	17.0	20.8
Type = Z80															
Pegasus MT+5.2	0.2	4.7	7.8	6.9	5.5	5.7	59.0	45.0	10.8	11.2	11.4	0.9	3.4	3.4	304.0
Mycro MT+5.1	0.5	8.5	12.5	11.9	3.0	9.0	78.0	60.0	14.5	16.5	16.5	1.5	5.5	5.5	494.0
Nascom 2 Naspas	0.2	3.1	5.4	4.7	3.7	3.9	28.0	27.0	9.3	6.0	6.0	4.0	4.6	4.6	—
Horizon Pascal Z	2.4	29.3	29.9	29.3	30.3	31.4	192.9	127.9	51.6	33.9	33.4	13.7	14.2	15.0	314.2
Horizon UCSD	3.5	38.5	35.0	31.2	44.8	45.0	47.2	44.7	96.4	58.8	58.4	20.7	23.9	24.2	23.6
Tuscan TCL	4.5	56.2	66.5	62.1	67.5	70.1	69.4	51.7	154.1	104.1	101.1	29.3	31.7	32.4	—
Philips UCSD	4.7	56.3	52.6	46.9	68.1	70.5	71.4	67.0	148.2	92.6	90.7	38.6	41.4	41.4	39.1
Ithaca TCL	5.0	62.6	74.4	69.1	75.3	77.7	80.0	59.4	172.5	115.7	112.5	31.3	35.1	36.1	206.9
SBrain M-debug	5.0	60.0	60.5	84.0	69.1	73.0	60.7	58.2	175.8	129.7	139.0	56.6	62.9	60.7	29.0
SBrain M	5.0	57.3	52.7	47.6	66.4	70.4	58.2	55.7	147.2	88.1	87.1	27.2	31.0	31.4	29.0
SBrain Pro	0.2	2.2	3.7	3.0	3.3	3.1	12.7	26.5	6.4	4.8	4.3	5.1	5.8	5.8	15.6
Clenlo Pro	0.2	2.0	3.4	2.8	3.1	2.8	11.8	24.4	5.9	4.4	4.7	4.6	5.2	5.2	14.2
TRS80-I Molimx	0.9	11.0	23.0	20.8	12.5	12.8	111.4	110.6	45.0	27.5	27.2	17.5	19.2	28.0	54.7
TRS80-I UCSD	7.2	86.6	79.2	70.8	101.4	107.0	103.1	98.0	217.1	133.4	131.7	46.3	51.8	52.3	52.5
Type = 16-bit															
MEngine UCSD	0.8	9.5	9.3	9.1	11.0	11.4	8.7	6.8	26.4	16.0	15.8	4.5	5.0	5.0	7.0
Onyx Onix	0.5	6.1	5.9	5.4	6.7	6.9	—	—	23.7	9.9	9.9	7.4	8.0	7.9	—
H11A UCSD	3.9	42.8	40.1	35.1	49.9	52.0	61.7	40.6	102.9	66.8	65.8	26.4	29.3	29.7	25.3
11/04 Omsi	0.3	3.3	2.5	2.2	3.9	4.2	42.8	38.2	9.4	5.3	5.2	3.9	3.9	3.9	21.6
11/34 Vri jeU	0.1	1.2	1.7	2.1	1.6	2.1	100.3	144.3	3.3	3.0	3.0	1.7	1.8	1.8	171.8
11/44 Vri jeU	0.05	0.5	0.7	0.9	0.7	0.8	68.3	87.5	1.8	1.3	1.3	0.7	0.8	0.8	120.8
11/70 Vri jeU	0.04	0.4	0.5	0.7	0.5	0.6	56.2	71.6	1.2	1.0	1.0	0.5	0.6	0.6	98.7
Nova LancU	4.0	41.0	42.0	37.5	49.0	49.0	216.0	206.0	92.0	67.5	66.0	16.8	19.0	19.0	—
Type = above 16-bit															
Eclipse LancsU	2.0	21.0	22.0	23.0	25.0	24.0	6.0	6.0	48.0	35.0	34.0	8.0	9.0	9.0	—
VAX750 Berkeley	0.08	0.8	0.8	0.8	0.9	1.1	1.8	1.8	2.7	1.5	1.4	3.5	3.5	3.6	1.3
Cyber 174 6000 3.2	0.05	0.64	0.68	0.75	0.8	0.87	0.3	0.26	1.22	1.55	1.35	1.86	2.01	1.92	0.16
CDC7600 6000 3.2	0.008	0.094	0.191	0.183	0.095	0.184	0.036	0.034	0.124	0.190	0.191	0.269	0.276	0.278	0.010
IBM370/165	0.06	0.23	0.27	0.24	0.21	0.22	0.3	0.40	0.74	0.38	0.37	0.40	0.42	0.40	—

PASCAL UPDATE

Thus two mathematical function calls take about the same time as a 10-step FOR loop containing one integer assign!

These timings could be further enhanced by changing the default options on the compiler to inhibit run-time checking (array bounds and sub-ranges) and suppress the code to enable post mortem dumps to be produced.

The compiler used is one for Pascal 3 (Pascal 6000 — V3.2.0) which is probably the same one used on Imperial College's Cyber 174, as Manchester University's Cyber 170/720 dual system also uses this compiler.

In conclusion, I hope you are able to use these Benchmarks. I realise that the 7600 isn't exactly a personal computer (at several mega-pounds) but I feel your readers would be interested in the results produced by a high-performance mainframe.

Roderick Buchanan, Stockport

Wow!

And finally here's a complete listing of the *PCW* Pascal Benchmarks Suite.

```
program magnifier;
var k:integer;
begin
    writeln ('s');
    for k := 1 to 10000 do;
    writeln ('e')
end.
```

```
program forloop;
var j,k:integer;
begin
    writeln ('s');
    for k := 1 to 10000 do
        for j := 1 to 10 do;
    writeln ('e')
end.
```

```
program whileloop;
var j,k:integer;
begin
    writeln ('s');
    for k := 1 to 10000 do
    begin
        j := 1;
        while j <= 10 do j := j+1
    end;
    writeln ('e')
end.
```

```
program repeatloop;
var j,k:integer;
begin
    writeln ('s');
    for k := 1 to 10000 do
    begin
        j := 1;
        repeat
            j := j+1
        until j > 10;
    end;
    writeln ('e')
end.
```

```
program literalassign;
var j,k,l:integer;
begin
    writeln ('s');
    for k := 1 to 10000 do
        for j := 1 to 10 do l := 0;
    writeln ('e')
end.
```

```
program memoryaccess;
var j,k,l:integer;
begin
    writeln ('s');
    for k := 1 to 10000 do
        for j := 1 to 10 do l := j;
    writeln ('e')
end.
```

```
program realarithmetic;
var k:integer;
    x:real;
begin
    writeln ('s');
    for k := 1 to 10000 do
        x := k/2*3+4-5;
    writeln ('e')
end.
```

```
program realalgebra;
var k:integer;
    x:real;
begin
    writeln ('s');
    for k := 1 to 10000 do
        x := k/k*k+k-k;
    writeln ('e')
end.
```

```
program vector;
var j,k:integer;
    matrix:array[0..10] of integer;
begin
    writeln ('s');
    matrix[0] := 0;
    for k := 1 to 10000 do
        for j := 1 to 10 do
            matrix[j] := matrix[j-1];
    writeln ('e')
end.
```

```
program equalif;
var j,k,l:integer;
begin
    writeln ('s');
    for k := 1 to 10000 do
        for j := 1 to 10 do
            if j < 6 then l := 1
                     else l := 0;
    writeln ('e')
end.
```

```
program noparameters;
var j,k:integer;
procedure none5;
begin
    j := 1
end;
procedure none4;
begin
    none5
end;
procedure none3;
begin
    none4
end;
procedure none2;
begin
    none3
end;
procedure none1;
begin
    none2
end;
begin
    writeln ('s');
    j := 0;
    for k := 1 to 10000 do
        none1;
    writeln ('e')
end.
```

```
program unequalif;
var j,k,l:integer;
begin
    writeln ('s');
    for k := 1 to 10000 do
        for j := 1 to 10 do
            if j < 2 then l := 1
                     else l := 0;
    writeln ('e')
end.
```

```
program value;
var j,k:integer;
procedure value5 (i:integer);
begin
    j := 1
end;
procedure value4 (i:integer);
begin
    value5 (i)
end;
procedure value3 (i:integer);
begin
    value4 (i)
end;
procedure value2 (i:integer);
begin
    value3 (i)
end;
procedure value1 (i:integer);
begin
    value2 (i)
end;
begin
    writeln ('s');
    j := 0;
    for k := 1 to 10000 do
        value1 (j);
    writeln ('e')
end.
```

```
program reference;
var j,k:integer;
procedure refer5 (var i:integer);
begin
    j := 1
end;
procedure refer4 (var i:integer);
begin
    refer5 (i)
end;
procedure refer3 (var i:integer);
begin
    refer4 (i)
end;
procedure refer2 (var i:integer);
begin
    refer3 (i)
end;
procedure refer1 (var i:integer);
begin
    refer2 (i)
end;
begin
    writeln ('s');
    j := 0;
    for k := 1 to 10000 do
        refer1 (j);
    writeln ('e')
end.
```

```
program maths;
var k:integer;
    x,y:real;
begin
    writeln ('s');
    for k := 1 to 1000 do
    begin
        x := sin (k);
        y := exp (x)
    end;
    writeln ('e')
end.
```

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This RAM pack and the replacement ROM are described below. And the description of each cassette makes it clear what hardware is required.

8K BASIC ROM

The 8K BASIC ROM used in the ZX81 is available to ZX80 owners as a drop-in replacement chip. With the exception of animated graphics, all the advanced features of the ZX81 are now available on a ZX80 – including the ability to run much of the Sinclair ZX Software.

The ROM chip comes with a new keyboard template, which can be overlaid on the existing keyboard in minutes, and a new operating manual.

16K-BYTE RAM pack

The 16K-byte RAM pack provides 16-times more memory in one complete module. Compatible with the ZX81 *and* the ZX80, it can be used for program storage or as a database.

The RAM pack simply plugs into the existing expansion port on the rear of a Sinclair ZX Personal Computer.

Cassette 1 – Games

For ZX81 (and ZX80 with 8K BASIC ROM)

ORBIT – your space craft's mission is to pick up a very valuable cargo that's in orbit around a star.

SNIPER – you're surrounded by 40 of the enemy. How quickly can you spot and shoot them when they appear?

METEORS – your starship is cruising through space when you meet a meteor storm. How long can you dodge the deadly danger?

LIFE – J. H. Conway's 'Game of Life' has achieved tremendous popularity in the computing world. Study the life, death and evolution patterns of cells.

WOLFPACK – your naval destroyer is on a submarine hunt. The depth charges are armed, but must be fired with precision.

GOLF – what's your handicap? It's a tricky course but you control the strength of your shots.

Cassette 2 – Junior Education: 7-11-year-olds

For ZX81 with 16K RAM pack

CRASH – simple addition – with the added attraction of a car crash if you get it wrong.

MULTIPLY – long multiplication with five levels of difficulty. If the answer's wrong – the solution is explained.

TRAIN – multiplication tests against the computer. The winner's train reaches the station first.

FRACTIONS – fractions explained at three levels of difficulty. A ten-question test completes the program.

ADDSUB – addition and subtraction with three levels of difficulty. Again, wrong answers are followed by an explanation.

DIVISION – with five levels of difficulty. Mistakes are explained graphically, and a running score is displayed.

SPELLING – up to 500 words over five levels of difficulty. You can even change the words yourself.

Cassette 3 – Business and Household

For ZX81 (and ZX80 with 8K BASIC ROM) with 16K RAM pack

TELEPHONE – set up your own computerised telephone directory and address book. Changes, additions and deletions of up to 50 entries are easy.

NOTE PAD – a powerful, easy-to-run system for storing and retrieving everyday information. Use it as a diary, a catalogue, a reminder system, or a directory.

BANK ACCOUNT – a sophisticated financial recording system with comprehensive documentation. Use it at home to keep track of 'where the money goes,' and at work for expenses, departmental budgets, etc.

Cassette 4 – Games

For ZX81 (and ZX80 with 8K BASIC ROM) and 16K RAM pack

LUNAR LANDING – bring the lunar module down from orbit to a soft landing. You control attitude and orbital direction – but watch the fuel gauge! The screen displays your flight status – digitally and graphically.

TWENTYONE – a dice version of Blackjack.

COMBAT – you're on a suicide space mission. You have only 12 missiles but the aliens have unlimited strength. Can you take 12 of them with you?

SUBSTRIKE – on patrol, your frigate detects a pack of 10 enemy subs. Can you depth-charge them before they torpedo you?

CODEBREAKER – the computer thinks of a 4-digit number which you have to guess in up to 10 tries. The logical approach is best!

MAYDAY – in answer to a distress call, you've narrowed down the search area to 343 cubic kilometers of deep space. Can you find the astronaut before his life-support system fails in 10 hours time?

Cassette 5 – Junior Education: 9-11-year-olds

For ZX81 (and ZX80 with 8K BASIC ROM)

MATHS – tests arithmetic with three levels of difficulty, and gives your score out of 10.

BALANCE – tests understanding of levers/fulcrum theory with a series of graphic examples.

VOLUMES – 'yes' or 'no' answers from the computer to a series of cube volume calculations.

AVERAGES – what's the average height of your class? The average shoe size of your family? The average pocket money of your friends? The computer plots a bar chart, and distinguishes MEAN from MEDIAN.

BASES – convert from decimal (base 10) to other bases of your choice in the range 2 to 9.

TEMP – Volumes, temperatures – and their combinations.

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3-D MADE EASY

Chris Horseman, author of several of those spectacular graphic games for the Atari, passes on some of his know-how.

Three-dimensional graphics are becoming increasingly used in many aspects of computing — simulation, animation, design and, more recently games. A certain mystique tends to surround the subject, although the mathematics involved are simple applications of trigonometrical equations. Often the mathematics corresponding to the spatial manipulations are represented in matrix form; this can be off-putting to those people without the mathematical background.

The sample program included demonstrates the elements of three-dimensional graphics described. It will run on both the Atari 400 and 800 and uses approximately 12k, including the high-res screen and the arrays. The program can be converted for use on other microcomputers providing that they have high-res graphics available. In the description of the program below, I have tried to point out all the parts that are Atari-specific. The program displays on the screen a line drawing of an Atari 800 console and, by moving the joystick, it is possible to view the object from any angle and distance.

In order to move an object drawn in three dimensions it is necessary to define its position in space relative to something fixed. For this purpose, a Cartesian coordinate set is used, with its X, Y and Z axes corresponding to the three dimensions. Various conventions dictate the labelling of the three axes; the one that I have used is shown in Figure 1.

Since the object is stored as a set of points with lines connecting them in a specific order, the individual points must be manipulated so that the new orientation of the object can be constructed.

There are three basic types of manipulation used in 3D graphics: translation, scaling and rotation.

Translation

The simplest of these types of manipulation is translation, which involves moving the object in one or more planes without altering its size or shape. New coordinate values are calculated by:

newx=oldx±distance to be moved in xdirection

with similar equations for Y and Z. Figure 2 shows a simple example of translation.

Scaling

Scaling has the effect of increasing or decreasing the size of the object. This can be done either uniformly or in just one or two dimensions. Figure 3 demonstrates the scaling of a cube. Mathematically, scaling takes this form:

newx=oldx * scaling factor in the X direction. Similar equations are used to define Y and Z.

In the program, only uniform scaling is used so that the object can appear to be approaching or receding from you, much like the effect of a zoom camera lens.

Rotation

Rotation can be applied about any of the three axes. The angles of rotation (that is, the degree of turn) are denoted throughout by THETA, PHI and PSI (Θ,ϕ,Ψ) and correspond to the Y, X and Z axes respectively. Rotating a point about one axis will change coordinates on the other two axes. For example, rotation about the Z axis can be written mathematically

newx=oldx*cos(Ψ)—oldy*sin (Ψ)
newy=oldy*sin(Ψ)+oldx*cos (Ψ)
newz=oldz (ie, no change)

Figure 4 shows the Z rotation described.

Besides these operations, there are some ancillary manipulations that must be performed on the object to make the image appear correct when drawn on the TV screen. They are perspective transformation and clipping. Displaying a three-dimensional object on a two-dimensional screen makes it necessary to flatten the image. However, to avoid losing its three-dimensional effect, the Z coordinates of the points must be converted to offsets in the X-Y plane. This requires perspective transformation which is mathematically represented

newx=oldx/z
newy=oldy/z

This gives an object perspective from a point at zero on the Z axis.

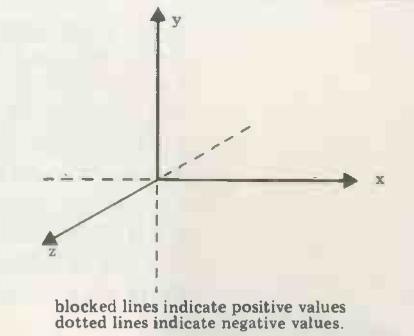


Fig 1 The cartesian coordinate system

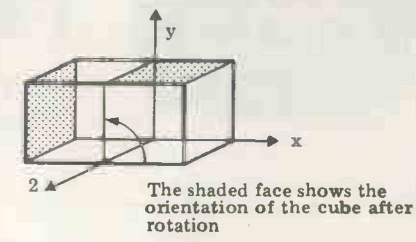


Fig 4 Rotation about the z axis

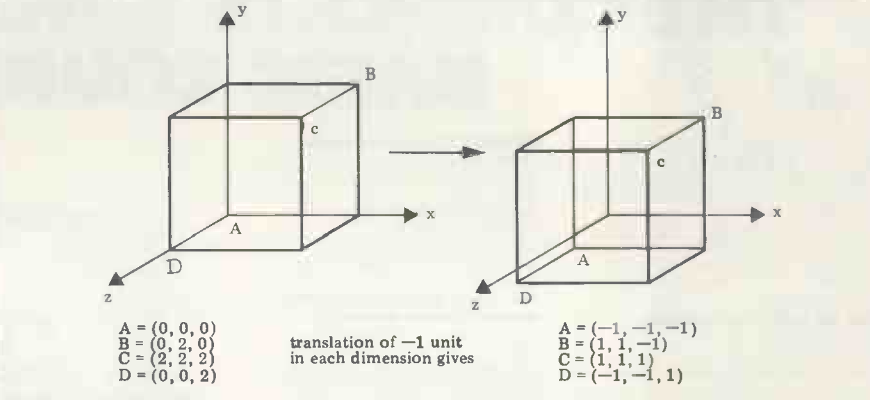


Fig 2 Translation of a cube

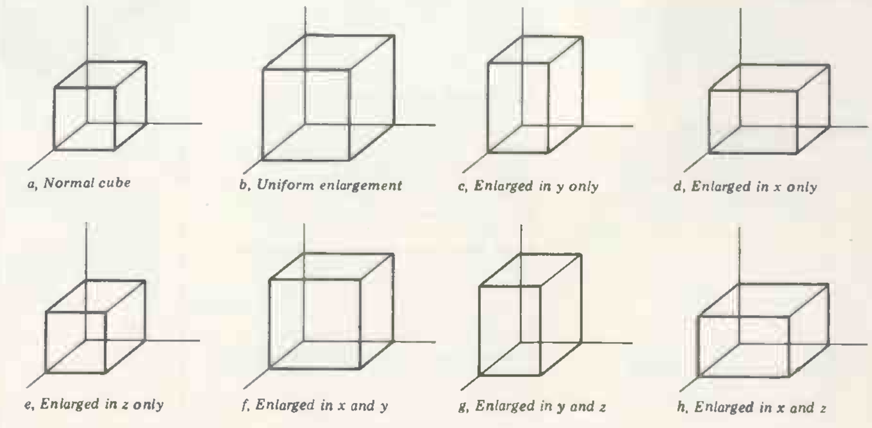


Fig 3 Scaling a cube

3-D

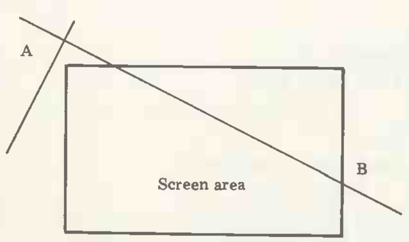
Because Y=0 is at the top of an Atari screen, it is necessary to change the sign of the Y coordinates at this point. The coordinate values of the points are now in the same coordinate system as the screen although some values may exceed the boundaries. In order to construct the image from these points, a data table or similar is necessary to indicate which points join to each other. Using this, a pair of points can be taken ready to draw a line. However, before drawing the line it is necessary to determine its position with respect to the observer. A line is only visible if it is in front of the observer, and at least partly on the screen area. Thus a test to see if the line is behind the observer must be performed.

If the Z coordinate of a point is negative it means that the point is behind the observer. A line is not drawn if both the Z coordinates of its points are negative, but if one of the Z coordinates is positive then the part of the line in front of the observer must be drawn. The line is drawn from the visible point in the opposite direction to the apparent position of the invisible point. The line is continued until it reaches one of the screen boundaries. This reversal is necessary because perspective offsets in the X-Y plane suffer a change of sign if the z-value is negative.

It is possible that a line is outside the boundaries of the screen, and a test must be performed to determine whether both X or both Y values of the points are off the screen in the same direction. If this is so then the line is not drawn. However, if both X and Y are off the screen but in opposite directions the line may cross the screen and still need to be drawn.

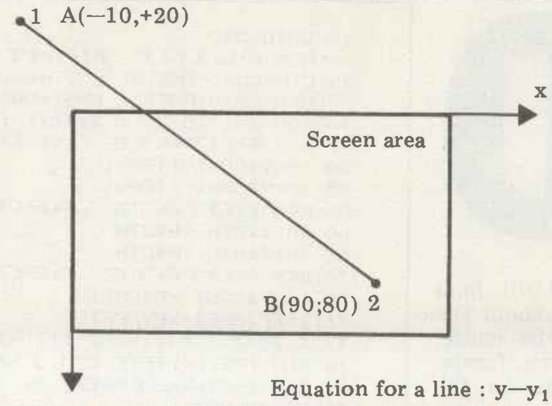
If the line is to be drawn but one or both points are outside the screen boundary, then the line must be clipped. To do this, the slope of the line is found and the boundary value that the line crosses is used to calculate the new coordinate. This is done first for the X and then the Y coordinates. An example of the use of this clipping procedure is given in Fig 6.

The line B2 now lies totally within the screen boundaries, but under certain conditions a line may still lie outside and



Both x values of the line A are outside the screen area (and one y value), so the line is not drawn. However both x values of line B and one y value are off the screen area, but part of the line must be drawn

Fig 5



Slope of the line $2 = \frac{dx}{dy}$

$= \frac{x_2-x_1}{y_2-y_1}$

$= -1$

Equation for a line : $y-y_1=\left(\frac{x_2-x_1}{y_2-y_1}\right)(x-x_1)$

Let the slope of the line be denoted by m.

$y-y_1 = m(x-x_1)$
$y = mx - (mx_1 - y_1)$
But $mx_1 - y_1$ is a constant denoted by c corresponding to the y intercept value of the line

$y=mx+c$

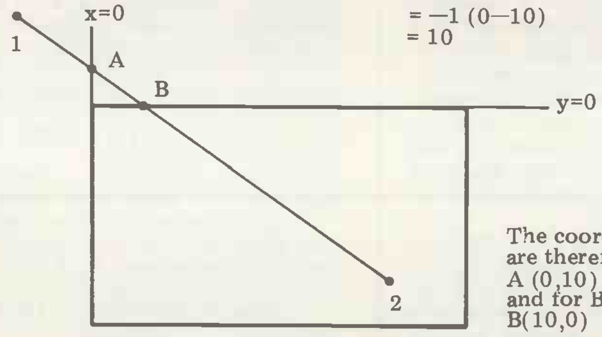
In the example the boundary value, x=0 is used to find the clipped value of y. Inserting numerical values this gives

$y = -1*0+10$
$= 10$

similarly for y = 0

$x = \frac{1}{m}(y-c)$

$= -1\ (0-10)$
$= 10$



The coordinates for A are therefore A (0,10) and for B B(10,0)

Fig 6 Example of clipping in the x-y plane.

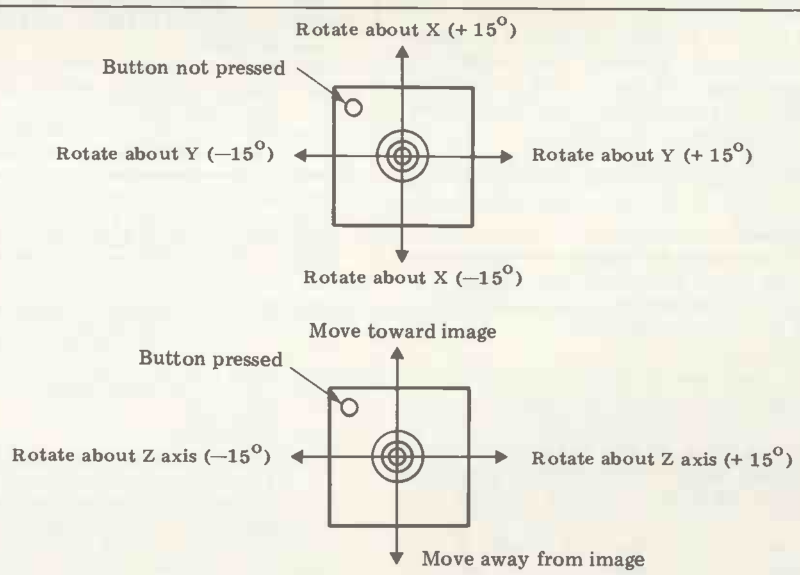


Figure showing joystick positions to move image.

a final test is performed before the line is drawn.

I have left our certain more complex aspects of 3D graphics such as colouring the faces of an object and hidden line removal. These are not impossible on a micro, but make the process of generating an image more time-consuming, and are out of the scope of this article.

The program

Initialisation (590-660): this routine dimensions the arrays and reads in their

3-D

initial values from data.

Manipulation of data (20-110): lines 30 to 76 perform rotations about the three axes; line 90 scales the image, carries out the perspective transformation and centres the image on the screen.

Line preparation (420-480): this routine contains the point connection table and, using this, it selects pairs of points and passes them to the draw routine.

I have used a shortcut here and sent the line to the draw routine without first clipping it. If the line is off the screen then Atari generates an error condition. If an error occurs, the trap statement on line 350 causes the program to jump to line 455 which sends the line to be clipped and redrawn before returning to the main routine. This 'shock horror' technique is used because Basic is able to test for an errant line much faster than I can and this cuts the routine down from 14 seconds an iteration to 6 seconds.

If you wish to use this program on a machine with neither trap nor ON ERROR GOTO statements then delete line 450, remove the POP statement from line 455 (POP just removes the top value on the stack and is used if a subroutine or FOR. . .NEXT loop has been jumped out of). Also, remove the trap statement from line 350.

Control routine (500 to 570): most of this routine is Atari specific but it would not be difficult to rewrite for another machine. This routine takes a value from the Atari joystick and its trigger and from this performs the required modification to angle or distance.

The two POKEs on line 510 make the keyboard speaker click when the joystick is moved and set the attract flag to zero to prevent the Atari from going into its colour cycling routine.

Clipping routines (120-410): this routine performs the clipping in the X, Y and Z directions and then sends the line to be drawn.

If you wish to change the image displayed you will have to change the point coordinate data on lines 610 to 630 and the connection data on lines 460 to 480.

If you use a different number of points you must change the array sizes on line 590 and the FOR. . .NEXT loops on lines 40 and 660. If you use a different number of lines then you must change the FOR. . .NEXT loop on line 430.

You will get the best results if you centre the image about the zero point in each axis. If your new object is very large or very small you may wish to change D on line 590; this is the initial distance of the observer from the object.

END

```
10 GOTO 590
20 REM POINT MANIPULATION ROUTINE
30 CTH=COS(-THETA) : STH=SIN(-THETA) : CPHI=COS(PHI) :
   SPHI=SIN(PHI) : CPSI=COS(PSI) : SPSI=SIN(PSI)
40 FOR I=1 TO 20 : X=X(I) : Z=Z(I) : Y=Y(I)
45 REM ROTATE ABOUT X
50 YP=Y*CPHI-Z*SPHI
55 ZP=Y*SPHI+Z*CPHI
56 REM ROTATE ABOUT Y
60 XP=X*CTH-ZP*STH
65 ZP=X*STH+ZP*CTH
70 REM ROTATE ABOUT Z
75 X=XP*CPSI-YP*SPSI
76 Y=XP*SPSI+YP*CPSI
77 X(I)=X : Y(I)=Y : Z(I)=ZP
78 REM PERSPECTIVE TRANSFORMATION
79 REM SCALING & CENTRE ON SCREEN
80 ZP=(D-ZP)
90 XN=X*100/ZP+160 : YN=-(Y*100/ZP)+96
100 XNEW(I)=XN : YNEW(I)=YN : ZNEW(I)=ZP : NEXT I :
    GOSUB 420
110 RETURN
120 REM CLIP ROUTINE FOR X & Y
130 N=0 : M=319 : R=191 : P=0
140 IF Z1<0 AND Z2<0 THEN RETURN
150 IF Z1<0 OR Z2<0 THEN GOSUB 370
160 X1=X1(1) : X2=X2(2) : Y1=Y1(1) : Y2=Y1(2)
170 IF (X1>M AND X2>M) OR (Y1>R AND Y2>R) OR
    (X1<N AND X2<N) OR (Y1<P AND Y2<P) THEN RETURN
190 IF X1=X2 THEN SLOPE=1E+30 : GOTO 210
200 SLOPE=(Y2-Y1)/(X2-X1) : IF SLOPE=0 THEN SLOPE=
    1E-10
205 REM CLIP X
210 FOR I=1 TO 2
220 IF X1(I)>M THEN C=M : GOTO 250
230 IF X1(I)<N THEN C=N : GOTO 250
240 GOTO 260
250 Y1(I)=SLOPE*(C-X1(I))+Y1(I) : X1(I)=C
260 NEXT I : FOR I=1 TO 2
265 REM NOW CLIP Y
270 IF Y1(I)>R THEN C=R : GOTO 300
280 IF Y1(I)<P THEN C=P : GOTO 300
290 GOTO 310
300 X1(I)=(C-Y1(I))/SLOPE+X1(I) : Y1(I)=C
310 NEXT I
315 REM FINAL CHECK
320 FOR I=1 TO 2 : IF X1(I)<N OR Y1(I)<P OR
    X1(I)>M OR Y1(I)>R THEN POP : RETURN
330 NEXT I
340 REM DRAW LINE
350 TRAP 455 : COLOR 1 : PLOT INT(X1(1)),INT(Y1(1)) :
    DRAWTO INT(X1(2)),INT(Y1(2)) : RETURN
360 REM CLIP Z
370 IND=1 : IND2=2
380 IF Z2<0 THEN IND=2 : IND2=1
390 X1(IND)=X1(IND2)-(X1(IND)-X1(IND2))*100
400 Y1(IND)=Y1(IND2)-(Y1(IND)-Y1(IND2))*100
410 RETURN
415 REM LINE PREPARATION
420 GRAPHICS 24 : SETCOLOUR 2,0,0 : COLOR 1 :
    RESTORE 460
430 FOR K=1 TO 26 : READ I,J : X1(1)=XNEW(I) :
    Y1(1)=YNEW(I) : Z1=ZNEW(I)
440 X1(2)=XNEW(J) : Y1(2)=YNEW(J) : Z2=ZNEW(J)
450 GOSUB 350 : NEXT K : RETURN
455 POP : GOSUB 130 : NEXT K : RETURN
460 DATA 1,2,2,3,3,4,4,1,5,6,6,7,7,8,8,5
470 DATA 9,10,9,5,10,6,1,5,2,6,3,7,4,8,1,
         0,11,11,12,12,9
480 DATA 13,14,14,15,15,16,16,13,17,18,18,
         19,19,20,20,17
490 REM CONTROL SUBROUTINE
500 A=STICK(0) : B=STRIG(0)
510 IF A<>15 THEN POKE 53279,0 : POKE 77,0 :
    GOTO 530
520 GOTO 500
530 C1=INC*(A=7)-INC*(A=11) : C2=INC*(A=13)-
    INC*(A=14) : THETA=C1*B : PHI=C2*B : PSI=
    C1*(B=0) : D=D+0.6*C2*(B=0)
570 GOSUB 30 : GOTO 500
580 REM INITIALISATION
590 DEG : DIM X(20),Z(20),Y(20),XNEW(29),YNEW(29),
    ZNEW(20),X1(2),Y1(2) : D=120 : INC=15
610 DATA -50,-40,0,50,-40,0,50,40,0,-50,40,0,
         -50,-35,20,50,-35,20,50,40,6,-50,40,6
620 DATA -40,-10,20,40,-10,20,50,0,13,-50,0,13
630 DATA -45,5,12.125,25,5,12.125,25,30,7.75,-45,
         30,7.75,30,5,12,125,40,5,12.125,40,30,7.75,
         30,30,7.75
660 RESTORE 610 : FOR I=1 TO 20 : READ X,Y,Z :
    X(I)=X : Y(I)=Y : Z(I)=Z : NEXT I : GOTO 530
```

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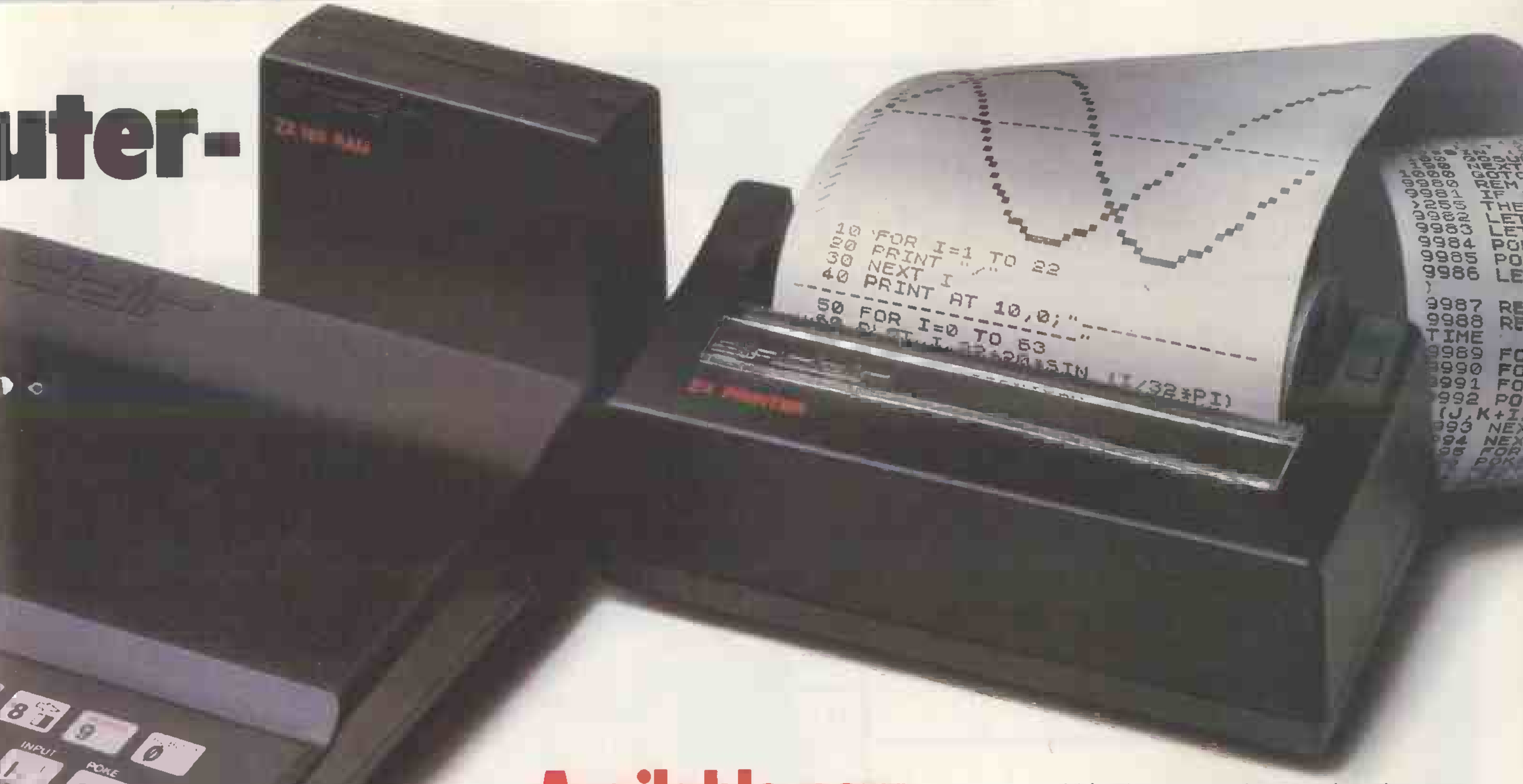

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PATTERNS

Alan Sutcliffe unveils a simple algorithm which produces complex results.

My first attempts at using a computer to make patterns relied on complexity: the complicated manipulation of random values and the construction of intricate programs to simulate randomness.

By reaction, this led me to look for simple methods of pattern generation and almost 10 years ago I invented a simple algorithm called Skip and Divide. This article describes this method, which operates on a set of intervals along a line and shows some elaborations of it for making two-dimensional patterns.

Suppose a line is divided into several sections or intervals, from left to right. These are the rules of Skip and Divide:

1. Start at the left-hand end, alternately dividing an interval and skipping over an interval. When an interval is divided, the new right-hand interval produced does not count as the next interval to be skipped: it will be divided or skipped the next time round the cycle.
2. After the right-most interval has been skipped or divided start again at the left: the ends of the line can be considered to be joined together.

Although these rules are best understood initially when there are several intervals to start with, the simplest way to begin is with a single interval. Look at Figure 1: cover up all but the very top of the picture leaving just the tops of the two end lines showing. The space between is the starting interval. Now follow the rules: starting with the left-most interval (the only one at this stage) divide it. Uncover the next level of the picture to show this line in the centre. As you are now at the right-hand end, move back to the start. There are now two intervals. Skip over the first and divide the second. Uncover the next level of Figure 1 to show three intervals. As you are again at the right-hand end return again to the start. Continue in this fashion, alternately skipping and dividing intervals.

Each run along the line from left to right I call a generation. In the first three generations only one interval is added to each cycle, but in the fourth generation and all the subsequent ones two or more new intervals are added.

Figure 1 shows the first nine generations. The bottom part of the picture shows how each generation looks in this form like a set of spectral lines from a photo-chemical analysis. Program A produced Figure 1. Lines 140 and 150 set the end points of the starting interval. At the start of each generation the coordinates of the division points are copied back from B into A and a vertical line is drawn at each division point. Lines 230 to 300 are the main loop in which each alternate interval is divided, the new values being put into B. M is the marker, alternately 0 and 1, to indicate whether to skip or divide each interval. For divide, the mid-point of the interval is calculated and entered as the new coordinate. I is the pointer to the items in A, and J is the pointer for B. N is the number of intervals currently represented in A: there are N+1 points for N intervals, the left-most point being in A(0).

Every interval is divided

If N=2n is even at the start of a generation, then n new intervals will be formed to give 3n at the start of the next generation.

If N=2n+1 is odd, then there will be 3n+1 intervals at the start of the next generation if the first interval in this generation is skipped, and 3n+2 intervals if the first interval is divided.

When an interval is divided in one generation, then one or other but not both of the 2 new intervals formed will be divided again in the next generation. Can any interval remain undivided for all further generations? In Figure 1 the interval at the right remains undivided from the third to the seventh generation, when it is divided.

I mentioned this question once to Lambert Meertens of the Mathematical Centre in Amsterdam when we were on a course together. The next day he

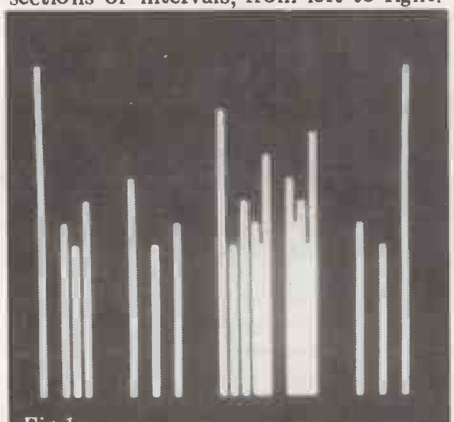
Fig 1

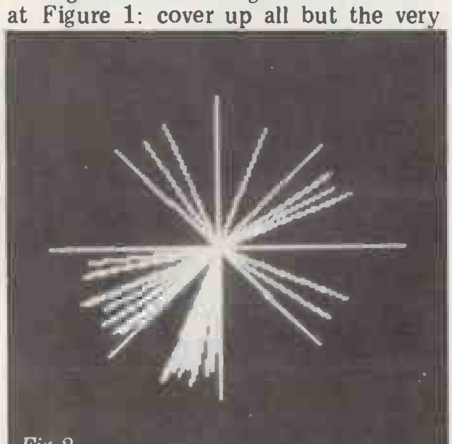
Fig 2

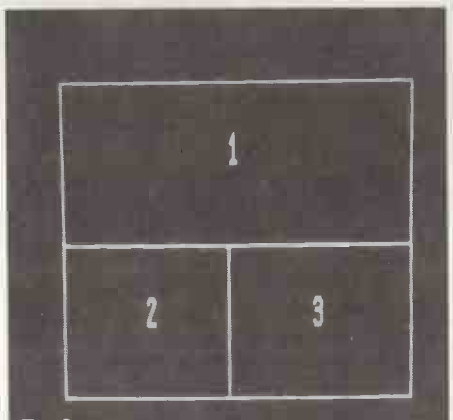

Fig 3a

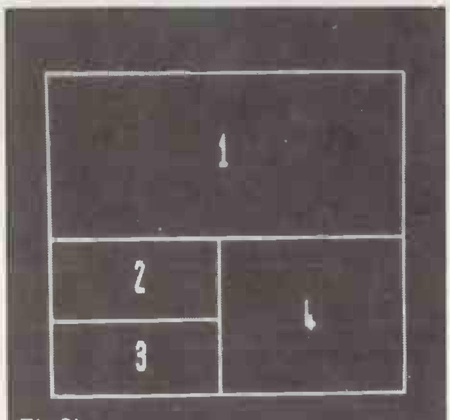

Fig 3b

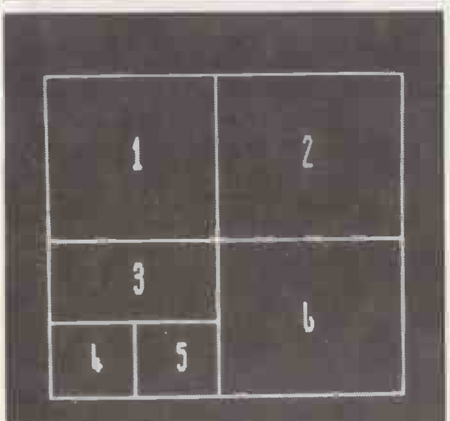

Fig 3c

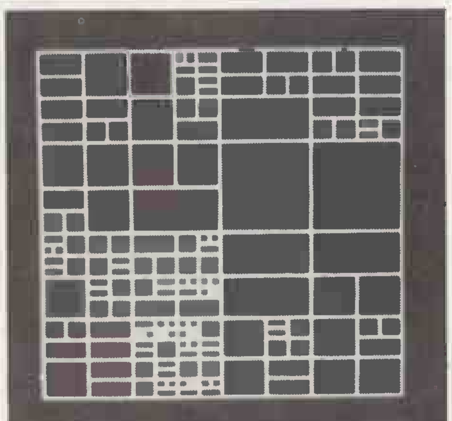
Fig 4

brought a proof that every interval is divided sooner or later. It goes something like this.

Take an interval that has just been skipped and suppose that there are now N intervals including this one. If N is odd the interval will be divided at the next generation. If N=2n is even then the interval will be skipped at the next generation, and immediately after it has been skipped there will be 3n intervals. So whether it is skipped or divided at the next generation will depend on whether 3n is even or odd. From this it can be seen that the interval will remain undivided for r generations where r is the largest power of 2 that divides N. For example, if $N = 40 = 2^3 . 5$, the interval will be skipped three times and divided the fourth time.

Circular display

Since the procedure treats the set of intervals as a cycle, it is natural to show the division process acting on a circle as in Figure 2. The original interval of 360 degree starts and ends along the x-axis. Once again the different generations are shown by a shortening line. The program for this manifestation of the process is obtained from Program A by the following amendments.

```
150 B(1)=PI+PI
152 X=XMAX/2
154 Y=YMAX/2
160 YM=32
200 DRAW X,Y X+YM*COS(A(I)),
    Y+YM*SIN(A(I)) 15
```

It is also necessary on the DAI to declare the arrays A and B as real (floating point). Figure 2 was produced with a slightly different version, at the next level of screen resolution (MODE 3), and it shows the first 10 generations.

Dividing a square

The two forms of pattern so far shown from the algorithm are still essentially one-dimensional, though stretched into two to make them visible. I have made some graphics by overlaying two versions of Figure 1 at rightangles, but this seems arbitrary and hardly disguises the linear form. Here is how to generate a properly two-dimensional pattern from the Skip and Divide rules.

The pattern is composed of areas that are either square or a rectangle formed by dividing a square horizontally in two: each such rectangle may itself be divided by a vertical line to give 2 smaller squares. Thus dividing a square gives two rectangles and dividing a rectangle gives two squares.

In all that follows the upper rectangle of a pair just formed is considered to come before the lower one, and the left-hand square of a pair just formed is taken to come before the right-hand one. Look at Figure 3(a). The original square has been divided into two rectangles, and at the next generation the upper rectangle has been skipped and the lower one divided. Figure 3(b) shows the next generation with the upper rectangle again skipped and the left-hand square divided. The next generation, this time with two more divisions, is shown in Figure 3(c). The order, upper before lower, left before right, is observed in all subsequent generations.

The result after 13 generations is shown in Figure 4, and was produced by program B. Each area, square or rectangle, is stored as the coordinates of its upper left corner (AU, AV) and its lower right corner (AX, AY). AT records whether the area is a square (0) or a rectangle (1). This information is used when the area is divided, and its two offspring are always of the opposite type. The overall flow of the program is much the same as for the first one. In lines 100 to 190 the initial values are set up. KK controls the main loop for the generations. The first inner loop again copies the B arrays into the A arrays, and also draws each square or rectangle.

The second inner loop generates the new areas. If the area is to be skipped (M=0), then the A values are simply copied into the B arrays. If the area is to be divided, the upper left corner of the first offspring and the lower right of the second offspring are the same whether the area is a square or a rectangle, but the other coordinates

PROGRAM A

Program to generate Figure 1.

```
IMP INT
CLEAR 12000
100 DIM A(255),B(255)
110 MODE 1
120 M=1
130 N=1
140 B(0)=0
150 B(1)=64
160 YM=64
170 FOR KK=1 TO 9
180 FOR I=0 TO N
190 A(I)=B(I)
200 DRAW A(I),0 A(I),YM 15
210 NEXT I
220 J=0
230 FOR I=1 TO N
240 J=J+1
250 IF M=0 GOTO 280
260 B(J)=(A(I-1)+A(I))/2
270 J=J+1
280 B(J)=A(I)
290 M=1-M
300 NEXT I
310 YM=YM-4
320 N=J
330 NEXT KK
999 GOTO 999
```

PROGRAM B

```
100 DIM AT(255),AU(255),AV(255),AX(255),AY(255)
110 DIM BT(255),BU(255),BV(255),BX(255),BY(255)
120 MODE 3
130 M=1
140 N*1
150 BT(1)=0
160 BU(1)=0
170 BV(1)=YMAX
180 BX(1)=YMAX
190 BY(1)=0
200 FOR KK=1 TO 13
210 FOR I=1 TO N
220 AT(I)=BT(I)
230 AU(I)=BU(I)
240 AV(I)=BV(I)
250 AX(I)=BX(I)
260 AY(I)=BY(I)
262 DRAW AU(I),AV(I) AX(I),AV(I) 15
264 DRAW AX(I),AV(I) AX(I),AY(I) 15
266 DRAW AX(I),AY(I) AU(I),AY(I) 15
268 DRAW AU(I),AY(I) AU(I),AV(I) 15
270 NEXT I
280 J=0
290 FOR I=1 TO N
300 J=J+1
310 IF M=0 GOTO 600
320 P=AU(I)
330 Q=AV(I)
340 R=AX(I)
350 S=AY(I)
360 T=1-AT(I)
370 BT(J)=T
380 BU(J)=P
390 BV(J)=Q
400 IF T=0 GOTO 500
410 QS=(Q+S)/2
420 BX(J)=R
430 BY(J)=QS
440 J=J+1
450 BU(J)=P
460 BV(J)=QS
470 GOTO 560
500 PR=(P+R)/2
510 BX(J)=PR
520 BY(J)=S
530 J=J+1
540 BU(J)= PR
550 BV(J)=Q
560 BX(J)=R
570 BY(J)=S
580 BT(J)=T
590 GOTO 650
600 BT(J)=AT(I)
610 BU(J)=AU(I)
620 BV(J)=AV(I)
630 BX(J)=AX(I)
640 BY(J)=AY(I)
650 M=1-M
660 NEXT I
670 N=J
680 NEXT KK
999 GOTO 999
```

Program to generate Figure 4.

PROGRAM C

Delete or jump over lines 262 to 268

Add the following lines

```
700 FOR I=1 TO N
710 IF M=0 GOTO 730
720 FILL BU(I),BV(I)-1 BX(I)-1,BY(I) 15
730 M=1-M
740 NEXT I
```

Amendments to Program B to produce Figure 5

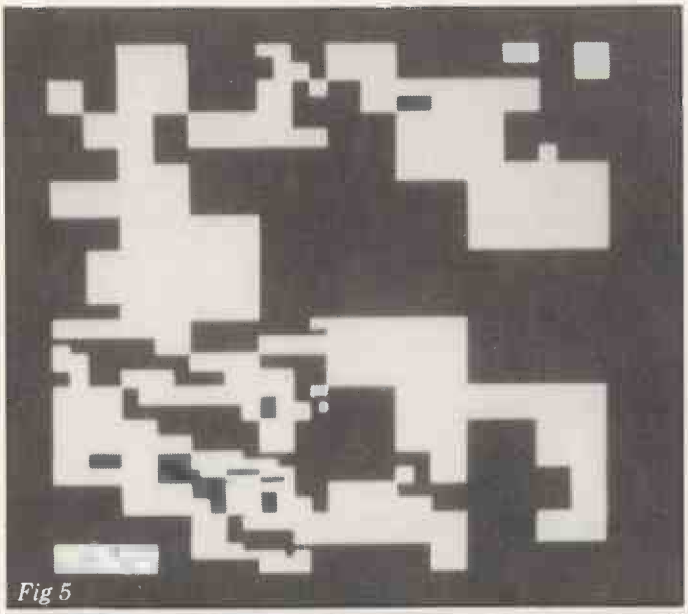

Fig 5

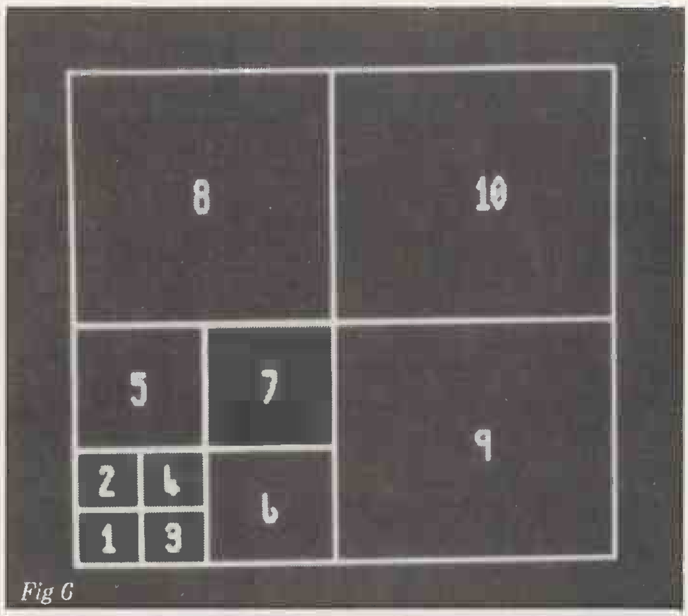

Fig 6

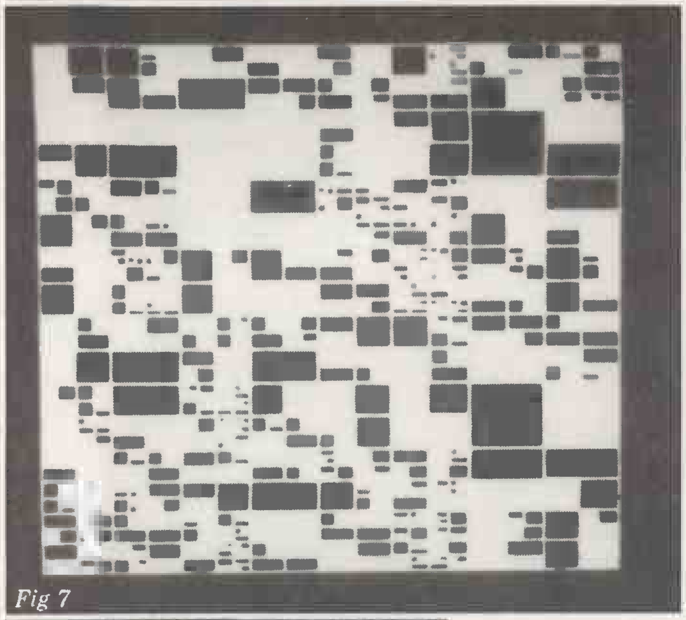

Fig 7

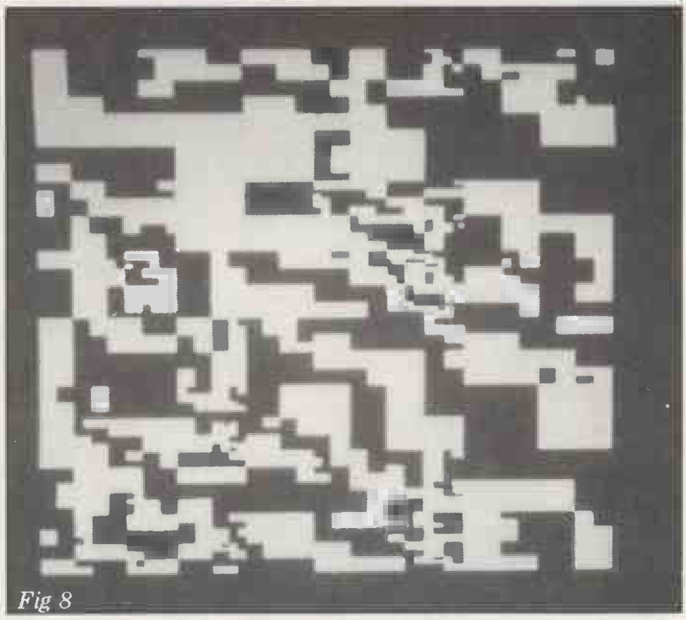

Fig 8

PATTERNS

depend on the type — hence the test for T in line 500.

It is clearly wasteful to plot the outline of each area: it would be enough just to plot the new dividing lines, once the initial square has been drawn. To make this more efficient still the whole diagram could be stored in terms of lines not areas. But Program B is an intermediate stage and the data for areas is needed for the next version of the program.

Figure 4 shows 13 generations. The reason for stopping at this point is not that the limit of the screen resolution has been reached: in fact only the middle resolution on the DAI is used for this display, and using the highest resolution at least two more generations could be shown. The reason is that the limit has been reached on the size for the arrays: 256 elements. The 14th generation has more than this number of areas.

The next development, to solid areas, is given in Figure 5. Instead of plotting the outlines of the areas, nothing is plotted until the last generation is reached. Then each alternate area is filled or left blank in place of being divided or skipped. The amendments to Program B to give this output are given as Program C.

Truly two dimensional

At last a truly two-dimensional pattern has been formed, but there is a sacrifice: now only the last generation is displayed and the earlier history is not shown. So the final development to be presented is a way of showing several such generations at once.

Look at Figure 6. This is a way of arranging squares on a plane. After square 1, there are three squares of the same size at each level, and from one level to the next the length of the side of the square is doubled. The succeeding generations can now be shown in these squares.

The gradual increase in the size of the main square roughly keeps pace with the increasing detail in the higher generations, so that the smallest area at each level is about the same. Figure 7 shows the result of this concatenation of the first 13 generations, and the boundaries of the areas have been left in, by retaining lines 262 to 268. Figure 8 is the same display without the boundary lines. Notice that the top right-hand corner of this design is the same as the whole of Figure 5: the 13th generation.

Some variants

There are many variations to be played on these programs. First the basic rhythm of alternating skip and divide can be changed, for example, by skipping every third element. To make Program A skip-divide-divide simply replace M=1−M in line 290 with M = (M+1) MOD 3. Another refinement is to add colour. Where several generations are shown at once they can be coloured differently. In a single generation, say for Program C, the areas can be coloured cyclically, for example blank-grey-white. This final colouring cycle need not be the same length as the cycle used for skipping and dividing.

And, to leave you with a slightly boggling extension: to three or more dimensions. The same procedure can be applied to a cube with divisions parallel to the faces. The rule for ordering the new volumes would have to be extended: left before right, upper before lower, and front before back. I am still waiting for the invention of an effective three-dimensional computer display device.

All the illustrations for this article were taken from the screen of my DAI computer using a Polaroid SX-70. The characters in Figures 3 and 6 were generated by software: see Patterns in *PCW* January 1982. END

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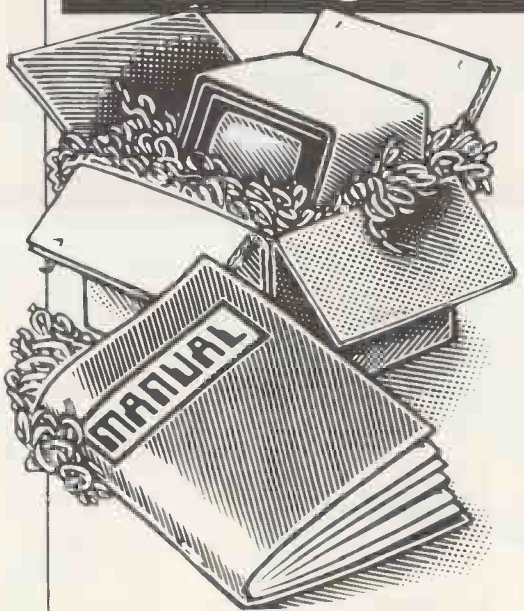


This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in PCW. *While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!*

Welcome to the confusing world of the microcomputer. First of all, don't be fooled; there's nothing complicated about this business, it's just that we're surrounded by an immense amount of necessary jargon. Imagine if we had to continually say 'numbering system with a radix of 16 in which the letters A to F represent the values ten to 15' when instead we can simply say 'hex'. No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, **PCW** will be publishing this guide — every month.

We'll start by considering a microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, **processing** it, storing the results or sending them somewhere else. All this information is called **data** and it comprises numbers, letters and special symbols which can be read by humans. Although the data is accepted and output by the computer in 'human' form, inside it's a different story — it must be held in the form of an electronic code. This code is called **binary** — a system of numbering which uses only 0s and 1s. Thus in most micros each character, number or symbol is represented by eight binary digits or **bits** as they are called, ranging from 00000000 to 11111111.

To simplify communication between computers, several standard coding systems exist, the most common being **ASCII** (American Standard Code for Information Interchange). As an example of this standard, the number five is represented as 00110101 — complicated for humans, but easy for the computer! This collection of eight bits is called a **byte** and computer freaks who spend a lot of time messing around with bits and bytes use a half-way human representation called **hex**. The hex equivalent of a byte is obtained by giving each half a single character code (0—9, A—F): 0=0000, 1=0001, 2=0010, 3=0011, 4=0100, 5=0101 .... E=1110 and F=1111. Our example of 5 is therefore 35 in hex. This makes it easier for humans to handle complicated collections of 0s and 1s. The machine detects these 0s and 1s by recognising different voltage levels.

The computer processes data by reshuffling, performing arithmetic on, or by comparing it with other data. It's the latter function that gives a computer its apparent 'intelligence' — the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in **memory** as bytes. The rules are called **programs** and while they can be input in binary or hex (**machine code** programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the nearer the **programming** language is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is **Basic**. Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To **run** such a program the computer uses an **interpreter** which picks up each English-type **instruction**, translates it into machine code and then feeds it into the **processor** for execution. It has to do this each time the same instruction has to be executed.

Two strange words you will hear in connection with Basic are **PEEK** and **POKE**. They give the programmer access to the memory of the machine. It's possible to read (**PEEK**) the contents of a byte in the computer and to modify a byte (POKE).

Moving on to **hardware**, this means the physical components of a computer system as opposed to **software** — the programs needed to make the system work.

At the heart of a microcomputer system is the central processing unit (**CPU**), a single microprocessor chip with supporting devices such as **buffers**, which 'amplify' the CPU's signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board (**PCB**) or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large, PCB; in others a **bus system** is used, comprising a long PCB holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function — for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the **S100**.

The CPU needs memory in which to keep programs and data. Microcomputers generally have two types of memory, **RAM** (Random Access Memory) and **ROM** (Read Only Memory). The CPU can read information stored in RAM — and also put information into RAM. Two types of RAM exist — **static** and **dynamic**; all you really need know is that dynamic RAM uses less power and is less expensive than static, but it requires additional, complex, circuitry to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Not surprisingly, manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM's contents and cannot alter them in any way. You can buy special ROMs called **PROMs** (Programmable ROMs) and **EPROMs** (Eraseable PROMs) which can be programmed using a special device; EPROMs can be erased using ultra-violet light.

Because RAM loses its contents when power is switched off, **cassettes** and **floppy disks** are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and play back information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, **floppy disks** are used on more sophisticated systems.

A floppy disk is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disk, in its protective envelope, is placed in a disk drive which rotates it and moves a **read/write head** across the disk's surface. The disk is divided into concentric rings called **tracks**, each of which is in turn subdivided into **sectors**. Using a program called a **disk operating system**, the computer keeps track of exactly where information is on the disk and it can get to any item of data by moving the head to the appropriate track and then waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts: **soft sectoring** where special signals are recorded on the surface and **hard sectoring** where holes are punched through the disk around the central hole, one per sector.

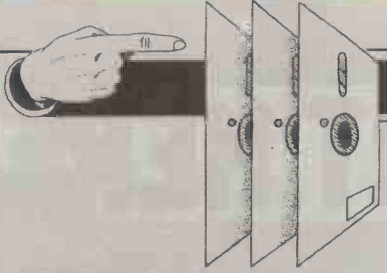
Half-way between cassettes and disks is the **stringy floppy** — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. **Hard disk** systems are also available for micro-computers; they store more information than floppy disks, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit (**VDU**), which looks like a TV screen with a typewriter-style **keyboard**; sometimes these are built into the system, sometimes they're separate. If you want a written record (**hard copy**) of the computer's output, you'll need a **printer**.

The computer can send out and receive information in two forms — **parallel** and **serial**. Parallel input/output (**I/O**) requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, with a separate wire carrying each bit. Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to tell the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as the **baud rate** and, very roughly, the baud rate divided by ten equals the number of bytes being sent per second.

To ensure that both receiver and transmitter link up without any electrical horrors, standards exist for serial interfaces; the most common is **RS232** (or **V24**) while, for parallel interfaces to printers, the **Centronics** standard is popular.

Finally, a **modem** connects a computer, via a serial interface, to the telephone sytem allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need British Telecom's permission; instead you could use an **acoustic coupler**, which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system — British Telecom isn't so uppity about the use of these.



PACKAGES

PCW's 'Packages' section is produced bi-monthly, alternating with our 'In Store' hardware guide. We have confined coverage to business packages which are available and supported at national level and which have been in use for at least six months in a minimum of five sites. Producers of packages which fall within these constraints should send details or updates to: **Dick Olney, *PCW*, 14 Rathbone Place, London W1P 1DE.**

The layout has been designed to allow you to discover which packages are available for the application you have in mind and to show you which packages are available for your computer if you already have a machine. In either case the code enables you to look up the supplier's name and telephone number in the table below.
All details published are the latest made available — some may have changed since this issue went to press.

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L3	Ludhouse (Computing) Ltd.	01-679 4321
L4	Logic Comp Systems	01-222-1122
M1	Micro Computer Applications Ltd.	0734 470425
M2	Microteck.	Orpington 26803
M3	Microsys Ltd	051 426 7271
M4	Microsave	0272 737555
M5	M.A.P. Comp Systems	061-624-5662
P1	Padmede Computer Services	02514 21892
P2	Personal Computers Ltd.	01-626 8121
R1	Rockliff	051-521 5830
S1	SMG Micro Computers	0474 55813
S2	The Softwarehouse	01-637 2108
S3	Stage One Software	0202 23570
S4	Systematics International	0440 61121
S5	Sumlock Bondain	01-250 0505
S6	Stemmos	01 602 6242
S7	Software Aids Int	01-204 9396
T1	Tridata Micros Ltd.	021 622 6085
T2	Templeman Software	0789 66237
T3	The Micro Solution	0608 3256
T4	Terodec Ltd	0734-664343
V1	Vlasak Electronics Ltd.	0494-448633
W1	Wisbech Computer Services	0945 64146
W2	Westfarthing Comp Services	03265-4098
X1	Xetal	061 682 7555

Applications

Application	Machine	Price	Code
Appointments planner	PET/CBM	£100	S3
	Challenger	£25	C7
Assembler dev	PET/CBM	£50	L2
Bank accounts	PET/CBM	£100	S3
Bill of materials	CP/M	£850	B5
	Cromemco	£850	B5
	Superbrain	£450	T3
Bonds/pension quotations	PET/CBM	£100	S3
	PET/CBM	£100	S3
Budgeting package	Apple II	£125	P2
	Apple II	£125	T2
	CP/M	£95	B5
	Cromemco	£95	B5
	North Star Horizon	£95	B5
Bureau de change	PET/CBM	£8	H3
Cash flow	Apple II	£125	P2
	Apple II	£80	V1
	Apple II	£100	C8
	CP/M	£250	L3
	CP/M	£95	B5
	Cromemco	£95	B5
	North Star Horizon	£95	B5
	PET/CBM	£8	A1
Cash register	CP/M	£300	T4
Company secretary	CP/M	£450	C4
Container accounting	CP/M	£750	M5
Contract costing	Apple II	£500	P1
	CP/M	£2000	L3
CP/M & utilities	Tandy Model II	£150	M1
Credit control	Apple II	£98	P2
	PET/CBM	£650	B4
Customer file	Famos	£1000	M2
Database management/Information retrieval	ACT800	£225	H4
	Apple II	£150	A2
	Apple II	£150	K2
	Apple II	£60-140	S2
	Apple II	£150	S5
	Apple II	£75	P2
	Apple II	£100	S4
	Apple II	£100	C8
	Apple II	£125	T2
	CP/M	£150-750	C4
	CP/M	£100	G3
	CP/M	£350	B3
	CP/M	£400	C3
	CP/M	£600	G5
	Famos	£1500	M2
	North Star Horizon	£250	[illegible]3
	PET/CBM	£250	C3
	PET/CBM	£325	A1
	PET/CBM	£225	H4
	PET/CBM	£75	B1
	PET/CBM	£50/150	C2
	PET/CBM	£150	J1
	PET/CBM	£150	C2
	PET/CBM	£45-250	S1
	Superbrain	£300	S6
	Tandy Model 1	£25-80	M[illegible]
	TRS-80	£60	[illegible]
	TRS-80	£150	J1
	TRS-80	£32.50	H1
	8000 Series	POR	C2
Dental Records	Apple II	£395	M4
	CP/M	£500	T4
Disk operating system	PET/CBM	£150	B1
Double glazing costing	North Star Horizon	£750	W1
Eire payroll system	CP/M	£650	M5
Estate agent	Apple II	£850	A2
	Apple II	£850	S5
	Apple II	£850	K2
	Apple II	£175	P2
	Apple II	£130	C8
	Apple II	£750	S4
	PET/CBM	£30	H3
	PET/CBM	£250	S[illegible]
	CP/M	£750	C4
	CP/M	£700	B5
	PCC 2000 Simpelec Triton 3	£350	B3
	MZ-80K	£195	W1
	PET/CBM	£25	A1
	Superbrain	£600	S6
Equipment lease/rent/HP	CP/M	£400	G1
File Handling	PET/CBM	£225	H4
Financial modelling	Apple II	£450	P2
	Apple II	£424-535	A1
	Apple II	£360	C8
	CP/M	£400	G1
	CP/M	£95	B5
	CP/M	£425-535	A1
	CP/M	£400	B6
	Cromemco	£95	B5
	North Star Horizon	£95	B5
	PET/CBM	£425-535	A1
Financial planning	Apple II	£250	S4
	Apple II	£125	A1
	CP/M	£125	A1
	PET/CBM	£125	A1
General ledger/NL	Apple II	£300	A2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£455	P2
	Apple II	£225	V1
	Apple II	£295	C6
	Apple II	£250P	S4
	Apple II	£600	T2
	Apple II	£490	L4
	CP/M	£500	L3
	CP/M	£375	L1
	CP/M	£500	C4
	CP/M	£400	G1
	CP/M	£400	M3
	CP/M	£400	B5
	CP/M	£275	S6
	CP/M	£275	S7
	CP/M	£350	B3
	CP/M	£300	W1
	CP/M	£425	B6
	CP/M	£500	T4
	CP/M	£400	M5
	Cromemco	£400	B5
	North Star Horizon	£250	B3
	North Star Horizon	£400	M3
	PCC 2000 North Star Horion	£400	B5
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£200	C2
	PET/CBM	£200	H3
	PET/CBM	POR	S3
	Sharp PC3201	£450	P2
	Superbrain	£400	M3
	Superbrain	£400	S6
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	TRS-80	£225	H1
	TRS-80 I	£225/325	T1
	TRS-80 II	£425	T1
	Vector	£400	C5
	8080/Z80	£357	L1
	8080/Z80	£275	G3
Hotel management	Apple II	£525	M4
	CP/M	£525	M4
Incomplete records	Apple II	£250	S2
	Apple II	POR	K2
	Apple II	£425	P2
	Apple II	£450	P[illegible]
	Apple II	£490	L[illegible]
	CP/M	£750	M3
	CP/M	£250	B5
	CP/M	£975	B3
	CP/M	£750	W1
	CP/M	£1250	M5
	Cromemco	£250	B5
	North Star Horizon	£750	M3
	North Star Horizon	£250	B5
	North Star Horizon	£975	B3
	PET/CBM	£750	S3
	Superbrain	£750	M3
	Tandy Model 1	£40	M1
	TRS-80	£40	H1
Industry Factory loading	Apple II	£360	X1
	CP/M	£360	X1
	PET/CBM	£300	X1
Industry work study	Apple II	£990	X1
	CP/M	£990	X1
	PET/CBM	£750	X1
Integrated accts	Altos (CP/M, MP/M)	£300	B1
	Apple II	£450	P1
	Apple II	£300	P2
	Apple II	£855	V1
	Apple II	£600	T2
	Apple II	£1470	L4
	Apple II	£300	W2
	CP/M	£950	L1
	CP/M	£1500	C4
	CP/M	£1100	G1
	CP/M	£990	M3
	CP/M	£690	B5
	CP/M	£850	S7
	CP/M	£900	B5
	CP/M	£1450	B3
	CP/M	£1200	B6
	Cromemco	£690	B5
	Cromemco	£900	B5
	Famos	£2000	M2
	MZ-80K	£150	P2
	North Star Horizon	£950	B3
	North Star Horizon	£690	B5
	North Star Horizon	£900	B5
	PET/CBM	£300	B1
	PET/CBM	POR	S3
	North Star Horizon	£990	M3
	PET/CBM	(£50)	C2
	PET/CBM	£650	J1
	PET/CBM	£650	G2
	Superbrain	£990	M3
	Superbrain	£1200	S6
	Superbrain	£1000	T3
	Tandy Model I	£350	M1
	Tandy Model II	£350	M1
	TRS-80	£75	J1
	Vector	£1000	C5
	8000 Series	POR	C2
	8080/Z80	£950	L1
	8080/Z80	£995	G3
Investment portfolio	TRS-80	£20	S2
Invoicing	Apple II	£295	S2
	Apple II	£300	P1
	Apple II	£300	P2
	Apple II	£140	V1
	Apple II	£300	T2
	Challenger	£25	C7
	CP/M	£325	L1
	CP/M	£150-350	C4
	CP/M	£250	M3
	CP/M	£150	S7

PACKAGES

Application	Machine	Price	Code
	CP/M	£100	B5
	CP/M	£200	B3
	CP/M	£300	W1
	Cromemco	£100	B5
	North Star Horizon	£100	B3
	North Star Horizon	£250	M3
	North Star Horizon	£100	B5
	PET/CBM	£350	A1
	PET/CBM	£25-50	B1
	PET/CBM	POR	J1
	PET/CBM	POR	S3
	Superbrain	£250	M3
	Superbrain	£150	S6
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	TRS-80	£25	H1
	TRS-80I	£75	T1
	TRS-80II	£125	T1
	8080/Z80	£325	L1
Job costing	Apple II	£300	P1
	Apple II	£990	X1
	CP/M	£700	C4
	CP/M	£350	M3
	CP/M	£990	X1
	CP/M	£500	T4
	CP/M	£650	M5
	North Star Horizon	£350	M3
	PET/CBM	£750	X1
	Superbrain	£350	M3
	Tandy Model I	POR	M1
	Tandy Model II	POR	M1
Job order control	8080/Z80	£275	G3
Legal precedents	CP/M	£1100	C4
Letter writer	Apple II	£80	V1
	CP/M	£150	M3
	North Star Horizon	£150	M3
	Superbrain	£150	M3
Lotteries	PET/CBM	£45	H2
Mailing List	Altos (CP/M. MP/M)	£75	B1
	Apple II	£300	A2
	Apple II	£50-150	S2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£40	P2
	Apple II	£100	[illegible]
	CP/M	£50-150	C4
	CP/M	£250	G1
	North Star Horizon	£195	W1
	PET/CBM	£45	H2
	PET/CBM	£15	A1
	PET/CBM	£75	B1
	PET/CBM	£35	H3
	PET/CBM	£100	S3
	CBM/8032	£75/150	S1
	Superbrain	£140	[illegible]
	Tandy Model I	£40	M1
	Tandy Model II	£75	M1
	TRS-80	£50-150	S2
	TRS-80	£25/38/55	H1
Mail shot	Apple II	£14	S2
	Apple II	£40	P2
	Apple II	£25	T2
	Challenger	£25	C7
	CP/M	£200-360	C4
	CP/M	£90	M3
	CP/M	£75	S7
	CP/M	£50/150	G5
	MCZ Zilog	£250	I1
	North Star Horizon	£90	M3
	PCC 2000 Simplec Triton 3	£450	B2
	PET/CBM	£125	S3
	Superbrain	£90	M3
	Tandy Model I	£75+	G4
	Tandy Model II	£75	M1
	Tandy Model II	£75+	G4
Membership accting	Apple II	£75	P2
	MCZ Zilog	£250	I1
	PET/CBM	£85	H2
Motor Dealer	Famos	£5000	M2
Order entry/invoicing	CP/M	£350	G1
	CP/M	£500	T4
	CP/M	£550	M5
Order processing	CP/M	£550	L1
	8080/Z80	£550	L1
Office admin	Apple II	£100	S4
Pad to plotter systems	Apple II	£250	P2
	Apple II	£180	C8
Payroll	Apple II	POR	A2
	Apple II	£200	S2
	Apple II	POR	S5
	Apple II	POR	K2
	Apple II	£200	P2
	Apple II	£375	V1
	Apple II	£375	C6
	Apple II	£250P	S4
	Apple II	£400	T2
	Apple II	£490	L4
	Challenger	£24	C7
	CP/M	£450	L3
	CP/M	£475	L1
	CP/M	£495	C4
	CP/M	£500	G1
	CP/M	£390	M3
	CP/M	£500	B5
	CP/M	£450	B3
	CP/M	£425	B6
	CP/M	Lease	W1
	CP/M	£500	T4
	CP/M	£450	M5
	Famos	£1500	M2
	North Star Horizon	£350	B3
	North Star Horizon	£390	M3
	North Star Horizon	Lease	W1
	PET/CBM	£200/350	C5
	PET/CBM	£200/25/195	A1
	PET/CBM	£50/195	I2
	PET/CBM	£150	G2
	PET/CBM	£150	J1
	PET/CBM	£150	C2
	PET/CBM	£10	H3
	Scorcerer	£250	L2
	Superbrain	£390	M3
	Superbrain	£400	S6
	Superbrain	£250+	T3
	Tandy Model I	£249	M1
	TRS-80	£200	H1
	TRS-80I	£218	T1
	TRS-80II	£375	T1
	8000 Series	£250	C2
	8080/Z80	£475	L1
	8080/Z80	£275	G3
	PET/CBM	£150	G2
	PET/CBM	£150	J1
	PET/CBM	£150	C2
	Sorcerer	£250	L2
	Tandy Model I	£249	M1
	TRS-80	£200	H1
	TRS-80I	£218	K1
	TRS-80I	£218	T1
	TRS-80II	£375	T1
	8000 Series	£250	C2
	8080/Z80	£475	L1
	8080/Z80	£275	G3
Perpetual Inventory	CP/M	£150	B5
	Cromemco	£150	B5
Personnel records	Apple II	£98	P2
	CP/M	£450	C4
	MCZ Zilog	£400	I1
	PET/CBM	£85	H2
Petaid report generator	PET/CBM	£125	S3
Petsoft programs	PET/CBM	£160	J1
Planning/Maintenance	CBM/8032	£595	S1
Postal advertising response package	Apple II	£350	S2
PR/advertising package	PET/CBM	£1000	S3
Price lister	PET/CBM	£12	H3
Printers job control	PET/CBM	£250	S3
Production analysis	Apple II	£75	P2
	CP/M	£700	C4
	PET/CBM	£300	B1
Prof appts groups	8080/Z80	£275	G3
Prof appts individ	8080/Z80	£220	G3
Prof client billing	8080/Z80	£330	G3
Programming aids	Apple II	£40	P2
Property management	CP/M	£450-1000	C4
	CP/M	£400	M3
	North Star Horizon	£400	M3
	Superbrain	£400	M3
Purchase ledger	Apple II	£300	A2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£295	C6
	Apple II	£300	P1
	Apple II	£300	P2
	Apple II	£315	V1
	Apple II	£250P	S4
	Apple II	£300	T2
	Apple II	£490	L4
	Challenger	£25	C7
	CP/M	£500	C4
	CP/M	£450	G1
	CP/M	£500	L3
	CP/M	£425	L1
	CP/M	£400	M3
	CP/M	£400	B5
	CP/M	£275	S7
	CP/M	350	B3
	CP/M	£300	W1
	CP/M	£425	B6
	CP/M	£500	T4
	CP/M	£400	M5
	Cromemco	£400	B5
	North Star Horizon	£250	B3
	North Star Horizon	£400	M3
	North Star Horizon	£400	B5
	Superbrain	£400	M3
	Superbrain	£300	S6
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£300	B4
	PET/CBM	£95/120/350	A1
	PET/CBM	£200	C2
	PET/CBM	POR	J1
	PET/CBM	£350	H3
	PET/CBM	POR	S3
	CBM/8032	£395	S1
	Sharp PC3201	£300	P2
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	TRS-80	£225	H1
	TRS-80I	£225	T1
	TRS-8011	£375	T1
	Vector	£400	C5
	8000 Series	£250	C2
	8080/Z80	£275	G3
	8080/Z80	£425	L1
Quotation estimating	Apple II	£300	P1
Sales ledger	Apple II	£300	A2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£295	C6
	Apple II	£300	P1
	Apple II	£300	P2
	Apple II	£315	V1
	Apple II	£250P	S4
	Apple II	£300	T2
	Apple II	£490	L4
	Challenger	£25	C7
	CP/M	£500	C4
	CP/M	£450	G1
	CP/M	£500	L3
	CP/M	£425	L1
	CP/M	£400	M3
	CP/M	£400	B5
	CP/M	£275	S7
	CP/M	£350	B3
	CP/M	£300	W1
	CP/M	£425	B6
	CP/M	£500	T4
	CP/M	£400	M5
	Cromemco	£400	B5
	North Star Horizon	£250	B3
	North Star Horizon	£400	M3
	North Star Horizon	£400	B5
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£300	B4
	PET/CBM	£800	C1
	PET/CBM	£95/350	A1
	PET/CBM	POR	J1
	PET/CBM	£200	C2
	PET/CBM	£350	C7
	PET/CBM	POR	S3
	CBM/8032	£395	S1
	Sharp PC 3201	£300	P2
	Superbrain	£400	M3
	Superbrain	£300	S6
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	TRS-80	£225	H1
	TRS-80I	£225	T1
	TRS-80II	£375	T1
	Vector	£400	C5
	8000 Series	£250	C2
	8080/Z80	£275	G3
	8080/Z80	£425	L1
Salesman		£10	D1
		£10	D1
S/L, P/L & stock control	Apple II	£900	P2
	Apple II	£1000	T2
	CP/M	£1000	L3
	CP/M	£900	B5
	Cromemco	£900	B5
	North Star Horizon	£900	B5
Solicitor's complete record accounting	Apple II	£3000	S2
Solicitor's package	CBM/8032	£750	S1
	CP/M	£1250	M5
Statistics	Apple II	£150	G3
	Apple II	£100-195	P2
	Apple II	£140	C8
	TRS-80	£45	S2
Stock control/ recording	Altos (CP/M, MP/M)	£300	B1
	AppleII	POR	A2
	Apple II	POR	K2
	Apple II	POR	S5
	Apple II	£150	G3
	Apple II	£80	S2
	Apple II	£75/300	P2
	Apple II	£285	V1
	Apple II	£300	P1
	Apple II	£500	S4
	Apple II	£490	L4
	Challenger	£25	C7
	CP/M	£325	L1
	CP/M	£500-1500	C4
	CP/M	£350	G1
	CP/M	£900	M3
	CP/M	£700	B5
	CP/M	£550	B5
	CP/M	£550	B3
	CP/M	£300	W1
	CP/M	£500	T4
	CP/M	£550	M5
	Cromemco	£700	B5
	Famos	£1500	M2
	MZ-80K	£150	P2
	North Star Horizon	£450	B3
	North Star Horizon	£900	M3
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£12/25/350	A1
	PET/CBM	£195	I2

PACKAGES

Application	Machine	Price	Code
	PET/CBM	£300	B4
	PET/CBM	£15	A2
	PET/CBM	£300	B1
	PET/CBM	£150	C2
	PET/CBM	£150	J1
	PET/CBM	£150	G2
	PET/CBM	£250	R1
	PET/CBM	£35/25	H3
	PET/CBM	£100/250	S3
	CBM/8032	£395	S1
	Sharp PC3201	£300	P2
	Superbrain	£900	M3
	Superbrain	£300	S6
	Superbrain	£450	T3
	Tandy Model I	£30-50	M1
	Tandy Model II	£300	M1
	TRS-80	£48	S2
	TRS-80	£200	H1
	TRS-80	£115	J1
	TRS-80I	£200	T1
	TRS-80II	£375	T1
	8080/Z80	£275	G3
	8080/Z80	£325	L1
Surveying	CP/M	£500	T4
TAP business system	PET/CBM	£125	H2
Text file librarian	Apple II	£125	S4
Time/cost recording	Apple II	£450	S2
	Apple II	£300	P1
	CP/M	£400	G1
	CP/M	£200	M3
	CP/M	£350	B3
	North Star Horizon	£250	B3
	North Star Horizon	£200	M3
	North Star Horizon	£450	W1
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£300	B1
	PET/CBM	POR	S3
	Superbrain	£200	M3
	Tandy Model I	POR	M1
	Tandy Model II	POR	M1
Travel agency accts	Superbrain	£800	S6
	Tandy Model I	£225	G4
	Tandy Model II	£225	G4
Travel Agents Dairy	Tandy Model I	£100	G4
	Tandy Model Ii	£100	G4
Travel Ticket Sales	Tandy Model I	£225	G4
	Tandy Model II	£225	G4
Utilities	Apple II	£40	P2
	Apple II	£20	C6
	CP/M	£50	B5
	ITT 2020	£20	C6
Utility set	PET/CBM	£78	H3
Various engineering	Tektronix		E1
VAT	PET/CBM	£17.50	A1
VAT master	PET/CBM	£25	H3
VAT register	TRS-80	£15	H1
Vet package	CBM/8032	POR	S1
Video message	Apple	£200	G3
Warehousing	CBM/8032	POR	S1
Word processing	ACT 800	£375	H4
	Apple II	£60	S2
	Apple II	£75	K2
	Apple II	£75	S5
	Apple II	£75	A2
	Apple II	£150-300	P2
	Apple II	£75	J1
	Apple II	£120	V1
	Apple II	£180/95	S4
	Apple II	£30	C8
	Apple II	£500	T2
	CP/M	£150-260	C4
	CP/M	£400	G1
	CP/M	£250	M3
	CP/M	£250	B6
	Famos	£500	M2
	North Star Horizon	£250	M3
	PET	£85/65/ 40/20	H2
	PET/CBM	£375	H4
	PET/CBM	£25/325	A1
	PET/CBM	£325	C5
	PET/CBM	£75/150	C2
	PET/CBM	£75/150	J1
	PET/CBM	£75/150	G2
	PET/CBM	£35	H3
	PET/CBM	£120	S3
	Superbrain	£250	M3
	Tandy Model I	£50/75	M1
	Tandy Model II	£175-240	M1
	TRS-80	£30/60/90	S2
	TRS-80	£45/95	J1
	TRS-80	£15	H1
	Vector	£400	C5
	8000 Series	£250	C2
Work In Progress	CP/M	£850	B5

Machines

Machine	Application	Price	Code
ACT 800	Database management/	£225	H4
	Word processing	£375	H4
Altos (CP/M, MP/M)	Integrated accts	£300	B1
	Mailing list	£75	B1
	Stock control/recording	£300	B1
Apple II	Budgeting	£125	T2
	Cash flow	£80	V1
	Cash flow	£75	P2
	Cash flow	£100	C8
	Contract costing	£450	P1
	Database management/ information retrieval	£150	K2
	Database management/ information retrieval	£150	A2
	Database management/ information retrieval	£60-140	S2
	Database management/ information retrieval	£150	S5
	Database management/ information retrieval	£98	P2
	Database management/ information retrieval	£100	S4
	Database management	£75	P2
	Database management	£100	C8
	Database management	£125	T2
	Dental records	£395	M4
	Estate agent	£850	S5
	Estate agent	£850	A2
	Estate agent	£850	K2
	Estate agent	£750	S4
	Estate agent	£130	C8
	Financial modelling	£360	C8
	Financial modelling	£425-535	A1
	Financial planning	£250	S4
	Financial planning	£125	A1
	General ledger/NL	£300	K2
	General ledger/NL	£300	A2
	General ledger/N/L	£450	P2
	General ledger/NL	£300	S5
	General ledger/NL	£225	V1
	General ledger/NL	£295	C6
	General ledger/NL	£250P	S4
	General ledger/NL	£600	T2
	General ledger/NL	£490	L4
	Hotel management	£525	M4
	Incomplete records	POR	K2
	Incomplete records	£250	S2
	Incomplete records	£450	P1
	Incomplete records	£450	P2
	Incomplete records	£490	L4
	Industry factory loading	£360	X1
	Industry work study	£990	X1
	Integrated accts	£885	V1
	Integrated accts	£450	P1
	Integrated accts	£300	P2
	Integrated accts	£600	T2
	Integrated accts	£300	W2
	Integrated accts	£1470	L4
	Invoicing	£295	S2
	Invoicing	£300	P2
	Invoicing	£140	V1
	Invoicing	£300	P1
	Invoicing	£300	T2
	Job costing	£450	S2
	Job costing	£990	X1
	Job costing	£300	P1
	Mailing list	£300	K2
	Mailing list	£300	A2
	Mailing list	£40	P2
	Mailing list	£50-150	S2
	Mailing list	£300	S5
	Mailing list	£100	S4
	Mailing List	£25	T2
	Mail shot	£14	S2
	Mail shot	£225	P2
	Pad to plotter system	£250	P2
	Pad to plotter system	£180	C8
	Payroll	POR	S5
	Payroll	POR	K2
	Payroll	POR	A2
	Payroll	£200	S2
	Payroll	£375	V1
	Payroll	£200	P2
	Payroll	£375	C6
	Payroll	£250P	S4
	Payroll	£400	T2
	Payroll	£490	L4
	Personal records	£75	P2
	Postal advertising response package	£350	S2
	Production analysis	£75	P2
	Programming aids	£40	P2
	Purchase ledger	£300	K2
	Purchase ledger	£300	P2
	Purchase ledger	£300	A2
	Purchase ledger	£300	S5
	Purchase ledger	£315	V1
	Purchase ledger	£300	P1
	Purchase ledger	£295	C6
	Purchase ledger	£250P	S4
	Purchase ledger	£300	T2
	Purchase ledger	£490	L4
	Quotation estimating	£300	P1
	Sales ledger	£300	A2
	Sales ledger	£300	K2
	Sales ledger	£300	S5
	Sales ledger	£300	P2
	Sales ledger	£315	V1
	Sales ledger	£300	P1
	Sales ledger	£295	C6
	Sales ledger	£250P	S4
	Sales ledger	£300	T2
	Sales ledger	£490	L4
	SL, PL stock control	£1000	T2
	Solicitor's complete record accounting	£3000	S2
	Statistics	£150	G3
	Statistics	£100/195	P2
	Statistics	£100-195	P2
	Statistics	£140	C8
	Stock control/recording	£150	G3
	Stock control/recording	POR	K2
	Stock control/recording	£300	P2
	Stock control/recording	POR	A2
	Stock control/recording	£80	S2
	Stock control/recording	POR	S5
	Stock control/recording	£285	V1
	Stock control/recording	£300	P1
	Stock control/recording	£500	S4
	Stock control/recording	£490	L4
	Text file librarian	£125	S4
	Time/cost recording	£450	S2
	Time/cost recording	£300	P1
	Utilities	£20	C6
	Video message	£200	G3
	Word processing	£75	K2
	Word processing	£75	A2
	Word processing	£60	S2
	Word processing	£300	P2
	Word processing	£75	S5
	Word processing	£120	V1
	Word processing	£75	J1
	Word processing	£180/95	S4
	Word processing	£30	C8
	Word processing	£500	T2
Challenger	Appointment Planner	£25	C7
	Invoicing	£25	C7
	Mail Shot	£25	C7
	Payroll	£25	C7
	Purchase Ledger	£25	C7
	Sales Ledger	£25	C7
	Stock Control	£25	C7
CP/M	Bill of materials	£500	B5
	Budgeting package	£95	B5
	Cash flow	£250	L3
	Cash flow	£95	B5
	Cash register	£300	T4
	Company secretary	£450	C4
	Container accounting	£750	M5
	Contract costing	£2000	L3
	Database	£350	B3
	Database management/ information retrieval	£150-750	C4
	Database management/ information retrieval	£100	G3
	Database management/ information retrieval	£400	C3
	Database management/ information retrieval	£600	G5
	Dental records	£500	T4
	Eire payroll system	£650	M5
	Equipment lease/rent/ HP	£400	G1
	Estate agents	£750	C4
	Estate agent	£700	B5
	Financial modelling	£400	G1
	Financial modelling	£95	B5
	Financial modelling	£425/535	A1
	Financial modelling	£400	B6
	Financial planning	£125	A1
	General ledger/NL	£500	L3
	General ledger/NL	£500	C4
	General ledger/NL	£400	G1
	General ledger/NL	£375	L1
	General ledger/NL	£200	B5
	General ledger/NL	£275	S7
	General ledger/NL	£400	M3
	General ledger/NL	£350	B3
	General ledger/NL	£300	W1
	General ledger/NL	£425	B6
	General ledger/NL	£500	T4
	General ledger/NL	£400	M5
	Hotel management	£525	M4
	Incomplete Records	£250	B5
	Incomplete Records	£750	M3
	Incomplete Records	£975	B3
	Incomplete Records	£750	W1
	Incomplete Records	1250	M5
	Industry factory loading	£360	X1
	Industry work study	£990	X1
	Insurance brokers	£995	W1
	Integrated accts	£1500	C4
	Integrated accts	£1100	G1
	Integrated accts	£950	L1
	Integrated accts	£690	B5
	Integrated accts	£850	S7
	Integrated accts	£990	M3
	Integrated accts	£900	B5
	Integrated accts	£1450	B3
	Integrated accts	£1200	B6
	Invoicing	£325	L1
	Invoicing	£150-350	C4
	Invoicing	£150	S7
	Invoicing	£250	M3
	Invoicing	£100	B5
	Invoicing	£200	B3
	Invoicing	£300	W1
	Job costing	£700	C4
	Job costing	£990	X1
	Job costing	£350	M3
	Job costing	£500	T4
	Job costing	£650	M5
	Legal precedents	£1100	C4
	Letter Writer	£150	M3
	Mailing list	£50-150	C4
	Mailing list	£250	G1
	Mailing list	£75	S7
	Mail shot	£200-360	G4
	Mail shot	£90	M3
	Mail shot	£50/150	G5
	Order entry/invoicing	£350	G1
	Order entry/invoicing	£500	T4
	Order entry/invoicing	£550	M5
	Order processing	£550	L1
	Payroll	£450	L3
	Payroll	£495	C4
	Payroll	£500	G1
	Payroll	£475	L1

PACKAGES

Machine	Application	Price	Code
	Payroll	£500	B5
	Payroll	£390	M3
	Payroll	£450	B3
	Payroll	Lease	W1
	Payroll	£425	B6
	Payroll	£500	T4
	Payroll	£450	M5
	Perpetual Inventory	£150	B5
	Personnel records	£450	C4
	Production analysis	£700	C4
	Property management	£450-1000	C4
	Property management	£400	M3
	Purchase ledger	£500	L3
	Purchase ledger	£450	G1
	Purchase ledger	£425	L1
	Purchase ledger	£500	C4
	Purchase ledger	£200	B5
	Purchase ledger	£275	S7
	Purchase ledger	£400	M3
	Purchase ledger	£350	B3
	Purchase ledger	£300	W1
	Purchase ledger	£425	B6
	Purchase ledger	£500	T4
	Purchase ledger	£400	M5
	Sales ledger	£500	L3
	Sales ledger	£500	C4
	Sales ledger	£450	G1
	Sales ledger	£425	L1
	Sales ledger	£200	B5
	Sales ledger	£275	S7
	Sales ledger	£400	M3
	Sales ledger	£350	B3
	Sales ledger	£300	W1
	Sales ledger	£425	B6
	Sales ledger	£500	T4
	Sales ledger	£400	M5
	Solicitors	£1250	M5
	S/L, P/L + stock control	£1000	L3
	S/L, P/L + stock control	£900	B5
	Stock control/recording	£325	L1
	Stock control/recording	£500-1500	C4
	Stock control/recording	£350	G1
	Stock control/recording	£500	B5
	Stock control/recording	£900	M3
	Stock control	£550	B3
	Stock Control	£300	W1
	Stock control	£500	T4
	Stock control	£550	M5
	Surveying	£500	T4
	Time/cost recording	£400	G1
	Time/cost recordin	£200	M3
	Time ledger	£350	B3
	Utilities	£50	B5
	Word processi	£400	G1
	Word processing	£150-260	C4
	Word processing	£250	M3
	Word processing	£250	B6
	Work in progress	£850	B5
Famos	Customer file	£1000	M2
	Data base	£1500	M2
	Integrated accts	£2000	M2
	Motor dealer	£5000	M2
	Payroll	£1500	M2
	Stock control	£1500	M2
	Word processing	£500	M2
MCZ Zilo	Mail shot	£250	I1
	Membership accting	£250	I1
	Personnel records	£400	I1
MZ-80K	Estate agent	£195	W1
	Integrated accounts	£150	P2
	Stock control/recording	£150	P2
North Star Horizon	Budgeting package	£95	B5
	Cash flow	£95	B[illegible]
	Database management/ information retrieval	£250	B3
	Double glazing costing	£750	W1
	Estate agent	£750	B5
	Financial modelling	£95	B5
	General ledger/NI	£250	B3
	General ledger/NI	£400	M3
	General ledger/NL	£400	B5
	Incomplete records	£750	M3
	Incomplete records	£250	B5
	Incomplete records	£975	B3
	Integrated accts	£950	B3
	Integrated accts	£990	M3
	Integrated accts	£690	B5
	Integrated accts	£900	B5
	Invoicing	£100	B3
	Invoicing	£250	M3
	Invoicing	£100	B5
	Job costing	£350	M3
	Letter writer	£150	M3
	Miling List	£195	W1
	Mail shot	£90	M3
	Payroll	£350	B3
	Payroll	£390	M3
	Payroll	Lease	W1
	Property Management	£400	M3
	Purchase ledger	£250	B3
	Purchase ledger	£400	M3
	Purchase ledger	£400	B5
	Sales ledger	£250	B3
	Sales ledger	£400	M3
	Sales ledger	£400	B5
	SL, PL + stock control	£900	B5
	Stock control/recording	£450	B3
	Stock control/recordng	£900	M3
	Time/cost recording	£250	B3
	Time/cost recording	£200	M3
	Time/cost recording	£450	W1
	Word processing	£250	M3
PCC 2000 Simpelec	Estate Agent	£350	B2
	General ledger/NL	£350	B2

Machine	Application	Price	Code
Triton 3	Mail Shot	£450	B2
	Purchase ledger	£350	B2
	Sales ledger	£350	B2
	Stock control/recording	£350	B2
	Time/cost recording	£350	B2
PET/CBM	Appointment planner	£100	S3
	Assembler dev	£50	C2
	Bank accounts	£100	S3
	Bonds/pension quotations	£100	S3
	Bureau de change	£8	H3
	Cash flow	£8	A1
	Credit control	£650	B4
	Database management/ information retrieval	£75	B1
	Database management/ information retrieval	£50/150	C2
	Database management/ information retrieval	£150	G2
	Database management/ information retrieval	£150	J1
	Database management/ information retrieval	POR	C1
	Database management/ information retrieval	£325	A1
	Database management/ information retrieval	£225	H4
	Database management/ information retrieval	£250	C3
	Database management/ information retrieval	£45-250	S3
	Disk operating system	£150	B1
	Estate agent	£25	A1
	Estate agent	£30	H3
	Estate agent	£250	S3
	File handling	£225	H4
	Financial modelling	£425-535	A1
	Financial planning	£125	A1
	General ledger/NL	£200	C2
	General ledger/NL	£1000	C1
	General ledger/NL	£200	H3
	General ledger/NL	POR	S3
	Incomplete records	£750	S3
	Industry factory loading	£300	X1
	Industry work study	£750	X1
	Integrated accts	£300	B1
	Integrated accts	£(50)	C2
	Integrated accts	£650	G2
	Integrated accts	£650	J1
	Integrated accts	POR	S3
	Invoicing	POR	J1
	Invoicing	£25-50	B1
	Invoicing	£350	A1
	Invoicing	£400	C1
	Invoicing	POR	S3
	Job costing	£750	X1
	Lotteries	£45	H2
	Mailing li	£75	B1
	Mailing list	£15	A1
	Mailing list	£45	H2
	Mailing list	£35	H3
	Mailing list	£100	S3
	Mail shot	£125	S3
	Membership [illegible]	£85	H2
	Payroll	£150	G2
	Payroll	£150	J1
	Payroll	£150	C2
	Payroll	£50/195 195	I2
	Payroll	£50/25/ 195	A1
	Payroll	POR	C1
	Payroll	£200/350	C5
	Payroll	£10	H3
	Personnel recors	£85	H[illegible]
	Petsoft programs	£160	J1
	PR/advertising package	£1000	S3
	Printers job control	£250	S3
	Prise lister	£12	H3
	Production analysis	£300	B1
	Purchase ledger	£200	C2
	Purchase ledger	POR	J1
	Purchase ledger	£95/120 350	A1
	Purchase ledger	£1000	C1
	Purchase ledger	£300	B4
	Purchase ledger	£350	H3
	Purchase ledger	POR	S3
	Sales ledger	POR	J1
	Sales ledger	£200	J1
	Sales ledger	£300	B4
	Sales ledger	£800	C1
	Sales ledger	£95/350	A1
	Sales ledger	£350	H3
	Sales ledger	POR	S3
	Stock control/recording	£150	C2
	Stock control/recording	£300	B1
	Stock control/recording	£150	G2
	Stock control/recording	£150	J1
	Stock control/recording	£195	I2
	Stock control/recording	£12/25/ 350	A1
	Stock control/recording	£15	A2
	Stock control/recording	£300	B4
	Stock control/recording	£35/25	H3
	Stock control/recording	£100/250	S3
	TAP business system	£125	H2
	Time/cost recording	£300	B1
	Time/cost recording	POR	S3
	Utility set	£78	H3
	VAT	£17.50	A1
	VAT master	£25	H3
	Word processing	£75/150	J1
	Word processing	£75/150	G2
	Word processing	£75/150	C2
	Word processing	£85/65 £40/20	H2
	Word processing	£375	H4

Machine	Application	Price	Code
	Word processing	£25/325	A1
	Word processing	£325	C5
	Word processing	£35	H3
	Word processing	£120	S3
PET/ Computhink	Stock control/recording	£250	R1
CBM/8032	Mailing list	£75/150	S1
	Planning maintenance	£595	S1
	Purchase ledger	£395	S1
	Sales ledger	£395	S1
	Solicitor's package	£750	S1
	Stock control/recording	£395	S1
	Vet package	POR	S1
	Warehousing	POR	S1
Sharp PC-3201	General ledger	£450	P2
	Sales ledger	£300	P2
	Purchase ledger	£300	P2
	Stock control	£300	P2
Sorcerer	Payroll	£250	L2
Superbrain	Bill of materials	£450	T3
	Database	£300	S6
	Estate agent	£800	S6
	General ledger	£400	M3
	General ledger	£400	S6
	Incomplete Records	£750	M3
	Integrated Accts	£1200	S6
	Integrated Accts	£990	M3
	Integrated accts	£1000	T3
	Invoicing	£250	M3
	Invoicing	£150	S6
	Job costing	£350	M3
	Letter writer	£150	M3
	Mailing list	£140	C9
	Mail shot	£90	M3
	Payroll	£400	S6
	Payroll	£390	M3
	Payroll	£250 +	T3
	Property management	£400	M3
	Purchase ledger	£300	S6
	Purchase ledger	£400	M3
	Sales ledger	£300	S6
	Sales ledger	£400	M3
	Stock control	£300	S6
	Stock control	£900	M3
	Stock Control	£450	T3
	Time recording	£200	M3
	Word processing	£250	M3
	Travel agency accts	£800	S6
Tandy Model I	Database management/ information retrieval	£25-80	M1
	General ledger/NL	£90	M1
	Incomplete records	£40	M1
	Integrated accts	£350	M1
	Invoicing	£90	M1
	Job costing	POR	M1
	Mailing list	£40	M1
	Mail shot	£75 +	G4
	Payroll	£249	M1
	Purchase ledger	£90	M1
	Sales ledger	£90	M1
	Stock control/recording	£30-50	M1
	Travel Agency Accts	£225	G4
	Travel Agents Dairy	£100	G4
	Travel Ticket Sales	£225	G4
	Time/cost recording	POR	M1
	Word processing	£50/75	M1
Tandy Model II	General ledger/NL	£90	M1
	Integrated accts	£350	M1
	Invoicing	£90	M1
	Job costing	POR	M1
	Mailing list	£75	M1
	Mail shot	£75	M1
	Mail shot	£75 +	G4
	Purchase ledger	£90	M1
	Sales ledger	£90	M1
	Stock control/recording	£300	M1
	Time/cost recording	POR	M1
	Travel Agency Accts	£225	G4
	Travel Agency Diary	£100	G4
	Travel Ticket Sales	£225	G4
	Word processing	£175-240	M1
Tektronix	Various engineering Packages		E1
TRS-80	Database management/ information retrieval	£60	S2
	Database management/ information retrieval	£32.50	H1
	Database management/ information retrieval	£150	J1
	General ledger/NL	£225	H1
	Incomplete records	£40	H1
	Integrated accts	£75	J1
	Investment portfolio	£20	S2
	Invoicing	£25	H1
	Mailing list	£25/38/ 55	H1
	Mailing list	£50-150	S2
	Payroll	£200	H1
	Purchase ledger	£225	H1
	Sales ledger	£225	H1
	Statistics	£45	S2
	Stock control/recording	£200	H1
	Stock control/recording	£48	S2
	Stock control/recording	£115	J1
	VAT register	£15	H1
	Word processing	£45/95	J1
	Word processing	£15	H1
	Word processing	£30/60/ 90	S2
TRS-80I	General ledger/NL	£225/325	T1
	Invoicing	£75	T1
	Payroll	£218	T1
	Purchase ledger	£225	T1

PACKAGES

Machine	Application	Price	Code
	Sales ledger	£225	T1
	Stock control/recording	£200	T1
TRS-80II	General ledger/NL	£425	T1
	Invoicing	£125	T1
	Payroll	£375	T1
	Purchase ledger	£375	T1
	Sales ledger	£375	T1
	Stock control/recording	£375	T1
Vector	General ledger/NL	£400	C5
	Integrated accts	£1000	C5
	Purchase ledger	£400	C5
	Sales ledger	£400	C5
	Word processing	£40	C5

Machine	Application	Price	Code
8000 Series	Database management/ information retrieval	POR	C2
	Integrated accts	POR	C2
	Payroll	£250	C2
	Purchase ledger	£250	C2
	Sales ledger	£250	C2
	Word processing	£250	C2
8080/Z80	General ledger/NL	£275	G3
	General ledger/NL	£375	L1
	Integrated accts	£950	L1
	Integrated accts	£995	G3
	Invoicing	£325	L1
	Job order control	£257	G3
	Order processing	£550	L1

Machine	Application	Price	Code
	Payroll	£475	L1
	Payroll	£275	G3
	Prof appts groups	£275	G3
	Prof appts individ	£220	G3
	Prof client billing	£330	G3
	Purchase ledger	£425	L1
	Purchase ledger	£275	G3
	Sales ledger	£275	G3
	Sales ledger	£425	L1
	Stock control/recording	£325	L1
	Stock control/recording	£275	G3

TRANSACTION FILE

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PET 16k. . . large keyboard, new ROM's and cassette. 1yr old. Exc cond. £425. Tel: Colchester 62205 (e/w.ends).

VIC 20. . . 3m-old, boxed as new, complete with Datacassette, 3k RAM expander, introduct to Basic course + games s/ware (worth over £300), will accept £260. Phone M Holdron, Dewsbury (0924) 466704.

S100. . . Ithaca static RAM 8k addressable to 4k wait states. £76. Newbear 2708/16 EPROM board. 16 sockets. Addressable to 16k. Wait states £33 (repaired) 021-354 9471 after 6.

ZX81. . . 16k RAM pack as new £45. Also videomaster Star Chess game, full colour, plugs into TV, £40. Both for £80. Tel 0236 23329.

ZX80. . . +8k ROM, Sinc built + power supply unit, manual and leads. Together with 4k ROM, manual and book of programs for 4k ROM. £40 ono. Tel: Plymouth (0752) 337905.

HP41CV. . . 2000 lines of program memory, as new, £150 ono. Tel: (0506) 55814 after 6.

Nascom 2. . . 8k Basic, assembler, 10k user RAM, expandable to 17k on board, compact PSU, Nas-Sys 1. Fully working, little used £250. Tel: 01-221 1443 eve/w.ends.

Video Genie. . . 3m-old, mint cond. box, leads & manuals complete. £275 ono. Tel: 01-602 3161 eves.

Tantel Prestel Adaptor. . . for use with domestic TV. Mint cond. £90 ono. Tel: Dumbarton (0389) 64384.

Apple II. . . (48k) 6mnths old, inc 1 disk with controller, Euro-colour card, modulator, paddle dustcover and paddle: £960. Ring 01-435 4638.

UK101. . . 8k cased, new PSU, True RS232, 48x32 screen. CEGMON fitted £150. Tel: John 0527-26887.

Atari. . . Video computer system complete with six cartridges. In ex cond. Only 1yr-old. £130 ono. Phone 01-574 1755 after 7.

ZX81. . . Sinc built, as new. Used only a few times. With mains adaptor, leads, manual, game etc. £55. Tel: Brighton 0273 724392.

Sorcerer 32k. . . Microsoft Basic, 8k Basic ROM, development pack, TV modified by engineer for TV/VDU use. Manuals, source magazines, all leads & cables. Exc cond. £500 ono. Phone 0952 47243.

Video Genie. . . EG3003 as new, with leads & manuals, original box. S/ware inc, 4 space games, 3 adventures. value £100, £300 ono. Tel: Wellingborough (0933) 224526.

Video Genie. . . 16k LII. New, 5m-old. Used for 1 month only. Complete with manuals, leads, etc. As new. £225. Tel: 0948 (Whitchurch, Salop) 840566.

Acorn Atom. . . 8k ROM + 12k RAM. Acorn built, Exc cond. 3m-old, rarely used. PSU/Leads, 1 manual £170. Phone Philip 0423 711609 after 5.

Sharp MZ-80K. . . 48k RAM, 3m-old, mint cond. Several progs. Basic language tape + manual and box. £380. Tel: 01-373 9176 after 5.

Apple II. . . +48k, single disk drive & controller, DOS 3.3 system. Sanyo '9' b/w monitor. Manuals, Sargon II & lots of quality s/ware. Bargain at £750. Tel: 01-504 9615 after 7.30.

UK101. . . 8k RAM. Microtype III cased with numeric pad. Tapes and manual inc. £150 in gc. Also cassette recorder and monitor available. Tel: Whitby 0947 605620 after 6.

ZX81. . . 16k Sinc built, manual, leads, power unit, also compatible Ferguson cass recorder & tapes, games, books (machine code) etc. Only 6m-old. £120 ono. Phone 01-486 6821.

Transaction File advertisement form

All Transaction File ads must be submitted by readers on this form or a photo-copy of this form. Maximum 30 words. Print one word per box, very clearly. Name, address and/or telephone number must be included in the 30 words. All ads must be accompanied by flat fee of £2.50. Make cheques or POs payable to Sportscene Publishers (PCW) Ltd. Ads accepted from private readers only. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by printing your ad very clearly. Send form to: Transaction File (PCW), 14 Rathbone Place, London W1P 1DE.

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

TRANSACTION FILE

Got a micro and in need of an offline data terminal?. . . I've an ASR33 Z/O terminal with printer, keyboard, tape punch and RS232 interface for sale. Chris Phillips 0494 25938.

ZX81. . . leads, manual etc. £57, 16k RAM £38, boots 12" b/w TV. £44. All hardly used, under gurantee, p. cond. Free immediate delivery. Write: J Burrell, 23 Hope Drive, Park, Notts.

Video Genie. . . 16k, arrow keys, all leads + manuals + sound. S/ware worth £400 inc m/l & Basic games + utilities. Tel: 01-446 0502 £350 (no offers)

Video Genie. . . 16k Model, 4th arrow key, cassette level meter, sound kit fitted. 6m-old. S/ware includes, ZEN assembler. Bargain £320 the lot. Tel: Layer De La Haye 342 after 8.

Free 64k Apple II Europlus. . . Basic, Pascal, Assembler, 2 disk-drives, parallel card, OKI printer, lockable case/Work-station, paper, books, magazines — with 50 disks of s/ware. £200 ono. Tel: 0222-530 531.

ZX81. . . Sinc built, 16k RAM, manual, leads, PSU and 5 books inc the ZX81 companion. £115 ono. Phone 01-902 2166 after 4.

UK101. . . 8k, built, new monitor, uncased (boxed with manual) £140, phone (01) 529 8829 after 6.

CBM 4008. . . large keyboard, ext cassette deck, dustcover, manuals, toolkit & many other m/c routines in ROM, over 80 progs on 30 cassettes inc. Asteroids, Microchess, £450. Tel: Birtley 405443 eve.

Nascom 1. . . 48k, T4, Nas-Sys 3, Zeap, XTal Basic, Eprom programmer, Cuts, port probe, I/O board with CTC & PIO etc. good case & PSU. £450 ono with full documentation. Richmond (N. Yorks) 2892.

Acorn Atom. . . Fully expanded. 12k RAM. Floating point. + Magic Book, Space Invaders, S/ware. Includes power supply and all original leads. Acorn built. Only £200. Tel: Holbrook 328287 after 6.30.

ZX81. . . 16k RAM, Sinc built, new K1B, 3A, 6V, PSU, in new case, s/ware, chess, gulp, adventure, 3D male, 3D oxo and lots more. Books: Machine code, Interface. Worth over £220 will accept £150. 01-524 1168

Superboard 2. . . 32x48 cased, 16k RAM Cegmon, toolkit & Basic 5 Eproms, High speed cas int. £80 of taped programs. All manuals £200 ono. Rochdale 33576.

Acorn Atom. . . 12k RAM, 12k ROM, power supply in its own metal case, manual, leads, progs woth £40. ready to run £190 ono. Phone Lutterworth 04555 57577.

Approx £70 worth Computer Mags offered. . . exchange for TRS80 LII peripheral, s/ware, or small computer. Write with offer to J R Christer, 22 Priestclose Rd, Prudhoe, Northumberland.

Mattel Intelivision Games. . . computer with 8 extra games inc Space Armada. Cost £351, only a few months old, upgraded to Apple. £280 for quick sale. Phone Maidstone (0622) 37550.

PET Basic IV. . . green screen, 4040 disc drives , cassette & deck, dust covers, orig documentation + boxes, cables, books, critical path program and others. £1200. No offers please. Ring 431 2040.

ZX80. . . Sinc built, 8k, PSU, Leads, manual, books & cassette (Sinc) £50, A Wadsworth, 4 Essex Close, Catterick Garrison, Richmond, Nth Yorks.

As new TRS-80. . . 48k VDU, 3-disc drives, Interface, recorder, microline printer. All type of superb S/ware inc light pen, sound et

As new TRS-80. . . 48k VDU, 3-disc drives, Interface, recorder, microline printer. All type of superb S/ware inc light pen, sound etc. Altogether a sacrifice at £1350, complete. Tel: Horley 73989.

UK101. . . 8k RAM, Microtype case, WEMON fitted, orig monitor & documentation inc. £150 for quick sale. Tel: Bracknell 53461.

Nascom 1. . . 32k, NasSys3, Nas Dis, Toolkit, Debug, 5A PSU, Cottis Blandford 300-2400 baud cassette interface, Nas graphics, sound port, s/ware + all INMC mags. Worth over £600. Bargain £375 ono. Tel: 01-806 5995.

Casio FX-502p. . . gc + FA-1, Master Pack and some progs. £60 ono. Tel: Ian 01-648 5927 Morden, Surrey.

T159. . . gc, magnetic tapes, library module and manual. Must sell. Offers of only £80 will be considered. Contact Mr J Hunt, Buttermere Hill, Churt, Surrey GP10 2PX.

Half price. . . ZX81 progs, £1 each. Life, Fruit machine, Twenty-one, Mastermind, £2.50 each, Defender, Startrek, Draughts, Nightmare Park, Asteroids, Lunar Landing, Dambusters. Alco cassette rack £2. Tel: Graham Upholland 632423.

Solenoid. . . operated cassette transports. Will interface simply to a PIO, allowing wind, rewind, stop & play under program control. Suitable for hobbyists to build into data-processing system or substitute disc drives. £25 + carriage. Pat Crabb Holmfirth, W. Yorks. 048-489 5263.

ZX81. . . Sinc built and tested as received from factory with power supply, leads and manual. Per cond. £45. Ring 01-834 0143 e/w.ends.

Acorn Atom. . . Acorn built, 12k + 12k, (word pack & 6522) + games tapes & others. All leads, PSU & manuals. 11m-old, £140 ono. Tel: Norwich (0603) 28886.

Nascom I. . . new 3A PSU, NII graphics & NasSys 3 in custom cabinet, £130. 16k RAM-A board, runs at 4MHz, £85. Buffer board, £25. Kenilworth 5-card frame with edge-connectors, £35. Tel: 01-903 2025 (Ansafone).

ZX81. . . 16k RAM. Sinc built. vgc. Inc mains sapator, manual and 3 cassettes of progs. £100. Tel: 061-336 6180.

MZ-80K. . . 48k RAM (green screen) + newsletters (Basic SP5025 completely explained) £500. Also languages, Utility and numerious other progs (tape) Inquiries to Mr G Rhys, 22 Cereodigion Hall, Marine Terrace, Aberystwyth.

Microtan 65. . . expanded to 24k RAM with Basic, XBug, new Tanbug toolkit, games, Forth £325 ono. Tel: Denis Field Ukbridge 51166 x 228 day, St Albans 60432 (eve).

Superboard II. . . cased, PSU, 4k RAM, leads, documentation. 40+ games progs, chess, 3D maze, Startrek, 3D Os and Xs, etc £150. Tel: (0892) 40919.

Micropolis. . . Mod I single disk drive, vgc. As add-on unit £150 or with s100 controller board, manual & system disks £300 Stansted (Essex) 0279 813566 eve.

Superboard. . . 16k RAM, 2 new ROMs with extended Basic. Cased, PSU, manuals, leads, tapes & cas player. Ready to run. £150 or offer. Phone Kevin Palmer 01-449 1049 — Barnet.

PET 2001. . . 8k new ROM, green screen, sound box, small keyboard, 50 programs, manuals and books £365. Also Texas TI-57 programmable calculator — new £20. View Basingstoke — Hastings (0424) 752736.

Texas T158. . . 480 step programmable calculator + charger, manuals etc, Matrix, statistical preprogrammed functions. Exc. cond. hardly used. £35 ono. Tel: 01-958 5252 eve, w/ends.

Acorn Atom: 9k RAM, 8k ROM, 3A-PSU, leads, manuals, Has on board sound generator chip £165. Phone Liverpool 051-638 2446.

Pet 16K. . . model 3008, cassette deck, Pet revealed, many progs inc. Starforce. £470. Tel: 031-663 5910. M Renwick, 8 Cockpen Avenue, Bonnyrigg, Midlothian, eve/w.ends.

8K Pet. . . with Expandamem, old/new ROMs, 2 cassettes drives, light pen, sound and commodore 2023 printer, lots of s/ware — £600 or may split — Tel: Hemel Hempsted 212212.

Pet. . . 32k Model 4032, fitted Superchip, toolkit, Pronto-Pet switch, cassette, dustcover, + TV adaptor, sound adaptor, program tapes, manuals, less than 8 hours use, £550 secures. Tel: 0723 65915 after 6.

Atom. . . 12kx12k, PSU, magic book, Invaders, Asteroids, Soft VDU etc. £260. P Chaisty, 27 Greatfield Rd, Wythenshawe, Manchester 22 7RU.

Museum Micro. . . Sharp Compet PC2600 (16 col printer, calculator type display, magnetic card reader/writer, 2 PC219 8" disc drives) GWO. Offers! Jon Boggon 01-623 7100 ext 3929.

FX-502P. . . programming calculator. Complete with instructions, manual and extra programs! Only £50. Tel: Cambridge 63763.

Acorn Atom. . . Word pack ROM, soft VDU pack and Atom Magic Book. Worth £47 inc VAT. Will sell for £30. Write G Hinds, 22 Hillingdon Rd, Uxbridge, Middx.

ZX81. . . Sinc built, power supply, leads, manual inc over 40 progs + Sinc games cassette. pwo, still in box £59. Phone Bridworth 2085 after 5 w.days.

S100. . . QT+ SBCII Z80A CPU A&T £100, 6slot Motherboard A&T £20. Wameco, Hex front panel built but no chips £45, Z80A CPU and S&PIO bare boards £20 each, eve 01-581 2451.

Acorn Atom. . . 12k + 12k, PSU, manual and Progs inc Invaders & machine code monitor/dis-assembler. £200 ono. Tel: 0724 846208.

UK101. . . 8k RAM, new monitor, exc cond, full documentation, some games inc chess, + 6522 VIA and data sheet. £110. Tel Cambridge (0233) 62096 office hours (Clements).

Acorn Atom. . . 12k RAM, 8k ROM. Fac built, PSU, all leads, manual, software inc Invaders, Asteroids, fast cos. Information duplicates. 6m-old. £195 Tel: 0732 883170 eve.

Acorn Atom. . . 12k RAM & 12k ROM inc PSU, leads and manual, S/ware & Atom Magic book free, will sell for £230. Also for sale, Atom Colour Encoder not fitted, sell for £15. Both for £240. Tel: Crumpsall 061-795 7435 after 6.

ZX81. . . Sinc built with 16k RAM and full size Fuller FD81 keyboard. All leads, manual and 2 cassettes and 30 listings. Exc cond. bargain at £129. Contact Paul on 01-440 7571.

Video Genie. . . EG3003, 16k, 4m-old, 8m-guarantee, as new, integral cassette and new keys, lots of s/ware included £260 ono. Tel: 01-654 4361 eve.

Pet 32k. . . new ROM, toolkit, superchip + arrow, external cassette. Over £200 of s/ware included. Games such as, Pet-chess, Cosmiads, Invaders, Asteroids, 3D Startrek. The whole package for £500. Tel: Bradford 881146 e/w.ends. Can deliver.

Nascom 1. . . 32k expansion, NAS-SYS 3, 8k Basic, Gemini EPROM board, Cottis Blandford tape interface, sound generator, much s/ware, and documentation. £230. Tel: 0602 392554 (Nottingham)

ZX81. . . + 16k RAM complete with unichain tapes and manual, Sinc built in GC, £100 or ono. Phone Dorchester STD 0305 65105 after 4.30.

Sharp MZ80k. . . 48k with Xtal Basic, Knight commander, service manual, many tapes, perfect condition. Original packing £350 ono. Ring Harry, Southend on-Sea 64756.

ICS. . . self-training course kit. S/ware-H/ware and real-time interfacing, + manufacturer's carrying case. 5 manuals. e. cond. Tel: Carrickfergus 63207 eve only.

TRS-80. . . 32k with l/case green screen, VDU, expansion interface, disk drive, line printer, manuals, blank disks, printer paper, programs. Must sell, offers around £1000. Tel: (0642) 551518.

Sharp MZ80K. . . (48K) with dust cover, 3 languages, Basic, machine code, and Forth. With manuals, many progs inc. Asteroids, Chess, etc. PC. £400. Tel: Southend (0702) 549856 anytime.

ITT2020. . . 48k, 2 disc drives, 9" Hitachi monitor, IDS 440G printer, desk, s/ware and manuals. Complete system £1500. Tel: 0243 783469.

PET. . . 32K new ROM with added green screen and 3 additional chips (toolkit, superchip and Pic-chip) worth additional £150. Cassette deck cover and £100 progs included £600 ono. Tel: 0303 862274.

UK101. . . 8k 1yr old, pc., cassette recorder, sound generator, new monitor, much s/ware all in wooden case with room for full expansion. £175 ono. Tel: Hatfield, Hertfordshire 64826.

TRS80. . . Model I expansion interface (Ok). Brand new and warranted. Surplus to requirements. Offers. Tel: 041-639 3822.

Teletype. . . ASR33 paper tape reader/Punch stand, 110/240v, manuals, VGC. £150 ono. Plessey Drum £20 PDP8 power supply £50 or offers (0344) 55869.

PET 4032. . . absolutely as new, RRP, £799, sell for £645. Tel: 061-904 9901.

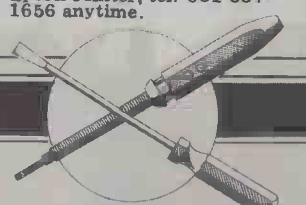
Diablo printer. . . Hytype 1 daisy-wheel printer complete with case, diagrams word processing keyboard, power supply, print-wheels & ribbons. Exc cond. £300. Tel: Maidenhead 37885.

ZX81. . . Sinc built inc all leads, adaptor 16k RAM exc cond. + manual and Mastering Machine Code on your ZX81 and cassette games 1. £100. Tel: 061 789 5375.

Texas TI59. . . and PC100C printer, with Master Library and Maths-utilities modules. Also 80 extra magnetic cards, programing pad and 3 rolls of printer paper. £220 ono. Tel: 01-764 7501.

TRS-80 16K L2. . . Numeric keypad, green screen VDU, CTR-80 cassette recorder, complete with manuals. Built into TRS-80 desk. £375. Assorted books and s/ware available at ¼ price. Tel: Kingsclere 298230.

TRANSACTION FILE



ACC NEWS

As this year is 'Information Technology '82' (IT82), the subject of Computer Communications is going to really take off. The ACC now has pages on Prestel (page 292500 or take a routing from page 292); at the moment we run the contents of *ACCumulator*, Club news and part of the ACC's national club database. In addition, there is telesoftware available for you to download from Prestel onto your machine.

Tangerine has made computer hobbyist use of Prestel possible by producing a modified Tantel which has an RS232/computer connection, so that you can have your computer online for about £200. The ACC is also starting a bulletin board in Oxford (300-300 baud, V21 spec, even parity, 7 data bits); the phone number will be published in a later 'ACC News' and in our Prestel area. We hope to have the bulletin board up 24 hours a day, six days a week.

The BBC referral service is going well, with over 150 enquiries per day. Is your club on the ACC database? If so, then the Beeb will have your details. Peter Whittle runs the ACC database; his address is 49 Bartlemas Road, Oxford OX4 1XU. Peter is also starting an amateur radio special interest group of the ACC. His call-sign is G4BBU.

Two new clubs have come to my attention this month. In Altrincham, ACE (Altrincham Computer Enthusiasts) has just started up; the secretary is Martin Hickling, 39 Barrington Road, Altrincham, Cheshire WA14 1HZ. In Oxford, we have OPeCC (Oxford Personal Computer Club), which has had three very successful meetings so far, including one addressed by David Annal, the secretary of the ACC, on 'The Ins and Outs of Interfacing'. The annual subscription is £8; this includes ACC membership (I'll give details of this scheme next month) and the secretary is Tim Fowler, 39 Charles Street, Oxford OX4 3AU.

As a follow-up to my article on how to start a computer club, I now offer a sample constitution for such a club (reprints of both the advice on starting and the constitution are available; write to me at the address at the end of 'ACC News').

CONSTITUTION OF THE WEST SOMEWHERE COMPUTER CLUB

1) Title
The name of the Association shall be the West Somewhere Computer Club.

2) Aims and Objects
The aims of the Association shall be to promote interest in personal computing in West Somewhere and the surrounding area, and to help its members use and learn about personal computers, both in lectures and informal workshops.

3) Affiliation
The Association may be affiliated to other clubs or associations of similar aims, and may accept affiliation from such bodies. In particular, the Association shall be fully affiliated to the Amateur Computer Club.

4) Membership
There shall be four classes of membership of the Association, namely 'Member', 'Corporate Member', 'Junior Member' and 'Honorary Member'. Honorary Membership is conferred only by special resolution of a General Meeting; there are no other requirements for Honorary Membership.

All other classes of Member must reside or work within twenty miles of 'The Rose and Crown', High Street, West Somewhere unless this requirement is individually dispensed with by the Committee. A Junior Member must be under 18, over 65 or unemployed. Corporate Membership is open to Schools, Youth Clubs and similar bodies, who may appoint one representative to vote at General Meetings of the Association.

The Committee may withhold any class of Membership (except Honorary Membership) from any individual or body without giving reasons, but the individual or body may put his case to the next General Meeting of the Association, which may overrule the Committee's decision. Similarly, the Committee may terminate in writing the membership of any class of Member whose conduct is proved (to their satisfaction) to be detrimental to the interests of his fellow Members, subject to appeal to a General Meeting of the Association.

5) Committee and Officers
5.1) The day-to-day business of the Association shall be managed by a Committee, subject to the final authority of a General Meeting of the Association. The Committee shall be empowered to act without reference to a General Meeting, providing that such action is within these Rules and there is no motion on that action pending for discussion at a General Meeting.

5.2) The Committee shall consist of the following Officers: Chairman, Secretary, Treasurer, Membership Secretary. In addition, there may be up to four 'elected members' of the Committee with general responsibilities, and up to six 'coopted members' of the Committee. The elected members are elected at the Annual General Meeting along with the Officers, while the coopted members of the Committee are appointed (and may be removed) by resolution of the Committee.
5.3) The Officers and elected members of the Committee shall hold office from the date of appointment until the next Annual General Meeting, and shall be eligible for re-election.
5.4) Should any member of the Committee resign or cease to act during the life of the Committee, the Committee may appoint a member of the Association to fill the vacancy.
5.5) The Committee shall have power to fix the rules under which it transacts business, save the following:
5.5.1) Four members of the Committee (including at least one Officer) shall form a quorum.
5.5.2) Committee meetings are held at the Chairman's discretion, except that a meeting must be held if requested by three or more members of the Committee.
5.5.3) Any resolution passed by a majority of the members present and voting at a meeting of the Committee shall be the decision of the Committee. In the event of an equality of voting, the presiding member shall have an additional or casting vote.
5.6) The functions of the Officers are as follows:
5.6.1) The Chairman shall preside over meetings of the Association and its Committee, and shall be responsible to the Members for the conduct of the Association.
5.6.2) The Secretary shall cause adequate records to be kept of the proceedings of the Committee and General Meetings of the Association. He shall act on behalf of the Chairman in his absence.
5.6.3) The Treasurer shall take charge of the funds and all receipts of the Association and shall pay all demands under the authority of the committee. He shall render full and complete accounts at each audit, and whenever required to do so by resolution of the Committee or General Meeting. He shall also be responsible for the maintenance of records of plant and equipment belonging to the Association.
5.6.4) The Membership Secretary shall be responsible for maintaining an up-to-date list of the membership of the Association.

6) Subscriptions
6.1) The Association's year of accounts shall end on 30 September.
6.2) All classes of Member (except Honorary Members) shall pay an annual subscription at rates to be fixed by a General Meeting of the Association. Nobody shall be considered to be a member until his subscription is paid, but there shall be a period of grace allowed to existing members of one month following the end of the Association's financial year, during which they retain their membership pending renewal.

7) General Meetings
7.1) The Annual General Meeting of the Association shall be each year within two months of the start of the year of accounts. in addition, Special General Meetings of the Association shall be held at the discretion of the Committee or whenever 25 or more members individually demand so in writing.
7.2) The agenda for any General Meeting shall be communicated to the members at least 14 days before the meeting.
7.3) Each member present at a General Meeting shall have one vote and when the votes are equal the presiding member shall have an additional or casting vote.

7.4) At any General Meeting a member may require that the accounts be audited. Normally this shall be done by some disinterested individual appointed by the meeting (or, at its discretion, the Committee), but by special resolution the meeting may require that a professional accountant be paid to formally audit the accounts. The accounts shall be audited after each Annual General Meeting.

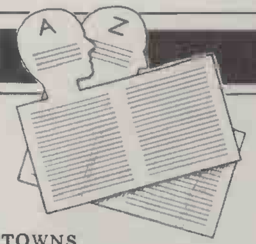
8) Interpretation
8.1) In these rules (unless such extensions are inconsistent with the subject of the context) words importing the masculine gender shall include the feminine and words importing the singular shall include the plural, and vice versa.
8.2) In any case of doubt as to the meaning of a rule or its applicability to a particular matter, the Committee shall have the power to decide the issue, subject to a General Meeting.

9) Amendment of the Constitution
This constitution can only be amended or added to by a resolution of a General Meeting, approved by two-thirds of those voting. Such a resolution must have appeared on the agenda notified to the membership as in 7.2 above.

10) Surrender of books and papers
Any member or ex-member who has the custody of any software, books, documents, records, property or monies belonging to the Association shall on request from the Committee or General Meeting surrender them to the Association.

11) Winding-Up
11.1) 28 days' notice of any proposal to wind up the Association shall be given in writing to all the members of the Association and the proposal shall be considered at an Annual General Meeting (which may be called specially under 7.1 above). To be effective a formal resolution to wind up the Association must be carried by a vote of at least two-thirds of those members present.
11.2) Upon the dissolution or winding-up of the Association, the property of the Association shall be disposed of at open Auction and the proceeds, together with the pecuniary assets of the Association, shall be used to pay off any debts owed by the Association, and the balance shall be donated to Oxfam.

Details of the ACC can be obtained from: Rupert Steele, ACC Membership Secretary, St John's College, Oxford OX1 3JP.



USER GROUPS INDEX

Here's an update of changes and new clubs. Full listing in July.

TOWNS

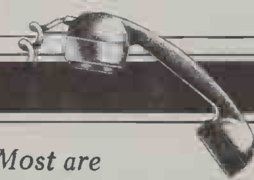
RAF Coltishall Computer Club meets at the Motor Club Social Centre, Coltishall, Nr Norwich, Norfolk on 1st & 3rd Thursdays monthly at 7.30. Contact: Chf Tech D McCandless, Sgts Mess, RAF Coltishall, Nr Norwich, Norfolk.

The SOBAT Computer Club (Leyton). Membership free for 1st two months and thereafter £1.50 pa. Inc Newsletter, software exchange. Contact: Mr T Kayani, 12 Calderon Rd, London E11 4EU. Tel: 01-556 5423.

Southampton Amateur Computer Club meets at 7.30 2nd Wednesdays monthly at the Medical Sciences Building, Bassett Crescent East, Southampton. Membership £5 pa (£3.50 students & OAPs) inc newsletter. Newly formed junior section (with own regular meetings). Contact: Paul Blitz, Gardenways, Chilworth Tower, Chilworth, Southampton. Tel: 0703 766161.

Casio fx702 User Group. Newsletter includes: Reviews, puzzles, programs, raffles etc. Membership £6.50 pa for 6 issues. Contact: R Cooper, 11 Baintree Rd, Dunmow, Essex.

NETWORK NEWS



These are all the European networks of which we're aware. Most are free — but phone them for details.

Forum-80 Hull. . . (Forum-80 H.Q) Tel: 0482 859169. System operator Frederick Brown. International electronic mail, library for up/down loading software. Forum-80 Users Group, Pet Users section shopping list system hours, 7 days a week midnight to 8.00am, Tues/Thurs 7.00pm to 10.00pm Sat/Sun 1.00pm to 10.00pm.

Forum-80 London. . . Tel: 01-747 3191. System operator Leon Jay. Electric mail, library for downloading. System hours: Tues/Fri/Sun 7.00pm to 11.00 pm.

Forum-80 Milton. . . (TRS-80 Users Group 80-Net) Tel: 0908 566660. System Operators: Leon Heller and Brian Pain. Electronic mail, library, newsletter, TRS-80 information system hours: 7 days a week 7.00pm to 10.00 pm.

Forum-80 Holland. . . Operator: Nico Karssemeyer, tel 01 313 512 533. Facilities: electronic mail, program up/downloading, shopping list. Hours: Tues-Sat 1800-0700 nightly, continuous from 1800 Sat — 0700 Tues.

CBBS London. . . Operator: Peter Goldman, tel 01-399 2136. Facilities: electronic mail, program downloading. Hours: Wed 0700-0930 & 1900-2200, Fri 1900-2200, Sun 1600-2200.

Mailbox-80 Liverpool. . . 051-220 9733. System Operator: Peter Tootill, Electronic mail, downloading TRS-80 information.

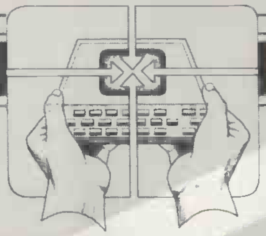
ACC. . . members bulletin board, Peter Whittle (0908 44262)

ABC-80. . . Stockholm, Sweden. Tel: 010 468 190522.

University Research Computer. . . Sweden. Tel: 010-468 23660, guests use password "66,66" for access.

Elfa. . . Sweden 010 468 7300 706

Tree Tradet. . . Sweden 010-468 190522.



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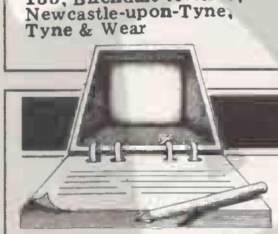


DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

West Germany	(Hanover) Hanover Trade Fair, Contact: Deutsche Messe-und Ausstellungs 01-651 2191	21-28 April
Brighton	(Town Hall) Business Equipment Exbn. Contact: Douglas Temple Design Bournemouth 20533.	28-29 April
Brussels	Compec Europe. Contact: IPC Exbns Ltd 01-643 8040	4-6 May
Wembley	(Conference Centre) Microcomputer Show Contact: Silver-Collins Ltd 01-729 0677	11-13 May
Bristol	(Exbn Complex) Micro City Exbn. Contact: Tomorrow's World Exbns Ltd, Bristol 292156	11-13 May
Aberdeen	Business & Industry Exbn. Contact: Silver-Collins Ltd, 01-729 0677	16-19 May

LEISURE LINES

by JJ Clessa

Last month's puzzle — judging by the enormous response — was the easiest to date. Well over 300 entries poured in and, as usual, most of you took the trouble to tell us just how easy it was.

Well, there are many solutions to the problem, but the most popular and smallest ones were 5039 and 7559. Each of these divides by ten to give a remainder of nine, by nine to give a remainder of eight, etc.

The winner, chosen at random, was Mr James Radley of Liverpool. Congratulations Mr Radley, your prize should have reached you by the time you read this.

For those readers who make use of London's main commuter stations, watch out for *PCW's* Commuter Computer Competition. You could win a Sinclair ZX81. Here's a free tip for those who may find the problem too difficult: take each station in turn from Notting Hill Gate and count how many different ways there are of getting to it from each previous node.

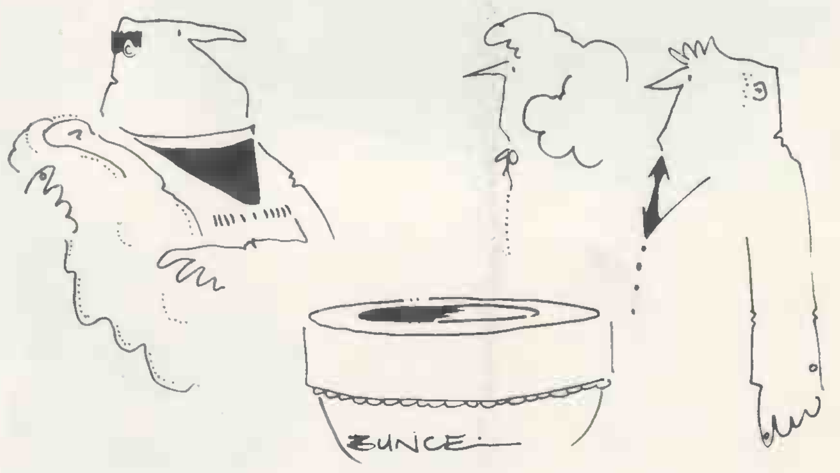
Quickie

No answers — no prizes. Two women sell 60lb of tomatoes in the market. The first woman sells half of them at 3lb for 50p, making £5 in all. The second sells the other half at 2lb for 50p, making £7.50, giving a total of £12.50 between them.

The following week they decide to sell their produce jointly and so they fix the price of the tomatoes at 5lb for £1. Once again they have 60lb to sell. However, when all the tomatoes have been sold they find they only have £12, and a quarrel ensues as to where the extra 50p went. Where did it go?

Prize puzzle

A number cruncher very solvable by micro — or any other method. We want you to find a six digit number which, when multiplied by an integer between 2 and 9 inclusive gives the original six-digit number with its digits reversed. Thus, if the original number if 123456 and the required integer is 8, then 123456 x 8 should equal 654321. Of course, it doesn't, but it is is possible to find more than one solution to this problem. We'll accept any as eligible for this month's prize. Answers, on postcards only, to May Prize Puzzle, PCW 14, Rathbone Place, London W1P 1DE, to arrive not later than last post 31 May 1982.



'We want to call him GOTO. That way he'll fit into the system better when he gets older.'

PROGRAMS

PCW is interested in Basic or Pascal Programs for any popular micro — please tell us which one you wrote your program on and how much memory it uses. Make sure your programs are fully debugged before you send them in on cassette (although we will accept disks) with a clear listing on plain paper. Documentation would be welcome, and if you want it returned please label everything with your name and address and include an SAE. Send contributions to Maggie Burton, *PCW* Programs, 14 Rathbone Place, London W1P IDE

PET Mini-animate

by M Whitworth

Mini-Animate will enable users of 'new ROM' PETs to produce animated graphics sequences of a good length. Instructions are not included in the program to save memory space. What the program actually does is to allow frames to be displayed in rapid sequence on the screen, thereby giving an animated effect. The author has included comprehensive editing facilities to allow easy handling of the frames. These are as follows:

Adjust: allows the current frame to be edited using the cursor controls.
Up/down/left/right: moves the current frame in the specified direction.
Clear: clears the frame on the screen.
Save: saves the displayed frame in memory.
Frame: recalls a specified frame.
Speed: determines the speed of animation.
Animate: animates the sequence.
Fetch/Dump: saves/loads an animated sequence.
New: 'NEWs' the sequence.

The chequered graphics character should not be used in any of the frames as it is used as a control character. Control mode is activated by hitting 'return' which also used to exit the Adjust mode. The control mode is advanced by pressing the space bar.

It is advisable to save the two programs in succession as the first automatically loads the second and also sets the memory pointers for it. Mini-Animate will need to be adjusted for 'old ROM' PETS by changing the POKE locations in line 130 of the first part of the program.

Part 1:

```
100 A=2815
110 A=A+1:POKEA,32:IFA<8192THEN110
120 FORA=826TO1010:READS:POKEA,S:NEXT
130 CLR:POKE42,168:POKE43,9:POKE44,168:POKE45,9:POKE46,168:POKE47,9
140 LOAD"MINI-ANIMATE",1
200 DATA169,81,141,108,3,169
210 DATA128,141,109,3,169,0
220 DATA141,142,3,169,11,141
230 DATA143,3,174,247,3,240
240 DATA22,173,142,3,24,109
250 DATA248,3,141,142,3,173
260 DATA143,3,109,249,3,141
270 DATA143,3,202,208,234,160
280 DATA0,185,201,128,201,102
290 DATA208,27,192,0,208,4
300 DATA238,247,3,96,173,108
310 DATA3,24,105,40,141,108
320 DATA3,173,109,3,105,0
330 DATA141,109,3,208,220,141
340 DATA108,11,238,142,3,208
350 DATA3,238,143,3,200,208
360 DATA208,169,81,133,0,169
370 DATA128,133,1,169,0,141
380 DATA203,3,169,11,141,204
390 DATA3,174,247,3,240,22
400 DATA173,203,3,24,109,248
410 DATA3,141,203,3,173,204
420 DATA3,109,249,3,141,204
430 DATA3,202,208,234,160,0
440 DATA173,9,11,238,203,3
450 DATA208,3,238,204,3,145
```

```
460 DATA0,200,204,246,3,208
470 DATA237,165,0,24,105,40
480 DATA133,0,165,1,105,0
490 DATA133,1,160,0,177,0
500 DATA201,102,208,216,96
```

Part2:

```
100 INPUT"▒FRAME SIZE";V,H:IFV>20ORH>20THEN 100
110 POKE1017,V*H/256:POKE1016,V*H-PEEK(1017)*256:POKE1014,H:POKE1015,0
120 FORA=1TOH+2:PRINT"▒";:NEXT:PRINT:FORA=1TOV:PRINT"▒";SPC(H);"▒":NEXT
130 FORA=1TOH+2:PRINT"▒";:NEXT
135 A=0:PRINT"▒▒";TAB(23);"FRAME #";PEEK(1015);"▒  "
140 PRINT"▒▒▒";TAB(23);R$;"   "
145 GETR$:IFR$<>" "ANDR$<>CHR$(13)THEN145
150 IFR$=" "THENREADR$:A=A+1:IFR$="*"THEN RESTORE:READR$:A=1
155 IFR$=CHR$(13)THEN165
160 GOTO140
165 ON AGOSUB240,450,270,280,290,300,390,410,490,400,220,200,480
170 R$="          ":RESTORE:IFA=-1THENPRINT"▒":GOTO110
175 GOTO135
180 DATAADJUST,SAVE,UP,DOWN,LEFT,RIGHT,CLEAR,FRAME,SPEED,ANIMATE,FETCH
190 DATADUMP,NEW,*
200 INPUT"▒PROG. NAME";R$:INPUT"DEVICE #";D:OPEN 5,D,1,R$:PRINT#5,V
205 PRINT#5,H:PRINT#5,MF
210 FORA=2816TOMF*V*H+2816:PRINT#5,PEEK(A):NEXT:CLOSE 5:A=-1:RETURN
220 INPUT"▒PROG. NAME";R$:INPUT"DEVICE #";D:OPEN 5,D,0,R$:INPUT#5,V
225 INPUT#5,H:INPUT#5,MF
230 FORA=2816TOMF*V*H+2816:INPUT#5,D:POKEA,D:NEXT:CLOSE5:A=-1:RETURN
240 PRINT"▒▒▒▒";:B=32849:A=PEEK(B)
245 GETR$:IFR$=CHR$(148)ORR$=CHR$(20)ORR$="▒"ORR$="▒"THEN245
250 IFR$=CHR$(13)THENPOKEB,A:RETURN
255 POKEB,A:PRINTR$;:B=PEEK(196)+PEEK(198)+PEEK(197)*256:A=PEEK(B)
260 IFA=102THENPOKEB,A:PRINT:PRINT"▒";:IFPEEK(B+1)=102THEN240
265 POKEB,86:GOTO245
270 A=32849:B=40:D=41-V*40:GOTO310
280 A=32809+V*40:B=-40:D=V*40-39:GOTO310
290 A=32849:B=1:D=41-H:GOTO310
300 A=32848+H:B=-1:D=39+H
310 IFPEEK(A+B)=102THENPOKEA,32:A=A+D:IFPEEK(A)=102THENRETURN
320 C=PEEK(A+B):POKEA,C:A=A+B:GOTO310
390 FORA=1TOH:FORD=1TOV:POKE32808+D*40+A,32:NEXT:NEXT:RETURN
400 POKE1015,0
405 FORA=0TOMF:SYS(923):B=PEEK(1015):FORD=1TOSP:NEXTD:POKE1015,B+1:NEXTA
407 POKE1015,0:RETURN
410 PRINT"▒▒▒";TAB(28);:INPUTA:PRINT"▒";TAB(28);"
420 IFA>-1ANDA<=MFTHENPOKE1015,A:SYS(923)
430 RETURN
450 IFPEEK(1015)=MF+1THENMF=MF+1
460 SYS(826):RETURN
480 MF=0:POKE1015,0:RETURN
490 PRINT"▒▒▒";TAB(28);:INPUTSP:PRINT"▒";TAB(28);"            ":RETURN
```

M2-80K Catch.

by W&T Thomas

While Catch is not necessarily subtle, it is certainly enjoyable. The aim of the game is to catch suicidal maniacs on a stretcher (held by two figures which you control) as they hurl themselves out of a four-storey building. The more men you catch the more points you get, and ten men jump from each floor. The program uses about 12k of memory. It is well thought out and planned and much attention is paid to those little details which can make a game as much fun to watch as to play. Disk system owners will have to change the machine code routine in lines 10-11. Full instructions are included in the game.

```
 1 REM        ******************
 2 REM        *      CATCH     *
 3 REM        *                *
 4 REM        *       BY       *
 5 REM        *                *
 6 REM        *  W & T THOMAS  *
 7 REM        *                *
 8 REM        *     20/9/81    *
 9 REM        ******************
10 B2=17380:FORI=B2TO17399:READE:POKEI,E:NEXT:B1=17374
11 DATA205,27,0,254,68,40,9,254,65,192,62,0,50,222,67,201,62,1,24,248
12 H$="▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"+SPC(17)+"MEN:"
```

PROGRAMS

```
13 DIMA(3),W(5,10),PV(5):TL=53248:XL=54090:XR=54125
14 PRINT"□":FORI=0TO3:READA(I):NEXT
15 FORJ=1TO10:READA:W(1,J)=A+TL:NEXTJ
16 DATA 202,204,205,203,128,129,130,138,139,140,141,149,150,151
17 FORI=1TO4:FORJ=1TO10:W(I+1,J)=W(1,J)+(120*I):NEXTJ,I
18 DATA200,250,300,400,500
19 FORI=1TO5:READPV(I):NEXT
20 ZZ=0:GOSUB80:FRINT"□"
21 REM****SCREEN FOKE*****
22 POKE59555,0:W1=1:Q=0
23 FORI=39TO999STEP40:POKETL+I,128:POKETL+I+1,128:NEXTI
24 PRINT"□    POINTS: 0";TAB(20);"HIGH SCORE:";HS;H$;Q
25 GOSUB106:Y=0:X=54108:PT=0:POKE59555,1:GOTO46
26 REM******MOVEMENT*******
27 POKEB1,2:USR(B2):M=PEEK(B1):M=M+(M=0):IFM=2THEN30
28 IF(X+M<XL)+(X+M>XR)THEN30
29 POKEX-1,0:POKEX,0:POKEX+1,0:POKEX-2,0:FOKEX+2,0:X=X+M
30 POKEX-1,202:POKEX,52:POKEX+1,202
31 REM*****FALLING MAN******
32 POKEV,AA
33 PRINT"□    POINTS:";PT;H$;Q+1:IFPT>HSTHENPRINT"□";TAB(20);"HIGH SCORE:";PT
34 T=T+1:IFT=4THENT=0
35 R=INT(RND(1)*3)+39:AA=PEEK(V+R)
36 IFAA=128THENAA=PEEK(V+40):R=40
37 IFPEEK(V+R)=202THENPT=PT+(PV(W1)/2):Q=Q+1:GOTO45
38 IFPEEK(V+R)=52THENFT=PT+FV(W1):Q=Q+1:GOTO45
39 IFV+R>54128THENQ=Q+1
40 IFQ=10*W1THENW1=W1+1
41 IFW1=6THEN53
42 IFV+R>54128THEN47
43 V=V+R:POKEV,A(T):GOTO27
44 REM*****MAN CAUGHT*****
45 FORI=1TO50:POKE4514,I:USR(68):NEXTI:USR(71)
46 IFQ=10*W1THENW1=W1+1
47 IFW1=6THEN53
48 IFY<W1THENY=Y+1:GOSUB116
49 S=INT(RND(1)*10)+1:V=W(W1,S)
50 ZZ=ZZ+1:IFZZ=1THENAA=163:V=V+40:GOTO52
51 AA=208:V=V+40
52 GOTO39
53 REM*****GAME OVER*****
54 GOSUB121:Y$=STR$(PT):Y=12:Z=0:GOSUB101
55 FORI=119TO1STEP-1:POKE4514,I:USR(68):NEXTI:USR(71):Q1=PT/Q
56 IFQ1=<50THENA$="ATROCIOUS"
57 IFQ1>50THENA$="POOR"
58 IFQ1>80THENA$="AVERAGE"
59 IFQ1>90THENA$="ABOVE AVERAGE"
60 IFQ1>120THENA$="EXCELLENT"
61 IFQ1>250THENA$="EXPERT"
62 IFPT>=HSTHENHS=PT:B$=A$
63 PRINT"□□□□□□□"
64 FRINT"YOU SCORED";PT;" FOINTS□"
65 PRINT"□SKILL RATING:";A$
66 PRINT"□BEST SKILL RATING SO FAR:";B$
67 Y$=A$:Y=13:Z=10:GOSUB101
68 PRINT"□□□□□DO YOU WANT ANOTHER GAME? ";
69 GETR$:IFR$=""THEN69
70 IFR$="Y"THENPRINT"YES":GOTO76
71 IFR$="N"THENPRINT"NO":GOTO73
72 R=RND(1):GOTO69
73 FORI=1TO50:K=INT(50*RND(1)+4)
74 POKE4514,K:USR(68):NEXTI:USR(71)
75 X$="□□OK......BYE":GOSUB100:GOSUB105:END
76 FORJ=50TO1STEP-1
77 FORI=1TO100STEPJ:POKE4514,I:USR(68):NEXTI,J:USR(71)
78 FRINT"□":GOTO22
79 REM*****INSTRUCTIONS*****
80 PRINTTAB(17);"CATCH"
81 PRINTTAB(16);"——————  "
82 A$=CHR$(99)+"-"+CHR$(99):FORI=1TO50
83 K=INT(50*RND(1)+4)
84 POKE4514,K:USR(68):NEXTI:USR(71)
85 X$="THE IDEA OF THIS GAME IS TO 'CATCH' THE FALLING MAN "
86 X$=X$+"BETWEEN YOUR MEN - "+A$:GOSUB100:Y$="BETWEEN":Y=12:Z=4:GOSUB101
87 GOSUB105:X$="□KEY MOVEMENTS -   A=LEFT  *  D=RIGHT":GOSUB100
88 X$="□EACH MAN IS WORTH:":GOSUB100
89 A$="□□□□□□□□□□□□□□□□□□□□":X$="□"+A$+"FLOOR 5....200 POINTS":GOSUB100
90 X$=A$+"FLOOR 4....250 FOINTS":GOSUB100
91 X$=A$+"FLOOR 3....300 POINTS":GOSUB100
92 X$=A$+"FLOOR 2....400 POINTS":GOSUB100
93 X$=A$+"FLOOR 1....500 POINTS":GOSUB100:GOSUB105
94 X$="□'CATCHING' A MAN WITH EITHER OF YOUR MEN"
95 X$=X$+"GIVES YOU HALF FOINTS.":GOSUB100:GOSUB105
96 X$="□THERE ARE 10 MEN TO CATCH ON EACH FLOOR.□":GOSUB100:GOSUB105
97 X$="□□□□WHEN YOU'RE READY PRESS ANY KEY.":GOSUB100:GOSUB105
98 R=RND(1):GETW$:IFW$=""THEN98
99 Z=0:RETURN
100 FORJ=1TOLEN(X$):PRINTMID$(X$,J,1);:FORG=1TO10:NEXTG,J:PRINT:RETURN
```

PROGRAMS

```
101 Z$="":FORI=1TOLEN(Y$):Z$=Z$+" ":NEXT
102 FORX=1TO10:POKE4465,Y:POKE4466,Z:IFINT(X/2)<>X/2THENPRINTZ$:GOTO104
103 PRINTY$
104 FORJ=1TO50:NEXTJ,X:RETURN
105 TEMPO7:FORI=1TO2:MUSIC"R2C1E1R2C1F1R2E1C1":NEXT:RETURN
106 PRINT"▒▒▒▒___┌────────────────────┐____"
107 FORI=1TO5:PRINT"▒▒▒▒▒▒▒▒   ▒▒▒▒▒▒▒▒   ▒▒▒▒▒▒▒▒   ▒▒▒▒▒▒▒▒"
108 PRINT"▒▒▒xxxx▒▒▒▒▒▒xx·xx▒▒▒▒▒▒▒xxxxx▒▒▒▒▒▒xxxx▒▒"
109 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒":NEXT
110 PRINT"▒▒ ▒▒▒▒  └_▒▒▒▒▒▒▒├──┤▒▒▒▒▒▒▒__┘  ▒▒▒▒"
111 PRINT"▒/▒▒▒▒/   ▒H▒H▒/  \▒H▒H▒   \▒▒▒▒\"
112 PRINT"/  ───   ────   ────   ───   \"
113 FORI=1TO40:PRINT"_";:NEXT
114 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒───▒▒▒▒▒▒▒───▒▒▒▒▒▒▒───"
115 RETURN
116 POKEX-1,202:POKEX,52:POKEX+1,202
117 FORI=1TO4:POKE4466,W1*3+1:PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
118 FORJ=1TO25:USR(68):POKE4514,35-J:NEXTJ
119 POKE4466,W1*3+1:PRINT"▒▒▒xxx▒▒▒▒▒xxxx▒▒▒▒▒▒xxxxx▒▒▒▒▒xxxx"
120 FORJ=1TO25:USR(68):POKE4514,35-J:NEXTJ,I:USR(71):RETURN
121 POKE54024,0:POKE54031,0
122 DI=54108-X:IFDI=0THEN132
123 IFSGN(DI)=1THEN128
124 FORI=-1TODISTEP-1:X=X-1
125 POKEX-1,0:POKEX,0:POKEX+1,0:POKEX-2,0:POKEX+2,0
126 POKEX-1,202:POKEX,52:POKEX+1,202
127 GOSUB137:NEXTI:GOTO132
128 FORI=1TODI:X=X+1
129 POKEX-1,0:POKEX,0:POKEX+1,0:POKEX-2,0:POKEX+2,0
130 POKEX-1,202:POKEX,52:POKEX+1,202
131 GOSUB137:NEXTI
132 POKEX,0:POKEX-1,0:LS=X-2:RS=X+1:POKELS,202
133 FORI=1TO2:POKELS,0:POKERS,0:LS=LS-41:RS=RS-39
134 POKELS,202:POKERS,202:GOSUB137
135 POKE54065,112:POKE54070,112:GOSUB137:NEXT
136 POKE54024,94:POKE54031,30
137 MUSIC"R5":RETURN
```

Apple 3D Maze.

by Malcolm Banthorpe

Over the past month or so I have become almost addicted to this game. The object is to navigate your way from entrance to exit of a maze which the computer draws (as a plan view) when the game starts. This is done using the commands Forward (one to nine steps), Left or Right. As soon as it has finished drawing the maze the computer puts you theoretically at the entrance to it, giving you a 3D perspective view of the tunnel ahead. You are told which direction you are facing each time you move and if you leave too much time between moves the computer will ask you to hurry up and remind you of the commands.

It is perfectly possible to get completely lost in the maze and provision has been made for this. You are allowed three 'Help calls' which show your position on the plan view for as long as you need to work out where you are, and three 'Jumps' which transport you to a random location so you can get even more lost. As the maze is drawn at random it is different every time so the variations are endless.

3D Maze will run on an ITT2020 with Palsoft in ROM, if a single statement is changed as per line 11, or on an Apple II Plus.

```
]
]LIST

10  H1 = 278
11  REM  FOR ITT 2020 CHANGE H1 T
     O 318
12  V1 = H1 / 2
15  HGR
20  TEXT : HOME
21  PRINT  TAB( 16)"*********"
22  PRINT  TAB( 15)"* 3D MAZE *"
23  PRINT  TAB( 16)"*********"
24  PRINT
25  PRINT "THE COMPUTER WILL DRAW
     A MAZE WITH A"
26  PRINT "SINGLE EXIT AT THE UPP
     ER EDGE"
27  PRINT
28  PRINT "AS SOON AS THE MAZE IS
     COMPLETE, THE"
29  PRINT "PLAN VIEW WILL BE REPL
     ACED BY A 3D"
30  PRINT "PERSPECTIVE VIEW AS SE
     EN FROM YOUR"
31  PRINT "CURRENT POSITION"
32  PRINT
33  PRINT "YOU START AT THE LOWER
     EDGE"
34  PRINT
35  PRINT "YOUR OBJECT IS TO GET
     WITHIN SIGHT OF"
36  PRINT "THE EXIT"
37  PRINT : PRINT
38  PRINT "PRESS ANY KEY TO CONTI
     NUE"
39  GET A$
40  HOME
41  PRINT "THESE ARE THE COMMANDS
     YOU CAN USE TO"
42  PRINT "NAVIGATE THE MAZE"
```

PROGRAMS

```
43  PRINT
44  PRINT  TAB( 10)"F - MOVE FORW
     ARD (1 -9) STEPS
45  PRINT
46  PRINT  TAB( 10)"L - TURN 90 D
     EGREES LEFT"
47  PRINT
48  PRINT  TAB( 10)"R - TURN 90 D
     EGREES RIGHT"
49  PRINT
50  PRINT "IF YOU GET LOST YOU CA
     N GET HELP BY"
51  PRINT "PRESSING 'H'
52  PRINT
53  PRINT "THIS WILL RETURN TO TH
     E PLAN VIEW"
54  PRINT "WITH YOUR POSITION IND
     ICATED"
57  PRINT : PRINT "OR YOU CAN TAK
     E A CHANCE AND PRESS 'J'"
58  PRINT : PRINT "THIS WILL TRAN
     SPORT YOU TO A RANDOM": PRINT
     "LOCATION"
59  PRINT : PRINT "YOU WILL BE LI
     MITED TO 3 JUMPS AND 3    HE
     LP CALLS"
60  PRINT : PRINT "PRESS ANY KEY
     TO START ";: GET A$
70  FOR I = 1 TO 17: READ D: NEXT

80  FOR L = 768 TO 793: READ D: POKE
     L,D: NEXT
90  FOR L = 800 TO 821: READ D: POKE
     L,D: NEXT
100  DEF  FN A(X) =  INT ( RND (1
     ) * X + 1)
105 HP = 0:JU = 0
110  GR : COLOR= 15
115  FOR V = 0 TO 39: HLIN 0,39 AT
     V: NEXT
120  HOME
125 X =  FN A(19) * 2:Y = 38
130  HTAB X + 1: FLASH : PRINT "^
     ": NORMAL
135 P = X - 12: IF P < 1 THEN P =
     1
140  HTAB P: PRINT "YOU START HER
     E"
145 SX = X
150  COLOR= 0: PLOT X,39
155 D =  FN A(2)
160 L = 2 *  FN A(24) - 24
165  POKE 815,100
170  CALL 800
175  IF D = 1 THEN YT = Y + L:XT =
     X
180  IF D = 2 THEN XT = X + L:YT =
     Y
185  IF XT < 1 OR XT > 38 OR YT <
     0 OR YT > 37 THEN 155
190 : IF D = 1 THEN 200
195  IF D = 2 THEN  FOR H = X TO
     X + L STEP  SGN (L): COLOR=
     15: PLOT H,Y: GOSUB 6000: COLOR=
     0: PLOT H,Y: NEXT
200  IF D = 1 THEN  FOR V = Y TO
     Y + L STEP  SGN (L): COLOR=
     15: PLOT X,V: GOSUB 6000: COLOR=
     0: PLOT X,V: NEXT
205 X = XT:Y = YT
210  IF Y <  > 0 THEN 155
215 EX = X
220 X = SX:Y = 38:D = 1
225  COLOR= 15: PLOT SX,39
230  HOME
235  GOTO 470
240 F = 0
245  VTAB 24: PRINT  CHR$ (7);: HTAB
     1
250  PRINT "COMMAND ? ";: FLASH :
     PRINT " ";:T = 0: NORMAL
255 P =  PEEK ( - 16384): IF P >
     127 THEN A$ =  CHR$ (P - 128
     ): POKE  - 16368,0: GOTO 280

260 T = T + 1: IF T < 800 THEN 25
     5
265  VTAB 24: HTAB 1: FLASH : PRINT
     "HURRY UP";: NORMAL : SPEED=
     10: PRINT " - THE COMMANDS A
     RE F,L,R,H,J ";: HTAB 1
270  SPEED= 100: PRINT "

       ";: SPEED= 255
275  GOTO 245
280  IF A$ = "R" THEN F = 1:D = D
     + 1: IF D = 5 THEN D = 1
285  IF A$ = "L" THEN F = 1:D = D
     - 1: IF D = 0 THEN D = 4
290  IF A$ = "F" THEN F = 1
295  IF A$ = "H" THEN F = 1
300  IF A$ <  > "J" THEN 320
305 JU = JU + 1: IF JU > 3 THEN  HOME
     : FLASH : PRINT "YOU'VE ALRE
     ADY HAD 3 JUMPS": NORMAL : GOTO
     245
310 F = 1:P = 0: GOSUB 6500
315 X =  FN A(19) * 2:Y =  FN A(1
     6) * 2: IF  SCRN( X,Y) = 15 THEN
     315
320  IF F = 0 THEN 240
325  IF D = 1 THEN B$ = "NORTH"
330  IF D = 4 THEN B$ = "WEST"
335  IF D = 3 THEN B$ = "SOUTH"
340  IF D = 2 THEN B$ = "EAST"
345  HOME : PRINT "YOU ARE FACING
     "B$
350  IF A$ <  > "H" THEN 385
355 HP = HP + 1: IF HP > 3 THEN  HOME
     : FLASH : PRINT  CHR$ (7); CHR$
     (7);"YOU'VE ALREADY HAD THRE
     E HELP CALLS": NORMAL : GOTO
     245
360  PRINT
365  PRINT "PRESS SPACE-BAR TO RE
     TURN TO 3D VIEW"
370  COLOR= 3: PLOT X,Y: GOSUB 50
     00: COLOR= 0: PLOT X,Y: GOSUB
     5000
375  POKE 49238,0: IF  PEEK ( - 1
     6384) = 72 THEN 370
380  GET A$: HOME : POKE 49239,0:
     GOTO 245
385  IF A$ <  > "F" THEN 470
390  PRINT "HOW MANY STEPS (1-9)
     ?";:: GET A$: PRINT A$
395  IF A$ < "1" OR A$ > "9" THEN
     390
400 S =  VAL (A$)
405 C = 1
410  ON D GOTO 415,430,445,460
415 Y = Y - 1: IF  SCRN( X,Y) = 1
     5 THEN Y = Y + 1: GOSUB 8000
     : GOTO 470
420 C = C + 1: IF C <  = S THEN 4
     15
425  GOTO 470
430 X = X + 1: IF  SCRN( X,Y) = 1
     5 THEN X = X - 1: GOSUB 8000
     : GOTO 470
435 C = C + 1: IF C <  = S THEN 4
     30
440  GOTO 470
445 Y = Y + 1: IF  SCRN( X,Y) = 1
     5 THEN Y = Y - 1: GOSUB 8000
     : GOTO 470
450 C = C + 1: IF C <  = S THEN 4
     45
455  GOTO 470
460 X = X - 1: IF  SCRN( X,Y) = 1
     5 THEN X = X + 1: GOSUB 8000
     : GOTO 470
465 C = C + 1: IF C <  = S THEN 4
     60
470  ON D GOSUB 480,570,650,730
475  GOTO 240
480  GOSUB 1000
485  RESTORE
490  READ B
495 YT = Y
500 A = B: READ B: IF B > V1 THEN
     530
505  GOSUB 9000
510 C = A / 2:D1 = B / 2:E = B
515  IF  SCRN( X - 1,Y) = 0 THEN
      GOSUB 1100
520 Y = Y - 1: IF Y = 0 AND  SCRN(
     X,Y) = 0 THEN 805
525  IF  SCRN( X,Y) = 0 THEN 500
530 Y = YT: RESTORE
535  READ B
540 A = B: READ B: IF B > V1 THEN 565
```

PROGRAMS

```
545 C = A / 2:D1 = B / 2
550  IF  SCRN( X + 1,Y) = 0 THEN
     GOSUB 1200
555 Y = Y - 1: IF  SCRN( X,Y) = 0
     THEN 540
560  GOSUB 1300
565 Y = YT: RETURN
570  GOSUB 1000
575  RESTORE :XT = X
580  READ B
585 A = B: READ B: IF B > V1 THEN
    610
590  GOSUB 9000
595 C = A / 2:D1 = B / 2:E = B
600  IF  SCRN( X,Y - 1) = 0 THEN
     GOSUB 1100
605 X = X + 1: IF  SCRN( X,Y) = 0
     THEN 585
610 X = XT: RESTORE
615  READ B
620 A = B: READ B: IF B > V1 THEN
    645
625 C = A / 2:D1 = B / 2
630  IF  SCRN( X,Y + 1) = 0 THEN
     GOSUB 1200
635 X = X + 1: IF  SCRN( X,Y) = 0
     THEN 620
640  GOSUB 1300
645 X = XT: RETURN
650  GOSUB 1000: RESTORE :YT = Y
655  READ B
660 A = B: READ B: IF B > V1 THEN
    685
665  GOSUB 9000
670 C = A / 2:D1 = B / 2:E = B
675  IF  SCRN( X + 1,Y) = 0 THEN
     GOSUB 1100
680 Y = Y + 1: IF  SCRN( X,Y) = 0
     THEN 660
685 Y = YT: RESTORE
690  READ B
695 A = B: READ B: IF B > V1 THEN
    720
700 C = A / 2:D1 = B / 2
705  IF  SCRN( X - 1,Y) = 0 THEN
     GOSUB 1200
710 Y = Y + 1: IF  SCRN( X,Y) = 0
     THEN 695
715  GOSUB 1300
720 C = A / 2:D1 = B / 2
725 Y = YT: RETURN
730  GOSUB 1000: RESTORE :XT = X
735  READ B
740 A = B: READ B: IF B > V1 THEN
    765
745  GOSUB 9000
750 C = A / 2:D1 = B / 2:E = B
755  IF  SCRN( X,Y + 1) = 0 THEN
     GOSUB 1100
760 X = X - 1: IF  SCRN( X,Y) = 0
     THEN 740
765 X = XT: RESTORE
770  READ B
775 A = B: READ B: IF B > V1 THEN
    800
780 C = A / 2:D1 = B / 2
785  IF  SCRN( X,Y - 1) = 0 THEN
     GOSUB 1200
790 X = X - 1: IF  SCRN( X,Y) = 0
     THEN 775
795  GOSUB 1300
800 X = XT: RETURN
805  TEXT : HOME
810  PRINT "CONGRATULATIONS YOU A
     RE WITHIN SIGHT"
815  PRINT "OF THE EXIT"
820  PRINT : PRINT
825  PRINT "PLAY AGAIN (Y/N) ?";
830  GET A$
835  IF A$ = "Y" THEN 100
840  END
1000  CALL 768: POKE 49239,0: HCOLOR=
     3: HPLOT 0,0 TO H1,V1: HPLOT
     0,V1 TO H1,0
1010  HPLOT 0,0 TO H1,0: HPLOT  TO
     H1,V1: HPLOT  TO 0,V1: HPLOT
      TO 0,0
1020  RETURN
1100  HCOLOR= 0: HPLOT A,C TO B,D
     1
1110  HPLOT A,V1 - C TO B,V1 - D1

1120  HCOLOR= 3: HPLOT A,C TO A,V
     1 - C
1130  HPLOT B,D1 TO B,V1 - D1
1140  HPLOT B,D1 TO A,D1
1150  HPLOT B,V1 - D1 TO A,V1 - D
     1
1160  RETURN
1200 A = H1 - A:B = H1 - B
1205  HCOLOR= 0: HPLOT B,D1 TO A,
     C
1210  HPLOT B,V1 - D1 TO A,V1 - C

1220  HCOLOR= 3: HPLOT A,C TO A,V
     1 - C
1230  HPLOT B,D1 TO B,V1 - D1
1240  HPLOT B,D1 TO A,D1
1250  HPLOT B,V1 - D1 TO A,V1 - D
     1
1260  RETURN
1300  HCOLOR= 0: HPLOT E,E / 2 TO
     H1 - E,V1 - E / 2: HPLOT E,V
     1 - E / 2 TO H1 - E,E / 2
1310  HCOLOR= 3: HPLOT E,E / 2 TO
     H1 - E,E / 2: HPLOT  TO H1 -
     E,V1 - E / 2: HPLOT  TO E,V1
      - E / 2: HPLOT  TO E,E / 2
1320  RETURN
5000  FOR T = 0 TO 100: NEXT : GOSUB
     6000: RETURN
6000  FOR SO = 1 TO 3:Z =  PEEK (
      - 16336): NEXT : RETURN
6500  FOR N = 255 TO 5 STEP  - 10
     : POKE 815,N: POKE 49238 + P
     ,0: CALL 800:P =  ABS (P - 1
     ): NEXT : RETURN
8000  FLASH : PRINT "ONLY "C - 1"
      STEPS WERE POSSIBLE": NORMAL
     : RETURN
8010  PRINT "DIRECTION"
8020  NORMAL : RETURN
9000  HCOLOR= 3: HPLOT V1,V1 - B /
     2: RETURN
10000  DATA  0,32,62,84,102,112,1
     22,130,136,140,144,148,152,1
     54,156,158,160
10010  DATA 162,0,138,141,94,192,
     160,32,140,13,3,157,0,63,232
     ,208,250,200,192,64,208,242,
     141,95,192,96
10020  DATA 160,1,162,0,138,24,23
     3,1,208,252,141,48,192,232,2
     24,5,208,242,136,208,237,96
```

Atari Sums For Kids.

by Derek Lees

At last I have managed to procure a program for the Atari 400/800! This one goes a little further than a lot of maths programs for infants in that it teaches addition as well as subtraction — albeit on a simple level — and should keep any child amused at the same time.

Two random numbers are generated which, when added or subtracted, give an answer between zero and nine. A correct answer will move two spaceships towards each other until they collide and explode. A wrong answer will yield different noises and colours, drive the symbols apart and cause the answer to be displayed prior to the next try. Five correct answers will give a noisy response of 'great stuff!'.

An effective amendment to this program is to replace the appropriate lines with the ones given below. This makes use of the audio track of the Atari 410 recorder. Immediately after CLOADing the program, take the tape out of the recorder *without rewinding* and put it into an ordinary recorder. Prepare a list of such comments as 'well done!' — these must be five seconds long. Then put the recorder into record mode with the pause control engaged and, when you are ready, use a stop-watch to time yourself recording the remarks. Finally, rewind the tape and reload the program. It is a good idea to use the child's name, thus adding a personal touch to the congratulations given by the computer. Synchronisation may need practice and line 3001 may need adjustment. Sums for kids needs 5k to run.

Amendment:

```
3000 POKE 54018, 52; REM SWITCH ON RECORDER
3001 FOR WAIT=0 TO 1200: NEXT WAIT
3002 POKE 54018, 60: REM SWITCH OFF RECORDER
3003 RETURN
```

```
1 REM +++ADDING & SUBTRACTION GAME"
2 REM +++FOR INFANTS. TRY TO MAKE"
3 REM +++THE SPACESHIPS MAKE CONTACT"
4 REM +++& EXPLODE.WRONG ANSWERS
5 REM +++DRIVE THEM APART.
6 REM
7 REM +++D.J.Lees,January 1982
8 REM
10 GRAPHICS 2:SETCOLOR 4,10,2
11 REM TYPE TITLE IN INVERSE VIDEO
12 POSITION 5,1:? #6;"**********"
13 POSITION 5,2:? #6;"*sums for*"
14 POSITION 5,3;? #6;"*  kids  *"
15 POSITION 5,4:? #6;"**********"
16 POKE 752,1:REM SUPPRESS CURSOR
17 ? "this program belongs to NAME OF CH
ILD"
20 FOR W=0 TO 3000:NEXT W
49 REM REMOVE GRAPHICS WINDOW
50 GRAPHICS 2+16
51 REM TWO POKES TO DISABLE BREAK KEY
52 POKE 53774,64:POKE 16,64
53 S1=3:S2=16
54 POSITION S1,4:? #6;CHR$(190):POSITION
 S2,4:? #6;CHR$(188)
55 SETCOLOR 4,2,3
58 X=0:Y=0
59 B1=INT(RND(0)*2)
60 A=INT(9*RND(1)+1)
65 B=INT(9*RND(1)+1)
67 TRAP 65:IF B1=0 THEN B=INT(-B):IF A+B
<0 THEN 60
68 TRAP 65:IF B1=1 THEN IF B>9-A THEN 60
85 FOR Z=0 TO 10:SOUND 0,200,10,10:NEXT
Z:SOUND 0,0,0,0
90 IF B1=1 THEN POSITION 7,7:? #6;A;"+";
B;"=?"
92 IF B1=0 THEN POSITION 7,7:? #6;A;B;"=
";"?"
100 C=A+B
120 CLOSE #1:OPEN #1,4,0,"K:":GET #1,E
121 IF E<ASC("0") THEN 120
122 IF E>ASC("9") THEN 120
125 POSITION 11,7:? #6;VAL(CHR$(E))
128 IF C-VAL(CHR$(E))=0 THEN 136
129 REM CHR$(45) IS FULL STOP IN COLOR 1
130 REM CHR$(188) IS < AND (190) IS > IN
 COLOR 3
131 S1=S1-1:S2=S2+1:IF S1<0 THEN S1=0:IF
 S2>19 THEN S2=19
132 POSITION S1+1,4:? #6;CHR$(46):POSITI
ON S2-1,4:? #6;CHR$(46)
133 POSITION S1,4:? #6;CHR$(188):POSITIO
N S2,4:? #6;CHR$(190)
134 POSITION 5,0:? #6;"                ":POS

ITION 5,0:? #6;S2-S1;" miles":REM TYPE M
ILES IN INVERSE ALSO
135 GOSUB 500:GOTO 150
136 POSITION S1,4:? #6;CHR$(46):POSITION

 S2,4:? #6;CHR$(46):S1=S1+1:S2=S2-1
137 POSITION S1,4:? #6;CHR$(190):POSITIO
N S2,4:? #6;CHR$(188):IF S2-S1=5 THEN GO
SUB 3000
138 IF S2-S1<=0 THEN GOSUB 2000:FOR W=0
TO 1000:NEXT W:GOTO 50
139 POSITION 5,0:? #6;"              "
140 POSITION 5,0:? #6;S2-S1;"  miles"
145 GOSUB 600
150 X=X+N:Y=Y+P
153 REM WAIT BEFORE SETTING NEXT QUESTIO
N
155 FOR W=0 TO 600:NEXT W
170 POSITION 4,10:? #6;"                    "

:GOTO 59
480 REM
490 REM +++WRONG ANSWER!+++
495 REM
500 LO=65:HI=35:PU=35
501 FOR J=1 TO 20:SETCOLOR 4,J,5
502 SOUND 0,PU,10,14
503 FOR W=1 TO 50:NEXT W
504 PU=LO:LO=HI:HI=PU:NEXT J:SOUND 0,0,0
,0:SETCOLOR 4,2,3
505 P=1:N=0
510 FOR W=0 TO 250:NEXT W
515 FOR J=0 TO 250 STEP 10:SOUND 0,J,10,
10:NEXT J:SOUND 0,0,0,0
520 IF B1=1 THEN POSITION 5,9:? #6;"no!
 ";A;"+";B;"=";C
521 IF B1=0 THEN POSITION 5,9:? #6;"NO!
 ";A;B;"=";C
525 FOR W=0 TO 1000:NEXT W:POSITION 7,7:
? #6;"        ":FOR W=0 TO 500:NEXT W:POSI
TION 5,9:? #6;"              "
550 RETURN

585 REM
590 REM +++CORRECT ANSWER!+++
595 REM
600 FOR J=0 TO 5:FOR I=0 TO 15:SETCOLOR
4,I,5:SOUND 0,10*I,10,10:NEXT I:NEXT J
601 SOUND 0,0,0,0:P=1:N=1
602 POSITION 11,7:? #6;C
604 RETURN

1850 REM
1900 REM +++EXPLOSION+++
1905 REM
2000 POSITION 5,0:? #6;"              ":POSI
TION 7,7:? #6;"         "
2001 FOR C=1 TO 100:POKE 710,INT(15*RND(
1)*17):POKE 712,PEEK(710)
2002 L=INT(150*RND(1)):V=INT(10*RND(1)+1
)
2004 SOUND 0,L,8,10:SOUND 1,75,8,V:SOUND
```

PROGRAMS

```
 2,50,8,10:SOUND 3,25,8,V:NEXT C
2006 FOR J=0 TO 256:SOUND 0,J,10,10:NEXT
 J:SOUND 0,0,0,0:SOUND 1,0,0,0:SOUND 2,0
,0,0:SOUND 3,0,0,0
2007 GRAPHICS 2+16:SETCOLOR 4,0,0:RETURN

2850 REM
2900 REM +++FIVE CORRECT ANSWERS!"+++
2905 REM
2906 REM TYPE GREAT STUFF INVERSE VIDEO
2907 REM TO GET COLOUR
3000 FOR L=0 TO 5:SOUND 0,200-L*30,10,10
3001 POSITION 4,10:? #6;"GREAT STUFF!!":
FOR W=0 TO 60:NEXT W:POSITION 4,10:? #6;
"              ":FOR W=0 TO 60

3002 NEXT W:NEXT L
3003 SOUND 0,0,0,0:RETURN
```

ZX81 Book Index.

by Ian Andrews

Useful applications for the ZX81 seem to be cropping up more and more in the programs mailbag. This one needs 16k and enables you to make an alphabetical index of book titles and their authors — although it could be used for indexing anything from the rest of your software to your record collection. Naturally you need a cassette recorder (unless you plan on leaving your ZX81 switched on 24 hours a day!) and a printer helps but is not necessary.

You have to specify at the beginning how many entries you wish to make and the maximum length for an entry. If you exceed either specification the computer lets you know and it will also tell you if it has insufficient memory to cope with the amount of data you wish to store. It is a pretty friendly program on the whole so using it is straightforward. Memory space could be saved by changing the PRINT ATs to plain PRINTs as they are purely cosmetic.

```
 30 CLS
 40 CLEAR
 50 FAST
 60 POKE 16510,0
 70 PRINT TAB 10;"I N D E X"
 80 PRINT
 90 PRINT "ENTER TITLE"
100 INPUT A$
110 CLS
120 PRINT "ENTER AUTHOR"
130 INPUT B$
140 CLS
150 PRINT "ENTER AN ESTIMATE
    OF THE NUMBER OF ENTRIES
    YOU WILL MAKE."
160 PRINT AT 15,0;"NB-BE
    GENEROUS AS YOU CANNOT
    EXTEND THE NUMBER LATER
    ON."
170 INPUT N
180 CLS
190 PRINT "ENTER MAX LENGTH
    OF ENTRY."
200 INPUT M
210 DIM L$(N+1,M+3)
220 CLS
230 LET D=10000-3*N
240 IF D<M*N THEN PRINT AT
    18,0;"RE-ENTER. MAXIMUM
    NUMBER OF ENTRIES WITH"
    ;M;"CHARACTERS IS";D/M
250 IF D<M*N THEN GOTO 170
260 PRINT "GET READY TO
    ENTER WORDS ONE BY ONE
    (UP TO**";M;"** CHARAC
    TERS IN LENGTH)."
270 PAUSE 100
280 PRINT
290 CLS
300 FOR I=1 TO N
310 PRINT "ENTRY";I;"TEXT"
320 IF I=N-10 THEN PRINT AT
    15,0;"WARNING-MEMORY SHORT"
330 INPUT X$
340 IF LEN X$>M THEN PRINT
    "ABBREVIATE ENTRY"
350 FOR F=1 TO M
360 PRINT AT 4,5;X$;AT 5,4
    +F;"-"
370 NEXT F
380 IF LEN X$>M THEN GOTO
    330
390 LET L$(I)( TO M)=X$
400 LET X$=" "
410 IF CODE L$(I)=227 THEN
    LET N=I
420 IF CODE L$(I)=227 THEN
    GOTO 510
430 CLS
440 PRINT "ENTRY";I;TAB 12;
    L$(I)( TO M);AT 15,0;
    "PAGE NUMBER?"
450 INPUT L$(I)(M+1 TO )
460 IF CODE L$(I)(M+1 TO )
    >0 AND CODE L$(I)(M+1 TO
    )<28 OR CODE L$(I)(M+1
    TO )>37 THEN PRINT AT 18,
    5;"ERROR"
470 IF CODE L$(I)(M+1 TO )>0
    AND CODE L$(I)(M+1 TO )<
    28 OR CODE L$(I)(M+1 TO )
    >37 THEN GOTO 450
480 CLS
490 NEXT I
500 REM ORDER
510 LET L$(I)=L$(I)( TO M)+
    L$(I)(M+1 TO M+3)
520 FOR K=1 TO N-1
530 FOR J=1 TO N-K
540 IF L$(J)<=L$(J+1) THEN
    GOTO 580
550 LET T$=L$(J)
560 LET L$(J)=L$(J+1)
570 LET L$(J+1)=T$
580 NEXT J
590 NEXT K
```

```
600 CLS
610 REM PRINT
620 SLOW
630 PRINT AT 15,0;"""";A$;
    """","BY;B$
640 PAUSE 100
650 FOR I=1 TO N
660 SCROLL
670 PRINT L$(I)( TO M);TAB M
    +7;L$(I)(M+1 TO )
680 NEXT I
690 PRINT
700 PRINT "INDEX ENDS"
710 PRINT
720 PRINT "DO YOU WANT TO SAVE
    IT (S),PRINT IT (P), NEW
    INDEX (A) OR END IT (E)?"
730 INPUT Q$
740 IF Q$="S" THEN GOTO 780
750 IF Q$="P" THEN GOTO 820
760 IF Q$="A" THEN GOTO 30
770 STOP
780 SAVE "BOOK INDEX"
790 CLS
800 GOTO 720
810 CLS
820 LPRINT """";A$;"""",BY";B$
830 LPRINT
840 LPRINT
850 LPRINT TAB 10;"I N D E X"
860 LPRINT
870 LPRINT
880 FOR I=1 TO N
890 LPRINT L$(I)( TO M); TAB
    M+7; L$(I)(M+1 TO )
900 NEXT I
910 LPRINT
920 LPRINT
930 LPRINT "INDEX ENDS"
940 GOTO 720
```

PET Stockmarket.

by Bob Chappell

A game on a slightly more serious note than usual. Stockmarket needs a quick brain and a good memory. It runs in just under 8k on both 'old' and 'new' ROM PETs. Full instructions are included in the game.

```
10 REM**STOCK MARKET**BOB CHAPPELL**14/2/82**
20 REM**ACKNOWLEDGEMENTS TO A FLEET**
30 GOTO1450
40 PRINT"" FORK=1TO12 PRINT" FRAUD!!"
50 FORL=1TO100 NEXT PRINT"          "
60 FORL=1TO100 NEXT NEXT GOTO430
70 PRINTZ$
80 GETA$ IFA$=""THEN80
90 IFA$=" "THENRETURN
100 GOTO80
110 FORL=1TO1000 NEXT RETURN
120 PRINT FORK=1TO10:PRINTNW$
130 FORL=1TO150:NEXT PRINT"          "
140 FORL=1TO150 NEXT NEXT PRINT"", RETURN
150 PRINT"        STOCK MARKET "
160 PRINT"HOW MUCH DO YOU WANT IN YOUR BANK" INPUT"ACCOUNT",B
170 B=INT(B) IFB<1ORB>100000THEN150
180 XZ=1 GOTO430
190 PRINTH$:FORJ=1TO6 PRINT""J". ",M$(J) NEXT
200 INPUT"SELECTION",C:C=INT(C)
210 IFC<1ORC>6THEN40
220 IFC=5THEN440
230 IFC=6THENTT=1:GOTO1010
240 IFF(C)=1THENPRINTDS$ GOTO430
250 INPUT"HOW MANY SHARES",S S=INT(S)
260 IFS<1THEN40
270 INPUT"BUY OR SELL (B/S)";A$
280 IFA$<>"B"ANDA$<>"S"THEN40
290 R=FNA(R) IFR=0THENPRINTMS$:GOTO430
300 P=V(C)*(5↑(4-C)) T=S*P:IFA$="B"THEN370
310 IFS>C(C)THEN40
320 B=B+T C(C)=C(C)-S
330 J=S*P(C) IFJ=TTHENPRINT" NO LOSS OR PROFIT ", GOTO360
340 IFJ<TTHENPRINT" A PROFIT OF"T-J,:PL(C)=PL(C)+(T-J) GOTO360
350 PRINT" A LOSS OF"J-T, PL(C)=PL(C)-(J-T)
360 PRINT" " GOTO390
370 IFB<TTHENPRINTNF$:GOTO430
380 B=B-T:TC=P(C)*C(C):C(C)=C(C)+S:P(C)=INT((TC+T)/C(C))
390 R=FNA(R) IFR>0THEN430
400 R=FNA(R) IFR<5THEN400
410 GOSUB70:GOTO810
420 REM*MARKET NEWS*****
430 GOSUB70
440 L1=0:FORJ=1TO5 R=FNA(R) IFR>4THENF(J)=0
450 NEXT:PRINTMN$ FORJ=1TO4
460 PRINT""J". ",M$(J) IFF(J)=1THENPRINTCS$;SF$ GOTO560
470 R=FNA(R) IFR=0THEN680
480 X=R-INT((V(J)*.4)+.9) IFX=0THENPRINTCS$"HOLD ",
490 OP=V(J)*(5↑(4-J)) V(J)=V(J)+X
500 CP=V(J)*(5↑(4-J)) Q=22:IFX<=0THEN520
510 PRINTCS$"UP "TAB(FNB(INT(CP-OP))),INT(CP-OP), GOTO530
520 IFX<0THENPRINTCS$"DOWN "TAB(FNB(INT(OP-CP))),INT(OP-CP),
```

PROGRAMS

```
530 Q=37:PRINTTAB(25)"█ PRICE█"TAB(FNB(INT(CP)));INT(CP),
540 IFCP<A(J)THENPRINT"*":GOTO560
550 PRINT
560 NEXT:IFL1<0THENPRINT"██ TOTAL LOSS OF"ABS(L1)"█ "
570 IFL1>0THENPRINT"██ TOTAL PROFIT OF"L1"█ "
580 L1=0:IFXZ=1THENXZ=0:GOSUB70:GOTO130
590 PRINT"██   █ BANK ";:R=FNA(R):IFR=0THENPRINT:GOSUB120:GOTO630
600 X=INT(R-(.2*I)):I=I+X
610 IFI>20THENI=20
620 PRINT"RATE █"I;"█%":GOTO670
630 R=FNA(R):IFR<>=0THEN650
640 PRINTCR$"FAILS ":L1=L1-B:PL(5)=PL(5)-B:B=0:GOTO660
650 PRINTCR$;SP$:F(5)=1
660 IFL1<0THENPRINT"██ LOSS OF"ABS(L1)"█ "
670 GOSUB70:GOTO800
680 GOSUB120:F(J)=1:R=FNA(R):IFR<7THEN740
690 PRINTCR$"TAKEOVER ";:GOSUB110:R=FNA(R)
700 IFR=0THENPRINTSP$:GOTO560
710 PRINT"█ SELL AT";:P=21*(5↑(4-J)):D=(20+(R/10))/100:PRINTINT(P*D)"█ "
720 T=INT(P*D*C(J)):B=B+T:T1=T-C(J)*P(J):L1=L1+T1:PL(J)=PL(J)+T1
730 C(J)=0:V(J)=1:P(J)=0:GOTO560
740 IFR>2THENPRINTCR$;SP$:F(J)=1:GOTO560
750 PRINTCR$"BANKRUPT "
760 L1=L1-(C(J)*P(J))
770 PL(J)=PL(J)-(C(J)*P(J))
780 C(J)=0:P(J)=0:V(J)=1:GOTO560
790 REM*FLASH***********
800 L2=0:R=FNA(R):IFR<5THEN1010
810 L2=0:PRINT"████████";:GOSUB120:IFR>7THEN890
820 R=FNA(R):IFR>4ORR=0THEN870
830 J=R:PRINT"███████ "M$(J)" BONUS ";:R=FNA(R):GOSUB110
840 IFR=0THENPRINTSP$:GOTO970
850 R=10*R:PRINT"█"R"█%":CP=V(J)*(5↑(4-J)):L2=INT(CP/100*R)*C(J)
860 B=B+L2:PL(J)=PL(J)+L2:GOTO970
870 PRINT"███████ TAX BONUS ";:GOSUB110:R=FNA(R):IFR=0ORB<1THENR=0:GOTO840
880 R=10*R:PRINT"█"R"█%":L2=INT(B/100*R):B=B+L2:PL(6)=PL(6)+L2:GOTO970
890 R=FNA(R):IFR=0THEN1360
900 IFR<5THEN940
910 PRINT"███████ SUPER TAX ";:GOSUB110:R=FNA(R):IFR=0THEN840
920 R=10*R:PRINT"█"R"█%":T=INT(B/100*R):PL(6)=PL(6)-ABS(T):B=B-ABS(T)
930 L2=L2-ABS(T):GOTO970
940 PRINT"███████ "M$(R)" BONUS ISSUE ";:T=P(R)*C(R)
950 C(R)=C(R)+(INT(C(R)/2))
960 IFC(R)<>0THENP(R)=INT(T/C(R))
970 IFL2<0THENPRINT"██████████ A LOSS OF"ABS(L2)"█ "
980 IFL2>0THENPRINT"██████████ A PROFIT OF"L2"█ "
990 GOSUB70
1000 REM**P/L ACCOUNT********
1010 GOSUB1020:GOTO1210
1020 PRINT"█";:IFTT=1THENPRINT"█ CLOSING";
1030 PRINT"█ PROFIT AND LOSS ACCOUNT █":T=0:Q=29:FORJ=1TO4:
1040 PRINT"█"TAB(9);M$(J);
1050 PRINTTAB(FNC(PL(J)));:IFPL(J)<0THENPRINT"█";ABS(PL(J))"█ ":GOTO1070
1060 PRINTPL(J)
1070 T=T+PL(J):NEXT:L2=0:IFTT=1THEN1090
1080 IFF(5)<>1THENL2=INT(B/100*I):B=B+L2
1090 F(5)=0:PL(5)=PL(5)+L2:PRINT"█"TAB(9)"INTEREST"TAB(FNC(PL(5)));
1100 IFPL(5)<0THENPRINT"█"ABS(PL(5))"█ " GOTO1120
1110 PRINTPL(5)
1120 PRINT"█"TAB(9)"TAX "TAB(FNC(PL(6)));
1130 IFPL(6)<0THENPRINT"█"ABS(PL(6))"█ ":GOTO1150
1140 PRINTPL(6)
1150 T=T+PL(5)+PL(6)
1160 PRINT"██"TAB(9)"TOTAL"TAB(FNC(T));:IFT<0THENPRINT"█"ABS(T)"█ ":GOTO1180
1170 PRINTT
1180 PRINT"██"TAB(23)"█ REVERSE █ = LOSS
1190 GOSUB70:RETURN
1200 REM**PORTFOLIO*****
1210 PRINT"█";:IFTT=1THENPRINT"█ CLOSING";
1220 PRINT"█ PORTFOLIO ":PRINTLL$:PRINTTAB(19)"ORIGINAL"TAB(31)"CURRENT
1230 PRINT"  METAL    SHARES    COST        PRICE":PRINTLL$"█"
1240 FORJ=1TO4:Q=14:PRINT"  "M$(J);TAB(FNC(C(J)));
1250 PRINTC(J);:IFC(J)=0THEN1270
1260 Q=25:PRINTTAB(FNC(P(J)));P(J),
1270 Q=36:CP=V(J)*(5↑(4-J)):PRINTTAB(FNC(CP));CP:PRINT:NEXT
1280 PRINT"█████BANK"TAB(FNC(B));B
1290 IFB<0THENPRINT"  █ OVERDRAWN "
1300 IFB<-999ANDC(1)=0ANDC(2)=0ANDC(3)=0ANDC(4)=0THEN1330
1310 PRINT:GOSUB70:IFC=6GOTO1430
1320 GOTO190
1330 PRINT"███ YOU ARE BANKRUPT AND YOUR NEW "
1340 PRINT"██ ADDRESS IS QUEER STREET!!":END
1350 REM**END**
1360 PRINT"███ MARKET COLLAPSE!!":GOSUB110:PRINT"██ BANK TAKEOVER ":GOSUB110
1370 Q=23:PRINT"█":FORJ=1TO4:PRINT"█"J"█."M$(J)" SOLD AT";
1380 R=FNA(R):P=21*(5↑(4-J)):T=(100-(10*R))/100:R=INT(P*T):L2=C(J)*R
1390 B=B+L2:T=C(J)*P(J)
1400 PL(J)=PL(J)+(L2-T)
1410 PRINTTAB(FNB(R))R:NEXT
1420 PRINT"██  █ CLOSING BANK BALANCE "B"█ ":GOSUB70:TT=1:GOSUB1020
1430 PRINT"██████ END OF SPECULATIONS!!█":END
1440 REM **** INITIALISE ****
```

PROGRAMS

```
1450 DIMM$(6):R=RND(TI):H$=" BUYING AND SELLING ":J=5:TT=0
1460 M$(1)="GOLD":M$(2)="TIN ":M$(3)="ZINC":M$(4)="LEAD":M$(5)="PASS"
1470 M$(6)="QUIT":LL$="────────────────────────────────────────"
1480 SS$="                                        "
1490 FORJ=1TO4:V(J)=12:P(J)=0:NEXT:FORJ=1TO5:F(J)=0:NEXT
1500 DEFFNA(R)=INT(10*RND(1)):FORJ=1TO4:C(J)=0:NEXT
1510 DEFFNB(Z)=Q-LEN(STR$(INT(Z)))-(ABS(Z)<1)
1520 DEFFNC(X)=Q-LEN(STR$(X)):A(1)=1500:A(2)=300:A(3)=60:A(4)=12
1530 Z$="         PRESS SPACE TO CONTINUE "
1540 SP$=" SUSPENDED "
1550 CS$=" "
1560 CR$=" "
1570 DS$=" DEALING"+SP$
1580 MS$=" MARKET"+SP$
1590 NF$=" INADEQUATE FUNDS "
1600 MN$="       MARKET NEWS    * = RECOMMENDED"
1610 NW$=" NEWSFLASH "
1620 PRINT"        STOCK MARKET "
1630 PRINT"DO YOU WANT INSTRUCTIONS (Y/N)";:INPUTA$
1640 IFLEFT$(A$,1)<>"Y"GOTO150
1650 PRINT"        STOCK MARKET "
1660 PRINT"YOU ARE FIRST ASKED HOW MUCH CAPITAL
1670 PRINT"YOU WANT TO START WITH.
1680 PRINT"DEALING IS IN 4 METALS:GOLD,TIN,ZINC AND LEAD.
1690 PRINT"VARIOUS REPORTS WILL HELP YOU CONTROL
1700 PRINT"YOUR SPECULATIONS.
1710 PRINT"THE GAME ENDS WHEN YOU DECIDE TO QUIT,":PRINT"OR IF YOU";
1720 PRINT" GET TOO DEEPLY IN DEBT,":PRINT"OR IF THE MARKET COLLAPSES.
1730 GOSUB70:PRINT" MARKET NEWS EXPLANATIONS "
1740 PRINT" UP ■ PRICE HAS RISEN
1750 PRINT" DOWN ■ PRICE HAS FALLEN
1760 PRINT" HOLD ■ UNCHANGED
1770 PRINT" SUSPENDED ■ NO DEALING ALLOWED
1780 PRINT" TAKEOVER ■ SHARES AUTOMATICALLY SOLD AT            PRICE SHOWN
1790 PRINT" TAKEOVER SUSPENDED ■ NARROW ESCAPE!
1800 PRINT" BANKRUPT ■  SHARES FORFEITED ":GOSUB70
1810 PRINT"     BANK RULES "
1820 PRINT" RATE X% ■ BANK ACCOUNT INCREASED BY X%
1830 PRINT"         (IF OVERDRAWN,INTEREST PAYABLE          ON OVERDRAFT)
1840 PRINT" SUSPENDED ■ NO INTEREST PAID
1850 PRINT" FAILS ■ ALL MONEY LOST (NEW BANK ARISES          NEXT TURN)
1860 GOSUB70
1870 PRINT"   PROFIT AND LOSS ACCOUNT ":PRINT"SHOWS NET GAINS AND LOSSES
1880 PRINT"       PORTFOLIO ":PRINT"SHOWS SHARES HELD AND BANK ACCOUNT
1890 GOSUB70:PRINT"     NEWSFLASHES
1900 PRINT" TAX BONUS X% ■ BANK BALANCE CREDITED
1910 PRINT" SUPER TAX X% ■ BANK BALANCE DEBITED
1920 PRINT" METAL BONUS X% ■ BANK BALANCE CREDITED
1930 PRINTTAB(17)"WITH INCREAS IN VALUE":PRINTTAB(17)"OF HOLDINGS
1940 PRINT" METAL BONUS ISSUE ■ HOLDINGS INCREASED
1950 PRINTTAB(20)"BY 1 SHARE FOR EVERY":PRINTTAB(20)"2 HELD
1960 PRINT" ANY OF THE ABOVE MAY BE SUSPENDED "
1970 PRINT" AT THE LAST MOMENT "
1980 PRINT" MARKET FAILS ■ END OF GAME - ALL
1990 PRINTTAB(15)"HOLDINGS SOLD AT CURRENT":PRINTTAB(15)"MARKET PRICE
2000 GOSUB70:PRINT"YOU ARE NOW ABOUT TO BECOME
2010 PRINT"VERY RICH OR VERY POOR.
2020 PRINT"BUT REMEMBER,IT'S ONLY A GAME!!":GOSUB70:GOTO150
```

Microtan 3D Rotation.

by D Round

This program makes good use of Microtan's 'Chunky' graphics with some fairly sophisticated geometrical techniques. A 3D body shape is input and is then rotated in prescribed steps about any axis passing through the origin, and is then projected onto the screen using a perspective projection in which the observer's distance from the shape can be varied. Surfaces which would be obscured if the shape were solid are omitted. Actual use of the program should be self-explanatory. It runs on the Tangerine Microtan+. The various stages of the program could each be extracted and used individually according to each user's requirements.

```
94 REM===========================================================
95 REM    Program to rotate any 3D solid body about any axis
96 REM    passing through origin through presribed steps,check
97 REM    for visible faces,and produce correct perspective plot.
98 REM    D.F.Round                                    12/2/82
99 REM===========================================================
100 DIM E%(6,4,2),R0(3,8),R1(3,8),A(3,3),VE(3),VN(3),EY(3),VA(3),
```

PROGRAMS

```
104 REM=========================================
105 REM     data i/p in correct order
106 REM=========================================
110 FORV=1TO8
120 READ RO(1,V),RO(2,V),RO(3,V)
130 NEXT V
131 DATA-9,-9,9,9,-9,9,9,-9,-9,-9,-9,-9
132 DATA-9,9,9,9,9,9,9,9,-9,-9,9,-9
140 FORF=1TO6
150 FORE=1TO4
160 READ E%(F,E,1),E%(F,E,2)
170 NEXT E:NEXTF
171 DATA1,2,2,3,3,4,4,1
172 DATA5,1,1,4,4,8,8,5
173 DATA6,5,5,8,8,7,7,6
174 DATA2,6,6,7,7,3,3,2
175 DATA1,5,5,6,6,2,2,1
176 DATA3,7,7,8,8,4,4,3
180 INPUT"EYE POS'N.";EY(3)
190 EY(1)=0
200 EY(2)=0
210 INPUT"D.C'S.OF AXIS";U1,U2,U3
220 INPUT"TOTAL,STEP ROT'N.";TM,TT
230 T=0
240 MO=SQR(U1*U1+U2*U2+U3*U3)
250 U1=U1/MO
260 U2=U2/MO
270 U3=U3/MO
279 REM=========================================
280 REM     transformation(rotation)
281 REM=========================================
290 SI=SIN(T/57.296)
300 CO=COS(T/57.296)
310 A(1,1)=U1*U1+CO*(1-U1*U1)
320 A(1,2)=U1*U2*(1-CO)-U3*SI
330 A(1,3)=U3*U1*(1-CO)+U2*SI
340 A(2,1)=U1*U2*(1-CO)+U3*SI
350 A(2,2)=U2*U2+CO*(1-U2*U2)
360 A(2,3)=U2*U3*(1-CO)-U1*SI
370 A(3,1)=U3*U1*(1-CO)-U2*SI
380 A(3,2)=U2*U3*(1-CO)+U1*SI
390 A(3,3)=U3*U3+CO*(1-U3*U3)
400 FORV=1TO8
410 FORI=1TO3
420 R1(I,V)=0
430 FORJ=1TO3
440 R1(I,V)=R1(I,V)+A(I,J)*RO(J,V)
450 NEXTJ:NEXTI:NEXTV
454 REM=========================================
455 REM     check for hidden faces
456 REM=========================================
460 £G
470 FORF=1TO6
472 FORJ=1TO3
474 VA(J)=R1(J,E%(F,1,2))-R1(J,E%(F,1,1))
476 VB(J)=R1(J,E%(F,2,1))-R1(J,E%(F,2,2))
478 NEXTJ
480 VN(1)=VA(2)*VB(3)-VA(3)*VB(2)
482 VN(2)=VA(3)*VB(1)-VA(1)*VB(3)
484 VN(3)=VA(1)*VB(2)-VA(2)*VB(1)
490 FORU=1TO3
500 VE(U)=EY(U)-R1(U,E%(F,1,2))
```

```
510 NEXTU
520 DP=0
530 FORU=1TO3
540 DP=DP+VN(U)*VE(U)
550 NEXTU
560 IFDP<0THEN690
564 REM==========================================
565 REM     perspective projection
566 REM==========================================
570 FORE=1TO4
580 V1=E%(F,E,1)
590 PE=ABS(EY(3)/(R1(3,V1)-EY(3)))
600 X%=PE*R1(1,V1)+30
610 Y%=PE*R1(2,V1)+30
620 Z%=3:£P
630 V2=E%(F,E,2)
640 PE=ABS(EY(3)/(R1(3,V2)-EY(3)))
650 X%=PE*R1(1,V2)+30
660 Y%=PE*R1(2,V2)+30
670 Z%=4:£P
680 NEXTE
690 NEXTF
700 T=T+TT
710 IFT<=TMTHEN290
720 GETA$:£A
730 END
```

MZ-80K Extra.

by D Willis

Anyone who has used Basic for any length of time will know that it is not possible to have a program print an inverted comma on the screen using the normal PRINT statement.

This easily adaptable program runs on the MZ-80K. Lines 100—140 are the program itself and lines 200—220 are for demonstration. They result in a display of 'TYPE "ENTER" ' on the screen. Lines 100—140 must be run before a USR call is made. The decimal start address is arbitrary and could be anywhere suitable in memory.

```
100 FOR N=1 TO 6
110 READ A
120 POKE 24062+N,A
130 NEXT N
140 DATA 62,34,205,18,00,201
200 PRINT"TYPE ";:USR(24063)
220 PRINT"ENTER";:USR(24063)
```

UK101 Crossword Notepad.

by John Rawcliffe

If there are any crossword fans reading this issue they will be interested in this program. It allows you to use the VDU as a notebook to help compile or solve crosswords of up to 16 characters square (a grid is presented and the user fills in the blocks and eventually characters). The number keys one to four move a cursor about the grid and you can insert or delete where required.

PROGRAMS

Although this is a fairly simple program, the graphics are good and so is the idea. As it only uses 2.5k, owners of machines with bigger memories should be able to add other facilities (maybe there's a genius somewhere who could write a program which made their computer able to pose clues as well!), although I'm stuck for useful suggestions. Superboard users will have to modify the display routines.

Finally, there is just one little disadvantage. The squares cannot be numbered as a number would take up a whole square and would mean you couldn't fit a character in. Still, it should prove more than useful for crossword fanatics who just can't get it right first time!

```
1 REM CROSSWORD COMPILER J.RAWCLIFFE
5 DIMA(4),V(4),H(4):POKE11,0:POKE12,253
10 GOSUB400
15 X=53792:VE=1:HO=1:FL=0
20 PRINTTAB(12);"CROSSWORD COMPILER"
22 PRINTTAB(12);"------------------"
25 PRINT"THIS PROGRAM HELPS YOU TO COMPILE (OR SOLVE)"
30 PRINT"CROSSWORDS USING THE SCREEN AS WRITING PAPER."
35 PRINT"TYPE IN THE SIZE OF THE CROSSWORD WHEN ASKED"
40 PRINT"AND THEN TYPE IN YOUR CHOSEN LETTERS WHERE YOU"
45 PRINT"WANT THEM.THEY WILL APPEAR WHERE THE CROSS IS"
50 PRINT"WHICH IS MOVED LEFT BY KEY 1,RIGHT BY KEY 2,"
55 PRINT"UP BY KEY 3 AND DOWN BY KEY 4."
60 PRINT"TO PUT A LETTER ON THE SCREEN SIMPLY PRESS THE"
65 PRINT"KEY ON THE KEYBOARD.TO PLACE A GREY SQUARE"
70 PRINT"PRESS KEY 0,TO REMOVE THE CROSS FOR COPYING"
75 PRINT"PRESS THE ? KEY,TO RESTORE A FREE SQUARE IN"
80 PRINT"THE CROSSWORD PRESS THE = KEY AND TO FINISH"
82 PRINT"THE PROGRAM USE CTRL C."
85 INPUT"SIZE OF CROSSWORD (2-16)";SZ
90 SZ=INT(SZ):IFSZ<2ORSZ>16THEN85
92 GOSUB400:GOSUB410
93 GOSUB400
95 FORI=1TO4:READA(I):READV(I):READH(I):NEXT
100 DATA-2,0,-1,2,0,1,-64,-1,0,64,1,0
105 H=INT(SZ/2)
110 SP=X-66*H
120 FORI=2TO(2*SZ)STEP2:FORJ=0TOSZ-1
130 POKESP+I+64*J,131:NEXT:NEXT
135 CU=SP+2:POKECU,219:OW=131
150 X=USR(X):O=PEEK(531)
160 IFO=67ANDFL=1THENGOSUB500:GOTO270
170 IFO<53ANDO>44THEN200
180 IFO<91ANDO>64THEN320
190 GOTO150
200 ONO-44GOTO310,150,330,300,210,210,210,210
210 POKECU,OW:VE=VE+V(O-48):HO=HO+H(O-48)
220 IFVE=0THENVE=SZ:CU=CU+64*(SZ-1):GOTO270
230 IFVE>SZTHENVE=1:CU=CU-64*(SZ-1):GOTO270
240 IFHO=0THENHO=SZ:CU=CU+(2*(SZ-1)):GOTO270
250 IFHO>SZTHENHO=1:CU=CU-(2*(SZ-1)):GOTO270
260 CU=CU+A(O-48)
270 OW=PEEK(CU):POKECU,219:GOTO150
300 OW=187:GOTO330
310 OW=131:GOTO330
320 OW=O
330 POKECU,OW:GOTO150
400 FORI=1TO16:PRINT:NEXT:RETURN
410 PRINT"IF YOU WOULD LIKE A SYMMETRICAL CROSSWORD"
420 PRINT"(EG IF YOU WANT TO SOLVE A PRE-SET CROSSWORD"
430 PRINT"RATHER THAN COMPILE ONE) PRESS KEY S."
440 PRINT"OTHERWISE PRESS ANY ALPHABETIC KEY."
450 X=USR(X):O=PEEK(531):IFO<65ORO>90THEN450
460 IFO<>83THEN495
465 FL=1:PRINT
470 PRINT"TO USE THIS FACILITY,COMPLETE THE TOP HALF OF"
475 PRINT"THE CROSSWORD (AND ALSO THE MIDDLE LINE IF"
480 PRINT"THERE ARE AN ODD NUMBER OF SQUARES IN THE"
482 PRINT"CROSSWORD) AND THEN WHEN YOU HAVE COMPLETED"
485 PRINT"THAT PRESS KEY C TO COMPLETE IT."
490 PRINT"PRESS ANY KEY TO START":X=USR(X)
495 RETURN
```

PROGRAMS

```
500 FP=SP+2*(SZ+1)+64*(SZ-1)
505 POKECU,OW
510 FORI=0TOH-1
515 FORJ=1TOSZ
520 S=PEEK(SP+(J*2)+(I*64))
530 POKEFP-(J*2)-(64*I),S
540 NEXT:NEXT
550 FL=0:RETURN
```

CALCULATOR CORNER

through until the display contains only P0 and then press the following sequence:- INV MODE FST GOTO0 P0 BST LBL0. Now save this on tape; it is your 'skeleton' program.

To produce the program we want, go back into Write Mode P0 and hit BST; you should see "A" LBL0 in the display. Backstep four times and you will see a pair of quotation marks the wrong way round go past; the display you end up with is:

⁝ ⁝ ⁝ ⁝ ⁝ "

It is between those quotation marks that our program will sit. Looking up the special symbols we need we find that $\bar{x} = \sqrt{}$ AR01 +/- AR02 % translates into M+16 cos M+12 Min01 M+13 Min02 $\cos^{-1}$ and so enter this now.

Here comes the magic bit; pressing FST repeatedly takes you past the end of the program and back to the beginning, but the second time through you will see the translated version "$\bar{x} = \sqrt{}$ AR01 +/- AR02 %"!

If you keep going you can cycle endlessly seeing alternately the alpha and the instruction versions of the program. Run the program and it executes as normal, inserting the contents of M01 and M02 in the appropriate slots eg:

$\bar{x} = \sqrt{}$ 2.45 +/- 8%

This can be used as an output subroutine to a main program: you can indeed enter the main program into P0 before Step 000 where the dots begin, to avoid using an extra register.

I think that this should provide sufficient food for thought and experiment for a while but I will let you in on the fact that Andrew McLeod's method leads on to a new way of displaying the whole of program memory (like an obscurely encoded hex dump) which allows you to crack password protected programs. That will be the subject of a future corner; there isn't space here to explain. Next month Calculator Corner will be a special double-sized edition in which I shall Benchtest Sharp's remarkable new pocket computer, the PC1500. To preserve the feelings of those Sharp owners who keep writing to me to complain 'it's not a calculator, it's a computer', I shall call it Not Calculator Corner.

BLUDNERS

Not a Bludner, actually, but quite deliberate. If you tried to ring a company called 'Wild Bill's Computer Rodeo' which advertised in last month's *PCW* and kept getting British Telecom's bedtime story, then take another look at the date on the magazine's cover!

BACK ISSUES SERVICE

Here is a complete guide to all available back issues of *PCW*. A quick guide to their contents is shown below. Check the coupon overleaf for the issues you require.

HP-125: Vol 5 No 3

Volume 1 No 1, 1978
The 77-68/Practical hints on kit building/Nascom 1/Charity case study/Flowcharting/Pontoon flowchart

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March 1979
SYM-1/Mk14/IEEE-488 Bus/Motorola 6809/Small computer networks/TMS-9900 homebrew.

Volume 2 No 1
May 1979
Chess programming/Using a small business computer Part 1/Smart 1/In defence of PET/3D Noughts & crosses.

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Different computer languages/(MSI) 6800/Using a small business computer Part II/Demonstrations using the Apple II Part I.

Volume 2 No 3
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Basic or Pascal?/The Sorcerer/Z8000/Chess programming/Graphics for the TRS-80/Applevision — part II/

Volume 2 No 4
Apple medical application/North Star Horizon/Word processing/High speed cassette interface/Sorting/Buying a computer for a small business

Volume 2 No 5
September 1979
Benchtest: Compucolor II/Checkout: Heuristics Speech Lab/Testing Precognition/Pascal series — Part I/Programs: 6800 Time response, Apple memory test, Fx 201p spaceship, PET Orbit sim, PET digital clock, Acronyms.

Volume 3 No 6
June 1980
Benchtest: Tandy TRS-80 Model II/Benchtest: Sintrom Periflex 630/48 / Staff case study/Checkout: Softy Intelligent EPROM Programmer/Checkout: Exatron Stringy Floppy/Practical examples of the IEEE-488 bus use/UK101 Nedge/PET Horse Race/Basic & PET Renumbers/UK101 Dogfight/Mk14 frequency counter/Basic Maths Test/PET Sweeper.

Volume 3 No 12
December 1980
Benchtest: Microwriter/Printerfacing: Series — Part 1/Sharp PC-1211 speed-up/Programs: TRS-80 Tarot, PET Cat & Mouse, PET Rebound, MZ-80K Alligator Swamp, PET Connect, UK101 Minefield, PET Simon Benchtest: Raannd SP1

Volume 4 No 1
January 1981
Benchtest: Transam Tuscan/Real-time control using trains — part 1/Recover from a data tape disaster/PET Music/Multi-user systems — part 1/Programs: TRS80 Four in a row, TRS80 Target Practice, PET Convoy, PET Wire, PET Maze Chase, PET Android Attack, PET Anagram

Volume 4 No 3
March 1981
Benchtest: Onyx C8002/Benchtest: Bigboard/Micro music software package/ALC circuit/Commons report/HP 34C/Programs: TRS80 Show Jumping, PET Grand Prix, PET Aircraft landing, PET Bouncy.

Volume 4 No 5
May 1981
Benchtest: Pasca 640/WP Benchtest: Magic Wand/PET colour/Low-cost digital tape system/Using calculator printers on micros/Apple music-making/Multi-user Benchtest: MVT-Famos/Programs: PET Grand Prix, PET Aircraft Landing, PET Bouncy.

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June 1981
Benchtest: NEC PC-8001/Multi-user Benchtest: MP/M/Benchtest: Sinclair ZX81/West Coast Faire report/Radio Teletype/WP Benchtest: Wordpro 4 Plus/Budget tape interface/Further Casio quirks/Programs: UK101 Zor, PET Chords.

Volume 4 No 7
July 1981
Benchtest: Sharp PC-3201/Multi-user Benchtest: Acorn Econet/Case study: Accident investigation on TRS-80/Zilog Z8 family/WP Benchtest: Format-80/Pascal Benchmarks: readers' letters/Quicker Casio computations/Programs: ZX80 Sliding Letters, UK101 Car Rally, TRS-80 Calendar, UK101 m/c code to Basic converter, PET Exam Questions, MZ-80K Designer, ZX81 Sketch Pad.

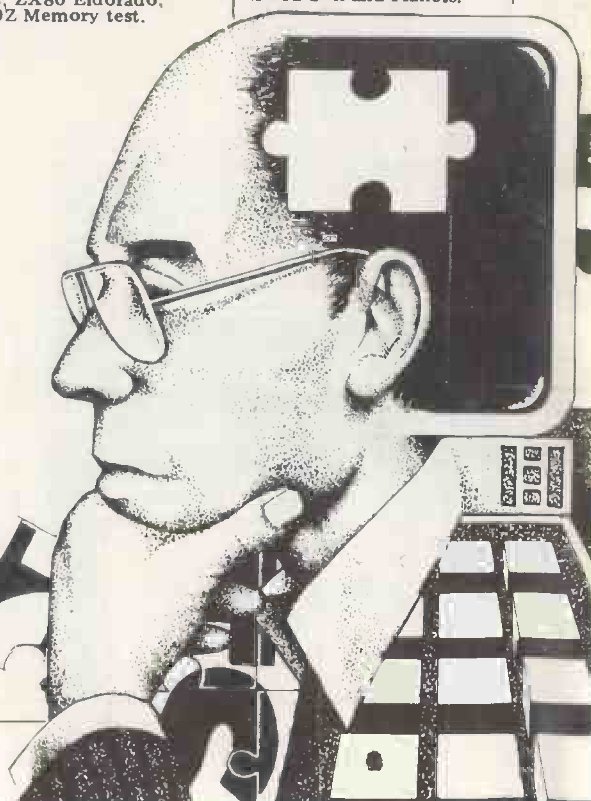
Volume 4 No 8
August 1981
Benchtest: Tandy Model

III/Viewdata update/WP Benchtest: Spellbinder/Printer survey/Microholism/Programs: ZX80 Othello; Easter Sunday; Apple Mondrian; MZ-80K Duck Shoot; PET Gomoku; MZ-80K Football.

Vol 4 No 9
September 1981
Benchtests: Tandy Color Computer, Commodore VIC/Checkouts: Hi Tech Speakeasy, Tantel/Multi-user Benchtest: HMSOS/WP Benchtest: Memorite III/Word proc program for PET/Apple dealership run by spastics/Printerfacing extra/Calc Corner: Casio fx602p review/Programs: PET Arithmetic test, ZX80 Eldorado, 380Z Memory test.

Volume 4 No 10
October 1981
Benchtest: OKI if-800/Checkouts: Heuristics speech link, Softy 2/Calc Corner: Texas TI51-III/Jeff Taylor on computer literacy projects/Introducing TJ's Workshop/Control Your Own Substation pt 1/Programs: TRS-80 Sailing

Vol 4 no 11
November 1981
Benchtests: Osborne 01, IBM Personal Computer. Checkout: Sharp IQ3100 Microtranslator. Calc Corner: Casio fx 702p. *PCW* Show report, Benchmark Summary, Euro Micro Chess Championship report. Programs: TRS-80 Sheepdog trial, ZX81 Sun and Planets.



Vol 4 No 12
December 1981
Benchtests: Sharp MZ-80B Philips P2000/School network/ BBC Micro inside story/ 'Turtle' Graphics for Apple/ Forth language/ Curve fitting/ Calc corner: HP14C review/ Programs: PET Fantasy, ZX81 Battleships and cruisers.

Vol 5 No 1 January 1982
Benchtests: BBC Micro, Xerox 820/Frames of Reference (new series)/ ZX81 Printer Checkout/ Digital Drummer for PET/ Calc Corner: Benchmarks/ Programs: MZ-80K Fortune, TRS-80 Reaction Timing, ZX80 Laybrinth, Apple Letters.

Vol 5 No 2 February 1982
Benchtests: Sirius-I, Casio fx-9000p, Gemini Multiboard/Word Processor Benchtest: Scripsit 2.0/ Plotter Checkout: Watanabe/Hardware feature: High Density VDU card project/Music system: FREQOUT/Calc Corner: Aerial Navigation/Programs: Pet Haemophilia, Pet Cheese, TRS-80 Extra, Sharp PC1211 Exam, Personality test.

Vol 5 No 3 March 1982
Benchtests: Texas Instruments 99/4A, Hewlett-Packard 125/Choosing a Database/Compsoft DMS reviewed/Screenplay (new series)/Calc Corner: Hewlett-Packard Interface Loop/Programs: TRS-80 Solitaire, TRS-80 Ducks, Nascom Business Documents, MZ-80K Race Chase, ZX81 Graphplot.

Volume 5 No 4
April 1982
Benchtest: Monroe OC8820/DB Benchtest: FMS-80/Checkout: Sid 1/ Generating screen forms/ Comal/Logo/Brain Dump-New series/Calc Corner: Casio FP-10 printer/ Programs: TRS-80 Maths & Trig, PET Boot the Cat, ZX81 Resistor & Res code.

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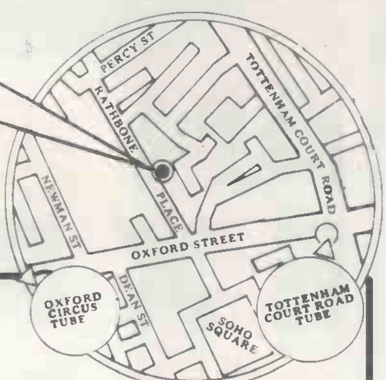

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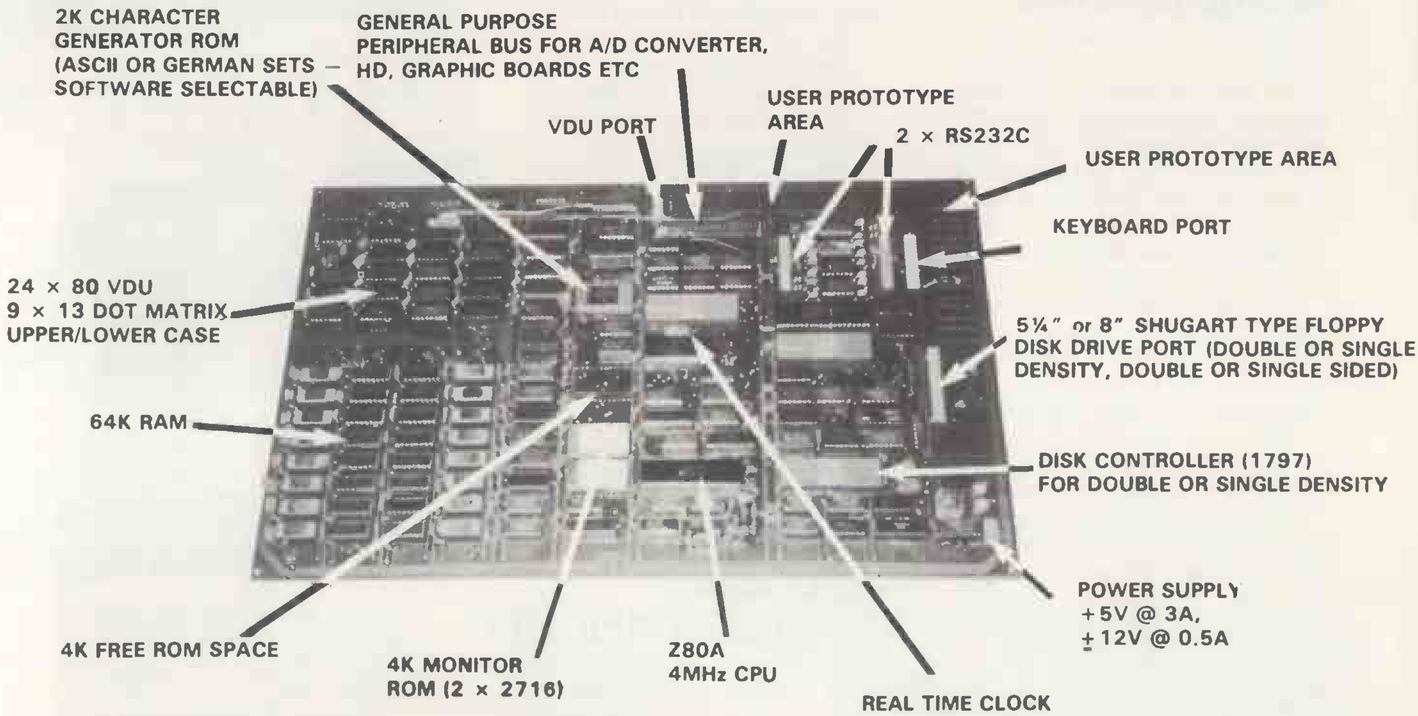

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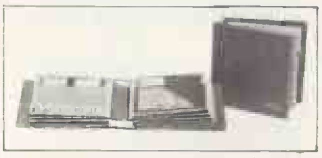

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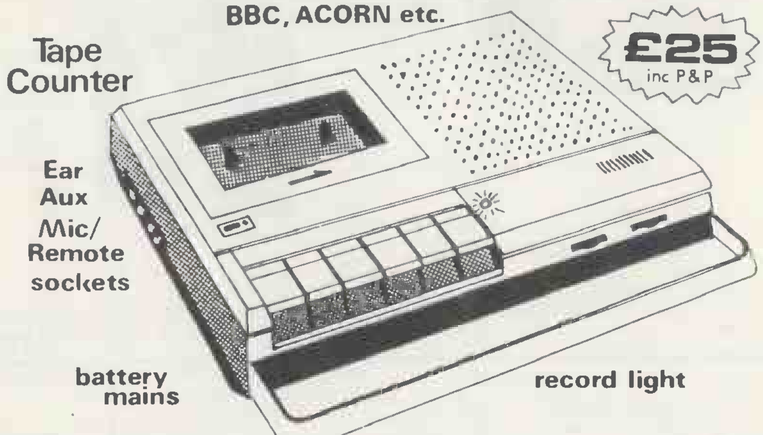

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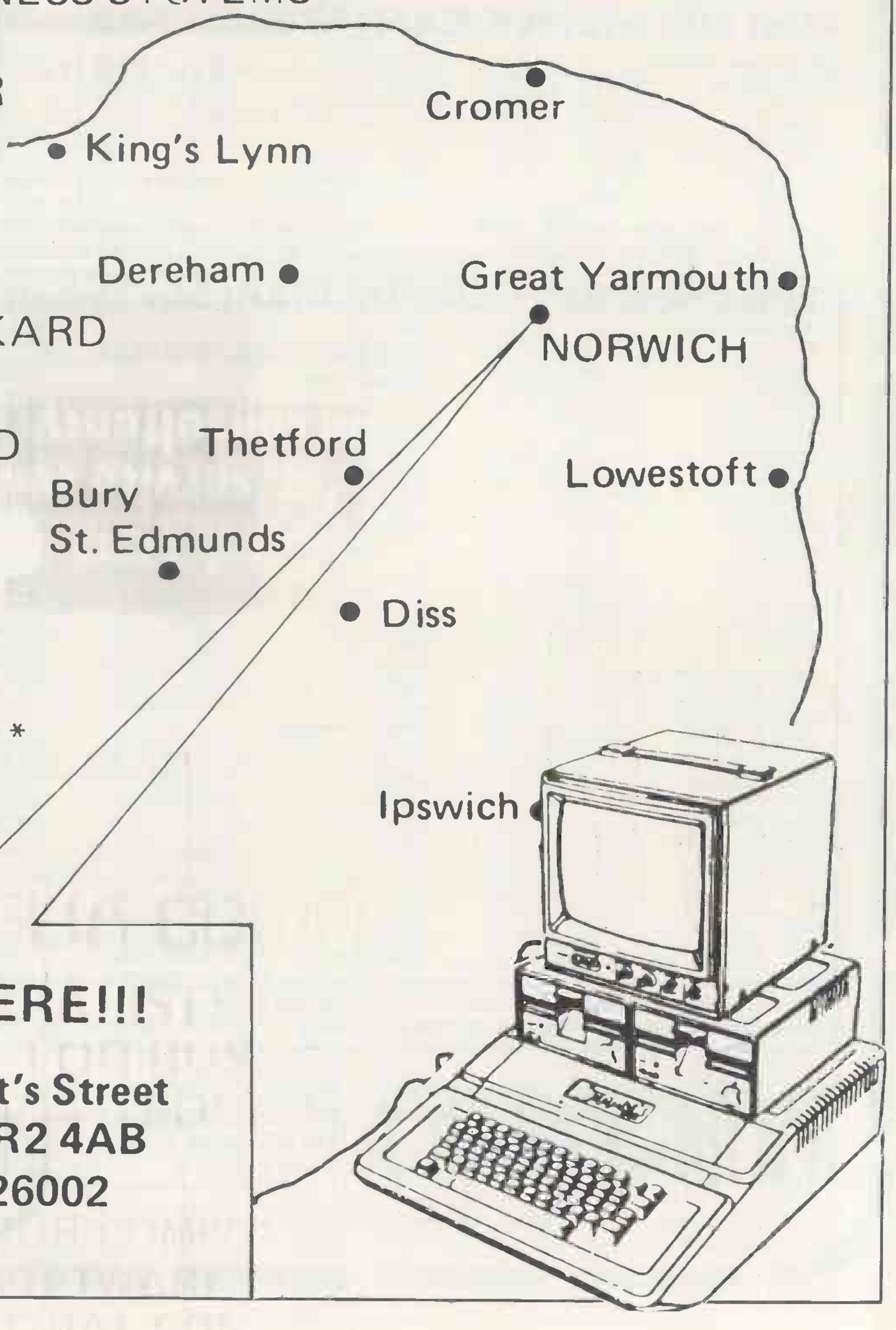

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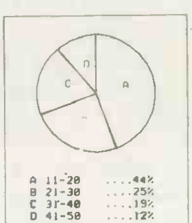

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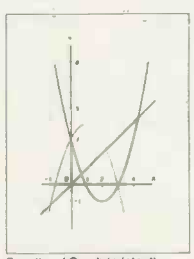
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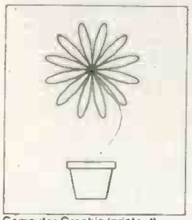
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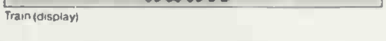
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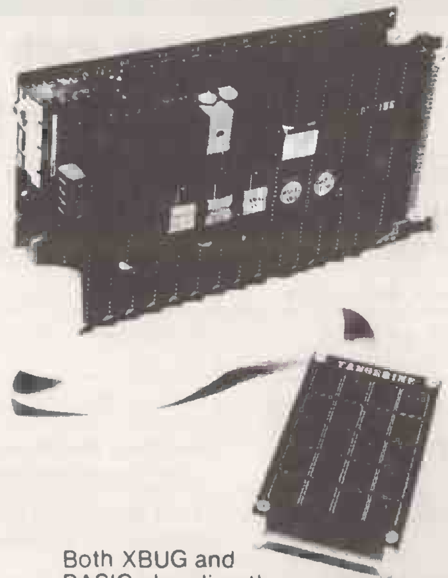

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* 2K Monitor TANBUG
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XBUG and BASIC
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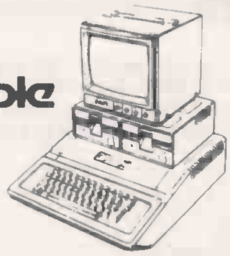

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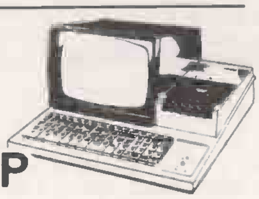

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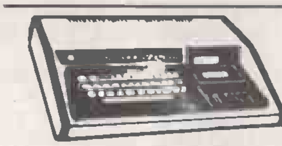

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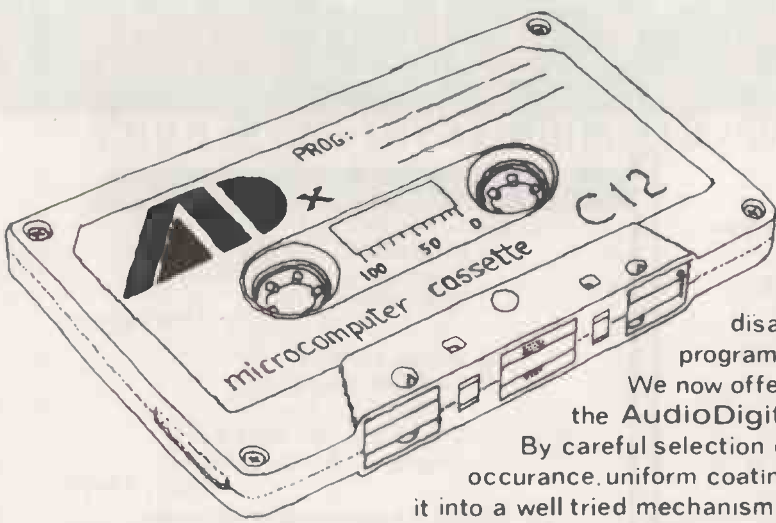

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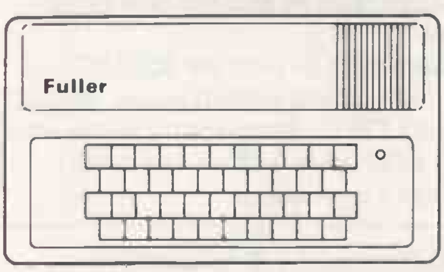

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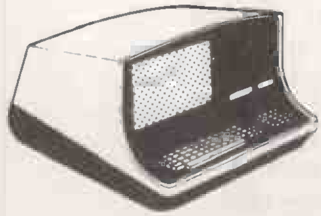

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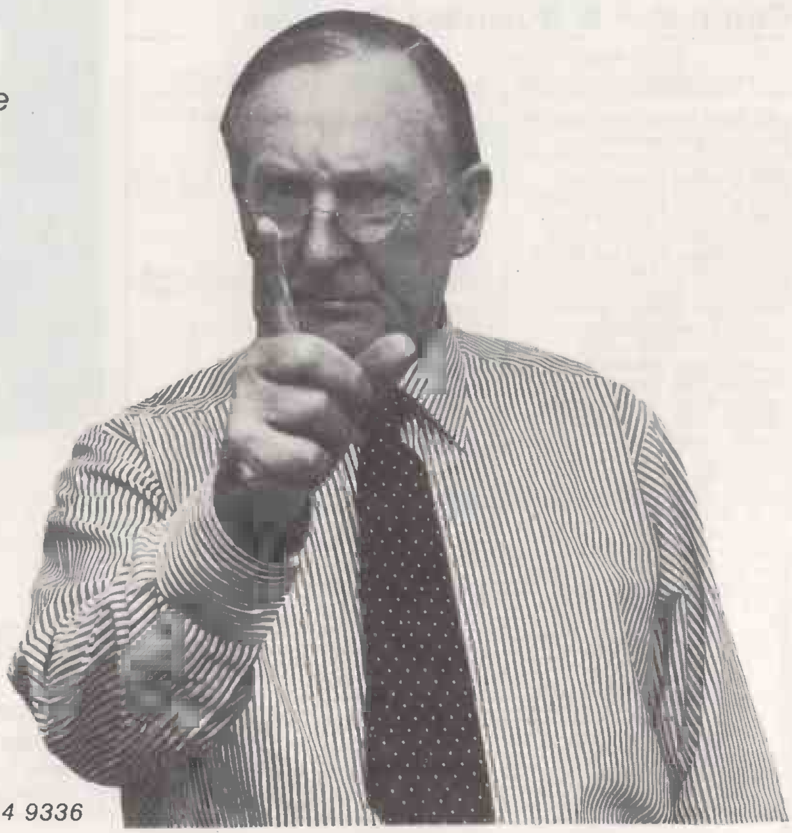

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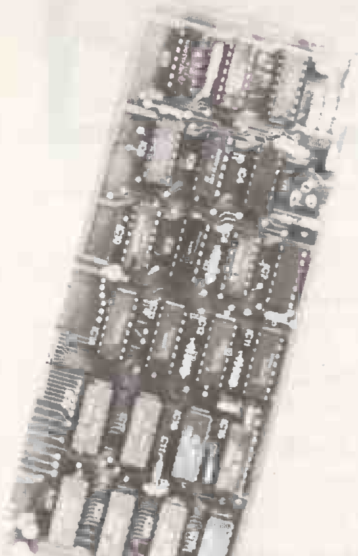

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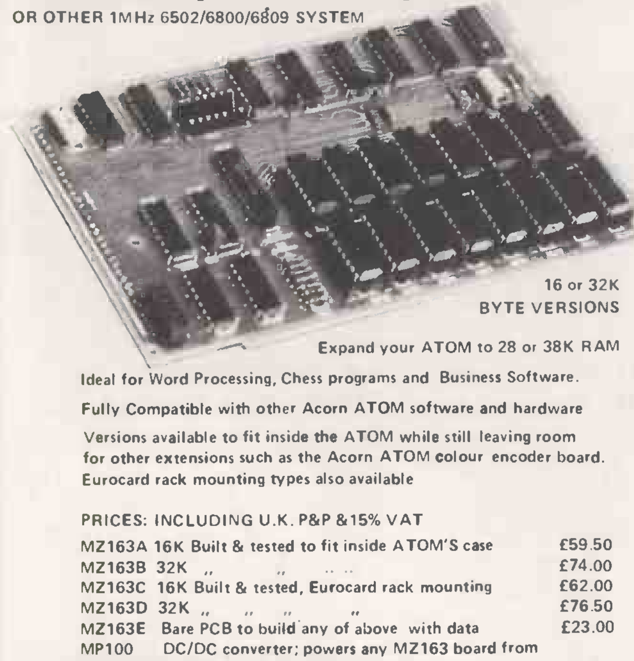

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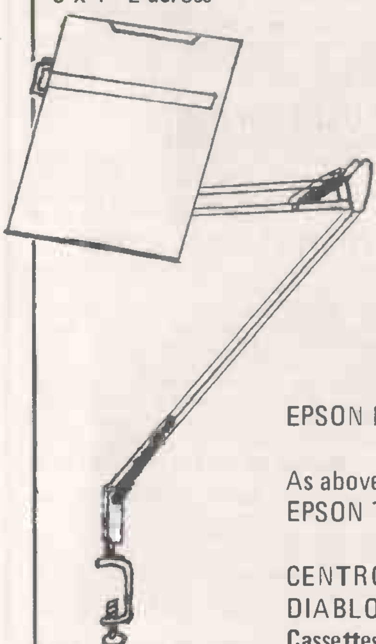

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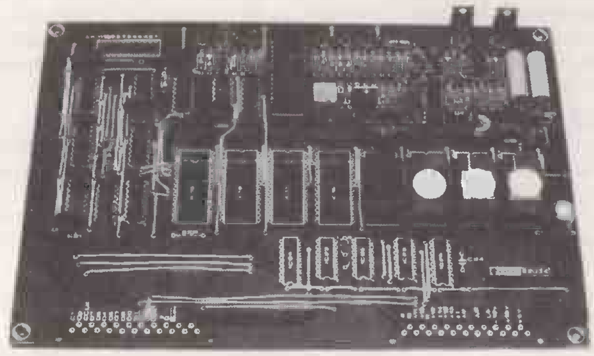

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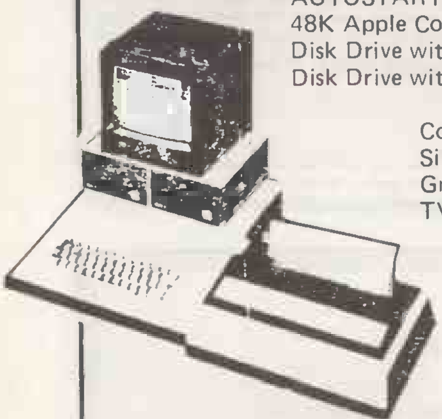

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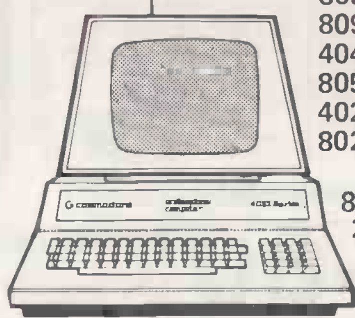

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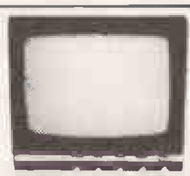

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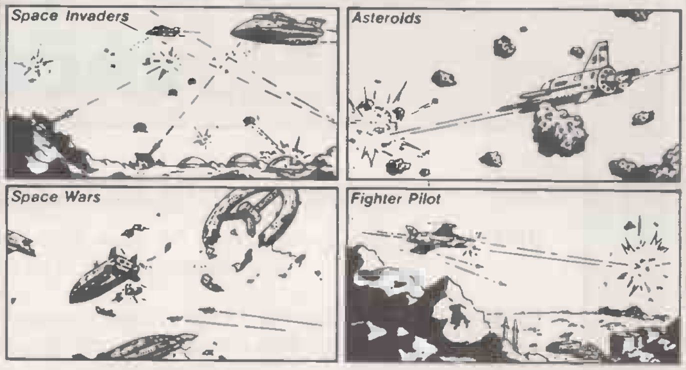

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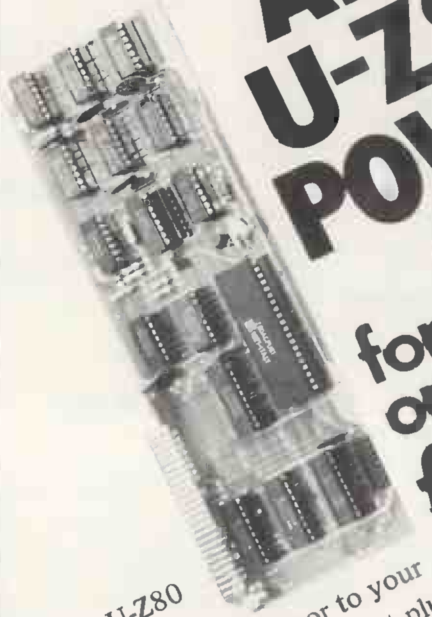

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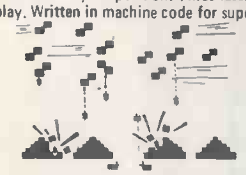

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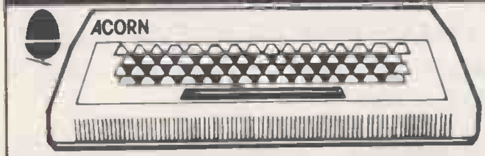

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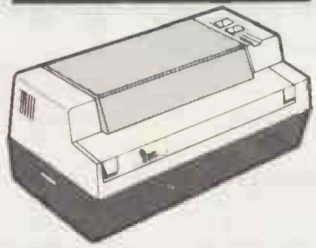

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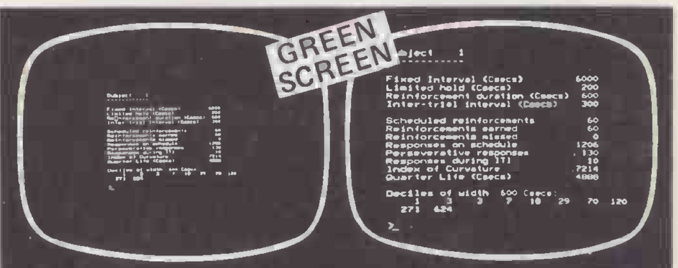

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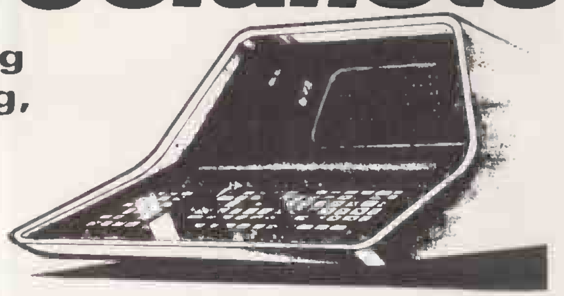

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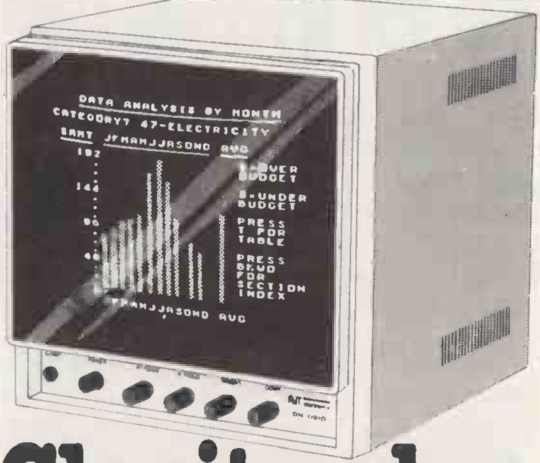

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CHIP CHAT

Coming up very soon, a new Sharp micro. Called the MZ-80A, it seems likely to replace the ageing MZ-80K, for it has a very similar spec — so our spy tells us — but with the high-res graphics from the '80B, a better keyboard and a 4 MHz Z80 instead of the '80K's 2MHz. . . Still in the rumours department, we hear from one of our usually unreliable sources that the latest Apple IIs have a modified main circuit board — Revision 8 — which has been redesigned to reduce RF emission. Unfortunately this has affected the timing signals along the bus where you plug in your add-on board, with the result that over half the add-on boards now being marketed don't work. . . How tedious to see the publisher of 'a certain other micro magazine' continue his doomed campaign to inform advertisers that his rag is 'widely regarded as Britain's most successful microcomputer magazine', even though the mag in question now sells 15,000-odd copies fewer than *PCW* in the UK. Is this 'legal, honest, decent, or truthful', the Advertising Standards Authority might ask?. . . Actually that rag seems to have an odd effect on some people — one of its minor contributors has taken to writing semi-coherent and wildly inaccurate letters to *New Scientist* while a senior member of its staff has deserted the sinking ship to start up a new micro magazine (yes, yet another!) with PET revealer Nick Hampshire. Other than vague rumours that Commodore has put money into the new venture little is known about what they're up to. . . Our very own Guy Kewney has been on the move, too. He's left VNU, the publishing company which owns *Datalink* (of which Guy was Editor), along with *Computing* and other publications, to go freelance. A shame, for *Datalink* made hilarious (and occasionally almost libellous) reading under Guy's Editorship. . . Hands up anyone who remembers the NewBrain! Quite a few of us do, although, apart from an appearance at last year's Compec, nothing has been heard of it for a long time. What happened was that there were enormous snags in getting the machine working which, together with the *eight* models planned in the range, gave Newbury boss Rod Saar no option but to sell the whole project to Grundy before it bled Newbury to death. Grundy, it seems has been quietly working on the project and at long last the NewBrain is to go into production — it should be on sale later this year, too late to fulfil its role as the official BBC Computer but still in time (provided they've got it right this time) to jump on the hand-held bandwagon. . . That bandwagon, by the way, is just about to take on another member in the shape of printer giant Epson, which will bring out a largish portable unit, with a four-line LCD display, full alphanumeric keyboard and integral cassette deck later this year. . . Finally, how's this for optimism: National Panasonic has decided that it's Basic will become *the* standard Basic in the micro world. This philosophy was founded on the company's success in the video cassette world, apparently, where becoming an industry standard was easy if you were one of the first in the field. Unfortunately for NatPan, it wasn't the first in the micro world.

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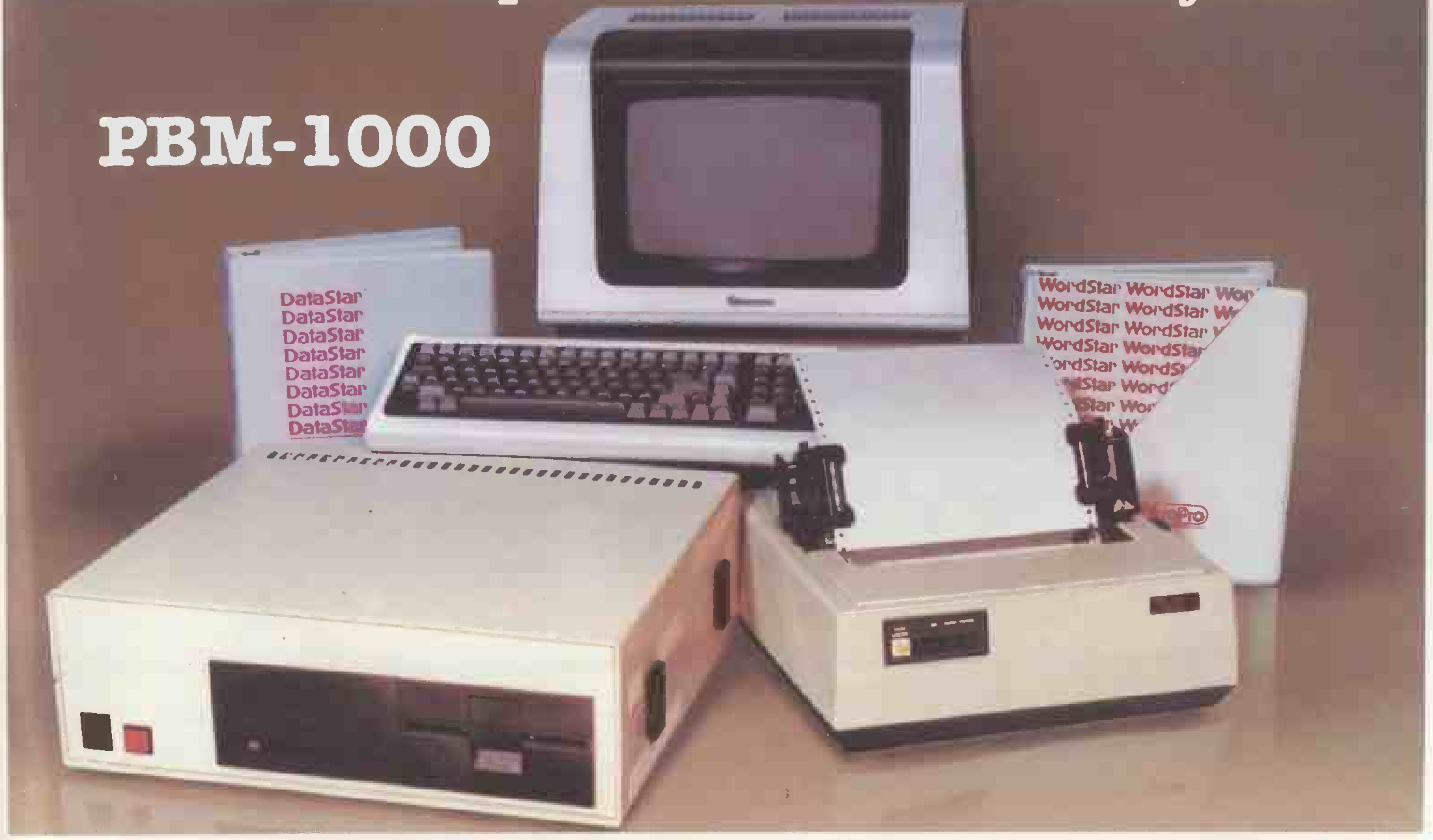

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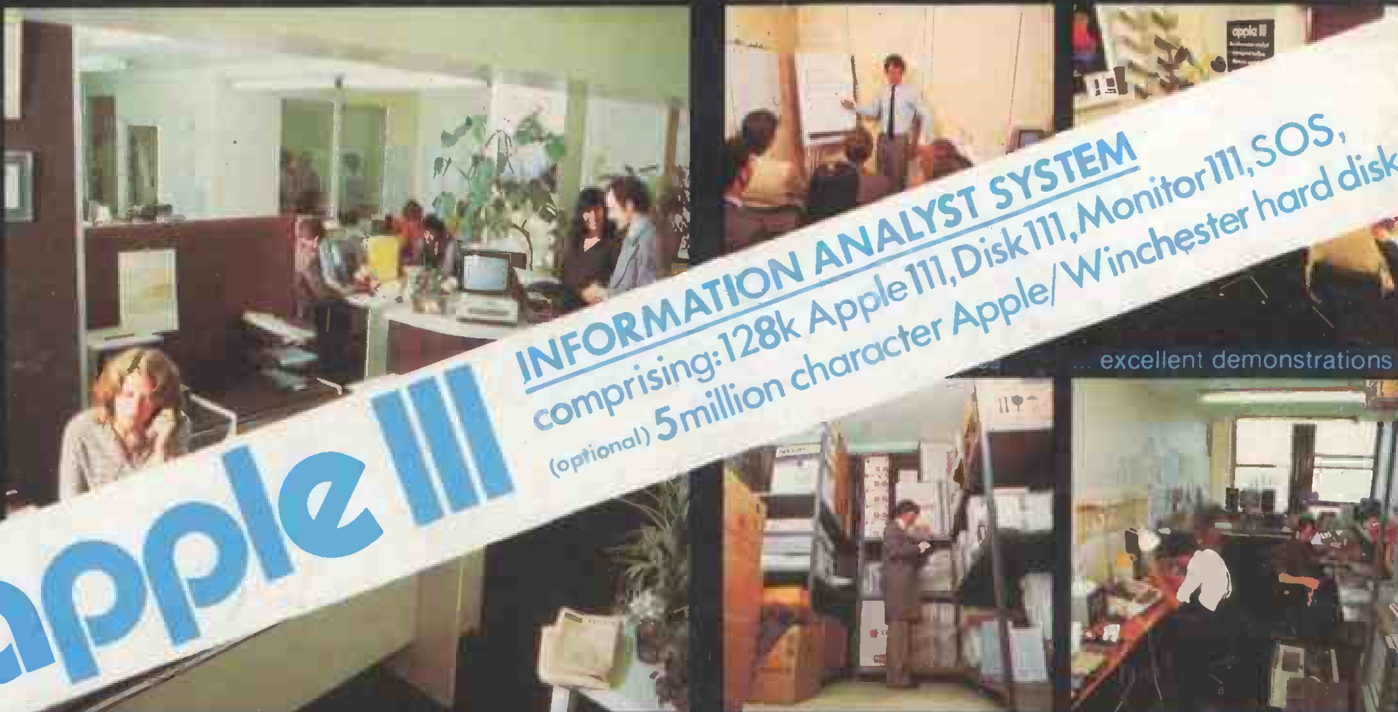

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WORD PROCESSING

HOW TO CHOOSE A WORD PROCESSOR
SEVEN PACKAGES REVIEWED

CONTENTS

Edited and introduced by Dick Olney.

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May 1982

CHOOSING A WORD PROCESSOR

Peter Rodwell introduces some general concepts and tells you what to look out for.

Word processors are very much a product of the so-called 'micro revolution'. In the bad old days it was totally unthinkable to use an entire computer for text processing — the machines were just too expensive for all but the most 'serious' of uses. Text editing programs have, of course, long been available on big computers but these were really designed for entering the source code of programs for later compilation.

Today, thanks to micros, computers are cheap and plentiful and it makes perfect sense to dedicate one to a specific task, such as text processing. In the last few years dozens of word processing (WP) systems have appeared on the market, most of them comprising a microcomputer system plus a WP program to run on it. At the top end of the market are the dedicated WP systems, microcomputers designed solely for WP and usually marketed by the big office equipment manufacturers.

Once you've made up your mind that you need (or want) a WP system, deciding which one is most suitable for your requirements can be a bewildering experience. With several dozen permutations of packages and systems now available, it's important to get a few things clear in your mind before you start looking. As with any other computer/package purchase, you've got to define your needs — existing and future. But before we get involved with that, let's take a look at what word processors are and what they can — and cannot — do.

What is word processing?

If you wanted to be pedantic, you could say that word processing at its simplest is somebody writing on a piece of paper. However, we're concerned here with the use of computers to input text, store it and to reproduce it onto paper only when you're completely satisfied that it's properly spelt and nicely formatted.

Because the text is stored in a computer's memory, it is very easy to make changes to it. The facilities for doing this range from the very simple to some quite powerful capabilities. For example, when you're reviewing your masterpiece, you may discover a typing mistake. By positioning the 'cursor' (the mark on the screen which shows you where you are in the text block) and typing in the correct spelling, the mistake is rectified within the computer's memory. If you find you've omitted a word, or you want to delete something, you position the cursor appropriately and, using special commands, either insert or delete as desired.

More sophisticated commands, available in all but the simplest word processors, allow you to move entire blocks of text around or to insert blocks or delete them. Search and replace commands are also available; these would allow you to, for example, replace every occurrence of the letter 'a' in your text with a '*', if you were so inclined, with a single command line.

Finally, you can send the text to a printer and perform various formatting operations to give an aesthetically pleasing appearance to the text.

Word processors are very good for certain jobs such as the repetitive typing of standard form letters, producing long, complicated documents which may need extensive revisions before they are ready for typing, or reproducing documents — guarantees, for example — which need a specific item included, such as a serial number, which differs with each copy. On the other hand, they have certain disadvantages: cost and the time taken to learn to use them may make word processors impracticable for very low volume work.

If you produce just a very small volume of unique documents such as one or two short letters a day, then a word processor is not for you. You'd find it cheaper and easier to buy a conventional typewriter as a full word processor system probably wouldn't be cost-effective.

To decide which word processor is best for you — or whether you need one in the first place — you must look carefully at the use to which you propose to put it.

Types of user

We've identified four potential WP users with differing word processing requirements. Firstly there's the author or journalist, who will be using a word processor to enter large amounts of text, each piece of which will be a unique, one-off document. On the hardware side, this user will need plenty of memory and a large disk capacity to cope with large volumes of text. Keyboard and screen considerations will be vital but the type of printer chosen may not be so important — a script or article which will be typeset doesn't necessarily have to be an immaculate document and most such users will probably be satisfied with a dot matrix printer, especially as these are much faster than daisywheel units.

Software considerations will tend to focus on the editing end of the package — authors want extensive editing capabilities such as moving around blocks of text, inserting whole blocks mid way through text, deleting blocks, substituting strings, etc. The command format should be easy to learn and to use, so as not to interfere with the thinking process and it helps here if as many as possible of the frequently used commands, such as insertion and deletion, are available as special function keys. For work on very lengthy documents like that best-selling novel, the speed at which the system can jump backwards and forwards through text, pulling sections off disk and writing back to disk, becomes important; if these operations take too long you might almost as well go back to the typewriter and masses of easily-accessible pages of manuscript because sitting waiting for a system to do its thing becomes quite frustrating if you've a flash of inspiration burning to be inserted somewhere way back at the start of the story.

Formatting is less important to the author. He isn't out to impress a business client as such, so it really isn't necessary for him to have extensive formatting commands at his fingertips. He will want to be able to vary the spacing between lines, as most publishers require double- or triple-spaced manuscripts but the author will want single spacing on his file copy. Automatic page numbering is very useful, as is the ability to centre headings and put a heading at the top of each page (which may have to change as the article/novel progresses). Automatic compilation of an index is extremely useful, although I know of only one microcomputer-based system which does this. In general, though, the author's requirements centre mostly around the editing end of the package and, as long as certain fairly rudimentary formatting features are available, he should be happy.

The next user is the technical/managerial report writer. Again, this user will be inputting large amounts of text and again he will require extensive editing capabilities. It probably doesn't matter too much if the commands are a little on the complicated side as the whole job of report-writing is made infinitely easier when you use a word processor. Special function keys make life easier, of course, but this user sould probably be prepared to spend a while learning a comprehensive system if it provided him with powerful facilities.

Unlike the author, the report writer will require very comprehensive formatting facilities. Apart from 'simple' functions such as justification and pagination, he will require features such as indenting and 'outdenting' of paragraphs, page titles and subtitles, centered headings, automatic blank lines for the later insertion of figures and the ability to do fancy things with the margins. Additionally, if he's using a daisywheel printer with proportional spacing, he'll need a formatter which enables him to exploit all its facilities, particularly the insertion of spaces between characters in a word. This gives a much better effect when justifying than simply inserting extra blank spaces between words, as has to be done with a simpler printer. Given a good-quality daisywheel printer with a carbon ribbon, it is possible to produce camera-ready copy for printing.

Next on our list of users is the manager. According to 'office of the future' theory, managers will soon be doing all their own word processing, leaving secretaries free to do other things. I don't see this happening for quite a while, particularly in Britain, so we'll assume an 'office of the semi-future situation in which the manager prepares rough drafts of his documents on a word processor and hands them over to the secretary for final formatting and printing. This means, of course, that either the two will have to share a system or that the two systems should be compatible, at least to the extent of being able to read each other's disks.

The manager, then will not require particularly extensive editing facilities other than the usual insertion and deletion features, perhaps with block move and deletion thrown in to make life easier. He wants to be able to type in his rough drafts in much the same way as he might currently dictate 'unformatted' documents to his secretary from rough notes. This allows the secretary to get on with other work instead of tying them both up, as dictation does at present. (I once heard of a civil servant who, unable to dictate off the cuff, used to write out all his letters in longhand before dictating them to his secretary — I hope he's bought himself a word processor.)

The manager's formatting requirements will be even more rudimentary, as the secretary's supposed to take care of all that. At the most he may want to print out draft documents, perhaps for reference while the disk's being processed in the 'outer office'.

If the manager requires only rudimentary facilities by word processing standards, what does he want? Ease of learning is going to be his main priority, as few managers have time to learn how to use a really complex system. User friendliness is essential, too. The manager needs a simple system which he can sit down and use after spending the minimum possible time with his nose in an instruction manual.

Printerwise, the manager should be perfectly content with a dot matrix unit for rough, reference drafts.

The secretary is our fourth user type and is probably the most demanding user of all. She will need a system with extensive editing and formatting commands and the fact that these may require a special training course to master should not be a particular disadvantage — the cost of such a course, in time as well as money — should be amply repaid in terms of the greatly increased efficiency brought about by the word processor.

On the editing side, the secretary will still want extensive facilities. After all, she's got to read through her boss's drafts, correcting spelling and punctuation and inserting commands for the formatter. She'll also want search and replace commands to correct any abbreviations used by the boss. (Search and replace commands are one of the beauties of word processors. In writing this article, for example, it would have been tedious to keep typing 'word processor' or 'word processing'; I therefore used the abbreviations 'wpor' and 'wping' and used the replace command to replace 'wp' with 'word process' throughout before printing the final text.)

The secretary might also require a special kind of text entry facility, the ability to build up files. For example, suppose the marketing department wants to send letters to several hundred prospective clients. A file of names and addresses can be created on disk, each with a code to indicate the products that a particular customer is interested in. A second file can then be created of standard paragraphs, each describing a product corresponding to a particular code. The secretary can then prepare a standard letter and get the word processor to type out an 'individual' letter to each client, pulling the name and address off the file, typing it at the head of the letter and then inserting the correct standard paragraph at the appropriate place within the letter.

The secretary's formatting requirements will range from basic, for one-off letters and memoranda, to comprehensive, for complex managerial, financial and company reports production.

Summarising these, then, we have four users with different requirements:

— Author/journalist: needs powerful editing, simple formatting, ease of use:

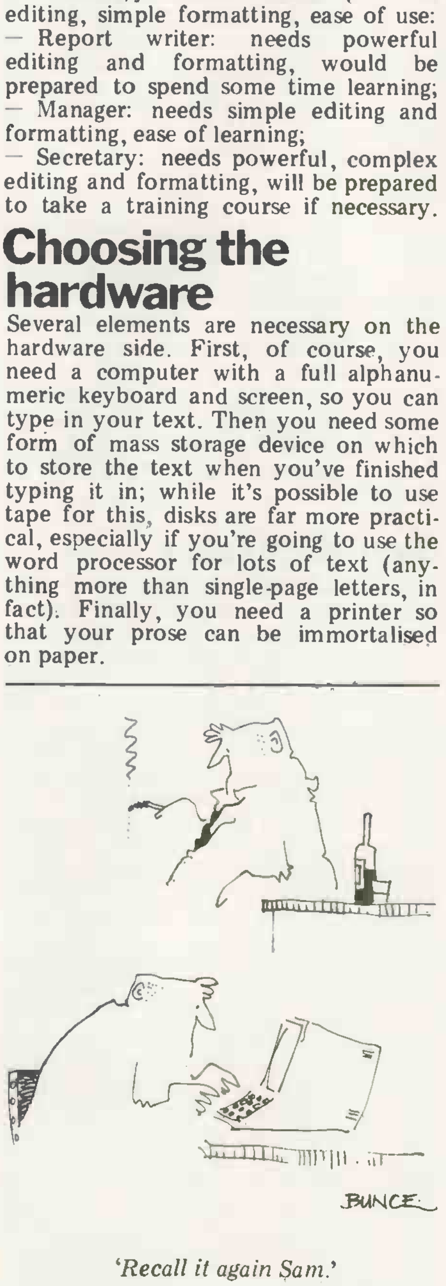
— Report writer: needs powerful editing and formatting, would be prepared to spend some time learning;

— Manager: needs simple editing and formatting, ease of learning;

— Secretary: needs powerful, complex editing and formatting, will be prepared to take a training course if necessary.

Choosing the hardware

Several elements are necessary on the hardware side. First, of course, you need a computer with a full alphanumeric keyboard and screen, so you can type in your text. Then you need some form of mass storage device on which to store the text when you've finished typing it in; while it's possible to use tape for this, disks are far more practical, especially if you're going to use the word processor for lots of text (anything more than single-page letters, in fact). Finally, you need a printer so that your prose can be immortalised on paper.



'Recall it again Sam.'

In choosing the hardware — the computer or word processor system — you'll have to take several things into account. First and often overlooked, are the ergonomics of the keyboard and screen. If you're going to be pounding away at a keyboard, you might as well make sure from the start that it's a keyboard you can live with. The keys should be of standard typewriter pitch and have a good, solid feel to them. Only you can judge whether this latter attribute suits you so you (or your secretary, or whoever's going to use the machine) should spend a while in the supplier's showroom typing at the machine to get its 'feel'. Keyboard layout is also important — a non-standard layout can be most annoying if you keep hitting, say, the repeat key because it's where you expect to find the shift key. A repeat key is vital, by the way, for moving the cursor around.

The display is also important because you're going to spend a lot of time looking at it. First priority is that it can show at least 24 lines each of 80 characters, although you could get by with a 64 characters by 16 lines format — anything less becomes a real nuisance. The 80 x 24 format is as close as most computers can get to the size of an A4 page, although a few dedicated word processor systems do have full A4 size screens. Some computers come with the screen and keyboard built in while others require a separate terminal, which gives you a greater choice. Other important features of the display are that it is legible, with proper descenders on letters like 'p' and 'q' and that it is steady, with no flickering. The brightness control should be easily accessible and a non-reflective screen surface also helps tremendously in reducing eye fatigue.

The subject of eye strain caused by VDUs is a controversial one, by the way, with experts contradicting each other. From personal experience I can say that peering at a flickering or over-bright display can strain the eyes, especially if the screen is reflecting ambient light as well. As far as I can gather, though, provided you pay close attention to the points I've mentioned above, you shouldn't have any trouble, although it seems there is some evidence to suggest that VDUs do tend to exaggerate any vision defects you may have (and a surprising number of people have minor vision defects without realising it).

As to the computer itself, what you buy isn't too important if you're just going to do word processing. You should go for the largest memory available on the system you choose, 64 kbytes on most micros, as this gives plenty of room for text after the editor and/or formatter have been loaded in. The reason for this is simple: once the memory is full, a good word processing package will automatically save the first part of the text onto disk. If you then want to read or revise what you wrote earlier, the system will have to recall it from disk, while saving the end of the text onto disk, which all takes time. Continued reading and writing from and to disk slows the whole editing process down so the longer you can put off this situation (by having as large a memory or 'text buffer' as possible in the machine), the happier you'll be.

With disks, there's something of a

compromise to be made. Most micros are available with 5¼in minifloppy disks, which are convenient but if you're going to need a lot of disk space for masses of text, you should consider 8in floppies or even hard disks. Be warned about the latter, though: cost apart (a hard disk unit is likely to cost almost as much as the rest of the system put together), hard disks have a back-up problem — should something go wrong with the disk unit, you could well lose everything you've put onto the disk, immensely frustrating if you were just reaching the end of that novel! You'll need to keep back-up copies somehow and this would generally involve using either very large numbers of floppy disks or a system available for some microcomputers which records data onto standard video cassettes using a VCR. On the other hand, it's fair to point out that hard disks are considerably more reliable than floppies. They're also a lot faster in use.

Unfortunately, the disk problem doesn't end there. There are different formats for recording data onto disks and they're mutually incompatible. Very briefly, the 'basic' disk is single-density, single-sided and holds about 80 kbytes of data; a double-sided, single-density disk will hold twice this amount. . Double-density disks hold twice the amount of information — sometimes double-sided double-density disks are called 'quad density'. One 'kbyte' is, roughly, a thousand characters; dividing by eight gives a rough idea of how many words this equals and assuming that a single-spaced A4 page holds roughly 450 words, you can work out the disk capacity you need in terms of pages of text, by far the most useful way of thinking. Hard disks, by the way, typically hold 8-10 megabytes, say a million words or well over 2000 A4 pages! But don't worry too much about disk formats; it only becomes important if you have several machines and you want to exchange disks between them, in which case the disk formats must be identical for all your machines. Personally, I would go for single-density, double-sided disks as I'm not at all convinced of the reliability of double-density disks; I'd rather trade off storage capacity in favour of peace of mind as there's nothing as annoying as finishing a long editing session and saving it to disk, only to lose it — I speak from personal experience!

Finally, you'll want a printer, as there's usually little point in saving text on disk and only being able to view it on your screen. Which type you choose will again depend on your application but there are two basic types in common use, dot matrix and formed character. Dot matrix printers form the characters by firing a series of small needles at the paper. They are quite fast and cheap but the result is a rather 'dotty' appearance, fine for rough drafts or manuscripts but not so good for important business correspondence which needs to impress its recipient. For this you'll need a formed character printer, which contains individual type elements like a typewriter, the most popular kind these days being the daisywheel printer. Adapted golf-ball printers are available but they are painfully slow — typically 15 characters per second — and quite noisy. Daisywheels are quieter and faster — 45 — 60 cps, usually — but cost from around £1000 upwards.

Most printers take fanfold paper which comes in a continuous sheet with holes along both vertical edges to allow the printer mechanism to pull it through and horizontal perforations so that you can easily tear it into individual sheets. It's not the stuff for serious business correspondence, although you can buy it ready-printed to form invoices or whatever; further, like most computer-oriented products, its physical format was devised in the States where they haven't heard of international standards, so that a typical paper size is 9½in wide by 11in long instead of the standard A4 format of 210mm by 297mm. All this is building up to say that if you want to print letters on your own company stationery, you'll probably need a sheet-feeding device to attach to your printer; currently these are shockingly expensive, typically £5-700 on top of the printer price.

Choosing the software

On the software side, there are two distinct sections to a word processing package. First, there's the input section, usually called the 'editor', which allows you to type in text, alter mistakes and carry out more sophisticated actions such as searching for every occurence of a particular letter, word or phrase and substituting another. Having prepared your text with the editor, you use another section called the 'formatter' to prepare it for printing. This side of things is concerned with the appearance of the text on paper and usually provides facilities for setting margins, centering headings, numbering pages and justifying text (making the right-hand edge line up, as it does here on this page). The commands to do this are frequently 'embedded' in the text, denoted by special marker characters, during the editing stage.

Generally, the more complex word processing packages come with the editor and formatter as two separate programs. You enter text with the editor, save it on disk and run the formatter to print it out nicely. This can be quite inconvenient if you start printing and realise you haven't achieved quite the format you wanted; you've got to exit the formatter, run the editor, make the necessary changes, exit the editor and save to disk before you can re-run the formatter. The big advantage of the 'split packages' is that they leave more memory free in the computer for text. If you want only simple editing and formatting features, or if you're content with a smaller memory buffer, then the integrated package is usually more convenient.

If you have already been investigating micro-based word processing systems, you will probably have come across CP/M. This is a piece of software called an operating system and, briefly, what it does is to carry out the routine work, such as operating the disks, getting characters from the keyboard, and put them into the computer's memory and sending text to the screen and printer. CP/M was designed to make things easy for computer programmers and presents a very unfriendly aspect to the novice user; for example, to copy a block of text from one disk to another, you have to type a semi-incomprehensible command such as 'PIP B:WORDS. TXT=A:WORDS.TXT' — this transfers the text file called 'WORDS' from disk A to disk B. CP/M can also be very unhelpful when things go wrong, typing a curt '?' if it doesn't understand the command you've just entered or flashing up unhelpful messages like 'BDOS ERROR ON DISK A:. . .' The overall effect of CP/M is somewhat intimidating to the newcomer who merely wants to get on with his word processing but you should persevere as some very powerful word processing packages are available for CP/M-based systems.

Dedicated WP systems

I have already mentioned that, as well as microcomputer-based word processsors, you can also buy dedicated systems. On paper these look like a pretty bad buy as the cheapest cost from £4500, enough to buy a big micro with a good quality printer which you could use for other applications such as accounts, stock control and Star Trek. But it would be wrong to dismiss dedicated systems out of hand.

If you're going to do an awful lot of word processing and you don't — and won't — want to do anything else on the system, you should look carefully at dedicated systems as they have several big advantages.

Firstly, as they're designed specifically for word processing, dedicated systems come with all sorts of useful things like special function keys and, in some cases, full A4-sized screens. Then there's the question of back-up or maintenance; most dedicated systems are marketed by large office equipment manufacturers who already have extensive maintenance procedures, something noticably rare on the microcomputer scene. Finally, the big manufacturers offer almost guaranteed compatibility with products further up the range or in the pipeline; this means that you shouldn't have any problems if you want to move to a bigger system, or turn your existing machine into a multi-user system or even just add some new bits announced a year or more after you bought your system.

Comparing WP systems

Having decided that you need a word processor and having decided which type will fit your current and future requirements, your next problem will be to sort out which of the (possibly) several systems is the best one for you. This will usually involve visiting numerous showrooms and being subjected to slick sales patter and dazzlingly confusing demonstrations. Listen to the sales patter by all means but be sure to ask all the questions which remain unanswered.

Unfortunately, no salesman is likely to let you test the system in the best possible way — by letting you take it away for a fortnight to try out. Disks are all too easy to copy and anyone with a Xerox machine can acquire his

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own documentation, so the salesman won't let it out of his sight until you've parted with your money. At best you'll be left alone for an hour or so to try out the system but even this may not be possible if other clients are waiting. Trudging from shop to shop is also very time-consuming and there's no guarantee that you'll find the system you really want at the end of the day. Which is why we have decided to Benchtest word processing packages.

A series of Benchmark tests has been devised to test the time taken to perform certain operations — the article following this one explains these tests in detail. The aim of the word processor Benchtests is to provide an indication of each system's suitability from the viewpoint of the four users outlined earlier; each Benchtest therefore ends with a summary indicating which user or users (if any!) will find the system most useful.

Finally, you may have noticed that I haven't mentioned a fifth type of user, the private user or hobbyist. If you're in this group, you haven't been forgotten but you're in a much more fortunate position than the 'Gang of Four' described earlier. While they have to worry about things like cost-effectiveness, staff training time and maintenance contracts, your only criterion is whether or not you can afford a particular package.

WP BENCHMARKS

A standard piece of text has been chosen for use in all WP Benchmark tests. It is, in fact, the first 3000 words of the Microwriter review printed in the December 1980 issue of *PCW* and contains 17,772 characters. The number of occurrences of the string 'Microwriter' has been increased to a nice, round 50 for reasons which will become apparent.

Once the text has been typed in and saved on disk, the following series of tests is performed and timings taken:

1. Load the text from disk into memory for editing; this time includes calling the editor program — if it is not possible to load the editor and text with a single command line, separate timings are taken for calling the editor and loading the text and are added together to give a total;
2. Save the text to disk and exit the editor;
3. With the text re-loaded, jump from the start of the text to the end;
4. Jump from the end to the start;
5. Substitute all 50 occurrences of 'Microwriter' with the five-letter string 'QQQQQ'. In doing this, the system has to differentiate between the string to be substituted, 'Microwriter', and the strings 'Microwrite', 'Microwrites' and 'Microwriting', each of which occurs once in the text. At each substitution, the system has to close up the entire text block by six characters;
6. Re-substitute 'Microwriter' for all 50 occurrences of 'QQQQQ'. This time the system has to open up the text as a result of each substitution.

Running these tests once provides a set of base times, which are printed at the end of each Benchtest. However, a 3000-word text isn't particularly long and it is useful to see how the system performs when the text buffer is, firstly, almost full and, secondly, over-full. In this latter case, a good system will automatically save the first part of the text onto disk and this is where it will begin to slow down, usually quite dramatically.

To provide an at-a-glance idea of how performance drops off as the text buffer fills and overflows, we need to provide a nominal performance degradation factor; in fact we provide two factors, one for a nearly-full buffer and one for a buffer which overflows onto disk. These factors are arrived at in the following way.

Firstly, the standard text is copied within the buffer by however many times it takes to fill the buffer with complete copies. Thus, with a text buffer of 40,000 characters, we can make only one complete copy. The Benchmarks are then repeated as before, except, of course, that we have 100 substitutions to make if we have the original text plus one copy in memory. All this gives us a second set of timings. We can now calculate a degradation factor using the formula $f=t/(n*b)$ where t is the second timing, n is the number of copies of the 3000-word text in memory and b is the base time for the operation. Figure 1 gives some dummy timings to show how this will appear. As you can see, increasing the amount of text actually speeds up the time taken per 3000 words, particularly in the disk read/write tests.

We now have to repeat the process by making a further copy of the original 3000-word text; on a good word processor, the overflow will stimulate the automatic saving on disk of enough of the start of the text to accommodate the new text. As before, we re-run the Benchmarks, work out the percentage increases and arrive at a second degradation factor. Not all the word processors we tested automatically save text on disk when the buffer overflows so we haven't always been able to carry out this final series of tests.

Timings for Benchmarks 3 and 4 may not always be very accurate as some systems manage these forward and backward jumps almost instantaneously. Unlike our Basic and Pascal Benchmarks, we cannot get a word processor to carry out these operations n times automatically and then arrive at the once-only time by dividing the resulting total by n. In these cases, the base time for the two tests depend to some — hopefully not too significant — extent on the Benchtester's reaction times.

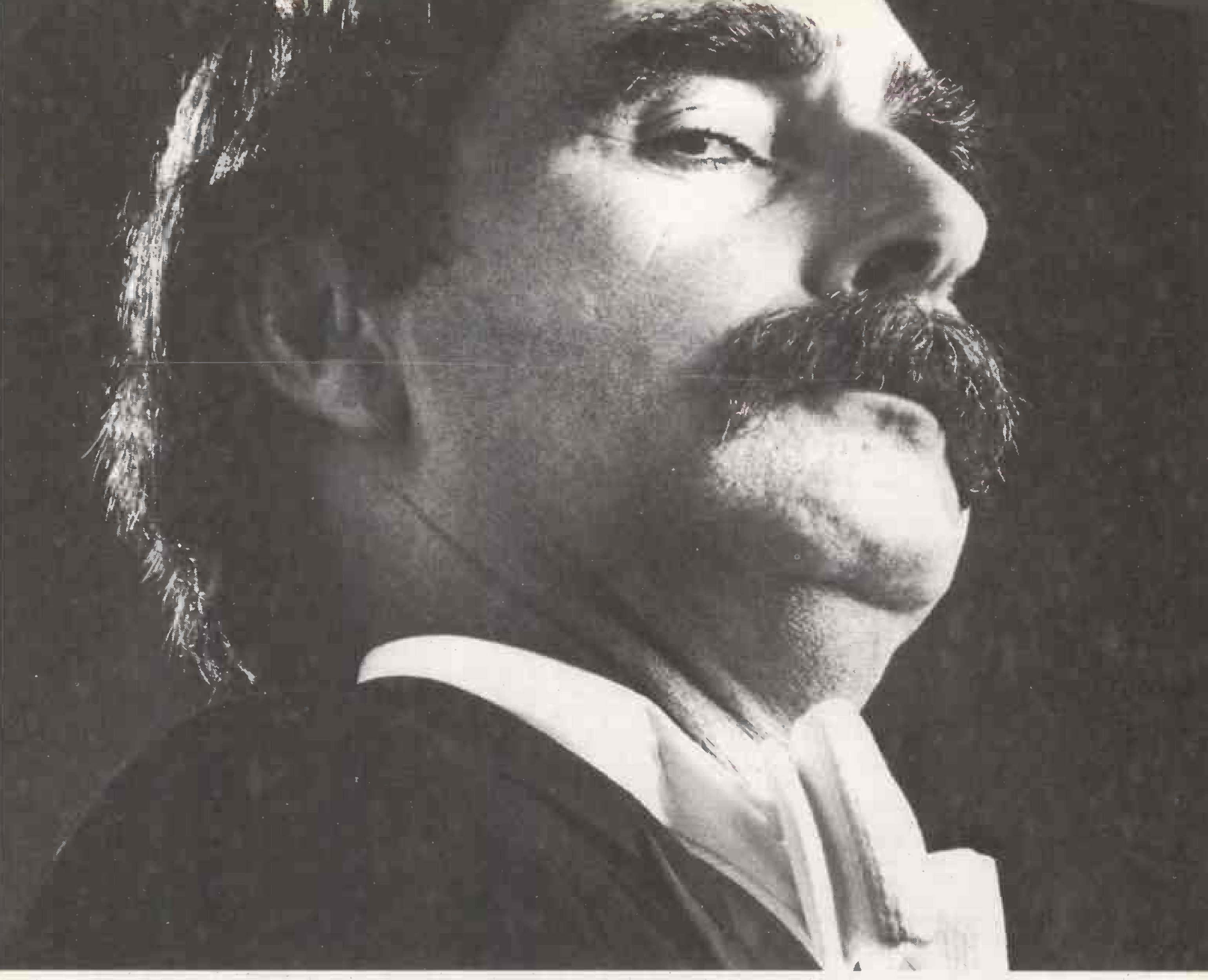
Benchmark	Base time	Buffer full	Overflow	Degradation DF2	DF2
1	27.3	33.8	35.1	0.6	0.4
2	29.2	32.1	34.8	0.5	0.4
3	1.7	2.1	11.7	0.6	2.3
4	1.5	1.9	14.2	0.6	3.2
5	6.1	11.0	21.7	0.9	1.2
6	7.2	13.6	22.5	0.9	1.0
	DF1: n=2		DF2: n=3		

Fig 1 A set of dummy WP Benchmark timings showing degradation factors.

The Benchmarks are primarily designed to show how the easy or difficult the system will be to live with when you're editing large amounts of text. If your application involves shorter texts, they will be of less interest, although Benchmarks 1 and 2 will be important as, if you're editing many short documents, the time taken to begin and end the editing of each document will be important — you don't want to spend more time waiting for the system to do its thing than you spend actually editing.

None of these Benchmarks tests the package in isolation from the hardware; the time taken to perform each operation will depend partly on the efficiency of the programmer's efforts but mostly on the hardware configuration on which the package was tested. In particular, Benchmarks 1 and 2 say more about the disk system being used than the package itself. But, as many packages are to be tested on hardware for which they have been specifically designed or adapted, this should not invalidate the timings — many users will be buying identical or very similar hardware to the configuration tested.

In addition to these tests, we also examined the printer supplied with each system and, as far as possible, used a variety of different printers throughout the series. We described their facilities, ease of use and how pleasant or otherwise they are to work with and commented on their suitability for different types of work. We have also tested how long the printer takes to print out the standard text of 3000 words. To keep this timing comparable throughout the WP Benchtests, the printer was run at the maximum speed possible with the computer being used and the text printed in a standard format: a left margin of ten characters, 60 characters per line, justified, with a top and bottom margin of six lines each, centered headings but with no fancy formatting such as different typefaces (if available) or page headings and page numbering. This enabled us to produce some realistic printing speed figures. Printer manufacturers quote speeds which can mislead — they measure the printing speed when the print head is printing at full speed in the middle of a line and this differs considerably from the average printing speed over several pages of text; one dot matrix printer on the market claims a printing speed of 80 cps but in fact prints out text more slowly than a 45 cps daisywheel because it doesn't print bi-directionally and has a very slow carriage return action at the end of each line.



INNOVATIVE

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The introduction of a brand new word processor is a major event and AJEDIT is without doubt a major program. There are, however, quite a few Word Processors around and most of them are extremely good ones - why, therefore, another? The question is even more pertinent when it is known that we specifically commissioned the writing of it from an author of the status of Denville Longhurst of Enhanced Basic fame. The answer is that user feedback shows that a large number of customers do not need or want word processor programs which require a quantity of training before use. Scripsit, for instance, is an excellent program, but is complex to use; it even comes with a training course on tape. If one operator is dedicated to using the word processor then it makes sense to have her trained, and the more complex the program (so long as the complexity is accompanied by more and bigger functions) the better.

AJEDIT has been written for the user who needs a word processor intermittently, say three or four times a week. Its prime design criteria was ease of use - and just as importantly - ease of recollection of its commands. Take, for instance, the text editing commands - they are as close to the Basic Edit commands as possible, so that the user will remember them: To insert type I, to delete D, to take out three letters type 3D and so on.

Furthermore, AJEDIT has benefited from being written after a number of other word processors. The deficiencies in its predecessors are corrected in AJEDIT. For Instance, any control characters can be outputted so that full advantage can be taken of the features of the particular printer being used. Disk directory access is available from within AJEDIT as is the killing of files on the disk. The FREE command and a number of other DOS commands can be carried out from within the program with a return to AJEDIT - with its text intact.

AJEDIT contains close to one hundred commands covering most word processor requirements. Dedicated printer commands for the Epson MX series and the Centronics 737 are included - again for ease of use of these two popular printers.

One of the big features of AJEDIT is the ability to ''mail-merge''. The facility is available whereby two special files are created, one containing names and addresses and a salutation, the other a standard letter or form. AJEDIT will call the address and salutation from one file and the letter from the other and thereby compile personalised letters. The salutation may be repeated in the body of the letter.

AJEDIT needs 48K and one disk minimum and is suitable for the TRS-80 Models I and III and the Video Genie Models I and II.

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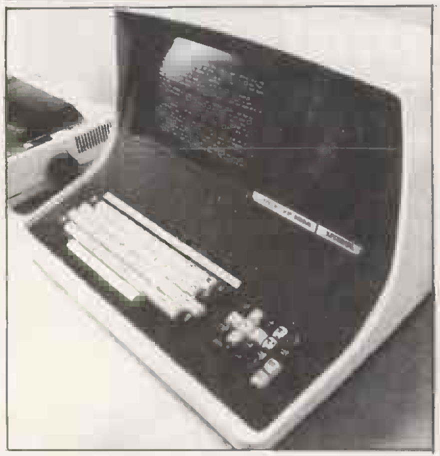
MAGIC WAND



Magic Wand is a very comprehensive word processing package produced by Small Business Applications Inc of Houston, Texas. It runs under CP/M and is one of the most versatile micro-based word processor systems currently available.

This test was carried out on a 64k Intertec SuperBrain running CP/M 2.2, with twin double-density minifloppy disk drives and an Epson MX-80 dot matrix printer. The version of Magic Wand tested had been specifically adapted to the SuperBrain and the computer itself had a set of special function keys replacing the normal numeric and cursor control keys.

Magic Wand comes as two separate programs: a text editor, with which you prepare your text, and a text formatter, which types the text in a format specified by you during the editing stage.

Editing

The editor is called from CP/M simply by typing EDIT and the file name, which can be either a new file or one already existing. You can type a second file name on the same command line and the results of your efforts will then be saved under this second name, which is useful if you want to leave the original file unaltered. Otherwise, Magic Wand saves text under the first file name and preserves the original file as a back-up.

Once the editor has been loaded, you're asked to insert the disk holding — or to hold — the text file and if the editor can't find the named file on the disk it asks you to confirm that you're working on a new file; this ensures that you'll notice if you intend to work on an existing file but had accidentally inserted the wrong disk.

You then find yourself looking at the command screen, which shows you what files are in use, the number of words and characters in the text buffer, the number of characters remaining and the current line length and tab positions.

A range of commands can be executed from the command screen, most of which are activated by only one or two letters. Typing an illegal command or a '?' causes a menu of all commands to be displayed; typing a command followed by '?' provokes a terse, single line explanation of the command.

Having set up the screen line length and any tabs you need, you move from the command page by pressing return. If you're working on an existing file, you find yourself at the top of text; with a new file, the screen blanks disconcertingly — the electronic equivalent of a fresh sheet of paper!

The Magic Wand editor provides all the facilities one expects from a good screen-oriented word processor. There's no need to hit return when you near the end of a line as the system has automatic word wrap-around — if the whole word won't fit onto the line, it's completely transferred to the start of the next line, which aids readability tremendously. Not pressing return takes a little getting used to but it speeds up editing significantly; you can, of course, use return to force an end of line — at the end of a paragraph, for instance.

Special function keys are provided for all the inserting and deleting. You can insert/delete a character at a time simply by positioning the cursor at the appropriate place and pressing the required key; the line is opened or closed automatically on the screen as you type. A 'full insert' key opens up several lines on the screen to allow you to type in large chunks of text — the mode is cancelled by hitting the same key again. Other keys allow you to scroll back and forth both a line and a page at a time, while another pair provides an instant jump to either the top or the bottom of the text.

Search and replace commands are provided via a special key; pressing it drops the cursor to the bottom line of the screen and you type in the strings to be searched for/replaced on this line. Search/replace operates on the text between the cursor position and the text end. A repeat search key is provided and is self-explanatory. Replace will take place on all occurrences of the specified string or on a specified number of occurrences; a query option is available, which allows you to miss out some occurrences if you wish.

Two commands deserve special mention. The Include command allows you to specify a file and incorporate all parts of it into your text. Thus you can have a file of standard paragraphs on disk and select from them as you compose your text. The system displays the text to be included and gives you the option of either slotting it in or moving on to other parts of the Include file.

Spool enables you to print and edit simultaneously. Having edited one file and saved it on disk, you can then get on with editing another, using Spool to print out the first one. The theory's fine but I found it nearly unusable since the system gives priority to servicing the printer with the result that response to the keyboard slows down dramatically, to well over a second between pressing a key and the character appearing on the screen, in some cases. It's pretty debateable whether using Spool would actually save you any time.

The block commands are straightforward but only allow you to have one block active at a time. Yes, there's a special key to insert block markers but these have to be deleted by returning to the command screen and using a special command after you've carried out your block operation.

The editor allows you to print a draft copy of your text; the printout is exactly what you see on the screen, which means that any embedded formatting commands (see below) are printed instead of being executed.

The text buffer holds 37,633 characters, just over 6000 words or 13 single-spaced A4 pages. Once the buffer is full (you're warned in advance) you must save the text to disk and continue on a new file. Magic Wand won't handle a file which is larger than the text buffer. If you're working on very long texts you may find this a trifle annoying as you'll have to split text into chapters or sections; it does mean, of course, that while you're working on chapter nine you can't zip back to chapter three to check what you said there. On leaving the editor, you are given the choice of saving the text on disk, either as a new file or as an update to an existing file, or of simply quitting without saving the text.

Formatting

Having prepared your text with the editor, you must first save it on disk before running the formatter program, which is called simply by typing PRINT followed by the file name.

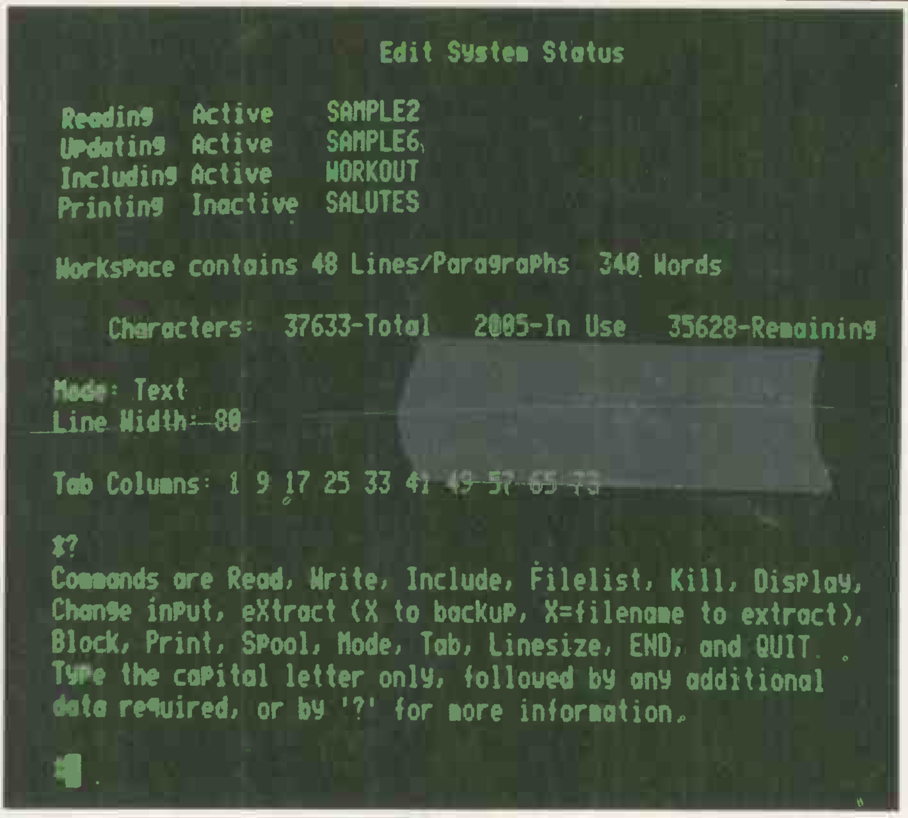
At this point an annoying inconsistency manifests itself. Once again, Magic Wand invites you to mount the disk containing your text file and press return. However, the formatter has no equivalent of the editor's command screen so, assuming the text disk is mounted, printing starts immediately after you hit return. Printing can, however, be aborted and you can start all over again, this time prepared for the fact that instead of hitting return, you can also enter commands: one allows you to preview the formatting instructions embedded at the start of the text and alter them if necessary, although if other commands occur later in the text, they will be executed when the formatter gets to them.

As well as entering the formatting commands after calling the formatter, you can also insert (embed) them into text during editing; they are separated from the actual text by the '\' character. If you happen to want to print that character, you can define a different character (or no character at all) as the command recognition character. Various other characters with special meanings, such as '&' for ghost hyphernation, can also be changed at will at any time in the text file. The formatting commands themselves can be entered either as abbreviations or in full to make them readable to less experienced users.

Magic Wand has some very sophisticated formatting capabilities as well as the usual ones provided by most word processing systems. Thus you can not only specify either justification (both margins even) or range right (ragged right margin, as produced on a normal typewriter) but you can print out range left, with the right margin lined up and the left margin ragged, a sort of 'mirror image' to normal typing!

The system gives you total control over the page layout, although there's a minor, initially annoying inconsistency with the margin commands: lm10 sets the left margin at the tenth column of the page but rm70, instead of setting the right margin at the 70th column, as in most systems, actually sets the *line length* to 70 characters, so the right margin is the 80th column. Top and bottom margins can be defined and you're given the ability not only to paginate but to place the page number anywhere you want to, even half-way through the text if you so desire. Magic Wand caters for text and paragraph indentations and allows you to centre lines or whole blocks of text between the margins. You can produce both page headings and footings of however many lines you require. Line spacing can be set to any number from one to six.

An extensive range of commands is available to control the printer. These range from a simple OUT command, which enables you to send out any ASCII control codes you like, to some very sophisticated commands for equally sophisticated printers, the expensive sort with proportional spacing, bolding, underlining, super- and subscripting capabilities, etc — Magic Wand caters for all these features. This allows you to produce justified text where the justification is achieved by varying the spacing between letters rather than by adding spaces between words, as is done with cheaper printers. Using Magic Wand with an expensive daisywheel printer, you could easily produce camera-ready artwork for printing which would feature some extremely sophisticated formatting and be virtually indistinguishable from properly typeset work.



The editor's command page (see text). Shown at the top are the input and output file names; part of another file ('Workout') is being included and a fourth file is being printed in the background. Also shown is the commands 'help' menu.

Other commands available include: a draft facility, which allows you to print a file containing speciality printer commands onto a faster dot matrix unit so you can check the formatting; the choice of printing onto continuous stationery or of pausing after each page to allow the insertion of single sheets into the printer; and the ability to print multiple copies of the same document, with or without a pause between copies.

As the Epson doesn't permit variable spacing between letters, justification was performed by adding spaces between words and Magic Wand seemed to do this particularly intelligently, frequently inserting the extra spaces after full stops or in the middle of lines instead of just at one end of the line; the result is a very neat printout.

Various facilities are included to make life easier for the operator. You can insert comments into the text file which will not be printed during formatting; NOTE prints a message to the screen only; WAIT stops the printing and waits for a command to be typed in (you can add a prompt which will appear on the screen); and SHOW prints on the screen the current values of any variables (see below) you specify, together with whatever explanatory text you require.

Summarising, the Magic Wand formatter is extremely powerful, as powerful as any user is likely to require without having resort to full typesetting facilities; it enables the user to produce simply-formatted documents with great ease and complex formatting with little extra effort.

Files and variables

If the features I have described so far were all that Magic Wand offers, it would still be a powerful tool for many in the form of the provision for variables with accompanying commands which are on the verge of being a programming language, plus the ability to set up files which can be referenced by Magic Wand as it is printing text.

Files are set up using the editor as though they were pieces of normal text. The files can be either 'data', such as names and addresses, together with other details such as the salutation used for each person ('Dear Mr Harris,' or 'Dear "Bumper",' for example) and any other details you require; or they can be paragraphs of text which you might wish to incorporate into standard letters to customise them.

There are four types of variable: string, numeric, formatted and system and you can have up to 128 variables in any one file. String variables can be up to 55 characters long (you can set them to shorter lengths to save on memory space) and you can reference the first n characters of a string. Numeric variables are positive integer only in the range 0 to 32767. Formatted numeric variables, used mostly for amounts of money, are printed out to two decimal places with commas — 10000.5 would be printed as 10,000.50, for example and you can set this to print out in continental format: 10.000,50.

These variables can have their values set in different ways: in the text file, using the SET command; from the keyboard when you run the formatter, using the GET command; or from a data file — it's this last capability which makes Magic Wand a very powerful tool indeed.

The system variables are for page number (the only one alterable by the

Condensed typeface
Condensed enlarged
Condensed double
Normal typeface
Normal emphasised
Normal double
Double typeface
Double emphasised
Double double

Fig 1 Sample typefaces from the Epson MX-80.

user), the pass number for when you're printing multiple copies of a document, the current file record number being accessed, an end of file marker, current line and column numbers and the number of lines left on the page. You can use this last to force a new page before printing a heading if there aren't enough lines of text after it — that way you avoid ending up with a heading on the last line of a page.

Coupled with the variables are conditional commands which allow you to test for a condition and act according to its value: IF NAME = "Fred", SKIP 4 would skip the next four lines if the value of the string variable NAME was "Fred", for example. So, you can get variables from a file of, say, names and addresses and print one of a variety of different paragraphs according to the variable's value.

You could use Magic Wand for many applications without ever using the variables feature; with variables, you have a word processor of great sophistication and power which would provide a very useful tool in a business environment.

Learning and documentation

As you will have gathered from the above, if you want to exploit the full potential of Magic Wand, you have a lot of learning to do. Fortunately, this is made very easy by what must be one of the best examples of documentation in the micro world.

The first two-thirds of the manual are a series of lessons which take you step by logical step through all of Magic Wand's abilities. The lessons use a series of text files which come on the disk with Magic Wand — you play the part of Abraham Lincoln's secretary, working on a draft of the Gettysburg address, which you have to polish and alter until the actual address results. You then go on to set up standard replies to various types of letters (from friendly to threatening) and a file of names and addresses so that each person gets the reply he deserves.

At each step you're given a photograph of what the screen should look like and reproductions of the printout produced by it. These are very useful for checking that you're actually doing what you're suppose to be doing.

The lessons are structured so that you can drop out at whatever level meets your requirements — there's no need to wade through files and variables if you want to use Magic Wand for straightforward text editing and formatting. Great care has been taken to explain any technical terms in full as they arise so that the complete novice can sit down with the manual and feel quite at home with the system from the start.

The final section of the manual contains summaries of the editing, formatting, files and variables commands. Two of the commands which appeared on the editor's command screen were nowhere explained in the manual but this apart, the summaries were well-written, logically laid out and easy to use.

The book also includes a brief introduction to CP/M, explaining all the features which are likely to be of concern to Magic Wand users.

Users

Because of its wide-ranging facilities, Magic Wand should prove useful to all four of our 'standard' users (outlines in the introduction to this series last month), although some of them would have to accept certain limitations.

The text buffer capacity of just over 6000 words could be regarded as a handicap unless you accepted the minor inconvenience of working by chapters and storing them as a series of separate files. The author/journalist would be most affected by this feature and in fact this user would be unlikely to make use of many of Magic Wand's capabilities, especially the files and variables facilities. On the other hand, many authors would find the hardware/software configuration attractive — Magic Wand is easy to learn to the level required for this use and the SuperBrain, with its integral construction, sits tidily on a desk. The Epson is a very civilised little printer for this application.

For the report writer there's again the 6000 word limitation but this is probably less of a problem than for the author. Again the report writer would probably not use the package's more sophisticated facilities but the very extensive formatting features would be of immense value in this application. Coupled with a high-quality daisywheel printer (the Epson would be useful only for rough drafts to check formatting), Magic Wand should fulfil most report writers' needs.

The manager would also find Magic Wand useful, although he would certainly use only a few of its capabilities. His requirement for quick and easy learning is more than met by the excellent manual and, of course, the extra facilities are still there for him to get to grips with for urgent work on the secretary's day off. The Epson would be at home in the manager's office for draft work since it's neat and unobtrusive.

In the introduction to this series, I said that the secretary is probably the most demanding of all four users. Magic Wand has been devised quite clearly for use in a busy commercial environment and would meet most requirements in this area. The system is friendly and foolproof but it's probable that, to make use of its full facilities, the secretary would want to go on some kind of a course — although the manual is certainly sufficient, a busy office is hardly the place to sit and learn the advanced features Magic Wand offers.

Hardware

The SuperBrain was Benchtested in *PCW*, August 1980 so I shall not go into its technical features and will concentrate on its suitability for word processing.

Firstly, the keyboard felt a little flimsy to me — the keys have a very light touch and a rather tinny feel to them.

The display was quite civilised, having a matt-finish screen to cut down reflections and a brightness control at the back of the machine. The character set is a little odd; characters such as 'g' and 'y' have proper descenders but these don't actually descend — instead, the characters are raised so the bottom of the descender aligns with the bottom of other characters. The overall effect was most graphically described by Sue Eisenbach in her Benchtest as 'vaguely ransom note' but the novelty quickly vanishes and after a couple of hours I didn't even notice it.

The disks each have a capacity of 179 kbytes, about 25,500 words or 56 A4 pages (single spaced), which is probably adequate for many people. The disk drives on the model I tested were permanently running — this creates noise (not too much) but, more importantly, increases wear both to the disks and the drives themselves. You can reduce disk wear by removing the disks once you've loaded the programs and text but drive wear might prove a problem. Some models of the SuperBrain have been modified to turn off the drives when they're not required so this problem won't apply to those.

Any cheap printer with an RS232 interface will plug straight into the SuperBrain's auxiliary port. Another RS232 port is provided which makes linking to other computers, directly or via modems, quite easy. High quality daisywheel printers can also be hooked up and, because the SuperBrain comes all in one box, there'll be a minimum of trailing wires to trip over in the office.

The special function keys which replace the SuperBrain's usual numeric and cursor control keys make the whole system very easy to use but at £50 they're very over-priced.

The Epson MX-80 is a very nice printer. It's very well made, as one would expect from Japan these days, is compact, light and very quiet. As the Benchmark results show, it's not particularly fast despite its bidirectional printing but the print quality is very good, as shown in Figure 1. Quite a variety of typefaces are available by sending sequences of control codes; of these, the emphasised condensed gives very dense, black characters which would, at a pinch, pass for correspondence quality for those not-too-vital letters. By changing switch positions inside, you can get standard ASCII, English, French, German and Japanese character sets, the European character sets differing in that the English set gives a '£' sign instead of '#' and the others provide accents and umlauts. TRS-80 graphics are also in there, unless you set up for Japanese characters, which replace most of the graphics. Depending on which character set you choose, the Epson prints over 40, 66, 80 or 132 columns and takes paper from 4in to 10in wide. I tested the F/T version, which has both pin and friction feed; these mean that, by disabling the paper-out sensor (with a special control code or a screwdriver), you can print on single sheets. The printer will accept one original plus two carbon copies. It uses a cartridge ribbon which is very easy to fit and the print head can also be replaced by the user — the manual tells you how to do it and replacement heads cost about £15. The bell, incidentally, is *very* loud.

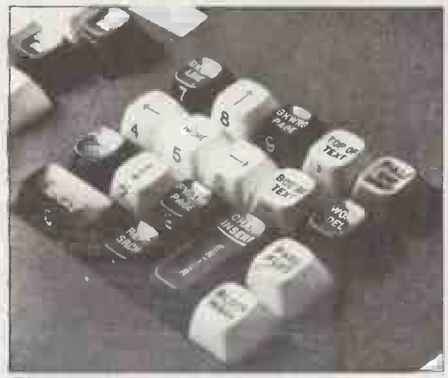
Summary

Magic Wand is designed specifically for commercial use and as an office tool it's a winner, providing a wide range of extremely powerful facilities. The secretary will be its heaviest user but the report writer will also find it very useful for its powerful formatting capabilities.

Thanks to the excellent manual, most users should have no trouble in learning the system to whatever level they require.

Coupled with Magic Wand, the SuperBrain is very good for word processing, especially when fitted with the special function keys, which make a major contribution to the system's ease of use.

The Epson is a very nice printer, certainly one of the better low-cost dot matrix printers on the market today. For draft or manuscript production it's ideal, but serious users will require a daisywheel unit to produce correspondence and report quality material.



The special function keys, which replace the SuperBrain's numeric pad.

WP Benchmarks

Magic Wand/Intertec SuperBrain

WP Test*	Base	Buffer full	DF1 (n=2)
1	24.5	37.3	0.7
2	24.3	39.5	0.8
3	1.2	1.3	0.5
4	1.0	1.7	0.9
5	3.0	5.5	0.9
6	3.1	5.9	1.0

All times in seconds

Epson MX-80 F/T printer test*

Claimed printing speed: 80 cps
Tested speed: 45 cps (485 words/minute)

* See April 1981 *PCW* for details of WP Benchmark tests

Prices (excluding VAT)

Intertec SuperBrain, 64k RAM, twin 5¼in disks:	£1595
Special function key set:	£50
Epson MX-80 F/T printer:	£399
Magic Wand:	£250

Our thanks to the London Computer Centre for the loan of the hardware and software for this review.

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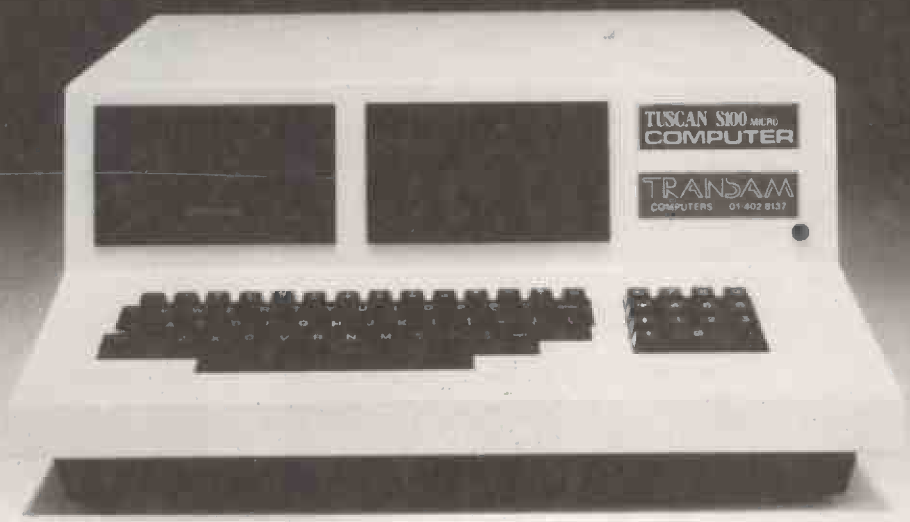

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BUSINESS SYSTEM DEALERS. Business Equipment Centre, 10 Edge Lane, Liverpool. Tel: 263 5783. Contact: Rod Crofts.
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FORMAT-80

The Apple II is one of the 'old faithfuls' of the micro world; it has been around for ages (or so it seems) and is one of the world's top-selling machines. This means that programmers and retailers have had plenty of time to get used to its quirks and that plenty of companies have been able to produce hardware additions to plug into the slots provided inside the case for this purpose.

The result is that, no matter how weird your application, it's quite probable that someone, somewhere has produced a piece of hardware and/or software to do the job on an Apple.

Word processing isn't, of course, a particularly weird application but the standard Apple II is not really suited to the job, mainly because of its 40-column screen and its lack of a true, typewriter-action shift key. (And please don't write in to say that you find 40 columns perfectly adequate for WP; either you haven't tried an 80-column system and don't know what you're missing, or you're not processing lots of business-type words.) Both these drawbacks can be overcome, though; there are several 80-column plug-in cards for the Apple and a proper shift function can easily be fitted. All you need now is the WP software.

This review is of a twin-disk Apple II Europlus, fitted with a Computer Stop 80-column card. The software package is Format-80, produced in-house by Apple specialist Personal Computers Ltd (no relation to this magazine). The package is an all-in-one editor and formatter which, as a bonus, includes a mailing list handler.

Editing

Format-80 is loaded simply by slotting the disk into drive 1 and switching on the Apple — it loads and starts running automatically. The disk, incidentally, is copy protected, which means you can't make a back-up copy and have to go back to Personal Computers if the master disk fails.

After loading, you are presented with a master menu which allows you to initialise disks, view the disks' directories, load, save, replace or delete text files on disk, print text or work on the mailing list. Additionally, there are two editing commands, one for 'old' text (ie, text already in the Apple's memory) and one for 'new' text, which means what it says.

Format-80 calls each text file a 'page', which means a memory-full of text rather than a printed page. The maximum page size is 80 lines long, which means just over 900 words will fit into each file. Once you've filled a page, you must save it to disk and continue on a new page.

The editor offers two modes of operation, text entry and format. In the text entry mode, everything you type appears on the screen; the system has word-wrap built in so there's no need to hit return at the end of each line — the word you're typing is transferred to the start of the next line if it won't all fit in. As well as word-wrap, Format-80 has automatic hyphenation built in, although this seems a little timid; in theory, it should hyphenate words correctly at the end of each line and only perform a word-wrap if it can't find a suitable place to put a hyphen, but in practice, over a *lot* of text editing, it only hyphenated twice and got both of those wrong ('pocket-sized' came out as 'pocket-s-ized', for example). The hyphens, incidentally, are 'ghost' hyphens, which don't appear on print-out.

You can move the cursor back to correct mistakes, using the back-arrow key, but the forwards arrow key provides a tab function since there's no tab key on the Apple's keyboard. Tab positions can be set while in the entry mode, the positions being shown by little arrows above and below the text area on the screen. Right and left margins can also be set and these are shown by white bars above and below the text. There's a column counter at the top of the screen to help set margins and there's also a line counter.

A shift lock is provided by pressing control and shift together and is unlocked by pressing shift, an action as close as it's possible to get on the Apple's keyboard to that of a real typewriter.

You enter the format mode by pressing escape, which has a toggle action; the screen tells you which mode you're in, which is important because in format mode, nearly every key activates a command. 'Format' is actually a slight misnomer — quite a few of the commands are editing commands.

The format mode gives complete cursor control: the ← and → keys function as expected, while up and down movements are also available. You can also move the cursor to the following word, line, sentence, paragraph or text block, jump to the start or end of similar locations or scan backwards or forwards through text at variable speeds to check it. The Apple has a repeat key, a must for cursor movements.

Text can be inserted at the cursor position and a simple, one-character delete function is activated by hitting the 'X' key. More elaborate deletion is also provided, operating on line, paragraph and all text and there's a blank command which differs from delete in that a blank space is left in the text, while delete closes it up.

There's a find command, which positions the cursor at the start of the sought text and there's a search and replace facility, oddly called edit, which is rather more intelligent than that on other machines: suppose, for example, you want to replace 'the' with 'some' throughout your text; unlike many other word processors, Format-80 will also act on 'The' and 'THE', replacing them with 'Some' and 'SOME', a very useful feature indeed.

A block move command is available, which allows you to place a block in a reserved part of the Apple's memory and recall it later for insertion at any desired place in the text.

Format-80 provides a useful range of editing commands, then. The only real criticism I would want to make is of the amount of key pressing needed to activate them. To delete a line, for example, when you're busy entering text, you must press escape to get into the format mode, then D for delete followed by L for line, then escape again to continue entering text. The reason is partly that care has been taken to keep the commands easy to remember and to provide sub-menus wherever possible, and also that the Apple's keyboard has no spare keys which can be dedicated to special functions; it would be interesting to know whether the add-on numeric keypad unit, with suitably re-labelled keys, could be used to activate some of the more frequently-used commands.

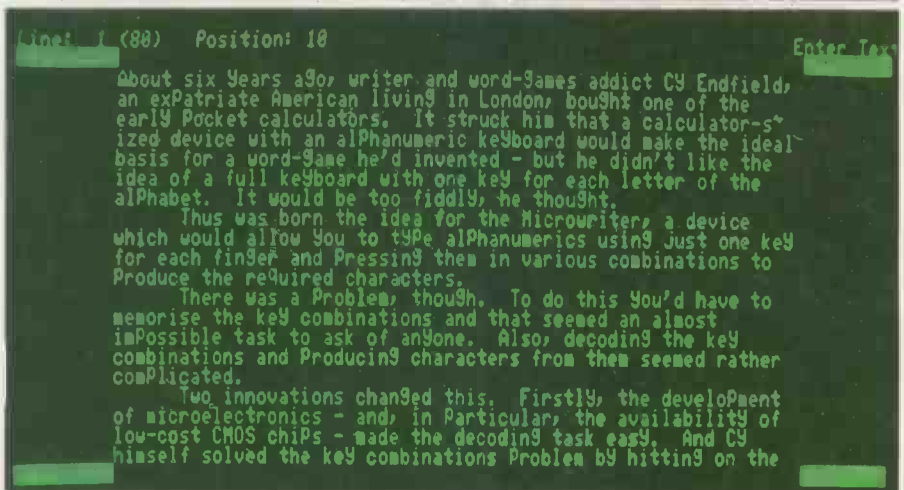
Saving text to disk is quite straightforward. Each page of text must be given a name and a number so that a document can be split into several pages — 'Text 1', 'Text 2', etc. Format-80 won't let you save a page with the same name and number as a page already on disk — you have to use the replace command instead, so there's little chance of accidentally over-writing your previous efforts. Each disk can hold up to 17 900-word pages. One annoying omission is a disk-to-disk copying command, so backup copies have to be made by loading individual pages from one disk into the Apple's memory and then saving them onto the other disk.

Formatting

Format-80's formatting is a mixture of pre-set system parameters and embedded commands. The embedded ones are entered while editing, using the format mode, and have an immediate effect — you can see what you've done and undo it if it's not what you wanted. In this way you can centre lines, justify text, close up blank spaces, insert printer codes, de-justify, underline, slide lines up and down and slide words left and right. You can also align numbers by decimal point, which is handy, although Format-80 contains no mathematical functions for adding columns of figures. (One of the nice things about reviewing Format-80 was that, as it's a British product, its author Mike Hardwick was but a phone call/tube ride away. The reason for not including maths functions, he explained, was that he felt that such functions shift responsibility for the figures away from the boss to the secretary. I see his point, although I'm not sure I agree that such a shift is always a bad thing.)

Another range of formatting parameters can be set up and saved on the master disk. These include the number of lines per printed page, what happens at the end of each page (form feed or wait for a key to be pressed, for example), the pagination start number and details of the header and footer. Special ASCII character sequences can be specified to be sent to the printer in response to printer codes embedded within the text, allowing the system to cope with special printer functions such as bolding, underlining, super- and subscripting. Format-80 can also cope with the proportional spacing found on the more exotic printers. The parameter file also includes comprehensive heading and footing options, which is a little inconvenient as you can't then easily change these within a document.

You can print either the text in memory or one or more pages on disk and multiple copies are catered for. There is no facility for previewing the text on the screen in its final format, with pagination, headings, etc.



Top: the system as tested; centre: part of a text page during entry — the white bars show the margins; bottom: an entry in a mailing list, with labels.

Mailing list

Format-80 contains a mailing list handler which allows you to build up and manage a file of up to 442 names and addresses per disk. Each line of each entry can be given a label and lists can be sorted by any of these labels; you can also create a standard letter incorporating label names and these will be substituted in each copy of the letter by the entries corresponding to those labels. Comments can be added under each mailing list entry.

The version of Format-80 tested was a pre-release version and had one or two features yet to be finished; one of these was a logical function which will allow, for example, selective printing of names and addresses depending on the contents of the labels' fields. Thus you could print 'personalised' letters to every solicitor in Birmingham whose name wasn't Smith, for instance.

There are facilities for reviewing, altering and deleting records in the list and for initialising disks. This last function is a little awkward as it doesn't allow you to initialise an unwanted text disk for mailing use — you have to initialise the disk using the Apple disk operating system and then re-initialise it from the mailing list section of Format-80.

Documentation

As the tested version of Format-80 was incomplete (as well as the mailing list logic, a whole-document word search and replace function hadn't been implemented), the accompanying documentation was also preliminary, taking the form of an 11-page 'Firstguide'. This briefly explained most of the package's features apart from the mailing list and was intended as a very quick introduction to the system. By the time you read this review, the final version of Format-80 should be ready, complete with a 200-page manual which, in view of the high standard of the software, I would expect to be very good.

Users

How, then, could Format-80 appeal to our four user groups?

As I said last month in my review of Wordpro 4 Plus, being a member of the author/journalist group, I don't find a system which enforces the splitting of documents into a number of separate files particularly convenient to use. If you weren't bothered by this, though, the system contains all the editing and formatting functions you're likely to need. Public relations-type persons might find it particularly handy for writing and mailing medium volumes of press releases.

The report writer would also find the system limiting, but to a lesser extent than an author, although the formatting commands — of great interest to this user — are not particularly powerful. The system does, however, allow good printer control, so fancy typefaces, etc, could compensate for this.

For the manager or small businessman, Format-80 could prove a valuable tool; like Wordpro on the SuperPET, it gives you a useful WP system while allowing the computer to be used for other things — there are certainly plenty of good business software packages available for the Apple.

Secretaries would feel very at home with the system. One of the main considerations in the package's design has been to make the hardware as much like a normal typewriter as possible, in terms of the way it's operated, while taking advantage of the features which only a WP can provide. This is as it should be, for a word processor is a piece of office equipment, not a computer, and should therefore be as user-friendly as possible. Format-80 *is* friendly and would make a useful general office tool.

Hardware

As I said at the start of this review, the Apple has been around almost since the dawn of the microcomputer age; it's a well-proven, well-known machine with a good reputation for reliability and has a well-built, quality feel to it. If it does go wrong, then there are plenty of people around to help you out.

For word processing, I found it quite pleasant to use. The keyboard felt a little cramped as it's slightly smaller than that of a standard typewriter, but the keys have a nice solid feel to them. A major horror when using the Apple as a computer is that of accidentally hitting the reset key when you intended to hit return, thereby destroying the program in the memory; with Format-80, hitting reset merely puts you back to the master menu and leaves the text in memory unchanged.

The modification to provide a true shift key is very simple and Personal Computers will do it for free if you buy either a complete system or just Format-80 from them; if you can't take your Apple along to have the mod done, PC will supply a circuit diagram, instructions and telephone advice for you to either do it yourself or have it done by a local dealer. The mod includes a switch at the rear of the machine to restore the Apple's normal shift function, should you also want to use it as a computer.

The output from the Computer Stop 80-column board is of good quality, although there are no true descenders on letters like 'p' and 'g'; the display actually has 81 characters on 25 lines.

The Apple's keyboard

You may have noticed that I haven't mentioned a printer so far in this review. Personal Computers supplies a choice of daisywheel printers for quality output, including the new Olympia 17 cps machine; unfortunately none of these was available for the test period and a Centronics 703 dot matrix unit was supplied instead. This defied my attempts to get it to work so printing was done on my Epson MX-80, which was reviewed in the Magic Wand test.

Summary

Format-80 is a friendly, well-designed word processing package which provides a useful range of functions for general office/small business use. It would appeal most to small business users, especially those wanting to use their Apples for other purposes. It's a particularly helpful system, with menus and sub-menus for almost every command, although the penalty paid for these is that you have to make more keystrokes to activate some functions than are necessary on other systems.

The Apple in the configuration tested is a pleasant machine for word processing, has a good reliability record, plenty of service backup across the country and can be used for many other applications.

Finally, because of the system's 900-word maximum page capacity and the lack of the document-wide search and replace function on the version tested, it wasn't possible to run any of our WP Benchmarks.

Prices

48k Apple II with twin disks and monitor	£1664
Computer Stop 80-col board	175
Format-80	300

Prices exclude VAT and are those of Personal Computers Ltd, whom we would like to thank for the loan of the hardware and software tested.

Format-80 update.

Personal Computers Ltd has informed us that the following changes have been made to Format-80 since the above Benchtest was written.

The logic function in the mailing list has been implemented and a find facility added. The complete manual has been produced, comprising a 90-page Quckguide and a 200-page reference manual. A utilities disk is included which allows the user to create his own character table and his own space table for proportional space printing, provides transmission facilities to transfer files via communications files and provides file converters to and from Apple DOS file types. Format-80 is copy protected but the user is supplied with *two* copies; back-up copies of text and mailing list disks can be made using standard copy utilities. And 10 user-definable keys have been provided through CTRL 0—9 to allow special characters and/or printer macros.

Format-80 works with the majority of 80-column cards, not just the Computer Stop board and, as a bonus, Videx Videoterm users get an inverse ROM. Any Apple-compatible printer can be used. Format-80's authors are Michael Hardwick and Gordon Beckmann of Elite Software Co; it is distributed by Personal Computers and is available from many Apple dealers.

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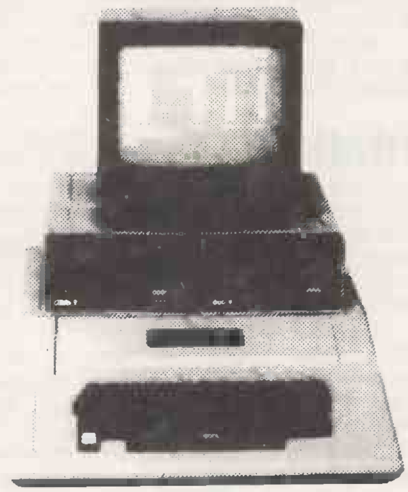

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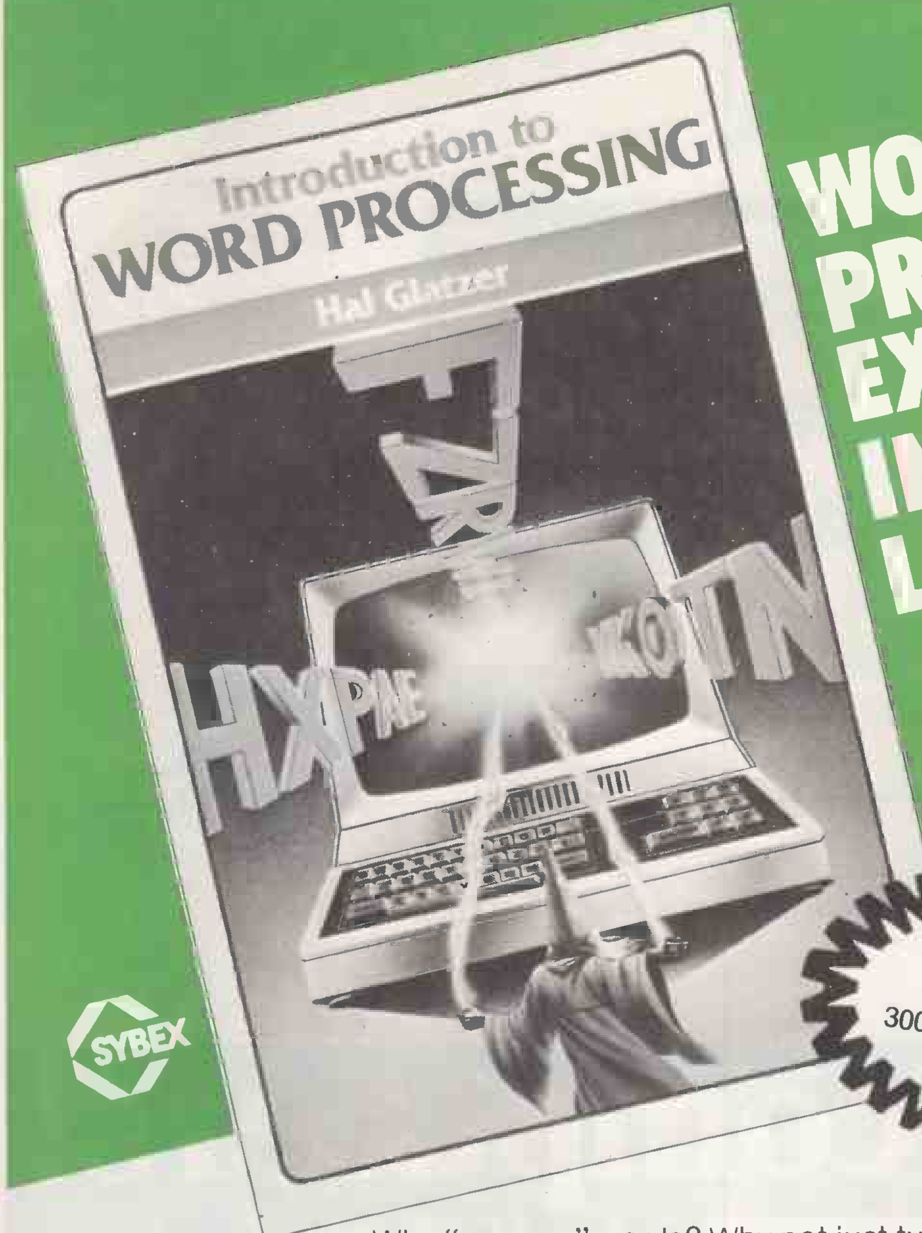

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MEMORITE III

Vector Graphics is an American microcomputer manufacturer which makes no secret of the fact that it's interested only in selling business machines. In the States, in fact, it doesn't even advertise in the computer press, preferring to concentrate on the sort of publications that businessmen read.

The current range of Vector Graphics machines starts with the single-disk VIP (which we Benchtested in February this year), continues through the twin-disk System B and 2800 systems and peaks with the recently-launched 3005, which has one minifloppy disk and one 5 Mbyte winchester hard disk.

Vector Graphics markets a number of packages, including a Visicalc-like planner called Execuplan and a word processor called Memorite III, the subject of this test.

Memorite III will run on all the Vector Graphics machines but I couldn't resist the offer of the top-of-the-range 3005 as the hardware to test Memorite; I'll talk about the hardware in more detail later.

Editing

Memorite III is a combined editing and formatting program which, although it runs under CP/M, has been designed specifically for Vector Graphics machines ('six man-years to develop,' says Vector).

With Memorite loaded, you're left with a text buffer of 30, 170 characters, approximately equivalent to nine and a half single-spaced A4 pages.

The editor provides a good range of facilities and, although there are plenty of commands to remember, they are all simple and most are sufficiently logical that they very quickly become second nature to use.

As with most of the better word processors, Memorite gives word wrap-around, enabling you to dispense with pressing return at the end of each line, which speeds up text entry enormously. Four cursor movement keys are provided and the up/down keys, when shifted, provide backwards/forwards scrolling; this last feature can be changed to display screenfuls at a time rather than continuous scrolling. Keeping the keys depressed while scrolling progressively slows the scrolling speed, right down to almost one line per second. You can also jump directly to the beginning or end of a screen or of the whole text. One nice feature is that, before scrolling or jumping around, you can save the cursor position and return to it immediately afterwards simply by pressing the escape key.

Inserting text is done either on a character-by-character basis or by opening a line on the screen, which, if not completely filled, will be closed up again when you exit this mode. Deletion works on single characters or from the cursor position to the first occurrence of any specified character; this allows you to specify a space for word deletion, a '.' for sentence deletion or even a return for paragraph deletion.

All the commands I have mentioned so far operate directly from the editing mode, mostly by pressing easy-to-remember control commands. Other facilities are available by exiting the editing mode to get into the command mode — these include all disk handling, search and replace, block moves and others.

In the command mode, the bottom three lines of the display are taken over with a two-line reversed video status display and a blank line beneath on which you type your commands (see photo). The status line shows the name and author of the document currently being edited, its length (in characters) and the number of unused characters remaining in the buffer, the type of printer for which the system is set up and the disk drives in use.

Block move is disguised as a copy command. This allows you to copy blocks of text from one part of the buffer to another but, as it gives you the option of retaining or deleting the original block, it also functions as a block move facility.

Search and replace ('find item' in Memorite parlance) is straightforward and allows you to operate backwards or forwards from the cursor position and has a query option, which allows you to leave some occurrences of the string being replaced as they are if you want to.

Tab stops can be set at every n characters or only in specific places; a tab ruler can be displayed to show you exactly where the tabs have been set and the tabs are saved with each document on disk, which makes life much easier if you use different tab layouts for every document.

The disk handling is simple and very well thought out; once into Memorite, the user is totally insulated from the unfriendliness of CP/M, which is good, and the system is simple to use and totally idiotproof.

Test files are saved by first giving them an 'identity'; this comprises a file name, of course, but also includes the author's name, a password and up to 25 characters of comment — the last two are optional. When you give the actual write to disk command, you are asked to type in the date in the American MM/DD/YY format (not DD/MM/YY as it says in the manual); I found this extremely annoying as it's not a piece of information which I need to store with *every* document yet with Memorite it's compulsory, even when saving a revised version of a document already on disk.

Reading a file is very easy. Asking for the disk directory gives a display of all the identity information for each file as well as the number of revisions for each file and their dates: the date each document was created and the date it was last revised. The directory can be printed out if required.

To read in a file, you move the cursor to its entry in the directory, type 'R' and in comes the text, unless, that is, you've given it a password, in which case you're asked for the password and you can only obtain the text if you reply with the correct one; the password does not appear on the screen, either when giving the document its identity or when trying to retrieve text. The password protection is, incidently, very secure; Memorite uses the password to scramble the text as it's saved on disk, so you can't read it by exiting to CP/M and giving a 'type' command — all you get is garbage.

When you revise a file, Memorite saves the earlier version as a backup. These backup copies aren't normally displayed on the disk directory but there's a special command which will display them, allowing you to read in a backup copy if you've done something awful to the working copy. There's also a command which will erase all backup copies from a disk to save space — use it with care.

Having finished your editing, you can either print the text out straight from the buffer or you can exit Memorite, either to the system's monitor or to CP/M. Whichever you choose, though, Memorite won't let you go until you've saved the text in the buffer onto disk, an excellent safeguard which can only be overcome by erasing the text first, pressing the reset button at the back of the machine or turning the machine off altogether.

Spelling

It's quite embarrassing to have typed in your text, formatted it and printed it out, only to discover some silly spelling mistakes (or have someone else discover them). It means you've got to re-edit and reprint, wasting time and paper. Memorite can help you avoid this because it comes with a spelling correction program.

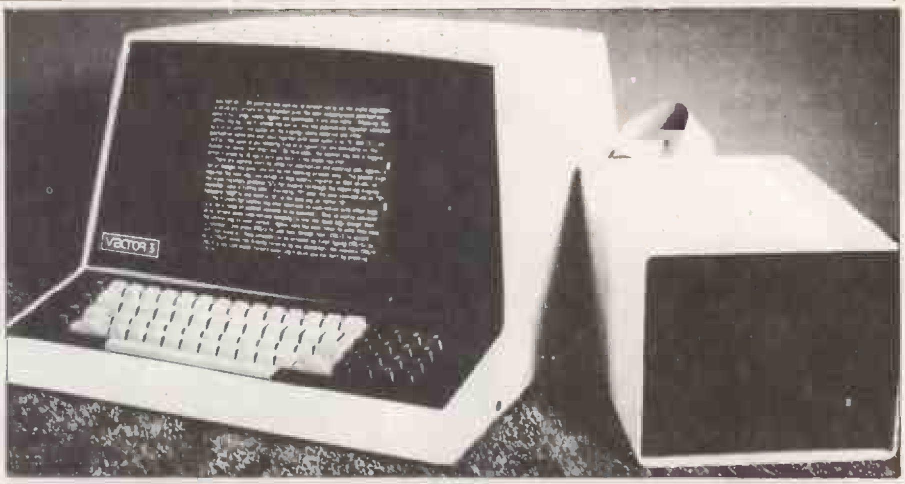
SPELL comes as a separate program, incorporating a 30,000-word dictionary, which you run after you've saved your file on disk. The text is displayed line by line on the screen and any words which the dictionary doesn't recognise are highlighted in flashing reverse video. The program waits for you to either type in the correct spelling (but it doesn't tell you what that is!) or you can just press return, which causes SPELL to include the word in a 255-word temporary dictionary so it won't query further occurrences of the same word in that text.

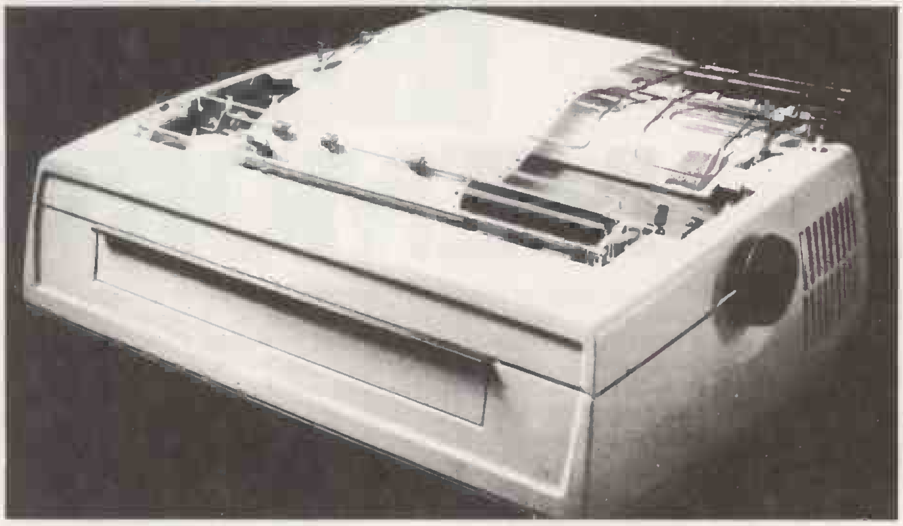
Although 30,000 words sounds a lot, I found that SPELL queried a lot of words which I'd regard as fairly ordinary — 'microcomputer', 'camera' and 'eleventh', for example (also 'Memorite'). SPELL is also an American product, which means it will query things like 'colour' and 'recognise', which is mildly irritating — why doesn't someone come up with English versions of these spelling programs?

If you're a rotten speller, SPELL will be worth its weight in gold; for the rest of us it's also very handy for weeding out typing mistakes, which it does far more quickly than a human proofreader could do (*nonsense! — Irate Sub Editor*), making it much more than just a gimmick.

Printing

Memorite III has a powerful range of print formatting commands, fewer than Spellbinder or Magic Wand but enough for most general users. They're also fairly easy to use and the system has a sensible set of default parameters for formatting (ie, if you don't specify things like left and right margins, the system will use its own, pre-set, values which will give a reasonable-looking result).





Above: The VG3005 and its disk unit; below: the NEC Spinwriter 7700.

If you don't like some of the default settings, you can create your own and incorporate them into the program on disk so that they will always be present when you run Memorite. The formatting commands are partly these semi-permanent parameters and partly commands embedded within the text. The pre-set commands can, however, be over-ridden by inserting different settings for them in text or by typing new ones in from the keyboard before printing.

All the usual formatting features are present: left, right, top and bottom margins, justification on or off, centred lines, etc. The system provides control over ghost hyphens and forced spaces, page breaks, indentation, character and line spacing, page width and length, and page numbers — you can start a document with page numbering from any figure, not just from 1.

Printer control is good, but is geared totally to daisywheel printers — as far as I could establish, it's not possible to use a cheapo dot matrix printer with Memorite III, which is a pity because dot matrix units, being much quicker, are handy if you want to run off several draft copies of a document for circulation to a number of people.

Memorite allows underlining, bolding, overstriking, extra strike, super- and subscripts, and contains the ability to cope with proportional spacing, found on the really top-quality printers. Printing can start at any page in the document and can be stopped at any time. There's provision for stopping the printer after any page, which is necessary for printing on single sheets instead of continuous stationery.

There is, unfortunately, only the most rudimentary facility for previewing formatted text on the screen before you print it. This allows you to see just the page breaks, enabling you to spot awkward layouts such as a page ending with, say, a chapter heading on its last line.

You can print directly from the keyboard, making the system an extremely expensive typewriter, and you can insert remarks into text which won't be printed out. Other interesting features include numeric justification, multi-column printing, the ability to link documents together for printing and the capacity for up to five footnotes per page.

Built into the system is the ability to compile a file of standard paragraphs, each of which is given a label. You can then draft out, say, a letter to incorporate one or more of these paragraphs, except that you merely put the label in the desired place; Memorite then automatically merges the appropriate paragraph into the text at the appropriate place. Names and addresses from the mailing list facility (see below) can also be inserted automatically into text.

Page headings and footings, incorporating the page number in whatever position you want, can be defined and printed automatically. It's possible to define separate headings for left and right pages, if you're preparing camera-ready artwork for a book.

Mailing list

Memorite includes a mailing list facility, but it's in Microsoft Basic; fortunately MBasic comes with the machine. It's a suite of programs, driven from a master-menu, which allows you to create/delete a mailing list, edit/display one, print it either as a list or on labels, or sort it by any criterion you choose — you're allowed to insert category codes when building the list.

The powerful sort program is a CP/M command program, not a Basic one, and seems pretty fast; unfortunately time didn't allow me to build up a large enough file of names and addresses to produce any meaningful figures for the sorting.

The mailing suite seems well thought out, is user-friendly and easy to use, with the mild exception of the label printing section. In order to cope with the massive ranges of sizes and shapes of labels, the program requires you to detail the label formats very carefully and specifically. It looks complex at first and requires a little experimentation, but, once mastered, isn't as formidable as it at first appears.

I could find no reference in the documentation to any maximum length of mailing list. Given the megabytes of hard disk on the 3005, you could build up a really massive list and use the sort program to produce categorised sub-lists as required. Back-up copies would be a problem, though, if the list exceeded the capacity of a floppy disk — more on this in a moment.

Other software

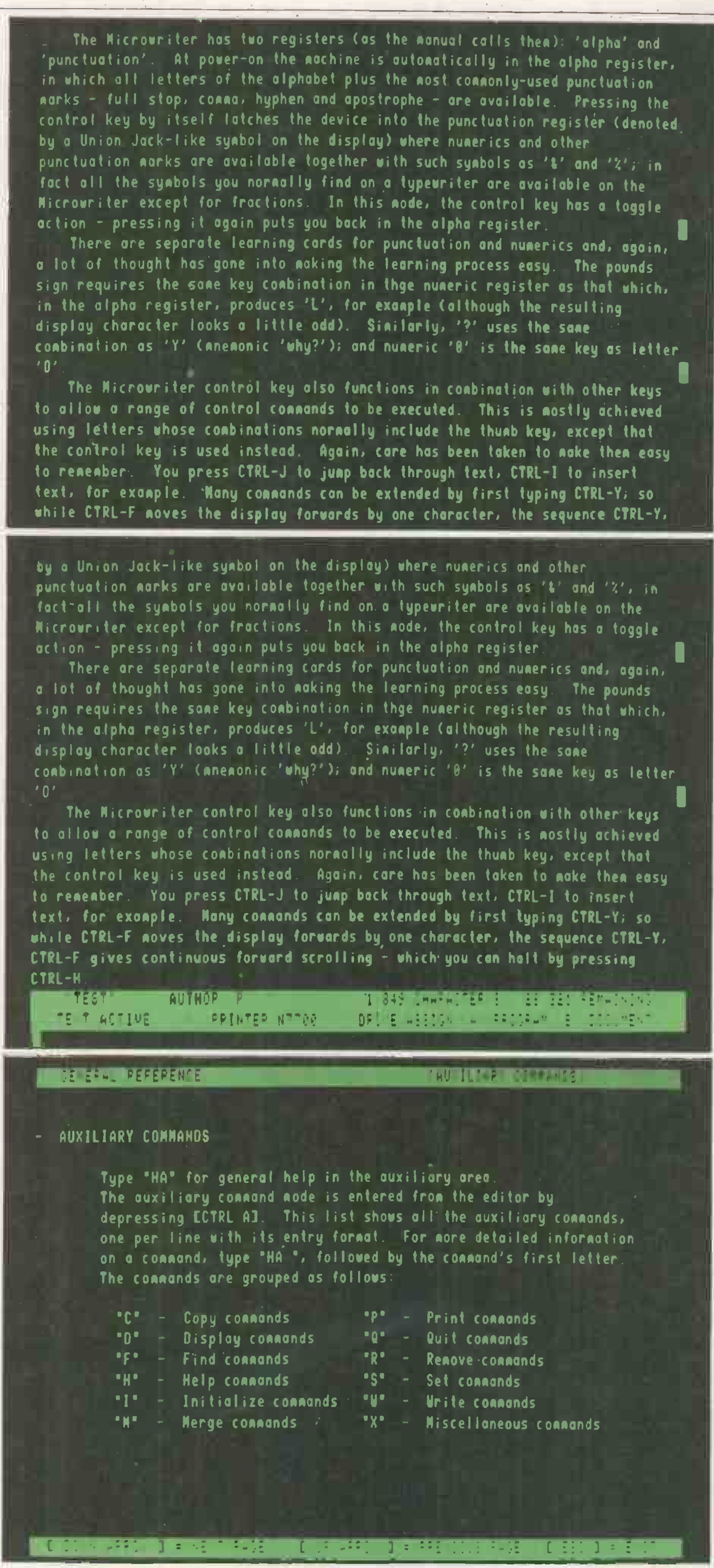
Vector Graphics produces a range of other software for business applications. I was loaned a copy of one of these, a Visicalc-like planner called Execuplan. Time didn't allow a thorough review of this, and in any case it's beyond the scope of this review, but it looked powerful (VG says it has more facilities than Visicalc) and its output can be saved on disk and linked into Memorite text files, which is exceptionally useful for the business report-writer. Vector Graphics also markets a nice Othello-type program, which I only managed to beat once and which could take up a lot of your time if you're not careful.

Users

Of our four hypothetical users, I feel that the business/technical report writer will find the system most useful, mainly in view of the other VG software available for the machine, especially Execuplan.

For general business users, the system would also prove exceptionally useful. As a word processor, it compares very favourably with dedicated machines on the market — one, selling at around the same price, gives you only a single floppy disk, for example, while the 3005 has that hard disk as well! It doesn't have the special function keys, of course, which you'll find on most dedicated machines, but if I was buying a word processor for commercial use now I'd certainly put the VG very high on the list.

For the author/journalist, it's a little more difficult to give a definite yes/no. As I've said before, this user would



Top: The screen during editing. Centre: the status bar which appears in the command mode. Bottom: one of the 'help' screens which explain Memorite's commands. This one's the master 'help', a guide to the others!

really like a machine which uses virtual memory techniques — as the text buffer fills up, text is automatically saved onto disk so you can work on a much larger document than will fit into the buffer. In turn, this allows you to skip back to see what you wrote 20 chapters earlier without saving the current file on disk and loading the earlier file. I have such a system at home, based on minifloppy disks; while it's very useful, it suffers from the slowness of floppy disks, especially inconvenient when writing to disk, and from the eventual limit on the amount you can get onto a floppy. With the hard disk, both these drawbacks disappear — hard disks are quick and hold a lot. It's a real shame that the Vector doesn't incorporate this facility, for that would make it into an author's 'dream machine'. The remaining objection, that of storing a several megabyte long piece of text onto floppy disks for security purposes, could be overcome.

Hardware

The Vector Graphics machine is nicely made, has a good, solid feel to it and would look at home in any office environment. The keyboard is of typewriter layout and pitch and the display is particularly pleasant: it gives 24 rows of 80 characters and, although a little small, is very clear, with true descenders on letters like 'p' and 'q'. The screen has an anti-reflective mesh in front of it and there's a brightness control at the back of the machine.

And that hard disk? If you've never used one, you can't imagine how nice it is. Firstly, it's incredibly quick — take a look at the WP Benchmark timings with this review. And it holds a *hell of a lot* of files. The disk is actually divided into two as far as the system is concerned — it looks and is used exactly like two enormous floppy disks. Each 'side' of the hard disk has 2408 kbytes available to the user, roughly 764 A4 pages of text per side! The minifloppy disk has a 298k capacity, approximately 94 pages, which puts things into perspective. The system was set up with CP/M on the hard disk, from which it booted up from the monitor in under a second.

Hard disks are very much more reliable than floppies but it would be extremely foolish to expect total reliability from them — there's always a danger that they might fail and you *must* make back-up copies of your files onto floppy disks — some 16 floppies would be needed to back up the entire contents of the Vector's hard disk, theoretically, but in practice you'd use more than that number.

You don't, of course, need to make a back-up copy of a file *every* time you change one; it would be sensible to work out a backing-up frequency that depends on how much work you do and how many hours' or days' work you can afford to lose if the hard disk crashes before you've made back-ups.

The printer which came with the system was the new NEC Spinwriter 7700, a thoroughly pleasant machine producing very high-quality print from even a nylon ribbon. It's fast and quiet (both by daisywheel printer standards) and has a claimed 27 per cent fewer components over the previous Spinwriter; it's still bloody heavy to move around, though.

Talking of moving things around brings me to my only major criticism of the Vector Graphics hardware — the way in which the three modules (computer, disks and printer) are connected together. Firstly, the connections use broad ribbon cables, one for the printer and three for the disks, which not only look out of place in an office but which have a knack of tangling themselves up untidily. Worse, though, is the fact that you can only connect and disconnect them by opening the computer and unplugging them inside — there are no sockets on the outside of the computer for them. This means that moving the system around is a four-person job; two for the printer and one each for the computer and disks, unless you're prepared to open the machine.

Summary

Memorite III is a well-designed word processing package which would be of use in general business and report-writing applications but less attractive to the author/journalist, unless the latter was considering a dedicated machine, in comparison with which Vector gives exceptional value for money.

The hardware is well made, apart from the connections arrangement which needs rethinking, and the NEC Spinwriter, newly available in this country, is a very civilised machine and a definite improvement on the earlier Spinwriter.

WP Benchmarks

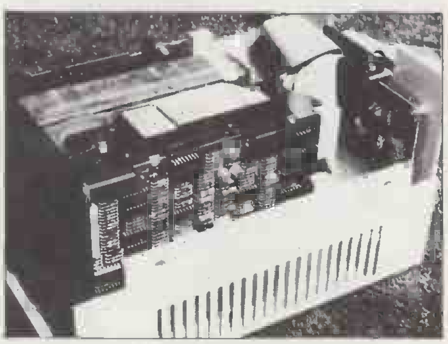
1 3.4 (6.0)
2 6.1 (54.9)
3 } instantaneous
4 }
5 3.3
6 3.3

All timings in seconds. Benchmarks 1 and 2 (load and save text) were carried out using the hard disk — times for the same tests with the floppy disks are in brackets.

Prices

Vector Graphics 3005	£4750*
NEC Spinwriter 7700	£2250
Memorite III (includes SPELL and mailing list)	£375
Execuplan	£150

*Includes CP/M and MBasic.
Prices exclude VAT.



Inside the disk drive unit. The hard disk is the nearer unit, with the floppy behind. Note the three broad ribbon cables which connect to the computer.

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SCRIPSIT 2.0

Word processing is just one of many tasks we expect micros to perform now that they have become virtually universal. But word processing is special: this particular use of micros demands something more than the applications package or program generator. The word processing micro has to imitate the obsolete machine it is ousting — the typewriter — while still being an intelligent terminal or stand-alone computer.

Scripsit 2.0 is the latest version of the standard word processing package for the Tandy TRS-80 and, as such, combines the benefit of powerful computing resources with the drawback of hardware designed also to be used by the programmer.

This test was done on a TRS-80 Model II which includes one 8in floppy disk drive, in addition to which I used a disk extension unit containing two more drives, although this is not essential to run Scripsit. Scripsit comes on its own disk, which also contains a copy of the operating system and space for creating documents.

On loading the Scripsit disk and inputting the appropriate date and time, the Scripsit directory is displayed. Pay due respect to the directory as it tells you a lot about the state of your disk and is very much the focal point of the system. It also appears on completing a utility or exiting from a document. The directory shows details of five documents at a time from the disk and you can scroll through to find the rest. The sort of details given include a brief description of content as entered by the user on each header, dates when the document was created and revised and the amount of space it occupies on the disk, with an 'efficiency figure' relating to how many times the document was revised. At the bottom of the screen is a list of your options for what to do next, each activated by a single letter command and pressing 'enter'. You can open one of the documents, copy one, print, delete or create a new document. (New documents are always listed at the beginning of the directory.) You can also jump straight to the directory for the next disk, or end the session.

To open a document you simply align the cursor against the appropriate name and press 'enter'. This brings you straight to the document's header, the 'open document' menu which has eight responses you have to go through.

The open document menu includes information identifying the document and specifying how many lines you want on a page. It displays updated figures on size and usage of the document. The 'create new document' menu also lets you state whether you want a vertical document with margins anywhere between columns 1 and 96, or a horizontal document with margins between columns 1 and 156. You tab through pressing 'enter' if you are changing the responses and 'escape' if you are not.

As soon as you've made it through the menu, a clean screen leaps into vision. At the bottom of the screen is the 'format line' and below that a status line which reminds you what page, row and column you are on. At this point, you can set up your special formats if you like, although at any stage within a document you can jump the cursor into the format line and alter margins, paragraph indent or tab settings. One very useful feature when inputting text is the ability to go into 'full video' mode, press CTRL and V, and have all the document's internal format commands displayed on the screen. This lets you see precisely where you have pressed 'enter' for a forced end of line, or 'tab', or simply let the soft wrap-around take effect.

The wrap-around prevents division of words and puts the whole word onto the beginning of the next line, but it is not perfect. One problem arises if you reach a full stop at the last position on the line. The following two spaces are wrapped around to the beginning of the next line where they look very odd. Of course, they can be edited out later.

On the subject of wrap-around, however, I did have one inexplicable 'bug' where the system failed and left me with the last letter of the word on the next line. I was building up a column of information on the right-hand half of the page and had margins set at 35 and 70. On typing the word 'advertising' I got 'advertisin' at the end of the first line and 'g' at the beginning of the second. Perhaps the computer was trying to introduce a more vernacular style into my turgid prose, but experiments showed the same thing happened when other words were substituted.

One advantage of using the 'full video' mode when editing is that you can see when the existence of a forced end of line, for example, is preventing text from shuffling back into the shape left from a deletion. But the confusing thing about editing with these format codes in view is that, while ordinary characters can be overtyped on the screen, format commands have to be deleted and then re-entered. Familiarity probably eliminates this problem, like others on the system.

Inserting and deleting can be done by pressing two keys to the far right of the keyboard marked F1 and F2 respectively, presumably so named on account of their function for the programmer since the abbreviation has no obvious reference for the average typist. If you want to delete volumes of text you can use the CTRL-D command which lets you define areas of text in words, sentences, paragraphs and larger blocks. Line centering is done by first entering the heading with a forced end of line and then pressing CTRL-L (mnemonic L for line-centering reflects the fact that the system only centres single lines). You can edit the text as you go along and have up to 22 lines of text in view, constantly inputting into the bottom line of the page.

Formatting

There are a number of ways of specifying how you want the text to be printed, the most obvious being to input special print codes within the text as you type. To get an underline, for example, you input the underline code at the beginning and end of the text you wish to be affected and similarly for text to be printed in bold. One obliging code allows you to input notes to yourself which will appear on the screen but which will not be printed. However, a problem with these codes is that they involve two distinct operations, first pressing 'escape' to get out of the straightforward text input mode and then using the shift key in combination with another key to input the command. This can be very laborious if you are writing something which needs lots of words underlined or in bold, and a shortcut I used was the search string utility. This allows you to choose your own shorthand, 'XX' for example, and at the end of the piece change every occurrence of 'XX' to, say, 'campaign for user-friendly micros'. The search string facility gives you the option of stopping as each string is found and checking that you want it to be deleted or replaced.

An apparent inconsistency means that the system ignores a single underlined space at the beginning of a line, which might later have something filled in by hand. The printer will simply not print unless you take the precaution of using the 'required space' command (ESC pressed with space bar). The same goes for the end of a line when the text is being right justified.

A gaping hole in the print facilities, however, is the absence of the vertical line. In fact it's there on the printwheel and a sufficiently dedicated user could work out the routine for using it, but there is absolutely no reference in the manual to the vertical line. This seems to ignore any need to put text in columns or boxes and offers no easy-to-use facility to draw lines round things on the screen.

There are commands for a wide range of diacritic marks, superscripts and subscripts.

The second method of affecting the final printed copy is by use of the format line which, unlike the print codes, allows you to see on the screen the effect of your format commands. Basically, the format line deals with tabs and margins but there are permutations of each. There is the 'outline' marker which determines the position to which the cursor will return after any forced end of line. The left margin can be to the right of the outline marker if you want the first line of each paragraph indented, and left of the left margin if you want paragraphs to start to the left of the rest of the text.

There are three different types of tab, a fact which seems unnecessary at first, but they do all perform discrete functions. Apart from the ordinary use of tab, you can also have aligning around a decimal point which is useful if you have columns of figures that run beyond the decimal point. By typing tab marker '@' you have the option of either function with the same tab marker.

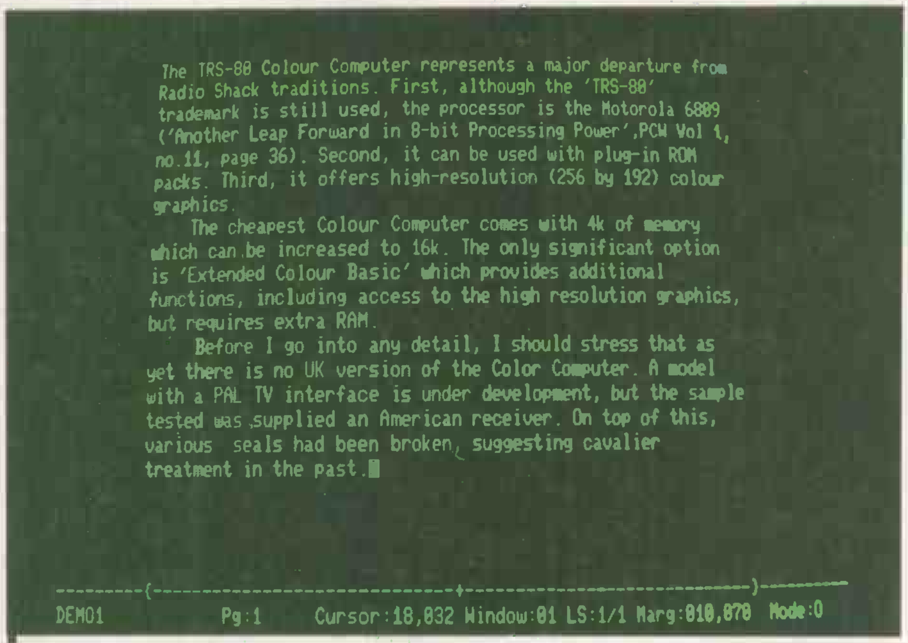
Printing

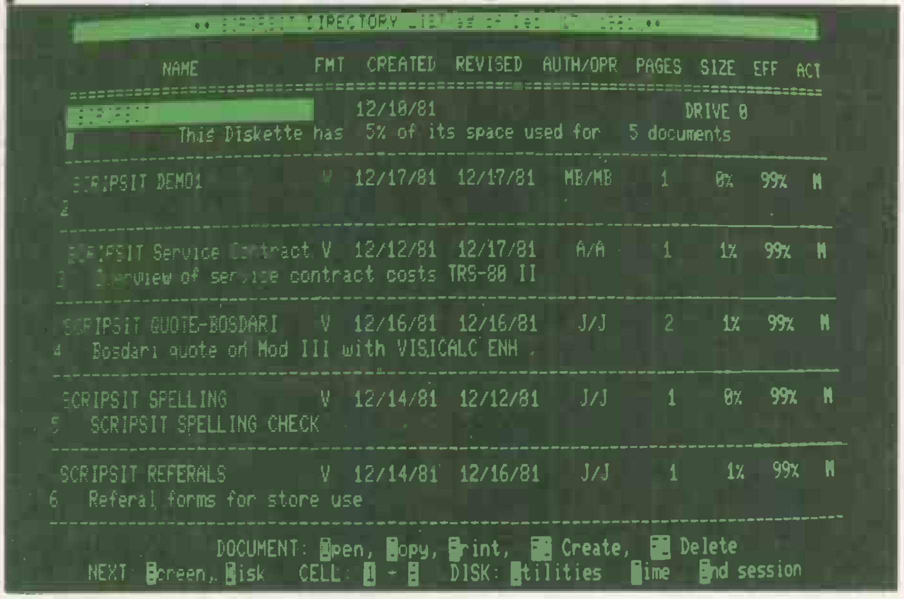
Whenever you try to print a document you will be presented with a print document menu. Apart from specifying precisely which pages you want to print, it also offers you another chance to affect the appearance of the text on the page. Options given include defining the column position for the left side of the paper, by justifying in character or word increments, and specifying the maximum number of lines on a page. Again, however, there is no way of bypassing this menu if there is nothing you want to change and you have to tab down through it. If the layout still doesn't look right then you can repaginate or define forced ends of pages. The print monitor menu allows you to pause between printing each page, or to stop printing or to move into another document while continuing printing.

Merging files

One valuable facility of Scripsit for the businessman is the ability to merge information from different files onto one sheet of paper. The classic application for this is the personalised letter with individual names and addresses attached to a standard text.

Merging files is done by creating two documents, one which contains the 'base document' where all variables are identified by names between brackets. You then build up a 'merge file document' which repeats the names of variables that you have used on the base document, followed by lists of what all these may be in individual cases. At the printing stage you can create standard





SCRIPSIT 2.0

text with different 'variable' information in each case. Although this facility is most obviously useful to the small businessman who can generate much more effective mailshots by addressing them to named individuals, there are applications for the hobbyist. One example is the production of letters that you may write regularly: 'Dear Mr Shilling. . . please transfer X pounds from my deposit account to my current account. . .' where X might be any one of a number of predefined sums. You can also create a base document which contains wholly variable information, such as lists of names and addresses.

In this case, all the base document contains is a set of identifiers for each piece of information: name, number of house, road, town county, postcode. Printing commands as to where the address should appear on the envelope can also be stored. When the files are then merged you get individualised envelopes generated.

Spelling and hyphenation

Dictionaries against which spellings can be checked are becoming a standard feature of word processing packages and are available from companies like IBM and ICL. They also include the facility for the user to include a list of specialist words that are likely to come up frequently in his own writing. This facility is provided on Scripsit which allows the user to add up to 2047 words of his own to the dictionary's 100,000 words. The dictionary facility is somewhat complicated to use since you are emphatically ordered first to make your own copy of the dictionary onto a backup disk. Then, as with the global search and replace facility, you have the option to stop and check over each correction that the dictionary wants to make. The capacity of the dictionary is huge; it can catch up to 1500 misspellings in one go which ought to be enough even for near-illiterates. It also deals with the hyphenation of words.

Given the considerable processing power of Scripsit it is disappointing that there is no simple arithmetic function. It is quite possible to list columns of numbers but there is no option to run the cursor down them and reach a total at the bottom. Given that this function is easily performed by the flimsiest of calculators these days, it seems an unnecessary omission from the all-singing, all-dancing word processor. Tools to perform simple mathematical functions have already proved to have great popular appeal. Scripsit already handles numbers dextrously with its facility for aligning columns of figures around the decimal point.

Documentation

Since the version of Scripsit that I tested was still very new, there was no completed documentation available. However, my major criticism of the prototype training manual is that the order of introducing the new procedures manual is extraordinary. The method is to direct the reader to perform certain exercises which draw on lessons of the *ensuing* chapter. It is easy enough to find out how to do the exercises by reading ahead but this tends to undermine one's faith in following the manual step-by-step. The reference manual deals with all the same procedures in a much more compact form but its index could prove unhelpful to the non-programmer. You have to be competent in computer jargon to know which words to look up for a solution to your problem. Words like merge, define, format and scroll.

The 'help' facility could be useful here although it is not particularly readable on the screen, amounting to a single line entry for all commands that can be entered under Scripsit, and appears as screens full of text. 'Help' could save you bothering with the manual over a simple command you have forgotten, but is not useful in explaining peculiar error messages on the screen or the apparent impossibility of entering a character where you want to put it.

Good and bad points

The most obvious irritation with Scripsit is the flashing cursor. Although word processing shouldn't require the user to look at the screen much, apart from when editing, the flashing cursor is most unpleasant. However, the method of highlighting text to be deleted or moved elsewhere is very effective and puts all the text concerned very clearly into reverse display.

I also found it laborious that the keys didn't automatically repeat when held down, although this facility can be awkward if you're not used to it. Cursor movement up and down the screen requires holding down the 'repeat' key at the same time as the 'arrow' key or the use of 'hold' to move directly to the top, bottom or either side of the screen. An automatic repeat on arrows would be particularly useful.

There are also no arrows to move the cursor diagonally across the screen. Also, the end of the page isn't marked on the screen, so unless you keep a sharp eye out, your sentences and paragraphs will be split in odd places from one page to the next.

Another straightforward facility which would be useful is to be able to alter upper case to lower case with a single key and vice versa. This would avoid the need to re-type headlines which you subsequently decided should be in upper case, for example. The 'convert-case' key could also be an automatic repeat if held down.

Where pieces of text that you want to alter do not fit neatly into words, sentences, or paragraphs it would also be nice to have a facility to let you run the cursor through the particular phrase or one-and-a-half paragraphs you want deleted.

There are some characters which cannot be printed without special user intervention. The keyboard contains no '£' sign and, by default, the printer makes the numeral '1' and lower case 'l' the same character, a characteristic of old-fashioned typewriters.

Attractive features of the system

You can make an individual document as big as you like up to the capacity of the disk. The 8in high-density disks have a capacity of over half a megabyte (509,184 bytes, to be exact). Tandy claims that it would take a 70-words-per-minute typist 24 hours of typing at speed to fill an 8in disk.

Another plus is that you can work on one document and simultaneously print another without getting any significant degradation on the system. Of course there are some special functions, such as formatting a disk or merging or copying documents, which you cannot do in this mode.

The need to back up documents created every day is made easier by means of the 'back-up' utility which copies disks wholesale at the end of the day at ten minutes a time.

Summary

Scripsit is a word processing package on the sort of micro that you would expect to find in a small business or educational environment. In both situations the user might be expected to be familiar with the rudiments of computing and, given that background, I would expect him to find Scripsit an exciting tool. For example, the dual function of the keyboard means it is often necessary to hold down two keys simultaneously to perform functions. Scripsit is very versatile but could be off-putting to the non-programmer.

Of the *PCW* 'standard users', I would expect the author/journalist to find this system a little over-complex. He/she wants a system that is relatively cheap and easy to use. He has no great need of sophisticated formatting facilities. However, he would benefit from the speed with which you can move around in the text and from the repaginate and page numbering facilities. And he/she might find the dictionary very useful for proof checking.

The technical/managerial report writer might bemoan the lack of simple maths functions but would appreciate the extensive facilities for formatting, printing and making global alterations. Such users could also employ the user-defined area of the dictionary for specialist words relating to their own subjects. However, they might regret the lack of a vertical line or graphics capability.

The manager might find that there is insufficient time to learn the wide range of functions that the system could perform.

The secretary, once familiar with the machine, should be able to make extensive use of it and find the dictionary useful.

Benchmark timings

1	(na)
2	(na)
3	1.0
4	1.0
5	32.0
6	27.0

Printer (Tandy daisywheel): 37.4 cps
All times in seconds.

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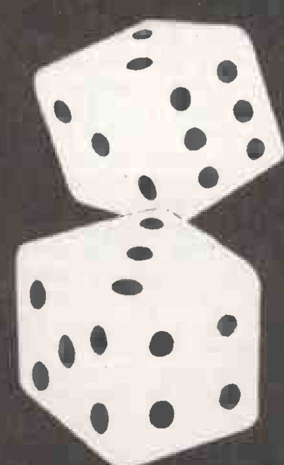

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SPELLBINDER

In the three months since I bought Lexisoft's Spellbinder word processing system, I've written several articles, lots of ComputerTown letters, a couple of lengthy reports and created a name and address file. So the system has been well exercised and, with just a couple of exceptions, I have been delighted with it. I am still discovering new features and functions which more than match my growing needs. Anyone at all serious about buying a CP/M-based word processing system should consider Spellbinder among their options.

Lexisoft describes Spellbinder as a 'Word Processing and Office Management system' — an interesting description because it's certainly more than a word processor, but how do you define office management? When I read Lexisoft's disclaimer that it 'makes no representation with respect to the fitness of the product for any particular purpose', I really wondered what I'd let myself in for. Still, the company has clearly gone to a lot of trouble in preparing the excellent manual and even used Spellbinder to produce it!

The package can be considered in two parts: word processing and — yes, why not? — office management. The word processing functions allow you to enter and manipulate text, store it on disk and print it out. The office management programs — some of which are provided, others you can program yourself — allow you to perform jobs such as sorting records, extracting and merging information from different files and printing text in multiple columns. These programs are called macros and they're written in a language called M-Speak. A typical program would be one which allows you to personalise a standard document by incorporating previously filed information about the recipient.

That's the overview. Since I quite like the structure of Lexisoft's manual, I shall follow the same sequence. This will introduce you to things in a sensible order and it will also give you a feel for the sort of documentation you'll get.

System operation

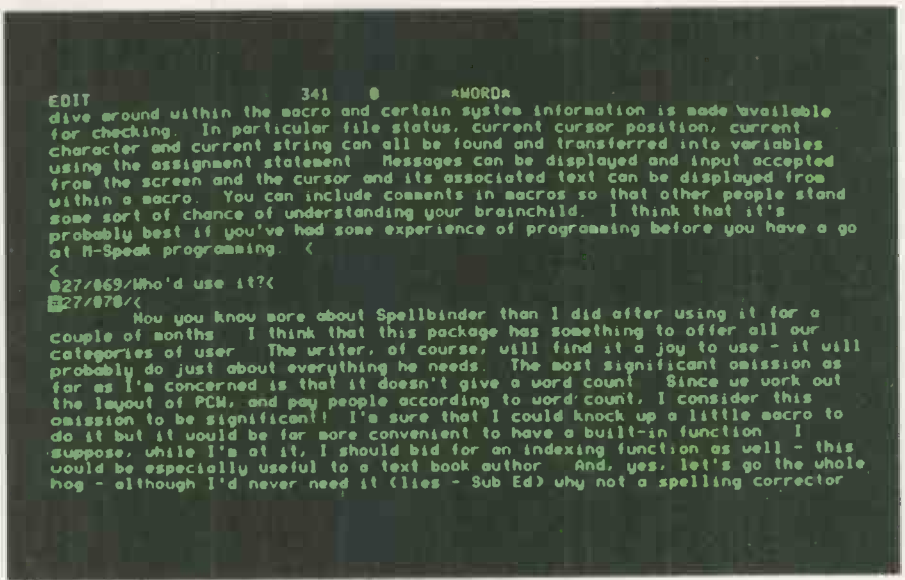
The introductory section explains how the manual should be used, describes Spellbinder's highlights and tells you how to tailor the package to suit your requirements. A further section describes how to set up Spellbinder to suit your system configuration. This last task should be performed by your dealer unless you are already experienced in the ways of computers. I run my version of Spellbinder on a SuperBrain connected to an Epson MX 80 F/T printer. Although this denies me a few of Spellbinder's smarter options, such as proportional letter spacing and underlining, I consider this configuration to be almost ideal for a writer. Clearly, most types of office work would demand a better quality print but this isn't a criticism of the Epson, which does its job very well. My system is configured so that I can use SuperBrain's numeric keypad as a set of function keys. Some users will have to use various letters in conjunction with the control key to achieve the same results.

The manual contains a pull-out, bound section called 'Spellbinding Made Easy' which, although it doesn't cover all the features and functions of Spellbinder, certainly gives the beginner enough information to start word processing in earnest. Edit mode is explained first, in which you can create, insert, change and delete text. Cursor control is provided, on the SuperBrain at least, by the normal arrowed keys. One key allows you to change between various 'cursor modes' — character, word, sentence and paragraph. This relates to the amount of text to be regarded as a single unit when skipping forwards and backwards or deleting using the three appropriate function keys. The mode chosen is permanently displayed at the top of the screen next to the current line and column numbers which tell you exactly where you are in the text. I find it best to stay in 'word' mode since it is quite easy to forget to check the mode before deleting. It's a mite inconvenient when you lose a carefully crafted paragraph by mistake! Another handy function key allows you to move the cursor to the beginning or end of the current line. A character delete key allows you to delete one character at a time regardless of cursor mode and an insert key opens up the text to allow you to enter extra material. A touch on the same key closes the text up again following insertion.

Command mode allows you to make major changes to text, print it and move it to and from disk. The word COMMAND is displayed at the top of the screen in place of the word EDIT. If you try to issue a command while you're in edit mode, then the command simply gets incorporated in your text. If you try to edit while in command mode then the outcome rather depends on whether you accidentally type a valid command. Most of the time, the system will regard your attempted command as gibberish and tell you so. A single key switches you between the two modes. On my 64k SuperBrain, I have room to enter 33894 characters before needing to save some to disk. If you need to find out how much room is left in this buffer command, 'm' does the trick. Right now I've got 28636 letters left to go. Cursor movement commands allow you to move the cursor to the beginning or end of text (beginning could be for printing or saving to disk and end for adding new text) or forward and backwards 'n' lines. For example, b5 will take the cursor back five lines. Two delete commands (d and da) allow you to delete all or part of the text. If you attempt to delete more than 1024 characters, Spellbinder gets suspicious and asks the question REALLY? at the top of the screen. Anything but a Y (for 'yes') will abandon the command. There are plenty of other commands but, for now, we'll move on to disk operations.

The four main disk activities are saving text, deleting files, reading files and asking for a disk directory (a list of all the files on a particular disk). Once again, the commands are pretty simple — to obtain a directory, type the letter q (for 'query' perhaps?) followed by the letter of the disk drive. Up to seven drives can be handled and they would be lettered from A to G. A listing appears on the screen of all the file names and the space each occupies, followed by the total amount of disk storage used to date. The command 'w' causes text to be written to disk and 'wd' allows the disk file to be closed down, so the most usual way of saving text is to type 'w/wd'. This takes care of everything. It is possible to save just a part of the text by specifying the number of lines from the current cursor position. After issuing the first 'w' command, Spellbinder asks you to name the file to which the text is to be saved. If the file already exists, the system automatically renames the existing file and creates a new one. The renamed file can then be used as a back-up in case anything goes wrong with the new file. During the course of writing an article, I frequently write the text to disk using the same name every time. For example, this article is being stored as SPELL and each time I write a new version of SPELL, the previous version is renamed SPELL.BAK by the system. Any existing SPELL.BAKs are lost on completion of a successful save. The 'qd' command followed by a file name allows you to delete a file from disk. To read a file in, simply type 'r' followed by the filename.

Printing is accomplished with the 'p' command and its variants. It is possible to fool the system into sending text to the screen instead of the printer by using a 'v' (view) instruction. This is very useful for checking that everything is laid out properly before actually committing your work to paper. I find that unless you use this facility, you are almost certain to get the odd heading printed at the foot of a page with its text printed on the following page. Or you may find words here and there that you'd prefer to hyphenate at the end of line. For anyone concerned with obtaining the best possible result first time, the 'v' command is invaluable. The layout of the printed page is dictated by two tables which can be modified using command or edit facilities. One table allows you to define page titles, numbering and spacing at the head and foot of the page, while the other table enables you to define things like the page layout and character treatment. In my case, there wasn't a lot I could do with the characters using the table since I don't have proportional spacing or underlining facilities. I do get round this problem to a certain extent, though, by sending control characters direct to the printer — more about this later on. However, I can easily define the other variables like right justification, lines per page, carriage returns per line, text width and indentation. Headings can be centred, and non-printing remarks and forced page-ends are all possible using some of the 'dot command' options. These are single letter commands which you can place at the beginning of a line and, not surprisingly perhaps, each is preceded by a full stop (dot).



Above: An important corner of the editor's dining room.
Below: Spellbinder in Edit mode. Note how control codes are sent to the printer.

Further facilities

Having dealt with the essential functions, we'll now move on to some of the more esoteric facilities. The first (did I say esoteric?) is the repeat key — on my system I use the decimal point on the numeric keypad. Other users might have to use CTRL-R. To start the repeat, hit the repeat key followed by the character to be repeated; to stop it, hit the repeat key again. One more depression of the repeat key restarts the repeat and so on. To discontinue the repeat function, just hit any key other than the one being repeated. More exciting perhaps is the 'hold' function which allows you to tuck sections of text away into a 'hold buffer' then 'unhold' it anywhere else in the text. If there's space, a copy is left in the hold buffer, so it's sometimes possible to 'unhold' the same text repeatedly. I often use this facility to shift paragraphs around to give my text a better sequence. 'h0' empties the hold buffer and prepares it for a fresh hold command.

Other features covered by the introductory text are tab setting, relining, hyphens, marks, character enhancement and indenting. Tabs can be set at regular intervals by a single command or individually by separate commands. Normally the screen 'wraps around' after 80 characters, taking any half-finished words on to the next line. Relining allows you to redefine the screen width as anything from 16 to 159 characters. The wider screen allows you to set up information in tabular form, for example. As the cursor reaches the 81st character position, the right-hand side of the 'screen' becomes visible. Hyphens come in two varieties: the normal (hard) hyphen which appears as part of the printed text and another, called the soft hyphen, which only comes into play if the word containing it happens to occur at the beginning of a line. If this happens, then Spellbinder will try to print the word up to and including the hyphen at the end of the previous line. This can be useful when a particularly long word causes a large end-of-line gap or weird proportional spacing. Marks are exactly this; they are used to arrest the progress of certain commands. For example, it is possible to hold or delete text up to a mark, or you might want to skip forwards or backwards to a marked spot in the text. I use it most for holding text when I'm doing one of my many reshuffling exercises.

Those with flashy printers will be pleased to hear about the various ways of enhancing text. By using a special character at the beginning and end of the area to be treated, you can underline, boldface, shadow print, slash overstrike (goodness knows why) or dash overstrike (ditto). There are other options but these are the main ones covered in the 'Made Easy' book. Finally, indentation redefines the position of the left-hand edge of text. It is superior to tabbing because it doesn't fill the unprinted area with spaces. This has two benefits — one is that it saves space and the other is that text can be inserted and deleted within an indented area without affecting the indentation. The same thing in tabbed text would cause the spaces to move around as the text is opened or closed up. The indent is achieved by pressing just one key and, each time you press it, the indentation moves to the next tab stop, taking all the text from the cursor position in the current paragraph along with it. I found this feature ideal when I was drawing up a draft constitution for ComputerTown because it is riddled with clauses and sub clauses.

So ends the beginner's book and very good it is, too. I should think that most people would learn enough from it to get well under way with their word processing. The next two chapters in the manual are reference sections. The first is a quick reference and the second is a more detailed general reference. The quick reference is the bit you'll use most once you get under way, since it lists EDIT and COMMAND instructions, user messages, table entries, dot commands and other special commands which we haven't come to yet.

Right, let's use the quick reference to see what was left out of the 'Made Easy' section. Rewrite is a single key operation which rearranges the screen so that the line containing the cursor becomes the second line displayed. Three major types of command appear in this section — commands which allow you to enter and execute the macro programs mentioned earlier, others which allow you to work on text files which are bigger than the computer's available memory and others which allow you to search through text for specific character strings and replace them if you want to. User messages are listed, together with a full explanation of each and, where appropriate, tips on how to proceed. The table entries relate to printing, as we saw earlier.

The general reference section covers much the same ground as the quick reference, but with much more explanation of each feature, going into the reasons why things are the way they are. I found this most useful once I'd got over the initial shock of having to learn so much in order to master the package. The section is ideal for those who have got the hang of Spellbinder and who now want to ferret out its innermost secrets. One of the first new things you learn in this section is that you have a fair chance of recovering text which you think is still in the computer's memory. Now and again something will go wrong, whether it's finger trouble, a machine fault or a bug in the software, and you'll find yourself sitting outside Spellbinder, probably back in CP/M, just when you least expect it. The answer is to reload Spellbinder and to answer Y to the question OLD FILE? which appears as you enter the package. If it's at all possible to recover the text file in memory, then Spellbinder will do it. And just in case you're worrying, the only times that this has happened to me is when my machine has gone wrong or when I've tried to access a non-existent disk drive. (What am I saying? It's just happened again! I suspect my cooker is sending out all sorts of nasty interference. And when I answered 'Y' I got a right load of rubbish, too. Ah well, thank goodness for backup copies.)

Three types of search are described: simple, discretionary search/replace and automatic search/replace. The first will place the cursor on the first letter of the first occurrence of the string being searched. That's provided that you put the cursor at the top of text before starting. Searching always operates from the current cursor position. Discretionary search and replace gives you the choice of replacing each occurrence of the searched text with a new text, whereas the third option automatically replaces every occurrence with a new string. 'Wildcards' are question marks embedded in the text and allow any character to satisfy the search. For example: '?nd' would result in both 'and' and 'end' satisfying the search argument. Global searches will traverse an entire file from the cursor position forward, including parts which may be on disk. These facilities are jolly useful for correcting misspellings and for expanding abbreviations used through the text. For example, the text used for Benchmarking contains the word 'Microwriter' 50 times. To save time, I entered the abbreviation 'M*' and when the keying was complete I entered an automatic search and replace command to exchange Microwriter for M*.

For those new to the system, it is possible to display a user guide on the bottom eight lines of the screen. This gives the operator a quick reference to the various functions and what keys access them. I certainly found this useful for the first couple of days. Once I'd got used to the keys, I removed the user guide because it restricted my view of the text. Another nice function is the HE command. This allows you to read through a file on disk without losing your place in your work. You could, for example, write a file containing all those odd little functions that you can never seem to remember, or you could even look up facts recorded in another document you might have prepared at another time. When writing ComputerTown News each month, I find it useful to look up the previous month's version because the magazine containing it is usually still being printed.

Sometimes you might use a sequence of commands over and over again. It is possible to carry out these sequences automatically. I often use this feature to print several copies of the same document. By embedding a form advance dot command at the end of a document, I can tell the system to print 'n' copies by issuing the command 'n p/t' the 'n' is the number of copies, the 'p' says I want to print text from memory and the 't' says I want to return the cursor to the top of text after each printing. Almost all commands may be strung together in this way. An 'i' in the command string would allow the operator to intervene after each execution of the instructions preceding it.

It's possible to switch between two alternative print format tables. This is useful if you change stationery regularly between, say, letters and invoices. You can, if you prefer (and I do), build print format tables into the text using our old friends the dot commands. This means that whenever you print a particular document you can be sure that the correct tables are in operation. And there's nothing to stop you sprinkling different tables at different points throughout the same text for some very interesting effects. Titles can be placed at the top or bottom of the page, page numbers can be included which can even be placed in different columns depending on whether the page number is odd or even (if you're wondering what's good about that, look where the *PCW* page numbers are) and the space between pages can be defined and redefined at various places in the text — a very flexible arrangement indeed. If you're writing a book and you write a chapter or two at a time, you can keep the page numbers is ascending order by specifying the starting page number before printing. Once again, you can even redefine it as you go along.

Spellbinder contains all sorts of interesting print options and I only wish I had a nice daisywheel printer to try them out. Here we go with the ones not mentioned already: Downshift and upshift allow you to print subscripts and superscripts. A couple of weirdos called firm hyphen and line tweaker allow you to space lines out neatly, but I'm still trying to figure out how they work. An ASCII transmitter allows you to embed printer control codes in text — ideal for changing character formats on the Epson. Using this facility I can print normal, enlarged and condensed characters either normally, emphasised or double printed — not bad for a low-cost printer, is it? I could even produce low resolution graphics, although I've not tried it yet.

Those of you with daisywheel printers can use a number of special commands comprising an exclamation mark followed by a single letter. If followed by a number between 0 and 7, this replaces the special character entry in the format table with either shadow, underline, slash overstrike, hyphen overstrike, boldface, space instead of character, skip character or ignore an enhancement indicator in the text. A 'p' causes the printing to pause, to change the daisywheel, for example. An 'a' causes a line feed. A 'b' causes a negative line feed. An 'h' causes a backspace. A 'q' changes the ribbon colour to black, while an 'r' changes it to red. Letters 'u' to 'z' can be defined by the user. A proportional spacing table is buried within Spellbinder but, if this doesn't suit you, you can easily define your own and replace the standard one.

The dot commands are used to centre lines, to indicate a title line, to advance the paper (vertical tab and form feed), to negative line feed, to include a non-printing remark, to stop the printer, to redefine format tables and to switch between these tables.

Macros

Nine ready-written macros are supplied with the package. One numbers the lines in a file to correspond to the screen line numbers. This is very handy if you want a document checked by various people before finalising it — they can refer to line numbers when discussing changes and you can go straight to the line when editing the document. Another macro gives a form generation and fill-in capability and a third enables you to extract paragraphs, words and phrases from a 'boilerplate' file and incorporate them into the current document. This would be useful in a variety of situations; one that springs to mind is when creating a contract because you tend to use the same phrases over and over again. Another macro allows you to define a batch of files to be printed and it gets on with the job unattended. Nice if you want to watch a good program on the television. Beware of printer wrecks, though.

Two-column printing is done with a standard macro and three sorts are provided, two of which work with standard format name and address records. These are fine if you want to conform to Lexisoft's idea of a name and address file. The other sort works on any field of any record and sorts the records alphabetically — very useful but, I feel, very slow too. Finally, a mail merge macro enables you to personalise letters by extracting relevant bits from the standard name and address file and incorporating them in your standard letter.

For those who'd like to edit CP/M assembler, MAC or any of the CP/M Basic files, you'll be pleased to hear that special read and write commands exist to ensure compatibility between the two formats.

M-speak

The final section of the manual introduces M-Speak programming so that you can have a bash at creating your own macros. Programs are entered using Spellbinder's edit mode. The M-Speak commands include virtually all the command mode instructions plus a number of special M-Speak commands which I'll come on to in a minute. The macros are manipulated and executed from command mode by a set of four instructions: move macro to or from the macro buffer, execute the macro one or more times, read a macro from disk and execute it and single step through a macro.

It is possible to define up to nine numeric variables and up to 23 string variables using assignment statements similar to those in Basic. I could only find examples of addition and subtraction in the text and I'm not sure if that's the limit of M-Speak's mathematical ability. Strings can be concatenated, truncated, space-filled and enhanced. They can be compared with other strings, their length determined and they can be converted into or derived from numeric variables. Loops in the macros can be created using special indexing facilities to step through alphabetic fields. Branch statements allow you to dive around within the macro and certain system information is made available for checking. In particular file status, current cursor position, current character and current string can all be found and transferred into variables using the assignment statement. Messages can be displayed and input accepted from the screen and the cursor and its associated text can be displayed from within a macro. You can include comments in macros so that other people stand some sort of chance of understanding your brainchild. I think that it's probably best if you've had some experience of programming before you have a go at the M-Speak language.

Who'd use it?

Now you know more about Spellbinder than I did after using it for a couple of months.

I think that this package has something to offer all user categories. The writer, of course, will find it a joy to use — it will probably do just about everything he needs. The most significant omission as far as I'm concerned is that it doesn't give a word count. Since we work out the layout of *PCW*, and pay people according to word count, I consider this omission to be significant! I'm sure that I could knock up a little macro to do it but it would be far more convenient to have a built-in function.

I suppose, while I'm at it, I should bid for an indexing function as well — this would be especially useful to a text book author. And yes, let's go the whole hog — although *I'd* never need it *(lies — Sub Ed)* — why not a spelling corrector built-in as well? The package probably has more than the average manager will ever use, unless he's mad keen on doing his own reports, but his secretary will love it. The fact that the entire package sits in memory allowing you to switch from edit mode to command mode at will makes life very easy compared with some other packages and, on my SuperBrain at least, I can plough on for hours before I start to fill up memory. Let's see now, ah yes — I've still got 7683 characters left to go before I need to worry about popping some of this evaluation on to disk. The fact that the package can run with any printer, from the Sanders through daisywheels to cheapo dot-matrix machines, means that whoever you are and whatever kit you've got, providing you don't mind spending £250 + VAT, Spellbinder has plenty to offer you.

As far as I can tell, Spellbinder has one bug and one fault. The bug is that it is possible, under certain (and rare) circumstances, to create an enormous gap in your text which defies most attempts to get rid of it. It usually happens in insert mode when you're messing around with cursor controls. There are two ways of baling out from this. One is to put a mark on the last line of the gap and to use the delete command (this doesn't always work), the other involves writing the text to disk and reading it back in again. The fault is that the system configuration should include an option to define the number of disk drives being used so that if you enter an invalid drive letter you at least get stopped by Spellbinder and not by CP/M.

Overall, I reckon that Spellbinder is excellent and not at all bad value for money.

The timings which follow reflect the performance of the hardware configuration in conjunction with Spellbinder, rather than giving any absolute measure of the word-processor's performance. The first set of timings relate to a 3000-word text containing 50 occurrences of a word to be replaced. The entire text is held in the memory of the machine.

1. Read from disk	14
2. Write to disk	21
3. Jump from start to end	.5
4. Jump from end to start	instantaneous
5. Replace QQQQQ with Microwriter	12
6. Replace Microwriter with QQQQQ	12

The next two timings are for a 6000-word text containing 100 occurrences of the word to be replaced. Since some of the text overflows the available memory area, this has to be called in from disk during the search and replace operation. The entire text is written to a new file on disk. The timing includes 100 replacements, writing the entire text to a new file and reading in the overflow.

5.	67
6.	66

To print the original 3000-word test text on the Epson MX 80 F/T took 6m 44s. This included headings, right justification, a left margin and an extra line feed between each paragraph.

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WORDPRO 4 PLUS

It was always a little difficult to take the original Commodore PET totally seriously. Name apart, it had several drawbacks as a business machine, even after it was given a proper keyboard: in particular, its 40-column screen width was limiting, especially for word processing, the application in which we're interested here.

Commodore, too, realised that a 'serious' PET was needed and produced the 8000 series, with a larger screen holding 80 characters per line; this, among other features, made the 'SuperPET' more suited to business use.

Software houses have responded by producing an ever-growing range of applications packages for the 8000 series, including several word processing packages.

This review is of the Wordpro 4 Plus package, produced by Pro-Micro Software Ltd and marketed by Professional Software. The package was tested on an 8032 computer with the 2040 twin minifloppy disk drive unit and a Diablo 630 daisywheel printer.

Wordpro 4 Plus comes on a disk (formatted for 2040, 3040, 4040 and 8050 drives), a ROM which fits into one of the spare sockets inside the SuperPET, a set of stickers to denote the control keys and a manual. Installing the ROM is easy — the manual even has a diagram of the ROM sockets to ensure that it's put in the right one — and it can stay in place while the machine is being used for other applications.

Editing

Wordpro 4 Plus is an all-in-one package, which means you can edit text and print it without having to first save it to disk and run a formatting program. This is convenient, but it eats up memory space, as we'll see in a moment.

With the ROM installed, you load the program from Basic and run it by typing RUN. The loading was not always fool-

proof and occasionally I had to abort it and jiggle the disk around in the drive before starting again; the manual warns you about this.

You're then asked a series of questions to set up various system parameters, such as the size of text buffer required and the type of printer being used (see photo); WP4+ has built-in drivers for any CBM printer, the NEC Spinwriter, Diablo 630, Qume Sprint 5, TEC 1500 and any other suitable printer which can be interfaced to the SuperPET. With the questions answered, you're into the program proper, which, initially, gives a blank screen with a status line across the top; this tells you what control mode you're in, prompts you when you're doing things like saving to disk, and shows the current cursor position as line and column numbers.

There's no need to hit return at the end of each line as you type unless you want to force a return — at the end of a paragraph, for instance; return is shown as a small arrow symbol on the screen. But WP4+ does not have auto word wrap-around, in which, if you're halfway through a word when you reach the end of the line, the whole of the word is automatically transferred to the start of the next line. The result (of not having wrap-around) is that the text is just that little bit more difficult to read as words are split randomly at the end of lines.

Control functions are activated by pressing the RVS key followed by the key corresponding to the desired command — using the stick-on labels makes this quite easy.

Cursor movement is by the SuperPET's normal cursor keys. If you're not familiar with a Commodore keyboard, this is a little inconvenient at first; there are only two cursor keys and upwards and right-to-left movements are obtained by shifting the keys. Nearly all the keys have an auto repeat action which functions if the key is held down for more than a second or so. The cursor can be homed to the top left-hand corner of the current page or text file but the only way to get to the bottom of text is by scrolling right through it with the cursor down key. A 'go to line n' command is available, useful if you have a standard text requiring minor alterations at a known line before printing. It's also possible to insert comments which won't appear in the printed text.

Tabs are set by positioning the cursor on the line and pressing a control key; tab positions are shown as small squares below the rule under the status line and tabbing is then carried out using the machine's tab key.

Insertion and deletion operate on words, sentences and lines, and are straightforward to use. Erasing works on all the text, specific lines or on all text following the current cursor position.

Blocks of text can be moved by first specifying which lines you're interested in — a very easy process — and then positioning the cursor at the required destination. Pressing a transfer control key then moves the lines and deletes them from their original position. This function only works on entire *screen* lines, however, not on complete sentences.

Commands are available to find occurrences of strings and to search and replace strings; the latter is quite good fun as the replacing happens on the screen before your very eyes, although this must slow down the process considerably.

Wordpro 4 Plus gives the user two text buffers, one called main and the other called extra. Together they can handle a total of 139 lines, of which a maximum of 116 can be allocated to the main, working buffer. This limits the size of any piece of text to 9280 characters (1325 words or just under three single-spaced A4 pages).

The extra text buffer can be as large as 69 lines (5520 characters) and is designed for reading in material from a separate file for incorporation into the text in the main buffer. An easy-to-use variable function enables you to set up a standard letter in the main buffer, load a file of names and addresses into the extra buffer and automatically produce customised letters. The facility is by no means as powerful as that of Magic Wand, reviewed last month, and the maximum size limit of the extra buffer prevents you from holding a big mailing list, but for low to medium volume work it's a foolproof and simple system. Similar operations can be performed using paragraphs of text held in the extra buffer.

At first sight the 116 lines main text buffer limit may appear to be a severe handicap. However, it is possible to handle lengthy texts by splitting them into separate files.

Having entered your set of text files, you can then print them using a global printing command, by means of which the system will automatically start to print the next file as soon as it reaches the end of the first. Search and replace can also function globally, which is *extremely* useful.

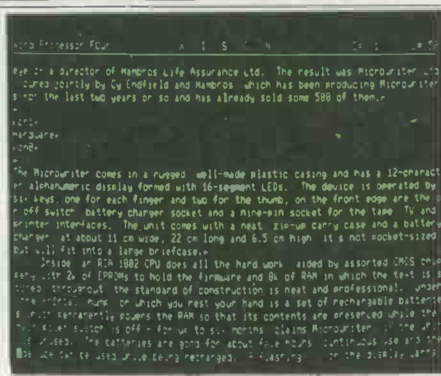
Because of the 116 lines limit, it was not possible to carry out the full range of WP Benchmarks; in fact, only the two search and replace and the printer tests could be made, using the global facility, with the stopwatch stopped when the system paused to read in the next file from disk.

The final function which deserves special mention is the numeric tabbing facility provided by WP4+. This enables you to enter columns of figures and line up the decimal points — it works to two decimal places and is designed mainly for accounting. Further, the system will automatically add up or subtract the columns.

Disk handling is very straightforward, both for reading and writing (called recalling and memorising in the manual). It is possible to view the directories directly from WP4+, although doing so destroys whatever's in the text buffer at the time, which can be unfortunate if you wanted to see if there was enough space on a disk to save the text you'd just typed in! Various disk utilities are built into WP4+ including formatting blank disks, disk validation (which removes 'bad' areas of the disk from use, as the manual puts it), duplicating an entire disk, copying files either singly or in a linked group using a global command, and renaming and scratching files.

Total disk capacity with the 2040 drives is 170 kbytes, which works out at about 54 single-spaced A4 pages, split across several files, of course.

In summary, the editing side of WP4+ has been well designed around the SuperPET's facilities, is easy to learn and use and provides some useful capabilities for the general business user.



The Wordpro 4 Plus screen showing (left) text as typed and (right) as formatted.

The stick-on labels help considerably.

Formatting

Wordpro 4 Plus gives a good range of formatting capabilities, achieved by embedding commands in the text. The commands are denoted by a ✓ mark on the screen and several commands can be placed on one line, separated by a colon, although a few must be placed at the end of a command line.

WP4+ checks the command syntax during output; if it encounters an error it stops printing with the cursor positioned on the error and a 'syntax error' message is displayed on the status line.

You are given control over both margins, overall page length, number of lines per page, and line spacing (single, double or triple). Text can be justified or printed with either the left or right margin aligned and the other left ragged and there's also provision for 'outdenting' lines. Lines can also be centred between margins. There's a command to insert n blank lines in the text to leave room for a diagram and you can specify a line at which printing is to start on a page, both of which eliminate the need to insert multiple returns in the text, which would waste lines in the text buffer. You can force a page feed, either immediately or if fewer than a specified number of lines remain on the page. Ghost hyphenation is also catered for.

To match its built-in printing drivers, WP4+ provides a good range of printer control commands, catering for bolding, underlining, superscripting and subscripting. You can specify horizontal pitch and vertical lines per inch and you can define certain keys to produce codes matching special characters on some daisywheels. There's a pause command (to which you can add your own prompt which will appear on the screen) to stop printing should you need to change a daisywheel, for example.

Headings and footings can be specified, each occupying a single line at the top or bottom of the page. These lines are split into three 'fields', two aligned with the margins and one centred between them.

WP4+ allows you to preview the formatted text by outputting it to the screen instead of to the printer; this is a very useful way to ensure you've got it exactly right without wasting paper on draft copies. If you spot a mistake you can stop the output; this automatically puts you back into the editing

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KINKAKUJI TEMPLE (Golden Pavilion) KYOTO mode so that you can correct the error.

Printing can be done a page at a time, to allow you to insert sheets into the printer, or it can be continuous; it's possible to print from any page and, as I mentioned earlier, there's a global command which will allow you to print a series of linked files automatically. It's also possible to send the formatted output to disk and then spool print the text — this allows you to carry on editing another document while the first is being printed.

Like the editing, then, WP4+'s formatting is straightforward; there are a few frills but not enough to make the system complicated to learn.

Learning and documentation

Wordpro 4 Plus provides a useful range of functions without being complex. It's easy to use and learning is not difficult, although it would be made easier with better documentation.

The manual is a loose-leaf affair in a smart ring binder — the initial impression is good but this is ruined once the would-be learner opens it and gets stuck in. The manual covers all aspects of using WP4+, certainly, but in a loosely structured and not particularly logical way. The layout is poor, taking little advantage of the formatting which WP4+ offers to make such documents clearer. Take, as an example, the page on making a back-up copy of the system master disk; firstly, this doesn't appear until you're well into the manual and have already started to learn the system — it should be one of the first things explained; second, it's only when you get half way down the page that you discover that the instructions which you've been trying to execute apply only to the 8050 drives — users with other devices are suddenly told to turn to a page near the back of the book for their instructions. This is silly because the general tone of the manual is aimed at the complete novice — earlier, several pages are devoted to switching the equipment on and off, for example.

The general (but inconsistent) format is a series of lessons, some of which are followed by exercises; unfortunately the exercises sometimes follow exactly the previous lesson, giving an impression of repetition which becomes slightly tedious.

There are other small anomalies, such as the use of the symbol '@' when referring to the control symbol, which is confusing as there's an @ key on the machine which is used for search and replace.

To be fair, though, the actual explanations of the system's facilities are clear and comprehensible and, with patience, a novice should be able to use WP4+ without trouble once he/she's waded through the manual.

Users

Looking at our four user categories, then, who's going to find WP4+ useful?

On the whole, I wouldn't recommend it to the author/journalist, mainly because of its small text buffer and the consequent need to split text into a large number of fairly small files. As I fall into this category myself, I know how useful it is to be able to look back at what you wrote 70 pages earlier without having to save the current text on disk, load a different text file, look at it and then reload the part you're working on.

The report-writer would find this less of a limitation, as reports are far more structured than a piece of creative writing or a newspaper article. For anything other than the smallest of reports, he'd also have to split his work into a number of files but I think this wouldn't be too much trouble. The numeric tabbing feature would make financial report writing a cinch and the good formatting capabilities, coupled with a daisywheel printer, make WP4+ a useful tool for this user.

Quite how useful the package would be to a manager depends in this case on what he manages. A departmental manager in a big company, with limited personal WP needs and a secretary to do the complicated stuff, might find it very handy for memos but might be deterred by the modular hardware — trailing wires don't go well with the executive image. But a small businessman, again with limited WP requirements, would find WP4+ useful as an addition to other packages (stock control, etc) needed to run his business and now available for the SuperPET.

If the office requirement is for high volume word processing only, with no need for the SuperPET's other capabilities, then I wouldn't recommend Wordpro; although the secretary would feel quite at home with the hardware/software combination reviewed here, its limitations would, I feel, make it unsuitable for large mailing shots of customised letters, for example, or for producing long texts.

Hardware

We Benchtested the 8000 series in September 1980 so I'll confine my comments to its suitability for word processing. Certainly the 80-column screen is pleasant to use; it displays 23 lines of text, as the status line and its rule take the two at the top, but this is not a problem. The SuperPET displays green letters on a black background and these are very legible; there's a brightness control at the back of the machine and the characters have true descenders. The keyboard has a nice solid feel and is of proper typewriter pitch and layout.

The 2040 disk drives are quiet and quick. I experienced occasional difficulties when loading the WP4+ program itself but these never occurred when loading text files.

The Diablo 630 printer was borrowed along with the rest of the hardware from Professional Software and thus came with no documentation. It's very large and very heavy and vibrates considerably when printing, although noise levels aren't too high — you could carry on a phone conversation in the same room provided you were a couple of metres away from it.

The Diablo's print quality, using a plastic daisywheel and a nylon ribbon, weren't very impressive, but I'd expect this to improve considerably with a metal wheel and a carbon ribbon. It's quite quick, as the test shows, but although it can print bidirectionally, it would only do so for the final line of each paragraph — all other lines were printed left-to-right with a carriage return performed at the line end. Frankly I haven't the slightest idea why this was so.

Normal typeface

<u>Bold & underlined</u>

Sub$_{\text{s}}$cript and super$^{\text{s}}$cript

Fig 1 Diablo 630 typefaces.

Summary

Wordpro 4 Plus is a useful system which most users should find easy to learn and use, despite the documentation, which could certainly be a lot better. Its facilities bias it firmly towards the small business user who could use the SuperPET for other applications as well, rather than towards someone who only wants to do word processing and who has a lot of that to do. The limitation of 116 lines of text would make it rather unsuitable for the author/journalist but this should be much less of a problem for the report writer.

The SuperPET is very handy for word processing, having a good-sized screen and a nice keyboard. Some users may not like the separate disk drive.

The Diablo 630 is a big, robust, heavy-duty daisywheel printer capable of a useful range of functions and eminently suitable for all general business uses where quality rather than absolute speed is required.

BENCHTEST

Benchmark	Base time
1	n/a
2	n/a
3	n/a
4	n/a
5	108.4
6	109.1

Note: Because WP4+ cannot store the entire test text within its buffer, Benchmarks 1-4 could not be tested.

Printer test: Diablo 630

Time taken to print out 3000-word test text: 9min 51sec (30 char/sec, 304.5 wpm).

Prices (excluding VAT)

Wordpro 4 Plus	£395.00
CBM 8032 computer	Prices vary
CBM 2040 disk drives	
Diablo 630 printer	

Peter Rodwell tests the 'industry standard' word processing package for CP/M-based systems.

WORDSTAR

Despite the fact that there are now probably nearly two dozen word processing packages available to run on microcomputers of one sort or another, the one you're most likely to come across, to find most frequently in dealers' showrooms and to hear mentioned most often, is the package called WordStar, produced by MicroPro.

WordStar has become the 'industry standard' word processing package and is available not only for just about every CP/M-based micro but for a few others as well, most notably the Apple II (provided the machine has been converted to run under CP/M with a Softcard and an 80-column screen card). There are even one or two dedicated word processors around which have been designed specifically to run WordStar. You can go on a training course or two to learn to use WordStar and you can even buy a book *(WordStar Made*

Easy by Walter A Ettlin, pub Osborne/McGraw-Hill) which teaches you to use it.

Oddly enough, although WordStar is available on just about every CP/M machine around, it proved somewhat difficult to borrow a micro specifically to test it. Luckily, though, Transam Computers felt it was time we reported on what has been happening to the Transam Tuscan since we Benchtested an early model back in early '81 and this test was carried out on the latest Tuscan, a twin-disk, CP/M business machine which, for a refreshing change, is British designed and built. But more on the hardware later — first let's look at WordStar.

Installation

Most WordStar users will buy the package already configured for their particular machine, probably at the same time as they buy the machine. But WordStar is supplied with a program called INSTALL which, if you've bought a standard WordStar, you run to configure it to your own system, taking advantage of any special features of the computer and/or printer.

In the case of this Benchtest, Transam had already installed WordStar on the Tuscan so the procedure wasn't necessary. Having installed WordStar on one or two other systems in the past, though, I can say that it's a very easy procedure provided you have a reasonably standard system. 'Standard' in this case means CP/M, a minimum of 45k of RAM (the more the better) and a terminal or VDU board with at least 16 lines of 40 columns and an addressable cursor (ie. the computer can move the cursor to any position on the screen by sending a special code followed by the row and column numbers of the position to which the cursor should move). WordStar can in fact operate with just about every terminal (except, damn it, mine!) and can handle up to 120 lines across 250 columns (although it needs lots of RAM to do this — it's very much a theoretical upper limit). WordStar can be installed to take advantage of special VDU characteristics such as character-by-character inverse video or bright/dim characters.

There's great versatility in the printer handling too — basically, if CP/M can drive the printer, WordStar can use all of its facilities, including sub and superscripts, backspacing, ribbon colour change etc. If you have very special requirements and you can write routines to handle them in Z80/8080 machine code, you can 'patch' WordStar to incorporate them — full details are given in the installation guide, together with assembler source code listings of the relevant parts of WordStar.

Most 'naive' (in computing terms) users should be able to manage a straightforward installation; more advanced users (those with programming experience) and dealers should be able to modify and install WordStar for just about any system currently around. One of the reasons for WordStar's widespread use must lie in the ease with which it can be installed on virtually any given system.

Editing

With WordStar installed, either by the dealer or by the user, the installed version is called up either by typing just its name or by additionally typing the text file name and the disk drive on which it can be found or is to be created. Optionally, you can add another disk drive name after the filename, indicating the destination for the finished text. So the line: WS A: TEXT. DOC B: would edit the file TEXT.DOC on drive A and put the result onto drive B with the same file name.

If no file name is specified, you find yourself looking at the 'No File Menu', a list of commands available plus a directory of the currently active disk. From this menu you can edit a file, either 'document' or 'non-document' (ie, a program source listing), change the currently logged-on disk drive, suppress or reactivate the automatic display of the disk directory, print, rename, copy or delete a file, exit WordStar temporarily to run another program and then return to it, or exit completely from WordStar. Additionally, there are special commands to run two programs linked with WordStar, MailMerge, the mailing list handler, and SpellStar, the spelling check program.

There's one other command available at this stage which deserves special mention, for it's to do with a feature for which WordStar has justifiably become famous — the 'help level'. WordStar comes with a whole set of 'help' menus which vary according to the operation you're performing at any given moment. Normally, when the system starts up, the help level is set to 3, the most verbose and, er, helpful level; this level can be changed, right down to 0 which suppresses the menus almost entirely so that, as you become more familiar with the package, you can clear space on the screen to display larger amounts of text. Unfortunately, though, there's no way to re-configure WordStar to start at any level other than 3, so you have to set the help level every time you start an editing session if you want a lower level than 3.

Once you have specified a document name, WordStar enters its editing mode automatically, displaying a new menu — this time of the controls used during text input. Also displayed is a ruler at the top of the text area (see Figure 1) showing the left and right margins and the tab stops, denoted by exclamation marks.

Anything typed at the keyboard using the normal alphanumeric keys is, at this stage, considered text and appears in the text area of the screen. Although cursor control keys are now fairly common on microcomputer and terminal keyboards, they are by no means universal and where they do occur, the codes they produce aren't necessarily standardised. To enable WordStar to work on every keyboard, then, its authors have chosen to rely on control characters to move the cursor around through the text and to perform other operations.

The result is, at first sight, a ghastly confusion of control codes which seem to bear no connection with the operation with which they are concerned. For example, you press CTRL-S to move the cursor left one character and CTRL-W to scroll text down by a line. There appears to be no logic behind the choice of control codes and certainly no attempt to make them easy to remember by using more mnemonic codes such as CTRL-L and CTRL-D respectively for the two operations just mentioned. In fact, WordStar is more cunning than this, for the codes chosen for these basic — and frequently used — cursor movements all use keys in a block next to the usual position for the control key, at the far left of the

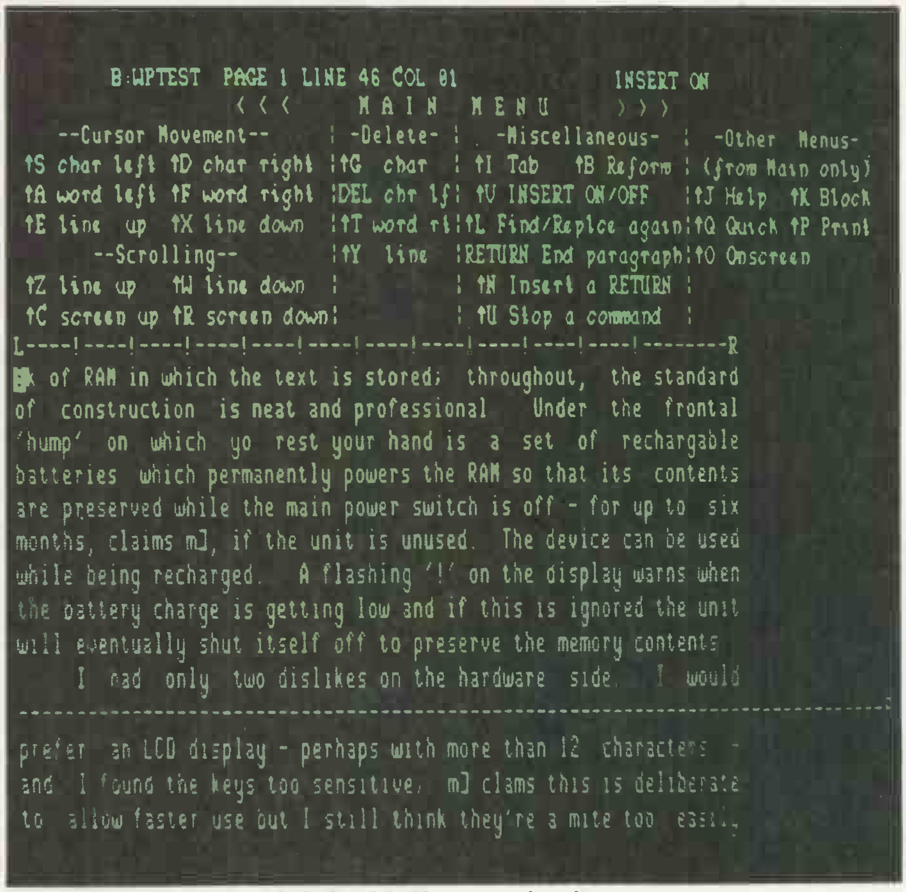

Fig 1. The main menu at help level 3. Note page break.

keyboard. Thus, while CTRL-S moves the cursor left one character, CTRL-A moves it left by a word; and while CTRL-D moves it right by a character, CTRL-F moves it right by a word. The up and down movements are similarly controlled. There's no need, then to try to *remember* the control codes for they fall naturally to hand and can be carried out with just the left hand, using the little finger to hold the control key and whichever other finger coincides with the appropriate key in the cursor movement block.

This works fine when you're using a keyboard on which the control key is sited next to the 'A' key but this isn't always the case and it can then become awkward if you have to stretch across the keyboard. Fortunately, it is possible to use the INSTALL program to configure WordStar to use any dedicated or programmable function keys available on your computer and this certainly makes life a lot easier. I have seen one or two dedicated word processors which use WordStar with a whole row of special keys, covering just about all the main WordStar functions and it's well worth looking out for this sort of 'customisation' if you're looking for a machine on which you intend to do a lot of word processing for it speeds up both the initial learning period and the actual entry of text.

WordStar uses auto word wrap (which can be switched off if required), as do most word processors nowadays, but it carried this a stage further by right-justifying the line when it wraps a word; this, too can be turned off if necessary. The effect is that you see on the screen a reasonable representation of what the text will look like when it's printed, an impression aided by the automatic insertion of a dashed line to show where page breaks occur (see Figure 1). Annoyingly, resetting the margins doesn't automatically reformat the text on the screen and it's necessary to issue a reformatting command to do this. The same is true when you insert text — the line containing the insertion spills over the margin and the paragraph has to be reformatted by the operator.

A useful feature of WordStar version 3 (the version tested) is that you can use lines which are longer than the screen width, thanks to a horizontal scrolling feature. This is very handy for producing, say, wide balance sheets, but I found it rather confusing to use for ordinary text.

Unless you turn it off, the insertion mode is continuously active, so you can insert text simply by moving to the appropriate place and typing it in — the existing text shuffles forward to make room for it. Deletion is similarly straightforward, and operates on characters, words, lines, blocks and, in this latest version, columns too.

Commands exist for changing the tab stops, centring lines and releasing the margins temporarily, much as one would on an ordinary typewriter.

It's important when processing words to save your text to disk frequently, a lesson I learned the hard way some time ago by getting towards the end of a *very* long piece of text only to have a power failure which wiped it all out and forced me to start all over again. WordStar allows you to save what you've written and continue writing, which is very useful. Additionally, you can save text and either go back to WordStar and work on another document or exit from WordStar completely, and you can simply abandon your file without saving it at all.

More advanced editing commands provide powerful block controls — move, copy, delete and write to a separate file — and there are also find and replace commands. These latter I found rather tedious, particularly the replace feature, which insists on showing you what it's doing on the screen, scrolling through the text and replacing as required, which slows the process down considerably and is only necessary if you're using the query option, where it stops at each occurrence of the text to be replaced and gives you the option of replacing it or skipping to the next occurrence.

All in all, editing text with WordStar is a somewhat fiddly business. Although carrying out the basic cursor movements with the control characters is easy, the more complicated commands require more complex sequences of control characters, to the point where things do become awkward. If your computer happens to have dedicated or programmable function keys, life is somewhat easier but, on a standard keyboard, WordStar is certainly not the easiest word processor to use.

Printing

Getting your text onto paper is rather easier than editing it in the first place. WordStar contains a mass of printing features, many of which are concerned with handling the special features of the more expensive daisywheel printers, while another batch takes care of page formatting.

Naturally you can define the number of lines to a page, the line spacing, set left, right, top and bottom margins, force new pages (either absolutely or conditionally) and position the page number wherever required.

The printer controls are very powerful and cater for underlining, bold face, double-strike, strikeout (often required in legal documents), sub- and superscripts, ribbon colour change, alternate character pitches (10 or 12 to the inch) plus four spare codes which you can use, via INSTALL, to send any special instructions to the printer which aren't normally available from WordStar.

Because the printing function is built into the main WordStar program (instead of being a separate program, as is the case with some word processing packages), it's possible to initiate the printing of a document and then carry on editing another. I found, though (and the manual warns about this), that response to the keyboard was slowed considerably and it was necessary to stop typing completely when the system was retrieving text from the disk as part of the printing process. As the manual states, it's probably better to use this facility to revise a document already on disk rather than to try to input large amounts of new text while the system is printing. As well as sending text to the printer, it's also possible to print to disk, in which case the resulting file is fully formatted and can be printed out without the aid of WordStar — by using the CP/M TYPE command, for example — or transmitted through a communications system.

Before printing starts, WordStar presents a list of options to choose from; as well as asking whether or not you want to output to disk, it gives you the chance to start and stop at specific page numbers (enabling you to print just part of a document), allows you to send a form-feed at the end of each page instead of the requisite number of line feeds (form-feed is quicker on some printers), suppresses page formatting if required — in which case the formatting instructions are printed instead of being executed — and pauses printing at the end of each page to allow you to insert a fresh sheet if you're not using continuous stationery. This options menu can be suppressed by pressing the ESCAPE key after giving the name of the file to be printed instead of pressing RETURN, in which case the defaults of output to printer only, full document printout, line feeds instead of form feeds, page formatting executed and no pause between pages are used.

Printing can be suspended or completely abandoned at any time and there's a third option which stops the printing and returns you to the main WordStar menu; printing is then reactivated by giving a further print command.

WordStar's printing facilities are therefore very comprehensive and easy to use. On the whole I found the printing side (by which I also include the formatting) a lot easier to use than the editing side, obviously because there's a smaller reliance on control codes. but also because it seemed generally simpler and more logical in its command formats.

Documentation

WordStar version 3 comes with a thick, loose-leaf manual which covers every aspect of the basic word processing package and also includes details of the MailMerge program.

The manual is divided into three parts: a general introduction, which gives you enough information to get started on basic word processing and formatting; a detailed guide, which explains every feature of the package in full, usually with brief examples and typed (as opposed to photographed) screen displays of all the menus plus a reference section and an appendix covering the largely self-explanatory and quite comprehensive error messages; and a longish section which goes into all the gory details of installation, complete with assembler source code listings of all the parts which you might need to get at to 'patch' WordStar to suit your own system.

Detailed and comprehensive though they are, the manuals are by no means the best in the business. Typographically they're a mess, having been printed out on a daisywheel printer and very badly formatted. The information is all there but it is presented in a very jumbled fashion which sometimes makes it difficult to pinpoint a specific feature about which you require further information. Compared to the Magic Wand manual, the best word processor manual I've yet come across, the WordStar offering is quite poor and could do with a complete revision.

On the plus side, though, it is clearly

written — jargon and obscure Californisms are avoided and there's none of the silly attempts to be humorous which I personally find extremely irritating in some US-produced manuals (but it could just by my sense of humour which doesn't find them at all funny). I did spot one sneerworthy phrase in the INSTALL manual, though, in the section discussing the fine tuning of your customised WordStar to extract maximum performance from it: 'Note that "sufficient" may mean acceptable to the general user but tweaking for maximum performance is the *American way* and is more often than not possible and effective.' (Their italics.)

Users

There are, I feel, several reasons why WordStar is so widely sold. I've already discussed how it can be installed easily onto just about any CP/M-based machine, either by the dealer or even by the end user — a factor which must obviously have contributed significantly to its dominant position among micro-based WP packages. Additionally, it seems to have been marketed quite aggressively, and MicroPro, its producer, seems to have been willing to do deals with a great many computer suppliers. A further reason for its success must lie in the facilities it offers, which are broad and reasonably powerful enough to appeal to most potential WP users.

WordStar's ability to handle text files larger than the capacity of the computer's memory is a definite plus for the author/journalist as it saves the drag of splitting documents into several pieces. The limitation on document size then becomes the disk capacity and you're going to have to write quite a large book to exhaust that on most of today's micros, especially if you have a winchester hard disk!

As I've stated before, the author/journalist does not usually require very elaborate formatting capabilities but he does need a system which is easy to use, and this is WordStar's major failing, as far as I'm concerned. It isn't the easiest package to use, either while learning or after considerable practice, although provided you don't want to do elaborate things it's not too bad.

The report writer does want to do elaborate things and the sometimes very clumsy command sequences required by WordStar may appear rather unfriendly to this user. On the other hand, though, he does have a useful range of powerful formatting capabilities at his fingertips with WordStar plus the horizontal scrolling facility which breaks the boundary of the standard 80-column screen. Decimal tabbing, which automatically aligns figures around the decimal point at a position specified by the user, is a feature which the financial report-writer will find very useful, although there's no built-in facility for performing maths (such as adding up a column of figures) as some word processors provide.

I think most managers would find WordStar rather over the top and difficult to use. Time is this user's scarcest resource and the plethora of control codes would probably be too much for a manager to get to grips with in a short time — he wants a machine which he can simply switch on and bash away at; and my feeling, backed by the reactions of people from this user bracket trying out WordStar for the first time, is that it's just a bit too confusing and difficult.

Likewise, I have found that many secretaries are initially confused by it and feel it's unnecessarily complex. Most, however, get to grips with it and 'get used' to it, by which I mean that they master it reasonably quickly and learn to live with its awkward features, mainly because it's the first and only WP package they've come across and thus assume that they're all like this. I have, on a couple of occasions, shattered this illusion by introducing them to other, easier to use, packages and left them somewhat disgruntled with WordStar as a result!

Conclusions

WordStar is a powerful, popular word processing package, available or easily adaptable to run on just about any CP/M-based microcomputer on the market now. A version to run under CP/M-86 has also been produced, so we'll see it being offered on the new generation of 16-bit machines such as the Sirius, the IBM Personal Computer and others.

Although it fulfils the WP needs of a wide range of users, it can be a rather awkward package to use — particularly with some of the sequences of control codes needed to execute the more advanced editing commands.

Although it can be configured to fit a wide range of machines, there is no provision for tailoring the package to do more complex things, such as exists in Spellbinder or Amethyst (but I must qualify this by stating that, from talking to users of these packages, I find they appeal more to programmers and computer professionals than to laypersons — the latter can find them quite intimidating).

The main competitor to WordStar — in terms of power and facilities plus ease and friendliness of use — must be Magic Wand, which is considerably easier to use and is more powerful, incorporating features which, with WordStar, you have to pay extra for in the form of MailMerge and DataStar, two add-on packages from the same stable. Until now, though, Magic Wand has not been marketed with the same aggression as WordStar and has not been made available for as many machines, lacking as it does the versatility provided by WordStar's INSTALL module. On paper, were I to have to choose between the two, I would go for Magic Wand; in practice, though, the chances are that I'd *have* to buy WordStar simply for the ease of installation. WordStar costs £255 from Transam or £315 with MailMerge.

Hardware

Although these WP Benchtests are primarily a review of software packages, it is interesting to comment on the hardware used for the review, where this has not previously been reviewed in *PCW* or where it has features directly relevant to word processing.

In this case, Transam Computers kindly lent us a Tuscan on which to review WordStar. We reviewed the Tuscan back in its early days in January 1981 and a lot has happened to it since then. Most notably, Transam has developed a memory-mapped 80 x 24 video board which plugs into the Tuscan's S100 bus and makes the machine more suitable for word processing and other 'serious' applications.

The standard business Tuscan comes with twin 5¼in floppy disks, either single or double sided for a maximum capacity of 760k, expandable by adding a further two drives if necessary. Or you can go for 8in drives for a maximum of 8 Mbytes or a mixture of 5¼in and 8in drives. Hard disks are also available to give up to 100 Mbytes of disk storage, which should be enough for even the most prolific of writers.

A range of add-in S100 boards is also available, including a Prestel-format colour video board and a high resolution graphics board as well as a speech synthesiser board.

I had mixed feelings about its suitability for word processing. Certainly the Tuscan is fine for the general business user to whom word processing is just one of several applications which must be carried out on the same machine. But for somebody who's interested mainly or exclusively in word processing the Tuscan is not the ideal machine, mainly because of its keyboard. Firstly, the keys have a rather 'dead' feel to them and tend to sound rather tinny — okay, this is a personal matter and not everybody may be as fussy as I am about keyboards — but there isn't the solid business-like feel to the Tuscan's keyboard which you find on many other business micros. More serious, though, is the small number of keys provided — just the standard typewriter keyboard plus a numeric pad and the bare minimum of computer keys — ESCAPE, DELETE and CONTROL. There are no editing or programmable function keys, making it a somewhat dated-looking machine, and worse, as far as word processing goes, there's no repeat function, either by holding down a key or by pressing a separate repeat key.

However, the display generated by Transam's VB4 video card was excellent, giving a clear picture which was rock-steady at all times and with a good, easily readable character set with proper descenders. The character set is programmable and two versions of WordStar were provided for this test — one using inverse video to pick out the help menus and the other using an attractive italics face for the same purpose (see Figure 1 again). The versions were supplied as auto-start disks — switching on or resetting the machine caused it to boot CP/M (unusually quick on the Tuscan as it's partially in ROM), load either the inverse or italics character set and then load and run WordStar, all with the operator doing nothing apart from telling the machine what size of disk the system has in response to the prompt which appears when the machine is switched on/reset.

Perhaps the nicest thing about the Tuscan is that it's British and that Transam has a good reputation for supporting its machines and users — the experts are all there at the end of a phone line or a tube ride instead of being inaccessible in California — and from personal experience I can say that this is both reassuring and important when your business depends on a quick and useful response to a problem.

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* Format-80 is available from most Apple dealers or direct from Personal Computers Limited and costs £300 (ex VAT) - this includes the mail merge facilities as well as a mailing list sorter.

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