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APRIL 1983

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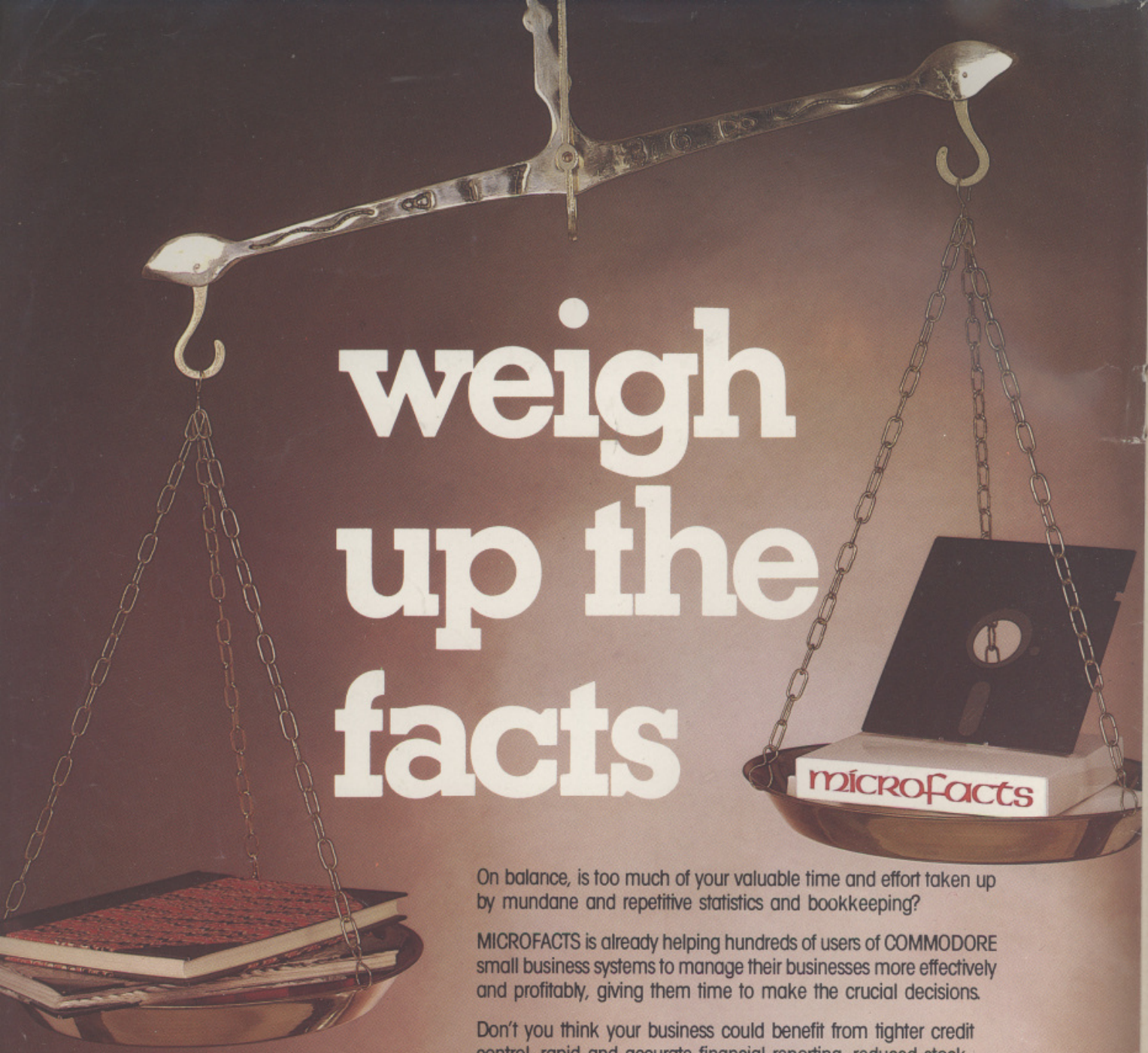
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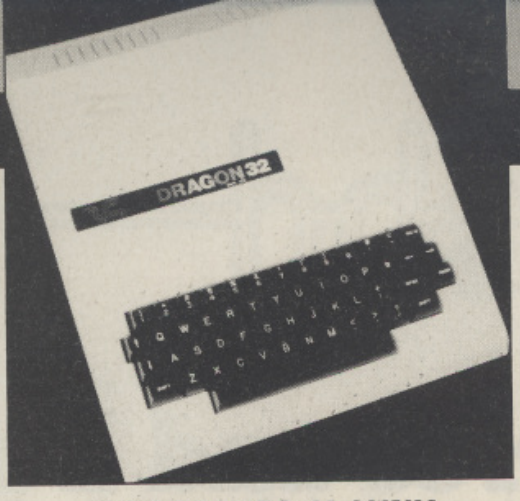
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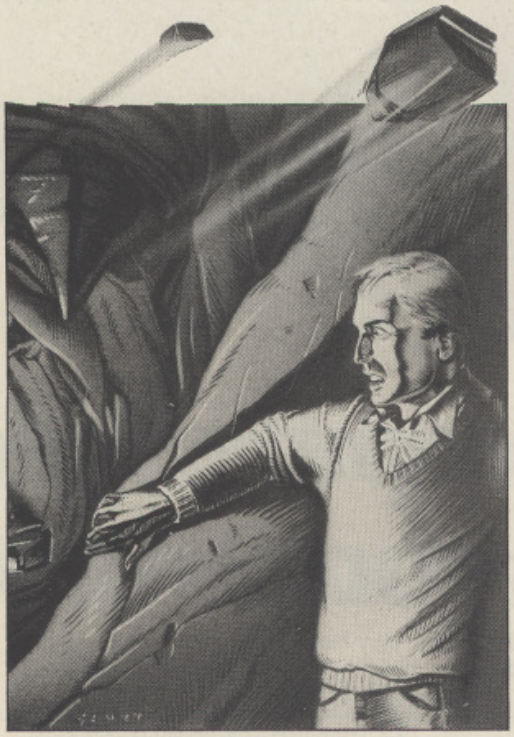
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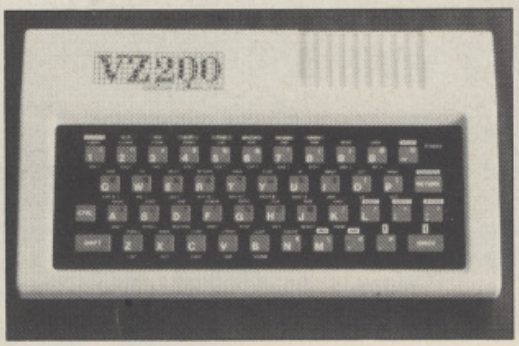
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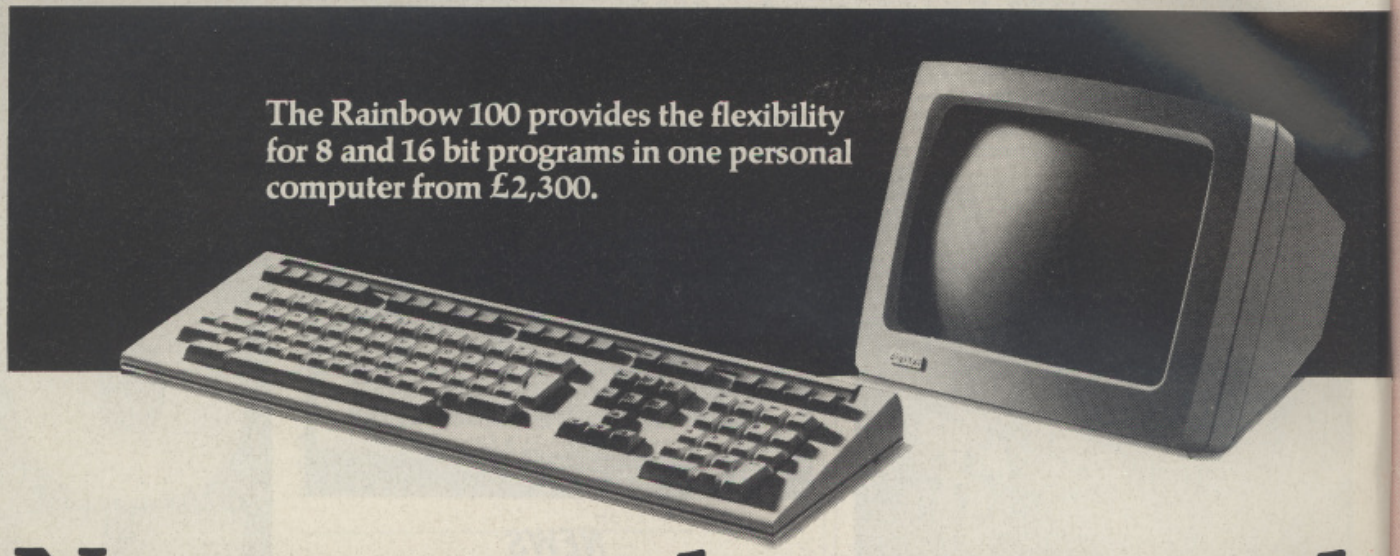
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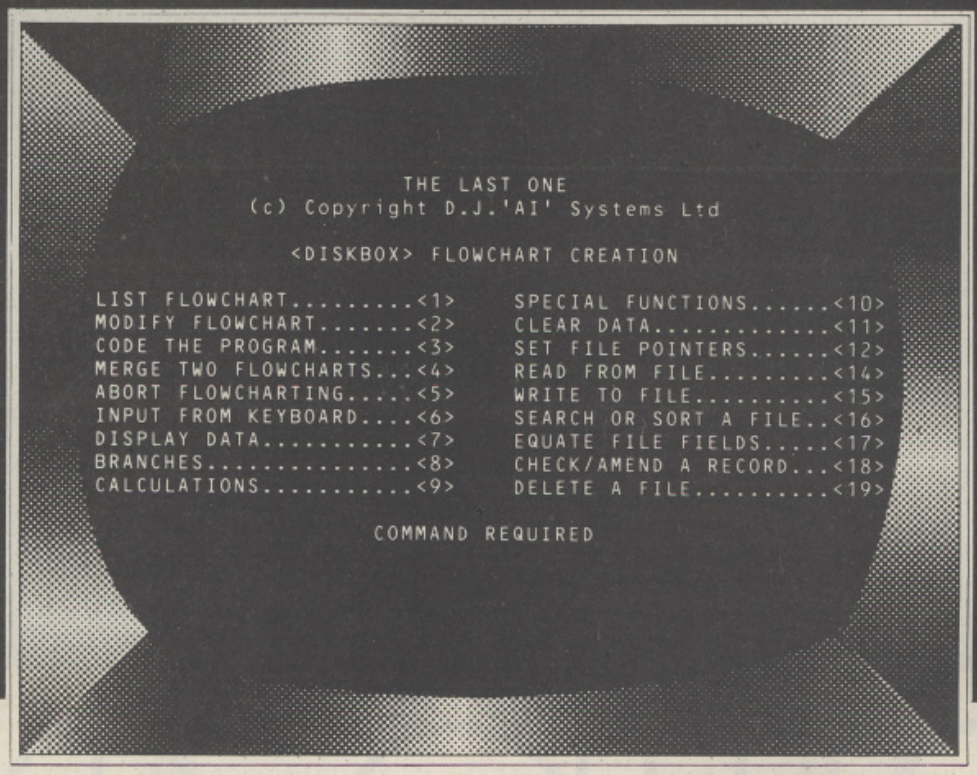
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VDP video games

Us Brits are normally so well-behaved and reserved, you'd think it quite proper that someone playing a computer game would only bring forth a subdued "Well played, old man", from a friend or relative.

Not a bit of it, according to one Brian Payne. His house has been filled with screams and shouts of enthusiasm, and the walls have echoed "to ghostly explosions and evil laughter of the villains." Oh well, another fantasy bites the dust.

There is, of course, a specific reason for Mr Payne to be pleased about the enthusiasm in his house, for he is managing director of a company called VPD, or Video Program Distributors, for long.

VPD has snaffled sole UK distribution rights for the games programs produced by Spectravision in the USA, and is starting the business rolling by launching six titles, all of which are in Atari-compatible cartridges.

Interestingly, Payne is convinced that there will be a large market for games rental as well as purchase, and is happy for VPD's dealers to do both. "We believe the rental market will develop," he said. "People become proficient at the games and require further stimulation."



The spectravision series has six new titles.

The six games that have so far been released are as follows: *Planet Patrol* involves players in fighting intergalactic wars and making refuelling stops, but not necessarily in that order. *Gangster Alley* has you being shot at by hoods and bombed by Nitro Ed, who is probably really someone big in the Government. *Cross Force* has you destroying evil Mirpods, or not as the case may be, in a shoot out in outer space. Whatever happened to the OK Corral?

You might get a gut reaction to *Tape Worm*, a program about a fruit-eating worm that you must protect from Spanky the Spider and Beeky the Bird. Now they sound much more interesting than a worm, but never mind.

For those that reject intergalactic warfare and like their ultimate destruction on a more homely scale, there is *China Syndrome*. This has you recovering nuclear particles and restoring operating levels so as to avoid a nuclear disaster. (There are rumours that this is really a CEGB training program.)

Last but not least is *Nexar*, which VPD claims is for the games 'buff', which means it is another 'get-them-before-they-get-you-and-we-switch off-because-its-time-for-dinner' program.

Cynical? Me, cynical?



Far East Epson

The latest machine to come from the Japanese manufacturer, Epson, is the QX-10, which the company says is a fully integrated microcomputer system that takes the hardwork out of using software. Without evidence to the contrary I can only, for now, take their word for it.

It is a straight-down-the-line desktop business machine with all the normal attributes that one would expect to see in such a system. The processor is the classic Z80A, which is connected to a considerable amount of user memory. This starts at 192K bytes and is upgradable to 256K.

A full 80-column screen that also has 640 x 400 resolution sits on top of the processor, which is fitted with two 320k per disc floppy drives. The separate keyboard has the full complement of buttons, including numeric keyboard and software programmable keys.

A range of optional interface cards adds a wide range of bits and pieces to the machine. These can include cassette storage, bar code reader joystick sound generator and the Omniet local area networking system. *Phone 01-900 0466/9.*

Personal ICL Mk 2

Fans of ICL will have to wait until at least late summer for a 16 bit processor option to appear on the company's new Personal Computer range.

At the press conference held to launch the new machine, ICL's head of marketing, Mike Warwick, denied that this factor would be a liability in a largely 16 bit market, saying that the decision to use the 8085 had been taken only after extensive consultation with the dealers involved.

ICL remains closely linked to Rair, the new system being a revision of the familiar Black Box designed by that company.

In the eleven months since the introduction of the original ICL microcomputer, only about 3000 units have been delivered, but the target for this year's sales is over 7000 systems (about 7 per cent of the market for this type of machine). The improvement is expected to be brought about by improved specifications and expansion of the third-party dealer network through which the machines are sold.

Prices are expected to start at around £1795 for the minimum 64K CP/M machine, going up to £10-12000 for a Winchester based multi-user system. In addition to the 16 bit 8088 processor, the near future should bring a colour option and communications facilities using ICL and IBM protocols.

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in brief . . .

BBC 'B' for CP/M

For those that suddenly feel the urge to turn their Model 'B' BBC micro into something completely different, more specifically a CP/M machine, they should look no further than Torch Computers.

It now has available a Z80 disc machine that runs CPN-Torch's own CP/M compatible operating system. It consists of a twin disc drive, a Z80 processor card and a CPN card, together with manuals and stuff like that.

The CPN operating system runs CP/M programs, but allows much more memory to be available to the user. The Z80, with 64K bytes of RAM, is almost entirely available to the user. *Phone 0223 841000.*

Text processing

Word processing is getting smarter and starting to do all the clever things that we always wanted them to do, especially as they never did them.

One such clever thing is shown here on the Exxon Series 500 word processing system. This can now incorporate graphical chemical structures into the text and these can be printed out on



a standard daisy wheel printer equipped with the necessary daisy.

The package is called the *Text-Formula* chemical option, but be warned, it is expensive. It adds nearly £1,500 to the £5,000 the minimum 500 machine costs. *Phone 01-834 6677.*

Oric competition

Results of January's *Which Micro?* Oric competition will be published next month in our May issue.

Tron stories



Lots of goodies have been set aside to be won in a competition being organised by Acorn Computers and Walt Disney Productions. Aimed at both primary and secondary schools in the UK, the winners will share in a total of £15,000 worth of prizes, including a complete BBC 'B' micro from Acorn.

The competition has two levels, one for primary schools and the other for secondary schools, but both make it obligatory that competitors have seen the film *Tron*, for that is what they are all about.

The primary school entrants, comprising teams of up to six children, have to write the story of *Tron* in no more than 100 sentences of 10 words or less.

The secondary school teams have to devise either an adventure game or a points-scoring arcade game based on the film.

Each of the 13 regional finalists in each section will receive a BBC 'A' micro (that's one per team) with cassette recorder and five Acornsoft programs.

The winners in each will get the full 'B' system including disc drive, Teletext adapter and 15 Acornsoft programs.

So kids, browbeat teacher, and get your artificial intelligence programs running.

Two new micros from Texas

Once upon a time, there was a company called Texas Instruments, and it produced a home computer that certainly fits the requirements of the home user NOW. The only trouble for the company was that they produced it THEN – some three years ago when no one was ready.

Now the company looks like doing it again – though this time the other way round. It has announced a new computer NOW that will be available THEN. This particular THEN

It is, in fact one of two new machines Texas Instruments has announced. The 'follower' is the TI 99/2, a low cost machine aimed at the 'computer literacy' market. The other, which will be returned to in due course, is the CC-40, an interesting sounding battery portable machine aimed at the professional user.

But first the 99/2. Despite the designation, it has little to do with the company's existing machine, the T199/4A. For a start, it is aimed squarely at the market created by Sinclair with the ZX81. It is a bare minimum computer with expansion capabilities, and it matches considerably improved performance with a higher price.

The price tag is not set yet, for the obvious reasons, though when it appears in the UK towards the end of this year, the 99/2 should sell for around £70 to £80. This is about par for the course at present, though somewhat more expensive than the existing Sinclair machine.

For the extra money, Texas hopes that the users will want the extra specification that the 99/2 offers.

It is built around the TMS9995, 16-bit processor chip, which makes the machine very fast. This is a single chip computer derived from the company's well known TMS9900 processor which drives the 99/4A amongst other machines.

Texas claims that the 99/2 is seven times faster than the 99/4A, and even a third faster than the IBM Personal Computer. Its main target, the ZX81 is, according to the company, well beaten. The 99/2 is said to be 30 to 40 times faster.

It is a black and white machine with no sound, so the plug-in cartridge software is not compatible with that used in the 99/4A. The built-in Basic of the machine is actually similar, being minus the commands relating to colour display and sound generation. It does however, offer access to PEEK and POKE, so assembly language can be learned.

The standard memory of the 99/2 is 16K bytes of ROM, holding the Basic and things like that, and 4.5K bytes of RAM. Both memories are expandable with plug-in options. The keyboard is of the moving key variety, and there are 48 of them altogether.

The 99/2 can be used with a range of new peripheral systems, including a low cost (Circa £150) four colour printer, a wafer tape drive (like a stringy floppy) holding 48K bytes per tape, and an RS232 and Centronics interface.

These can also be used with the other new machine from Texas, the CC-40 portable.

This is a hand-held, battery or mains powered machine aimed directly at the professional user. Featuring a Qwerty keyboard plus numeric keypad, it comes with 6K bytes of RAM, expandable up to 18K bytes, and 34K bytes of ROM.

The software will come in cartridge of Wafer Tape form, and wil cover a wide range of professional business and engineering applications – you know, things with long words like linear regression.

It is expected to appear here by April, with a price tag that should be under £200.

Apple connections

Interfacing the dear old Apple II with the outside world, and the outside world withthe Apple II, is still big business, and will be for several years yet. One company that is well aware of this fact Digitek International, which has recently launched some more interface cards that extend the capabilities of that venerable machine.

The first is the Super Printmaster III, a card that provides both black and white or colour graphics interfacing, as well as text between the Apple and any contemporary parallel printer. With addition memory, it can be used as a print buffer and manager,



letting the Apple be used for other tasks while printing takes place.

The extra memory should, in Digitek's view, come int he form of its RAM-Master RAMCards, which add 16K, 64K or 128K bytes of RAM. A 256K byte card is available to special order.

Joining the ranks of interfaces that improve the Apple's standard text display capability, and make it much more suitable for word processing, is the Screenmaster 80 card. As well as an 80-column display capability, it features 256 keyboard characters. These are the standard 128 character set plus an alternate 128 set, which can include user-defined graphics characters.

Soft magic States

Here at the offices of *Which Micro?* all is peace and calm, sweetness and light until, having cast a spell on the receptionist to gain entry, we are inundated with hordes of young persons wearing a strange mixture of wizard's garb and police helmets. They mutter strange runes and incantations, while drawing sinister faces on display screens.

Well, it got your attention, didn't it.

There is some connection however, for we have received a communication from across the waters from a company called Sir Tech Software Inc. The have just launched two new games programs that may interest you.

One is *Legacy of Llylgamyn* (I can't pronounce it either), the third in a series of wizardry programs. This concerns the descendants of the heroes of the Knights of Diamonds – which just happens to include you if you're playing. It involves having to take a mystical orb from a dragon and similar emasculating exercises.

The other is *Police Artist*, which is described as a children's game! The blurb goes on to say that it is basically a face recognition program with recreational overtones to help alleviate the stuffiness that most educational tools tend to have'. I feel there is very little I could add to that. *Both are available to run on the Apple II, and the company lives at 6 Main Street, Ogdensburg, NY 13669, USA.*

Torch light cricket

I'm trying to write this while doing a John Arlott impersonation, for it concerns one Philip Edmonds, a demon spin bowler who plays cricket for Middlesex and England.

This year is his benefit year, a traditional way of rewarding a player that has served his side loyally and with dedication. In practice, a benefit year means that the player gets involved in all sorts of fund-raising activities that should, hopefully, land him with a tidy lump sum of money at the end of it.

To help Phil sort it all out, especially all the accounting bits and pieces, Torch Computers has donated him one of its machines. As well as the accounts, it will get used for word processing, and may even get connected to Prestel to transmit news of upcoming events associated with the benefit.

The software needed for the task, including some programs that are being specially written, comes from Microcomputer Products International, which is now Torch's prime supplier of business applications programs.

Among the special programs MPI is developing are some in connection with the benefit and bowling averages.

ZX Lisp

Said to be ideally suited to the needs of students and hobbyists learning about the subject, Serious's LISP comes in interpreter form, and features full error checking, full property list implementation, and has the ability to support machine code subroutines.

Ideally, it requires a 48K byte Spectrum to run, though it can be used with a 16K version. It is supplied on cassette, and with its demonstration program and programmers manual, costs £15.

Serious can be contacted by writing to 7 Woodside Road, Bickley, Bromley, Kent.

in brief . . .

Dog handler



This portrait of 'Camouflaged Man With Dalek and Nissan Hut' is not, as some art experts have categorically stated, by the brush of David Hockney. No, instead it comes from the press office of DVW Microelectronics.

The camouflage cunningly conceals a soldier, who in turn is trying to conceal a Husky portable computer. The beast (the computer that is) has been selected by the Ministry of Defence for maintenance data collection for all Rapier missile batteries in the British Services.

Bar talk

Here is a system designed to teach children how to read the bar code price tags on items in supermarkets. In this way all written numbers, and finally letters will be irradicated from the face of the earth . . death to all impersonal pronouns is what I say.



Actually it is nothing of the sort. It is instead the *Magic Wand Speaking Reader* from Texas instruments, which combines a bar code reader with speech synthesis chips to produce a book that 'talks'. It not only talks, therefore helping graphically young children to learn to read, it can add sound effects and simple tunes. Just imagine what it could make of Noddy. *Phone 0344 54471.*

in brief...

Dragon News

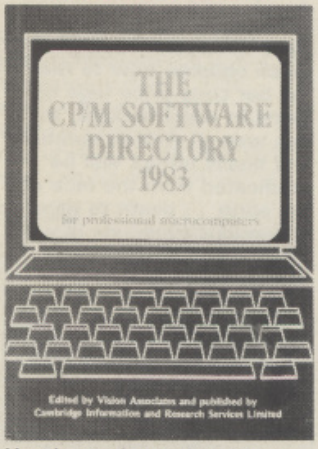
Dragon freaks amongst others will be interested in two US magazines that are now available in this country.

Both specialise in coverage of all that is interesting to colour computing funsters, and in particular those that are into the Dragon 32, and the Tandy Color Computer.

One is called *Color Computer News,* and is actually intended for Tandy users. It is being imported into the UK by Dragon dealer, Gravesend Home Computers, and costs £2.25 for a single copy, or £21 for an annual subscription.

The other is *Rainbow,* and this again is aimed primarily at the Tandy user, though it is also relevent to Dragon owners. It is being imported into the UK by Manchester-based Elkan Electronics. *Gravesend Home Computers is on 0474 50677, and Elkan Electronics is on 061 798 7613.*

CP/M Directory



Hands up those that have never heard of CP/M?

Right, those with their hands up can stop reading this story and move on to the next.

Hands up those who use CP/M programs?

OK, you are the people who should now read-on, for Cambridge Information and Research Services has something which might interest you – namely the CP/M Software Directory 1983. *Its price is £12.50 and further details can be obtained from the company on 0763 83615.*

Upmarket Texas

Yet another 'name' company from the mainstream computer business has made a move into the market for 'no-it's-not-IBM-PC-compatible - it's - just - that - the - the - specifications - look - very-similar' marketplace.

The company is Texas Instruments, better known to *Which Micro?* readers for its TI99/4A home computer though it is also big in the minicomputer world. Appearance is deceptive but it could be construed that Texas is moving up market with the announcement of its Professional Computer, it is also a move down for the company, relatively speaking.

The Professional Computer (dare we actually shorten it to PC?) is based on the now obligatory 8088 processor, giving the facility to run all the popular operating systems of the day. These include MSDOS, CP/M-86, Concurrent CP/M-86 and P System.



This means that all those applications programs that are available for these systems are available for use on the TI machine.

The ProfComp comes with a minimum of 64K bytes of user memory, which is expandable up to 256K bytes. Standard on-line storage is in the form of a 320K byte floppy disc drive. Expansion here is in the form of either a second floppy drive, or a mini-winnie hard disc unit. *Call 0344 54471.*

IBM's Matey Comart

The IBM Personal Computer has a mate. Indeed, it has several of them. They come from a US company, Tecmar Inc, and they include such goodies as hard disc subsystems and communications interfaces.

These mates, collectively called the PC-Mate range, are now being sold in the UK, through the good offices of Comart.

The range consists of what is claimed to be the widest selection of PC-compatible peripherals and subsystems so far made available. They include Winchester disc subsystems, exchangeable cartridge disc systems, memory and communications interfaces, high resolution colour graphics, analogue to digital converters and a range of other industrial modules.

As well as distributing the products in the UK, Comart's subsidiary company, Microserve, will provide service and maintenance coverage. This will also be extended to the IBM-PC itself, which is handled by Comart through Group companies, the Byteshops, and Xitan. *Phone 0480 215005.*

Talking Spectrum

Here's something that sounds like fun, quite literally, for it is now possible to get your Sinclair Spectrum to talk. What it talks about, of course, is entirely up to you, for its words will spring forth only as a parroting of what is keyed in.

How it is done is by using the **Orator** from Fuller Micro Systems, the Liverpool-based company that has become something of a specialist at producing conversion kits for Sinclair's machines.

Orator is a speech synthesis system that attaches to the back of a Spectrum. It contains a sound amplifier, three-tone sound generator, a joy stick control port and a single chip phoenem-based speech synthesiser.

Using this, it becomes possible for a user to key in words, and have the Spectrum drive the *Orator* into saying them by generating sounds that match the letters. As it is phoenem-based, this does mean that certain tricks have to be learned to ensure that the system talks English rather than gibberish. This is because the English language, as she is writ, occasionally bears little resemblance to how she is spoke.

It therefore behoves the user to learn how to spell some words phonetically so that the machine understands what you want it to say, rather than what you say it should say.

The *Orator* unit complete is available for £54.90. Fuller also has a variety of optional add-on systems that contain different parts of the complete unit. For example, the *Orator* by itself is available for £39.95, while a striaght sound amplication unit costs £6.95.

Fuller claims to have now sold over 10,000 keyboard and keyboard case conversions for the Sinclair ZX81. Its latest offering in this area is a re-designed keyboard unit that incorporates a proper space bar and double-sized keys for both Shift and Data Entry. This costs £39.95, and should be available about now. *Phone 051 236 6109.*

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Texet TX8000 colour micro

We review the latest rival to the Sinclair Spectrum



The Texet TX8000 is a microcomputer new to the UK market, aimed at the same buyer as the highly successful ZX spectrum.

Texet claims that the newcomer is the cheapest colour computer available in Britain, and at an intended launch price of £98 for the basic 8K version, the TX8000 does indeed undercut the previous holder of that title, the £99.95 Oric.

The computer itself is small, about the same size as the Spectrum, but of more conventional styling. An injection moulded case is held together by six screws and a stern warning not to dismantle anything.

One of the TX8000's best features is its keyboard. The rubber pad keys are similar in concept to those of the Spectrum and Jupiter Ace, but are much more pleasant to use, with a slight but positive over-centre action and a synthesized click eliminating much of the uncertainty experienced with other machines. In particular, it avoids the disconcerting "corpse's hand" feel of the Spectrum.

We were impressed by the common-sense attitude to one-key entry displayed by the Texet. Many people are put off the Sinclair machines by the difficulty of locating the desired keyword on the complex keyboard, especially since it is not possible to just type in the relevant word letter by letter.

On the TX 8000, the keys normally operate in the usual typewriter sense, but when the programmer uses them in conjunction with the Control key, the relevant keyword is produced with each depression.

It's a pity that this sensible attitude didn't extend to the space bar, which is merely a small oblong key hiding in the lower right corner of the keyboard.

The eight colours obtainable are yellow, buff, red, blue, cyan, magenta, orange and green.

Externally, the impression is one of high build quality, but open the case and the computer's Hong Kong origins can be clearly seen in the construction of the circuit board.

The layout is somewhat haphazard, and ugly blobs of glue seem to be the main method of locating components.

The back of the computer features expansion ports for the add-on RAM pack and one other peripheral such as a joystick or printer. The Texet printer is due at the end of the year, but no-one from the company was able to say what type it would be.

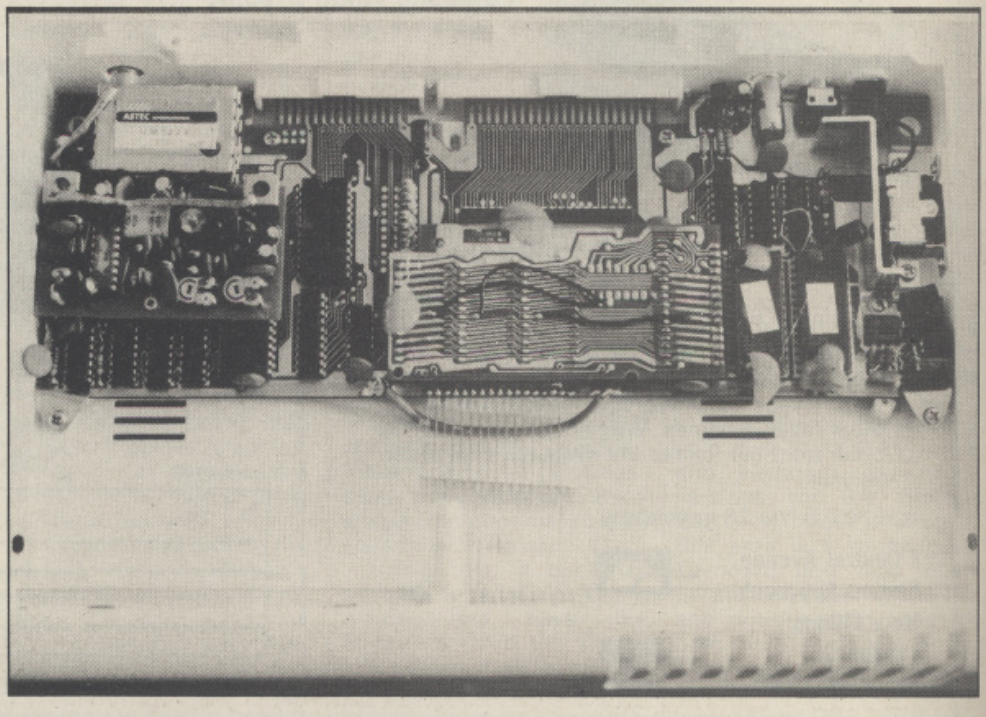
Outlets for connection with a television or RGB monitor are built in, as is the socket for the external power supply unit.

When switched on, the machine greets the user with the message "Video Technology Basic". It seems to be a standard subset of Microsoft Basic, being notable for its lack of utility commands (TRACE ON, AUTO and RENUMBER for example), but remaining a reasonably powerful and fast interpreter with no strange quirks.

We only once lost control of the machine, when LLIST was typed with no printer attached. The lack of a reset button meant that switched off (thus losing the program) was the only way to regain control.

Those who have spent hours struggling with the Microsoft line editor will be pleased to learn that a full screen editor is implemented on the TX8000. In conjunction with the auto-repeating keys, it makes editing fast and easy.

In use, the Texet seemed rather old-fashioned. The display is upper case only, and the graphics capabilities





are extremely limited. The resolution is only 128 by 64 in the single graphics mode, and the only Basic commands for graphics are SET, RESET, POINT, and CLS, so every pixel has to be laboriously plotted individually. A few ZX81 type chunky block graphic characters are available in the text mode.

It is also very surprising that an entrant to the Spectrum/Oric market should have no sound capabilities apart from an electronic blip when a key is depressed.

With these points in mind, and in the knowledge that while the computer is new to the UK it has been available elsewhere for some time, we turned to the provisional manual for a clue as to the age of the design.

Confusingly, there are two Video Technology copyright dates, 1982 and 1977, so the age of the machine remains a mystery for the moment.

Our particular review machine was an old 8K model which still bore the Video Tehnology logo, and as such it is possible that it had been on the receiving end of some harsh treatment.

This may explain the reliability problems we experienced, which included a total lack of display in the graphics mode and a number of problems with non-functioning keys.

The quality of the text display was also disappointing, the light green characters being difficult to read against a dark green background.

The internal construction suggests that individual TX8000 computers may be more prone to variations in quality than their rivals, and indeed the example we used at Texet's headquarters seemed much better.

We are unable to comment on the manual supplied, since ours was just a provisional (though quite comprehensive) guide to the Basic used.

At the moment there is very little technical documentation for the Texet, indeed no-one from Texet was able to provide very much detailed information at all, since the company merely imports the machine and has no hand in its design or manufacture.

The Texet may well prove to be a happy hunting ground for those who write supplementary guides to new machines. Until this is done, however, little independent software is likely, though Texet plan to launch the TX8000 with a range of games, utilities and domestic/business programs at the end of March. ■

BENCHMARKS – The Texet versus The Spectrum

(in seconds)	Texet	Spectrum
Test 1	18.0	44.7
Test 2	7.9	8.9
Test 3	18.7	20.7
Test 4	19.8	19.8
Test 5	21.9	23.5
Test 6	35.5	52.6
Test 7	55.00	76.8
Test 8	84.0	339.4

SPECIFICATIONS

8K RAM, 64K upgrade for £52.
45 soft plastic moving keys.
6502 central processor.
UHF, RGB, cassette, peripheral and memory expansion ports.
Cassette interface speed: 600 bps.
Language: Microsoft Basic.
Prices: 8K £98, 64K £150
Availability: in many leading chain store groups from the end of March.
UK importer: Texet Limited, Commercial Avenue, Stanley Green Trading Estate, Cheadle Hulme, Cheshire.

COMMENT

The TX8000 is far from being the Spectrum clone it appears to be at first sight. It has a powerful, easy to use Basic, and is the cheapest colour computer on the UK market at £98.

The poor graphics resolution and lack of sound may well deter potential buyers, especially since the 16K Oric at £99.95 is strong in both these areas.

The introduction of the TX8000 is something of a watershed in the British home computer world. For the first time, the supplier has no direct connection with the design or construction of the machine, being just an importer who books a production run of computers from the Hong Kong factory, and markets them in the U.K.

the old-fashioned feel of the computer will be a handicap in its intended market. It will probably be difficult or impossible for programmers to produce the sort of graphics most home users will expect from games software.

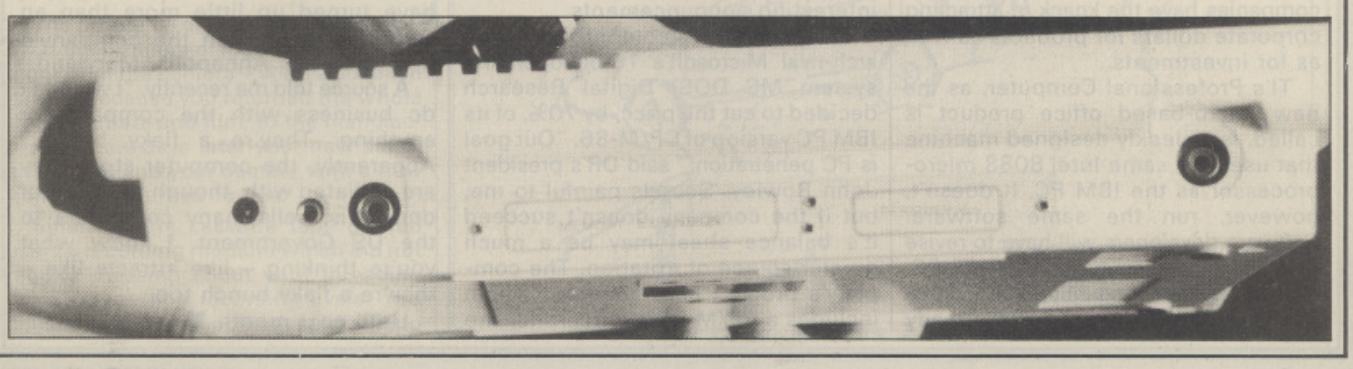
The Benchmark tests suggest that the use of Microsoft Basic has made the Texet a respectable number-cruncher, and this might make it suitable for limited scientific use if the software were available.

Unfortunately, the machine is not really made to cope with constant heavy use, nor do the limited input/output facilities lend themselves to serious work.

Texet's entry into the home computer market can be compared to that of Binatone, another importing company which has built itself up on cheap consumer electronics.

The danger facing the British microcomputer industry is that the home computer market will be drawn into the same price wars which affected the pocket calculator market.

Low prices may seem to be good news for the micro buyer, but the possible long term cost must not be ignored.



AMERICAN REPORT...

Texas Instrument enters the office market: CP/M has own show: Seequa sequel: By Deborah Wise, East Coast Editor, InfoWorld

Texas Instruments recently introduced an office microcomputer to compete, head-on, with the IBM Personal Computer (which has now "officially" arrived in England). It fills a gap in its product line between powerful, expensive minicomputers and limited, cheap home computers.

Over here, TI is best-known to the general public as the company Bill Cosby (the black comedian who starred in California Suite) is going to get $188 from when he buys its home computer. That tv ad campaign helped TI sell out of its 99/4A computers over Christmas.

Since then TI has also enlarged its home computer line with the code-named Timex Killer – the TI 99/2. It's aimed directly at the Timex Sinclair market and costs under £100.

And Timex had best beware. The home computer market is a dangerous place to be. The company took the opportunity of at a major consumer electronics show recently to introduce the Timex 2000, better known to all of you as the Sinclair Spectrum.

That machine will face tough competition in the US market where price wars have brought down the cost of several machines, including the Commodore VIC 20, the TI/994A and the Radio Shack Color Computer, to around the $200 range.

TI business

TI won't find the business microcomputer market any safer than Timex finds the home market. It faces strong competition from entrenched, known companies, like IBM and Apple.

Here, Apple's new Lisa, which I should imagine you've all heard quite enough about already, produced quite the splash – though the price shocked a few small businessmen. The IBM PC has been picking up market share quickly – an indication that blue chip companies have the knack of attracting corporate dollars for products as well as for investments.

TI's Professional Computer, as the new micro-based office product is called, is a sleekly designed machine that uses the same Intel 8088 microprocessor as the IBM PC. It doesn't, however, run the same software. Software developers will have to revise their programs to run on the TI PC. And many, including Microsoft, Digital Research nd VisiCorp, have already done so which is a major plus for TI.

Another commendable advantage for the TI PC is its immediate availability: As the company spoke to the press in New York, dealers across the country put on display, ready-to-buy, TI PCs. This is unfortunately, not general industry practice. Normally companies provide fanfare, promises, prototypes and hype – but rarely the finished product when they host an "announcement."

TI, I'm afraid, did in the end succumb to some hypothesizing about future "revolutionary" applications for its Professional Computer.

Natural language

Come autumn it will have a speech recognition capability, the company said. It will have a natural language interface so dummies can type in English sentences as comands, the company said. It will have a voice management capability – a fancy name for a very expensive, but very clever telephone voice mail system and telephone answering machine – the company said. It did show canned versions of these capabilities but gave no prices. Very impressive but not good enough.

(From what I could tell, the natural language programming is a bit of con really. It's actually a clever menu-driven command sequence that lets you build English language sentences using phrases printed on the screen).

And talking of displays hyping products: get this, CP/M, that ubiquitous 8-bit operating system that's having problems convincing the world that it's 16-bit version is up to scratch, now has a computer show all to itself.

The first CP/M show – CP/M'83 – attracted more than 45,000 people a few weeks ago in lovely San Francisco. Organized by Digital Research, the inventors, purportrators, or what have you, of CP/M, the show had few surprises, lots of support and two interesting announcements.

In the face of competition (from arch-rival Microsoft's 16-bit operating system MS DOS) Digital Research decided to cut the price, by 70%, of its IBM PC version of CP/M-86. "Our goal is PC penetration," said DR's president John Rowley. Sounds painful to me, but if the company doesn't succeed it's balance sheet may be a much greater source of irritation. The company's product line, however, which includes a CP/M Plus softcard for the



Apple II and CP/M versions for the Motorola 68000 microprocess (the one Lisa uses) in addition to the language and operating system products it is famous for, is strong by any software developer's standards.

And Gary Kildall, inventor of CP/M and microcomputer industry legend, announced a new addition which he thinks marks a landmark in professional educational computer languages: an enhanced version of Logo for the IBM PC. Logo is the educational languaged developed at the Massachusetts Institute of Technology by Seymour Papert and others.

Said Kildall, "We've added quite a bit to make it a little more professional and easier to use." In fact, the friendly turtle, known to many young Logo users, becomes a pointer in DR's version. "Businessmen don't work with turtles," observed Kildall.

Logo won't be available until later this year, but can you really blame Digital Research showing it off at a gathering it organized that attracted 45,000 people.

Seequa's ghost?

Last month I mentioned an off-the-wall company called Seequa that claimed to have an IBM PC compatible portable called the Chameleon that runs all IBM PC software and Z80 software and costs £1795. I saw the computer's chassis at a trade show but no one could track down its guts. And they're still having problems. Scouting parties reported that they have turned up little more than an empty warehouse in the company's home town of Annapolis, Maryland.

A source told me recently, "I wouldn't do business with the company for anything. They're a flaky bunch." Apparently, the computer store they are affiliated with, though they sort of deny this, sells many computers to the US Government. I know what you're thinking – like attracts like – they're a flaky bunch too.

Until next month. ■

OPINION

Phil Manchester puts a case for mice, imprecision and pictorial convenience. Computers you drive like cars

A favourite analogy of some of the more enlightened employees of the world's largest computer corporation (that is IBM, not Apple or Commodore), compares computers to cars.

The story goes that, in the early days of the motor car, a large US car manufacturer commissioned a market survey on the future of the motor industry. One of the things discovered was that, by around 1920, there would be a world shortage of chauffeurs – to the tune of about a million.

Given that motor cars were pretty unreliable and rather complex beasts at the time, this statistic caused great consternation in the minds of the company executives.

How were they to expand their marketplace and sell more cars when there would be no one around with the requisite skills to use them? The answer, of course, was simple. They made the car less complex, more reliable and easy to use and eliminated the need for skilled 'operators'.

Similar analogies can be made between computers and a number of other technologies that have had to make the transition from the realm of the expert to the mass consumer market place. Eastman's box camera and Philips' compact cassette are other examples.

Computer manufacturer's and software builders are now faced with the same problem. They are in a position to produce the technology cheaply enough to appeal to a growing mass market and are desperately trying to find the right way of packaging it.

The essence of this packaging, if it is to be successful, is to provide the user with the right amount of power to do the job with the minimum amount of fuss.

Going back to the box camera for a moment, its success was based on it being a simple way to take 'snapshots'. You pointed the camera at your chosen subject and pressed the button. All of the 'programming' required to get the exposure and focussing right was done for you.

The problems of processing the film – even the problem of loading and removing it from the camera – were also taken care of because you returned the whole thing, camera and film, to the manufacturer. A few days later your new set of snapshots and your camera with a new film were returned to you.

Similarly, the cassette tape offered users a recording medium which did not require messing about with threading reels and setting recording evels. You could not perform sophisticated editing using cassettes, but then most users did not want to.

In both these cases success came as a result of removing all of the awkward aspects of the technology required by the experts and leaving the important functions in a simple form.

Unfortunately, this has still to happen with computers.

As products of the technologically sophisticated industry which designs and builds them, they reflect the needs of that industry.

Part of the problem lies in the predominant method of interface between person and machine – the keyboard for input and the screen for output. It is worth noting, incidentally, that both of these technological 'innovations' predate computers by a good few years.

The keyboard in particular exerts a tyrannical influence over the form and content of information fed into a machine. It is an instrument that demands precision.

That influence also affects the way that information is processed within the machine (the 'instructions' are fed in through the keyboard too) and, inevitably, the method used to present the processed information. At all levels, precision is the order of the day.

In the scientific and military worlds where computers were first spawned, such precision is mandatory and those needs are reflected in almost all current machine designs.

But in the world at large it is not only unnecessary, it is a positive inconvenience.

The appeal of good quality graphics reflects this desire among the majority of users. It is only recently that graphics have been introduced on larger computers whereas microcomputers have had them all along – there is a lot of evidence to suggest that the Apple's success was based on its excellent graphics above all else.

Pictorial methods of presenting data are far more convenient in many of the applications of microcomputers. In the same way that the digital watch is less convenient as a method indicating the time than an old fashioned analog watch, tables of numbers are less convenient than pie diagrams and bar charts.

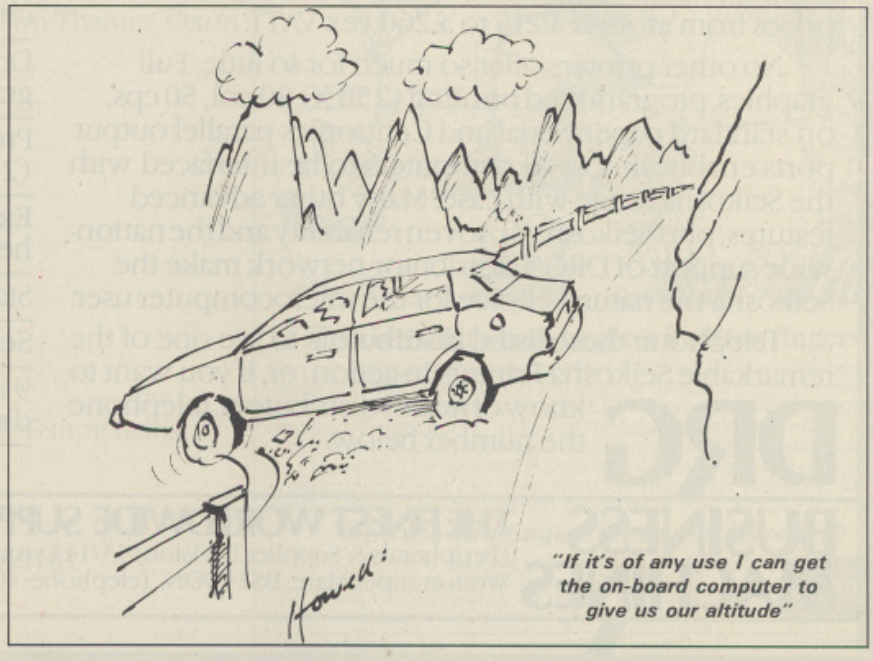
But these methods of presenting data are 'vague'. Like the analog watch, they are used to provide an indication rather than precise information. Nevertheless, it is quite adequate in the right context.

Until recently this desire for vagueness has not been reflected in the way you get your data into the system. You still have to pick out the right keys on that tiresome old keyboard.

It is encouraging that companies like Apple and Xerox have recognised the potential of the sort of devices used in video games.

In the Lisa system from Apple and the Star system from Xerox with their 'mice' we can see the beginnings of a new way of packaging a computer system (Apple's Lisa was reviewed last month).

Hopefully, the next breakthrough will come in the way that software works so the curse of precision will be lifted from computers altogether. ■



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Mr Mughal 0279-412639

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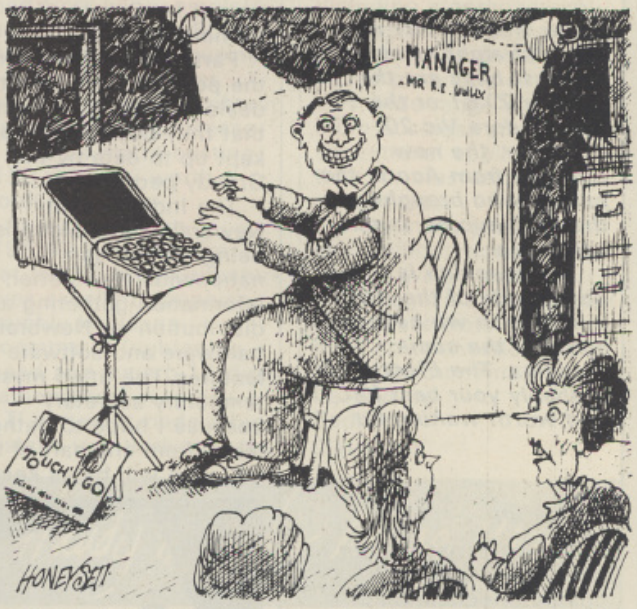
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Letters
TO THE EDITOR
Which Micro & Software Review, 57a Hatton Garden, London EC1

BBC acorns

I am a teacher in a village school and an order has been placed, via the local authority, for a BBC B micro.

Before this machine arrives in school and the pupils are 'let loose' on it I feel the need to get a microcomputer for myself so that I can get the best out of the school machine. However, I do not feel that the family budget can be stretched to the extent of paying for my own BBC.

I wonder whether you could suggest a micro, in a cheaper price range, say £100-£150, that could be bought as a substitute for the BBC machine. I am looking for the machine that behaves in a way most like the performance of the BBC micro at a fraction of the cost.
W M Price
South Glamorgan

If you want to buy a micro straight away, then the best buys are the Sinclair ZX81 or the Commodore Vic 20. However, the new Electron from Acorn, the people who brought you the BBC micros, is due very soon.

This machine is a downgrade of the BBC micro, with we believe, some of the same facilities. The Electron is probably your best bet, and worth waiting for.

Education

As a post-script to your excellent article on computer education in your January issue, I feel I must point out that the subject is not just a matter for schoolchildren.

Computer education in the adult sphere is equally important, if not vital, if the more "mature" among us are to remain conversant with this fast moving area of technology.

I have been studying computing on a day-release basis for the past three years and have found the whole exercise most rewarding. As an account I find that the course not only "keeps the old grey matter ticking over", but also gives me a good insight into the technology which surrounds me in my every day work.

Perhaps a follow-up article could be considered in due course.
Greg Mallett
Sudbury, Suffolk

A follow-up article is being considered at present (Ed).

Newbrains

In my view the Newbrain has received a poor press for what most of its users consider as an excellent machine if poorly supported by Grundy and the dealers (at least the ones I have encountered except for Calisto of Birmingham).

Part of the reason for the poor support from the dealers is not their fault in that they don't seem to be kept up to date by the Grundy people.

The Independent Newbrain User Group is being formed as a nationwide Newsletter, information gathering and distribution on Newbrain hardware and software features. I've titled myself temporary secretary because I hope to gather a team, from any part of the UK, who will be as keen as I am to get real and adequate support for all the users and a few people will share in the necessary tasks.

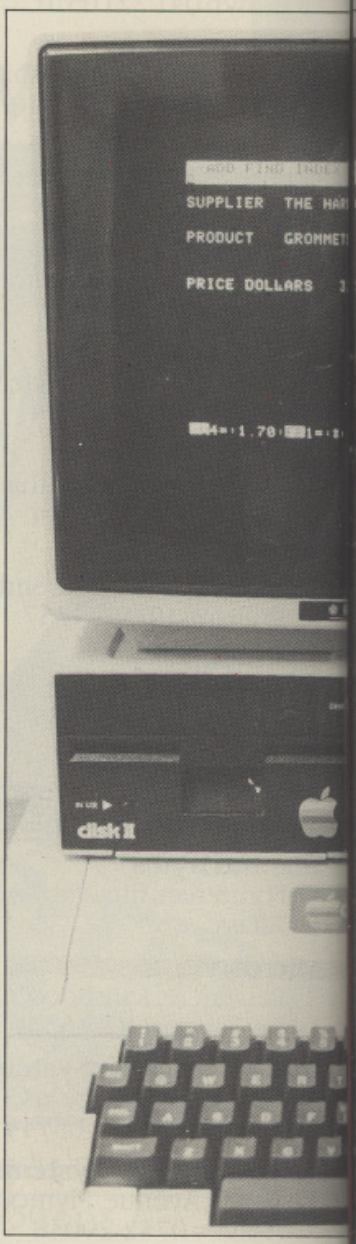
I've written software for the PC2, 1500, HX20, PC1, FX702P, SUPERBRAIN etc and I would like there to be an editorial balance determined by other people's interests and views so the Newsletters are not just a plug for the suite of software I call MISCIS, pronounced Mrs, designed for the smallest of growing businesses.

The Newsletter editions will initially be distributed to people known to have in the hope they will get membership subscriptions from selling spare copies. A short-form edition will be distributed to about 1000 micro enthusiasts. The first few hundred members will get a free error summary card as well as a mix of programs, hardware hints and an up to date dealer report in the Newsletter itself.

The yearly subscription for the Newsletter/IN GROUP membership is to cover the production and postage costs of an A4 style magazine format and has been set at £8.50 for twelve issues and £1 for single issue samples (or back copies).

The main feature that should occupy a significant part of the Newsletter are question/answer sessions but any query sent in for a personal rather than public reply will get an answer.
Anthony D. Hodge
Temporary Membership Secretary
The Independant Newbrain User Group OUP
15 St. Johns Court,
Wakefield WF1 2RY.





Atari fox

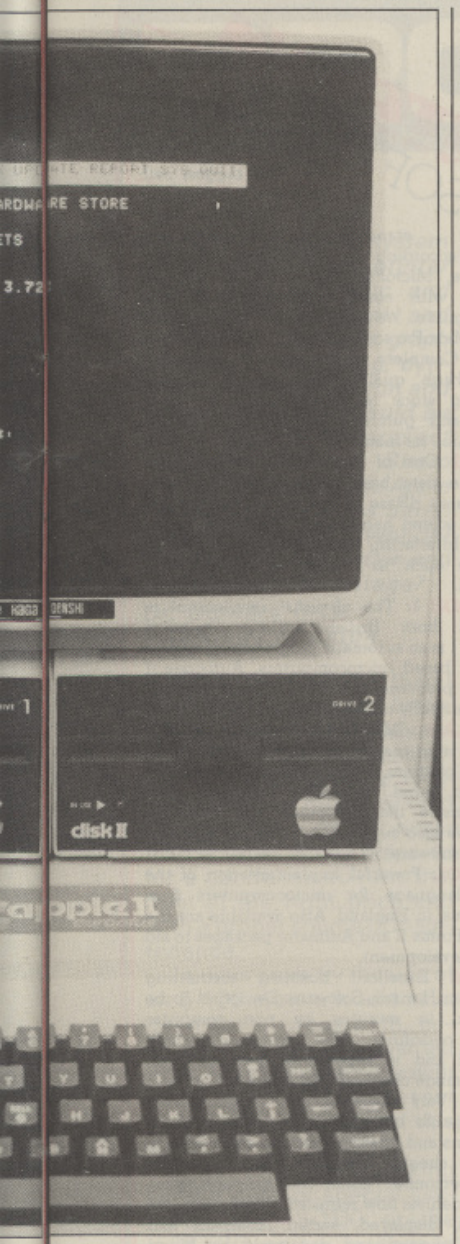
As a newcomer to computing, I tried playing with the Apple program *Fox & Hounds* in February's software review, to see if it would run on my newly acquired Atari 800. It does

```
Add line      57 DIM AS(3)
Change       435 ARC = ATN
Change       455 ATN = ARC
Correct      540 IF X = 1
                 THEN GOTO 1360
```

Tony Deacon
Kidlington, Oxford

TV damage

"How Micros can damage TV's" – you invite correspondence on TV/computer matching,



this is my problem.

I have a Dragon 32 and a Thorn 9000 TV. I get patterning in the background and the figures shimmer.

I've tried the Dragon on other people's TV's, a Sony and Hitachi are no problem. With a Grundig there is only a very slight problem, with another Thron TX model the problem is just as bad as mine.

What's the solution – short of buying a Japanese TV?
D N Park
Bradford

Hedley will be replying direct to you Mr Park, but in the meantime, has anyone else found similar problems?

Program clones

With reference to your advertisement in the February issue of *Which Micro?* asking for people who are interested in writing programs for the Dragon 32 to contact you. Firstly you request a printed listing for the program – is this really necessary? Would a hand-written program not suffice? Secondly, is it Basic or machine code programs you are interested in, or does it not matter?

My third query concerns the law. Are programmers allowed to work for two organisations simultaneously? I am thinking particularly about royalties. What are the ethics of somebody writing programs for the Dragon then perhaps offering the same programs to Commodore or Sinclair?
John Ponomarenko
Burnley, Lancs.

Although we prefer a machine-printed listing for obvious reasons of accuracy, we can get by with a cassette containing two copies of the program, a full variables list, and an explanation of any machine-specific statements such as PEEKs and POKEs of FX calls. As a general rule, if you can't provide a printer listing there is no need to produce a hand-written one.

We are mainly interested in Basic programs, since they appeal to the widest readership.

As far as the legal question goes, it is really impossible to give authoritative advice, since to our knowledge there has never been a test case on this subject. If all the manufacturers involved were aware of the programmer's intentions and raised no objections, then it might be possible to proceed.

TI994/A Admissions

I was somewhat surprised by your recent review of 16-bit micros (February) in that Texas Instruments were not even mentioned apart from an incomplete summary of their £5000 TMS 9900 driven business system. The fact that readers can already obtain the ame 16 bit processor in a home micro costing £150 is surely worth a word!

As a user of the T199/4A I can confirm that the 16 bit architecture gives excellent graphics, asembly language programs of frightening speed and superb 13 digit mathematical accuracy.

TI certainly made a big mistake in introducing the 99/4 too quietly and quickly in 1980 at a very high UK price of almost £1000 but the 'A' version at £150 beats the opposition out of sight for reasons too numerous to list.

As a final point could you please soften the rather discouraging notes about the T199/4A in your machine summary, e.g. references to previous prices are surely unnecessary as almost every micro in the list has been reduced drastically at some time starting at the top with the ZX81.

- At small extra cost SPRITE graphics are available with an easily programmable 28 compared to only 8 on the new Commodore 64.
- A *complete* range of peripherals including speech exists.

Availability of 3rd party softare is not widely advertised but TI publish a catalogue containing almost 1000 programs, 90 per cent of which are 3rd party, the UK User Group has a library of 400 low cost programs and there are other sources including a company importing excellent programs from America and Canada. These programs cover a very wide range with far more business and educational applications than for most other low cost micros.

How many programs can anybody actually use? (By the way, I think still your magazine is excellent and please note that I have no connection with Texas Instruments.)
I C Swales
Redcar,
Cleveland.

SILICON TIPS

Handy Hints for Micro Users

By Richard Howell

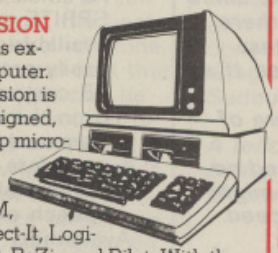


INTEDAM COMPUTERS

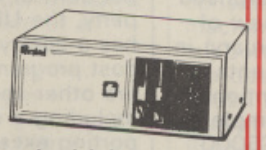


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MICRO DECISION
Morrow Designs exciting new computer. The Micro Decision is a beautifully designed, compact desk-top microcomputer that comes packaged with CP/M, WordStar, Correct-It, LogiCalc, BASIC-80, BaZic and Pilot. With the addition of a printer the Micro Decision system has all the hardware and software necessary for word processing, proof reading, financial modelling and programming.



MINSTREL
The U.K.'s most competitively priced, S-100 bus based microcomputer with integral high capacity hard disks. Manufactured in England, the MINSTREL standard configurations include 800K-1.6 mb floppy and 5-20 mb of hard disk storage.



ADVANTAGE
Very compact, desk-top computer with high resolution graphics and dual processors. The Advantage is available with optional 16 bit processor and MS-DOS. Up to 64 Advantages can be networked with North Star's latest software/ hardware package, NorthNet.

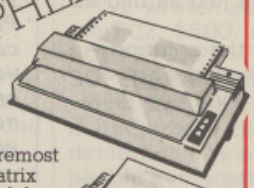


EPSON HX-20 The first truly portable computer with full size typewriter keyboard, LCD screen, printer and microcassette facility actually built-in.

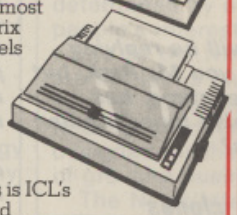


TELEVIDEO TS806/TS816
The TS806 and TS816 microcomputers are powerful, multi-tasking, multi-processing system with true multi-user capabilities. The TS806 and TS816 systems support up to 6 and 16 users respectively.

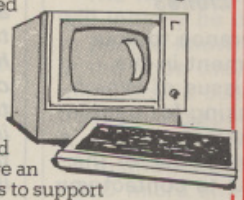
INTEDAM PERIPHERALS



MX80F/T and MX100 Epson are the world's foremost supplier of dot-matrix printers. Both models can print four character pitches and have high resolution bit image graphics.



ICL KDS7362 This is ICL's latest VDU designed for the microcomputer market. The KDS7362 is very good value, reliable and attractively designed. Supplied with every VDU are an extra set of keycaps to support several foreign languages. Firmware compatible with Televideo TVI-950.



TEC EXECUTIVE 40R and 55R.
Superior, inexpensive daisy wheel printers. Features include quiet operation and bi-directional, logic seeking printing.



INSIGHT VDT-6 and VDT-8 Very competitively priced 'WordStar' VDUs. The VDT-6 and VDT-8 have 12" and 15" screens respectively. Both models incorporate a WordStar customised keyboard for use with MicroPro's excellent word processing system or with general purpose software. Firmware compatible with Televideo TVI-912.



FLOWRITER RP1300 and RP1600 The RP1300 and RP1600 are high performance, reliable, daisy wheel printers with print speeds of 37 and 60 cps respectively. The Flowriter's internal microprocessor controls proportional spacing, logic seeking, margin justification and internal 8K RAM buffering.





PRISM 80 and 132 The PRISM is an intelligent, high quality dot-matrix printer. Special PRISM features are colour printing, correspondence mode and single sheet feed capability.

INTEDAM SOFTWARE

WORDSTAR: The biggest selling word processing program. "The de facto standard for microcomputers" according to Microcomputing magazine. MicroPro's WordStar is supplied complete with comprehensive manual and training guide. We also supply the complete range of MicroPro software.

EXACT: Complete businessman's accounting system. High quality, inexpensive package comprising stock recording; invoicing; sales, nominal and purchase ledgers; and payroll. Superb value for money.

dBASE II: One of the world's foremost programmable data base management packages. Ashton Tate's dBase II has comprehensive file handling, screen handling and report printing facilities. Interfacing to files created by other languages such as BASIC or WordStar is supported.

AUTOCODE 1: The obvious complement to dBase II from British authors Stemmos. Autocode 1 is an automatic programming system for CP/M based microcomputers. Autocode 1 generates program code for complete systems executed directly under dBase II.

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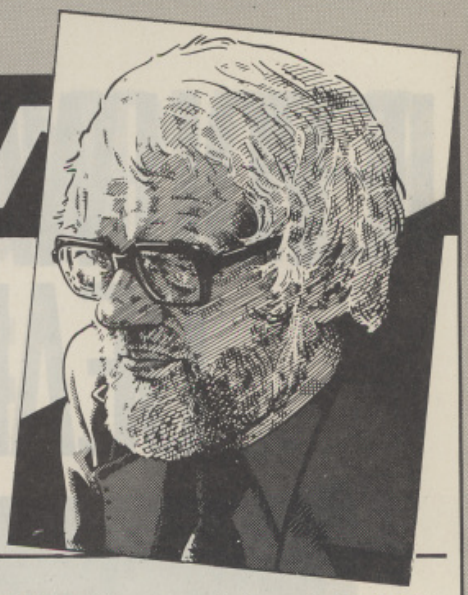
SUPERCALC: Probably the most popular CP/M based electronic worksheet program. SuperCalc makes it possible for decision makers to manipulate data quickly, setting up exactly what is necessary for in-depth analysis and financial modelling. With a minimum number of commands to get the maximum power and full screen help menus called up only when required, SuperCalc is very easy to use.

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PROBLEM



Letters to: **Hedley Voysey** *(above), EMAP Computer Publications,* **Which Micro & Software Review,** *Petersham House, 57A Hatton Garden, London EC1N 8JD*

Basic maths

I require a complete system including disks and printer which can do basic and advanced statistical and mathematic functions, graph plotting, curve fitting, dynamic model simulation and so on. The price should be around £2,000. My present short list is the Sharp MZ80B, Mimi 802 and Apple II. The Apple seems dated but suitable and I wonder whether the Z80 option and CP/M by an advantage?
Dr. Bernard Ince, University of Aston.

If the Apple II is used, then I think the bending of it into a CP/M system is an advantage. Your graphics requirements would seem to indicate that more money should be spent on a good printer than is usual. So be prepared for a careful search for this item at the right price and with a proper source of maintenance.

In days gone by the use of an S-100 system would have been the obvious path, because if the package wanted extra array processing power then a special processor could always be added this way.

It is still worth taking careful note of special systems using S-100 or the IEEE 696 (as it now tends to be labelled) as these can start at roughly the same figure as your British Micro 802. This will run to about £1,500 if the screen is to have the best graphics supplied as an option. The Sharp seems to suffer from a restricted supply of software – pity.

I would tend to steer you towards the Newbrain, but the CP/M option is not yet on the market. However, if you get in touch with a source of Grundy expertise it is well worth talking things over. The attraction here is the store expansion options and the fact that it is aimed to cover your kind of usage.

Finally, I should hold off until the Commodore supply cavalry have caught up with its new offerings. This would seem to cover CP/M (price unknown) and via the 'Interpod' device some connections to special units for expansion.

Transparent

I read the glossaries published about computer terms, but I am still puzzled about the use of the term 'transparent'.
Peter McWilliams, Stirling.

You ain't the only one. It tends to be used when it is not really needed at all. However, there was once a real meaning. Remember how you learnt to write with a decent pen. The well made pen and your familiarity with it (with a bit of luck) should have resulted in the 'tool' (the pen) being 'transparent' to you.

In plain language, you did not see it at all. In the behavioural jargon – you were able to 'apply your intellect directly to the task' that is putting thoughts down on paper.

So, a feature, or piece of software or hardware, that is said to be transparent is thought to be (with a bit of practice) unlikely to obstruct your mental vision of the job you are doing that really matters to you.

A good set of controls in a car, to an experienced driver, can be said to be transparent, because your mind can deal with the road conditions, without being distracted by peculiarities of the controls.

You can probably realise now why ideas like 'telecommunications protocols' (for enabling computers to talk to each other) are claimed to be transparent. It is thought that they should not complicate, or obscure, any mainstream design of processing which the user has in mind.

the other term that sometimes crops up describes a kind of awkwardness in using things that is usually terms as being 'orthogonal' to the problem in hand.

Now you might think that this is a funny way to refer to something that complicates an issue, or obscures the intellectual task a little (or a lot) – and you would be right.

Orthogonal, by the way, properly means that something is perpendicular to some other thing. In descriptions of computing work it has taken on a similar meaning in that a feature may help, but it approaches the problem from an unexpected direction. Most programming languages can be said to be 'orthogonal' to the problem to be solved. This is because they rarely tackle solving the problem, but help in processing a solution that you have to devise in your head independently of the programming language.

An American was asked about his use of the term 'orthogonal' and replied as follows 'if the recipe book uses a language that is foreign to you and a set of units that you do not have measures for, and describes the cooking sequence using head adjustments to each burner, when you have fixed heat burners and have to move the pans around – then that book is probably orthogonal to your cooking needs.

And it will still be more use to you than most of our aids to solving computing problems.'

CP/M BBC

I am anxious to know about the performance of the BBC Micro when used as a CP/M based disc system. Can you help?
Mark Newmann, Portsmouth.

The problem has been that evaluations seemed silly when many people could not get hold of the basic machines. But I do expect that to end now. There is more than one offering aimed at the CP/M market.

Basically that means providing a low cost entry machine for learning about computing and for home use, while providing access to decent sized disk store and Z80 based CP/M to enlarge the product's applications.

The obvious source of supply must be the Torch Computers unit for the BBC machine. However, both pricing and products in the CP/M usage field are fast moving targets and so hard to evaluate with any lasting returns. Also see this month's news pages.

Electronic mail

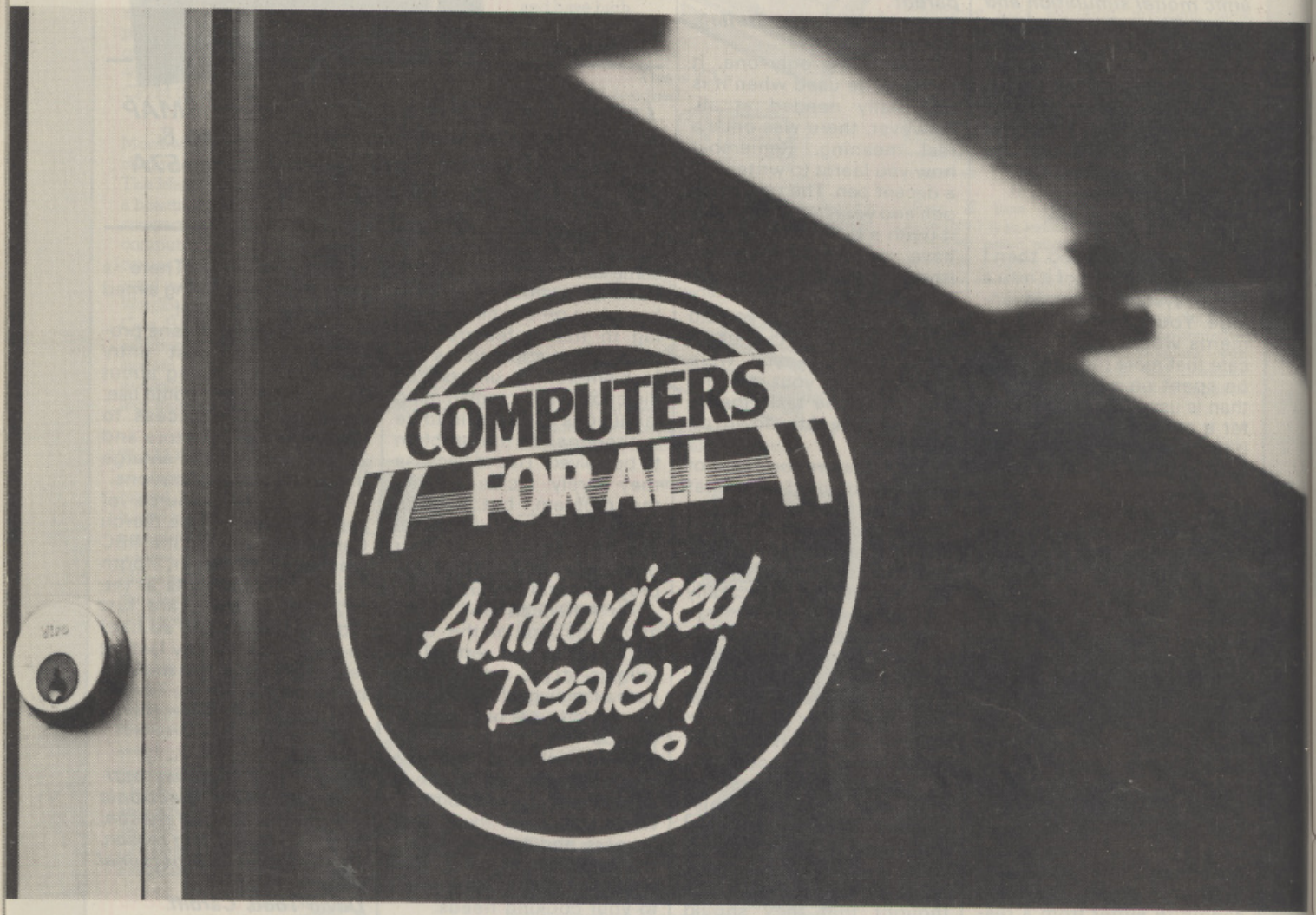
Would you give an estimate of when electronic mail will be a valid reason, or strong supporting reason, for investing in a personal micro?
David Todd, Cardiff.

No, but I can swing a club at it. The use of electronic mail is simply a matter as to whether those you deal with are also on it. That is why the club is a good basis for moving people in.

Micro owners form a club in themselves, but so do professional groups, enthusiasts for certain sports and so on.

The threshold for finding that enough people are likely to be linked to it, to make it worthwhile to join the mob will be different for each 'club', rather than a feature of general citizenry. ■

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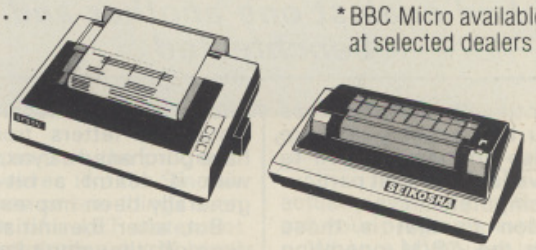
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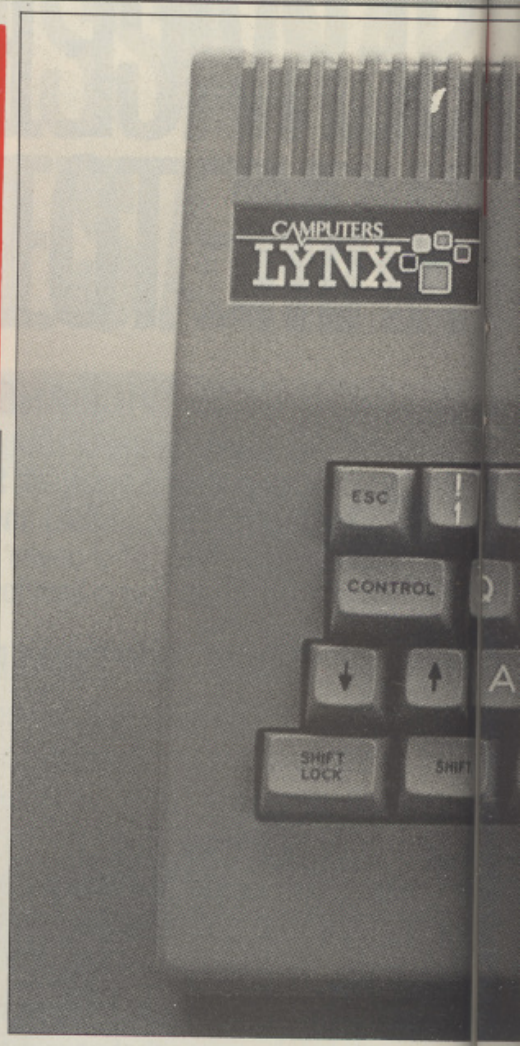
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"THE SHOP WHERE PEOPLE MATTER"

DRAGON v LYNX



Two newcomers to the micro arena are here matched against one another and then benchtested

As we continually try to stress when you buy a micro you are usually also limiting yourself to the software available for that particular brand of computer.

The exception to that is those machines with the CP/M operating system but that applies really only to much more expensive business micros.

Except for the most argent programmers amongst us the vast majority of micro owners will at some time want to purchase software.

And the reason for this homily at the beginning of a comparative review of the Dragon and the Lynx is that any computer comparison should include an assessment of the software. To whit how much, what type and what quality of software is available.

In the case of Dragon and the Lynx however that is night on impossible. The Dragon now has a steadily increasing range of what is essentially games software that is of variable quality (see *Which Micro?* – Soft Release February and March issues) though compared with some other packages it is refreshingly cheap – typically less than £10.

The Lynx on the other hand has absolutely no software at all available for it at the time of writing (early March) and they have only just got round to including an introductory demonstration tape for purchasers of the machine.

The point about software cannot be over-emphasised. The *Which Micro?* office has recently had several distraught letters from those who have purchased a Lynx, happily played with it, learnt a bit of Basic and generally been impressed.

But, after the initial euphoria has worn off, they don't know what to do with it and with no software there is little more to do unless you want to become an ace programmer. But the Lynx, we are assured, will have software very soon – initially educational but then some games packages to follow.

Lynx manufacturers, Camputers, have now set up a separate software company – Camsoft – to commission material and write their own in-house. First packages are promised for the end of March and Camsoft will also be developing a disc operating system as well as teletext and Prestel interfaces.

The Lynx has absolutely no software available at present

One final point about Lynx software. As a Camputers representative frankly admitted the powerful facilities available have been put in to some extent at the expense of screen handling capabilities and so what games packages there are, are unlikely to be of the highly interactive arcade type so loved by manufacturers such as Atari.

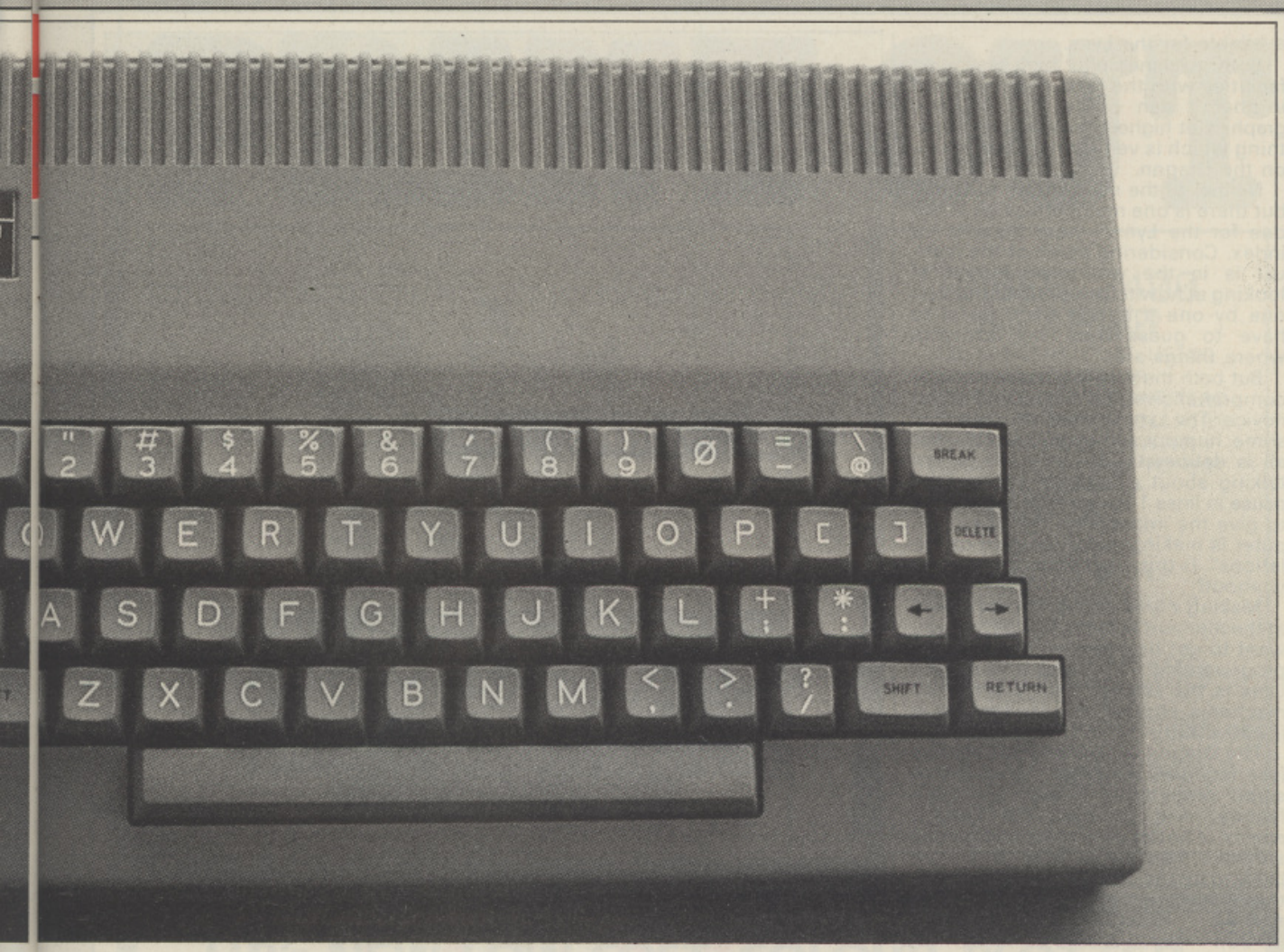
But that said, what of the machines themselves? In terms of looks the Lynx wins hands down with its grey colour and smaller size making it a neater package than the more old-fashioned-looking Dragon. It is, as our US cousins would say, a "tighter machine".

In terms of ease of use however the Dragon is well in front. Part of this is due to the fact that with fewer facilities on the Dragon there is less to worry about.

More complex keyboards mean more complexities for the user. On the other hand it is well worth having the Lynx's lower case letters whereas on the Dragon you are limited to upper case characters (capital letters) only.

But ease of use is not just to do with the number of facilities. While the Dragon performs in a perfectly healthy way when you are typing in instructions or programs by scrolling the screen neatly upwards the Lynx does not have a scrolling facility at all.

Instead when reaching the bottom of the screen the next line is displayed at the top. And when listing programs it is irritating to say the least to have the first half of the program at the



Camputer's Lynx

bottom of the screen and the second half at the top.

the Dragon keyboard conforms fairly closely to a typewriter whereas the Lynx is a little more eccentric. For example the return key – surely one of the most heavily used keys – is tucked away in the bottom right hand corner of the keyboard.

Because of a few extra keys the Lynx offers the ability to shift easily from lower case to upper case, and because of the addition of a separate delete key the backwards arrow can be used for inserting characters in a line.

With the Dragon you must enter a special mode and type "I" before inserting a character, all of which is quite time consuming. The Lynx also has auto-repeat on all keys unlike the Dragon.

When entering programs the Lynx scores by printing up error messages straight away – unlike the Dragon which wil not inform you of mistakes until you attempt to run the program.

The Dragon Basic is very similar to Microsoft's standard Z80 Basic and entering the benchmark routines required no alterations in the program.

The Lynx, however, like the Sinclair machines, requires certain things such as the provision of a LET statement i.e. LET A = K rather than A = K but if you omit LET the machine will automatically insert it for you.

What it won't do however is insert certain other commands such as GOTO. Thus the line IF A = 1000 THEN 300 – which is acceptable to many micros – must be changed to IF A = 1000 THEN GOTO 300.

Fortunately however these requirements – as with Sinclair Basic – are easy to incorporate once you are familiar with them. And for those interested in really getting into Basic programming the Lynx version easily wins offering such goodies as TRACE, APPEND, RENUMBER and automatic line numbering.

With the Dragon you must enter a special mode and type "I"

Since our full review of the Lynx (see *Which Micro?* December) Camputers have announced that string arrays are now to be included. (Arrays are single dimension but by using subscripts multi-dimensions array can be created). So the Lynx has a powerful Basic but how much space is actually available in the computer to put your programs into.

When a computer is referred to as having a certain amount of memory it usually refers to RAM. But not all that RAM will be available to the user for his/her programs.

And the amount which is left can vary considerably between different manufacturers. Hence the Commodore 64 (i.e. 64K RAM) allows only 38K for Basic programming while the BBC B (listed as only 32K) allows 27.5K for the user.

With the Lynx and the Dragon the contrast is even more revealing. The Dragon 32 (i.e. 32K – see, it's easy) has 24K available for Basic programs but the Lynx – with 48K RAM – has only 13.5K available.

So despite the fact that at first sight the Lynx has more memory it is the Dragon which will accept the larger programs.

Where does this extra 34.5K of the memory for the Lynx go? On screen mapping Camputers told us. And to a certain extent the more varied and powerful facilities of the Lynx will take up more memory – so you pays your money and you takes your choice.

But, and a big but, the screen handling on the Lynx is very slow – hence the comment about highly interactive games software being unlikely to be

available for the Lynx.

Both machines offer high resolution facilities with the Lynx slightly ahead in that it can easily mix text and graphics at highest resolution – something which is very complicated to do on the Dragon.

Neither of the manuals are excellent but there is one major omission in the one for the Lynx – here there is no index. Considering much of the manual is in the well-worn format of looking at how to use each instruction one by one it is less than useful to have to guess from the contents where things are.

But both the manuals are reasonably comprehensive and adequate for the novice. The Lynx manual also contains some humour although possibly not all is deliberate. For example, when talking about a program listing "the pause in lines 170 and 220 is intended to give the impression that the computer is making some weighty calculations". Is this what home computing is about?

Making a final choice comes down, at the moment at least, to whether you want to get heavily involved in Basic programming – in which case the Lynx is the answer, though the BBC machines should also be looked at (£299-£399).

The Dragon is easier to use but has less facilities although the ability to scroll properly is a very desirable feature. And although the Dragon screen is better able to handle games software than the Lynx, if games are likely to be the prime use of your micro then other machines should be considered – especially the Atari 400 (£199).

The Lynx has strong potential and if good software and the promised disc drives, teletext and Prestel interfaces actually arrive it could be a winner.

The Dragon must also be considered in relation to its software and though there are around 50 packages now available it is surprising that there are not more, considering it is compatible with the Tandy Colour computer – for which there is a wealth of software available in the US. ■



"Ve vill give ze orders!"



From Dragon Data the 32

The Finsbury Benchmark

Here we race the 48K version of the Lynx against the 32K of the Dragon

For the purposes of bench testing *Which Micro?* has tested both computers with a series of eight Basic routines. The object is to compare the speed of different machines by running identical programs through them.

As can be seen the Lynx comes out well on top in all the tests. In fact in four of the routines the Lynx takes less than half the time to perform them. And although speed of operation is by no means the most important factor when choosing a micro it is still worth considering.

How far the speed advantages of the Lynx may help in producing good packages is of course still a mystery due to the total lack of software for it. But the speed of the limited range of Dragon software currently available tends to be satisfactory rather than stunning.

And the gap between finishing one play of a game and waiting for the computer to adjust itself for the next play can be annoying.

So the Lynx at £225 is faster than the Dragon (£200) and surprisingly also beats the Commodore 64 (£345). The BBC machines (£299 and £399) are faster still. See *Which Micro? & Software Review* for March.

120 Benchmarks – The Dragon versus the Lynx

(in seconds)	Dragon	Lynx
Test 1	15.1	9.8
Test 2	10.7	4.4
Test 3	19.8	12.7
Test 4	21.8	9.1
Test 5	23.5	10.8
Test 6	34.2	17.6
Test 7	49.8	22.3
Test 8	128.6	86.9

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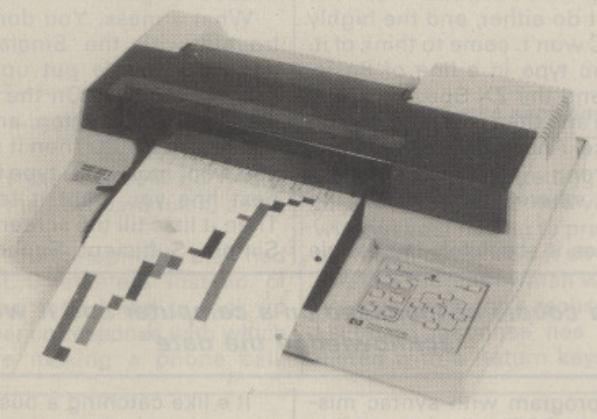
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ZX81 v IBM PC

Some surprises for IBM as our rabid XZ81 enthusiast-David Babsky puts his 'puny' machine against the might of the Personal

This IBM is certainly supposed to be a marvellous machine. Some afficionados would even claim it can emulate a full size mainframe in many respects.

It's certainly got a very pretty screen here on the monitor – very fancy easy to read letters in cool green and a very positive action clickety-click keyboard.

But . . . you're provided with a Disc Operating System (DOS) to load into the machine when you first use it.

Then the first thing it comes up with is a prompt to type in the day's date. A simple task.

But not for the IBM Personal.

Even though it shows you how on the screen!

It shows: Current date is Tue 1-01-1980
Enter new date:

So you type in something like Fri 3-12-1982
and it says Invalid date
Enter new date:

So you leave only one space between Fri and 3 and try again. Still it's no good. So you try Fri 03 and Fri 3 12 1982, without the hyphens and then Fri3121982 then you try Fri03121982 and so on.

I stood behind someone for a full twenty minutes while he tried to log in the date – after that, a spot of lateral thinking inspired him to just press the Enter button and ignore the date altogether!

Can you imagine it? Spend over a couple of thousand on a computer, then it won't even acknowledge the date when you type it in as instructed.

The IBM is definitely a finicky machine.

Now the Apple – and if you've tried one you'll know – is a much more forgiving computer.

If you type in spaces where there shouldn't be any in a program instruction, or you miss them out when you should have put them in, the machine doesn't care. Type CATA LOG when you want to look at a disc, and it'll read over the gap. Type RUNPROGRAM when you mean RUN PROGRAM and it'll still do the job.

But if you use an Apple or an IBM, or a BBC or a NewBrain or almost any other computer there is one stumbling block you're sure to trip over.

You can write a program of a hundred or more instructions in BASIC, then you type out those last three letters R U N; discs start to whirr, memory clicks its abstruse thoughts across silicon synapses, and then it responds with ERROR IN LINE 200.

Do you know of anything so infuriating as spending six hours or more planning out a program, feeding it in, checking it bit by bit – well, section by section – then you put it all together and run it, and it tells you there's a mistake hidden deep somewhere inside?

But there's one computer which doesn't tease like that.

It's a wonderfully brainy little micro which won't let you waste your time and make a fool of yourself. It doesn't cost a couple of thousand; it doesn't cost of a couple of hundred.

It's the fifty pound Sinclair ZX81.

For those who've never tried a Sinclair, and just dismiss it as a 'toy', let me tell you that it does two things that the IBM won't do, and which the Apple won't do either, and the highly praised BBC won't, come to think of it.

When you type in a line of Basic, the ZX81, and the ZX Spectrum, will check there and then whether the line makes sense. And if it doesn't, it'll tell you it's wrong – and, moreover, it shows you where you've made the mistake!

That makes it absolutely impossible to write a program with syntac mistakes in it (although it is still possible to completely miss out a line, like RETURN).

The Sinclair machines – can you call a computer with no mechanically moving parts a machine? – will check each instruction as you write it, to check that the complete program will, as far as possible, be bug free, and will run first time.

And not only that, but you can write a program on a Sinclair in half the time that it takes on any other Basic machine. Why? Because you simply press the 'P' button to get PRINT, and you just press 'G' to get GOTO on the screen.

If you're using a FOR/NEXT loop you only have to prod the 'F' and 'N' keys, and each of the words writes itself for you – complete with easy-read spaces to spread out the rest of the line more legibly.

The more I use a really sophisticated computer – I mean a really expensive computer – the more I yearn for my unassuming little ZX81.

Let's list a program on an Apple or on the IBM PC, for that matter.

Press LIST – I mean type in the four letters L I S T – and off it goes; bzzzrrr, whizz whizz zap! A flickering train of data goes sizzling up the screen, flying off the top and getting wrapped around somewhere at the back of the monitor.

Was that line 395 flashing by? Gone.

LIST it again, and try and stop 395 as it whizzes on its way. Jab at Control-C, or Control-Break. Blast! Missed it again.

What a mess. You don't have that trouble with the Sinclair. Why on earth do people put up with these flash-by listings? On the Sinclair you press the LIST button, and it lists till the screen is full. Then it stops. And if you want more, you type LIST and the next line you want it to start from. Then it lists till the screen's full again. Simple. Sufficient. Superb.

"Spend a couple of thousand on a computer and it won't even acknowledge the date"

It's like catching a bus; you expect it to wait at the bus stop while you get on. You don't want to try and grab the handrail while it's still whistling past – but that's the way the Apple, the IBM and others work.

They seem to have been designed to let the computer get on with its work – whisking bits of data all over the screen – without a thought for how the human is supposed to interact with all the technology.

And what about the graphics?

Why do I have to refer to a notepad to see which key gives which graphics



The XZ81 checks each line of Basic

symbols on this IBM and on the BBC micro?

Why can't the symbols be neatly displays on the keyboard itself, as on the ZX81?

It's as if the telephone dial had letters A,B,C,D etcetera instead of numbers, and then I had to look up which number corresponds with which letter before making a phone call.

Doesn't make sense, does it?

And, most incredibly of all, you should try the IBM's INKEY$ function, and then compare it with the unassuming little £50 ZX81's. It's a fiasco even more appalling than trying to type in the date the way the DOS disc tells you to, then finding that the machine won't accept it!

You know what INEKY$ does, don't you? It's a way of getting a computer to react to what you've typed in, without your having to press the Enter or Return button. So it's very handy to use in a program which will be run by novices who don't realise that every keyboard response has to be completed with a Return keystroke.

Whereas the Sinclair takes a second or so, the IBM took almost four seconds.

And it ought to be good for games, because it means that you can produce a quick reaction from the keyboard: responding with '1' or 'A' is obviously quicker than having to reply to a prompt with '1' & Return or 'A' & Enter.

I was writing my own *Adventure* game on the grand IBM PC. And I thought I'd go one better than the Microsoft version. Instead of typing 'l' and Return to move left, or 'r' and Return to move right – as in Microsoft – I thought I'd write a little routine in which the machine tested to see if the player had responded with 'l', 'r', 'u', 'd', 'f' or 'b'.

That would cover left, right, up, down, forward or backward. And the IBM, don't forget, has a 16-bit processor, so it should work darned fast!

Nope.

My simple little Sinclair must have been three times faster to run the same routine.

But most abhorrent of all, the IBM displays no acknowledgement of what you've typed in when you use the INKEY$ function, (see page 36).

If you press a button and the machine doesn't appear to recognise it, it's a fairly human reaction to hold your finger on the button until some response does appear.

While the IBM is testing to see if the key pressed is one of the six specified letters, nothing appears on the screen. You hold your finger on the key.

Then when it's tested the various conditions and responds with the appropriate reply, it also prints out a string of characters, letter 'l' for example. For all the time you left your finger on the 'l' key it prints another character onto the screen – extraordinarily messy, and utterly stupid.

And the Sinclair?

You type in your 'l' to move left in the *Adventure* game, and the computer immediately responds by putting a single letter 'l' on the bottom left of the screen. Then it tests to see if it should make a particular move in reply to your input of the 'l'. In the second or so that it takes to analyse that input, the processor remains incommunicado – rather like the IBM. But as it's already reacted to your letter 'l' you realise that it's now busy thinking of what to do next.

And whereas the Sinclair takes a second or so, the IBM took almost four seconds before it then splattered letter 'l' all across the screen!

Hmm, well all right – I know I'm not the world's best programmer; maybe I didn't write the program succinctly enough. Maybe I gave the processor too many options for it to make up its mind quickly enough for my liking.

Perhaps I'm a dumb son-of-a-gun, and even though I programmed the IBM according to its BASIC manual it could be that I introduced some unnecessary error-checking, which wasted time.

But my point is that I couldn't have made such a programming error on the ZX81. It won't accept bad lines – it weeds them out as you write them.

That's the feature that I, as a newcomer to computing, want to see incorporated into every micro. I want

an error-proof computer.

It's not impossible, when you see how error-proof the Sinclairs are.

My simple question is, if it can be foolproof for £50, why pay two grand just to make mistakes? ■

INKEY$ Function

Here's how the INKEY$ feature works on the IBM, the Apple II and the ZX81.

IBM–

10 A$=INKEY$

assigns whatever keyboard character is pressed to be the content of the $tring A$. That $tring can then be tested to see if it fulfils certain rules, thus:

20 IF A$="L" THEN 50

By using the line

100 A$=INKEY$: IF A$="" THEN 100

a program will pause indefinitely until a key is pressed (i.e. until the value of A$ is something other than an empty $tring).

Apple–

A program can be similarly halted just by using

10 GET A$

As soon as some keyboard button is pressed the program will continue. A$ can be tested for various conditions, as witha the IBM. It isn't necessary to use the magic word INKEY$.

ZX81–

10 IF INKEY$="L" THEN GOTO 50

works just as on the IBM, but it isn't necessary to convert INKEY$ into another $tring, such as A$; in other words the operation requires only a single instruction instead of two, as on both the Apple and IBM.

100 IF INKEY$="" THEN GOTO 100 will halt a program till any key is pressed.

By using INKEY$ or GET it's possible to pick up a single character instruction from the keyboard on all these machines without having to follow it with CR, Enter, Newline or Return. ■



The IBM – just not personal enough

The Finsbury Benchmark

In many ways the diminutive Sinclair machine makes a surprisingly strong showing against the mighty IBM. The gap in favour of the 16 bit machine is narrowest when running Benchmark 4, where the ZX81 is only 29 per cent slower.

Naturally, any comparison must take into account the fact that in FAST mode, the ZX81 does not have to support a display, whereas the IBM keeps it's user informed at all times.

Although this comparison may seem pointless, it does go to show that the running speed of a Basic interpreter is less dependent of the CPU design than one might think. ■

The Finsbury Benchmark – IBM PC versus the ZX81

These eight tests are designed to compare the speed of different machines by running identical programs through them. They range from simple counting to testing arrays and sub-routines.
(See* Which Micro? *– February for further details of the tests)

(in seconds)	IBM PC	Fast	Slow
Test 1	12.5	43	278.1
Test 2	5.6	7.1	42.3
Test 3	11.1	16.4	101.3
Test 4	12.4	16.1	97.5
Test 5	13.2	18.9	115.3
Test 6	17.0	50.8	308.7
Test 7	37.7	71.9	421.0
Test 8	31.8	232.9	1430.5



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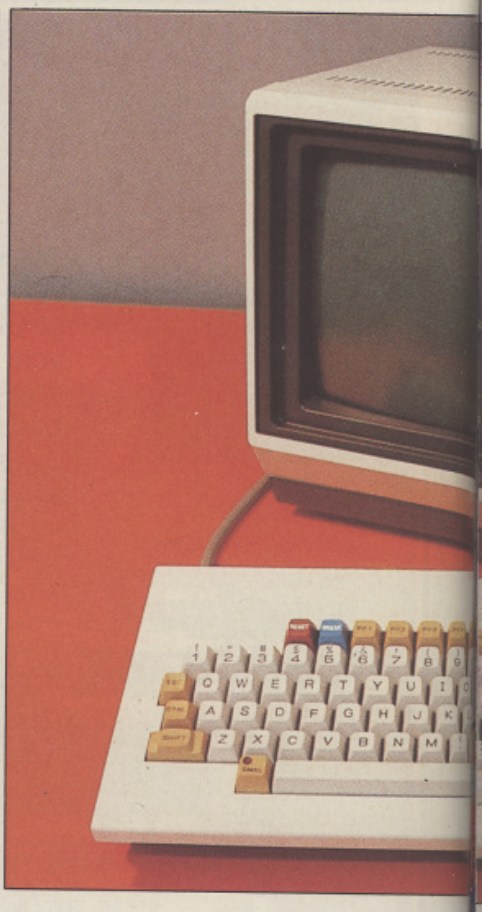
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SANYO MBC-1000

Sanyo have recently dropped the price of this desk top now making it an attractive small business purchase



THE Sanyo Creative Computer MBC-1000 has been designed primarily for office use. In this context, the name "Creative Computer" conjures up images of a machine to aid in the development of wonderful business opportunities or perhaps wizardry with the accounts!

In reality it is unlikely, single-handedly, to achieve either of these results.

The computer supports a CP/M operating system with integral 5¼ inch disc drive. It has a Centronics Printer interface and an RS232 port. The CPU is a Z80A and has 64K of RAM.

These features are all fairly standard requirements for an office machine for use either as a single user desk top computer within a large business, or as the first machine purchased by a small business.

The MBC-1000 has been in existence for about a year, but is only now being extensively marketed in the UK. It is the smallest member of Sanyo's MBC family, and it's price has now been reduced to £1195.

The machine consists of the main body of the computer, housing the screen and a single disc drive, in addition to the CPU and memory.

To be connected to this is the keyboard which is on a cable long enough to allow some flexibility of positioning in relation to the screen.

The main box is 410 X 320 X 370mm and as it weighs 14kg, it is certainly not designed for portability. However, in most office applications this should not be a major concern.

The keyboard is 410 X 76 X 211 mm and weighs 3.5kg. The computer and keyboard are housed in a metal case and have been well screened to avoid radio interference.

The screen is 30cm (12") and displays green characters on a black non-glare background. The display shows 80 characters by 25 lines. the characters have a 6 X 7 dot resolution plus lower case descenders.

In addition to the basic characters and punctuation, the rest of the 255 character set provides a good range of scientific notation and symbols useful in presenting information – for drawing charts and histograms for example.

Thirty two of the characters can be redefined using a programmable character generator provided in the basic utility package.

Coordinate screen addressing is provided, which facilitates the production of charts and histograms.

The 58 key keyboard contains the standard qwerty set together with a range of punctuation keys.

In addition there are five cursor control keys, 5 programmable function keys, BREAK and RESET in a row at the top of the keyboard. There is also a numeric keypad.

One particularly nice feature of the keyboard is the deeper indentation of the F and J keys. This makes it much easier to locate the home position on a keyboard that is rather wider than that which most typists might be used to.

The SMAL key to the left of the space bar controls whether the characters are entered in upper or lower case. This is a necessity for word-processing.

The location of the cursor control keys at the top right of the keyboard makes them rather difficult to access.

The RETURN key is also in a rather unorthodox position, located in the third row below an equally large LINE FEED key, rather than in the more usual second row. Each key press results in a key click.

The keyboard is firm to the touch, and a key click for confirmation that the key has been pressed seems unnecessary.

Holding down a key for more than 0.6 secs results in the character being automatically repreated.

The fact that the keyboard is not integral to the rest of the computer, does mean that it can be arranged at a height to suit the user.

The integral disc drive uses double sided, double density, soft sectored discs providing 320K of storage.

Additional floppy disc drives can be added. These can be bought as a further single drive or as a unit of two, and are available in 5¼" or 8" sizes. A single 5¼" disc drive costs £445 and a double unit £699.

This adds considerably to the storage capacity of the machine.

The computer is equipped with a Centronics Printer port. This gives the purchaser a wide choice of compatible printers.

Both the connectors for disc drives and the printer port are clearly marked on the back of the computer which makes connecting the system up a straightforward exercise.

However, the sockets are both of the same type, and if the appliances to be connected were carelessly plugged into the wrong sockets, then some problems may arise.

The machine is provided with a single RS232 port which allows communication with a variety of other



devices. A further board can be added if more than one device is required.

To move on to the software provided. The machine comes equipped with a system disc containing CP/M 2.2 and also SBASIC II.

CP/M 2.2 is becoming the industry standard especially in the field of office equipment.

SBASIC II is similar to Microsoft BASIC, and as such is supplied with an adequate range of commands and functions for most business and mathematical applications.

The Sanyo MBC-1000 is designed with ADM-31 screen addressing, and so programs for any other CP/M machine built to comprehend that standard will require only minimal changes.

The RS232 port does allow the computer to be connected to a mainframe office system.

However, no provision is made in the Sanyo MBC-1000 for any networking of this machine.

This is certainly not unusual in an office machine of this type, but is a feature which is likely to be more in demand as time goes on.

The lack of a networking facility means that it is not possible to purchase several computers and then connect them up to a single printer, or external disc drive for example.

This has implications for the small-businessman particularly.

A networking facility would allow him to develop his computer system from one machine and printer to several computers plus printer.

This avoids making the switch currently required from individual computers plus add-on machines, to the purchase of a new complete system.

Few machines currently offer networking facilities, but those that do are likely to be particularly successful in the small business field.

One of the most significant factors involved in buying a business machine is the backup provided by the dealer supplying the machine. This must supplying the machine.

This must be of special concern to any small businessman about to acquire his first computer.

On technical grounds the Sanyo MBC-1000 must be amongst those he should consider.

In Britain, Logitek has recently become the sole distributor for Sanyo machines.

Logitek intends to achieve sales through the use of an existing network of 1000 dealers and to expand these to 500 in time.

This should enable potential customers to have hands on experience of the machine before buying it.

The size of the machine, the integral single disc drive and the software availability suit the MBC-1000 to two potential markets.

One is as the desk top personal computer for the accountant, secretary etc within a larger company, and the other as a relatively inexpensive computer for the small businessman.

In a larger company, it is likely that the knowledge and experience of computers and systems will be available in house, in which case the dealer's support is less significant.

For the small businessman buying his first computer, advice from a dealer must be particularly relevant, both in terms of the hardware's capabilities, and the software available for the machine.

In this situation, the successful sales of this or any other computer, is likely to depend on the development of a good dealer network.

With this in mind, Logitek have indicated that they intend to be rigorous in ensuring that their dealers offer a high standard of support.

One area of assistance that is likely to be available is in terms of configuring software for the machine in addition to that which will be of their standard range.

The documentation provided with the computer is thorough, including diagrams indicating how the additional RS232 board should be connected, circuit diagrams as well as concise descriptions of the functioning of the commands and features available.

It has not been written with the computer novice in mind however, and for somebody who is new to the constraints of computers this could be daunting.

This is an area in which the purchaser should expect some assistance from his dealer.

The manual comes in a binder which cannot be laid flat, and which needs a hand or weight to keep the pages open.

This seems an unnecessary inconvenience suggesting a lack of care in designing documentation which is not shown in the machine.

In conclusion, the Sanyo MBC-1000 is a well designed and solidly constructed basic office machine.

It is particularly suited to the needs of the single user, especially as the computer plus disc-drive is put together in one unit.

The main frustrations of the machine are in terms of the keyboard layout which is not of a standard design, and which could make changing to or from this machine a little difficult.

In reality a decision to buy this machine is not likely to depend solely on the nature of the hardware.

Of more significance to the user is its aggressive price, the support given by his local dealer, and the availability and appropriateness of the software for his purpose.

Logitek seems to be working hard to satisfy the user's needs in each of these areas. ■

COMMENT

The MBC-1000 is a robust office machine designed for the single user. As it is CP/M operated, it is able to utilise an extensive range of software. SBASIC provided offers a range of commands suited to business applications, and gives a high level of calculating accuracy. In addition to running independently, the machine can be connected to a mainframe computer.
A good dealer network and the machines price should make the MBC-1000 competitive in the office machines market.

SPECIFICATIONS

Sanyo MBC-1000
Main distributor, Logitek EIC Electronics Ltd, Logitek House, Bradley Lane, Standish, Greater Manchester.
Based on the Z80A, with 64K of RAM.
Integral 5¼ inch disc drive and 12 inch non-glare screen
Centronics port and RS232 interface supplied.
58 key keyboard plus 5 programmable function keys.
CP/M operating system, with SBASIC supplied.
Forth, Pascal/M, Cobol-80, and Fortran-80 available.
Price £1195, plus £499 for additional single disc-drive and £699 for a double unit.

EAGLE 1600

The Eagle is probably the first economically sensible competitor to the IBM PC

If 1982 was the year of the 16 bit microcomputer then 1983 is emphatically the year of the IBM PC.

The Eagle 1600 is superficially just another of the IBM lookalikes which have sprung up in the wake of the PC's astonishing sales results, but closer examination reveals a number of features which give the newcomer a technical edge.

The most important of these is a new CPU – the original's 4 MHz Intel 8088 is replaced by an Intel 8086 running at a heady 8 MHz. Since the new chip is a true 16 bit processor, the Eagle has the potential of much faster operation when running applications.

Of the three models in the range, we examined the cheapest which meant 128K RAM and a pair of 1Mb floppy disc drives.

HARDWARE

The Eagle follows the current trend for separate keyboards, the CPU and disc drives sitting under the separate monitor.

The keyboard itself is connected to the computer by a coiled lead which allows the user to shift it into any position he finds comfortable. There are 105 keys in all, of which 24 have special functions depending on the software being used. In fact, the entire top row is marked with a variety of functions, many of which offer single key operation of the Eaglewriter word processing package.

The right hand side of the keyboard features a numeric keypad, and on the far right is the most helpful function key of all. Marked HELP, this key works with both the software packages supplied as standard with the Eagle. It acts almost as a built-in manual for the program.

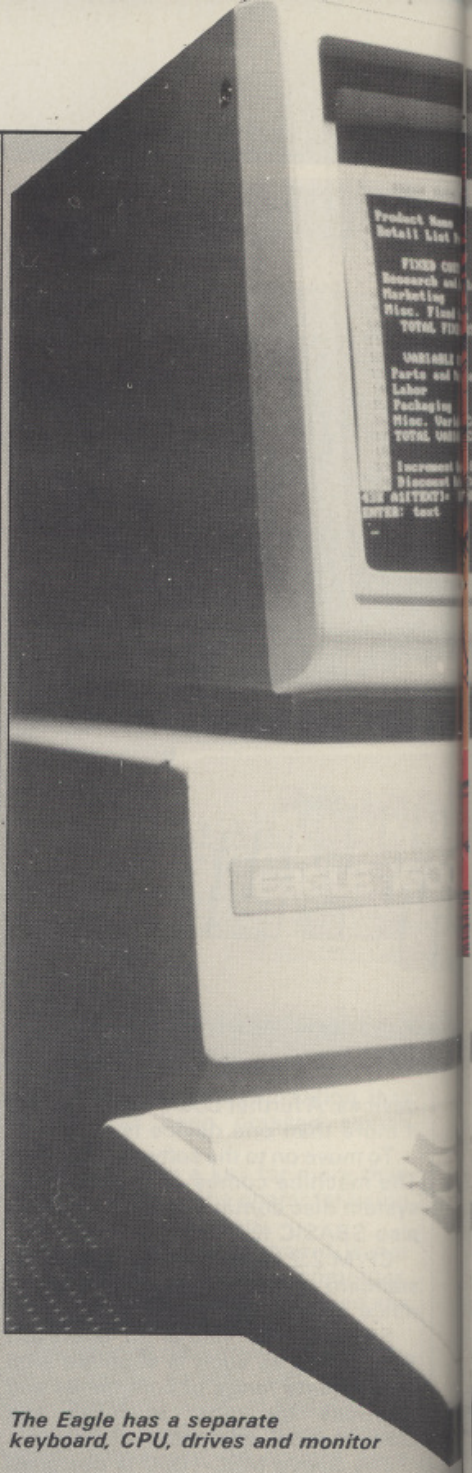
The keyboard is generally easy and pleasant to use, though it was irritating to find that the IBM's adjustable angle feature was not used, and we also found the return key rather too small for comfort.

The monitor is a 12 inch type presenting 80 x 25 text in a clear green display. The graphics resolution is an impressive 720 x 352 pixels, but a colour display is available only at extra cost.

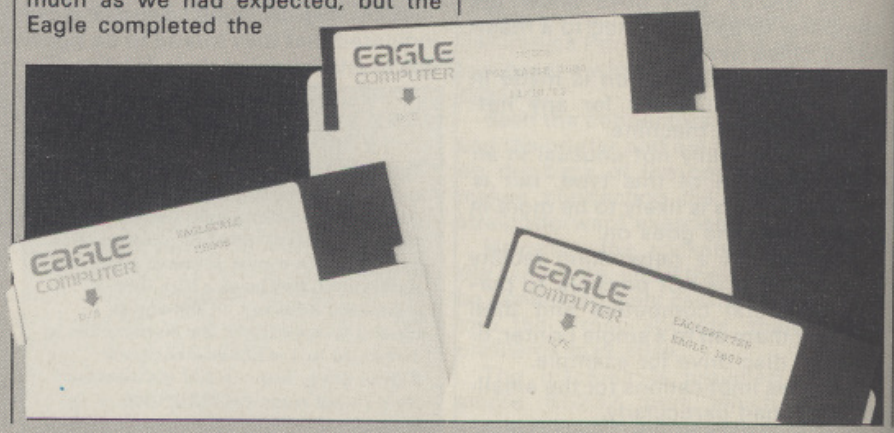
The 5¼ inch disc drives are double sided, double density units which provide a formatted capacity of 804K each; sufficient for up to 500 pages of Eaglewriter text. A Winchester option is available for a few dollars more.

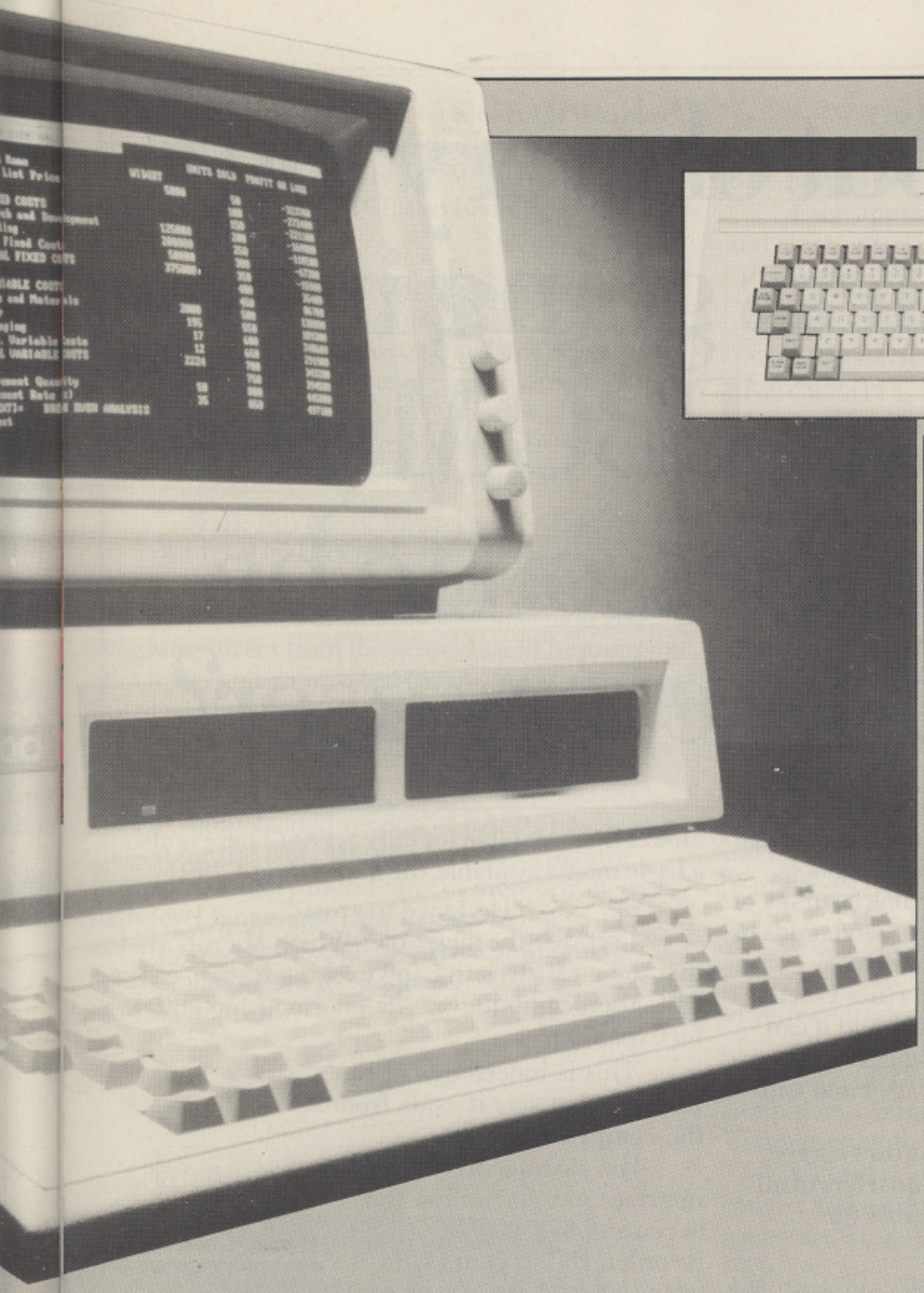
The change of processor promises greatly increased operating speed, but whether or not this turns out to be important to the user is another question.

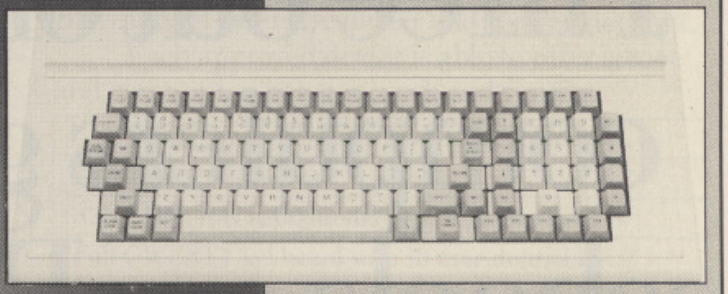
Using the popular database *Cardbox*, we ran a comparative test on both Eagle and PC. Each system had to retrieve a matched sequence of characters from seven fields of 198 records. The IBM took 30 seconds which was much as we had expected, but the Eagle completed the



The Eagle has a separate keyboard, CPU, drives and monitor







COMMENT

Priced at £3150, the Eagle 1600 appears more expensive than equivalent 16 bit micros. But when you subtract the price of the two software packages and second operating system – a total of around £500 – then the Eagle would cost £2650, which makes it extremely competitive bearing in mind the full specification.

SPECIFICATIONS

Processor	Intel 8086 operating at 8 MHz
Minimum config	128K RAM 2 x 1 MB floppy disc drives Green 12in monitor
Price	£3150
Max config.	512K RAM
Interface:	2 RS-232 serial ports and 1 parallel ports.
Price	On application – many independent RAM cards available
Operating systems	MS-DOS & CPM-86 supplied
Colour monitor	Extra
Hi res graphics	Yes
Multiple users	Yes
Printess	Yes
Applications	*Eaglewriter* and *Eaglecalc* supplied.

Programs for most applications available.
Distributor: Mediatech Ltd., Woodside Place, Alperton, Wembley, Middlesex, HA0 1XA. 01-903-4372.
Manufacturer: Eagle Computer Inc., 983 University Avenue, Los Gatos, California 95030.

task in a mere 15.

Unfortunately, having a hot-rod processor does not reduce the time the disc drives or printer take, so in terms of the time needed for any given job the Eagle will show less of an improvement than the bare figures suggest.

SOFTWARE

The Eagle comes with both MS-DOS and CPM-86 included in the basic price, and two applications packages are also supplied.

Eaglecalc is a development of the Ultracalc electronic spreadsheet, and is fairly standard in use, with 64 columns and 255 rows. On the cynical assumption that most users probably won't read the manual properly, we tried the same approach.

The Help button provided the essential information, and we were unable to provoke a vicious reaction by pressing keys when we shouldn't.

The *Eaglewriter* word processing package is a development of *Spellbind,* and proved similarly easy to use. By providing these two packages, the manufacturers make it possible for the typical small business user to start recouping his investment right away.

Since one of the Eagle's main claims to fame is its compatibility with software produced for the IBM, we tested this feature by using our IBM format copy of *Cardbox* for the speed trial. We encountered no problems.

EXPANSION

The Eagle can take up to 512K internal RAM in the form of cards inserted into some of the eight slots on the right hand side of the machine. One slot is dedicated to the monitor interface, leaving seven for RAM addition and printer or network interfaces.

Conclusion

The Eagle 1600 is something of a sleeper, hiding its technical superiority under the IBM clothing. It is in many ways a Super IBM lookalike, and its edge on speed and price should make it a front runner in this highly competitive market. ■

Three out of every four computers going into schools are BBC Micros. Is there a lesson to be learned by every user?

As part of the current government subsidised scheme aimed at introducing micros to schools, the Department of Industry undertook a survey of machines available and made recommendations to education authorities all over the country.

The BBC Micro met their priorities exactly: it is economical yet fast and powerful, and it can justify the investment involved, through its capability to grow with the needs of the user and with the rapid changes in technology.

Teachers and education authorities agreed, and today it represents over three-quarters of all micros being ordered for schools across the country under the DOI scheme.

The BBC's choice too.

In choosing a machine to put their name to for their massive Computer Literacy Project, the BBC had the same set of priorities as the DOI. The BBC Micro is now an integral part of that project, which includes books, software, courses and a number of major television series, one of which, "Making the Most of the Micro" is now being broadcast.

All this for only £399.

The BBC Micro is light and compact. It generates high resolution colour graphics, and is capable of synthesising music and speech using its own internal speaker. The keyboard uses a conventional layout and typewriter feel.

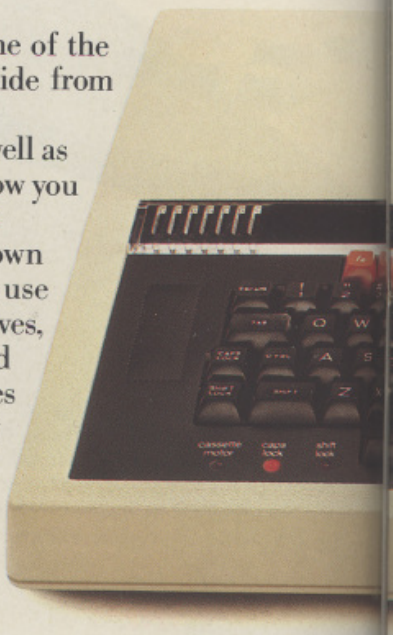
The most sophisticated version (called Model B) is available for only £399. (There is also a basic model available, the Model A, at £299.)

Designed to grow.

Last year the magazine "Which Micro?" said that the most attractive and exciting feature of the BBC Microcomputer was its 'enormous potential for expansion'.

This is indeed one of the features that sets it aside from the competition.

For example, as well as interface sockets to allow you to connect to a cassette recorder, and to your own television, you can also use video monitors, disc drives, printers (dot matrix and daisy wheel) and paddles for games or laboratory use.



You can also plug in ROM cartridges containing games with specialist application programs.

The Tube. A unique feature.

The Tube, which is unique to the BBC Micro, provides for the addition of a second processor via a high speed data channel. The possibilities are enormous. For example, the addition of a second

3MHz 6502 processor with 64K of RAM doubles processing speed. While a Z80 with 64K of RAM opens the door to a fully CP/M* compatible operating system, with all the benefits for business applications.

Linking up with other computers.

The BBC Micro also offers a facility of immense potential value to schools, colleges and businesses. It's called Econet® – a system which uses telephone cable to link with other BBC Micros. A number of machines can then share the use of expensive disc drive and printer facilities.

Make full use of Prestel & Teletext.

With special adaptors you will not only be able to turn your TV set into a Prestel terminal and Teletext receiver, but you can also take data and programs direct from these services. (The programs, which are known as telesoftware, are already being broadcast by BBC's Ceefax service.) This is another first for the BBC Micro.

BASIC plus.

A sophisticated version of BASIC has been chosen for the BBC Micro, which incorporates features normally found only in more advanced high level languages. However, there is also a facility allowing access through a simple command to another language – for example, PASCAL, FORTH and LISP.

*Trademark of Digital Research.



A full range of software.

Applications software for the BBC Micro already cover a very wide field. Packages covering games, education and business applications are available on cassette. All developed to the same high standards set by the hardware.

The best possible back-up.

Your BBC Micro comes with the backing of the BBC and an extensive dealer and service network.

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Alternatively, you can buy a Model B directly by sending off the order form below to: BBC Microcomputers, c/o Vector Marketing, Denington Estate, Wellingborough, Northants, NN8 2RL.

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FUTURE COMPUTERS FX20

Unlike its competitors IBM's PC remains unchanged since its US launch. We look at a strong contender

Many industry watchers were pretty surprised when the IBM Personal Computer was launched back in January this year. Not because IBM had finally presented its 16-bit baby for its first UK photocall, but because it was virtually unchanged since birth.

Unlike its competitors, IBM's micro hadn't grown or developed in those long 18 months since its US launch.

Elsewhere had seen enormous technological advances and the launch of a plethora of 'IBM – lookalikes' from dozens of computer manufacturers large and small. Even the month that saw the launch of the IBM PC also saw a wide range of alternative 16-bit micros – some faster and some cheaper than the IBM PC.

One of these alternatives was the Future Computers FX20 which was unveiled for the first time at the *Which Computer?* Show, and is available from March. This machine is faster, cheaper more flexible and more attractive than the PC.

Of course, you won't get the rock – solid dependability of buying a system from a megacompany such as IBM, but Future is in the process of negotiating with established suppliers and OEMS to set up a distributorship and OEM base in the UK.

Already Encotel, a well-known nationwide supplier of the Superbrain and Televideo microcomputers, is signed up to distribute the FX20 in the UK. The FX 20 itself forms the "heart" of a range of systems from Future designed to give maximum flexibility of use – from a standalone micro to a complex multi-user network, with simple upgrades to whatever level you want.

And at the price the FX20, which knocks nearly £1000 worth of spots off the IBM PC, warrants a close look.

In effect this means that all IBM PC software will run on the FX20

This system which claims total compatibility with the PC – claims in fact to be an IBM 'thinkalike'.

In effect, this means that all software now available on the IBM PC – and there is probably more written for this system than for any other 16-bit micro on the market – will run on the FX20 if it is running the MSDOS operating system option.

We saw this demonstrated by taking a standard IBM formatted disc, and placing it in the FX20's disc drive. It read and displayed the appropriate titles as if it were a PC.

The processor is an Intel 8088 and the system is supplied with the CP/M 86 plus operating system as standard and MSDOS, which runs on the IBM PC under the name PCDOS, as an option.

The FX 20's standard memory is 128 KB, which is double the standard for the PC.

Future claims the system to be twice as fast as the PC, – and three times as fast as the Sirius – a claim we were inclined to go along with after a demonstration of the Supercalc financial planning package.

Hardware

The first thing which strikes you about the pale grey and white FX 20 is its streamlined, low profile good looks – a sharp contrast to the IBM PC which is altogether more bulky.

Conventionally, the screen stands on top of the processor box and the keyboard sits in front. However, all three units are completely separate and can be put wherever you like on a desk.

The processor box, which is pleas-



The FX20 is £1000 less than IBM's PC.

antly slim thanks to the half-height floppy disc drives, can be slung from the side of the desk if the user needs more room to manoeuvre.

All the parts of the FX range are built in the EEC, apart from the Japanese disc drives from Hitachi. A hard disc version is available, called the FX30, which offers from five to 50 Mbytes of storage.

The 12 inch VDU stands on a pedestal, can tilt and swivel, has an anti-glare screen and comes in two types of green phosphor or one orange on brown display.

The display is 25 lines x 80 characters with a clear 16 x 10 character matrix and the display brightness is software controlled.

The processor box houses the twin floppy discs, a local area network facility as standard, with two RS232C ports a well as a diagnostic and keyboard port. It contains expansion slots for 128 Kbytes RAM, graphics and Winchester add-on boards, as well as the facility for adding any two IBM application boards.

The keyboard has 109 keys arranged into separate logical groups

The most interesting point about the floppy disc drives is that they are half-height drives – that is although they take standard 5¼ inch floppy discs – the mechanism makes the drive half as high when laid horizontally.

This means that although they will take the one sided IBM PC floppy disc as standard and will read information just like an IBM PC, they will not take IBM's double sided discs – yet.

The keyboard has 109 keys arranged into separate logical groups – a Qwerty keyboard, separate numeric and cursor control keypads and 20 function keys with an interchangeable vinyl identification strip.

The whole keyboard has an attractive low profile, and the keys have a good 'click' touch.

Software

With both CP/M 86 and MSDOS available, FX20 users will have a relatively wide range of software to select from. We say relatively because there is still a lack of 16-bit software compared to the mountains of packages on the 8-bit computer market.

Nevertheless, the use of the 8088 processor means that you can get a good selection of packages – you have access to those written for both the IBM PC and the popular Sirius from ACT.

Future Computers has selected what it considers to be the best packages from a number of software suppliers including MicroPro, Micro Focus and Microsoft, and packaged them with its own label.

Applications covered include general ledgers, word processing, database management, IBM and ICL emulation protocols and a complete business suite.

These packages will be available from Future's distributors, along with the hardware. Of course, users will still be able to select any other IBM-compatible packages they wish.

Manuals were still at the production stage when we looked at the machine, so were not available for examination. However the company say that there will be four different types of manual available.

The first will be a beginner's guide to using the machine – the sort of aid that saves you having to wade through a complete system manual just to find out how to turn the damned thing off.

The second will be a technical manual with a complete description of the machine. The next is a maintenance manual and the last will be a software manual for each software package you buy from the dealer.

Some training will be included in the

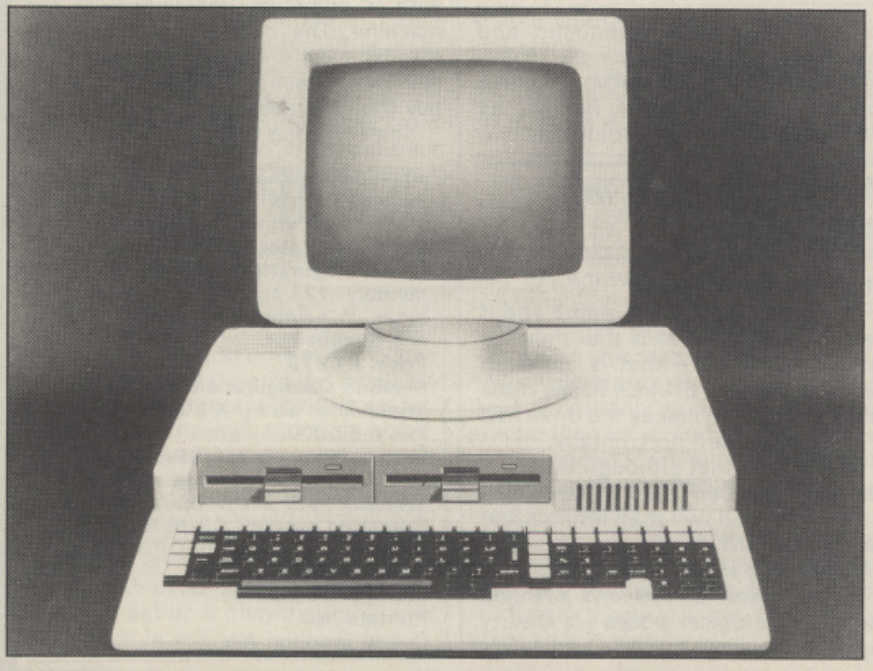
SPECIFICATIONS

Processor: Intel 8088.
Min Configuration: 128 KBytes memory, 12" screen, 2 x 800 K bytes, ½ height floppy discs, LAN and Spellbinder.
Price: £1,875.
Medium Configuration: With 5MB Winchester disc (FX 30/5).
Price: £2,800.
Extras: Network processors with up to 300 M bytes of mass storage available later in the year.
Operating system: CP/M 86 Plus (standard), Concurrent CP/M (Opt), MSDOS (Opt).
Multiple Users: Yes.
Printers: No.
Colour monitor: No.

price of the system, but the exact amount depends on what software you buy.

We couldn't get a price for the maintenance agreement, but Jackson the managing director, did tell us that Encotel has a nationwide maintenance agreement with software sciences. There is a warranty on non-moving parts.

Leasing, as an alternative to outright purchase, will be available through third party leasing organisations, although this would probably only be worthwhile if you wanted a large, multi-user system configuration. ■



Standard memory is 128KB.

COMMENT

Most large and many small computer manufacturers are jumping on the 16-bit micro computer band wagon at the moment, and Future Computers is but one of 50 fighting for a share of the market.

But the product looks good nd future has gone for well proven hardware with access to a wide range of software.

The company is new, but it has some solid capital behind it – around £1.3 million. Most of that came from general government-backed schemes and organisations, the remainder from private investors.

Future Computers does not intend selling direct to the public itself – it has spent several months setting up a dealer network prior to promoting the product nationwide.

It will be interesting to see how the FX range fares over the next year against the ever-increasing flood of new low-cost Japanese products, not to mention the IBM, Sirius and DEC Rainbow, against which it will specifically be marketed in this country.

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PROGRESS REPORT



...now the pedigree really shows

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New Range Additions The Communicator range has broadened to add a new 20 Megabyte 5" Winchester Hard Disk Drive System to the already well established 5 Megabyte and floppy diskette models. Another new system offers 8" floppy disk drives for compatibility of data transfer. With the associated tape and additional Winchester back up systems that adds up to eight basic models – all in the same neat, stackable, casing – all based on S100 bus construction to keep future options in memory, users, peripherals and interface requirements wide open.

New System Additions Communicator operating systems continue to broaden both in options and facilities. An improved CP/M offers enhanced diagnostics, for example, and auto boot from Hard Disk. These basic improvements are reflected in the now tried and tested Communicator multi-user MP/MII™, which also provides for full CP/M™ compatibility.

New Communications Options Communicator now offers CP/Net™ and RBTE communications protocols. Individual Communicator Systems can now operate as intelligent information terminals, integrated with either existing mainframe or mini computer installations, or be part of a shared resource or communications network.



New Range of Terminals Find out more about Comart's new smart VDU. It's a new advanced ergonomically designed unit. It has a 105 keyset detached keyboard, soft green phosphor tilt screen, and a low profile foot. Its a perfect complement to the Communicator in both styling and performance.

Some things don't change Communicator still has Comart's established dealer network and nationwide after sales service back up, supporting thousands of Communicators already at work throughout the UK.

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Cave Hunter. Finding the hidden gold is hard. But surviving the attacks of malevolent creatures may well prove to be impossible. Cave Hunter is on cartridge.



Dragon Selection. A cassette of utility programs, allowing you to create your own database. Write your own tunes - or learn other language vocabularies.



Starship Chameleon. A cartridge game. You find yourself under attack by the dreaded Gabolators! Their task is to take your planet - yours is to protect it.



Computavoice. This cassette actually enables your Dragon to speak to you.

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APRIL 1983



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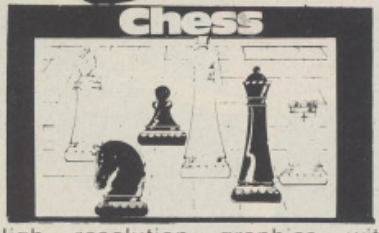
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Word Processing

Word Processing
Word Processing

Looked at sensibly, word processing is always something that other people do, or should do.

No one in their right mind, unless of course they are being paid for it, would consider getting involved in chewing words around — well, not often anyway, and surely not often enough to warrant being interested in such things as a pukka word processing system.

That is, for the vast majority of the population, thought to be exactly true. After all, a word processing system can be an expensive item if the subject is to be addressed properly.

Now that statement is not so exactly true. A year ago, even less, it would have been so, but not now.

What has changed, of course is both the availability of, and sudden rush of interest in, home computer systems of all types.

These so called 'home machines', beasts like the Commodore Vic-20 and the TI99/4A and the Atari and the Sinclair Spectrum etc are doing to personal computer what the personal computer had already done to the mini and mainframe computers —namely

Cheap home based text and word processing is now a reality

make their prices and capacity inexpensive to the man on the street.

And those same people are also discovering that such machines are capable of much more interesting and worthwhile labours than simply playing Space Invaders, or any other game. They are starting to look at other applications like — word processing.

Classic word processing is one of the most profligate applications when it comes to the use of such features as secondary storage. Here, disc drives — and large disc drives — are *de rigeur,* not an option.

This is because the classic application of word processing is seen as a professional exercise; teams of secretaries constructing reams of formal letters that are extracted from massive disc drives holding 'N' million different standard paragraphs.

This is the application where someone dictates a letter by numbers rather than words, where the numbers refer to those standard paragraphs.

But there is another side to word processing, or perhaps more specifically, text processing, that can be achieved using one of the new home computers.

These applications do not, in practice, require vast amounts of storage; certainly there are limitations under which the exercise becomes impractical, but most of the common home computers with memory expansion can easily accommodate simple word and text processing jobs.

Typical of this type of application will be the user who wishes to produce short circulars reports, articles or just their personal letters.

Here, machines like an expanded Commodore Vic-20 or the new 64, or a Sinclair Spectrum, or a TI99/4A — amongst others with similar specifications — should be able to allow the user to key-in and edit a document or two or three pages length.

With luck, that same user should also be able to mix, albeit slowly, the edited document with a simple mailing list program, so that each letter can be individually addressed and labels can be produced for envelopes.

For this type of application, the larger machines in the home computer ranges should be quite satisfactory and should give ample power to perform the tasks required.

There is however, going to be a need for some form of secondary storage system so that the prepared texts can be kept and used again, or updated. This will also be needed as the means by which the selected program is loaded into the machine. A word processing program is not the type that can be easily loaded via the keyboard every time it is required.

This is where one of the many trade-offs found in the world of computing occurs. It will be necessary for the user to decide on various related aspects on secondary storage so that the best option can be selected.

Two options are normally available to the home computerist: cassette storage, and floppy disc storage. Many

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So send your masterpieces to Software Editor, Which Micro & Software Review, 57a Hatton Garden, London EC1. We look forward to hearing from you.

Word Processing
Word Processing
Word Processing

users will already understand the advantages of them, but for new readers, here is a rapid run-down.

Cassette storage systems – ie the standard audio cassette recorder – are cheap and effective, but very slow and serial. This means that, like with an audio tape, every part of the tape has to be played in sequence to find the part you want.

Floppy discs are much more expensive, but much faster in operation, and they are also random access. This means you can instruct the computer to find a specific file and it will go straight to it on the disc. As a subsidiary but important point, floppy disc storage systems offer a much greater storage capacity than cassette.

Therefore the trade-off for the user thinking about word processing must be made using the following variables: the importance of word processing as an application, i.e. will it be worth the expense in the end budget, this will also be governed by importance of the application, the amount of storage capacity thought to be needed and the amount of use the program and files will be put to – the price range can cover an order of magnitude, £30 for a cassette drive through to £300 or more for a floppy disc system.

Similar trade-off criteria will appear when it comes to choosing a printer. Unfortunately, a printer is essential for word processing tasks, and printers are expensive.

There seems little way round the expense of the printer. It is a mechanical or largely mechanical system, and these cost money to engineer to any quality these days.

Though there are cheap printers available – the less than £60 Sinclair system being an excellent case in point – they are not suitable for word processing work.

This is because these low-cost devices are predominantly thermal printers that require specially sensitised paper. For word processing, the printer has to be good enough to print on ordinary paper, quite probably headed paper, with a print quality that is good enough to look as though it has been tolerably 'professionally' produced. After all, if the final copies come out looking tatty, then the user might just as well stick to a manual typewriter.

Three options are now available here, though they are all relatively expensive. The cheapest solution, the matrix printer, can be obtained for £2-£300, or even less. Below this price however, a printer with reasonable print quality and features such as full character descenders is unlikely to be found.

At the top of the pile is the daisy wheel printer, so called because the character set is held on the 'spokes' or 'petals' of a small wheel. These are hit by a hammer onto the paper to produce the output. A 'cheap' daisy wheel is going to cost around £1,000. The output quality however, is excellent.

It is possible to word process for less than £700

The third option sits in the middle. It is something of a compromise, perpetrated by a growing number of companies, where a standard electric typewriter is modified to be driven by the output from the computer. These can be had from around £5-600.

With word processing, there is really no way of avoiding making a choice amongst these options to obtain the necessary hard copy output. In general terms, however, the daisy wheel option will normally be dismissable by most home users. If there is sufficient requirement for that quality of output, and that expense, there is the equally justifiable argument that a fully comprehensive word processing system running on a large personal computer should be purchased, and to hell with the expense.

For the home user, expense is going to be a serious consideration, and the £3,000-£6,000 system typical in the professional arena are just not on. So, at what sort of price can a viable WP system be developed?

As a rough guide, the following may provide some assistance. The computer itself, with a memory expansion if required, is liable to cost around £300. The printer, depending on the quality and facilities the user is willing to put up with, will be around the same cost – as a minimum. The cassette recorder for storage etc, should be no more than £40, and the program?

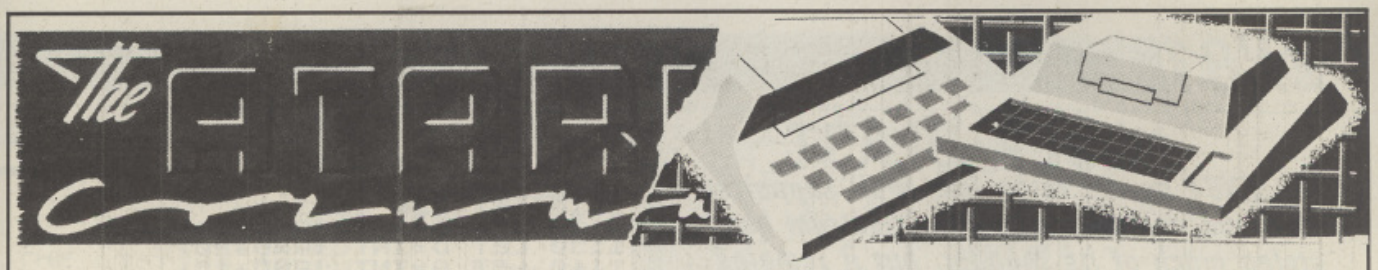
Well, at this level, it must be said that the programs will not be equipped with too many bells and whistles in the full-features-and-facilities-department. They will predominantly be competent text editors. Their price, however, will normally reflect this.

For example, the *Rabbit Writer* package for the Vic-20, costs under £20 in cassette form. *Rabbit Base*, a program suitable for mailing lists, and with which *Rabbit Writer* can operate, costs under £15.

It is therefore possible to go word processing, after a fashion, for an all up cost of less than £700. ■



"It's amazing the add-on bits you can get for micros these days."



Ron Stewart chips away at GTIA and CTIA graphics

It would seem from your letters and from talking to the people at Atari that a lot of you are still in the dark about the GTIA chip and it's graphics. I will try to shed some light on them this month.

First what is GTIA? When the Atari was first introduced it had a chip known as a CTIA (Computer Television Interface Adapted integrated circuit) chip that would process all the information from the ANTIC and 6502 chips into a signal that goes to the television.

CTIA also looked after player/missiles, joystick and console inputs.

GTIA still carries out these functions and gives us three new graphics modes as well. Rumour has it that the 'G' in GTIA stands for George one of the Atari technicians who was not satisfied with the CTIA chip.

This might be a good time to define some of the commands used in the programs below. GRAPHICS-We use this command to select a graphics mode. e.g. GRAPHICS 9. SETCOLOR-We use this command to assign hue and luminance to the colour registers.

We have five colour registers and it might be better to think of them as a paint box into which we can dip our graphics brush. Register 4 is used only for background colour and register 3 is only available in modes 1 and 2. This means that in the graphics modes we have a maximum of four base colours available at any one time.

Modes 9-11 are an exception as we shall see later. If we use a SETCOLOR statement in our program we must assign to it three numbers, e.g. SETCOLOR 2, 8, 0.

The first number, 2, is the colour register. The second number, 8, is the colour assigned to the register. In this case blue and finaly the 0 is the luminance value. The 0 makes the blue as dark as possible. Luminance values must be assigned an even number. The colour registers are already set with default colours and only need to be changed when another colour is to be used.

The default colours are:
Register 0 Defaults to Orange
Register 1 Defaults to Green
Register 2 Defaults to Dark Blue
Register 3 Defaults to Red
Register 4 Defaults to Black

COLOR-With this command we can load individual screen pixels (Picture Elements, the graphics building blocks) with colour. The number stored in each pixel calls up one of the colour registers. In other words COLOR determines the colour to be used for the drawing commands that follow it.

PLOT-This command places the cursor at a specified location on the screen and fills the pixel there with the colour given in the COLOR command. The command is written as PLOT x, y where x is the column number and y is the row number.

DRAWTO-This command draws a line from the last plotted pixel position to the new specified one, using the last colour given in the COLOR command.

We can put some of the above commands together in a short program. Try experimenting with the program yourself. Change the graphics modes and the COLOR, PLOT and DRAWTO commands.

```
10 GRAPHICS 5
20 COLOR 2
30 PLOT 40, 20
40 DRAWTO 20, 10
```

The new modes (9-11) do have several features in common. One is that no text window is available in the GTIA modes. We can get around this as we shall see next month.

Another feature is the pixel size. It is very small and allows us to use high resolution graphics. Each pixel is the same height as a mode 8 pixel but it is four times as wide.

In graphics modes 3 through 8 pixel size is square in modes 9-11 it is rectangular. This gives us a common screen resolution of 80 columns and 192 rows.

GRAPHICS MODE 9. Only one hue is available in graphics 9, but 16 luminance values of that one colour are available. This will allow us to create scenes of depth and give it a sense of the third dimension.

Since only one colour or base hue is used we need only one colour register, register 4. We can set the base hue to blue using the command SETCOLOR 4, 8, 0. The first value is the colour register, the second the base hue and the third the luminance.

If we set a higher luminance value at the start of our program it could restrict the number of luminances later on when we plot points on the screen.

To plot the screen we use the standard graphics statements such as COLOR, PLOT and DRAWTO or we can use the PRINT #6; statement. In doing this we can load the luminance value with any number between 0 and 15.

```
5 REM GRAPHICS 9 DEMO
**BRASS**
10 GRAPHICS 9
15 SETCOLOR 4, 15, 0
20 FOR Y=55 TO 0 STEP -10
30 FOR X=0 TO 24
40 C=X: IF X>11 THEN C=24-X
45 C=C+3
50 Z=Y+(X)
55 D=INT (SQR (144-(X-12)*(X-12)))/2
57 COLOR 15-C
58 PLOT Z, Y+7-D
60 DRAWTO Z, Y+7+D
70 COLOR C
80 DRAWTO Z, 180-Y=D
180 NEXT X
190 NEXT Y
200 GOTO 200
```

This is the famous Brass. It is well known to all the old hands, but it includes most of the elements we have discussed so far and it is easy to understand.

I'll finish this month off with another graphics 9 demonstration programme. This one was written by John Norledge of Atari. See if you can work out how he achieved the screen display. Then show it to all your friends who own Spectrums and who thought the Atari only had six colours. My thanks to John for his permission to use the program.

```
0 REM *** IDEA BY RICHARD ALLISON
**1 REM ***PROGRAMMED BY JOHN NORLEDGE*
5 GRAPHICS 9: POKE 712,0
10 FOR I=0 TO 21: READ A: POKE 1536+I, A: NEXT I: DL=PEEK (56)+256*PEEK (561): FOR D=1 TO 16: POKE DL+7+(10*D), 143
20 POKE DL+8+(10*D), 0: NEXT D
30 DATA 72, 138, 72, 24, 173, 160, 6, 105, 16, 141, 10, 212, 141, 160, 6, 141, 26, 208, 104, 170, 104, 64.
40 POKE 512, 0: POKE 513, 6: POKE 54286, 192: FOR X=0 to 191:? #6: "AA BB CC DD EE FF GG HH II JJ KK LL MM NN NN MM LL";
45 ? #6; " KK JJ II HH GG FF EE DD CC B": NEXT X
50 GOTO 50
```

Next month I'll be looking at graphics modes 10 and 11.

Send program listings, letters or reviews to Ron Stewart, ***Which Micro & Software Review,*** *Petersham House, 57A Hatton Garden, London EC1.* ■



"I'm telling you, Mr Jones, you're in the red. It says so here in magenta and emerald."

LASER BLAST

The ZX81 seems to be less well supported than one might expect. The Spectrum has stolen much of its thunder, but it remains an extremely widely used computer.

This month we open the listings section with a ZX81 program from R de Mercado. We would like to ask him to get in touch with us, as his address has mysteriously vanished from the files.

Although we have a special interest in software for new machines, we don't want to rule out contributions from users of less glamorous machines. What has happened to all the TRS-80 and Video Genie owners for example?

```
  0 REM COPYRIGHT R.DE MERCADO
 750 PRINT AT 2,0;"    INSTRUCTIO
NS: EVERY FEW        SECONDS,TWO S
PACE INVADERS        WILL APPEAR O
N THE SCREEN.IF      ONE OF THEM A
PEARS WITHIN ONE     SPACE OR ON T
HE CROSS PRESS ANY KEY TO FIRE T
HE LASER."
 760 PRINT AT 8,0;"    THE INVADE
RS WITH A QUESTION MARK IN THE C
ENTRE ARE WORTH      ANYTHING BETW
EEN 20 AND 50        POINTS AND TH
E OTHERS 10 POINTS."
 770 PRINT AT 15,0;"  BUT BEWARE
,IF YOU DO NOT       CONCENTRATE
AND ONE LANDS ON THE CROSS,THE C
ROSS WILL DISSAPEAR UNTIL THE NE
XT SHOT."
 780 PRINT AT 21,0;"PRESS ANY KE
Y TO CONTINUE."
 785 IF INKEY$<>"" THEN GOTO 795
 790 GOTO 785
 795 CLS
 800 PRINT "PLEASE ENTER THE LEV
EL YOU WANT";AT 2,0;" THEN RETUR
N"
 805 PRINT AT 10,0;"LEVEL 1:EASY
";AT 12,0;"LEVEL 2:AVERAGE";AT 1
4,0;"LEVEL 3:HARD"
 808 PRINT AT 16,0;"LEVEL 1 THE
INADERS REMAIN ON    THE SCREEN F
OR A FEW SECONDS.    LEVEL TWO T
HEY STAY FOR LESS    TIME AND LE
VEL 3 IS VERY FAST."
 810 INPUT A
 820 IF A=1 THEN LET J=30
 830 IF A=2 THEN LET J=10
 840 IF A=3 THEN LET J=3
 843 LET Q=0
 846 LET R=0
 890 CLS
1000 REM TARGET
1002 PRINT AT 9,10;"   +   "
1010 PRINT AT 2,26,0
1015 PRINT AT 0,26;"SCORE"
1016 PRINT AT 7,26;"SHOTS";AT 8,
26;"LEFT";AT 10,26;10-R
1017 IF 10-R<=9 THEN PRINT AT 10
,26;10-R;" "
1020 FOR Y=0 TO 20
1030 PRINT AT Y,0;"▌"
1040 NEXT Y
1050 PRINT AT 0,1;"▀▀▀▀▀▀▀▀▀▀▀▀
▀▀▀▀▀▀▀▀▀▀▀▀"
1055 PRINT AT 21,0;"▒",AT 21,24;
"▒"
1070 FOR Y=0 TO 20
1080 PRINT AT Y,24;"▌"
1090 NEXT Y
1100 PRINT AT 21,1;"▀▀▀▀▀▀▀▀▀▀▀▀
▀▀▀▀▀▀▀▀▀▀▀▀"
1110 LET A$=")=("
1120 LET S=INT (RND*13)
1130 LET D=INT (RND*20)
1140 LET G=INT (RND*13)
1150 LET H=INT (RND*20)
1160 IF S>=13 THEN GOTO 1120
1170 IF D>=20 THEN GOTO 1120
1180 IF G>=13 THEN GOTO 1120
1190 IF H>=20 THEN GOTO 1120
1200 IF S<=1 THEN GOTO 1120
1210 IF D<=1 THEN GOTO 1120
1220 IF G<=1 THEN GOTO 1120
1230 IF H<=1 THEN GOTO 1120
1240 LET B$="(?)"
1250 IF INKEY$<>"" THEN GOTO 137
0
1260 PRINT AT S,D;A$
1270 IF INKEY$<>"" THEN GOTO 137
0
1280 FOR I=1 TO J
1285 IF INKEY$<>"" THEN GOTO 137
0
1290 NEXT I
1300 PRINT AT G,H;B$
1310 IF INKEY$<>"" THEN GOTO 137
0
1320 FOR I=1 TO J
1325 IF INKEY$<>"" THEN GOTO 137
0
1330 NEXT I
1340 PRINT AT S,D;"   "
1350 PRINT AT G,H;"   "
1360 GOTO 1010
1370 LET T=48
1380 LET T2=-1
1390 LET I=1
1400 LET I2=1
1402 LET W=INT (RND*50)
1403 IF W<20 THEN GOTO 1402
1404 IF S>=8 AND S<=10 AND D+2>=
11 AND D<=13 THEN LET Q=Q+10
1405 IF S>=8 AND S<=10 AND D+2>=
11 AND D<=13 THEN GOTO 1410
1406 IF G>=8 AND G<=10 AND H+2>=
11 AND H<=13 THEN LET Q=Q+W
1410 PLOT T,I
1420 PLOT T2,I2
1430 LET I=I+1
1440 LET T2=T2-1
1450 LET T=T-1
1460 LET I2=I2+1
1470 IF I=25 THEN GOTO 1490
1480 GOTO 1410
1490 LET T=48
1500 LET T2=-1
1510 LET I=1
1520 LET I2=1
1522 FOR Z=8 TO 10
1524 PRINT AT Z,10;"▒▒▒▒▒▒"
1525 PRINT AT Z,10;"      "
1526 NEXT Z
1530 UNPLOT T,I
1540 UNPLOT T2,I2
1550 IF I=25 THEN GOTO 1610
1560 LET I=I+1
1570 LET T2=T2-1
1580 LET T=T-1
1590 LET I2=I2+1
1600 GOTO 1530
1610 PRINT AT S,D;"   "
1620 PRINT AT G,H;"   "
1625 LET R=R+1
1627 IF R=10 THEN GOTO 1640
1630 GOTO 1002
1640 CLS
1650 PRINT "WELL DONE YOU OBTAIN
ED ";Q;"          POINTS OUT OF
A POSSIBLE 500"
1655 PRINT AT 10,0;"CARE FOR ANO
THER GAME (Y/N)"
1660 INPUT A$
1670 IF A$="Y" OR A$="YES" THEN
GOTO 1690
1680 IF A$="N" OR A$="NO" THEN S
TOP
1690 CLS
1700 RUN
```

```
THE NOUGHT LINE IN THE MAIN
LISTING I DISCOVERED BY ACCIDENT
THE NOUGHT LINE IS USEFUL FOR
COPYRIGHT ON TAPES BECAUSE IT
CANNOT BE REMOVED
THE LISTING BELOW WILL PRODUCE
A NOUGHT LINE

    1 INPUT A
    2 IF A=PEEK 16555 THEN GOTO 1
0
    6 POKE 16597,0
    7 POKE 16597,0
   10 REM COPYRIGHT (YOUR NAME)

WHEN YOU RUN THE PROGRAM TYPE IN
 11 .WHEN TWO NOUGHTS COME UP
,PRESS NEWLINE AND DEETE LINES
1,2,5 AND 7.YOU WILL BE LEFT
WITH LINE 0.

SEE LISTING BELOW

    1 INPUT A
    2 IF A=PEEK 16555 THEN GOTO 1
0
    6 POKE 16597,0
    7 POKE 16597,0
    0 REM COPYRIGHT (YOUR NAME)
```

FROGHOP

This Spectrum program comes to us from Micronet 800. It is self explanatory, but there does seem to be a mysterious bug. If it stops during the final graphics display, enter GOTO 1050.

```
    1 FOR i=1 TO 9: READ p$: FOR
j=0 TO 7: READ h: POKE USR p$+j,
h: NEXT j: NEXT i
    2 DATA "a",0,16,126,127,30,4,
2,30,"b",16,126,127,28,2,4,12,48
,"c",0,8,126,254,120,32,64,120,"
d",8,126,254,56,64,32,48,12
    3 DATA "e",0,0,127,127,34,65,
34,20,"f",127,127,34,34,34,34,0,
0,"g",0,0,24,60,90,129,66,36,"h"
,24,60,90,66,66,66,66,0
    4 DATA "i",0,0,0,0,0,0,126,12
8
    5 GO SUB 2000
   10 LET ln=10
   20 DIM s$(4,4): LET s$(1)="▒▒▒
▒": LET s$(2)="▒▒▒▒": LET s$(3)=
"▒▒▒▒": LET s$(4)="▒▒▒▒"
   30 LET f$=s$(1)+"_"+s$(2)+"_"+
s$(3)+"_"+s$(4)
   35 PAPER 6: BORDER 7: CLS
   40 LET goes=0
   42 INPUT "WHAT LEVEL 1 TO 5";L
E
   43 IF LE<1 OR LE>5 THEN GO TO
42
   49 LET L$="_"
   50 GO TO 51+LE
   52 LET B$=S$(1)+L$+S$(3)+L$+S$
(2)+L$+S$(4): GO TO 100
   53 LET B$=S$(1)+L$+S$(4)+L$+S$
(3)+L$+S$(2): GO TO 100
   54 LET B$=S$(3)+L$+S$(1)+L$+S$
(2)+L$+S$(4): GO TO 100
   55 LET B$=S$(4)+L$+S$(2)+L$+S$
(3)+L$+S$(1): GO TO 100
   56 LET B$=S$(4)+L$+S$(3)+L$+S$
(2)+L$+S$(1)
  100 CLS : PRINT AT 1,8;"FINAL P
OSITION"
  101 PRINT AT 2,8;F$
  102 PRINT AT 5,8;"LEVEL=";LE
  103 PRINT AT 6,8;"GOES TAKEN=";
GOES
  104 PRINT AT 10,8;B$
  105 PRINT AT 11,8;"abcdefghijkl
mnopqrs"
  110 FOR i=0 TO 21: PRINT PAPER
2; INK 6;AT i,1;"▒▒": PRINT PAPE
R 3; INK 7;AT i,29;"▒▒": NEXT i
  150 INPUT "Please make your mov
e";k$: IF LEN k$<>2 THEN GO TO 1
50
  160 LET ff=CODE k$(1)-89
  161 BEEP 1,1
  170 LET to=CODE k$(2)-89
  180 LET pf=ff-7: LET pt=to-7
  200 IF b$(pt)<>l$ OR ABS (to-ff
)>2 THEN GO TO 150
  210 LET goes=goes+1: PRINT AT 6
,19;goes
  220 GO SUB 300
  230 LET b$(pt)=b$(pf): LET b$(p
f)=l$
  240 PRINT AT 10,8;b$
  250 IF b$=f$ THEN GO TO 270
  260 GO TO 150
  270 GO SUB 1000: CLS : PRINT "W
ELL DONE ",,"THAT TOOK ";GOES;"
GOES"
  275 PRINT "TRY AGAIN": INPUT "
1=YES 2=NO";U
  280 IF U=1 THEN RUN
  290 CLS : PRINT "PLAY AGAIN SOO
N": STOP
  300 IF b$(pf)="▒" THEN LET c$="
▒": GO TO 350
  305 IF b$(pf)="▒" THEN LET c$="
▒": GO TO 350
  310 IF b$(pf)="▒" THEN LET c$="
▒": GO TO 350
  315 IF b$(pf)="▒" THEN LET c$="
▒": GO TO 350
  350 BEEP .5,-30
  351 PRINT AT ln,ff;c$: GO SUB 4
00: PRINT AT ln-1,ff;c$: PRINT A
T ln,ff;l$: PRINT AT ln-1,to;c$:
 GO SUB 420: PRINT AT ln-1,ff;"
": GO SUB 450: PRINT AT ln,to;c$
: PRINT AT ln-1,to;" ": PRINT AT
 ln,to;b$(pf): GO SUB 500: RETUR
N
  400 FOR i=1 TO 5: BEEP .1,i: NE
XT i: RETURN
  420 BEEP 1,5: RETURN
  450 FOR i=10 TO 5 STEP -1: BEEP
 .1,i: NEXT i: RETURN
  500 FOR i=1 TO 5: BEEP .05,-20:
 BEEP .005,10: NEXT i: RETURN
  900 SAVE "p" LINE 910
  905 STOP
  910 RUN
 1000 CLS : BORDER 6: PAPER 6: IN
K 2
 1010 OVER 1: BRIGHT 1
 1020 FOR i=1 TO 30: CIRCLE 128,9
0,i: NEXT i
 1025 FOR i=1 TO 5 STEP PI/36
 1030 LET in=RND*1: LET ink=2*(in
<=.5)+5*(in>.5)
 1035 LET rnd=RND
 1040 PLOT 128,90: DRAW (COS (PI/
i)*30+70*SIN (i/PI+35))*(-1*(rnd
<.5)+(rnd>=.5)),(TAN (i/PI+i*COS
 (RND*360))*SIN (i*PI))*(-1*(rnd
<.5)+(rnd>=.5)),PI/i
 1050 NEXT i
 1060 PAUSE 100: CLS : RETURN
 2000 BORDER 0: PAPER 0: INK 7: C
LS
 2010 PRINT " THIS GAME IS CALLED
 BLOBHOP","THE OBJECT IS TO GET
THE BLOBS  AND HOBS TO THE FINAL
 POSITION  THIS IS DONE BY ENTER
ING THE  LETTER UNDER THE OBJE
CT TO BE  MOVED AND WHERE IT IS
 TO MOVE TO"
 2020 PRINT "YOU MAY ONLY MOVE TO
 A SPACE  WITH A  ON IT. YOU
MAY MOVE TO AN ADJOINING SPACE I
E jk  OR HOP OVER 1 PIECE
IE ik  "
 2030 PRINT "HIT ANY KEY TO CONTI
NUE"
 2040 IF INKEY$="" THEN GO TO 204
0
 2050 BORDER 7: PAPER 6: INK 1: C
LS : RETURN
```

Steve Langford takes a hard look at the new software offering from Sinclair and gives his judgement



I recently received a whole bunch of new tapes from Sinclair. All of them third party software acquired by Sinclair for sale under their label. Unfortunately the standard is not at all high. Let's look at the games tapes first.

Thro' the Wall is a game in the 'Breakout' mould. The game itself is pretty much the same as any other Breakout game and needs no introduction from me.

This version has three ball speeds and the bat is moved using keys 5 and 8 on the ZX81. The main problem I see with this version is that every time the ball goes out of play the whole game resets and you have to start again with a new wall. I found this to be a dull and frustrating especially if I missed the ball just before the breakthrough.

thro' the Wall is the main game on this cassette but on the reverse side is a version of **Scramble.**

Sinclair has played down the inclusion of this game on the tape. The only note of its presence being printed in very small letters on the front of the insert card. This is a shame as I found this to be the better game of the two.

It has all the usual *Scramble* features including ground to air missiles and defending aircraft. Your aircraft is equipped with forward firing guns and a smart bomb which destroys all the enemy installations on the screen. The game has 10 play speeds.

It seems a pity that this cassette has been spoiled by the reset problem on *Breakout* otherwise it would have been reasonable value for money.

Superglooper is yet another maze game variant. You control a man who is painting the inside of a maze. The maze itself contains all the usual aliens and shields with which to destroy them. Once painted you are sent on to another maze, more difficult than the last.

On the flip side is a game called **Frogs.** Set on the river bank you have to guide your frog over the floating logs to one of the jetties on the other side.

Sinclair have made an unfortunate choice with their graphics and terminal eyestrain would seem to be the order of the day here.

The river is constructed using the graphics 'A' key on the 81 and the small checks are not going to give your optical orbs a restful time when they are moving at speed.

Once again this cassette is made up of two fairly basic games that could have been improved upon.

Finally in the games section Sinclair have released a 1K games tape for the ZX81 this one written by Artic Computers of Hull. There is not a lot you can say about 1K games, but these are of a good standard and with 11 games on the tape it represents value for money.

I especially liked the **Man Eating Budgie** game. The object being to steal the eggs from our carnivorous feather friends.

The last tape for the ZX81 is a toolkit which provides new commands for the ZX81. They are **RENUMBER** which renumbers a program from any start line and will also renumber gosubs, gotos, etc.

NEM prints out how much memory there is left in the computer, **DUMP** prints mout a list of the values of all string and numeric variables, **FIND** will locate any string and list every program line that includes the required string, **REPLACE** exchanges any string with another string, i.e. replacing Print with Lprint to utilise the ZX printer.

SAVE and **APPEND** are used together to join two seperate programs together and finally **REMKILL** which eliminates all Rem statements in a program. If you own a ZX81 this is a potentially useful tape although I think one or two of the commands will not be used very frequently.



"I'm in for trying to erase computer records of my previous convictions"

Spectrum

I will change computers now and review two of the Spectrum tapes sent in by Sinclair. These are **The Collectors pack** and **Club Record Controller.** Both of these tapes carry out essentially the same function, only the field lengths incorporated within the programs are different.

I'll use the **Collectors Pack** for the review and list the differences later.

After loading in the program for the first time the field lengths and titles have to be set up. This needs careful thought as the length of the fields determines how many files you will get into the computer.

I set my files up to keep track of my software collection. I started off by selecting the number of fields I required, which was five: Title, Computer, Publisher, RAM required and Type of Game.

Then I had to allocate the number of characters in each field. The program allows a maximum of 30 characters per field and 50 per record. I found this a bit limiting and I would have liked to have seen more space.

You have to decide upon an indexing field, I made mine publishers, so that if I wanted all the software produced by Sinclair all that I would type in would be Sinclair.

The computer then works out how many records you will be able to store within it's memory. The program then progresses to display a menu. You can create a new record or alter an old one.

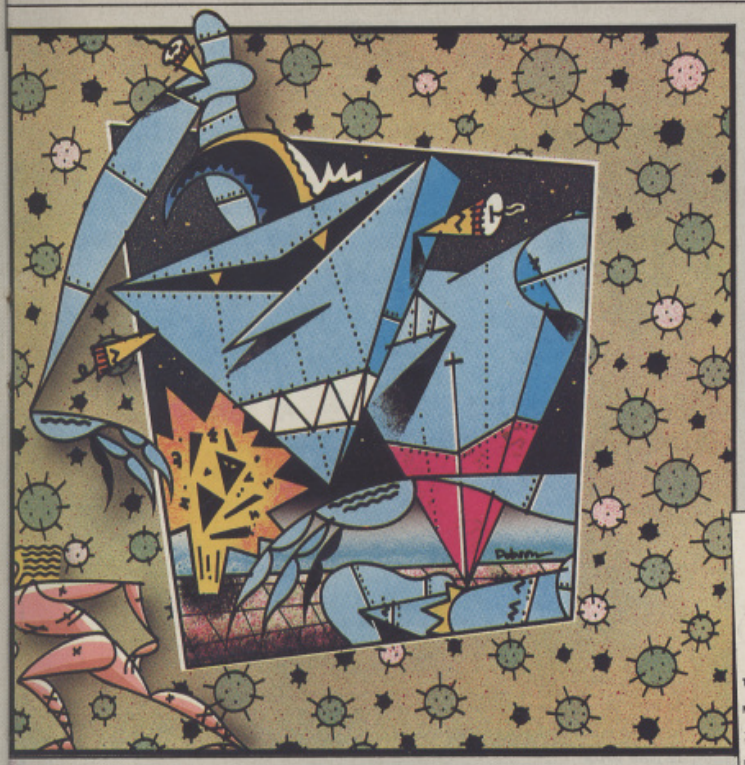
You can debate or list a file to the printer. Finally you can save the files onto cassette, the computer allocates a number to each file that you have made. It could get to the point where you need a file to keep track of where your files are . . .

The Club Record Controller holds slightly more information in it's files with a maximum of 70 characters for the names and address's and nine other fields of 12 characters maximum.

The question I always ask myself with regard to these programs is "Is it faster with a pen and paper". I usually answer yes and go back to the old ways. Perhaps when the micro drive becomes available this type of program will become more viable.

Sinclairs programs are not the best around by any means but they are certainly not the worst. I think you can buy them with confidence and be assured that you are getting reasonable value for money.

Comments, enquiries or reviews to Steve Langford, *Which Micro & Software Review,* Petersham House, 57A Hatton Garden, London EC1. ■



SYNTHESIZER

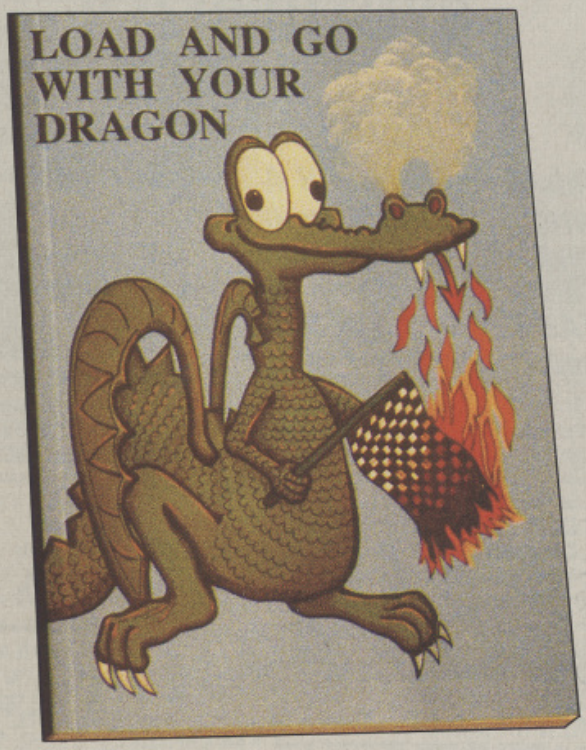
This program from R A Lober of Cardiff turns any BBC Micro into a musical keyboard, with a range of 2.2 octaves. "Black" keys are on the same row as the TAB key, with the "white notes" underneath.

```
  10 REM 19/2/83
  30 K=1:V=1
  40 DIM N(3)
  50 MODE7
  60 PROCDISPLAY
  70 INPUTTAB(0,19)"PIANO OR MOUTH ORGAN",A$
  80 IF LEFT$(A$,1)="P" THEN ENVELOPE 1,0, 0,0,0,0,0,0, 126,-4,0,-1,126,10
  90 IF LEFT$(A$,1)="M" THEN ENVELOPE 1,10, 0,0,0,0,0,0, 60,10,0,-60,60,120
  91 REM NOTE SELECT
 100 *FX 15,1
 101 IF INKEY(-116)=TRUE THEN ENVELOPE 1,1,2,-2,2,6,1,2,6,1,1,-1,-1,63,126:PRIN
TTAB(20,17);"ENVELOPE ";3
 102 IF INKEY(-114)=TRUE THEN ENVELOPE 1,0, 0,0,0,0,0,0, 126,-4,0,-1,126,10:PRI
NTTAB(20,17);"ENVELOPE ";1
 103 IF INKEY(-115)=TRUE THEN ENVELOPE 1,10, 0,0,0,0,0,0, 60,10,0,-60,60,120:PR
INTTAB(20,17);"ENVELOPE ";2
 105 IF INKEY(-21)=TRUE THEN ENVELOPE 1,0, 2,-2,2,6,12,6, 126,-4,0,-1,126,100:P
RINTTAB(20,17);"ENVELOPE ";4
 106 IF INKEY(-117)=TRUE THEN ENVELOPE 1,1, 0,0,0,0,0,0, 5,126,0,-5,40,126:PRI
NTTAB(20,17);"ENVELOPE ";5
 107 IF INKEY(-118)=TRUE THEN ENVELOPE 1,1, 50,50,50,2,2,2, 12,0,126,1,126,9:P
RINTTAB(20,17);"ENVELOPE ";6
 108 IF INKEY(-23)=TRUE THEN ENVELOPE 1,0, 2,0,2,6,12,6, 126,0,126,1,126,9:PRIN
TTAB(20,17);"ENVELOPE ";7
 109 IF INKEY(-119)=TRUE THEN ENVELOPE 1,1,100,100,100,100,100,100,25,-50,-50,-
50,126,90:PRINTTAB(20,17);"ENVELOPE ";8
 110 IF INKEY(-1)<>TRUE GOTO100
 120 IF INKEY(-98)=TRUE SOUND 0,1,1,10
 130 IF INKEY(-67)=TRUE SOUND 0,1,2,10
 140 IF INKEY(-83)=TRUE SOUND 0,1,3,10
 150 IF INKEY(-100)=TRUE SOUND 0,1,4,10
 160 IF INKEY(-101)=TRUE SOUND 0,1,5,10
 170 IF INKEY(-86)=TRUE SOUND 0,1,6,10
 190 IF INKEY(-66)=TRUE N(K)=53:K=K+1
 200 IF INKEY(-82)=TRUE N(K)=61:K=K+1
 210 IF INKEY(-51)=TRUE N(K)=69:K=K+1
 220 IF K>3 GOTO430 ELSE IF INKEY(-35)=TRUE N(K)=57:K=K+1
 230 IF K>3 GOTO430 ELSE IF INKEY(-52)=TRUE N(K)=65:K=K+1
 240 IF K>3 GOTO430 ELSE IF INKEY(-68)=TRUE N(K)=73:K=K+1
 250 IF K>3 GOTO430 ELSE IF INKEY(-36)=TRUE N(K)=77:K=K+1
 260 IF K>3 GOTO430 ELSE IF INKEY(-84)=TRUE N(K)=81:K=K+1
 270 IF K>3 GOTO430 ELSE IF INKEY(-69)=TRUE N(K)=85:K=K+1
 280 IF K>3 GOTO430 ELSE IF INKEY(-85)=TRUE N(K)=89:K=K+1
 290 IF K>3 GOTO430 ELSE IF INKEY(-54)=TRUE N(K)=93:K=K+1
 300 IF K>3 GOTO430 ELSE IF INKEY(-70)=TRUE N(K)=97:K=K+1
 310 IF K>3 GOTO430 ELSE IF INKEY(-71)=TRUE N(K)=101:K=K+1
 320 IF K>3 GOTO430 ELSE IF INKEY(-2)=TRUE N(K)=49:K=K+1
 330 IF K>3 GOTO430 ELSE IF INKEY(-65)=TRUE N(K)=41:K=K+1
 340 IF K>3 GOTO430 ELSE IF INKEY(-55)=TRUE N(K)=105:K=K+1
 350 IF K>3 GOTO430 ELSE IF INKEY(-87)=TRUE N(K)=109:K=K+1
 360 IF K>3 GOTO430 ELSE IF INKEY(-88)=TRUE N(K)=117:K=K+1
 370 IF K>3 GOTO430 ELSE IF INKEY(-56)=TRUE N(K)=113:K=K+1
 380 IF K>3 GOTO430 ELSE IF INKEY(-73)=TRUE N(K)=121:K=K+1
 390 IF K>3 GOTO430 ELSE IF INKEY(-72)=TRUE N(K)=125:K=K+1
 400 IF K>3 GOTO430 ELSE IF INKEY(-89)=TRUE N(K)=129:K=K+1
 410 IF K>3 GOTO430 ELSE IF INKEY(-57)=TRUE N(K)=133
 420 IF K>2 GOTO430 ELSE IF INKEY(-74)=TRUE N(K)=137
 430 PRINTTAB(5,15);CHR$141;"KEYS PRESSED ";K-1
 440 PRINTTAB(5,16);CHR$141;"KEYS PRESSED ";K-1
 450 PROCPLAY
 460 GOTO 100
 470 ************************
 480 DEFPROCPLAY
 490 IF ADVAL(-6) > 3 THEN *FX 15,0
 500 IF ADVAL(-7) > 3 THEN *FX 15,0
 510 IF ADVAL(-8) > 3 THEN *FX 15,0
 511 IF N(1)=0 V=0
 530 SOUND &0201,1,N(1),V
 555 SOUND &0202,1,N(2),V
 570 SOUND &0203,1,N(3),V
 600 K=1:N(1)=0:N(2)=0:N(3)=0
 610 V=15
 620 ENDPROC
 630 ************************
 640 DEFPROCDISPLAY
 650 FOR A=4 TO 8 :PRINTTAB(0,A);CHR$129;CHR$157;CHR$135
 660 NEXT
 670 PRINTTAB(10,0);CHR$141;"SYTHERSIZER"
 680 PRINTTAB(10,1);CHR$141;"SYTHERSIZER"
 690 PRINTTAB(0,6);"  "
 700 PRINTTAB(4,4);"      E     R     T     Y     U"
 710 PRINTTAB(4,5);"     C£    D£    F£    G£    A£"
 720 PRINTTAB(4,7);"A    S     D     F     G     H     J"
 730 PRINTTAB(4,8);"C    D     E     F     G     A     B"
 740 PRINTTAB(0,9);"NOTES ARE:-"
 750 PRINTTAB(0,10);"A,B,C,C£,D,D£,E,F,F£,G,G£,A,A£,C,C£,D"
 770 PRINTTAB(0,12);"D£,E,F,F£,G,G£"
 780 PRINTTAB(10,20);"NOISE:-"
 790 PRINTTAB(0,21);"Use SHIFT and Z,X,C,V,B"
 800 PRINTTAB(0,22);"Z,X,C=Pink noise Z=High,X=Medium,C=Low"
 810 PRINTTAB(0,23);"C,V,B=White noise C=High,V=Medium,B=Low"
 820 ENDPROC
 830 ************************
30000 ENVELOPE 1,1, 0,0,0,0,0,0, 5,126,0 -5,40,126
```

ROBOTCHASE is one of the programs on this month's free flexible record. Unfortunately it is not possible to list it here since no known printer can cope with the colour graphics!



"Don't say anything – but he's freaking out to my 'job – costing/inventory management' package"



DRAGON'S LOAD AND GO

The remorseless flood of new entries to the microcomputer market is matched only by the tide of books intended to cater for their bewildered users.

The recently introduced Dragon 32 has already become a best-seller as many a gleeful Boots manager will testify, so it makes a natural target for the attentions of John Phipps and Trevor Toms, whose books on the various Sinclair machines have been appearing since the introduction of the ZX80.

The result of their recent labours is *Load and Go with your Dragon*, a 128 page paperback aimed at the relative newcomer to computing, as is the Dragon itself.

Unlike many similar books, it does not pretend to be a reference work, nor does it fall into the trap of attempting to replace the manufacturer's own manual. The 33 programs at the heart of the book are an assortment of games and instructional programs, with the odd utility thrown in for good measure.

They include old favourites like *Nim* and *Space Docking*, but on the whole an interesting range of software is provided.

Just to check for errors, I keyed in two of the listings, Castle Walls and Morse Code Tester. Both were error-free, and well rewarded the time spent at the keyboard.

The programs vary in length between nine and 188 lines, to match whatever degree of stamina the reader is able to summon, and each is exceptionally well documented — indeed many listings contain almost as much explanation as code!

The games themselves gradually increase in complexity, so that each one introduces a new programming technique. Anyone using this book should quickly come to terms with using quite advanced Basic in his own applications, since subjects such as tape data files and string or array handling are examined in some depth.

The ease with which the examples can be related to real life makes the book complementary to the Dragon manual, which can be a little inaccessible for the novice. This is especially true with regard to the computer's graphics facilities, which enjoy a special section in the book.

Another welcome feature is the provision of a chapter on debugging. The reader is quickly introduced to checking variables, renumbering to insert extra lines, and the use of temporary STOP lines to test the program a chunk at a time.

There seems to be a stage in the life of every new micro user, just after he has played Space Invaders and learned how to print his name all over the screen, when he sits back and thinks "What next?" It is here that *Load and Go with your Dragon* is most useful. My only quibble is with the price. I know that the market is necessarily limited, but even so, £5.50 seems a little expensive for a 128 page paperback.

Load and Go with your Dragon by John Phipps and Trevor Toms from Phipps Associates £5.50.

AERO 3

AERO 3 by Malcom Saunders is the star program we have chosen for this month's listings section.

As the author of this month's star program, Malcom receives £80 for his work.

All players should make the following changes:

DELETE: SCREEN 0, 1 in line 20
ADD: 310 GOTO 350
ADD: 10 CLS: PRINT = 233, "PLEASE WAIT"

```
10 CLEAR 500
20 PMODE3,1:SCREEN1,0:PCLS:DIMA(25,14):DIMI(30,10):DIMB(25,14)
30 DIMC(25,14):DIMD(25,14):DIME(25,14):DIMF(25,14)
40 GET(20,24)-(55,38),B
50 B$="NL12U4R1NU4R5NU4R1D4R9NR3UBNR5L25ND8L5"
60 C$="BD13BR10U3BF1E3R7F3BE1D3"
70 DRAW B$+C$
80 GET(114,88)-(149,102),A,G
90 PCLS : DRAW"A1"+B$+C$
100 GET(134,87)-(148,122),E,G
110 PCLS : DRAW"A2"+B$+C$
120 GET(113,105)-(148,224),D,G
130 PCLS : DRAW"A3"+B$+C$
140 GET(115,85)-(129,120),C,G
150 PCLS : GET(110,73)-(124,108),F
160 PCLS
170 LINE(130,65)-(140,65),PSET:LINE-(130,60),PSET
180 LINE(122,70)-(130,70),PSET:LINE-(122,64),PSET
190 LINE(110,65)-(120,65),PSET:LINE-(110,60),PSET
200 A1=0:CN=0
210 GET(115,68)-(140,70),I:FOR I=250 TO 150 STEP- 5:SOUND I,1:NEXT I
220 CLS:PRINT@35,"r/c model aircraft flying"
230 PRINT @70,"BY:MALCOLM SAUNDERS"
240 PRINT@130,"YOUR MISSION TO TAKE-OFF,FLY"
250 PRINT@194,"ABOVE THE BIRDS,DO A ROLL AND"
260 PRINT@258,"LAND-REPEAT 5 TIMES BEFORE"
270 PRINT@324,"YOU RUN OUT OF FUEL!!!!"
280 PRINT@386,"ENTER ENGINE RUN REQUIRED IN"
290 PRINT@450,"SECONDS--(BETWEEN 40 AND 60)"
300 INPUT F8:CLS
310 GOTO 340
320 CLS:PRINT@192,"ENTER ENGINE RUN-(40 TO 60 SEC)"
330 INPUT F8:CLS
340 PRINT@192,"JOYSTICK FULLY BACKWARD TO START"
350 G=JOYSTK(0):H=JOYSTK(1):X=3+(G+3.4):Y=(H+2.8)
360 A1=0:CN=0
370 IF X)60 AND X(160 ANDY)170 THEN 380 ELSE 350
380 PMODE3,1:SCREEN1,0:PCLS:M=1:H1=190:TIMER=0:SOUND100,1
390 A1=0: GOTO 460
400 REM++++START OF FLYING SEQ+++
410 G=JOYSTK(0):H=JOYSTK(1):Y=(H+2.8)
420 IF TIMER/100)F8 THEN 1020
430 IF G=G1 AND Y=H1 THEN 410
440 IF Y(H1 AND H1-Y)60 THEN GOSUB 960 ELSE 450
450 IF Y)H1 AND Y-H1)50 THEN 990 ELSE 460
460 A=130-(H/2)+G:B=190-(H/2)-G
470 U=INT(78+G/63):U1=INT(B+G/63)
480 C=176+U:D=(163-H/2)-U1:E=(157-H/2)+U1:F=1+U:X=3+(G+3.4)
490 M=M+(10+RND(10)):IF M)200 THEN M=1
500 L=100-RND(50)
510 PCLS:PUT(X,Y)-(X+35,Y+14),A,PSET:SOUND(240-(H+2)),1
520 PUT(M,L)-(M+31,L+10),I,PSET:N=M+60:P=L+20:IFN)222 THEN N=0
530 LINE(0,A)-(254,B),PSET:LINE(107,E)-(F,190),PSET:LINE(147,D)-(C,190),PSET:PUT
(N,P)-(N+31,P+10),I,PSET
540 IF Y(16 AND A1=0 THEN GOSUB 1420
550 IF Y )20 THEN A1=1
560 IF Y)176 AND A1=1 THEN 570 ELSE 580
570 CN=CN+1:SOUND200,5:A1=0:IF CN=5 THEN 900
580 IFM)X-25 AND M(X+25 THEN 590 ELSE 600
590 IF L)Y-10 AND L(Y+10 THEN 680
600 IF N)X-25 AND N(X+25 THEN 610 ELSE 620
610 IF P)Y-10 AND P(Y+10 THEN 680
620 IF E(Y+20 THEN 630 ELSE 650
630 IF X(48 THEN 730
640 IF X)170 THEN 730
650 X6=X:Y6=Y:G1=G:H1=Y
660 GOTO 410
670 REM+++++END OF FLYING SEQ++++
680 GOSUB 1180
690 CLS
700 PRINT@193,"YOU HAVE BEEN HIT BY BIRDS!!!":PRINT@320,"+PRESS SPACEBAR FOR AN
OTHER GO+"
710 PRINT@256,"SORRY YOU MADE:";CN;"GOOD LANDINGS"
720 U$=INKEY$: IFU$=" "THEN 320 ELSE 720
730 GOSUB 790
740 CLS
750 PRINT@195,"YOU HAVE CRASHED!!!":PRINT@320,"+PRESS SPACEBAR FOR AN OTHER GO+"
760 PRINT@256,"SORRY YOU MADE:";CN;"GOOD LANDINGS"
770 U$=INKEY$: IF U$=" " THEN 320 ELSE 770
780 REM++++CRASH ON TAKEOFF/LAND+
790 SOUND1,2
800 PMODE 3,1
810 SCREEN1,0
820 N=2
830 FOR I=1 TO 50STEP RND(6):C=RND(4)
840 CIRCLE(X+15,Y+7),I,C,.3:SOUND1,1
850 FOR I=10 TO 60 STEP RND(6):C=RND(4)
860 CIRCLE(X+15,Y+7),I,C,.2:SOUND(60+I),1
870 NEXT I
```

```
890 FOR I=150 TO 5 STEP -5:SOUND I,1:NEXT I
895 RETURN
900 CLS
910 V=TIMER/100+V2
920 PRINT@192,"WELL DONE 5 TAKE-OFFS & LANDINGS":PRINT@266,"IN":V;"SECONDS"
930 GOSUB 1600
940 PRINT@384,"*PRESS SPACEBAR FOR ANOTHER GO*"
950 U$=INKEY$:IFU$=" " THEN 320 ELSE 950
960 CLS:PRINT@193,"CLIMBING TOO FAST YOU STALLED":PRINT@261,"TIME PENALTY 5 SECO
NDS"
970 V2=V2+5
980 FOR K=1 TO 1000:NEXT K:PCLS:PMODE3,1:SCREEN1,0:RETURN
990 GOSUB 1290
1000 CLS:PRINT@196,"YOU DIVED TOO FAST!!!!":PRINT@259,"YOUR WINGS BLEW OFF!!!!!!
":PRINT@320,"*PRESS SPACEBAR FOR ANOTHER GO*"
1010 U$=INKEY$:IF U$=" " THEN 320 ELSE 1010
1020 FORY=Y TO 180 STEP3
1030 PUT(X,Y)-(X+35,Y+14),A,PSET
1040 FOR I=1 TO 30:NEXT I:PUT(X,Y)-(X+35,Y+14),B,PSET
1050 NEXT Y
1060 REM***OUT OF FUEL**********
1070 CLS:I=RND(2):IF I=1THEN 1110
1080 PRINT@196,"ENGINE STOPPED-OUT OF FUEL":PRINT@256,"YOU WERE LUCKY YOU LANDED
 SAFELY"
1090 CN=CN+1:V=TIMER/100+V2:PRINT@320,"YOU MADE":CN;"LANDINGS IN":V;"SECONDS":GO
SUB 1600
1100 GOTO 1150
1110 FOR I=2 TO RND(70) STEP RND(5):C=RND(4):CIRCLE(X+15,187),I,C,,.3:SOUND4*I,1:
NEXT I
1120 SOUND60,15
1130 PRINT@196,"ENGINE STOPPED-OUT OF FUEL":PRINT@260,"HARD LUCK YOU CRASHED!!!"
1140 PLAY"P2:O2:T2:L4:C:L6:C:L8:C:L4:L4:C:L6:4:L8:D:L6:D:L8:C:L6:C:L8:O1:B:O2:L3
:C"
1150 PRINT@416,"*PRESS SPACEBAR FOR ANOTHER GO*"
1160 U$=INKEY$:IF U$=" " THEN 320 ELSE 1160
1170 REM**** BIRD STRIKE*******
1180 FORI=4 TO 20+ RND(30)STEP RND(3):C=RND(4)
1190 CIRCLE(X+15,Y+7),I,C,,.5:SOUND 200+I,1:NEXTI
1200 FOR Y=Y TO180 STEP 4
1210 PUT(X,Y-4)-(X+35,Y+10),B,PSET
1220 PUT(X+4,Y)-(X+32,Y+19),A,PSET:SOUND(250-Y),1
1230 NEXT Y
1240 FOR I=2 TO 30 STEP 5+RND(5):C=RND(4)
1250 CIRCLE(X+15,180),I,C,,4
1260 NEXT I
1270 SOUND30,10:RETURN
1280 REM*****LOST WING**********
1290 PUT(X6,Y6)-(X6+35,Y6+14),B,PSET
1300 Z=Y:FORY=Y TO 180 STEP3
1310 PUT(X,Y-4)-(X+35,Y+10),A,PRESET
1320 PUT(X,Y)-(X+35,Y+14),A,PSET
1330 NEXT Y
1340 FOR Y=Z-3 TO 175 STEP 3
1350 PUT(X,Y)-(X+35,Y+14),B,PSET
1360 NEXT Y
1370 FORI=5 TO 100 STEP2+RND(5):C=RND(5)
1380 CIRCLE(X+15,Y+7),I,C,,.2:SOUND I,1
1390 NEXT I
1400 SOUND2,3:RETURN
1410 REM***ROLLING AEROPLANE***
1420 PUT(X,Y)-(X+35,Y+14),B,PSET
1430 IFY<15 THEN Y=15
1440 PUT(X+10,Y-14)-(X+24,Y+19),E,PSET
1450 SOUND 60,2
1460 IF E<Y+30 THEN 730
1470 PUT(X+10,Y-14)-(X+24,Y+19),F,PSET
1480 PUT(X,Y-4)-(X+35,Y+24),D,PSET
1490 SOUND 120,2
1500 PUT(X,Y-4)-(X+35,Y+24),B,PSET
1510 PUT(X+9,Y-15)-(X+23,Y+20),C,PSET
1520 SOUND 180,2
1530 PUT(X+9,Y-15)-(X+23,Y+20),F,PSET
1540 PUT(X,Y)-(X+35,Y+14),A,PSET
1550 SOUND 240,2
1560 Q=PEEK(65280)
1570 IF Q=126 THEN 1420
1580 RETURN
1590 'DAM BUSTERS MARCH
1600 PLAY"O2:T2:L2:G:O3:L4:C:O2:G:G:L8:F:E:L4:F:G:L2:E:L4:A:E:E:L8:D:C:L4:O1:B:O
2:D:"
1610 PLAY"L4.:C:L8:D:L4:E:A:L2:G:E:L4:D:G:L8:A:B:L4:O3:C:L2.:O2:B:P8"
1620 RETURN
```

If you wish to use the keyboard instead of the joystick, the following alterations should be made.

DELETE:

340

370

CHANGE:

```
350 G=35:H=60:X=3+(G*3.4):Y=(H*2.8)
410 G1=PEEK(343):IF G1=223 THEN G=G-9:IF G<1 THEN G=1
```

ADD:

```
351 G1=0:G2=0:G3=0:G4=0
```

352 GOTO 380

```
411 G2=PEEK(344):IF G2=223 THEN G=G+13:IF G>63 THEN G=63
412 G3=PEEK(341):IF G3=223 THEN H=H-6: IF H<1  THEN H=1
413 G4=PEEK(342):IF G4=223 THEN H=H+11:IF H>63 THEN H=63
414 Y=(H*2.5)
```

The program will now run using the four arrow keys to move the aeroplane.

MORSE MADE EASY

Morse Code Tester is one of the programs featured in* Load and Go with your Dragon, *reviewed opposite. The documentation is a model of concise clarity, but remember that it is up to you whether or not to type it all into the computer.

Any of the lower case writing after the apostrophes on many of the program lines may be deleted without preventing the correct operation of the program, since these remarks are intended for the human brain rather than the computer's.

Perhaps this is a good place to point out that the author's permission* must *be obtained before any program is reproduced. Unfortunately, there have been cases of people sending us published listings without mentioning where they got them from.

Morse Code Tester

The main problem in learning Morse code is not learning to send the code, but learning to receive it. To practice receiving you need an expert assistant to help. The Dragon can be this assistant and give you practice at different speeds with completely consistent sending, with the same "fist" every time.

You still need a helper to key in the message but the helper need know nothing of Morse code.

```
10 REM MORSE CODE SENDER
20 CLS1:PRINT TAB(8);"MORSE CODE SENDER"
30 INPUT"SPEED";SP        'higher numbers go slower
40 DS=INT(SP):DD=3*DS
50 GOSUB 230              'set up the code array
60 INPUT A$               'text to be sent
70 FOR L=1 TO LEN(A$)
80 W=ASC(MID$(A$,L,1))    'get next letter
                          'numbers
90 IF W>=48 AND W<=57 THEN W=W-48:GOSUB 150:GOTO 120
                          'letters
100 IF W>=65 AND W<=123 THEN W=W-55:GOSUB 150:GOTO 120
110 FOR DL=1 TO SP*100:NEXT DL      'inter word gap
120 FOR DL=1 TO SP*60:NEXT DL       'inter letter gap
130 NEXT L
140 GOTO 60

                'subroutine to "send" the code
150 S=M(W+1)
160 IF S=0 THEN RETURN
170 C=S-INT(S/10)*10
180 IF C=1 THEN SOUND 100,DS:GOTO 200
190 IF C=2 THEN SOUND 100,DD
                          'get next bit and inter-bit gap
200 S=INT(S/10):FOR X=1 TO 30*SP:NEXT X
210 GOTO 160
220 RETURN
                          'set up morse code array
230 DIM M(36)
240 DATA 22222,22221,22211,22111,21111,
         11111,11112,11122,11222,12222
250 DATA 21,1112,1212,112,1,1211,122,1111,11,2221,
         212,1121,22,12,222,1221,2122,121,111,2,
         211,2111,221,2112,2212,1122
260 FOR X=1 TO 36:READ M(X):NEXT X
270 RETURN
```

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PONTOON

R F Burdett of Mickleover in Derby provides this version of an old favourite,* Pontoon, *for the increasingly popular Dragon 32.

Full instructions are given at the beginning of the program, so the game needs no further explanation. We decided that it was worth £30. If you think you can do as well, or even better, why not send in your listings for consideration? Our rates compare very favourably with those of other magazines.

```
10 CLS:GOSUB 2200
20 PRINT@141,"Pontoon";
30 PRINT@224,"**********
**********";
40 PRINT@265,"COPYRIGHT 1983";
50 PRINT@296,"**********";

60 PRINT@331,"RF BURDETT";
70 PRINT@362,"**********";
80 PRINT@420,"-PRESS ENTER TO CO
NTINUE-";
90 IF INKEY$=CHR$(13) THEN 100 E
LSE 90
100 CLS:GOSUB 2200
110 PRINT@65,"THE OBJECT OF THE
GAME IS TO ";:PRINT@129,"SCORE T
WENTY-ONE OR AS NEAR";:PRINT@193
,"AS POSSIBLE WITHOUT 'BUSTING'.
";
120 PRINT@257,"PLEASE FOLLOW THE
 INSTRUCTIONS";:PRINT@321,"GIVEN
 BY THE COMPUTER";
130 PRINT@420,"-PRESS ENTER TO C
ONTINUE-";
140 IF INKEY$=CHR$(13) THEN 150
ELSE 140
150 CLS:GOSUB 2200
160 PRINT@65,"YOU START THE GAME
 WITH ";:PRINT@97,"5000 POUNDS";
:PRINT@161,"THE COMPUTER ALSO ST
ARTS WITH";:PRINT@193,"5000 POUN
DS"
170 PRINT@292,"-PRESS ENTER TO C
ONTINUE-";:PRINT@364,"Good luck"
;
180 IF INKEY$=CHR$(13) THEN 200
ELSE 180
200 REM PONTOON
210 CLS:GOSUB 2200
220 FOR N=1 TO 50:PRINT@141,"PoN
tOoN";
230 PRINT@172,"**********";
240 X=RND(255):SOUND X,1
250 PRINT@141,"POnToOn";:X=RND(2
55):SOUND X,1
260 PRINT@298,"PLEASE WAIT WHILS
T I SHUFFLE";
270 NEXT N
300 REM SET CARD ARRAY
310 DIM A$(13)
320 A$(1)="AN ACE":A$(2)="A 2":A
$(3)="A 3":A$(4)="A 4":A$(5)="A
5":A$(6)="A 6":A$(7)="A 7":A$(8)
="AN 8":A$(9)="A 9":A$(10)="A 10
":A$(11)="A JACK":A$(12)="A QUEE
N":A$(13)="A KING"
330 REM SET VARIABLES
340 M=5000
350 CLS:FOR P=1 TO 9:B(P)=0:NEXT
 P
360 FOR P=10 TO 13:C(P-9)=0:NEXT
 P
370 FOR N=1 TO 5:P(N)=0:NEXT N:F
OR R=1 TO 5:D(R)=0:NEXT R
380 Q1=0:Q2=0:E1=0:E2=0:N=0:R=0:
S=0
390 N=1:GOSUB 1010
400 PRINT@64,"YOUR FIRST CARD IS
 ";A$(P(1))
410 PRINT:PRINT"YOU HAVE ";M;" P
OUNDS":PRINT:PRINT@256,"ENTER YO
UR BET";:INPUT S1
420 IF S1>M THEN 410
430 S=S1:N=2:GOSUB 1010
440 C LS:PRINT@64,"YOUR SECOND C
ARD IS ";A$(P(2)):PRINT:PRINT"YO
UR HAND IS NOW ";A$(P(1));" & ";
A$(P(2))
450 PRINT@256,"DO YOU WISH TO BU
Y Y/N";:INPUT B$
460 N=3
470 IF B$()"Y" AND B$()"N" THEN
450
480 IF B$="Y"THEN GOSUB 710 ELSE
 GOSUB 810
490 CLS:PRINT@64,"YOUR THIRD CAR
D IS ";A$(P(3))
500 PRINT:PRINT"YOUR HAND IS NOW
":PRINT:PRINT A$(P(1));",";A$(P(
2));" & ";A$(P(3))
510 N=4
520 IF B$="N" THEN 560
530 PRINT@256,"DO YOU WISH TO BU
Y Y/N":INPUT C$
540 IF C$()"Y" AND C$()"N" THEN
530
550 IF C$="Y" THEN GOSUB 710 ELS
E GOSUB 810
560 IF B$="N" THEN GOSUB 810
570 CLS:PRINT@64,"YOUR FOURTH CA
RD IS ";A$(P(4))
580 PRINT:PRINT"YOUR HAND IS NOW
",,,A$(P(1));",";A$(P(2));",";A$
(P(3));" & ";A$(P(4))
590 N=5
600 IF B$="N" OR C$="N" THEN 640
610 PRINT@256,"DO YOU WISH TO BU
Y Y/N":INPUT D$
620 IF D$()"Y" AND D$()"N" THEN
610
630 IF D$="Y" THEN GOSUB 710 ELS
E GOSUB 810
640 IF B$="N" OR C$="N" THEN GOS
UB 810
650 CLS:PRINT@64,"YOUR FIFTH CAR
D IS ";A$(P(N))
660 PRINT:PRINT"YOUR HAND IS NOW
 ":PRINT:PRINTA$(P(1));",";A$(P(
2));",";A$(P(3));",";A$(P(4));"
& ";A$(P(5)):PRINT:PRINT"YOU HAV
E A FIVE CARD TRICK!":GOTO 1610
700 REM BUYING ROUTINE
710 PRINT@256,"YOU HAVE ";(M-S);
" POUNDS":PRINT:INPUT"HOW MUCH D
O YOU WISH TO BUY FOR";S(N)
720 IF (S+S(N))>M THEN 710
730 S=S+S(N)
740 GOSUB 1010
750 RETURN
800 REM TWISTING ROUTINE
810 PRINT@256,"DO YOU WANT TO TW
IST Y/N"
820 PRINT:INPUT E$
830 IF E$()"Y" AND E$()"N" THEN
810
840 IF E$="Y" GOSUB 1010 ELSE 13
10
850 RETURN
900 REM CHECK LIMIT FOR STICKING
```

```
910 PRINT@256,"YOU HAVE LESS THA
N 16!","YOU MUST TWIST":PRINT:FO
R Z=1 TO 1000:NEXT Z:GOTO 810
1000 REM PLAYERS CARD SELECTION
1010 P(N)=RND(13)
1020 IF P(N)<10 THEN 1030 ELSE 1
040
1030 IF B(P(N))=4 THEN 1010 ELSE
 1050
1040 IF C(P(N)-9)=4 THEN 1010 EL
SE 1050
1050 IF P(N)<10 THEN B(P(N))=B(P
(N))+1 ELSE C(P(N)-9)=C(P(N)-9)+
1
1060 IF P(1)=1 AND P(2)>=10 THEN
 1210
1070  IF P(1)>=10 AND P(2)=1 THE
N 1210
1080 IF P(N)>9 THEN 1110
1090 IF P(N)<10 AND P(N)>1 THEN
1120
1100 IF P(N)=1 THEN 1130
1110 Q1=Q1+10:Q2=Q2+10:GOTO 1150

1120 Q1=Q1+P(N):Q2=Q2+P(N):GOTO
1150
1130 IF (Q1+11)<22 THEN Q1=Q1+11
 ELSE Q1=Q2+11
1140 IF (Q1+11)<22 THEN Q2=Q1+1
ELSE Q2=Q2+1
1150 IF Q2>21 THEN 1860
1160 IF Q1>21 THEN Q1=Q2
1170 FOR Z=1 TO 1000:NEXT Z
1180 RETURN
1200 REM PONTOON ROUTINE
1210 CLS:PRINT@64,"YOUR SECOND C
ARD IS ";A$(P(2)):PRINT:PRINT"YO
UR HAND IS NOW ";A$(P(1));" & ";
A$(P(2)):PRINT:PRINT"YOU HAVE PO
NTOON!!!"
1220 FOR Z=1 TO 2000:NEXT Z
1230 R=1:GOSUB 2010
1240 R=2:GOSUB 2010
1250 PRINT:PRINT"MY CARDS ARE ";
A$(D(1));" & ";A$(D(2)):PRINT:PR
INT"YOU HAVE WON!!!":FOR Z=1 TO
2000:NEXT Z:GOTO 1910
1260 PRINT:PRINT"MY CARDS ARE ";
A$(D(1));" & ";A$(D(2)):PRINT:PR
INT"I HAVE PONTOON!!!":PRINT:PRI
NT"I HAVE WON!!!":FOR Z=1 TO 200
0:NEXT Z:GOTO 1920
1300 REM DEALER'S HAND FOR 5 CAR
D TRICK
1310 IF Q1<16 THEN 910
1320 IF Q1>21 AND Q2<16 THEN 910
1330 FOR Z=1 TO 2000:NEXT Z
1340 CLS:R=1:GOSUB 2010
1350 R=2:GOSUB 2010
1360 PRINT@64,"MY CARDS ARE ";A$
(D(1));" & ";A$(D(2)):GOSUB 1410

1370 FOR Z=1 TO 2000:NEXT Z:CLS:
PRINT@64,"MY THIRD CARD IS ";A$(
D(3)):PRINT:PRINT"MY HAND IS NOW
 ":PRINT:PRINTA$(D(1));",";A$(D(
2));" & ";A$(D(3)):GOSUB 1410
1380 FOR Z=1 TO 2000:NEXT Z:CLS:
PRINT@64,"MY FOURTH CARD IS ";A$
(D(4)):PRINT:PRINT"MY HAND IS NO
W ":PRINT:PRINTA$(D(1));",";A$(D
(2));",";A$(D(3));" & ";A$(D(4))
:GOSUB 1410
1390 FOR Z=1 TO 2000:NEXT Z:CLS:
PRINT@64,"MY FIFTH CARD IS ";A$(
D(5)):PRINT:PRINT"MY HAND IS NOW
 ":PRINT:PRINTA$(D(1));",";A$(D(
2));",";A$(D(3));",";A$(D(4));"
& ";A$(D(5)):PRINT:PRINT"I HAVE
A FIVE CARD TRICK!!!":PRINT:PRIN
T"I HAVE WON!!!"
1395 FOR Z=1 TO 2000:NEXT Z:GOTO
 1920
1400 REM CHECK DEALER'S HAND
1410 IF E1<17 THEN 1530
1420 IF E1>19 THEN 1470
1430 IF E1=17 THEN X=RND(3)
1440 IF E1=18 THEN X=RND(2)
1450 IF E1=19 THEN X=RND(3)-1
1460 IF X>1 THEN 1530
1470 PRINT:PRINT"I WILL STICK"
1480 IF Q1>21 THEN Q1=Q2
1490 IF E1>21 THEN E1=E2
1500 IF E1>=Q1 THEN 1510 ELSE 15
20
1510 PRINT:PRINT"I HAVE";E1;". Y
OU HAVE";Q1:PRINT:PRINT"I HAVE W
ON!!!":FOR Z=1 TO 2000:NEXT Z:GO
TO 1920
1520 PRINT:PRINT"I HAVE";E1;". Y
OU HAVE";Q1:PRINT:PRINT"YOU HAVE
 WON!!!":FOR Z=1 TO 2000:NEXT Z:
GOTO 1910
1530 PRINT:PRINT"I WILL TWIST":R
=R+1:GOSUB 2010
1540 RETURN
1600 REM DEALER'S HAND
1610 FOR Z=1 TO 2000:NEXT Z
1620 R=1:GOSUB 2010
1630 R=2:GOSUB 2010
1640 PRINT@256,"MY CARDS ARE "A$
(D(1));" & ";A$(D(2)):PRINT:PRIN
T"I WILL TWIST":R=3:GOSUB 2010
1650 FOR Z=1 TO 2000:NEXT Z:PRIN
T@256,"MY THIRD CARD IS ";A$(D(3
)):PRINT:PRINT"MY HAND IS NOW ":
PRINT:PRINTA$(D(1));",";A$(D(2))
;" & ";A$(D(3)):PRINT:PRINT"I WI
LL TWIST":R=4:GOSUB 2010
1660 FOR Z=1 TO 2000:NEXT Z:PRIN
T@256,"MY FOURTH CARD IS ";A$(D(
4)):PRINT:PRINT"MY HAND IS NOW "
:PRINT:PRINTA$(D(1));",";A$(D(2)
);",";A$(D(3));" & ";A$(D(4)):PR
INT:PRINT"I WILL TWIST":R=5:GOSU
B 2010
1670 FOR Z=1 TO 2000:NEXT Z:PRIN
T@256,"MY FIFTH CARD IS "A$(D(5)
):PRINT:PRINT"MY HAND IS NOW ":P
RINT:PRINTA$(D(1));",";A$(D(2));
",";A$(D(3));",";A$(D(4));" & ";
A$(D(5)):PRINT:PRINT"I HAVE A FI
VE CARD TRICK!!!"
1680 IF E2<Q2 THEN 1690
1690 PRINT:PRINT"YOU HAVE WON!!!
":FOR Z=1 TO 2000:NEXT Z:GOTO 19
10
1700 PRINT:PRINT"I HAVE WON!!!":
FOR Z=1 TO 2000:NEXT Z:GOTO 1920

1800 REM DEALER BUST
1810 FOR Z=1 TO 2000:NEXT Z
1820 PRINT@192,"MY NEXT CARD IS
";A$(D(R)):PRINT:PRINT"I HAVE BU
ST!!!":PRINT:PRINT"YOU HAVE WON!
!!":FOR Z=1 TO 2000:NEXT Z:GOTO
19101850 REM PLAYER BUST
1860 FOR Z=1 TO 500:NEXT Z
1870 PRINT@192,"":PRINT@224,"YOU
R NEXT CARD IS ";A$(P(N)):PRINT:
PRINT"YOU HAVE BUST!!!":PRINT:PR
INT"I HAVE WON!!!":FOR Z=1 TO 20
00:NEXT Z:GOTO 1920
1900 REM CHECK MONEY LEFT
1910 M=M+S:GOTO 1930
1920 M=M-S:GOTO 1930
1930 IFM<=0THEN1960
1940 IF M>=10000 THEN 1970
1950 CLS:PRINT@262,"I WILL DEAL
AGAIN":FOR Z=1 TO 2000:NEXT Z:GO
TO 350
1960 CLS:PRINT"YOU ARE BROKE!!!"
:PRINT:PRINT"GO & GET SOME MORE
```

SOFT RELEASE

Spectrum

3D Tanx is certainly for military hawks. This game for the Spectrum includes some unusual features. You sit at the controls of a mighty field gun, with armoured shields each side of the barrel. The aim may be adjusted in any direction.

The enemy, in the shape of a series of hostile tanks, trundles across a bridge ahead, and it is up to you to return their fire as effectively as possible.

Despite the "3-D" title, the tanks only move in a line from left to right in front of you, but some illusion of depth is given by the changing perspective of the gun barrel as you alter its elevation.

The setting-up procedure offers a range of skill levels, and the choice of unlimited or fationed ammunition, and I was pleased to see that the player can select the keys which will be used for the game.

The omission of a high score feature was disappointing, however, and tended to make the game seem a little aimless (no pun intended) after a while.

3D Tanx will probably appeal if you like precision shooting, but it becomes repetitious and rather too easy.

Spectrum (16K)
3D TANX. £4.95
D'k tronics, 23 Sussex Road,
Foreston,
Great Yarmouth, Norfolk.

Centipede

Centipede is virtually a direct replica of the well-known arcade game in which a fast-moving, multi-sectioned monster winds its way down the screen. When it meets a mushroom, it reverses direction, dropping a line and speeding up. Meanwhile, the player blasts away with a missile gun, shooting the loathsome beast into smaller chunks, while trying to avoid a mysterious bug which zig-zags across the bottom of the screen.

You can move left or right as usual, and the facility of moving the missile base up the lower quarter of the screen is very useful at times.

This version of an old favourite is quite accomplished and well presented. The main drawbacks are the rather slow firing rate at some stages of the game and the fixed choice of keys used for playing.

However, it holds the player's interest well, and with practice, the skilful can progress to controlling the centipede's path by shooting out strategic mushrooms.

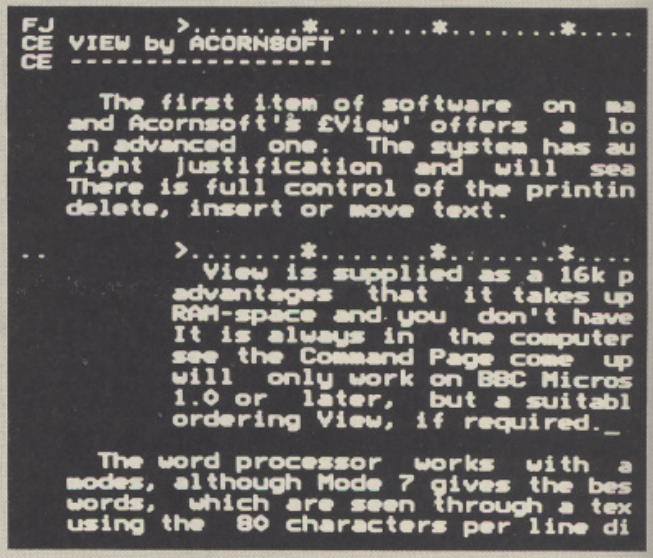
Spectrum (16K)
CENTIPEDE. £4.95
D'k tronics, 23 Sussex Road,
Goreston, Great Yarmouth, Norfolk.

BBC micro

View and Wordwise (word processors in ROM - plug-in Read Only Memory)

It is now possible to buy a variety of text processors for the BBC Micro, which range from simple string-handling programs to fully-fledged word processors.

The most advanced programs available so far are Acornsoft's **View** and **Wordwise** from Computer Concepts, both of which need operating system 1.0 or greater as they come in the form of plug-in ROMs.



Acornsoft's View, a ROM word processor.

View works in any screen mode, i.e. 20, 40 or 80 characters per line, and offers very fast SAVEing and LOADing with discs, but has the disadvantage that text files must be saved before they can be printed — a lengthy process indeed when using a cassette filing system.

Wordwise is a little slower when filing on disc but it does permit immediate printout, making it the winner with cassettes.

The method of filing adopted means that Basic programs which have been *SPOOLed from the machine may be read into *Wordwise* as text files, and modified using full on-screen editing and the search and replace functions.

Wordwise normally operates in the Teletext 40 character per line mode, but it is possible to preview short files in the 80 character Mode 3 before printing, to see the final format. The program is menu-driven, which makes it easy for beginners to use, and control codes can be embedded anywhere within the text to change the printing style.

View comes complete with an upgrade operating system is required, while Computer Concepts have been given a supply of 1.2 ROMs by Acorn, which they will have to sell for about £7.50.

Neither wordprocessor will access external files to produce standard letters, nor will they handle documents longer than the space available in RAM, i.e. an average of 4000 words, and we will have to wait for a system that deals with filing automatically as the computer's memory fills up.

Being plug-in ROMs, both *View* and *Wordwise* can be resident in the machine without taking up any memory until they are called up by typing *VIEW or *WORDWISE.

The BBC Micro will eventually be able to handle up to 16 of these 'paged'

```
CASH!!!":FOR Z=1 TO 2000:NEXT Z:
END
1970 CLS:PRINT"I AM BROKE!!!":PR
INT:PRINT"GO PLAY SOMETHING ELSE
 WHILE I":PRINT:PRINT"FIND MORE
CASH!!!":FOR Z=1 TO 2000:NEXT Z:
END
2000 REM DEALER'S CARD ROUTINE
2010 D(R)=RND(13)
2020 IF D(R)<10 THEN 2030 ELSE 2
040
2030 IF B(D(R))=4 THEN 2010 ELSE
 2050
2040 IF C(D(R)-9)=4 THEN 2010 EL
SE 2050
2050 IF D(R)<10 THEN B(D(R))=B(D
```

```
(R))+1 ELSE C(D(R)-9)=C(D(R)-9)+
1
2060 IF D(1)=1 AND D(2)=10 THEN
 1260
2070 IF D(1)=10 AND D(2)=1 THEN
 1260
2080 IF D(R)>9 THEN 2110
2090 IF D(R)<10 AND D(R)>1 THEN
2120
2100 IF D(R)=1 THEN 2130
2110 E1=E1+10:E2=E2+10:GOTO 2150

2120 E1=E1+D(R):E2=E2+D(R):GOTO
2150
2130 IF (E1+11)<22 THEN E1=E1+11
 ELSE E1=E2+11
```

```
2140 IF (E1+11)<22 THEN E2=E1+1
ELSE E2=E2+1
2150 IF E2>21 THEN 1810
2160 IF E1>21 THEN E1=E2
2170 FOR Z=1 TO 500:NEXT Z
2180 RETURN
2200 PRINT@32,"****************
****************";
2210 PRINT@480,"****************
****************";
2220 FOR X=32 TO 448 STEP 32
2230 PRINT@X,"*";:PRINT@X+31,"*"
;
2240 NEXT X
2250 RETURN
```

```
Words-1227  Characters free-17408 I
EP PLGG LMS
DR Wordwise Example Document
DF CE Page  pp

LL 1.  INTRODUCTION

jO ti6 This example document consists
mainly of parts of the WORDWISE manual,
which was produced totally on WORDWISE.
 It is assumed that the manual has
already been read through and the reader
 is, at least, slightly familiar with
the general structure of this word
processor.

 ti6 It is intended that the user play
around with this text and experiment
with the various commands that are
littered throughout.  Remember when
previewing the formatted text with Menu
option 7, pressing CTRL and SHIFT
together will stop the screen scrolling.
```

Computer Concepts' rival chip Wordwise.

ROMs, although only four sockets are available inside the machine so far, and of these, two are likely to be taken up by Basic and the disc operating system.

Hopefully, someone will make an add-on board to allow the full 16 ROMs to be installed, especially as there are currently plans for a 'calc'-style spreadsheet, a graphics package, machine code aids, printer routines and the LISP and FORTH languages in ROM.

Future releaes on casette will include a touch-typing tutor, more spreadsheets and graphics aids and high-resolution screen-dumps for printers. People will soon be able to create their own 'Viewdata' systems with a teletext editor, and software will be available via Ceefax and Prestel when the corresponding adaptors are released by Acorn.

There will soon be several databases on disc and some business software is on its way for disc users from Acornsoft, including a Sales Ledger, Payroll and Stock Control but rumour has it that these may not be seen until later in the year and that their release will coincide with the appearance of a business system for the BBC machine.



Although there is now a lot in the pipeline, the BBC Micro has got off to a very sluggish start in generating software. In fact it goes against all the trends recently observed in the U.S. where software tends to sell micros, rather than the other way round. Witness the case of thousands of Apple II's being bought to run Visicalc!

By a combination of good design and being seen on television, the BBC computer has managed to sell well, despite the lack of good software to go with it. There are certainly no innovative programs for the machine as yet, and BBC fans who have waited months for their micros to be delivered will have to be patient a while longer if they crave anything really interesting to run on them.

VIC-20

Alien Blitz

It is a trip back in time, a faithful reproduction of the original *Space Invaders* arcade game, with no frills (and precious few thrills); a return to the days when aliens advanced meekly down the screen, but never broke ranks, never peeled off in random attacks, never gave vent to any sound except a mechanical humming beat.

You control a laser base at the bottom of the screen, firing upwards at five ranks of aliens, who travers the screen, advancing one row downwards at the end of each traverse and shooting as they come.

You avoid their missiles by moving your laser to right and left, and by sheltering behind the blockhouses that provide some defence, but are eroded by the shots of either side. Your score proceeds by zapping an alient, with the highest scores gained by hitting the bleeping UFO that crosses the top of the screen at random intervals. Three laser bases in a turn are offered with an extra base at 1000 points.

Perhaps one shouldn't criticise Audiogenic for the concept and action of the game, since they are merely reproducing the very first arcade game but it is bound to seem limited compared to today's offerings. This is compounded by their realisation of the game which is unimaginative and limited.

Only two colours are used; white symbols on a bue background. Surely each row of aliens could have been differentiated; or new colours used for each wave of attacks? The use of sound is equally unspectacular, every alien and UFO at whatever stage of the game disappears to the same feeble bleep. Would it have been so hard to have used a range of sound effects?

Effort has been put into some areas needlessly, while there are inconsistencies and shortcomings in others. Ten levels of play are provided, but the difference between them is infinitesimal, and five would be sufficient. Yet the method of selecting play level is fiddly and error prone. Why is a new laser base awarded at 1000 points, but not subsequently? Couldn't the highest score of the session be displayed?

The documentation preserves the standards already established. It is skimpy and somewhat flavoured with errors. There are no instructions on loading the game from cassette — very necessary for the new user trying out his first cassette game.

Scores are given for each of the four rows of aliens, but there are five rows on the screen: Worst of all, there is no warning or explanation of the demonstration game. If 10 seconds elapses without a game being started, a silent, uninterruptible demo game is enacted. The effect on the player is, to put it mildly, bemusing!

Alien Blitz is a disappointing, overpriced experience. It creates the impression that the unexpanded VIC-20 puts a straight jacket on the games developer. Thank goodness there are software houses like Rabbit who consistently prove that this is not the case and that flair and imagination is possible in 5K.

Alien Blitz from Audiogenic (£7.95 inc. VAT) is a machine code game supplied on cassette for the unexpanded VIC-20.

Chess Game

This cassette is nicely presented with the program recorded twice on both sides in case of loading difficulties. However, my copy has loaded successfully every time. Audiogenics have also thoughtfully removed the tabs at the back of the cassette so that your favourite nephew cannot accidently record over the program while trying to load it.

Once loaded the screen displays a very clear chessboard and pieces. Initially you are white, though hitting the stop key changes your side to black. If you play several games in a row you alternate colours automatically.

In addition to the chess board, the screen displays two clocks, one for your moves and the other for the

THE VIC-20 TOP TWENTY

Position Dec '82	Position Jan '83	Software Title	Code
(1)	1	Introduction To Basic I	(P)
(2)	2	Introduction To Basic II	(P)
(5)	3	Hoppit	(G)
(3)	4	Blitz	(G)
(4)	5	Sargon II Chess	(A)
(6)	6	Adventureland	(A)
(37)	7	Gorf	(G)
(13)	8	Engine Shed	(C)
(12)	9	Omega Race	(G)
(15)	10	Mission Impossible	(A)
(7)	11	Strategic Advance	(A)
(28)	12	Appletree and Birds	(C)
(9)	13	Avenger	(G)
(8)	14	Star Battle	(G)
(19)	15	Vic Money Manager	(B)
(10)	16	Jelly Monsters	(G)
(14)	17	Vic Road User	(H)
(-)	18	Gortek & The Microchips	(P)
(22)	19	Mastermind	(H)
(41)	20	Robert Carrier's Menu Planner	(H)

Code: A = *Adult* P = Programming H = Home Package B = Business Package C = Child Education G = Games

computer's. The level of play is also shown (there are 10 levels, zero to nine) and you can change this at any time by keying 'S' and the required level number.

When the program is loaded it is set at level 1. The display also shows how many half-moves ahead the Boss is considering. Finally the screen shows how many moves both players have made.

All the above information is displayed in a clear and uncluttered way, which goes to show what can be done on a screen of restricted character width.

You enter your moves using the usual algebraic notation, e g E2E4. If the move is illegal it doesn't happen! Otherwise your move is displayed on the screen (as E2-E4 for the above example) and your piece is moved. An arrow whizzes up and down the screen to indicate that the Boss is thinking about the next move. When the Boss moves the appropriate algebraic notation is displayed. When a king is in check a '+' sign is displayed after the notation.

Check mate is announced by the word MATT appearing in place of the notation. (MATT because the program is of German origin).

Clear instructions for using the program are printed on a card accompanying the cassette. The only feature that is missing is the ability to set up a position for analysis.

When I first loaded Boss I sat down confidently to give it a thrashing. Ten moves later I had lost! After five more lost games in as many minutes I was rather shaken. I swallowed a black coffee and my pride, then switched to level zero.

This time the games lasted longer but I still lost. However there was light at the end of the tunnel. After a few more games at level zero I managed to win.

Mulling over my games with the Boss I realised that the Boss is unforgiving, never letting you get away with a mistake. My human opponents, out of respect for my play, would suspect a trap rather than a mistake on my part. I gradually started to evolve a strategy to beat the Boss. I have now won several games at level one. My next challenge is level two (where the Boss spends all of 15 secs thinking about the next move).

I think that I have begun to understand the Boss and its style. My conclusion is that it is a sucker for sacrifices. Whereas I normally am a defensive player who waits for his opponent to make a mistake I now attack the Boss aggressively. By diverting the Boss with sacrifices, I rely on pushing ever onward for a quick 'matt'.

It's altered my style of play, (my wife says my personality as well) but I've had lots of fun and a better challenge than from my nephew.

The Boss costs £14.95 inc VAT from Audiogenic.

Great Britain Ltd

I am sure that to a great extent, the popularity of computer games is fostered by the inherent megalomania of most of the players. Simon Hessel has recognized this characteristic and exploits it in **Great Britain Ltd.**

The game aims to take you out of your mundane existence as a submarine captain or spaceship pilot and put you in the hot seat of No. 10 Downing Street.

It is a complex and challenging game; indeed, if you share my tendency to armchair punditry I would advise you to practise the game in private before atempting to show off your political skills.

Running the country is a lot harder than it looks. After doing to the country in five minutes what most governments could not manage in 10 years — and all with the family chortling over my shoulder — I know I'll never again be able to win a political argument at home.

After waiting for the program to load — and it is quite a wait — you are requested to enter your name and which of the four main political parties you wish to represent.

After sorting out who you are the computer tells you the current state of the nation, the most important figures being inflation, unemployment, the exchange rate, the country's current account balance and the vital popularity rating.

After a further briefing in the shape of an index-linked "shopping basket" you actually get your hands on the levers of economic policy. Successive categories of taxation and benefits are displayed in a clear and colourful format, and any of these may be altered as you think fit.

Having completed the bread and butter of your annual budget you have the option of risking a few hundred million on the possibility of a social reform being recognised.

These reforms are a real gamble since there is no guarantee of a return on investment, but the potential electoral benefits are extremely tempting.

When your policy is fully shaped, the computer calculates the effect over the next year, amid a burst of mechanical noises and flashing messages. The less successful you are, the more you will hear from the news media, who keep right up to date with civil unrest and party rebellions.

The new state of the country is now displayed, and the effect of your policies revealed. The game continues until a general election must be held.

Verisimilitude is maintained with an opportunity to boost your popularity by lying as effectively as possible in your manifesto, and the nerve-wracking process of "Election Night" commences.

The game scores heavily over its competitors in the sheer number of variables it takes into account. It is about as complex as such a program can be on a home computer, but is still a game rather than a serious simulation.

Providing this is born in mind, *Great Britain Ltd* is an absorbing and thought-provoking game which exercises the mind rather than the fingers, yet without becoming dry and academic.

Since it can be listed (on my BBC version at least), it is also possible to examine the programming techniques and algorithms involved.

Excellent value for money.

Game: GREAT BRITAIN LTD.
Supplier: SIMON W. HESSEL SOFTWARE.
Computer: ZX SPECTRUM 48K, BBC MICRO 32K, ZX81 16K.
Price: £5.95 including V.A.T.

Business

Information Management Systems

It may come as a surprise, but the micro software industry has a problem. It's not the potential size of the market — that's expected to exceed £3 billion before 1985; nor is it the potential applications — there are already well over 5000 different packages available.

The problem is in becoming, and remaining, one of the elite group of two or three separate packages that always emerge to dominate any one application area.

For example, word processing on a general purpose business micro, is dominated by *WordStar, Spell Binder,* and *PeachText,* probably in that order. During the last year, however, *Spell Binder* has become increasingly popular, and has closed the gap between it and *WordStar* quite considerably.

The rewards for the elite few are extensive; the remainder will list only as "also rans".

Other examples of this market polarisation can be seen in the domination of spreadsheet analysis by *VisiCalc, SuperCalc* and *PlannerCalc;* the domination of data management systems by Compsoft's *DMS,* and the American *dBase II* and *FMS80;* and

SYSRES

A PROGRAMMER'S AID PACKAGE FOR THE COMMODORE

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accounting systems by Jarman, Pedmede and Tabs systems.

The initial problem for each designer is how to get ahead and then stay ahead of his rivals; but this is compounded by the inevitable levelling effect of continuous improvement.

As any two products get better and better, so do the effective differences between them get fewer and fewer. Each designer is then forced to look for new and original approaches that might, for a while at least, maintain a general competitive edge over his rivals.

One obvious method is to improve the user interface, and, in fact, a growing tendency towards this is already discernible.

The new version of *VisiCalc*, for example, has considerably extended "help files"; while Jim Taylor, Ashton Tate's senior product manager in charge of *dBase II*, has recently confirmed to us that imminent new versions of *dBase II* will also carry improvements in this area.

Even Gary Kildall, the author of that most unfriendly of all unfriendly operating systems, *CP/M*, has recently released version 3.0 (*CP/M Plus*), designed to "simplify the user interface of the operating system" and including "a help facility to explain operating system commands and how to use them".

There will come a time, however, when even this latest trend will cease to be effective, and further solutions will be needed.

But perhaps the beginnings of the next approach are already visible, and referred to by some designers as "fourth generation" software; that is, integrated business systems. The whole concept can be neatly described by the persistent rumour of just such a development of MicroPro.

MicroPro's current products include *WordStar, Datastar, CalcStar, SpellStar* and *Formgen;* each one of which is compatible with the others. The rumour is that of the development of a new package, which will perhaps be called **Starburst** and be released in the new year.

Starburst will basically provide a main menu controlling all the other systems. In other words, entry to *WordStar* or *CalcStar, DataStar* or *Formgen,* will be all controlled as menu options from within *Starburst.*

Although this concept is new, the UK software house Graham-Dorian Software Systems has already become first off the mark with the ***GDSS Information Management System.***

GDSS is the UK's main supplier for the *FMS80* file management package, which is undoubtedly one of the more powerful systems of its kind currently available. In fact, the power and versatility of *FMS80* enables it to be the organising software behind the whole IMS concept.

Two main features make this possible: the FMS programming language, and the ability to produce user menus from within the system. IMS provides a master menu from which any one of 15 options (including entry into a complete integrated accounting system as well as several major sub-levels of FMS itself) may be selected.

Graham-Dorian's IMS is supplied on a series of four discs. Each disc contains one or more of the different subsystems (each of which is a major stand-alone application in its own right)that can be accessed from the master menu.

Thus, where *FMS80* is used as the systems disc in one drive, the second drive should contain discs 2, 3 or 4 depending on whether Business Management, Business Accounting, or Word Processing is required.

Further Business Planning software is supplied on the same disc as *FMS80,* and comprises MicroPro's *CalcStar,* and *Plan80* from Business Planning Systems Inc.

The word processing software is MicroPro's *WordStar* together with *MailMerge* and *SpellStar* for automated proof-reading, while the Business Accounting is Graham-Dorian's own Integrated Accounts System.

Management

The last group of software, *Business Management* is a project management and time scheduling program from Organic Software; *Microstat,* a library of statistical programs from Ecosoft Inc; and *Personal Datebook,* a time scheduling program from Digital Marketing.

The basic concept is that the user may enter any one of these packages directly from the IMS master menu, which is itself initially invoked by typing FMS MENU MASTER at the keyboard, and then be returned automatically to the menu for reselection as soon as use of that option has been completed.

The system reviewed was supplied by Graham-Dorian on a Sirius 1 with a Small Systems Engineering Z80 card installed.

ACT (Sirius) was quick to point out that there is already plenty of alternative 16-bit software available, including the rival *dBase II* and their own newly launched *Pulsar* accounting systems, that can take full advantage of the 16-bit processor within the Sirius.

Everything in the GDSS IMS except *FMS80* itself, however, is also available in 16-bit format, and by the time this article is printed, we can expect the whole system, including *FMS80,* to be available directly on the 16-bit Sirius.

Win £20 worth of software

The *Which Micro?* team have often thought that there was a need for a more comprehensive software list. Thinking about the problem we found that we could not come up with an all inclusive listing.

There are simply too many programs and too many computers. Our contributors could compile a list for their own computers, they could not compile one that would include, with any degree of accuracy, any of the others.

After giving the problem a lot of thought we think we have come up with the solution. We would like you to tell us about your favourite programs.

With this in mind we have printed a coupon below. Please fill it in and send it off to us. If you want to tell us about more than one program write it all down on a separate piece of paper.

The first five names out of the bag each month will get software vouchers worth £20.

And if you feel that the program warrants more comment than we have left space for why not write us a short review (about 200 to 250 words). If the review is published in Soft Release we will pay you our normal freelance rates.

When we have collated enough information we will publish a list of the programs and the ratings that you have sent in. The list will be updated each month.

We want to hear from YOU so please drop us a line. You never know but your next program could come courtesy of *Which Micro?*

NAME .....

ADDRESS .....

.....

NAME OF PROGRAM .....

TYPE OF PROGRAM .....

FOR THE ..... COMPUTER. SIZE OF PROGRAM .....K

PUBLISHED BY .....

HOW MUCH DID YOU PAY FOR IT? .....

Please mark each section on a scale of 1 to 10.

Quality of program instructions?

Does the program make good use of your computers facilities? (Graphics, Sound etc).

Does the program hold your attention?

How does the program rate against others of the same type?

Was it easy to learn and use?

Is the program well packaged?

Do you consider it good value for money?

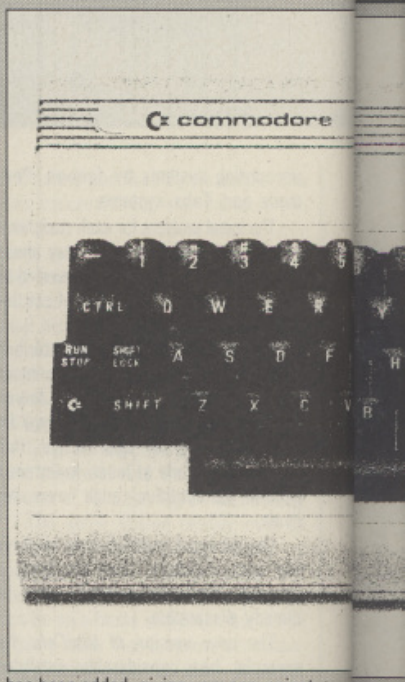
Overall Mark.

Any other comments .....

.....

.....

SYSRES For COMMODORE



Commodore users will probably say they have heard it all before – but nothing like this claims Barry Miles

We have come a long way from the days when Renumberers in BASIC were being sold for over £50.00, and it was even possible for a Basic Renumberer to sell in America, which left you to change the GOTO's, GOSUB's and RUN's yourself manually, and for its author to claim in print in a magazine that this had positive advantages!

Nowadays, we take for granted the existence of what have become known as "Toolkit" functions, although, interestingly enough, there are new machines coming out without these facilities, and even the very user-friendly COMAL language for the Commodore machines contains minimal help of the Renumber, Delete, and Automatic numberer variety.

Commodore enthusiasts will have lost count of the programming aids available, and indeed may be inclined to produce a large yawn at the thought of yet another. However, this one is different!

Sysres is entirely for the benefit of the programmer — it contains no run-time modules offering such conveniences as PRINT USING, which is a facility of some other packages, notably "Commando".

Also, unusually nowadays, the package is not available on an EPROM for plugging into the already overcrowded spare sockets in the machine.

What you get is a simple Master diskette, from which you prepare up to three Boot diskettes which are uncopiable, and cannot be used for any other files, because of the unusual way in which they are formatted.

This approach to security is very handy, because, as Solidus say, the provision of three Boot disks should cover all usual accidents, and yet this method gives them some protection against piracy.

The Boot disk offers a menu so that you can choose where the program is to load, and it is even possible to load part or all of the program into RAM if you have it at $9000 (perhaps in the form of Instant Rom). This facility gives you a way of reducing memory usage.

And there are no peculiarities about the programs written with the aid of this package, so they are fully transportable.

The manual, and the advertising (which contains much knocking-copy aimed at "Power"), suggest that over 1000 new functions are added to Basic.

Sceptics will not take this seriously, and in fact one soon discovers that this is a function of the wide range of choices available in the FIND and CHANGE commands.

It seems a pity to overstate the case like this, because the simple fact is that this package needs no such hype. It has been painstakingly put together by a programmer determined to reduce the work involved in programming to an absolute and enjoyable minimum.

The package abounds in carefully-thought-out facilities, which enrich the programmer's range of possible ways of operating.

The loose-leaf manual is written in technical style, and has been designed to be a complete reference-work, section by section, so that the reader will find many parts repeated. This does no harm at all, because speed of reference is increased, since every command is fully dealt with. The number of features is impossible to examine fully in an article of this length, but I will do my best.

Sysres enables you to edit text files as if they were BASIC programs, and to save and load them to and from disk at will. The program provides auto-repeat functions, and these operate at different speeds according to whether the keys are cursor-control keys or other: the former repeat after 1/3 of a second, and then repeat rapidly.

Others repeat after ¾ of a second, and then repeat at half speed.

The listing of a program may be scrolled up and down, which is very convenient for editing, and this function is available from within the Machine Language Monitor, which is useful for examining a Basic program whilst staying in the Monitor environment.

You may produce a printed copy of the screen's contents at any time, by holding down both Shift Keys, and pressing OFF/RVS.

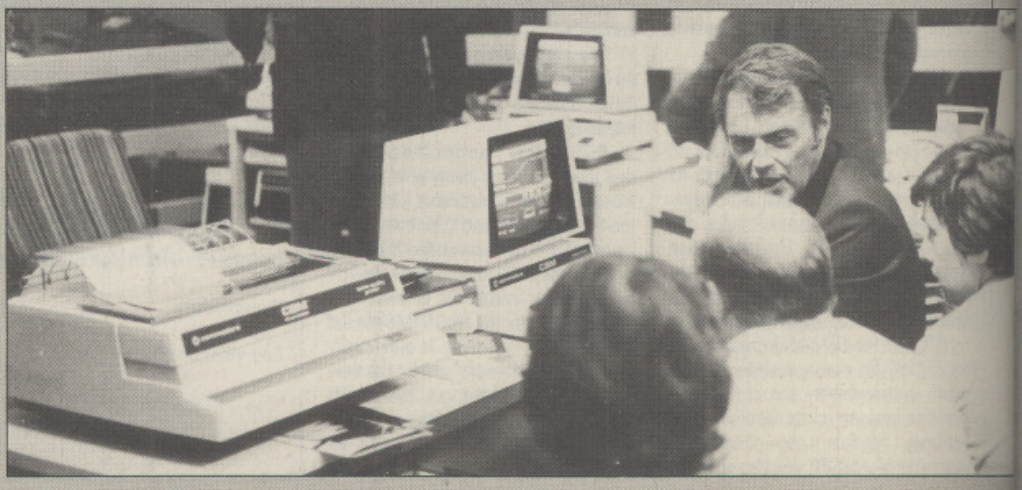
An enhanced Dos support system has been added, giving very convenient access to the disk, the @, !, left arrow, and > keys, may be used, interchangeably, and commands have been improved and added.

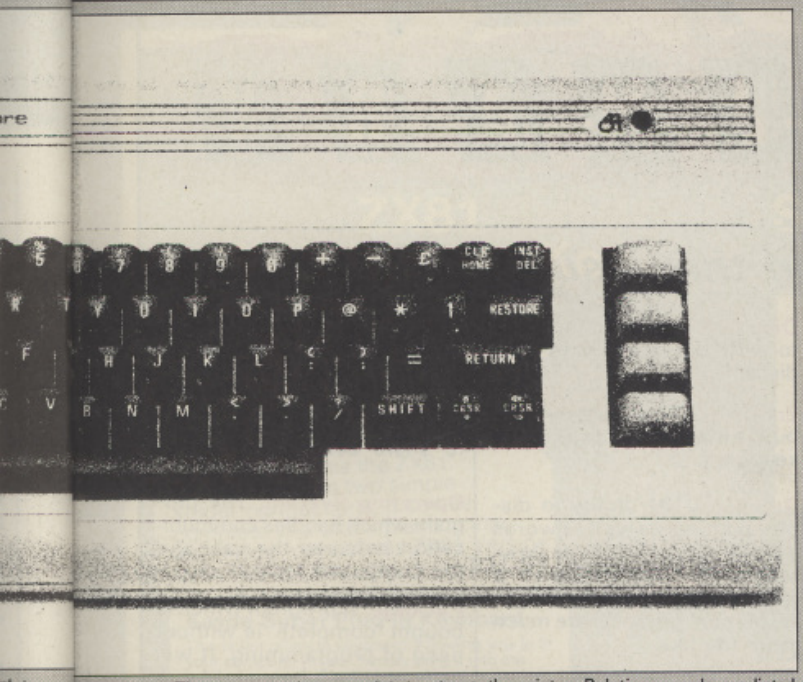
Thus "@U" resets the disk drive, and "@I" lista a disk file, without disturbing the program resident in the machine at the time.

When programs are being listed to the printer, a small range of set-up commands enables you to use CBM or ASCII printers, and the ASCII printer does its best to overcome its deficiencies: it prints text in lower case, and Keywords in upper; it overstrikes the zero with a slash to distinguish it from the letter "O", and also over-strikes systems to represent special characters in the CBM character set.

Shifted unrepresented letters, like CBM graphics, are printed with the unshifted characters, underlined. Listings are also printed in pages, 60 lines to the page, and then skipping 6 lines, although these parameters, like many others, are changeable at your option.

You may also specify a formatted listing, in which case each command is listed on a different line, FOR NEXT loops are indented, and line numbers are right-justified.





The program is powerful in the FINDING and CHANGING, facilities provided. The extra options not found in any other system make this particularly pleasant to use. The ability to find strings or keywords occurring only at the beginning or end of lines of Basic, and to display only if found in the command area, but neither in data statements nor quotes nor in rems, are helpful indeed. The use of "wild cards" is search strings is also attractive.

One of two imaginative features of the package is the way the need to type file names when doing file manipulations has been eliminated. The commands all work directly from the directory display, and you do not need to remove the information or numbers of blocks and file type before getting the results you need.

The needs of copying have been particularly well met, in that a very simple set of four key strokes against the directory display will arrange for the file to be copied from its existing drive onto the one specified.

In order to copy many files, you will want to take advantage of the facility to Set Keys, of which more later. Those who have more than one disk unit will regret that the facility to copy between units is not available with this command.

Multiple scratching is equally easily accomplished. However, you may also appreciate the fact that the disk drive will buffer one copy command, so that speed is aided.

Really serious manipulation of files requires that you take advantage of many of the special functions of Sysres. Thus you will want to load the directory as a program, then renumber the "program" in steps of 1, thus enabling you to scroll up and down the list of files, scratching and copying the files at very high speed.

Listing of Sequential and Relative files is easily accomplished, with the list being sent either to the screen or to the printer. Relative records are listed field by field, and Record numbers are displayed.

The Renumber command takes four parameters, so that blocks may be selectively renumbered, and therefore moved. This aids neat program development, and is very attractive for the tidy-minded programmer who always wants to start Subroutines at a recognisable place, and would like to put the original program in chronological order, and then move code around to optimise speed.

Remarks and spaces can all be removed by judicious use of the Change command, which offers the chance of removing the remainder of a line after finding the string specified. Thus if you always put your Remarks on separate lines, or at the end of lines, there is no problem in speeding up the run-time version of your program.

The Disk Unit Device number may be changed by a single command. Append and Merge functions are both provided. Breaking to the Machine Language Monitor is achieved without the incrementation of the Stack pointer, each time the Monitor is accesed, and the Monitor is properly initialised so that an accidental "g" instruction is not disastrous. The "Old" command does an "Un-new".

The EXEC command is one of the most interesting to use. It permits the machine to follow a set of instructions from a Sequential file, as if they are being typed into the keyboard. The possible uses for this are legion, but some obvious ones are: to enter program generated lines; to set up "Key" functions, including multiple line ones i.e. Instant Subroutines; and to preset variables to desired values.

In addition, you may use a file to supply input to a program when debugging, and the manual helpfully explains how you may get around the problem of encountering the "GET" command. Users would appreciate many more illustrations of how this command might be put to good use.

The Trace provided is a very sophisticated one. The screen displays the current operation and the previous five. In addition the new values of variables being set by LET statements may be shown, as may the starting variables for loops.

However, the display is not cluttered-up by commands which are usually of minor interest, e.g. GET, READ, INPUT and NEXT, although this can easily be accomplished by reassignment of the variable concerned.

Tracing takes place at a variable speed, and may be held off and reinstated at will. Finally it can be sent to your printer! Clever design extends to this feature, and in that when variables are being traced to the printer, they are flagged by means of the ">" symbol, for easy identification.

The KEY command is very versatile, especially if used in a labour-saving fashion, by using the EXEC command to do the work for you. Any shifted key may be set to represent any Basic or SYSRES keyword, and up to 15 may be defined as a string of up to 255 characters.

The commands can come onto the screen in full or in the normal abbreviated form, and all keys have a default function if not changed. The manual is extremely helpful in describing the limitations of this function, and also shows how to get the best out of it.

In particular, I found the ability to set up strings containing SYSRES functions to be a real advantage. Debugging applications would include setting keys to provide standard input to answer INPUT commands in the program.

The thoughtful designer has arranged for inverted commas and Carriage Returns to be represented by shifted "Q" and shifted "Z", thus saving much typing of "CHR$(".

People who like to keep saving their program at frequent intervals will find the example of how to do this with, say, shifted "@" instructions.

It is worth looking at what has been left out, since this is the inevitable question. Firstly, a HEX to Decimal conversion routine would have been welcome, although of course, this, plus any other small routine you may care to mention, can be activated by use of a specially defined KEY.

Similarly, one might have hoped to have been able to DUMP arrays. You can of course write a small amount of code to do this, but that will be peculiar to a particular program, and it is so much more pleasant to be able to do this kind of thing automatically.

LOS 96 Enhanced by SM Software, SM KIT, and PDAS, have shown the way, so it is no longer satisfactory to claim that "It is too difficult", as the designers of the original Toolkit did.

The glaring omission is that there is no spooling facility, to enable programs to be printed out from a disk file, while the computer is being used for some other purpose.

It would be pleasant to make full use of the fact that the disk units have their jown micro-processors, and not having to wait for the printer to stop operation is attractive.

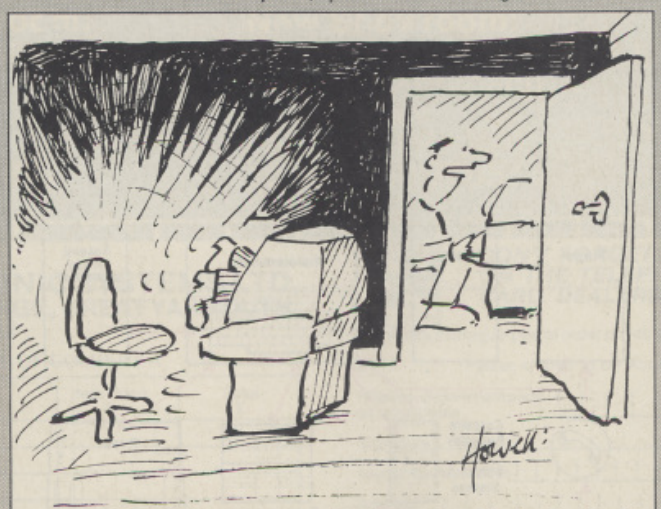
The ommission is all the more surprising because of the great care which has been taken to make the listing facility a good one, and to accommodate a large variety of printers.

Perhaps it is a question of running out of space, since it is desirable for the package to be kept within bounds, especially for users of 16k machines.

A Rapid Reference Guide would also be useful, although the summaries of commands given on various pages in the reference manual lend themselves to such use.

These criticism apart, the package is truly a valuable one, and the attention to detail is of the highest order, as witnesed by the use of special variables for Carriage Return and for Inverted Commas, and the ease of use of the directory-orientated commands.

It is with pleasure that I report that a version for the Commodore 64 is already being prepared which cunningly occupies no RAM area, and it is to be hoped that additional versions will appear for other new machines from Commodore. ■



"I said, don't you think that film Tron *is a bit far-fetched."*

DICTIONARY

Terms used in this issue

Access time: The time taken from the moment of executing an instruction to call for data to the moment when the data has been stored in the appropriate location. (eg. magnetic tape has a longer access time than magnetic disc).

Address: The position in which items of information are stored inside the computer's memory.

Alphanumeric: Letters and numbers mixed.

Applications: These are the things that you can actually do with the help of a computer. Application programs are written to be applied in a particular context: word processing, financial model-ling etc.

Assembler: A conversion program to change assembly language into binary code which can then be read by the computer.

Basic: A high level language (close to written English) used by many micros. The name is an acronym for Beginner's All-purpose Symbolic Instruction Code.

Binary: A numeric system involving two possibilities in which the only digits used are 0 and 1.

Bit: The smallest piece of information in a computer. The word comes from Binary Digit. A bit is therefore either 0 or 1.

Bus: A number of wires that 'bus' (carry) the signal around a computer.

Byte: A group of bits (usually eight in microcomputers) operated as one unit.

Cassette: Same as a music cassette. Stores information as sounds using magnetic tape cassettes.

Chip: A complicated electronic circuit etched on a sliver of silicon. It can be used as the CPU, for the user's program memory, or for the computer's internal instructions.

Compiler: A program which converts instructions from a computer language into machine operations.

CP/M: A Control Program for Microcomputers. The best known and most widely compatible operating system. If a machine has CP/M there is a good chance that a lot of software will be available.

CPU: Central processing unit – the part of a computer which obeys the instructions of a program.

Crash: The result of a hardware or software malfunction usually when a program loses control of the operating system.

Cursor: A (sometimes flashing) blob or line which indicates the point on the screen at which the next character will appear.

Data page: Usually a set of programs which make it easy to handle data in different ways. A substitute for a filing system, so that information can be put in, cross referenced, altered, and got out.

Disc: Similar in looks to a plastic 45 pop record. Information is recorded on to it for later retrieval (other name 'floppy disc').

Disc Drive: A machine used to write on to and read from discs.

End-user: The person who buys a machine and sits at the keyboard.

Graphics: The ability to display pictures as well as words on the VDU. 'Block' or 'low-resolution' graphics give a rather crude picture; 'high-resolution' graphics are much more life-like.

Hard copy: A permanent form of computer joutput usually coming in the form of printout from a printer.

Hardware: The physical parts of a computer system. If you can break it, it's hardware.

I/O or Interface: Input and Output. The way in which a computer 'talks' and listens to equipment connected to it ie. printers, monitors etc. The most common interface is the RS232.

K: An abbreviation of Kilobyte. 1K is 1024 bytes, not 1000.

Machine code: Instructions to the machine reduced to their final binary form so that the circuitry can treat them as switches or gates. All higher level codes have to be translated into this by an interpreter.

Network: Linking several computers together in order to share common facilities.

Operating System: The program which handles communication between the user and the computer.

Package: A program which is bought 'complete' ie without need of programming. It will carry out useful general functions such as word processing.

Program: A set of instructions to the computer sufficient to produce some desired result. There must be a beginning, middle and end.

RAM: Random Access Memory. You can write information on it as well as read from it. It is memory that is available as a blank page.

ROM: Read Only Memory. You can get information or instructions from it but not put any on it. This is like a printed book of information which can be read but not written on.

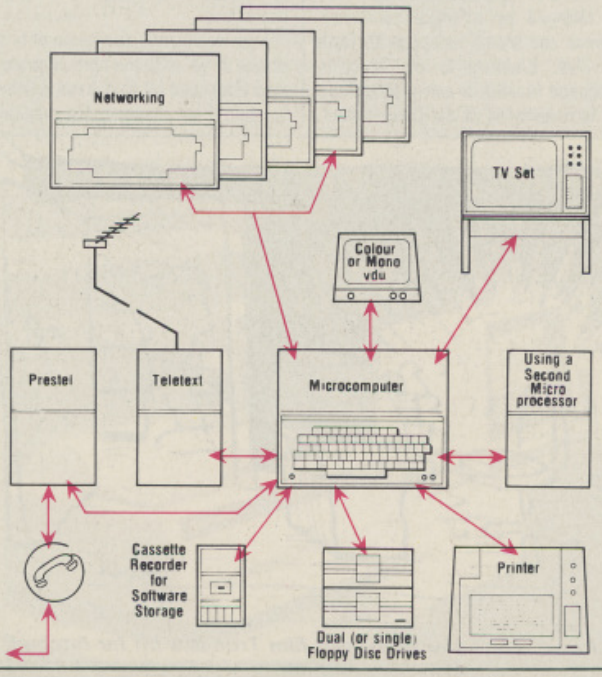
Scroll: A method of moving the display up and off the screen to make room for more text at the bottom.

Software: Programs which control the computer's activity. This is the brain which is placed into the machine's hardware body to make it perform.

VDU: Visual Display Unit; the screen on which you see your dialogue with the computer. An ordinary tv is often used, but a special computer 'monitor' gives a better display.

Winchester: Now a generic term for hard discs. That is discs in a rigid form compared to the usual "floppy disc'. On a Winchester more information can be stored and the time taken to retrieve the said information is faster than using floppies. Winchester was the place that IBM developed these discs and the name became synonymous with hard discs. ■

Ways of Enlarging a Micro System



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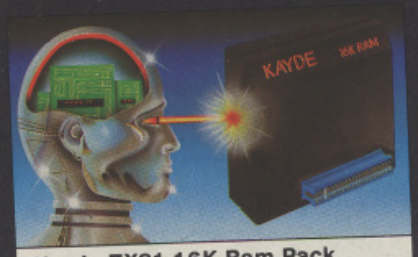
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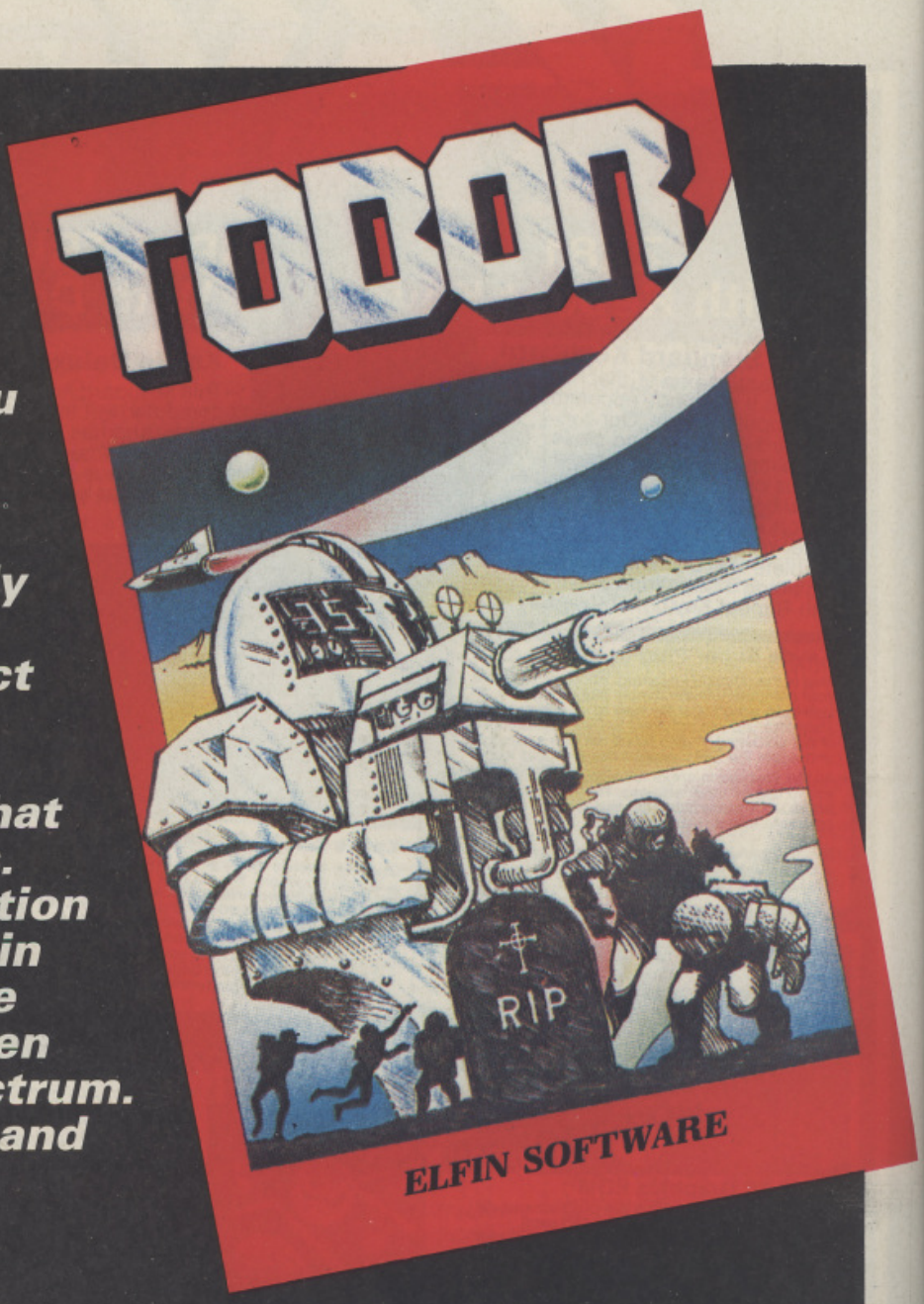
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In your quest for a life somewhere in the universe your ship is damaged and you must repair it.

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Brilliant animation and colour used in this 24K machine code game written for the 48K Spectrum. A really original and addictive game.



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T D I

SAGE COMPUTER TECHNOLOGY®

THE WISE MAN'S CHOICE

THE SAGE family of computers is expanding! Added to the exciting SAGE II is the new SAGE IV. Both machines provide power from the Motorola 68000 chip which is a true 16 bit processor (some even call it 32 bit) and give new levels of performance in personal computers.

With the addition of the new machine SAGE now covers the complete range of business micro-computers. Configurations now extend from memory of 128K to a massive 1 Megabyte, and storage systems from 640K to potentially 200 Megabytes of Winchester disk.

SAGE software is expanding! There is now a choice of four operating systems for the machines. The standard UCSD p-System (complete with Pascal, FORTRAN, and BASIC compilers) is now available in a multi-user form for the SAGE IV which has ports for six users.

For the user who prefers a COBOL environment MPSL now offer the BOS system (CAP Micro-Cobol) together with their large range of multi-user application software. With the implementation of RAMDISK, BOS runs twice as fast on the SAGE as any previous machine, and the list includes some sizeable mini computers!

CPM is available. What more to say except that Digital Research now give their blessing to SAGE with their CPM68K system. This comes complete with a 'C' compiler and will allow UNIX software to be compiled and run under the CPM environment.

SAGE Application software is expanding! Many of the major Apple Pascal system houses have opted for the SAGE as their development machine (remember it goes 14 times as fast as an Apple), and our software directory is getting very large, with a choice of Accounting programs, Modelling programs, Database programs, Project monitoring systems, and a host of software for specialist applications. As we say it's rather hard for anyone developing software to look away from SAGE because it makes other so-called 16 bit computers look pedestrian.

SAGE draws pictures! An interface to the PLUTO graphics system gives superb high speed, high resolution graphics in eight colours.

MicroAPL offer their MIRAGE APL system on SAGE computers, and again the SAGE delivers performance only previously found on mainframe or timesharing systems.



Every SAGE shipped is complete with ONE YEARS ON-SITE SERVICE from GCS Engineering who have over 120 field engineers, so 24 HOUR CALLOUT means just that.

SAGE is affordable! SAGE prices start at under £3000 and a typical 4 user system complete with Winchester disc AND terminals is under £7500.

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Anadex

PRESTEL UNDER ATTACK

Connect your micro to Prestel for £5 a quarter and kiss Micronet goodbye

There was only one star of the Birmingham **Which Computer?** Show – Apple's new Lisa office workstation, (reviewed last month), which draws a desktop on a tv screen, and plays cat and mouse with files, waste-paper bins, pieces of drawing paper and a clock.

It's similar to a high-resolution monochrome Bit-Stik system, and draws graphs and pie-charts without your needing any knowledge of programming languages.

But one other stand made a show impact – with hardly any product to display. That was the infamous Micronet 800 – everyone has heard about it, but who has actually seen it? And who has had their enquiry acknowledged so far?

Can it really be that Micronet's been so overwhelmed by applications to join that there hasn't been time to process the tens of thousands of enquiries? At least that's what they claim.

The Micronet people are offering a moulded plastic coupler, into which you insert your telephone receiver. The coupler plugs into the RS232 or 423 socket in your BBC, TRASH-80 (whoops, sorry . . . TRS-80), Pet, Sirius, or Apple cassette port.

Then you receive computer programs straight off the phone, and straight into your micro. British Telecom started the idea ages ago themselves with their 'Aladdin's Cave' software area of Prestel.

But what had sighs of disbelief and gasps of incredulity ventilating the Micronet stand at the Which Computer? fair was that the black plastic acoustic coupler costs only £49.

Now if you look for an advert from a firm called O E Limited in the micro magazines, you'll see their blast plastic Modem advertised for £135, and 15 per cent VAT on top of that brings the price to £155.25p.

If Micronet are subsidising the cost of your coupler by over 200 per cent, who on earth pays for the cost of building the database – that's the 'information environment': the pages of info and programs which Micronet loads onto the Prestel system?

It's like my saying I want to fly to Majorca for £5, and the travel agency says "Yes, that's fine, my man. Just put down your fiver, and we'll pay for the cost of the ride to the airport, the flight to Palma, the coach to the hotel, three days in the sun, all your food, the journey back to the plane, train back from Gatwick and any other costs and taxes."

And impossible as it sounds, that really did happen back at Christmas '71 . . . and I've a son conceived in Majorca to prove it! But that's another story. Nevertheless this travel agency up at Tottenham was doing that deal – which makes me believe Micronet really are on the level.

The agency, and the Spanish tourist authority, were expecting to make money on the purchases after your cheap flight there, in Majorca and Micronet are expecting their money to

come in from the programs you guy, and the quarterly subscription – £13 – which you'll pay.

But what if you don't pay the subscription, and you don't buy programs either, but simply extract the free telesoftware from Aladdin's Cave?

You'll get locked out of Micronet after three months. Yes, but so what?

Of that £13 quarterly bill, £5 – it turns out – goes direct to British Telecom as your subscription for using Prestel, because Micronet is an area of Prestel. The remaining £8 covers your subscription to Micronet itself: the area of Prestel on nodes 600, 700 and 800.

So after you've joined Micronet, and been give your unique identity number (valid for both Micronet and all the rest of Prestel) and you've been subsidised to the tune of £106.25 you could just pay a quarterly £5 to British Telecom for the use of Prestel pages, and let Micronet itself go hang! Micro owners, am I doing you a favour, or am I doing you a favour!

What Micronet is doing – and British Telecom should have done years ago if they'd had any sense – is to make the Prestel down-the-phone info service accessible to everyone.

What you actually get for your £49 (as an example we took the BBC micro version) is what they grandly call a 'Networking Interface' – or the O E Modem. Also in the box there's a low voltage adaptor, to plug in the mains, and to give 12 or 18 volts out to drive the Modem.

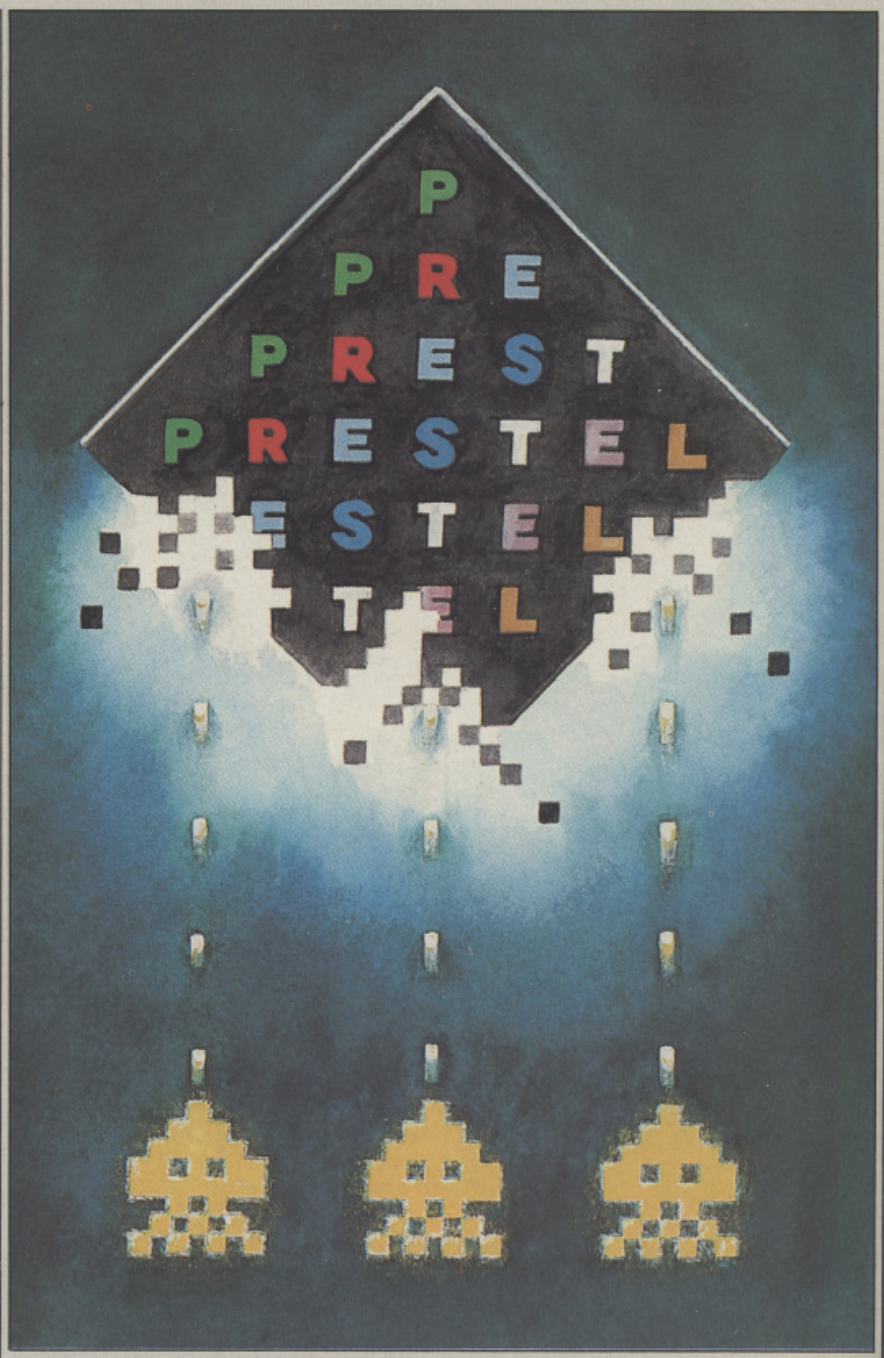
They also give a lead which simply sticks in the RS 423 socket on the back of the Beeb. It's a 'domino' plug, and there seems a fair chance it can be pushed in upside down, leaving you wondering you wondering why there's no signal getting through.

They promise to supply a comprehensive instruction book, too, but there was no sign of it at Birmingham. The rest of the package is a nice wrapper (with a couple of misprints on it!) and a software tape or disc to configure your Beeb's function keys.

The software puts up very useful system messages on your tv which included apologies for phone-line breaks and BBC operating system errors.

The packages for the Pet and Sirius don't appear so friendly. You certainly have to be familiar with your Commodore to know what to do next if things aren't going well, and you have to know what kind of graphics chip you have inside.

Stephen Rabagliati who wrote the software will have to put a little more friendlines into it before it's released. Same with Harry Broomhal's software for the Sirius. Sci-con's software to turn the TRS-80 into a Prestel/Micronet terminal is far kinder, but can they



spell 'occurred'? They cannot.

(And can Apple spell 'stationery' – coming back to the Lisa for a moment? They cannot, either).

So back to our original break-in aims.

Anyone wanting to have a taste of Prestel can now do so for £49 – as long as you've already got a compatible micro, such as a Pet, Apple, Beeb, Sirius, or in a few months' time we're told that we'll be able to use a Sinclair, too.

The business advantages of hooking up to Prestel/Micronet are that you can receive an unlimited amount of electronic mail for no fee at all – anyone sending a Prestel Mailbox message pays only for the phone call while they're typing their message onto the system, and of course it's there waiting when you turn on.

So the electronic mail facility is rather like having a Telex or phone answering machine.

It'll be interesting to see whether it's possible to corrupt the system, and have someone else's electronic mail delivered to your terminal instead. More of this next month ■

Electronic mail on your home micro


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ZX Spectrum
BLUE EDIT
RED CAPS LOCK
MAGENTA TRUE VIDEO
GREEN INV. VIDEO
CYAN
YELLOW
WHITE
GRAPHICS
BLACK DELETE
1 ! DEF FN
2 @ FN
3 # LINE
4 $ OPEN #
5 % CLOSE #
6 & MOVE
7 ' ERASE
8 (POINT
9) CAT
0 _ FORMAT
SIN COS TAN INT RND STR$ CHR$ CODE PEEK TAB
Q <= PLOT ASN
W <> DRAW ACS
E >= REM ATN
R < RUN VERIFY
T > RAND MERGE
Y AND RETURN [
U OR IF]
I AT INPUT IN
O ; POKE OUT
P " PRINT ©
READ RESTORE DATA SGN ABS SQR VAL LEN USR
A STOP NEW ~
S NOT SAVE |
D STEP DIM \
F TO FOR {
G THEN GOTO }
H ↑ GOSUB CIRCLE
J − LOAD VAL $
K + LIST SCREEN $
L = LET ATTR
ENTER
LN EXP LPRINT LLIST BIN IN KEY$ PI
CAPS SHIFT
Z : COPY BEEP
X £ CLEAR INK
C ? CONT PAPER
V / CLS FLASH
B * BORDER BRIGHT
N , NEXT OVER
M . PAUSE INVERSE
SYMBOL SHIFT
BREAK SPACE

Sinclair ZX Spectru

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...

From only £125!



First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power– personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

rum



The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

The transfer rate is 16K bytes per second, with an average access time of 3.5 seconds. And you'll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.





How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard, Access or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

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ZX Spectrum software on cassettes – available now

The Spectrum software library is growing every day. Subjects include games, education, and business/household management. Flight Simulation...Chess...Planetoids...History...Inventions...VU-CALC...VU-3D...Club Record Controller...there is something for everyone. And they all make full use of the Spectrum's colour, sound, and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, and the module will be available in the early part of 1983 for around £30.

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Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS.
Tel: Camberley (0276) 685311.

Sinclair ZX Spectrum–technical data.

Dimensions

Width	233 mm
Depth	144 mm
Height	30 mm

CPU / memory

Z80A microprocessor running at 3.5 MHz. 16K-byte ROM containing BASIC interpreter and operating system.

16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Keyboard

40-moving-key keyboard with full upper and lower case with capitals lock feature. All BASIC words obtained by single keys, plus 16 graphics characters, 22 colour control codes, and 21 user-definable graphics characters. All keys have auto repeat.

Display

Memory-mapped display of 256 pixels x 192 pixels; plus one attributes byte per character square, defining one of eight foreground colours, one of eight background colours, normal or extra brightness and flashing or steady. Screen border colour also settable to one of eight colours. Will drive a PAL UHF colour TV set, or black and white set (which will give a scale of grey), on channel 36.

Sound

Internal loudspeaker can be operated over more than 10 octaves (actually 130 semitones) via basic BEEP command. Jack sockets at the rear of computer allow connections to external amplifier/speaker.

Graphics

Point, line, circle and arc drawing commands in high-resolution graphics.
16 pre-defined graphics characters plus 21 user-definable graphics characters. Also functions to yield character at a given position, attribute at a given position (colours, brightness and flash) and whether a given pixel is set. Text may be written on the screen on 24 lines of 32 characters. Text and graphics may be freely mixed.

Colours

Foreground and background colours, brightness and flashing are set by BASIC INK, PAPER, BRIGHT and FLASH commands. OVER may also be set, which performs an exclusive–or operation to overwrite any printing or plotting that is already on the screen. INVERSE will give inverse video printing. These six commands may be set globally to cover all further PRINT, PLOT, DRAW or CIRCLE commands, or locally within these commands to cover only the results of that command. They may also be set locally to cover text printed by an INPUT statement. Colour-control codes, which may be accessed from the keyboard, may be inserted into text or program listing, and when displayed will override the globally set colours until another control code is encountered. Brightness and flashing codes may be inserted into program or text, similarly. Colour-control codes in a program listing have no effect on its execution. Border colour is set by a BORDER command. The eight colours available are black, blue, red, magenta, green, cyan, yellow and white. All eight colours may be present on the screen at once, with some areas flashing and others steady, and any area may be highlighted extra bright.

Screen

The screen is divided into two sections. The top section – normally the first 22 lines – displays the program listing or the results of program or command execution. The bottom section – normally the last 2 lines – shows the command or program line currently being entered, or the program line currently being edited. It also shows the report messages. Full editing facilities of cursor left, cursor right, insert and delete (with auto-repeat facility) are available over this line. The bottom section will expand to accept a current line of up to 22 lines.

Mathematical operations and functions

Arithmetic operations of +, –, ×, ÷, and raise to a power. Mathematical functions of sine, cosine, tangent and their inverses; natural logs and exponentials; sign function, absolute value function, and integer function; square root function, random number generator, and pi.

Numbers are stored as five bytes of floating point binary – giving a range of $+3\times10^{-39}$ to $+7\times10^{38}$ accurate to $9\frac{1}{2}$ decimal digits.

Binary numbers may be entered directly with the BIN function. =, >, <, >=, <= and <> may be used to compare string or arithmetic values or variables to yield 0 (false) or 1 (true). Logical operators AND, OR and NOT yield boolean results but will accept 0 (false) and any number (true).

User-definable functions are defined using DEF FN, and called using FN. They may take up to 26 numeric and 26 string arguments, and may yield string or numeric results.

There is a full DATA mechanism, using the commands READ, DATA and RESTORE.

A real-time clock is obtainable.

String operations and functions

Strings can be concatenated with +. String variables or values may be compared with =, >, <, >=, <=, <> to give boolean results. String functions are VAL, VAL$, STR$ and LEN. CHR$ and CODE convert numbers to characters and vice versa, using the ASCII code.

A very powerful string slicing mechanism exists, using the form a$ (x TO y).

Variable names

Numeric – any string starting with a letter (upper and lower case are not distinguished between, and spaces are ignored).
String – A$ to Z$.
FOR-NEXT loops – A-Z.
Numeric arrays – A-Z.
String arrays – A$ to Z$.

Simple variables and arrays with the same name are allowed and distinguished between.

Arrays

Arrays may be multi-dimensional, with subscripts starting at 1. String arrays, technically character arrays, may have their last subscript omitted, yielding a string.

Expression evaluator

A full expression evaluator is called during program execution whenever an expression, constant or variable is encountered. This allows the use of expressions as arguments to GOTO, GOSUB, etc.

It also operates on commands allowing the ZX Spectrum to operate as a calculator.

Cassette interface

The ZX Spectrum incorporates an advanced cassette interface. A tone leader is recorded before the information to overcome the automatic recording level fluctuations of some tape recorders, and a Schmitt trigger is used to remove noise on playback.

All saved information is started with a header containing information as to its type, title, length and address information. Program, screens, blocks of memory, string and character arrays may all be saved separately.

Programs, blocks of memory and arrays may be verified after saving to confirm successful saving.

Programs and arrays may be merged from tape to combine them with the existing contents of memory. Where two line numbers or variables names coincide, the old one is overwritten.

Programs may be saved with a line number, where execution will start immediately on loading.

The cassette interface runs at 1500 baud, through two 3.5 mm jack plugs.

Expansion port

This has the full data, address and control busses from the Z80A, and is used to interface to the ZX Printer, the RS232 and NET interfaces and the ZX Microdrives.

IN and OUT commands give the I/O port equivalents of PEEK and POKE.

ZX81 compatibility

ZX81 BASIC is essentially a subset of ZX Spectrum BASIC. The differences are as follows.

FAST and SLOW: the ZX Spectrum operates at the speed of the ZX81 in FAST mode with the steady display of SLOW mode, and does not include these commands.

SCROLL: the ZX Spectrum scrolls automatically, asking the operator "scroll?" every time a screen is filled.

UNPLOT: the ZX Spectrum can unplot a pixel using PLOT OVER, and thus achieves unplot.

Character set: the ZX Spectrum uses the ASCII character set, as opposed to the ZX81 non-standard set.

ZX81 programs may be typed into the ZX Spectrum with very little change, but may of course now be considerably improved. The ZX Spectrum is fully compatible with the ZX Printer, which can now print out a full upper and lower case character set, and the high resolution graphics; using LLIST, LPRINT and COPY. ZX81 software cassettes and the ZX 16K RAM pack will not operate with the ZX Spectrum.

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ZX Spectrum

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Tel: Camberley (0276) 685311.

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We believe that the quality of the software we sell is more important than the quantity that we sell. And since we've been producing top quality microcomputer software since 1978 you can be sure that we can tell the difference between the wheat and the chaff!

Good news for 64 owners. We've got two great arcade games for the 64 with several others almost ready. **TANK ATAK** is a free adaptation of the Battlezone arcade game, but **MANGROVE** is a totally new idea — and a very addictive one at that. Your task is to mastermind the survival of primitive cells in constant danger from malignant microbes; their life is in your hands! These games are written entirely in machine code with colour graphics and sound; they cost just £8 plus VAT each.

BUSICALC is a simple program that could save you hours of calculation and re-calculation, whether you're balancing a household budget or doing forward planning for ICI. It has been described as the poor man's **VISICALC**, but in fact it does one or two very useful things that **VISICALC** won't do. See the review in February's Which Micro, or phone for further details. **BUSICALC** costs £39 plus VAT on tape, £40.50 plus VAT on disk; it's available now for PET (40 or 80 column), VIC-20 (with 16k expansion), and Commodore 64. Also available soon for the BBC 32k.

THE HITCH-HIKER'S GUIDE TO THE GALAXY is an adventure program based on the popular book and TV series. Like all real adventure games it is entirely textual, so if your brain can't handle anything more complicated than Space Invaders you'd better think again. Hundreds of **PET** owners have enjoyed this great game, and now it's also available for the Commodore 64, BBC 32K, and Dragon at a new low price of £12 plus VAT (£13.50 on disk).

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professional software on ATARI computers.

ADVENTURE

The classic game* Adventure *is now available for a selection of different micros. Alfred Rolington looks at some literary myths which have shaped its form.



The true adventurer' – so says W S Porter in *Green Door* – 'goes forth aimless and uncalculating to meet and greet unknown fate'.

To compound his 'error' Porter claimed that the Prodigal Son's return was a fine example of an adventurer. Here is comprehensive proof that neither WSP or the Prodigal really knew what they or adventure is about – 'aimless and uncalculating' certainly won't take you to meet the green serpent or visit the satanic moulten cavern with the hanging words of fire.

No – in the words of the OED an adventurer is 'one who lives by his wits' and if you are contemplating a journey through **Microsoft Adventure** (and we strongly suggest you do) then wits about and beyond are just a snatch short of imperative.

For the uninitiated *Adventure* is the original computer game which started life as a Fortran program at the Massachusetts Institute of Technology. Completed long before Chuck Peddle had sired the micro, *Adventure* was the night game of the legendary West Coast open-sandled programmers and the game bears some of their wood folkness.

Just as the name Homer represents a series of poets so there is no one author of *Adventure*. The final and 'completely unabridged' version which now snuggly fits a 32K micro with a single drive took a number of years to reach its final form or so the mythology tells us.

This final form evokes a 'mind fantasy' in which you are the protagonist. (To anyone who has read *The Hobit* or *The Lord of the Rings* you are Bilbo to the PC's Tolkien – I assure you there are similarities). After the usual welcome and help preamble at the opening juncture proper the screen will explain:

You are standing at the end of a road before a small brick building. Around you is a forest. A small stream flows out of the building and down a gully.

As you can see there are no dramatic screen graphics in the classic adventure models. The whole game just uses words and to play you simply type in pithy phrases (the complete *Adventure* dictionary is surprisingly extensive) at times it appears almost intuitive, reprimanding abuse with a **Watch It!**

The machine responds with lucid descriptions of where you are, what is or is about to happen and in which direction new and old paths head.

The whole has the appearance of a man machine dialogue which fakes the appearance of artificial intelligence and has often been likened to the plot of a novel with you as hero.

So much for the form. The content of Microsoft's game describes three levels of geography, time and space. The first is as I earlier explained – an extensive area above ground where your main task is to find the entrance to the cave. If you fumble about too long the machine interrupts with a terse

Are you looking for the caves? Answer yes or no

Having finally established the caves' whereabouts, found the keys and married them to the entrance you enter the second level of play, the Upper Caves, and begin to explore some of the interesting and mysterious 'rooms'.

Clues, objects and treasure are there to be picked up and found but

A mind fantasy in which you are the hero, villain and adventurer

not without the ever-present harassment from the knife and axe throwing dwarves.

Deeper and deeper into a complex labyrinth of tunnels and caverns until the lower cave levels are encountered.

In total there are 'over 130 rooms, 15 treausres, 40 useful objects and 12 obstacles of varying difficulty', so says the instruction booklet. 'Your goal' it explains 'is to find the cave, explore it completely, locate all the treasures and return them to the building before you run out of lamp light (or get killed)'.

Running out of lamp light or getting killed can become a practised option for the novice but with a strangely captivating doggedness you 'wise-up' and begin to formulate your own mental picture of this dark underworld city.

After a few more excursions you realise that even if cartography has never really been your 'thing' now is not the time for shyness – you need a map. But once you start regularly going deeper you need, it seems, more geography than 'O' level if you are to negotiate the complex of windy little passages.

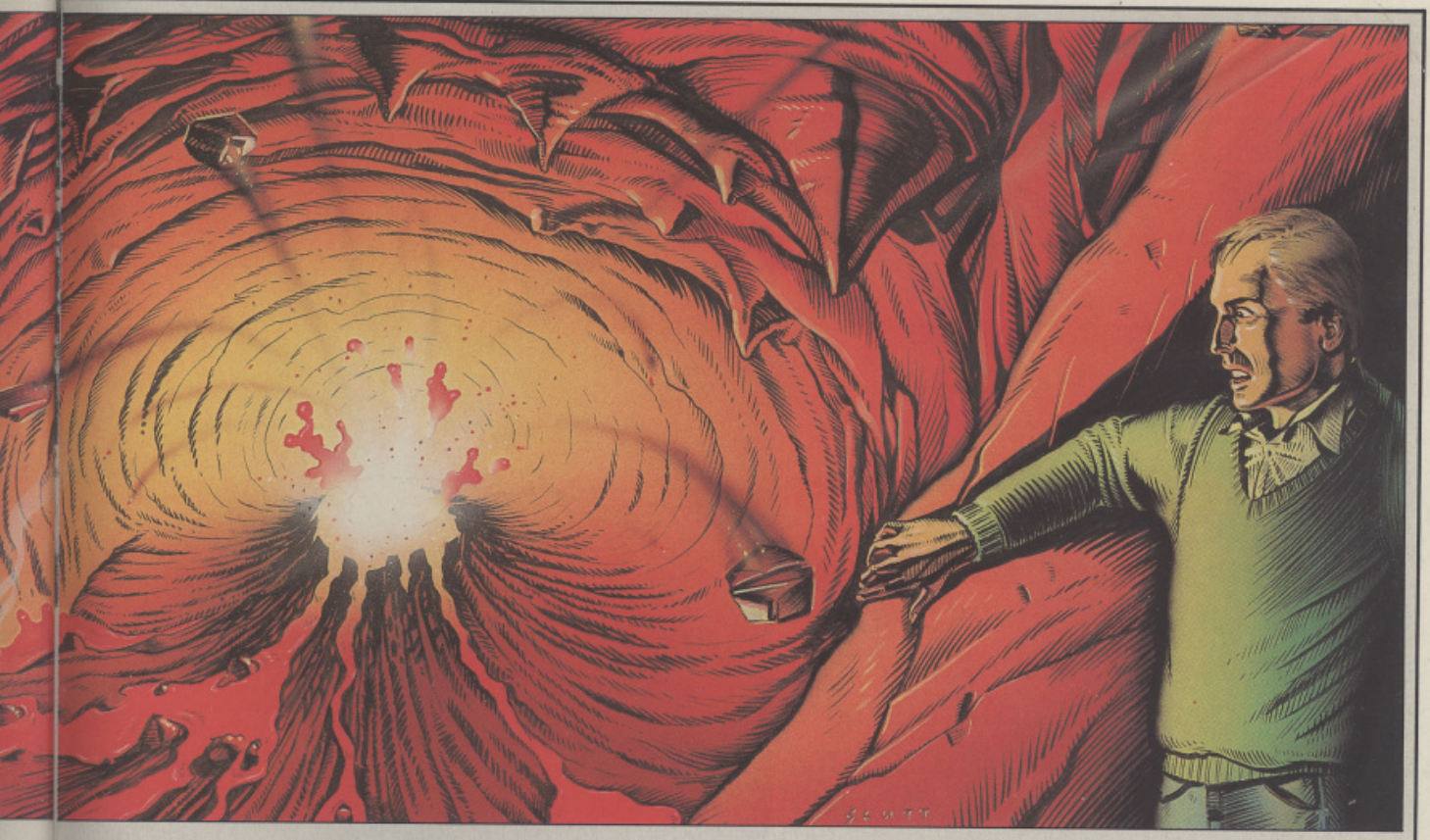
As Tracy Kidder says in his infamous *The Soul* of a *New Machine.*

You are in a maze of twisty little passages, all alike

As the adventure proceeds the obstacles get harder, the descriptions longer and more evocative. A midway point is reached when finally after a diffficult journey up a stalk with an oak tree girth through a series of testing tunnels and a barter deal with a troll you will arrive at:

You are on the edge of a breathtaking view – far below you is an active volcano, from which great gouts of molten lava come surging out, cascading back down into the depths.

the glowing rock fills the farthest section of the cavern with a blood red glare, giving everything an eerie, macabre appearance. The air is filled with flickering sparks of ash and a heavy smell of brimstone. The walls are hot to the



touch, and the thundering of the volcano drowns out all other sounds.

Embedded in the jagged roof far overhead are myriad twisted formations composed of pure white alabaster, which scatter the murky light into sinister apparitions upon the walls.

To one side is a deep gorge filled with a bazarre chaos of tortured rock, which seems to have been crafted by the devil himself. An immense river of fire crashes out from the depths of the volcano, burns its way through the gorge and plummets into a bottomless pit far off to your left.

The instruction booklet wryly states:

"You may want to spend your initial excursions into the cave exploring the area and locating treasures. Then in later visits, figure out how to get the treasures to the surface".

It's the second word *may* that amuses – I would like to quietly ask the copy writer how else he or she expects one to proceed. It took me some days of prolonged and intensive play before the monitor filled with the above 'narration'.

After some weeks of fairly concentrated play with maps and notes of what I believed to be the complete cave area I figured I was ready for the final assault. This means, in the words of the illustrious copy writer, "when you feel you are ready, try to get all the treasures to the surface in a minimum amount of time".

The adrenalin burns and your mental vision narrows to a piercing tunnel of logic. By now you are practised at manipulating the objects of use, discarding the useless and manhandling of magic has become second nature.

But the 'trouble' with *Adventure* is that a randomness still exists and for no apparent reason you can still be killed or robbed.

It was only later that I discovered that this is not completely true, however after a couple of abortive attempts one fine morning around 2am I had located and stashed all the treausre, explored all the requisite caverns and tunnels and done all my magic – I knew I had won and to prove it my score, which for so many weeks would not top the 100, now hit the final 360 points but just as I beamed and quashed a scream the screen went blank and then a new message kicked up:

Cave closing soon. All adventurers exist immediately through main office.

The disc drive hummed and buzzed, the screen again darkened and I was left at the opening to a new and totally unexplored part of the caves.

I won't go on any further but suffice it to say I still have not cracked this final (I presume it's the last) aspect of the game. I cannot claim the coveted Grand Master title but one of these fine mornings . . .

If one were to criticise Microsoft's Adventure the criticisms would hardly be specific to this particular version of *Adventure* (Microsoft's has to be one of the most impressive computer games I have encountered) but would apply to Adventure games in general.

But for all that they are still relevant and so with my tongue stuffed neatly into my cheek . . .

I would want to say that *Adventure,* although likened to the novel is really closer to epic in form. It is male oriented, so much so that nothing female appears in Microsoft's version, and completely action-based allowing no room for contemplation or emotion. It can therefore be said to be a game played on one psychological level. For this reason it is mentally quite strenuous and perhaps finally unrewarding.

Perhaps one of the other interesting aspects about this type of activity is that although I have stressed the single user/machine interrelationship the game can also be entertainingly played by a number of 'adventurers' with one person wielding the keyboard and the rest tossing around suggestions.

It is with this in mind that one friend claims that *Adventure* is the closest thing to a communal activity since playing cards and the old Victorian parlour game – whatever, there is certainly no comparison between it and the current missile alient bombardment of an average video invader.

The thinking man's micro 'book' has arrived with true adventure!

Adventure is available for BBC, Nascom, IBM PC and the Spectrum machines. For the IBM PC it is called Microsoft's. *Adventure* (this is the one we tested) for the other machines it is known as **Colossal Adventure.** It requires 32k of memory and the price starts at £10 depending on machine. ■

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COMPUTER BLUFF

If you have wanted to bluff your way through a conversation about programming take a deep breath. Stephen Castell explains how it's done

In this article we are going to forget computer hardware for the time being (well, almost). Roll up your sleeves, take a deep breath and plunge into the rich, creative world of computer programming: a computer is like a genie – Your Every Wish Is Its Command. Provided, that is, you get your programming language syntax right.

Hold tight as we bluff our way from bootstraps to BASIC . . .

As we explained in the last Chapter, the essence of machine language is that there is a precise hardware operation, part of the design and construction of the computer equipment itself, corresponding exactly to a specific bit-pattern contained in the instruction-code byte of the instruction word: this is the cornerstone on which all higher levels of programming and software (which we are about to describe) are built.

The next level up from machine language is **assembly language**, and this step is a fairly gentle one.

Assembly language instructions consist of simple English-looking mnemonics such as 'ADD' for which there is a direct one-to-one correspondence with machine language bit-pattern instructions. Also, instead of having to specify the address of the number to be ADDed, say, as a bit-pattern, the byte containing the number may be referred to by a *name* (further explanation in a moment).

Thus, a program written in assembly language is effectively like a machine language program 'made legible' to humans.

A key concept in computer programming is that it is possible to write a program (in machine language) to **translate** any assembly language program into its equivalent machine language program.

In other words, this **translation program** carries out a rather special and powerful piece of data processing: it accepts mnemonic instruction names, decimal numbers and other convenient abbreviations which a programmer can remember easily (each character of these, of course, already having been converted into its own **character code**, and stored in individual bytes of memory).

It then carries out the conversion into the monotonous but critical bit-pattern appropriate to the instruction.

Such a translation program is called an **assembler**; thus, we talk of 'an assembler assembling an assembly language program' into its bit-pattern machine language equivalent.

After assembly, the computer can be instructed to *run* the assembled program: this is nothing more nor less than the equivalent of pressing a button which ensures that the next fetch-process-store cycle of the CPU acts upon the first instruction word of our assembled program.

And then off it goes, as we have already described.

For example, using our simple character coding system developed in earlier issues (A is code 1, B is code 2, etc.), the assembly language instruction.

ADD A

which may be interpreted in English semantics as '**add** the number contained in the byte whose address is associated with the name **A** to the contents of the special register in the CPU' would be read into memory before assembly as:

1,4,4,27,1.

The assembler (itself a program, remember) would then be run to process the bytes containing this 'character code' number data in memory and translate them into the correct machine language instruction word (storing it in some other part of memory) which, when subsequently acted on by the fetch-process-store cycle would carry out the required English semantic operation.

We describe the **syntax** of assembly language instructions such as 'ADD A' as being made up of an **operator mnemonic** (the 'ADD' part) followed by an **operand name** (the 'A' part).

Some assembly languages permit more than one operand name to be specified in one go, giving assembly language instructions of increased power. For example, the mnemonic.

ADD A,B,C

might be interpretable in English semantics as '**add** the number contained in the byte whose address is associated with the name **A** to that for the name **B**, and store the result in the byte given by **C**'.

Whatever the type of assembly language, the Computer Bluffer need only remember that the crucial feature is that the operator/ operand(s) syntax structure has a direct counterpart in the instruction-code-byte/ address-byte(s) layout of the assembled instruction word.

Now, a 36-bit instruction word would actually be made up of four '9-bit bytes' (not the 8-bit bytes we have become used to hitherto), so that 'ADD A,B,A', for example, might assemble into:

010111000 000001011 000001101 000001011.

The first 9 bits of this 36-bit instruction word, '010111000', is interpre-



. . . very software



. . . lovely little packages

table by the hardware of PROCESSOR as an instruction to add the contents of the byte in memory whose address is '000001011' (the second 9 bits of the instruction word) to the contents of the byte in memory with address '000001101' (the third 9 bits), and place the result in the byte in memory with address '000001011' (the last 9 bits).

One thing should by now be becoming blindingly clear to the computer Bluffer: whatever **source code** we start off with, whether it be high-level language statements, assembler language mnemonics, alphabetic and numeric characters as data, or whatever, the ultimate machine code always ends up as bindary digits within the memory of the computer.

Thus, each character of source code has an eventual **internal binary representation**. As we have seen, this may, of course, be the result of a complex translation process (particularly when statement / mnemonic / instruction codes are involved), so that no one-to-one correspondence exists between a given character of source code and any part of the total internal bytes of bit-patterns which make up a given program.

In the case of characters and numbers in the source code which are to be treated as **literal data**, however, rather than as part of the statement 'vocabulary' of the language, there is always a direct relationship between the character or number itself in the source code and its internal binary representation.

There are in fact generally just three different **data types** to consider when discussing internal representation of input literal data. These are:

integer: whole numbers, such as 123456, are represented internally by their direct binary number equivalent.



What did you do in the micro-revolution dad?

For example, if the whole decimal number 9 were input it might be stored in a single 8-bit byte set with the bit-pattern: 00001001.

real: decimal numbers, such as 123.456, are usually represented internally in what is known as **mantissa-exponent** format.

Thus, the number 123.456 would be treated as 1.23456×10^2 and two bytes would be used, one to store the **mantissa** 123456 (decimal point assumed after the first digit position), the other to store the **exponent**, or 'power of 10', namely 2.

Of course, both mantissa and exponent, being integers, would be converted direct into their equivalent binary number representation.

Normally, to give maximum capacity for representation of large numbers (of which, indeed, 123456 is an example), both integers, and the individual mantissa and exponent of reals, are stored in a whole 36-bit word, rather than an 8-bit byte.

character: this data type effectively covers everything else which is not an integer, or real, 'pure' number. It thus caters for *all* possible input characters typed in from a standard typewriter keyboard.

A suitable **coding system**, as we have already simply described (e.g. A is code 1, B is code 2, etc.) must be used to convert characters into numbers so that the equivalent binary number representation may be stored in memory.

The next level of computer language hierarchy carries much further the extremely powerful idea of using the computer itself to translate programs from a high level into lower levels.

After people had programmed in assembly language for a number of years, in the early 1950's, they realised that there were a number of characteristic structures which keeps reappearing in program after program, and it became obvious that much tedium could be relieved if 'higher-level' instructions could be designed, each of which could be translated by the computer into a whole stream of appropriate assembly language (and thence machine code) instructions.

Having perceived that this higher-level translation process should indeed be possible (being conceptually no different from the assembly of assembly language instructions into machine code, albeit with much greater complexity), it also seemed like a very good idea to design the syntax and semantics of the collection of allowable instructions.

This would form the new higher-level language to be closer in form and textual legibility to the statement of the problem being programmed as given initially in English,

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or perhaps mathematical, language/ notation.

Of course, there was no bluffing the computer itself – on a machine language level, everything would still be composed of the same old machine code instructions, but that would not be explicitly visibe to the higher-level programmer.

The new languages based on these ideas were called **compiler languages.** In the mid-1950's, successful programs called **compilers** were written whose function was to carry out the translation from compiler languages to machine language.

Unlike the case with assembly language, there is no straightforward one-to-one correspondence between **statements** in a compiler language and machine code instruction. An alternative method of translation from compiler languages into machine language was also invented: instead of compilers, which translated all the statements of a compiler language first and then allowed the machine code to be executed, **interpreters** were written which read one line and executed it immediately.

This has the advantage that a user need not write a complete program to use an interpreter.

It is also possible to stop the program during execution and look at what is going on, and then let program execution continue. This is very useful in fault-finding and correction.

Two coding schemes, both rather more involved and comprehensive than our simple 'A is code 1' example to date, are in common use: ASCII (American Standard Code for Information Interchange) and EBCDIC (Extended Binary Coded Decimal Interchange Code): the Computer Bluffer need not actually worry too much about these coding schemes as such aspects are usually these days totally 'transparent' to the computer user.

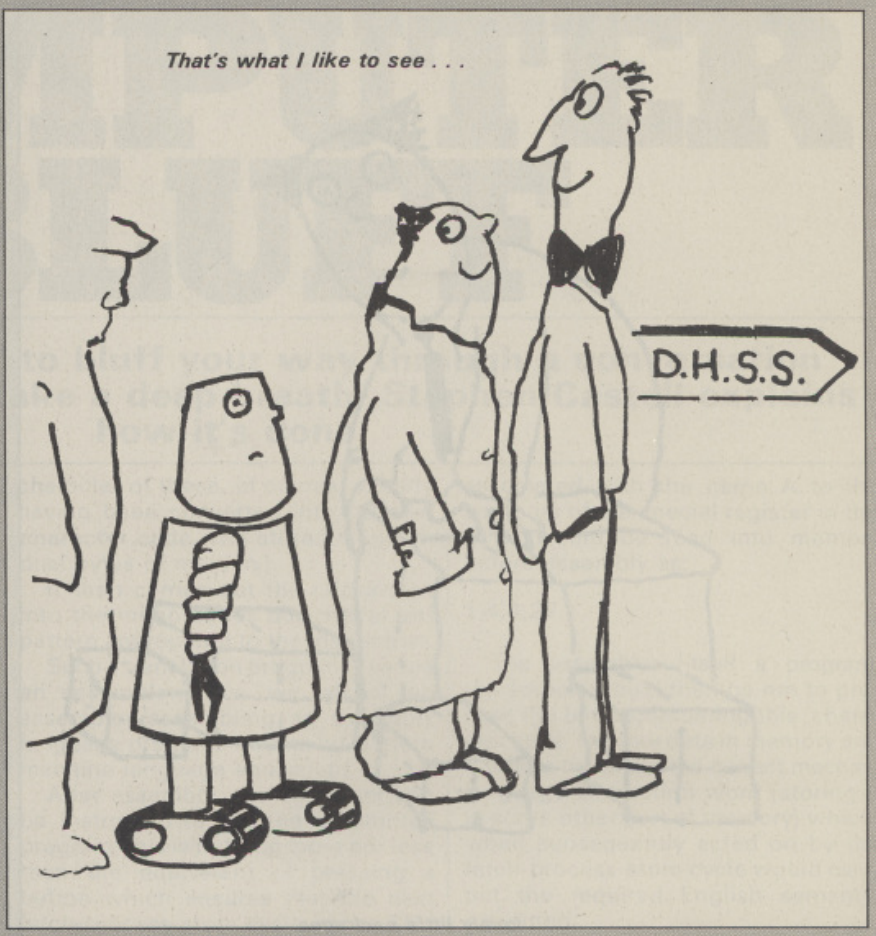
Notice, incidentally, that each individual coded character gives rise to *one byte* of binary data (remember that 'character' and 'byte' are often used synonymously).

Thus, the string of characters 123456 when treated as one whole integer number would fit comfortably into a 36-bit word when internally represented.

However, the string of characters '123456' when treated as 6 individual characters, would take 6 8-bit bytes to store the (e.g. ASCII) codes of each of the six characters '1', '2', '3', '4', '5', '6' separately – that is, 48 bits all together.

There are thus two ways of viewing the characters which also are, or make up, numbers viz; 0-9 and the decimal point (or comma, in many countries); either direct as integer or real numbers, or **literal character data.**

To distinguish the latter case, the string of numbers is usually enclosed between quotation marks on input:



That's what I like to see . . .

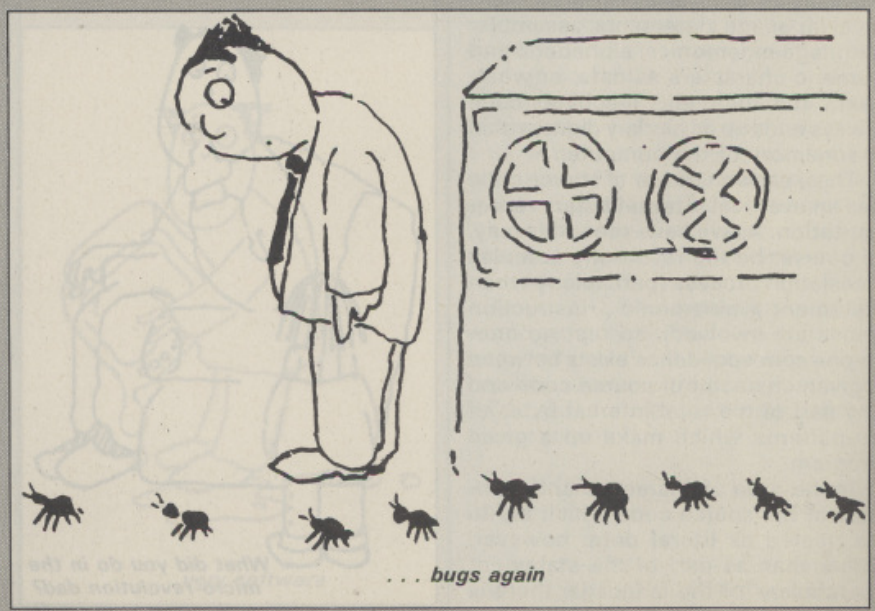
123 (one whole number) is thus distinct from '123' (a string of 3 successive characters) on input to a computer.

In the case of non-numeric characters, a similar, appropriate distinction is made between, for example, ADD and 'ADD' on input.

We have now given a 'bit-level, bottom-up' bluffers' guide to the way in which computer software (i.e. programs) and data 'get into' the hardware and how they are used by the hardware.

The Computer Bluffer can heave something of a sigh of relief at this point. Next month's extract is all about an 'application-level, top-down' approach to *using* computers – professionally, or just for fun, but always *creatively.*

For application programming is the creative breath of life in the inert electronic hardware clay. And we still have the Third, and perhaps Most Important, Very Important Thing To Remember in Computing to reveal – it should come as no surprise to learn that it is the key to good programming design and implementation. Read on joyfully. ■



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USER G

Microcomputer User Groups in alphabetic order by brand of machine or specialised interest

APPLE

Apple Music Synthesis Group, 22 Lennox Gardens, London SW1. Dr D Ellis. This group is interested in the Mountain Hardware, ALF, Soundchaser and Alpha Syntauri systems.
Apple User Group. Mr. J. Johnston, Cardiff. Monthly meetings at the University of Wales, Institute of Science & Technology. Newport 422298.
BASUG – British Apple Systems User Group, P.O. Box 174, Watford, WD2 6NF. Telephone 09273-75093. John Sharp. Apple, ITT 2020, Pear, Basis. Monthly meetings. Hardcore magazine 6 times a year. 1200 members. Subscription £10 plus £2.50 joining fee. Total £12.50. Software library. Medical, education and graphics sub-groups.
BAUD – British Apple System Users, c/o Datalink Micro-Computers, 10 Waring House, Redcliff Hill, Bristol. 0272-213427. Geoff Smythe. Monthly meetings; Datalink newsletter. Subscription free with 100 members £2 for access to software library.
LAUGH – Leicester Apple User Group, 7 Bude Drive, Glenfield, Leicester, LE3 8BA. 0533-875-253. Hazel Brown. Regular meetings. Affiliated to BASUG.

ATARI

Atari Users Club, 63 Alma Road, Windsor, Berks. Mr. D. Bell, Slough 70639, during office hours.
Birmingham Atari User Group, Mr. L. Ellingham. 0785-41153 or 021-233-1488.
Preston Atari Enthusiasts, 177 Forest Drive, Lytham St. Annes, Lancs. 0253-738192. Mr. R. Taylor. Monthly meetings. Membership £5 per annum. Other brands represented.
Silica Atari Users Club, 1-4 The Mews, Hatherley Road, Sidcup, Kent. DA14 4DX. 01-301-1111 or 01-309-1111.
South Middx Atari Club, 50 Linkscroft Avenue, Ashfield, Middx. Mr. B. Milligan. Regular meetings at the Ashford Community Centre. Membership 50p.
UK Atari Computer Owners Club, c/0 Maplin Electronic Supplies, P.O. Box 3, Rayleigh, Essex. 0702 552911/554155.

ATOM

Atom User Group, 18 Frankwell Drive, Potters Green, Coventry, CU2 2FB. Peter Frost. Quarterly newsletter. 2000 members. Subscription £4.00.
Atom User Group, Sheerwater, Yealm View Road, Newton Ferrers, S. Devon PL8 1AN. Mr Meredith. Atom/Proton User Group, 71 Mill Farm Close, Pinner, Middlesex. 01-429 8042. Mr M. Jaffer.
Manchester Atom Users Group, Abraham Moss Centre, Crescent Road, Manchester 8. 061-370 5121 X27, or 061-681 4962 evenings. Mr. J. Ashurst.
Medway Atom Users Group, St. John Fisher School, Ordnance Street, Chatham. 0634-42811. Mr. C. Rutter. Monthly meetings.
National Acorn User Group, 105 Fairhole Avenue, Gidea Park, Romford, Essex. Mr. A. Carr. Monthly program magazine.

BBC

BBC (National) User Group, 40 Mount Pleasant Avenue, Wells, Somerset. 0749-75783. John Craig. Monthly news sheet. Software library being built-up. Workshops to be introduced.
BEEBUG – Independent National User Group, Registered Referral Centre for the BBC project. The Editor, P.O. Box 50, St. Albans, Herts. AL1 1AR. Sheridan Williams. Membership now exceeds 10,000 and still rising. Software library. Membership £4.90 for six months. £8.90 for a year. £1 and SAE for sample.
Bottisham BBC Micro Users Club, 27 Bell Road, Bottisham, Cambridge, CB5 9DF. Mr. P.M. Rank.
Cardiff BBC Micro Club, held twice a month at University College, Newport Road, Cardiff in the Engineering Dept.
Fareham & Portsmouth BBC Group, 23 Sandy Close, Petersfield, Hants. Mr. P. Smith. 0730-4058. Monthly meetings, also referral group.
LASERBUG – independent national BBC User Group, 10 Dawley Ride, Colnbrook, Slough, Berks. SL3 0QH. Paul Barbour. Monthly A4 format magazine – meetings arranged through the magazine. Membership £12. £1 and SAE for sample. Members in 14 countries.
North London BBC Micro Users Group, 73 Uphill Road, Mill Hill, London NW7 4PT 01-959 0114. Mr. J. San.
Norwich and District BBC Micro User Group, Room 12A, Norwich City College, Norwich. 0603-60011 ext 233. Paul Beverley. Subscription £2 p.a. (£1 for students and OAPs).
Preston BBC Micro-computer Group, 8 Briar Grove, Ingol, Preston, Lancs. Mr. D. Coulter. Meetings at Preston Polytechnic. Newsletter. Software Library.

CASIO

Casio FX500P Users Group, 38 Grimsdyke, Gt. Missenden, Bucks, HP16 0LP. Max Francis.
Casio FX702 User Group, 11 Braintree Road, Dunmow, Essex. R. Cooper, Newsletter. Membership £6.50 for six issues.

CHESS COMPUTERS

Chess Computers Owners Club, Vulcan Electronics Ltd., 200 Brent Street, Hendon, London NW4. David Bishop. Membership open to all computer chess players. Regular magazine. Your Move. Opportunity to participate in chess competitions, to acquire a chess grading and entitlement to join the Computer Chess Swap Shop. Additional year's guarantee on chess computers supplied by Vulcan Electronics. Membership free.

COMAL

NCHCC, Polytechnic of North London, Holloway Road, London N7 8DB, Mr. S. Anderson. Meetings twice a month a Community Computer Centre, North London Polytechnic.

COMMODORE

(this includes PET, CBM & VIC)
Commodore Pet User Club, 818 Leigh Road, Slough Industrial Estate, Slough, Berks. 0753-74111.
Independent Commodore Products User Group
Berkshire group, Mr. Brian Jones, Dept of Maths and Computing, Slough College of Higher Education, Wellington Street, Slough, Slough 34585 ext. 81.
Canterbury area. Mr. J. Bickerstaff, 48 Martin Down Lane, Whitstable, Kent. 0227 272702. Monthly meetings at the Physics Laboratory of the University of Kent, Canterbury.
Derby area. Mr. Raymond Davies, 105 Normanton Road, Derby. Derby 514016. Meetings twice a month at the College of Further Education, Normanton Road, Derby.
Durham area. Mr. J. Cocallis, 20 Worcester Road, Newton Hall Estate, Durham. 0385 67045. Meetings at Lawson School, Burtley.
Dyfed area. Mr. Simon Kniveton, Penpompren Hall, Talybont, Dyfed. Talybont 303.
Essex area. Carol Taylor, 101 Courtland Avenue, Cranbrook, Ilford, Essex. 01-554 4236. Meetings to be held at Grande Remedial Centre, Woodman Path, Hainault, Essex.
Glasgow area. Dr. Jim MacBrayne, 27 Paidmyre Crescent, Newton Mearns, Glasgow. 041-639 5696.
Glos/Bristol area. Mrs. Janet Rich, 23 Sheppard Leaze, Wootton-under-Edge, Glos. Wotton-under-Edge 2498. Monthly meetings.
Hampshire. Mr. R. Geere, 109 York Road, Farnborough, Hants.
Herts/Stevenage. Mr. Brian Grainger, Stevenage 27925. Monthly meetings at the Provident Mutual Life Assurance, Purwell Lane, Hitchin, Herts.
Herts/Watford. Mr. Stephen Rabagliati, c/o Institute of Grocery Distribution, Grange Lane, Letchmore Heath, Watford. Monthly meetings at the institute.
Liverpool area. Mr. Tony Bond, 27 Ince Road, Liverpool 23. 051-924-1505. Meetings twice a month at the Merchant Taylor School for Boys, Crosby.
Manchester/Blackpool area. Mr. David Jowett, 197 Victoria Road, East, Thornton-Clevelets, Blackpool. Cleveleys 869108.
Norfolk area. Mr. J. Blair, 7 Beach Road, Cromer, Norfolk. Vic 20. Mr. Peter Petts, Bramley Hale, Wretton, Kings Lynn, Norfolk, PE33 9QS. Stoke Ferry 500692.
Northants group. Mr. Peter Ashby, 215 Lincoln Way, Corby, Northants. Corby 4442.
Northern Ireland. Mr. David Bolton, 19 Carrickburn Road, Carrickfergus, Co. Antrim BT38 7ND.
North London. Mr. Barry Miles, Department of Business Studies, Polytechnic of North London, Holloway Road, London N.7. Pet group of ACC meets every other Tuesday at the Poly.
North Wales area. Mr. John Poole, 6 Ridgeway Close, Connah's Quay, Clwyd, CH5 4LZ.
South-East Region. Wng. Cdr. M. Ryan, 164 Chesterfield Drive, Riverhead, Sevenoaks, Kent. 0732-53536. Meetings twice a month at Charles Darwin School, Jail Lane, Biggin Hill, Kent.
South Midlands. Mr. M.J. Merriman, 12 York Street, Stourport-on-Severn. Meetings on last Thursday of month.
South West Scotland. Mr. John Smith, 19 Brewlands Road, Symington, Kilmarnock, KA1 5RW.
Suffolk area. Mr. A. Morris, 30 Kelso Road, Bury St. Edmunds, Suffolk, Bury St. Edmunds (0284) 61870.
West London. Mr. Geoff Squibb, 108 Teddington Park Road, Teddington, Middlesex. 01-997 2346.
Yorkshire area. Mr. Bob Wood, 13 Bowland Crescent, Ward Green, Barnsley, South Yorkshire. 0246 811585.
Independent Pet Users Group, Robert Mays School, West Street, Odiham. Mr. G.A. Parkin. 025-671-2700.
Pet Users Education Group, Dept. Physiology, Queen Elizabeth College, Camden Hill Road, London W8 7AH. Dr. C. Smith. 01-937-5411 x 429.
Southern Association of Pet Users, 42 Compton Road, Brighton, BN1 5AN. Mr. H.W. Pilgrim. 0273-56.

COMPUCOLOR

Compulcolor 11 Users Group UK, 19 Harwood Avenue, Bromley, Kent. 01-460 2626. Bill Donkin. Quarterly newsletter. Hard and software advice. Software library.

COSMAC

Cosmac Users Group, 54 Runnymede Avenue, Bournemouth, Dorset. BH11 9SE. Mr. P. Hibbs.

CPM

CPM Users Group, 11 Sun Street, Finsbury Square, London EC2M 2PS. 01-247 0691. Ms. Stevenson. All CPM machines. Meetings six times a year. Newsletter six times a year. 750 members. Membership £6. £15 corporate. £50 vendor.

CROMENCO

International Association of Cromenco Users, P.O. Box 17658, Irvine, California, 92713, USA.

DAI

DA Inamic, Heide 98, 3171 Westmeerbank, Belgium.

DIGITAL

DECUS, P.O. Box 53, Reading, Berks. 0734-387725. Debra Brown. Three meetings a year. Regular newsletter. Seminars. Free membership.

DYSLEXIA

Mayfield Dyslexia Computer Group, CFX, Bradley House, Little Trodgers Lane, Mayfield East, East Sussex TN20 6PW. Brother Henry.

EDUCATION

MUSE – MINI AND MICROCOM/

GROUPS

PUTER USERS IN SECONDARY EDUCATION, c/o Five Ways School, Scotland Lane, Bartley Green, Birmingham B32 4BT. 021-476 7669. Mr. R.M. Trigger. Muse insurance for micro-computer equipment. MUS software library and distributed software scheme. MUSE publications. Quarterly magazine. Subscription £9 per year. Over 3000 members.

1800 & 1802

1800 users group of Finland, P.O. Box 559, SF 00101, Helsinki, Finland. Richard Eller.

FORTH

Forth Interest Group. Polytechnic South Bank, Borough Road, London SE1. Contact Mr. K.G. Morrison, 15 St. Albans Mansions, Kensington Court Palace, London W8 5QH. Monthly meetings. Newsletter. £7 p.a.

GENEALOGY

Computers in Genealogy, Society of Genealogy, 37 Harrington Gardens, London SW7 4JX. Mr. A.J. Dramp. Subscription £3 a year.

HEALTH

Primary Health Care Group of the British Computer Society. Cheveley Park, Medical Centre, Belmont, Durham. 0385-64285. Dr. Malcolm. Variety of machines from ZX81, Apple, Pet to Black Boc and RML380Z. Meetings every six weeks. Sub-groups throughout the country. 150 members. £6 subscription.
British Medical Information Foundation working on software development with over 100 doctors using Apples for prescribing.

HP41C & ZX81

Norsk Data Samfunn, Tuengen Alle, Oslo 3, Norway. Chris Solheim. 02-147110.

INTEL

UK Intel MDS Users Group, Space Intelligence, The Old Coach House, Court Row, Upton-Upon-Severn, Worcestershire WR8 0NS. Lewis Hard.

INTERCALC

International Electronic Spreadsheet Users Group— Intercalc, Intercalc UK, Alpha House, 7th Floor, Rowlandsway, Manchester M22 5RG. For everyone interested in Visicalc, Supercalc, Magicalc and other electronic spreadsheets. £15 subscription.

ITHACA & S100

Ithaca Intersystems and S100 BUS Users Group, Seastian, Baverstrasse 20C, 800 Munich 83, West Germany. Beorge Brooke.

MEDICAL

Medical Micro Users Group. c/o Medicom, 14 Broadway, London W.13. 01-579-5845. Mr. P. Dixon.

MENSA

The Home Computing Special Interest Group of British Mensa, 305 Stand Lane, Radcliffe, Manchester M26 9JA. Gordon Grant. Six newsletters a year. £2 subscription. Restricted to members of MENSA.

MK-14

MK-14 User Group. 8 Poolsford Road, London NW9 6HP. 01-200-6209. Mr. G. Philips.

NASCOM

International Nascom Microcomputer Club. c/o Oakfield Corner, Sycamore Road, Amersham, Bucks. HP6 6SU. The Secretary.
Merseyside Nascom Users Group, 14 Hawkeshead Close, Maghull, Liverpool L31 9BT. Mr. T. Searle. Monthly meetings.

990

990 User Group. 21 Thistle Downs, Northway Farm, Tewksbury. 0684-293821 x 310.

9900

9900 Users Group, Dept. of Computer Science, University of Manchester, Manchester M13 9PL.

OHIO

Ohio Scientific UK User Group, 19A West End, Somerset BA16 0LQ. Tom Graves. Newsletter. £5 subscription.

ORIC

Oric Owner Magazine. Tangerine Computer Systems, Cambridge Science Park, Cambridge CB4 4BH.

PASCAL

Pascal User Group. P.O. Box 52, Pinner, HA5 3FE. Mr. N. Hughes. 01-866-3816.
UCSD Pascal User Group. Dicoll Data Systems Ltd., Bond Close, Kingsland Estate, Basingstoke, Hants. RG24 0QB. Mr. J. Ash.
UCSD p-System Users' Society (UK), Oxford University Computing Laboratory, Programming Research Group, 45 Banbury Road, Oxford OX2 6PE. Malcolm Harper, Secretary. The society exists to promote the use of the UCSD p-System and of the UCSD Pascal Language Quarterly newsletter. Software library. Membership £12.50.

PILOT

UK Pilot User Group. Wirral Grammar School, Cross Lane, Bebington, Wirral L63 3AQ. Alec Wood. Pilot is available for a wide range of micro-computers. Full details from this group.

POCKET COMPUTERS

The Pocket Computer Users Club. 13 Sutherland Avenue, Leeds LS8 1BY. Leeds 663433. A Faint. PC-1211, Tandy pocket computer, PC-1500 and Tandy PC-2. Six issues of Output magazine a year. 150 members worldwide. Subscription £5.

POWERTRAIN

Powertrain Users Club. 50 Cromwell Road, Wimbledon, London SW19 8LZ. 01-540 3713.

PROTON ACCELERATION

Epworth House, 25/35 City Road, London EC1Y 2DE. Research & development with 6502-6809 machines including Apple, BBC, Microtran, Pet etc. Newsletter, meetings.

RESEARCH MACHINES (RML)

North East RML-380Z Users Group, Computer Unit, Northumberland Building, Newcastle Polytechnic. 0632-326002. Mr. Hatfield. Monthly meetings. Subscription £5. 30 members.

ROBOTICS

Robotic Study Group. 01-982-7044. Peter Matthews. 30-40 members.

SCIENTIFIC

Comp-80 Scientific Computer Users Group. 50 Cromwell Road, Wimbledon, London SW19 8LZ. Mr. Roberts. 01-540-3713.

6502

6502 Users Club, 16 Bun Yam Close Pirton, Nr. Hitchin, Herts. 0462-18522.
6502 Users Group. 70 Sydney Road, Gosport, Hants. PO12 1PL. 07017 24805. Mr. S.E. Cole. Interest group with information database. 30 members.

6800

68 Micro User Group, 41 Pebworth Road, Harrow HA1 3UD. Mr. J. Anderson. SAE for info.

77/68

77/68 Users Group, Newbury Computing Store, 40 Bartholomew Street, Newbury, Berks. Free membership for first year after you have bought the instruction book/manual. £1.50 afterwards.

SHARP

Humberside Sharp User Group and Microcomputer Society, 39 Humberville Road, Immingham, South Humberside DN40 1AX. Mr. N.J. Bennington. £5 subscription.
International Sharp User Group, 108 Rosemount Place, Aberdeen. 0224 630526. Mr. Graham Knight. Regular magazine. Subscription £3 for life. 3000 members in 44 countries.
MZ-80K User Group. 19 Madingley Road, Cambridge. CB3 0EG. Mr. P. Hendrie. SAE.
Sharp Gamers Group. 29 Buttermere Road, Sheffield, S7 2AX. Mr. N. Williams. Membership £3 a year.
Sharp MZ80K User Group, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE. Mr. J. Seet. 04024 42905.
Sharp MZ-80K User Group. c/o Carisma Computer Consultants, 8 Blackdown Avenue, Waterthorpe, Sheffield S19 6NG. Mr. R. Erdinc. Meetings and newsletter to be arranged. Subscription £10 including free tape of disassembler which will co-reside with any program and free chess tape. 25 members.
Sharp MZ80 Users Club. Computer Centre, Yeovil College, Yeovil, Somerset BA21 4AE. Paul Chappell. Free membership. Meetings, Library, newsletter.
Sharp PC-1211 Users Club, 281 Lidgett Lane, Leeds. LS17 6PD. Mr. J. Dakeyne.

6800

New Address. 63 Millais Road, London E11 4HB. Mr. J. Turner. 01-558 3681.

SORCERER/6800

Shipley College Computer Group. Shipley 59531. Paul Channell.

SORCERER

European Sorcerer Club, 32 Watchyard Lane, Formby, Liverpool L37 3JU. 0704 872137. Mr. Colin Morle. 10 newsletters/magazines a year. Subscription £7.50 UK, £10 European, £15 overseas. 500 members.

TANGERINE

Tangerine Users Group. 16 Iddlesleigh Road, Charminster, Bournemouth, Dorset BH3 7JR. 0202 294394.

2650

Amateur Computer Club 2650. Tyn-Y-Coed, Kilnwood Lane, South Chailey, East Sussex BN8 4AU. 0273 400347. Mr. Roger Hunt. Related data and assistance on 2650.

TEXAS

National TL58/9 Club. Dept of Electronic Engineering, University College, Swansea, S. Wales. Mr. R.M. Murphy. Bi-monthly newsletter. Program exchange. £5 subscription.
TI 99/4 Users Group. 157 Bishopsford Road, Morden, Surrey. Mr. P.M. Dicks.
TI99/4A. TI Home, 157 Bishopford Road, Morden, Surrey.

TRANSDUCER

66 Waterloo Road, Penylan, Cardiff, S. Wales. Mr. D. Stockqueler, special interests robotics, micros and micro hardware.

TRS80

80 UK User Group including Video Genie. 123 Roughwood Drive, Northwood, Kirkby, Merseyside L33 9UG. Mr. N. Ruston. Bi-monthly magazine.
Independent TRS80 User Group. 17 Langbank Avenue, Rise Bank, Nottingham NG5 5BU. Mr. Costello.
Mid Kent TRS-80 Users Club. Kent Micro Services, 55 High Street, Maidstone, Kent. Mr. Marriott.
National TRS-80 Users Group. 40A High Street, Stony Stratford, Milton Keynes, 0908 566660/564271. Mr. Brian Pain. Regular newsletter. Subgroups throughout the country. Workshops also held around the UK. Software libraries. Newsletter.
Barrow-in-Furness. Mr. Jack Lowther, 131 South Row, Roose, Barrow-in-Furness, Cumbria, 0229 34953. Home 0229 26214 Work.
Belfast. Mr. Jim Erskine, 94 Trossach Drive, Upper Malone, Belfast BT10 0HU. Belfast 626626 Home. Belfast 48259 Work.

USER GROUPS

Birmingham. Mr. Mike Gibbons, 1 New Street, Castle Bromwich, Birmingham. 021-747 2260.
Blandford Forum. Os House, Blandford Computers, Higher Shaftesbury Road, Dorset. 0258 53737.
Bridgend. Mr. Peter Chapman, 36 Park Court Road, Bridgend, Mid Glam. 0656 3484.
Brighton. Mr. John Bedford, 198 Rose Walk, Goring-by-Sea, West Sussex.
Bristol. Mr. Roger Bampkin, 19 Wood Street, Eastville, Bristol.
Chelmsford. Mr. R. Hamlett, Pine Lodge, Debden Lane, Loughton, Essex.
Colchester. Mr. Roy Smith, 8 Mallard Close, Laver-de-la-Haye, Colchester, Essex.
Derby. Mr. John Kidd. Derby 766590. Business Sub Group. Mr. Brian Pain. 0908 564271.
Edinburgh. Mr. Ted Gladstone. 031 661 4558.
Fareham – Hants. Mr. Brian Shepherd, Security Centre, 203 West Street, Fareham, Hants. Fareham 289114.
Glasgow. Mr. Jim Macpherson, Uddineston 813717 or 812797.
Gloucester. Mr. John Christie, 10 The Pramleys, Longhope, Gloucester GL17 0QP. 0452 830141 Evenings.
Haywards Heath. Mr. Mike Molloy, 6 The Copse, Haywards Heath, Sussex. 01-799 8844.
Hull. Mr. John Lawrence, Hull 497150 Day. Hull 493856 Evening.
Isle of Wight. Mr. M. Collins, 3 Altcroft Gardens, Ventnor, I.O.W. 85 2008.
Leeds. Mr. John Jowitt, 39 King Edward Crescent, Horsforth, Leeds. 0532 581734.
London – North. Mr. John Wellsman, 292 Caledonian Road, London N.1. 01-608 0157.
London – S.W. Mr. Ron Everitt, 2A Longdown Lane North, Ewell, Surrey. 01-394 2123.
London – West and Medical Subgroup. Dr. Nick Robinson, The Residencies, Northwick Park Hospital, Watford Road, Harrow, Middlesex HA1 3UJ. 01-864 5311.
Manchester. Mr. Francis Glenister, 13 Pridmouth Road, Withington, Manchester M20 9GN. 061 445 7191.
Market Harborough. Mr. Neil Griffiths. Market Harborough 65718 Work.
Medway. Mr. Alan Reid, 22 Woodleys Road, Rainham, Kent. Medway 367012.
Merseyside. Microcomputer Group. Mr. Peter Toothill. 051 9227260 Work. 051 2209733 Home.
Middlesex. Educational Sub-group. Mr. D. Futcher, Beaconsfield First and Middle School, Beaconsfield Road, Southall, Middlesex. 01-574 3506 School. 01-743 5310 Home.
Midlands East. Mr. Brian Chiplin, 33 Hurst Croft, Chilwell, Notts NG9 5DE. 0602 252015.
North West Group. Mr. Melvyn Franklin, 40 Comlees, Westhoughton, Bolton BL5 3EG.
Nuneaton. Mr. Fred Challoner, 40 Whoberley Avenue, Coventry CV5 8BP.
Oxfordshire. Mr. Steve Bird, 139 The Moors, Kidlington, Oxford OX5 2AF. 05675 6703.
Rochdale. Mr. Melvyn Palmer, 28 Rooley Moor Road, Rochdale, Lancs. 0706 54681.
Southampton. Mr. Ron Watson, 136 Ringwood Road, Totton, Southampton. 0703 866239.
Swindon. Mr. Bob Sparling, The Ridgeway, 51 Station Road, Chiseldon, Nr. Swindon, Wilts. SN4 0FW.
Wirral. Mr. M. Keegan, 205 Holmlands Drive, Oxton, Birkenhead, Merseyside L43 0US. 051 608 7262.
York. Mr. John Rutherford, 12 Gregory Close, Skelton, York YO3 6XS. 0904 470727.
TOPIC – Tandy Owners Programming & Information Club. 1 Alexandra Road, Bournemouth, BH6 5JA. Mr. D. Washford. 0202-671122 – day. 0202-423964 – evenings.
TRS-80 & Video Genie Users Group of Nottingham. 30 Waterloo Road, Beeston, Nottingham. Mr. Leduc. 0602-225165.
TRS-80 User Group. 3 Highbury Close, Springwell, Gateshead, NE9 7PU. Dr. S. Tetlow. Washington 462532.
West Herts 80 Group. 20 Spruce Way, St. Albans, Park Street, 73633. Mr. T. Bradbury. Meetings twice a month at St. Stephens Parish Church, Bricket Wood.

UK 101/SUPERBOARD

CUA User Group (Computer User Aids), 14 Carlton Road, Romford, Essex. Mr. Adrian Water. Quarterly newsletter. Subscription £9.20.

ZX80/81

Arnold School ZX81 Users Club. 4 Little Polton Lane, Polton le Fylde, Blackpool, SY6 7ET. Mr. Hilton.
Aylesbury ZX Computer Club, Aylesbury 630867. Mr. D.P. Nowotnik. Monthly meetings at Aylesbury College.
Edinburgh ZX Computer Club. 19 Meadowplace Road, Edinburgh. Mr. K. Mitchell. 031-334 8483.
Educational ZX Users Group. Highgate School, Birmingham, B12 2DS: Mr. Eric Deeson. Bi-monthly newsletter, other publications and software. Subscription £2.00. 1500 members in 30 countries.
Harrogate ZX User Club. 7 Dragon Parade, Harrogate. HG1 5BZ. Mr. P. Richmond. Fortnightly meetings.
National ZX User Group. 44-46 Earls Court Road, London W8 6EJ. Mailing address. Interface magazine monthly. Subscription £9.50 UK, £12.50 Europe. £16 Rest of World. 4000 members.
Orpington ZX Computer Club. 23 Arundel Drive, Orpington, Kent BR6 9JF. Mr. R.A. Pyatt. 66 20281. Weekly meetings. Bi-monthly newsletter and actual reviews of software. £8 associate subscription. £28 including all refreshments and equipment covered by insurance on premises and to and from meetings. Software library available.
Sinclair ZX81 National Software Association. 15 Woodlands Road, Womburne, Staffs, WV5 0JZ. Newsletter. £6 subscription includes software on cassette.
Swindon Users Club. 47 Grosvenor Road, Swindon. Wilts. SN1 4LT. Mr. A. Bartlett. 0793-30770.
ZX Walsall. Mr. C. Rose. Walsall 25465.
ZX80 Users Club. P.O. Box 159, Kingston upon Thames, Sy. KT2 5YQ. Mr. D. Blagden.



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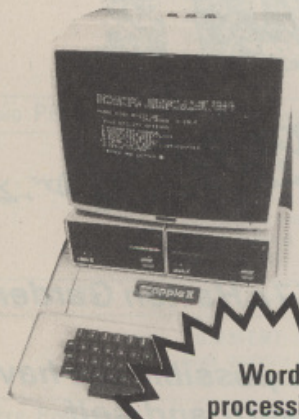
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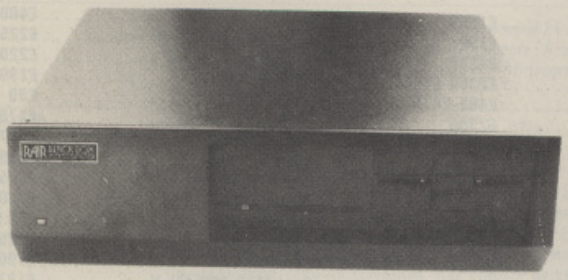
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BUYER'S GUIDE

APRIL 1983

Here is this month's updated buyer's guide giving information on microcomputers currently available in the UK for under £5000. New machines are highlighted in blue. Every effort is made to keep the information accurate and comprehensive but please send any additions or corrections to:
Buyer's Guide Editor, Which Micro & Software Review, 57a Hatton Garden, London EC1N 8JD. Telephone 01-242 6552.
In order to keep the listings as free of computer jargon as possible we have wherever possible tried to make the guide straightforward and self-explanatory.

The Microcomputers listed in the main section of the Buyer's Guide are arranged by price in ascending order. To find a particular computer check its price in our alphabetical cross reference section.

Acclaim	£2225-£4450
Acorn Atom	£120-£250
ADSSSystem 42	£3000
Altos Series 5-15D/5-50	£2425
Andromeda 12L	£1299
Andromeda Alpha	£695-£3695
Andromeda Zita P+PW	£995-£2895
Apple II	£812
Apple III	£2418
Atari 400	£400
Atari 800	£399
Basic 108	£1095
BBC A&B	£299-£399
BMC Oki 800 Model 20	£3150
Bonsai SM3000	£2750
Caltext 1/1A-3/3A	£1899-£2149
Caltex 4/4A	£4457-£4657
Canon TX10/15	£800
Canon CX-1	£2500
Casio FX 700P	£90
Casio FX 702P	£135
Casio FX 801P	£350
Casio PB100	£80
Colour Genie	£199
Comart Communicator CP range	£1895-£2495
Comart CP1000	£3395-£4395
Commodore 64	£340
Commodore Series 4000	£550-£695
Commodore 510	£695
Commodore Series 8000	£895-£1195
Commodore 700 Series	£995
Concept-09	£995
Cortex	£295-£395
Corvus Concept	£4250
Cromenco Personal Computer	£1095-£1795
Cromenco System 1/2	£2295-£2620
Cromenco System 3	£4495
Data General Enterprise 100	£4750
DEC Rainbow 100	£2359
DEC Professional 325	£2677
DEC Professional 350	£3317
Director System	£1999
Dragon 32	£199
Durango F85	£4995
Eagle II-IV	£2350-£3650
Epson MX-20	£402-£475
Equinox Series 5000SX	£2950
Equinox Series 8000SX	£4250
Facit Desktop 6510/6520	£2560-£3420
Fox	£2900
Genie I & II	£299
Globe 101	£1900
Hewlett Packard HP75C	£694
Hewlett Packard HP86A	£1251
Hewlett Packard HP85A	£1917
Hewlett Packard 87	£1739
Husky	£2280
IBM Personal Computer	£2950
ICL Model 10-31	£2421-£4321
Iona	£3600
IT 3030	£2700
Kalamazoo K1000	£3750
Kemitron K3000E	£3795
Kontron P5180	£3700
Link 480Z	£550
MS	£2795
Metrotech Dynabyte 5200/5300	£2440-£3350
Metrotech Dynabyte 5505	£4690
Midwitch Controller	£375
Microtan	£79-£90
Micro Professor	£80
Midas Range	£895-£3520
Millbank System 10	£2395-£2895
Mimi 801	£1350
Morrow Designs	£895-£2295
Multicomputer M210	£4250
Nascom 1-2	£125-£265
Nascom 1-2	£125-£265
Nascomb 3	£376-£506
Newbrain A/AD	£233-£267
North Star Advantage	£2195
Olivetti M20	£2395
SWTP	£4000
Sanyo MBC 200/300	£2250-£3500
Saracen	£2200
Seed System 19	£1900-£4895
Sharp PC1251	£80
Sharp PC1500	£170
Sharp MZ80A	£477
Sharp MZ80B	£899
Sharp PC3201	£2750
Signet 202S/211	£1400-£1750
Sinclair ZX81	£49.95
Sinclair Spectrum	£125-£175
Sorcerer	£790
Sord M23 Mkl-Mk V	£1870-£2266
Sord M23P	£1560-£2060
Stratos	£2950
Sundance	£4999
Superbrain 11/W6	£1800-£2415
System M-Three	£1795-£3150
TECS	£1380
Tele Video TS802 Range	£2535-£4349
T199/4A	£150
Torch	£3499
TRS-80 PC-1	£89
TRS-80 PC-2	£179
TRS-80 Colour Computer	£229-£369
TRS-80 Model II	£2699
Transtec BC2	£1975-£2400
Triumph Adler Alphatronic P2	£2935
Tuscan	£309-£1149
Vector V4 20/30	£2995-£3995
Vector Series 801	£3255
Vic 20	£120
Wicat 150	£4995
Xerox 820 & 820-11	£1750
YD8110	£3500-£3900
Zenith Z100/120-22	£1973-£2453
Oric 1	£100
Oscar	£2645
Osborne 1	£1250
Rair Black Box 3/30A	£3750

UNDER £500

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Sinclair ZX81	£49.95	Home Education	1K- 64K	No	No	Basic	Other	Sinclair Research 0276-685311

COMMENT: The classic "starter" computer now available for less than £50. Considered best for learning rather than doing anything too serious. Cassette tape storage only. Memory can be expanded to 16K with plug in extra memory and even further with the independent suppliers. This additional memory can cost more than the ZX81.
SOFTWARE: Plenty of software available at around £5, but anything useful tends to require the extra RAM pack. Includes limited graphics but it won't look like an arcade game. Wide range of independent companies supplying software packages.

Microtan	£79-- £80	Home Technical	1-48K	Extra	No	Basic Forth	RS-232 available	Tangerine 0353-2271

COMMENT: A micro supplied either in kit or ready assembled form intended for home and technical use. The Microtan is based on the 6502 chip and consists of a basic motherboard with the keyboard or numeric keypad extras. You view the image on your own domestic TV. Provision for ultimate up to 328K if required. Programs can be loaded from your own cassette recorder and the system can expand to include disk drives. The Microtan appeals to both the enthusiastic beginner or the dedicated hobbyist who wishes to expand his system from the essential elements to include larger memory capacity and high-resolution graphics.
SOFTWARE: Limited range available.

Casio PB100	££80	Home, Business	None	No	No	Basic	Own	Casio 01-450 9131

COMMENT: Yet another pocket "computer" — one of the fastest growing areas of the micro world — the PB100 has the capacity to handle ten programs totalling up to 544 program steps with 26 independent memories available. If you trade program steps for memory there can be a maximum of 94 memories. Using an optional expansion pack the number of program steps can be extended to 1568 and memories to 222. With a typewriter style keyboard and separate numeric keypad, the PB100 has a 12 position dot matrix display and has facilities for playing games just like larger micros. Powered by 2 lithium batteries the PB100 works up to 360 hours on a single set. A cassette interface and printer will be available soon.
SOFTWARE: The PB100 comes with its own programming guide to Basic.

Sharp PC1251	£80	Home, Business	4.2K	No	No	Basic	Exclusive	Sharp 061-205 2333

COMMENT: A pocket micro computer on the lines of the PC1500 from the same company. 24 character single line liquid crystal display. Up to 300 hours operation from a single set of batteries. Optional cassette recorder — using micro-cassette and combined printer available at around £100.
SOFTWARE: Though the system can be programmed in Basic there is only a very limited range of programs available as yet.

Micro Professor	£80	Education Home	2-4K	No	No	—	Other	Flight Electronics 0703 34003

COMMENT: The Micro Professor is a complete micro computer system but designed chiefly to be a learning tool. It is really only suitable for hobbyists, students and for use by instructors of electronic engineering and computer science. It can be expanded with a speech synthesiser board (£85), a 20 character thermal printer (£72), a sound generator board (£70) and an Eprom Programmer Board (£85).
SOFTWARE: None supplied — as a learning tool the user is expected to write his/her own software.

TRS-80 PC-1	£89	Home	1.9K	No	No	Basic	Other	Tandy 0922-648181

COMMENT: Genuine pocket computer with integral 24 character display. Separate numeric keypad with 15 arithmetical functions and ten digit numeric accuracy. Limited business use with 1.9K memory. A printer/cassette interface available as an extra produces hard copy 16 characters wide.
SOFTWARE: Range of cassette software with 15 programs ranging from games and business statistics to surveying and aviation. Prices start at £5.95 and go up to £15.95.

Jupiter Ace	£89.95	Home Education	3K- 19K	No	No	Forth	Other	Jupiter Cantab 0954-80437

COMMENT: Designed by two people involved with the Sinclair Spectrum, the Ace is unusual in using Forth as its native language. However Forth is ten times faster than Basic and easy to learn. Your own domestic television is used with the Ace, together with your cassette tape recorder. The Ace has chunky graphics and a sound facility. There will be a 16K memory expansion and a parallel printer interface available soon.
SOFTWARE: A catalogue is sent with each machine, but as yet there is only a small choice for Ace users. But with increased popularity of the machine, the independent software companies may produce packages for this model.

Casio FX-700P	£90	Business	None	No	No	Basic	Own	Casio 01-450 9131

COMMENT: Pocket computer on the lines of the Sharp models, with a typewriter style keyboard and 12 position dot matrix display. Handles up to ten programs with a total maximum number of steps of 1568 and 26 memories. The memory steps can be increased to up to 222 at the cost of program steps. Offline programs and data storage available using the cassette tape recorder interface FA3. There will be a printer available soon.
SOFTWARE: The FX-700P is supplied with a program library included in the price.

Oric-1	£100- £169	Home Education	16-48K	Yes	No	Basic	Centronics	Oric Products International 0990-27641

COMMENT: The Oric comes into the hottest part of the micro market competing head on with the Spectrum, at a far lower price. It has an ergonomic keyboard with 57 moving keys, 8 colours, 7 octaves of sound and a hi-fi sound output. Teletext/viewdata compatible graphics. There's an optional modern costing just £50 and coming soon a micro drive and speed printer. Forth language with 48K version.
SOFTWARE: To quote the advertising — software is becoming available for business and other applications but check that the type of software you want is really available and not just "coming soon".

Acorn Atom	£120- £250	Home, Business Education	2-12K	Optional	No	Basic, Lisp Forth	Other	Acorn 0223-245200

COMMENT: Acorn, manufacturers of the BBC machine, supply their own machine in kit or assembled form. You have the choice of cassette or disk drive loading, and viewing with your domestic television set. A special communication module is available to link your Atom to any number of Atoms or even an IBM mainframe computer. So it's a good starting point at a price well below the BBC machine.
SOFTWARE: Acorn have their own range of Acornsoft programs for the Atom micros and currently there are over 50 programs ranging from games, to household and business applications, plus interactive teaching. Though the range of truly business programs is limited only by the machine's memory space. A number of independent software companies are now producing programs for the Atom, so there must be over one hundred packages in total available.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Vic 20	£120	Home Education	5- 29K	Yes	No	Basic	RS-232C	Commodore 0753-79292

COMMENT: Apart from the Sinclair ZX81, probably the fastest selling home computer in the UK. A complete departure for Commodore from their chunky Pet days. The Vic 20 has a typewriter style keyboard with special function keys. The colour is excellent and the graphics make it ideal for games. Programs can be loaded from cassette or disk drive, but the drives cost twice as much as the Vic. You also have the choice of plug-in cartridges. Sinclair is going to produce disk drives at £50, so the price of Commodore drives should drop.
SOFTWARE: You have three different systems for your software, cassettes — takes the longest time, but the cheapest; cartridges — most convenient — but expensive and disks if you can afford the drives. There must be over two hundred different games for the Vic ranging in price from £5 upwards. Cartridges cost around £20 each, with disks £2 more than the equvalent cassette. An increasing number of educational programs are being produced for the Vic, but as yet little business software.

Nascom 1-2	£125- £265	Home Education	1-2K	No	No	Basic	RS-232C	Lucas Logic 0926-497733

COMMENT: Two kit form micros that can also be supplied ready assembled, both using IBM style keyboards. The Nascom 1 has 47 keys, while the model 2 increases it to 57 including more controls. Both models produce a 16 line 48 character display on the monitor bought separately. Essentially for the enthusiast. Now the basis of a range of commercial/industrial systems.
SOFTWARE: Using Basic many programs can be adapted and there is a limited range available.

Sinclair Spectrum	£125- £175	Home Education	16-48K	Yes	No	Basic	RS-232 soon	Sinclair Research 0276-685311

COMMENT: On specification the Spectrum is a best seller, with the colour graphics facility, 16-48K memory and Teletext compatibility. Add the sound facility, plus the low cost printer and cheap disk drives and you have potentially the strongest contender in the under £200 market. However it has suffered from long delivery times just like the BBC machine, but not as long. Once the £50 disk drives and networking facilities become available and the delivery problems are solved, the Spectrum will have few competitors. But one could well be the Oric.
SOFTWARE: Initially there is a small amount of software available for the Spectrum, mainly in the games field, but this is increasing fast. There should also be some business programs available in the near future.

Casio FX702P	£135	Business	None	No	No	Basic	Own	Casio 01-450 9131

COMMENT: A pocket micro computer which is really a more sophisticated version of the FX-700P. Programming capacity between 1680 steps with 26 memories or 80 steps with 226 memories. Variable between these two figures. Typewriter style keyboard and 55 single key routines including log, trig and hyperbolic functions. Built-in statistical routines including standard deviation, regression anaalysis and correlation coefficient. Liquid crystal display showing up to ten digits plus two in the exponent. Powered by lithium batteries providing power for up to 240 hours operation. programs and memory are retained when the Casio FX-702 is turned off. Other elements in the Casio system include a cassette interface and the FP10 printer. There will also be interchangeable RAM packs to extend the memory capacity.
SOFTWARE: Supplied complete with a program library comprising 73 computation examples covering nine fields. You just type them in.

Texas Instruments TI99/4A	£150	Home Education	16-48K	Yes	No	Basic Pascal TI Logo	Other	Texas Instruments 0234 67466

COMMENT: Uses a 16-bit chip and has three ways of loading programs. Cassette, floppy disks and plug-in cartridges. Used with your domestic televsion the TI99/4 hasn't reached the popularity expected and the price has been reduced from £399. And voucher system makes price effectively £150.
SOFTWARE: Mainly available on cassette and cartridge, there is less independent software for this micro than others in this price range.

Sharp PC1500	£169.95	Home, Education Business	3.5- 11.5K	No	No	Basic	RS-232 available	Sharp 061-205-2333

COMMENT: A true pocket micro computer with single line display replacing the conventional monitor. Large typewriter style keyboard with separate numeric keypad. Add-on memory chips increase total RAM to 11.5K, while CMOS circuitry retains data even when the PC1500 is switched off. Accessory printer/cassette interface produces a printing facility in four colours using ballpoint pens.
SOFTWARE: Limited range available in cassette form for the PC1500. Mainly from independent companies like: Kuma Computers of Maidenhead, Microl of Cambridge, Elkan Electronics and Micros of Managers — London.

TRS-80 PC-2	£179	Home Business	3.5- 11.5K	No	No	Basic	Other	Tandy 0922-648181

COMMENT: This pocket computer looks very similar to the Sharp PC1500, the main difference being the name at the left hand end of the micro. Sharing the features of the Sharp PC1500, the PC-2 also has the printer/plotter/cassette interface for printing out results in four different colours.
SOFTWARE: Limited range of software available in cassette form for the PC-2, mainly from independent companies like Kuma Computers, Microl of Cambridge, Elkan Electronics and Micros for Managers.

Atari 400	£199	Home Education	16- 32K	Yes	No	Basic	RS-232	Atari 01-900-0511

COMMENT: Advertised extensively on television, the Atari has extremely effective graphics where you can choose from 128 colour combinations and 18 screen arrangements. There are four sound channels with a range of three octaves. The Atari 400 has a touch sensitive keyboard and loads from cassette recorder or disk drive. Programs in cartridge form can also be slotted into the micro. In the under £200 market the 400 faces strong competition from the Dragon and the Colour Genie apart from the Spectrum.
SOFTWARE: Several hundred different programs are available for the 400, including utility and educational programs. One dealer is even offering 100 free programs with each Atari 400 and that's a real bargain.

Colour Genie EG2000	£199	Home Education	16-32K	Yes	No	Baic	RS-232	Lowe Electronics 0629-4995

COMMENT: Another contender in the under £200 market with 128 programmable graphic characters and three sound channels, plus music synthesiser. Full size typewriter keyboard, cassette loading, view on your domestic television set.
SOFTWARE: Genie computers are very similar to the TRS-80 range and there is a degree of interchangeability with software. As more programs are available for the TRS-80 range, even than the Apple, there should be no shortage of programs for the Colour Genie.

Dragon 32	£199	Home Education	32- 64K	Yes	No	Basic	RS-232	Dragon Data 0792-580651

COMMENT: A new contender in the under £200 market, with 32K RAM, nine different colours and a range of nine octaves of sound. Standard typewriter keyboard with space bar. Eight graphics pages for five different resolutions and scale from 1/4 to 15 times magnification. The Dragon uses the 6809 chip, more powerful than the 6502 fitted to the Pet, Apple, Atari and similar machines. Programs are loaded by cassette from your own recorder and viewed on the domestic television set. Disk drive units will be available soon.
SOFTWARE: Currently you have a very limited choice of cartridges or cassettes. Cartridges are expensive but load faster.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Lynx	£225	Business Education	48-192K	Yes	Com-patible	Most	RS-232C	Camputers Ltd., 0223 315063

COMMENT: Claimed to have an extremely simple Enhanced Basic and easy to understand manual plus a typewriter style keyboard. Unlike most low priced micros that use a lot of memory for the colour display, the Lynx produces true hi-res graphics. Currently uses a cassette interface, but disk drives, monitors and printers should be available soon. Provision for expandability to 192K, puts the Lynx streets ahead of many of the £200 competitive machines.
SOFTWARE: CPM compatibility puts the Lynx ahead of many of its competitors as far as business and professional use is concerned. So you could use Wordstar with a £200 micro. However Camputers are working on their own range of software.

Micro-Professor MPF-11	£230	Home, Business Education	64K	Yes	No	Basic	RS-232	Flight Electronics 0703-34003/27721

COMMENT: The Micro Professor's claim to fame is quite simple, it's compatible with Apple software. Currently you can only load from cassettes, but disk drives and low cost printers will be available "soon". Unlike the Apple, the MPF-11 is not expandable but in its normal configuration it has 16K more RAM than a normal Apple. Provision for software to be plugged into the MPF-11, when its supplied in cartridge form. It takes a few short cuts and the keyboard is less well designed but if you want an Apple and can't afford it, consider the MPF-11.
SOFTWARE: Compatibility with Apple software gives you an almost unlimited range to choose from.

Newbrain A/AD	£233-£267	Business Education	32-upwards	No	Yes	Basic	RS-232	Grundy Business Systems 01-977 1171

COMMENT: Almost pocket sized micro with full size keyboard. You have the choice of loading programs from an extra tape recorder or disk drive depending on the application. Two versions, with the AD having a calculator type 16 character blue-green display. Optional battery back-up module and videotext module for communications with Prestel and all types of viewdata.
SOFTWARE: Initially little available, covers a graphs pack, simple graphics and a text processing package. However, the CPM option lets you have access to plenty of programs including Wordstar.

Cortex	£295-£395	Home Education	64K	Yes	Other	Basic	RS-232	Powertran 0264-64455

COMMENT: 16 bit colour computer available either in kit or ready assembled form. High resolution graphics with user definable characters. Memory mapped video controller. Up to 16 serial I/O ports. Provision for using twin 5¼" disk drives extra.
SOFTWARE: Using a form of Basic the only current option is to write your own programs.

BBC A & B	£299-£399	Home Education	16K upwards	Yes	Extra	Basic, Forth Pascal, Lisp	RS-232	BBC Microcomputer Systems P.O. Box 7, London W3 6XJ

COMMENT: Developed from the Atom, by Acorn, the BBC machine has a full keyboard with ten user definable keys. Programs can be loaded either from a cassette recorder or a disk drive. Extensive graphics facilities and tone generator. Extremely versatile through built-in connections for taking telesoftware direct from Prestel and Teletext services. The BBC uses the Econet networking system using ordinary telephone cable. The model B machine has more sophisticated graphics facilities and an RS-232 compatible interface. This specification makes an attractive package and to avoid the months and months delay buy your BBC machine direct from one of the handful of dealers stocking it.
SOFTWARE: Acornsoft have their own range of programs for the BBC machine and an increasing number of independent suppliers have a range of packages. Acornsoft themselves have: Business games, Tree of Knowledge, Algebraic Manipulation and Peeki Computer. For business use: word processor, desk diary, games are available in the usual range from Invaders to Flight Deck and the solution of the Rubik Cube to name just three. Special plug-in ROM cartridges are also available and can be used with a special extra interface socket.

Genie 1 & 11	£299	Home, Business Education	16-48K	No	No	Basic	RS-232	Lowe Electronics 0629-4995

COMMENT: Two similar micros both using the range of TRS-80 Model 11 software. The Genie 1 has its own built-in tape recorder and a full keyboard with space bar. There's a programmable sound unit and the keyboard gives upper and lower case leter. The Genie 11 has a more advanced keyboard with 71 keys that has a full typewriter style section and four special function keys. A disk drive is available.
SOFTWARE: Apart from the wide range of programs available for the TRS-80 Model 11 Molimerx also have a wide range of TRS-80 software in fact there are probably more programs available for the TRS-80/Genie range than any other machine.

TRS-80 Colour Computer	£299-£369	Home Education	16-32K	Yes	No	Basic	RS-232	Tandy 0922 648181

COMMENT: Lowest priced of the TRS-80 range with 16K memory producing eight different colours. Instant loading program packs or choice of loading from cassettes or disk drives. Upgrade kit £69.95 for extra Basic ROM and hi-res graphics.
SOFTWARE: Wide range of programs covering games and education available from Tandy and Molimerx Ltd.

Tuscan	£309-£1149	Home, Business Education	8-24K	No	Yes	Basic, Pascal Cobol, Lisp	RS-232	Microsystems 01-405 5240

COMMENT: Starter kit available at £309 intended for first time users and schools and skill centres. Expandable to full CPM, for the person who likes building computers. The home computer is ready assembled with printer and cassette interface expansion slots and has a professional keyboard as optional extra, price £499.
SOFTWARE: Use of CPM plus the range of programs in the Microsystems catalogue.

Commodore 64	£340	Home, Business Education	64K	Yes	Extra	Most	RS-232 IEEE 488	Commodore 0753-79292

COMMENT: Far more powerful version of the Vic 20 with a massive 64K for £130 more than the Vic. Hi-res graphics with bit mapped screen. The dedicated video chip let you use hi-res Sprites — movable object blocks — which can give full three dimensional effects. Three independent voices available with the sound chip giving a range of nine octaves. Wide range of interface adaptors lets the Commodore 64 communicate via networking, printers, plotters and Prestel. Typewriter style keyboard with special function keys. Program loading either from cassette recorder or disk drives, both extra. View the image on your domestic television set.
SOFTWARE: While a special range of business software is being produced, existing Vic and 40 column Pet programs can be easily converted. A machine port accepts plug-in ROM cartridges for business, home and educational applications plus CPM packages.

Casio FX-801P	£350	Business	—	No	No	Basic	Own	Casio 01-450 9131

COMMENT: Measuring around 10 x 8 x just under 2", the Casio FX801P is an all-in-one micro which could be compared to the Epson MX-20. It's portable, weighs just 2.3lb, has a built-in micro-cassette recorder and a 20 digit dot matrix all in a single unit. Powered by 6 AA batteries which provide power for around 250 hours, optional mains use. From 80 to 1680 steps and 26 to a maximum of 226 memories. Maximum of 10 groups for the built-in programs. Ten digit single line LCD display.
SOFTWARE: As an optional extra there's a program library with 73 examples covering 9 fields, but you have to type them in yourself.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
MC Microcontroller	£375	Education	16K	No	No	Basic	RS-232C	Datec 061-941 2361

COMMENT: Aimed at the education market and a potential competitor for the Research Machines 380Z, the Midwitch MC is a control computer for schools and universities. Intended for cassette loading of programs it uses a version of Basic which is quite close to Microsoft Basic.
SOFTWARE: As this micro uses Basic of a slightly different type, it should be simple to adapt programs that can be run with it. In the education market, most of the users will most likely be producing their own programs rather than relying on commercially produced products.

Nascom 3	£376-£506	Home Education	8-48K	No	Yes	Basic Pascal	RS-232	Lucas Logic 0926-497733

COMMENT: Single piece micro with typewriter style keyboard complete with cassette interface. Disk drives available as optional extras. Graphics facilities and potting commands in Basic. 16 parallel input/output lines available. Video controller for 40 or 80 column display.
SOFTWARE: CPM programs plus NAS-Pen — Nascom's own word processor plus specialised debugging aids and editor assemblers.

Atari 800	£379	Home, Business Education	16-48K	Yes	No	Basic	RS-232	Atari 01-900 0511

COMMENT: The Atari 800 is the top model of their range and features a typewriter style keyboard and memory expansion to 48K. It retains the excellent graphics facilities of the model 400. Loading of programs from cassettes or cartridges or a disk drive.
SOFTWARE: Apart from the hundreds of software packages for the Atari range, there has been a new trend to produce business programs for the model 800. There is the Chipsoft range from Silicon Chip of Slough who offer: Stock control, sales ledger, purchase ledger, mail shot and PAYE for around £150 each.

Epson HX-20	£411	Business	16-32K	No	No	Basic	RS-232	Epson UK 01-900 0466

COMMENT: A portable micro computer which includes a liquid crystal display that shows 20 characters on a line, and a printer. The keyboard is standard typewriter style plus eight special function keys. With its built-in ni-cad cells the Epson can operate for up to 50 hours and can be recharged in eight hours. There is provision for a micro cassette drive as optional extra, to fit on the right of the screen. Price £75 pius VAT.
SOFTWARE: Will be provided in microcassette form and about 12 applications are claimed to be available at launch time.

Yoric	£450	Business, Home Education	48K	Extra	Extra	Basic (in ROM)	Other	Kram Electronics 0533 27556

COMMENT: This is an Apple lookalike made in the Far East, which claims to be compatible with their disk drives and software. No software is supplied. For an outfit with monitor and disk drive the prices goes up to £850. For the potential Apple purchaser at a slightly lower price, but without their extensive back-up.
SOFTWARE: Being compatible with the Apple there is probably more software available for this micro than any other, apart from the TRS-80. Whether you want games, education or business programs. If you add the Z80 softcard CPM programs can be used.

Irvine IBS 750	£475	Business	64K	No	Yes	Most	IEEE 488	Irvine Business Systems 0294-75000

COMMENT: Single board computer using Z80 processor with basics for use with separate keyboard and monitor. CTC, real time clock with battery back-up. Monitor in PROM. 80x24 lines video generator. 2 serial ports and 4 parallel ports. Floppy disk controller. 5¼" floppy disk double sided, double density 400K, £195 each.
SOFTWARE: Use of CPM as the operating system assures a wide range of packages for most requirements.

Sharp MZ80A	£477	Home, Business Education	48K	No	Extra	Basic Pascal	Other	Sharp 061-205 2333

COMMENT: Single unit micro incorporating 9" green screen monitor, cassette recorder and standard typewriter keyboard with numeric keypad. Optional disk drives for faster loading of data.
SOFTWARE: Limited range of software available, but ample for the home user. Small range of business and education programs. Adding the CPM option opens the door for specialist programs including Wordstar.

£500-£999

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Commodore Series 400	£550-£695	Home, Education Business	16-32K	No	No	Most	IEEE 488	Commodore 0753-79292

COMMENT: Updated version of the first micro available in the UK, the Commodore Pet. The Series 4000 is a one piece micro with integral monitor with separate disk drives available as extras. You could use cassette loading. Now looking long in the tooth against the competition.
SOFTWARE: The Commodore applications brochure lists hundreds of specialised programs from word processing to most of the applications needed in modern business. A large number of games and educational programs are also available.

DAI Personal Computer	£595	Home, Business Education	48K	Yes	Com-patible	Most	RS-232	Data Applications UK 0285-61828

COMMENT: Micro with 16 colour hi-res graphics offering program loading either from cassette or disk drives extra. Sound commands for music generation. The 24K ROM based software includes a fast Basic interpreter, scrolling screen editor, machine code utility program, twin cassette file handling and disk support.
SOFTWARE: CPM compatibility plus a range of Dainasoft programs covering games, education, word processing and viewdata — Prestel.

Link 480Z	£550	Education Business	32-256K	Yes	No	Basic, TXED Forth, Assem	IEEE 488	Research machines 0865-49866

COMMENT: Micro specifically designed to be used in a networking system at far lower cost than competitive systems. Basically a simplified 380Z with cassette program loading and choice of 40 or 80 characters on your domestic TV screen or monitor. Full graphics facilities of the Research Machines 380Z, with memory not eaten up by the use of graphics.
SOFTWARE: Compatible with the wide range of programs available for the 380Z.

Orange	£595	Business Education Home	48K	Yes	Extra	Most	RS-232	Collins International UK Ltd., 8 Staple Inn, London WC1V 7QH

COMMENT: Another Apple II lookalike which offers more features at a lower price. Apart from being compatible with hardware and software, this machine has a keyboard with upper/lowercase capability and a separate numeric keypad. 8 slots for expansion just like the Apple original.
SOFTWARE: Literally all the programs available for the Apple II/IIE should fit, plus CPM using a Z80 softcard.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
NEC PC-8001	£599	Business, Home Education	32-64K	Yes	Extra	N Basic	RS-232	NEC 01-388 6100

COMMENT: The NEC PC-8001 looks like lots of other micros on the surface. However it has a Z-80 chip for the central processing unit and two more chips for the RAM and masked ROM. Making a more advanced specification with the chips than some other micros. The keyboard is typewriter style and there is a numeric keypad plus five special function keys. You have the choice of adding programs by cassette or disk drive. Green screen monitors and colour models are available. Complete systems comprising the PC-8001, printer, dual disk drive and green monitor start around £1,825. For the 64K system which includes a daisy wheel printer for word processing the cost is around £3,300.

Hewlett Packard HP75C	£694	Business	16-120K	No	No	Basic	RS-232C HP-IL	Hewlett Packard 03446-3100

COMMENT: Pocket computer with potential for using Visicalc and producing graphics presentations. Battery powered, the memory is retained even when the computer is switched off, making it ahead of larger micros. Plug-in memory modules can increase the ROM memory to 120K. Built-in 32 character liquid crystal display acts as movable window on a 96 character line. Magnetic card reader gives off-line storage capacity apart from the cassettes normally used to load programs into this pocket micro. Real time clock and non-volatile memory so the HP75 can remind the user of future appointments and run programs unattended. The HP75C comes complete with an HP interface for communications with a range of peripherals and other computers.
SOFTWARE: Two different types. There will be plug-in ROM modules designed to answer specific problems covering finance, real estate, surveying, data analysis and electrical engineering. These will become available during 1983, while there will also be software ROM based, for graphics presentations in full colour, plus personal time management, data communications, memo writing and Visicalc file management. Tape cassettes will aos be available from the HP users library to be used with the HP82161 Digital Cassette Drive.

Andromeda Alpha	£695-£3695	Business	64K	No	Yes	Most	RS-232	IT Computer Services 0784 63211/2/3

COMMENT: The selling methods used for the Andromeda Alpha are the unusual – you buy the software and the hardware comes "free" like the Andromeda Zita range. You have a choice of well known software packages likes MARS and Micromodeller, just two of the packages available. The Alpha is a three part system with separate monitor, twin disk drive and typewriter style keyboard. There is a choice of disk capacity from the single 125K 5¼" floppy disk to win 12MByte Winchester hard disks at the top end of the scale.
SOFTWARE: Buying the programs and getting the hardware free makes the Alpha look like a potential bargain regardless of how many programs you purchase. And with a choice of the most well known ones under CP/M it could well be an attractive package overall.

Commodore 510	£695	Home, Business Education	64-256K	Yes	Extra	Most	RS-232C IEEE 488	Commodore 0753-79292

COMMENT: Combines the features of the Commodore 720 and 64 in a single package. Full QWERTY keyboard with programmable special function keys and separate numeric keypad. Display on your domestic TV set 40 characters by 25 lines. High resolution graphics 320 x 25 pixels and 16 colours available simultaneously. Provision for loading programs from cassettes or disk drives. SID – Sound Interface Device controls the sound and provides three vhoices each with a nine octave range. The 6567 chip lets you create three dimensional graphics.
SOFTWARE: Currently no software produced, however it's likely that many existing Commodore programs will be compatible with the 510.

Apple 11 Plus Europlus	£699	Home, Business Education	48K	Extra	Extra	Most	RS-232 other	Apple UK 0442-60244

COMMENT: One of the first major products in the micro boom, the others being Pet and TRS-80, the Apple 11 Plus is still going strong, basically because it can be all things to all people. With eight slots in the back, you can start with a disk drive and printer and develop to using an 80 column card, colour and CPM with a Z80 card. You can even increase the memory to over 256K by the use of independent cards that slot into the back of the machine. Apple were the first to have extensive colour graphics facilities hence their popularity for games. The basic Apple has a fairly standard keyboard, without a numeric keypad and programs can be loaded from cassette recorders or the disk drives. Independent companies provide 8" disk drives and Winchester hard disks. Depending on your choice of separate monitor or domestic television set, you can have a black and white image or colour, just by adding the appropriate card in the back of the Apple.
SOFTWARE: Apart from the TRS-80, there is more software available for the Apple than any other micro on the market. Plus hundreds from the independent companies including Visicalc responsible for selling more Apples to businessmen than any other software package. There is a very wide choice of specialised programs for most types of small business. Add the Z80 card and you have access to CPM.

Sorcerer	£790	Business Education Home	48K	No	Extra	Most	RS-232	EMG Micro 01-688 0088

COMMENT: Desktop micro that has typewriter style keyboard with separate 16 key numeric keypad. Provision for cassette program loading or floppy disks or even a hard Winchester disk, depending on the application. Special video/disk unit incorporating 12" green screen monitor and twin 5¼" floppy disk drives and CPM operating system available as optional extra.
SOFTWARE: EMG have programs available covering business and education. Their current list has around 20 different business packages and 50 educational programs. Using CPM you have range of packages available.

Prophet 2	£795	Business	32K	No	No	Basic	RS-232	Busicomputers 0832-72052

COMMENT: Dedicated micro computer with financial modelling system actually supplied on a chip. This saves the time in loading and lets you make better use of your RAM. The Prophet 2 comes complete with a monitor, keyboard and your model is stored in a cassette player.
SOFTWARE: As the software is supplied on a chip the situation is different from other micro computers. However a range of standard applications is planned with an average cost of around £30.

Apple IIE	£845	Business Home Education	64-128K	Yes	Extra	Most	RS-232 choice	Apple UK 0442-60244

COMMENT: Replacement for the best selling II Plus which sold three quarters of a million worldwide. Instead of the normal 48K RAM fitted to the II Plus, the IIE has 64K as a standard expandable to 128K. The keyboard is typewriter style with 63 keys, upper and lowercase facility. Auto repeat on all keys. 4 cursor control keys and 2 programmable keys. Far less internal components for greater claimed reliability. Apple brand 80 column card and dual 80 column/64K card.
SOFTWARE: Claimed to be compatible with virtually all Apple II Plus programs plus new programs being launched to take advantage of the new IIE features. Certainly there's probably more programs available for this micro than any other.

Midas range	£895-£3520	Business	64K	Extra	Yes	Basic, Cobol Fortran	IEEE 488	Sirton 01-640 6931

COMMENT: Range of micros from the Midas I at £895 right through to the Midas 8-16 with both the Z80 and 8086 processors. Choice from 5¼" floppy disk drives to twin 8" drives and Winchester hard disks.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Fujitsu Micro 8	£895	Business, Home Education	64K	Yes	Yes	Most	RS-232	Minichip Ltd. 09322-42777

COMMENT: Using three separate processors, the Micro 8 has twin 6809s for handling the eight colour high resolution graphics and the third chip, the Z80, lets you use the wide range of CPM programs. The screen format is software controlled between 40 and 80 columns. There are 10 programmable function keys. You have a choice of using either 5¼ or 8" disk drives and there is provision for bubble memory.

Commodore Series 8000	£895-£1195	Business Education	32-96K	No	Extra	Most	IEEE 488	Commodore 0753-79292

COMMENT: Commodore had the first micro in this country, known as the Pet. This is their updated version with typewriter style keyboard, built-in monitor, with disk drives separate from the basic unit. Unlike the smaller models the 8000 series gives you a full 80 columns for word processing. Design and specification wise it's now being overtaken by the newcomers who offer more advanced specifications for similar prices.
SOFTWARE: Commodore have built up a wide range of programs for the 8000 series, from information management, through word processing to management planning and finance. Further programs cover costing, retail, planned maintenance, construction and engineering. A 42 page brochure called "Using your computer" details the comprehensive range of software for the Commodore range.

Morrow Designs Micro Decision	£895-£2295	Business	64K	No	Yes	Basic	RS-232C	Interam 01-675 5325

COMMENT: Using the CPM operating system, the Morrow Designs Micro Decision provides proven technologh at an attractive price for the business user. In its basic form with a single disk drive, the Morrow costs under £1000 and can be built-up by adding a suitable VDU and printer to a complete accounting system for under £2500. Up to 4 disk drives can be used with the controller and the disk format is compatible with Osborne, Xerox and the IBM PC.
SOFTWARE: The Micro Decision is supplied complete with Wordstar, Correct-It and Logicalc — a spreadsheet. Plus CPM, Basic 80, Bazic — North Star compatible, Pilot and Micro Menus. The system including the printer at £2295 comes complete with the Exact Accounting system. Plus the wide range of CPM programs, over 2000 available as extras.

Sharp MZ80B	£899	Home Education Business	64K	No	Extra	Basic Assembler Pascal	RS-232C	Sharp 061-205 2333

COMMENT: Desktop micro with built-in 9" green screen monitor and cassette drive. Standard keyboard with separate numeric keypad and ten special function keys. Optional graphics facilities and disk drive units for when you find the tape system takes too long.
SOFTWARE: Currently 15 business programs are available and the number is increasing all the time. By adding the CPM facility, you have a range of programs covering most business applications.

Andromeda Zita P & PW	£995-£2895	Business	64K	No	Yes	Most	RS-232	IT Computer Services 0784 63211/2/3

COMMENT: Range of portable micros competitors to the Osborne but instead of "free" software as with the Osborne if you buy the Zita software to a value from £995-£2895, depending on the packages, the hardware comes free. There is a choice of well known business packages like MARS, Micromodeller and full business programs. The hardware in the Zita P range starts with a single disk drive of 125K and goes up to 3 disks of 1MByte each at the top of the range at £2095. The Zita PW incorporates either a 6 or 12MByte Winchester hard disk making it the first Osborne type portable to offer such a large amount of storage capacity built-in. Both models have 10" monitors and typewriter style keyboards with numeric keypads and special function keys. Like the Osborne the keyboard forms the lid of the micro computer when its not being used, and provides a weatherproof seal. As an alternative both machines can be obtained under a loan plan run by the manufacturers.
SOFTWARE: Buying the programs and getting the hardware free looks like making the Zita range a very attractive proposition. It claims to offer Osborne features and more with a larger screen and greater disk capacity — even hard disks, and the CPM option for a large range of programs.

Commodore 700 series	From £995	Home, Business Education	128-256K	No	Extra	Basic	RS-232C IEEE 488	Commodore 0753-79292

COMMENT: Desktop micro with adjustable monitor, typewriter style keyboard and twin 5¼" floppy disk drives, in a single unit. Second processor capability (Z80, 8088, 6809). Adjustable monitor produces an 80 column by 25 line display. Four models in the 700 range from £995 to the top of the range at £1995. All models have 80 column display monitor.
SOFTWARE: Though no software has been currently announced, it's likely that the 700 series will be compatible with the wide range of existing Commodore programs.

Concept-09	£995	Business	56K	No	No	Basic Pascal, Forth	RS-232 Centronics	Micro Concepts 0242-510525

COMMENT: A new British micro computer system using the 6809 micro processor with built-in twin 5¼" disk drives. Requires a monitor and keyboard for use as a system.
SOFTWARE: Using the Flex operating system, the Concept already has a word processor, electronic worksheet, record management system, a cross assembly, micro assembler and two compilers available.

£1,000-£1,999

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Basis 108	£1095	Business, Home Education	64-128K	Yes	Yes	Extra	RS-232C	Community Computers 07308 7567

COMMENT: The Basis claim to fame comes from its Apple 11, compatibility, while offering a more advanced specification. Unlike the Apple, the Basis has both the 6502 and Z80 processors, so the whole range of CPM software is available without any extra cards for the operation. Apple drives can be used with the Basis and there is provision for mounting two drives above the computer unit. Colour is available as standard and the Basis produces an image 80 characters wide on your monitor. The keyboard is connected to the computer by a ribbon cable and has standard typewriter layout with numeric keypad and programmable function keys.
SOFTWARE: Any of the Apple software for the Model 11 Plus can be used, plus the Z80 facility opening the door to CPM programs.

Cromenco Personal Computer	£1095-£1795	Business Education	64K	No	Yes	Basic, Cobol Fortran	RS-232	Comart 0480 215005

COMMENT: Three piece system including software and optional printer. The single 5¼" floppy disk drive has a capacity of 390K. At £1795, this outfit also includes a 120 characters per second daisy wheel printer.
SOFTWARE: Supplied complete with a word processing package and a financial spreadsheet, so it's ready to use. Plus CPM.

Sanyo MBC1000	£1195	Business	64K	No	Yes	Most	RS-232	Sanyo Watford 46363

COMMENT: Three piece system with typewriter style keyboard and numeric keypad, that is detachable from the computer and monitor. Double, sided, double density disk drive. Five programmable function keys.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Osborne 1	£1250	Business	64K	No	Yes	Most	RS-232C IEEE-488	Osborne 0908 615274

COMMENT: First of the truly portable micros that comes with its own built-in case to produce a weatherproof package. The keyboard folds down on the computer to form a lid with the total package weighing 24lb. Standard typewriter style keyboard with separate numeric keypad. Built-in twin 5¼" floppy disk drives producing up to 60 pages of typed text on each disk. Small monitor measuring 5" across fitted in between the two disk drives providing a 52 character window on a 128 character line. Optional extras include modern, battery pack. Double density disk drive version available at £1375.
SOFTWARE: The Osborne comes complete with CPM as its operating system, plus Wordstar including Mail Merge, Supercalc, M & C Basic. £800 worth of software in a micro costing £1250 complete. Plus the possibilities of using CPM, the most popular operating system in the world for any extra software you need.

Hewlett Packard HP86A	£1251	Business	54-500K	No	Yes	Most	RS-232	Hewlett Packard 03446-3100

COMMENT: Desktop micro using separate disk drives for program loading and a separate monitor. Typewriter style keyboard with separate numeric keypad and 14 user definable function keys.
SOFTWARE: The HP86A uses the Hewlett Packard Series 80 software including statistics and engineering packages costing from £68 to £143. There are also four specialised programs for the HP86A. These are Visicalc Plus £178, Graphics Presentation £178, Basic Training Pack £68 and Word 80 £178. Plus the range of programs under CPM.

Mimi 802	£1350	Business Education	64K	No	Com-patible	Most	RS-232C	British Micro 0923-48222/43956

COMMENT: British made micro with twin double sided, double density 5¼" disk drives included in the price. Colour coded keyboard with numeric keypad and 17 prgrammed function keys. Options include a Winchester hard disk, high resolution graphics and matching monitor with choice of orange or green display. Disk format conversion facility. Light pen socket.
SOFTWARE: Mimi uses OS/M as its operating system, which is compatible to CPM, so there is a wide range of programs already available including Wordstar. British Micro are developing Trojan — a major software innovation that simplifies the learning process and makes creating programs simple. British micro are already using this product themselves to generate new programs for the Mimi.

TECS	£1380	Business	56K	No	No	Most	RS-232	Technalogics 061-793 5293

COMMENT: Business micro which uses both the 6800 and 6808 processors. Monitor produces 80 column by 24 line display. Typewriter style keyboard with numeric keypad. Disk drives extra, example twin 5¼" floppy disk drives £850.
SOFTWARE: Limited amount of software as you are restricted to programs using FLEX TDOS.

TRS-80 Model 111 Business	£1399-£1699	Business	48K	No	No	Basic, Cobol Fortran	RS-232C	Tandy 0922-648181

COMMENT: Desktop machine incorporating 12" monitor, one or two 5¼" disk drives and a keyboard with separate numeric keypad. The TRS-80 Model 111 can be bought with one or two disk drives and an extra two can be added later on. In the USA TRS-80 was the first large selling microcomputer and it had been the largest seller until Sinclair came along.
SOFTWARE: Programs for the TRS-80 are available in a wider range than even Apple packages. Apart from the range of programs from Tandy, Molimerx have an extensive range of software for this micro. Most of the independents also have TRS-80 programs.

Signet 202S 211	£1400-£3435	Business Education	64K	No	Yes	Most	RS-232C	Micro APL 01-834 2687

COMMENT: Compact micro with twin 5¼" disk drives each 188K. Supplied complete with the Micro Span self-teaching interactive software system, claiming to take the beginner through the entire system in 14 days. Similar version available with double sided, double density disk drives at £1750. The 211 model replaces one of the 5¼" floppy disk drives with a 12Mbyte Winchester hard disk drive.
SOFTWARE: Using CPM a large range of packages is available including Wordstar. The APL Z-80 4.1 Interpreter and Micro Span self-teaching system costs £450. Microtask project development utility £200, Microfile data storage utility £200.

Galaxy 1	£1450	Business Education	64K	No	Yes	Most	RS-232C	Gemini 02403 28321

COMMENT: Two piece computer with the twin 5¼" floppy disk drives housed separately. Twin Z80 processors with each of the disk drives having 400K storage. 80 column display on monitor — extra — with pexel graphics facility. Cassette and light pen interfaces also supplied.
SOFTWARE: CPM is the operating system chosen for the Galaxy and supplied with each machine you have — Comal-80 structured Basic, GEM-Pen text editor formatter, GEM ZAP Z80/assembler and GEM DEBUG, a de-bugging utility.

Tuscan Dual	£1449-£2365	Home, Business Education	60K	No	Yes	Most	RS-232	Microsystems 01-405 5340

COMMENT: Supplied with either twin5¼" or twin 8" floppy disk drives and typewriter styel keyboard with 71 keys and separate numeric keypad. Additional monitor shows 64 columns and 32 graphics characters.
SOFTWARE: Using CPM many programs are available. Plus the Microsystems catalogue that contains over 100 packages.

Kaypro 11	£1495	Business	64K	No	Yes	Most	RS-232	LSI Computers 04862-23411

COMMENT: Kaypro is another portable computer on the lines of the Osborne. However the Kaypro has larger capacity disk drives and a 9" monitor. The keyboard has a separate numeric keypad and there are programmable function keys. The entire system is housed in a steel case with the keyboard folding on top to provide a lid.
SOFTWARE: Although the Kaypro uses CPM, it's supplied with software ready to use. Microplan — a financial modelling package, Select — the latest word processing package and M-Basic a powerful programming language. Options include dBase 11, Spellguard and CPM programs.

Merlin	£1500	Business	48K	No	Extra	Basic	Centronics	CT Maddison 0993-73145

COMMENT: A single piece micro combining screen, keyboard and twin disk drives in one unit. The Merlin uses the Z80 chip and has a detachable 76 key keyboard, with numeric keypad and 5 programmable special function keys. The matt green screen provides a 64 x 16 line display. The twin disk drives offer from 200K to 1.5MByte capacity. As extras Maddison are working on CPM, am RS-232 interface, hard disk option and special hi-res graphics.
SOFTWARE: The Merlin uses LDOS and is supplied with Microsoft Basic in RTM. LDOS is Tandy's TRS DOS, so you can use the range of TRS-80/Genie software — an extremely wide range.

Powerhouse 2 & 3	£1535-£3220	Business	32-64K	No	No	Basic	RS-232	Powerhouse Micros 0442 48422

COMMENT: Two business micros both with 5" monitor and typewriter style keyboard. The Model 3 includes twin 5¼" floppy disk drives in its specification.
SOFTWARE: Range of specialised software only available.

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File 1 record 1	G.W. Computers	01-636-8210	
File 2 record 1	800,000	5 years	1
File 1 record 2	Lloyds Bank	01-123-4567	
File 2 record 2	10000,000,000,00	100 years	500
File 1 record 3	Selfridges	01-631-4818	
File 2 record 3	100,000,000	98 years	1
File 1 record 4	Debenhams	01-636-1234	
File 2 record 4	120,000,000,00	50 years	50

Actually there doesn't need to be a strict correlation between the same record numbers in different files, and you can also on just one JUMP command go to any record in any of the 3200 records in any of the twelve files and carry on cross-referencing from there onwards.

ONE OF THOUSANDS OF DIFFERENT TASKS ON WHICH THIS PROGRAM MIGHT BE EMPLOYED

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Simply design your file, give its field your words, setup your report mask, and then enter your records. Switch to 'automatic drive' and formulate any task you wish the program to fulfil, the task is stored as a macro. Take a copy of the program on another 'task disk' and from then on, the task disk will function without a single key-stroke. Think of a number of such 'task disks' such as "stock-re-order reports"; "stock-valuation reports"; "analysis"; "patient history analysis"; "research-analysis"; "budgetting-analysis"; "vehicle-location control"; "librarian analysis"; "plus more?"

Previous issues showed examples of "employees-short-list", "garage stock re-order", "sales analysis", "librarian's list", "hospital's patient list".

Here is an example of a "rental file" and a report it might generate:

The record may look like this:
1-record number (413)
2-client (Radio Cars Ltd)
3-date of contract (01.04.81)
4-date last pmt (12.02.82)
5-period/frequency (36 / monthly)
7-amount of pmt (22.50)
8-item type (Taxi-phones)
9-repairs made (faulty microphone – item replaced)
10-cross reference (3.442!C details of full system spec and supplier)

One report might be: Select?? all records where the amount of payments are less than 50 pounds, that were taxi-phones and faults were detected. When found, pick up the cross reference code and look up that record to identify the supplier.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Sord M-23P	£1560-£2060	Business	128K	Yes	Extra	Basic Pips 11 Pascal, Fortran	RS-232	Sord 01-930 4214

COMMENT: A micro small enough to fit in a custom made briefcase. The micro will have Sony type 'micro' floppy disk drives and there is an optional 8 line by 80 character display. Typewriter style keyboard with special function keys. The Sord 23P can produce graphics in 8 colours and the dot resolution is 640 x 200.
SOFTWARE: The M23P is supplied complete with Pips which Sord claim is an easy to learn self-programming system. And for an extra cost of around £50 you can buy SP80 — which is Sords version of CPM.

Research Machines 380Z	£1601-£3347	Home Education Business	32-56K	Extra	Yes	Basic Forth	RS-232 IEEE 488	Research Machines 0865-49866

COMMENT: The RML range has sold largely to schools and colleges with its CPM operating system and wide range of interfaces. It has been included in the Department of Industry Micros in Schools Scheme. The basic micro consists of the typewriter style keyboard with separate disk drives. A wide range of plug-in boards extend the RMLs possibilities. It can be bought complete with monitor and can load programs and data from disks or cassettes. To reduce the cost of an RML outfit, deduct the cost of the drives and load your programs from a cassette recorder.
SOFTWARE: Apart from range of programs available under CPM, RML also supply a catalogue of software from a wide range of independent companies. Currently there are over 75 programs covering education, games, commercial and financial programs and statistics. Prices range from £5 to £80.

Televideo TS1600	From £1629	Business	128K Plus	No	CPM86	Most	RS-232	Encotel 01-680 6040

COMMENT: Televideo's first entry into the 16 bit world, using the 8088 chip. The TV1600 series range from a single work-station right through to a multi-user system with satellite user stations. The basic 16 bit range comprises the computer including monitor and disk drives in a single unit. Options on hard disk storage go to 10Mbytes and more. This 16 bit Televideo can plug into your existing 8 bit system.
SOFTWARE: A limted but increasing number of business programs are becoming available for 16 bit micros covering most fields.

Epson QX-10	£1700	Business	192-256K	No	Com-patible	Most	RS-232C	Epson 01-900-0466

COMMENT: A business machine from the people who brought you the briefcase size HX-20. Using the popular Z80A chip, the system is compatible with CPM. Standard typewriter style keyboard with separate numeric keypad plus special function keys. 12" green screen monitor with non-glare screen and 80 character by 25 line display. 640 x 400 pixels for greater resolution. Twin 5¼" floppy disk drives each 320K. Graphics capability has zoon facility. Up to five extra interface cards can be used to expand the system. Clock and calendar with battery back-up. Designed for first time users.
SOFTWARE: Compatibility with CPM opens the door to an almost unlimited range of programs.

Hewlett Packard HP87	£1739	Business	32-544K	No	Yes	Most	RS-232	Hewlett Packard 03446-3100

COMMENT: Single piece desktop business micro with integral monitor for 24 line display combined with typewriter style keyboard having separate numeric keypad and special function keys. Can be connected to mainframe computers. Program loading and data storage from separate 5¼" floppy disk drives with hard disks available as optional extras.
SOFTWARE: Accepts the Hewlett Packard range of Series 80 software including statistical and engineering packages, programs under CPM, plus Visicalc Plus, Graphics Presentation and Word 80 each £178 and Basic Training pack £68.

Xerox 820 & 820-11	£1750-£2350	Business	64K	No	Yes	Most	RS-232	Rank Xerox Uxbridge 51133

COMMENT: Based on the Z80 chip, the Xerox 820 range is a three part system comprising monitor, keyboard and floppy disk drives. The new 820-11 has a monitor with 80 character display with green on black option. The keyboard is typewriter style with a separate numeric keypad. Though the 820 is supplied with 5¼" drives, 8" drives and hard disks can be used. Provision for communication with other micros making the 820-11 an intelligent terminal.
SOFTWARE: Apart from the range available under CPM, Rank Xerox also have a wide range of application programs in their catalogue.

Digico Price 11	£1790-£5500	Business	64K	No	Yes	Most	RS-232	Digico 04626-78172

COMMENT: Models range from the basic without any drives to a combination of 800K 5¼" floppy disk drive and 5Mbyte hard disk. Extensive facilities for expanding the system to multi-user, multi-terminal use.
SOFTWARE: Apart from packages available under CPM, Digico also produce a range including ones for company sales, company purchase, general accounting, lease, rental and hire purchase, name and address, order entry and invoicing, payroll, stock control, time recording, word processing, integrated business systems, sales administration and bills of quantity.

Apollo	£1795-£1995	Business	64K	No	Yes	Most	RS-232	Videcom 04912-78427

COMMENT: Business computer with adjustable angle monitor built-in and 15" screen. Choice of twin 5¼" floppy disk drives with either double sided/double density or double sided/quad density, a total capacity of 1-2 Mbytes. Keyboard has typewriter style approach with 102 keys with rollover facility. Numeric pad, editing and cursor control keys, Wordstar control keys. This keyboard is detachable. Monitor display 26 lines by either 80 or 132 characters.
SOFTWARE: Use of CPM as the operating system assures a good choice of programs for most applications.

Haywood 9000	£1795	Business	64K	No	Yes	Basic	RS-232C	Haywood Electronics 01-428 0111

COMMENT: Desktop micro computer with detachable keyboard, using twin 5¼" floppy disks mounted alongside the 12" monitor producing an 80 column display. W version available with Winchester hard disk for greater data storage. Plug-on Wordstar keyboard available. Sculptured keyboard with numeric keypad and 35 special function keys.
SOFTWARE: Using CPM as an operating system, the Haywood 9000 has access to plenty of programs from Wordstar to the most sophisticated applications package.

System M-Three	£1795-£4750	Business	64K	No	Yes	Most	RS-232	LSI Computers 04862-23411

COMMENT: British made single piece micro with detachable keyboard. Cabinet houses the 12" green screen monitor and twin disk drives. These disks can be single, double or quad density. Another version of the System Three uses 8" disks and for even more storage you can also use a 10Mbyte Winchester hard disk. The monitor produces an 80 column display with graphics. The keyboard has 109 keys including the standard QWERTY plus editing, cursor control and 24 programmable functions plus a numeric keypad. Looks ugly and is incredibly heavy but with good software it can be a robust workhorse.
SOFTWARE: System M Three uses CPM and the following programs are available from LSI: A modular accounting package, word processing, prospect mailing and the Oasis range of accounting programs.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Superbrain 11	£1800-£4360	Business	64K	No	Yes	Most	RS-232	Icarus 01-485 5574

COMMENT: Single unit housing 12" monitor, twin disk drives and typewriter style keyboard with numeric keypad. Twin Z80 processors for efficient data transfer to other peripherals like printers. Real time battery operated clock. Three versions with 5¼" floppy disk drives of increasing capacity up to £2415. W range replaces one of the 5¼" floppy disk drives with a 5 or 10Mbyte Winchester hard disk.
SOFTWARE: The Superbrain uses the CPM operating system which covers most applications from Wordstar and Spellbinder for world processing to the most specialised use.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Hewlett Packard HP125	£1845-£2690	Business	64K	No	No	Basic	RS-232	Hewlett Packard 03446-3100

COMMENT: The HP125 uses twin 5¼" disk drives to provide 512K of on-line storage. The Model 20 in this series uses 8" disks and other versions are available that include a green screen monitor and thermal printer. Detachable typewriter keyboard with separate numeric keypad and eight user definable keys.
SOFTWARE: Visicalc 125 on 5¼ and 8" £134, Graphics both sizes also at £134. Word 125 available in both versions price £336. Link 125 at £84. Basic 125 £218 and HP125 programming pack £50.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Future FX-20	£1850	Business	128K	No	Yes	Most	RS-232	Future 01-689-4341

COMMENT: A British IBM lookalike and thinkalike, at an extremely attractive price which includes a word processing package. Though the machine uses the 8088 chip just like the IBM PC, the Future runs this chip at 8 Mhx. and that's fast indeed. Monitor can be adjusted for viewing angle providing an 80 column by 25 line display using a high definition 16 by 10 dot matrix for each character. Twin 5¼" floppy disk drives with total capacity of 1.6Mbytes. Part of a complete Future computers system. Typewriter style keyboard with special function keys and numeric keypad.
SOFTWARE: Spellstar – the word processing package is supplied free of charge. Apart from the increasing range of packages available under MS/DOS, an 8 bit emulator for CPM will be available opening the door to over 2000 programs.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Grundy 8202/8222	£1850-£4500	Business	64-256K	No	Yes	Most	RS-232C	Micro Memory Systems 0635-40405

COMMENT: The Grundy is a two piece computer with twin disk drives and a 12" monitor housed in a single cabinet. The typewriter style keyboard is separately connected by a short lead. This keyboard has numeric keypad. Both the drives are 5¼" of 0.5Mbyte capacity. The 12" green screen monitor shows an 80 column display. The model 8222 replaces the twin floppy disks, with one floppy and one Winchester hard disk which can be 6, 12 or 18Mbyte depending on the application. Security lock to prevent unauthorised use.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Sord M23 Mark 1/111/V	£1870-£3776	Business	128K	Yes	No	CBasic	RS-232C	Sord 01-930 4214

COMMENT: Three business micro systems sharing the choice of monochrome or colour monitors and only differing in their choice of disk drives. The Mark 1 uses the micro-floppy disk and costs £1870 with BW monitor, £2266 with colour. Mark 111 uses the 5¼" floppy disk drive costing the same price as the Mark 1. The Mark V uses 8" floppy disks and costs £3380 with BW monitor and £3776 with colour. All models have twin disk drives, typewriter style keyboards and also use Sords own graphics language SGL. The SGL plugs in with a cartridge having its own 64K RAM making a total of 192K.
SOFTWARE: You can create your own programs with the Sord PIPS self programming language. Sord also produce a range of plug-in cartridges so you can use the M23 without floppy disks. First programs will be PIPS, Basic and a word processing package.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Comart Communicator CP range	£1895-£2495	Business	64K	No	Yes	Most	RS-232	Comart 0480 215005

COMMENT: Basic computer, keyboard and monitor extra. Built-in expandability including being ready for Prestel and Viewdata. Twin 5¼" floppy disk drives each with 390K capacity. Seven expansion slots for growth. CP200 has higher capacity disks at £2495.
SOFTWARE: Database management, word processing, production and stock control, business systems and financial planning. CAP Application software for: invoicing, sales, purchase, nominal ledger, payroll, inventory control. Plus the range of programs available under CPM.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Triumph Adler Alphatronic P	£1895-£2935	Business	From 48K	No	Yes	Basic, Cobol Fortran	RS-232	Triumph Adler 01-250 1717

COMMENT: The Alphatronic range were first introduced as word processors, with the other facilities added afterwards. The P2 is sold as a complete system including monitor and printer at around £2935. There's a typewriter style keyboard and twin 5¼" floppy disk drives. The P3 is sold as the Alphatronic Micro and has provision for using 8 or 16 bit software.
SOFTWARE: Wide range of programs available under CPM – plus an increasing range offered by Adler themselves.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Caltext 1/1A to 3/3A	£1899-£3845	Business	64-256K	No	Yes	Most	RS-232C	Computer Ancillaries Egham 36455

COMMENT: Range of single piece desktop business micros differing only in their disk capacity. All have detachable typewriter style keyboards and 12" monitors with 890 column display. The keyboards also have numeric keypads, plus special function keys for word processing. There is also provision for link-up with IBM mainframe computers. The Model 1 is 64K and the 1A is 256K. The 2 & 2A replaces one of the 5¼" floppy disks with a 5Mbyte Winchester and the 3 & 3A replace the 5Mbyte Winchester with a 10Mbyte hard disk.
SOFTWARE: Apart from the wide range of programs available with CPM Computer Ancillaries also supply the range of Oasis business software and Microplan.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Globe 101	£1900	Business	64K	No	Yes	Most	RS-232	Globe Business Machines 0934-835222

COMMENT: A single piece micro with special function keys that makes it ideal for using Wordstar. 12" green screen monitor with 80 column display and 24 lines length. Twin 5¼" disk drives with capacity of 1Mbyte unformatted. 100 keys on typewriter style keyboard with numeric keypad, plus special function keys. Provision for upgrading to the Globe 102 with twin 8" disks and to Globe 103 with Winchester hard disk.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Seed System One range	£1900-£2480	Business	From 32K	No	No	Basic, Cobol Assembler	RS-232	Strumech 054-33-78151

COMMENT: Business system based on the 6809 chip. There's a choice of either twin 5¼" drives or twin 8" drives. the System One is expandable to 56K and up to 8 input/output devices. Double headed version of the System One available. This was the first system of its type based on the 6809 chip.
SOFTWARE: Wide range of system software including text editor, processor, assemblers and compilers. Business packages available include stock control, sales and purchase ledger and a mailing program. You have the choice of separate modules or a fully interactive package.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Seed System 19	£1900-£4895	Business	32K-1MB	No	No	Basic, Cobol Pascal	RS-232	Strumech 054-33-78151

COMMENT: Uses the Motorola 6809 processor expandable from 32K to 1Mbyte. Choice of single user operating systems or the OS-9 multi-user/multi tasking system. Variety of storage from 5¼" floppy disks through 8" floppies to 10Mbyte hard disks. Monitor and disk drives extra.
SOFTWARE: Under the Microware OS-9 and SSB DOS 69 software there are a range of programs including Styleograph Word Processor (£130).

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Hewlett Packard HP85A	£1917	Business	16-32K	No	No	Basic	RS-232	Hewlett Packard 03446-3100

COMMENT: Single piece desktop unit with built-in 5" monitor with 32 character display and thermal moving head printer. Typewriter style keyboard with separate numeric keypad and plug-in tape cartridges. Plug-on modules are also available for extending the memory.
SOFTWARE: Special Application packs are available for the HP80 series micros. They include general statistics, finance, application circuit analysis, linear programming, wave form analysis and statistical programs. All costing £68. The HP85A also has Visicalc Plus, File Manager, and Graphics Presentation as three of a range of programs all costing around £140.

Toshiba T200	£1950	Business	64K	Extra	Extra	Most	RS-232	Office International Sunbury 85666

COMMENT: Two part business system with the monitor and disk drives in a single package with a detachable keyboard. 12" green screen monitor with 80 character by 25 line display. Twin 5¼" floppy disk drives each 280K. Typewriter style keyboard with separate numeric keypad and special function keys. Also available in outfit complete with choice of printer.
SOFTWARE: Apart from the wide range available under the optional CPM, Office International have their own range of business programs covering most applications.

Zenith Z100 range	£1973-£2467	Business	128-768K	Yes	Yes	Most	RS-232	Zenith 0452-29451

COMMENT: Single piece micro with both 8 and 16 bit micro processors, incorporates single 5¼" disk drive with 320K capacity. High-resolution graphics with facilities for resolution of 320,000 dots normally found only with dedicated graphics terminals. Multi-user capability and compatible with mainframe computers. Another version has twin disk drives and costs £2453. The 120-22 Zenith is a single piece system that incorporates the monitor and twin 5¼" drives in a single cabinet. The monitor produces an 80 column display. The 120-22 costs £2467.
SOFTWARE: Apart from the vast range of programs available under CPM and the newer ones under CPM 86, Zenith also supply their own electronic spreadsheet costing £135.

Transtec BC2	£1975-£2400	Business	64K	No	Yes	Most	RS-232	Transtec 0272-277462

COMMENT: Single unit computer with all three components, monitor, twin disk drives and keyboard housed in a single cabinet. 12" green screen monitor with 80 column display. Typewriter style keyboard with eight way cursor control, nine special function keys and numeric keypad. Capacity of 5¼" disk drives 800K. Eight multi-level expansion connectors. The outfit comprises the BC2 plus a choice of printer depending on the package chosen. The Olivetti DM5050 print head matrix printer operating at 100 characters per second is used for all the packages apart from word processing. The word processing package uses the Smith Corona daisy wheel printer.
SOFTWARE: Transtec financial package comprising BC2, Olivetti printer and Calcstar £1975. Total Database includes the same hardware plus the Datastar set of programs £1990. Transtec word processing package includes the BC2, Smith Corona daisy wheel printer and word star, £1990. Transtec total accounting package including the BC2, Olivetti printer and Business Desk a fully integrated accounting software suite £2400.

Philips P2000	£1990	Business	16-48K	Yes	No	Basic	Other	Philips 01-580 6633

COMMENT: Business micro that can run programs from cartridges or floppy disks and can accept data from cassettes. 12" green screen monitor with twin 5¼" floppy disk drives. 80 column display shown on the monitor with full colour graphics. The P2000 has slots for insertion of program cartridges and a special slot for mini-cassettes which can hold up to 39,000 characters per side. Typewriter style keyboard with separate numeric keypad and special function keys.
SOFTWARE: Range of special programs covering Payroll, nominal ledger, purchase ledger, stock recording, sales ledger and analysis ledger. Prices of individual programs averages £150. A special word processing package costs £230, while the BIS – Information System, has just been launched which has a universal application from graphics to moving effects, set up announcements and can be used for presentations and training. Price on request.

CAL PC	£1995	Business	128K	No	Yes	Most	RS-232	Computer Ancillaries Egham 36455

COMMENT: Another British IBM lookalike with the extra feature of including a Z80 processor so that 8 bit programs can be run until large numbers of 16 bit programs become available. So it's a dual 8-16 bit machine around the same price range as the Future FX-20, without any software included in the price. 80 column display, typewriter style keyboard with numeric keypad and special function keys. Versions to be available that incorporates hard disks replacing one of the floppy disks.
SOFTWARE: Add the vast choice of CPM programs to the increasing number for the IBM PC and there's an ample choice for people buying the CAL PC.

TMK 320/330	£1995-£3195	Business	64K	No	Yes	Most	RS-232	Peripheral Hardware 021-745 3033

COMMENT: Single piece units from Nippon Univac, sharing the features of typewriter style keyboard and numeric keypad. Each has a green screen monitor and 4K of shadow ROM for start-up hardware diagnostics. The keyboard also has 22 programmable keys. Twin 8085 processors are used allowing separate processing of input and output data. The TMK 320 uses twin 5¼" floppy disk drives mounted horizontally, while the TMK 330 has twin 8" drives mounted vertically.
SOFTWARE: Apart from the range of software under CPM, there is also a range of Nippon Univac software available from Peripheral Hardware.

Director System	£1999	Business	64K	No	Yes	Most	RS-232C	Anglotech Slough 74201

COMMENT: Desktop micro with built-in 7" monitor and twin double sided, double density 5¼" floppy disk drives and detachable keyboard. Can also linked to Anglotech hard disk system. 16 bit video RAM allows the system to be Prestel compatible.

£2,000-£3,000

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Wang Professional	From £2000	Business	128-640K	No	Yes	Basic, Cobol Fortran, Pascal	RS-232	Wang 01-560-4151

COMMENT: True 16 bit machine using the 8086 chip. Self-test at power on, with parity checking. Choice of single or dual 5" disk drives. 360K per drive. Optional 5 Mbyte hard disk. Green on black monitor producing 80 column display. Detachable keyboard with 101 key unit, 16 programmable function keys, numeric keypad and cursor control keys. Work station emulation.
SOFTWARE: PC Multiplan and Wang PC Word processing plus the increasing range of programs available under MS-DOS. And the CPM range made available through the CPM80 emulation.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
IBM Personal Computer	From £2080	Business Education	64-256K	Extra	Extra	Basic, Cobol Fortran Pascal	RS-232	IBM UK 0705-694941

COMMENT: Now officially available in the UK, the IBM Personal Computer is destined to be a mass seller in 1983 due to the reputation of the letters IBM. Available in its smallest system with a single disk drive of 160K. With provision for using drives with twice that capacity. Using the 8088 chip, the IBM is a three part system with monitor, processor and keyboard. 80 character green screen monitor with adjustable angle typewriter style keyboard with separate numeric keypad. Provision for colour graphics facility. Diagnostic system checks machine automatically as soon as it's turned on. Now officially here, the competition for the lookalikes will be even more intense.
SOFTWARE: As increasing number of programs are available for MS-DOS and CPM86. Popular programs already available to fit the IBM PC include Micromodeller, Visicalc, Wordstar and TIM III. Systemics and Tab products will also be available.

Haywood 3000	£2100	Busines	64K	No	Yes	Most	RS-232C	Haywood Electronics 01-428 0111

COMMENT: Single board computer with separate disk drive unit and monitor. Programmable counter/timer with four channels. The Twin disk drive unit takes 5¼" disks which have a capacity of 350K per drive. This equals 130 pages of A4 on each disk.
SOFTWARE: Micromass business programs are fully integrated through stock control, invoicing, sales and purchase ledger. The entries, payroll, management accounts, P11D through to trial balance complete this powerful business system. Plug CP/M.

System M-Four	£2150	Business	128-256K	No	Yes	Most	RS-232	LSI Computers 04862 23411

COMMENT: Two systems in one with the 8088 16 bit chip and the Z80 8 bit chip, offering the choice of either type of operation. Single unit with detachable keyboard. Range of disk drive options from 5¼" floppies to hard disks. Up to three concurrent users. 12" monitor with green screen, graphics facility plus 80 column display.
SOFTWARE: The System M-Four uses five operating systems MSDOS, CPM, CPM86, MPM86 and LSI NET for wide range of programs.

North Star Advantage	£2195	Business	64K	No	Yes	Basic Fortran Cobol	RS-232C	Comart 0480 215005 Trader Computers 01-328 3484

COMMENT: Desktop machine with 12" green screen monitor, twin 5¼" floppy disk drives and Selectric style keyboard in a single cabinet. Monitor offers choice of 80 character display or bit-mapped graphics from simple line charts and bar charts to three dimensional charts nd complex three dimensional forms. Typewriter style keyboard has 87 keys including 15 special functions and 14 key numeric keypad. Versions available with Winchester hard disk and upgrade to 16 bit (£345).
SOFTWARE: North Star Application Support Orogram Operating system provides sequential and random file management for North Star packages:- ACCPAC order entry/invoices, accounts receivable and payable, general ledger, Northword a word processing package. Mail manager for mailing list management and Info management for Data management. Plus CPM.

Saracen	£2200	Business	32K	No	Yes	Most	RS-232	Bytronix 0252-726814

COMMENT: Using the popular Z80 processor the Saracen comes with two 5¼" floppy disk drives and 8" disk drives available as an option.

Pasca 640	£2200	Business	64K	No	Yes	Most	RS-232C	Westrex 01-578 0950

COMMENT: Single unit micro with twin disk drives, 8" IBM format, green screen monitor and keyboard with separate numeric keypad, all housed in a single cabinet. Typewriter style keyboard with 18 special function keys for user defined operations or CPM control sequences.

Acclaim	£2225-£4450	Business Education	64K	Extra	Extra	Most	RS-232	Country Computers 0527-29826

COMMENT: If you wanted an Apple 11 Plus, but weren't satisfied with the 40 column display, extra monitor and limited disk storage, the Acclaim is the answer. In a single cabinet you have a green screen monitor and a choice of single 5¼" disk drive, twin floppies right up to Winchester hard disks. The keyboard is detachable and has a separate numeric keypad, plus 12 programmable function keys. The monitor gives you the choice of 40 or 80 character displays, so you have all the Apple compatibility plus extra features in a single unit.
SOFTWARE: The Acclaim accepts all the Apple software, so you have a choice that's virtually unlimited, plus when you add the Z80 softcard CPM packages become available.

Quantum 2000	From £2250	Business	64K	No	Yes	Most	RS-232 Centronics	Quantum Computer Systems 0532-458877

COMMENT: Two part British made computer system which has the green screen monitor mounted above the typewriter style keyboard. The disk drive unit has three drives built-in — unusual as most have just the two drives — but can be useful for business use. 2.4Mbyte of formatted storage capacity. Monitor shows 80 columns by 25 lines format and 160 x 75 pixel graphics.

Sanyo MBC 2000/3000	£2250-£3500	Business	64K	No	Com-patible	Basic Pascal Cobol Fortran	RS-232	Sanyo Watford 46363

COMMENT: Two desk-top single piece business micros both using the 12" green screen monitor and having typewriter style keyboards with numeric keypads and special function keys. The MBC-2000 has twin 5¼" floppy disk drives and the MBC-3000 has twin 8" floppy disk drives. Commercially available Multi-bus cards can be used for further expansion.

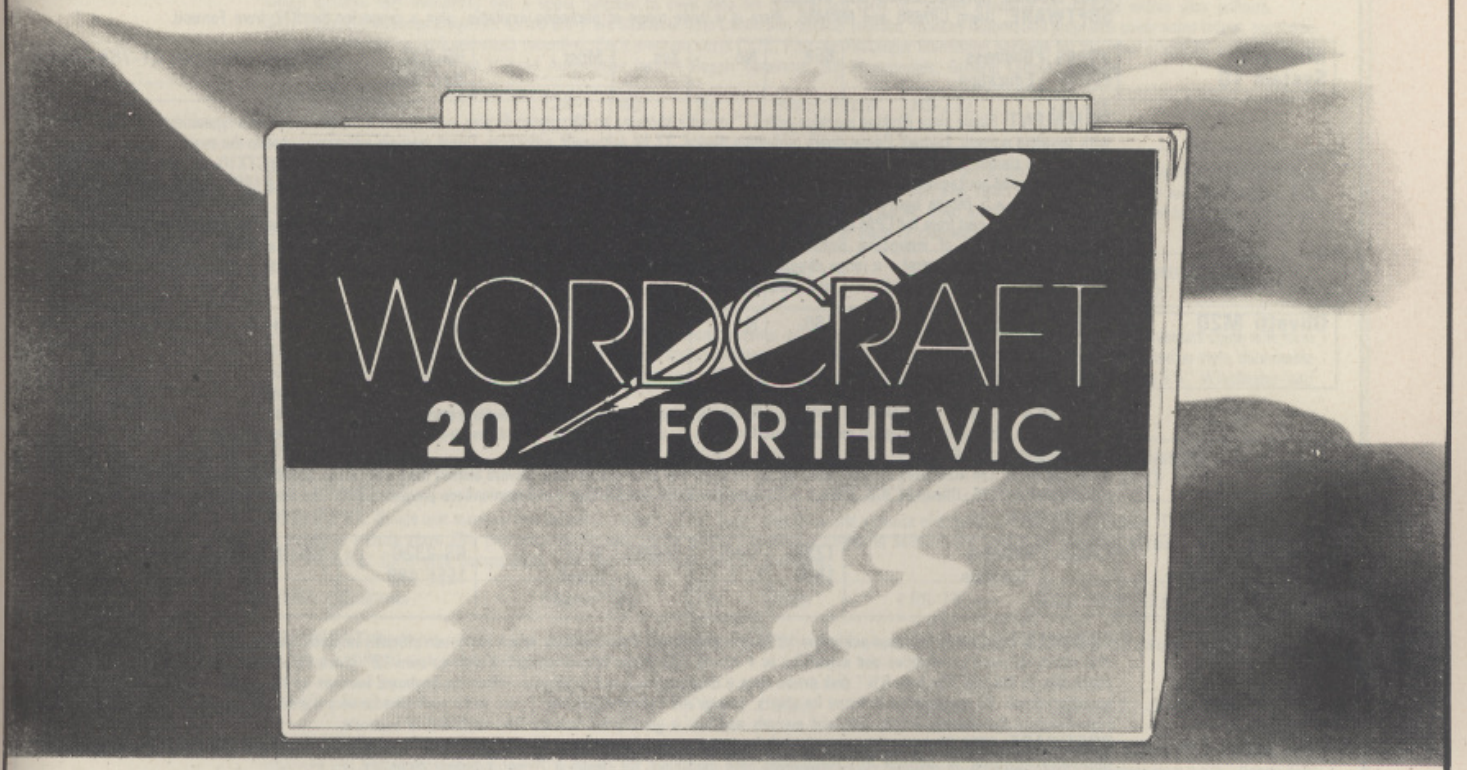
Husky	£2280	Business	32-144K	No	Yes	-	RS-232	Datec 061-941 2361

COMMENT: Business micro with built-in monitor producing 32 column display. Full typewriter style keyboard with dual function keys and numeric keypad. Disk drives extra.
SOFTWARE: Using CPM there can be an extensive range of programs available though certain software will be very difficult to use with 32 column display.

Cromenco System 1/2	£2295-£2620	Business Education	64-512K	Yes	Com-patible	Most	RS-232	Comart 0480 215005

COMMENT: Desktop system needs keyboard and monitor are essential extras. 8 slots of expansion. Twin 5¼" floppy disk drives. The System 2 is designed for rack mounting and has 17 slots for expansion. Both micros produce colour graphics using the SD1 interface, with 16 shades of 256 colour ranges, giving a total choice of 4096.
SOFTWARE: Packages available for Database management, word processing, CAP applications, sales ledger, invoicing, purchase and nominal ledger, payroll and inventory control. Plus CPM.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Eagle II-III-IV	£2350 - £4195	Business	64K	No	Yes	CBasic	RS-232	Mediatech 01-903 4372

COMMENT: Range of single unit business micro computers with 12" monitor showing 80 column display, twin 5¼" floppy disk drives and a keyboard with separate numeric keypad. The models differ only in their storage capacity with the greatest storage available on the Eagle IV.
SOFTWARE: All the Eagle range are sold as complete packages with software. You have the choice of an Office Management configuration which includes Spellbinder the word processing package, an electronic spreadsheet, Ultracalc and MBasic. While the business configuration also has Spellbinder plus the Accounting Plug suite of programs. Prices range from the £2350 for the office management system with the Eagle II to the Eagle IV at £4195 also with the office system. Accounting packages are priced between £2350 and £4195 depending on the disk capacity.

DEC Rainbow 100	£2359	Business Education	64-256K	Extra	Yes	Most	RS-232	Digital Equipment 0256-59200

COMMENT: The Rainbow uses the Z80 and 8088 chips, so you have a dual 8-16 bit machine which automatically senses the type of program and selects the correct processor. Complete system including the disk drives, monitor and typewriter style keyboard. There are two 5" disk drives, and optional Winchester hard disks. The 12" monitor produces an image 80 columns wide with an optional colour monitor available. The ergonomically designed keyboard has special function keys and a numeric keypad.
SOFTWARE: Using a combination of CPM and CPM 86, you have a wide choice of 2000 programs plus the ones available through the DEC catalogue. So if you want a machine to use for the future, the DEC Rainbow is a good choice.

Ferranti PT7 Model 265	£2395	Business	128-896K	Extra	Yes	Basic, Cobol Pascal	RS-232	Ferranti 061-499-3355

COMMENT: This machine using the 8086 chip is the Ferranti version of the PT7 range of IBM and ICL compatible terminals. With twin 320K 5¼" floppy disk drives and an 800 x 400 bit mapped graphics display, the PT7 is extremely competitively priced with the Sirius I, though less disk storage. Typewriter style keyboard with special function keys and numeric keypad. Offers multi-tasking foreground/background operation. Higher capicity disk drives available. Optional printers also available.
SOFTWARE: Using CPM86 and MPM86, there is a wide range of packages available, plus a range for the PT7 from Ferranti.

Millbank System 10	£2395 - £2895	Business Education	65K	No	Yes	Most	RS-232 IEEE 488	Millbank Computers 01-788 1083

COMMENT: Single piece desktop machine with 12" monitor showing an 80 column display, with twin 5¼" disk drives and a typewriter style keyboard with separate numeric keypad. Power down protection device. 32 bit arithmetic processor. Direct memory addressing makes the system 10 faster than other micros claiming 4 MHZ processing speed. Can be used with the Millbank CTX10 Telex system. Using this system the CTX10 can be combined with other CPM based packages to offer a simultaneous word processing, business computing/telex combination. The CTX costs £1600. The System 10 is also available with a 5 Mbyte hard disk.
SOFTWARE: Apart from the CPM based software that can be used with the System 10, Millbank have these specialised packages: - Financial Director — a complete suite of interactive British Accounting Software, R.E.A.M.I.S. — Residential estate agents management information system, Instrumention/Process control — a range of scientific/industrial packages for specialist users, Solicitors — User specific data retrieval/word processing package utilising standard legal terms and phraseology.

Olivetti M20	£2395	Business Education	160-500K	No	Extra	Basic Pascal Fortran	RS-232 1EEE 488	Olivetti 01-785 6666

COMMENT: True 16 bit micro with twin 5¼" disk drives above an Olivetti typewriter style keyboard which has a separate numeric keypad. Monitor supplied, fully adjustable, in green or monochrome. Provision for using Winchester hard disks up to 11 Mbytes. Full graphics facility outside RAM. Wide range of printers available.
SOFTWARE: The M20 uses MSDOS and PEKOS, CPM 86 will be available soon. Olivetti already have a full range of accounting packages for the M20, plus Multiplan £175, Oliword £300, Oliterm a TTL emulator £150 and Oli Com a communications program £300. The Olivetti catalogue contains around 100 programs.

Sirius 1	£2395	Business Education	128K-1MB	Extra	CPM86	Basic Cobol Fortran	RS-232C 1EEE 488	ACT 021-501 2284

COMMENT: Certainly the most publicised 16 bit computer apart from the IBM, which isn't even officially imported yet by IBM. Using the Intel 8088 chip offers far more possibilities and expansion to 1 Mbyte. The Sirius is self-contained with its own 12" green screen monitor showing 80 or 132 characters to the line. The twin 5¼" disk drives have a total capacity of 1.2 Mbytes. While the keyboard features an IBM style nucleus with separate numeric keypad. Hi-res graphics included for charts, graphs and half tone pictures. Codec audio controller for verbal prompts and operating instructions. Ergonomically the monitor screen tilts and swivels and has a glare proof screen. The keyboard is separate.
SOFTWARE: CPM 86 is the latest version of the popular operating system. Already you have Micromodeller, Supercalc, Wordstar, Spellstar and Mailmerge available. In addition ACT themselves have developed the range of Pulsar business programs.

Victor 9000	£2395	Business	128-896K	No	CPM86	Basic Cobol Fortran Pascal	RS-232	DRG Business Machines 0934 415 398

COMMENT: See Sirius. Victor Business Machines produce the Sirius and Victor 9000 computers. Victor have the sole rights for the machine under this name in North America and the UK. Feature for feature the hardware is identical apart from the name.
SOFTWARE: Special software will be available under the Victor name — Victor Writer and Victor Calc and companies like Pegasus and Peachtree will also be supplying packages for this machine. Plus all the software that is available for the Sirius I and of course vice-versa.

ICL Models 10, 30, 31, 32	£2395-£5250	Business	64-256K	No	Yes	Most	RS-232C	Trader Point 01-788 7272

COMMENT: Range of micros ranging from the twin 5¼" floppy disk drives to hard disks. Available without kehyboard or monitor or as system.
SOFTWARE: CPM, plus range from ICL.

Apple 111	£2418	Business Education	128-256K	Extra	No	Basic Pascal Cobol Assembler	RS-232	Apple UK 0442-60244

COMMENT: Big brother to the best selling Apple 11 Plus, the Apple 111 hasn't had the same success. Having a typewriter style keyboard and separate numeric keypad, the Apple 111 uses a new type of operating system known as SOS — Sophisticated operating system. There is one disk drive built-in with provision for another three to be used. A special hard disk known as Profile gives a storage capacity of 5 MBytes and up to four can be used with the Apple 111. Unlike the Apple 11, the model 111 provides an 80 column display on a special green screen monitor supplies as part of the system. There is a special emulation mode to let you use Apple 11 software on this new model, so the Apple 111 offers the features of a larger machine plus access t the best selling packages for the model 11.
SOFTWARE: Apart from the vast supply of Apple 11 software that can be used in the emulation mode, there is a limited range specifically for the Apple 111.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Altos 5-15 & 5-50 range	£2425-£4950	Business	192K	No	Com-patible	Most	RS-232C	Logitek 0257 426644

COMMENT: Single board computer requiring keyboard and monitor for use. Suplied with two double sided 5¼" floppy disk drives in single cabinet. With the 5-50 range one of the floppy disk drives is replaced with a 5¼" Winchester hard disk. Up to three users can use the system.
SOFTWARE: Logitek supply the range of Peachtree software for the Altos range. These programs cover — sales ledger, inventory management, payroll, nominal ledger, purchase ledger. Plus the extensive range of programs available under CPM. There is also the MPM operating system used by Altos the multi-tasking/multi-user version of CPM.

Logica VTS	£2499	Business	64-512K	No	Yes86	Basic, Pascal Cobol	RS-232	Logica 01-637-5171

COMMENT: Using the true 8086 chip, the VTS is a three part system. The monitor has a 15" screen and bronze display. Twin 5¼" floppy disk drives giving 500K storage. Typewriter style keyboard with numeric keypad and 12 programmable special function keys. The 15" monitor matches the height ergonomic standards set by the Logica word processor.
SOFTWARE: An increasing amount of programs are becoming available under CPM86.

Canon CX-1	£2500	Business	64-128K	No	No	Basic, Cobol Assembler	RS-232C	Canon 01-680-7700

COMMENT: Single unit micro comprising 12" green screen monitor, twin 5¼" floppy disk drives and typewriter style keyboard with separate numeric keypad. Each disk has information storage of 320K and a maximum of 128 programs can be stored on each disk. Uses the Canon MCX operating system, which includes text formatting and a spool function to save data for printing out later. 8" drives available as optional extras plus printers.
SOFTWARE: Special programs for the CX-1 are available from Canon and outside sources. Holland Automation programs cover sales ledger, purchase and general ledger, payroll and stock recording. Each program costs £275. Plus the Filekeeper foundation package for the other programs costing £135. Other programs available from Holland Automation include Report Generator, Bill of materials, General Ledger, Budgets.

Sage II	£2500	Business	128-512K	No	No	Basic, Pascal Fortran	RS-232	TDI Ltd.

COMMENT: One of the increasing number of micros using the 68000 16 bit chip combining the processor and twin disk drives in a single package.
SOFTWARE: Sage uses the P-system for an operating system using UCSD. It is claimed that over 1000 application packages will be available. But currently only a few business packages are available and many were first written for the Apple. Used on the Sage they are claimed to be up to 14 times faster. In comparison with 8088 machines like the IBM Personal and Sirius, the Sage is claimed to be 4 times faster.

Tele Video TS800 range	£2535-£4788	Business	64K	No	Yes	Most	RS-232	Hotel Microsystems 01-328 8737

COMMENT: The TS801 and TS806 are basically similar micro systems, with the TS806 having the multi-tasking facility. The systems come with twin 5¼" floppy disk systems which are integral with the green screen monitor which shows an 80 column display. The keyboard is typewriter style, detachable with numeric keypad and special function keys. Further versions of the Tele Video range replace one of the floppy disk drives with a 5¼" Winchester hard disk for greater storage capacity.
SOFTWARE: CPM means a wide choice of programs including Wordstar.

Minstrel	£2550-£3200	Business	64K	No	Yes	Most	RS-232	Hotel Microsystems 01-328 8737

COMMENT: Single unit machine that incorporates both a 5¼" floppy disk drive and a choice of either 5 or 20MByte hard disks. The options which will be available include slave Z80 processor cards, and 16 bit cards. You have a choice of MINOS and OASIS as operating systems apart from CPM.
SOFTWARE: CPM plus compatibility with the North Star Horizon Software.

Oscar	£2560	Business	64K	No	Yes	Most	RS-232	IDS 0908-313997

COMMENT: Another business micro system complete with twin 5¼" floppy disk drives and a 12" monitor providing an 80 column display. Provision for using additional disk capacity for more data storage.

Olympia Boss	£2645	Business	64K	No	Yes	Most	Parallel	Olympia 01-262-6788

COMMENT: From the business equipment manufacturer Olympia, the Boss is their first real micro computer system. With a full typewriter style keyboard and 12" monitor showing an 80 column x 28 line display, the Boss has a fairly standard specification loading programs from a 5¼" floppy disk drive. There is provision for adding a hard disk when required.

DEC Professional 325	£2677	Business Education	256K	Extra	No	Most	RS-232	Digital Equipment 0256-59200

COMMENT: Three piece professional system compatible with the mainframe PDP-11/23 series. Supplied complete with 12" monochrome monitor and dual 5¼" double density floppy disk drives. Bit mapped graphics.
SOFTWARE: As the PDP-11/23 is popular, both DEC and independents are converting programs for use with this micro.

TRS-80 Model 11	£2699	Business Education	64K	No	No	Basic	RS-232	Tandy 0922-648181

COMMENT: Desktop machine with single 8" drive and 12" monitor. He-res graphics option £399.
SOFTWARE: Vast range of programs of all types, in line with the TRS-80 being the largest selling micro until the ZX81 came along.

ITT 3030	£2700	Business Education	64-256K	Extra	Yes	Most	RS-232 1EEE 488	ITT 0268-3040

COMMENT: Three part system with the twin disk drives (560 bytes). Provision for using IBM format 8" disks and hard disks. Provision for various character set, 16 colours in graphics mode, background colour and hi-res graphics.
SOFTWARE: CPM plus ITT's own range of business software.

Sharp PC3201	£2750	Business	64K	No	Extra	Basic	Other	Sharp 061-205-2333

COMMENT: Unlike most micros, this is supplied as a complete system including the monitor, disk drives and a printer. Plus an electronic spreadsheet. So you really can plug-in and use the system as soon as its on your premises. The 12" green screen monitor produces an 80 character display including graphics. The printer is marked Sharp, but bears a very close family resemblance to the Epson MX80 range.
SOFTWARE: There are over 70 business programs covering most of the popular subjects plus specialised programs for the wholsesale fruit market, coin machine accounting, farmers payroll, insurance broking and surveyors. With the addition of CPM, another 2000 packages are available from Wordstar to the most sophisticated and specialised programs.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Toshiba T-100	£2750	Business	64K	Yes	Yes	Most	RS-232	Office International Sunbury 85666

COMMENT: Complete system including a colour monitor and 80 column printer. Typewriter style keyboard with numeric keypad and special function keys. Colour monitor producing 80 characters by 25 lines or 36 characters by 24 line display. In other modes provides graphics and text 160 x 100 and 640 x 200 pixels. Dual disk drives each 254K formatted. 80 column dot matrix printer including graphics facility included in the outfit price.
SOFTWARE: Use of CPM as the operating system assures a wide range of packages for most users.

Torch	£2795	Business	96K	Yes	Com-patible	Most	RS-232	Torch Computers 0223 -841000

COMMENT: Monitor shows colour display plus wide range of graphics facilities. Twin 5¼" disk drives, double density. Combination of 6502 and Z80 processors for flexibility. Handles communications via Teletext, dial up, telex, Econet and the RS-232 as standard. The basic board from the BBC micro forms the base for the Torch micro, plus all the added features making an extremely advanced micro especially for sending information locally or worldwide. A complete screen of information can be sent in ten seconds. Plus hard disk options.
SOFTWARE: CPM plus Torchcalc, electronic mailing, secretary's aid and integrated accounting packages. Edword is Torch's new word processing package integrated with the communications software. It enables letters to be typed, corrected, edited and then automatically sent along a dial-up line to its destination. True electronic mail.

Samurai	£2795	Business	128K-1MB	No	CPM86	Basic, Cobol Fortran	RS-232C	Micro Networks 01-839 3701

COMMENT: Single piece of business micro using the 8086 chip having a 12" monitor with 80 column screen display, twin 8" floppy disk drives, double sided, double density. Typewriter style keyboard, detachable with numeric keypad.
SOFTWARE: There's an increasing amount of programs for micros using CPM86 and MSDOS.

Columbia	£2800	Business Education	128K-IBM	No Extra	CPM86	Most	RS-232C	Icarus 01-485 5574

COMMENT: A 16 bit machine looking just like an IBM Personal Computer, with full compatibility of IBM PC Software and hardware. 12" green screen monitor, twin 320K 5¼" floppy disks and Winchester hard disk interface. IBM compatible keyboard with 83 keys, full numeric pad and 10 special function keys.
SOFTWARE: CPM 86, the latest version of the popular operating system already has Micromodeller, Supercalc, Wordstar, Spellstar and Mailmerge. The software for the IBM Personal Computer is compatible with the Columbia. Plus the Pulsar range of business programs which cover sales and purchase ledger, analysis and product management reports plus nominal ledger.

Compucase	£2800	Business	64K	No	Yes	Most	RS-232	Advanced Software Technology 01-330-0764

COMMENT: Compucase must be an abbreviation for computer in a case. Using gas plasma technology, the Compucase has twin 8085 processors and 8Mbytes of disk storage. Typewriter style keyboard and built-in monitor with display 40 characters by 12 lines, housed in the lid. The system is completed by an 80 column printer. All housed in a briefcase measuring just 13 x 18 x 5.5".
SOFTWARE: Use of CPM as the operating system assures a wide range of packages for most requirements.

Hitachi MB 16001	£2800-£3500	Business	128-384K	Yes	No	Basic, Cobol Fortran, Pascal Assembler	RS-232C	Hitachi 01-848-8787

COMMENT: 16 bit business micro using the 8088 chip which is unusual as its fitted with a colour monitor as standard. Detachable typewriter style keyboard with numeric keypad and special function keys. Large capacity video RAM provides 640 x 400 dot graphic resolution in 8 colours. Text and graphics can be overlaid. Twin 5¼" floppy disk drives, double sided, double density. t slots for expansion.
SOFTWARE: An increasing amount of well known packages are available under MS-DOS.

Fox	£2900	Business	64K	No	Yes	Most	RS-232	Digital Micro Systems 0734-343885

COMMENT: Single unit micro, with integral 9" monitor and twin 5¼" floppy disks (1.2Mbytes). Can work as workstation in an area network.
SOFTWARE: CPM compatible so range of programs available.

Tycom 12 Microframe	£2900	Business	128K	Extra	Extra	Most	RS-232	Tycom Corporation 01-583-2255

COMMENT: British built micro claimed to be future proof due to use of VBC — Versatile Base Bus Concept, where the computer processor is not considered to be the centre of a system — but like a peripheral like a disk drive. So extra processors can be plugged in including their extra memory space and operating systems. The System 12 has its own VRTX executive operating system and 128K of RAM. The twin 5¼" floppy disk drives each have a 600K capacity or 1 floppy and a Winchester hard disk. Typewriter style keyboard with special function keys and numeric keypad. Extra boards available for Z80 processors and 6800 processor. The Model 12 uses the 8088 processor.
SOFTWARE: With the choice of processor there should always be a wide selection of packages available for the Tycom range.

Stratos	£2950	Business	64K	No	Yes	Most	RS-232	Phoenix Systems 061-440 0739

COMMENT: The Strtos is a business system which comprises a 12" monitor, twin double sided, double density 8" disk drives and a typewriter style keyboard which has a separate numeric keypad. The VDU is the ADDS Viewpoint with detachable keyboard. Disk capacity 2Mbytes. Provision for multi-user x capacity up to 16 on-line users.
SOFTWARE: Use of CPM 2.2 assures a wide range of programs for the Stratos including specialised packages from Phoenix Systems.

Equinox 5000SX & 8000SX range	£2950-£4250	Business Education 64K	No	Yes	Most	Other		Equinox 01-739 2387

COMMENT: System selected by the government computer advisory service for use in government departments. Highly expandable. The 5000SX is the single user system using double density, double sided 5¼" disk drives and the Viewpoint VDU. The 8000SX is the multi-user version of this Equinox system.
SOFTWARE: CPM offers a wide range of programs including Wordstar. There is also DOS available which lets you load programs faster and also process filer quicker.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Vector V4 20/30	£2995-£3995	Business	128-256K	Yes	Yes	Most	RS-232	Almarc Data Systems 0602-52657

COMMENT: The Vector V4 is an 8/16 bit computer using the Z80 and 8088 chips. You have the advantage of both systems with the facility of upgrading without any additional hardware cost. Colour available using external monitor. Programmable sound generator can be controlled by application programs. The /30 replaces one of the 5¼" floppy disk drives with a 5Mbyte hard disk.
SOFTWARE: Use of the 8 and 16 bit chips plus CPM offers wide choice of programs.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
ADS System 42	£3000	Business	48K	No	No	Basic	RS-422	Ads 01-947 4881

COMMENT: A retail orientated business micro that incorporates a 5" green screen monitor. Monitor shows a display 40 columns by 8 lines. Uses 5¼" floppy disk drive and provision for using cassettes at 9600 Baud.
SOFTWARE: Supplied complete with a software system for stock control, in retail business. The ADS uses the Holland Automation operating system.

Dot	£3000	Business	Up to 700K	No	Extra	Choice, inc Basic, Fortran Pascal, Cobol	RS-232	Transdata 01-403-5115

COMMENT: A portable micro claimed to be IBM PC compatible using the same processor, the 8088. Twin 3¼" Sony floppy disk drives 5 x 9" monitor. Typewriter style keyboard with numeric keypad and special function keys. Built-in thermal printer, dot matrix type up to 132 column display at 160 c.p.s. Options available to use Dot as on-line terminal.
SOFTWARE: An increasing amount of software is becoming available under MS-DOS — however the 3½" disk still is uncommon — though destined to be the new standard according to certain industry experts.

BMC Oki 800 Model 20	£3150	Business Education	Up to 256K	Yes	Yes	Most	RS-232	Encotel Systems 01-680 6040

COMMENT: Combines colour monitor 64 colours) with integral twin 5¼" floppy disd drives and a printer. The Oki 800 can also be used as a work station to a mainframe computer.

Eagle 1600	£3150	Business	128-512K	Extra	Yes 86	Most	RS-232	Mediatech 01-903-4372

COMMENT: The Eagle 1600 is an IBM lookalike that uses the true 8086 chip, rather than the 8088 fitted to the IBM PC. Using twin 5¼" double sided, double density disk drives with a capacity of 1Mbyte each unformatted and 784K formatted. Typewriter style keyboard with sculpted design, 105 keys with full numeric keyset and 24 user definable keys. Plus HELP facility which works with the two software packages supplied. 12" green screen monitor producing 80 characters by 25 line display. Video/graphics controller provides full IBM character set plus a 720 x 352 pixels graphics mode. Selectable communications rates from 75-9600 baud. Provision for local area networking up to 64 stations. 8 expansion slots.
SOFTWARE: The Eagle 1600 is supplied complete with two packages, Eaglewriter — a word processing program and Eagle Calc an electronic spreadsheet. As both MS-DOS and CPM86 are supplied, there's an ample range of programs available including ones for the IBM PC.

Vector Series 801	£3255	Business	64K	No	Yes	Most	RS-232	Almarc Data Systems 0602-52657

COMMENT: Single user system in three basic parts: monitor 12" keyboard with numeric keypad and twin floppy disk drives (1.6Mbyte).

Positron 9000	£3256	Business	64K-0.5MB	No	No	Most	RS-232	Positron Computers

COMMENT: Comprises keyboard and numeric keypad, 80 column monitor, 760K floppy disk drive and Epson MX80 printer. Provision to receive pages direct from Prestel. To quote Positron "It's an information handling machine rather than a normal data processing machine". Hard disks are available and up to 4 can be used.
SOFTWARE: The Peachtree range of software will be available plus Styleograph II (word processor) and RMS Database and Dynacaic.

Sord M223/Mk III	£3285	Business	64K	No	No	Most	RS-232C	Sord 01-930 4214

COMMENT: Includes 12" monitor and twin 5¼" floppy disk drives (350K) plus keyboard with numeric keypad.
SOFTWARE: Currently no packages have been specifically announced for the Sort, however using PIPS it is claimed you can write your own.

Panasonic 800 range	£3300--£4350	Business	64K	No	Yes	Most	IEEE 488 RS-232	Panasonic Slough 75841

COMMENT: Two desktop micros both using twin 8" floppy disk drives and typewriter style keyboards. While the 800M is a single piece unit, the 850 has a separate keyboard. Optional hard disk available for the 850 which also has tape back-up.
SOFTWARE: Wide range of programs under the CPM system including Wordstar. There's also a range from CAP-CPP micro-products, The Computer Company, IAL Gemini and CPS Data Systems. There are also specialised programs for dentists, doctors and hotel accounting.

DEC Prof 350	£3348	Business, Education	256K	Extra	No	Most	RS-232	Digital Equipment 0256-59200

COMMENT: Top of the range DEC micro with 12" monitor, showing 80-132 characters, plus twin 5¼" floppy disk drives and optional hard disks. Bit mapped graphics. Compatible with the PDP-11/23 mini computer.
SOFTWARE: As the PDP 11/23 range is popular both DEC and independent suppliers are producing or converting software for this micro.

Comart CP1000	£3395-£4395	Business	Up to 1Mbyte	No	CPM86	Most	RS-232	Comart 0480-215005

COMMENT: The CP1000 is a true 16 bit micro using the Intel 8086 chip. Choice of storage systems from twin 5¼" floppy disks with 390K capacity up to 20Mbytes with the 5" integral Winchester fitted to the CP1520.
SOFTWARE: Increasing amount of packages available using CPM86 — CP1000 also can use the MP/M86 and MS-DOS increasing the amount of programs available.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Signet 211	£3435	Business Education	64K	No	Yes	Most	RS-232C	Micro APL 01-834 2687

COMMENT: Compact machine using two disk drives, one 12Mbyte Winchester hard disk and one 5¼" floppy disk. Keyboard and monitor extra.
SOFTWARE: CPM plus the programs available for the Signet 202S.

Almar Series 1605	£3495	Business	128-1Mbyte	No	Yes	Most	RS-232	Almarc 0602-52657

COMMENT: 16 bit computer using 8086 chip featuring 5Mbyte Rodime Winchester hard disk and 800K 5¼" floppy disk system. 8087 maths processor and 8089 DMA available. Expansion up to 15 slots with the S100 motherboard. Real time clock. Multi-user and networking available. Winchester disk controller supports up to 4 Winchesters in one system. On site maintenance available. 8 bit option available as extra.
SOFTWARE: Full range of commercial, industrial and scientific programs available from Almarc plus the increasing number of packages available under MS-DOS and CPM86.

YD 8110	£3500-£3900	Business	128-256K	No	CPM86	Most	RS-232C	Wilkes 0272-25921

COMMENT: Twin 8" floppy disks (1.2Mbyte) with IBM format. Uses the 16 bit 8086 chip with compatibility to use CPM packages. Hi-res graphics. Version with 256K RAM meant as basis of multi-user system costing £3900.
SOFTWARE: Compativility with CPM and CPM86 opens the door to choice from Wordstar to specialised programs.

TRS-80 Model 16	£3599-£4199	Business	128-512K	No	No	Most	RS-232	Tandy 0922-648181

COMMENT: A dual 8/16 bit micro. Single hard disk for multi-user software or two floppy disk drive version. Can be extended up to 3 or 4 disks. Built-in monitor.
SOFTWARE: You can use current TRS-80 model II programs. 16 bit and multi-user programs promised soon.

Iona	£3600	Business	64K	Yes	Yes	Basic Forth	RS-232C	10 Technology 01-248 4876

COMMENT: The Iona is the only micro supplied as a complete outfit that includes a colour monitor and colour printer. It also includes twin 5¼" disk drives. The monitor supplied as part of the outfit has a 14" screen and there are full graphics facilities. Cassette loading of programs is provided if required. The Iona keyboard has a separate numeric keypad and 15 special function keys. While the printer operates at 125 characters per second and works in seven colours. First seen at the PCW show, the Iona can also be turned into a telephone dialler for connecting to Prestel and the phone network.
SOFTWARE: CPM offers a choice of around 2000 plus programs covering all possible applications. Plus a new range of software from Iona which will cover sales ledger, purchase ledger, general ledger, stock control, payroll, word processing and financial modelling.

Kontron P5180	£3700	Business	64K	No	No	Most	RS-232	Kontron Watford 45991

COMMENT: This business micro has it own 9" monitor producing an 80 column display and a typewriter style keyboard with special function keys and a numeric keypad. The keyboard is detachable. High resolution graphics facility with optional colour graphics expansion. 5¼" floppy disk drive with provision to add up to four more and the possibility of using a Winchester hard disk.
SOFTWARE: Specialised range available.

Kalamazoo 1000	£3750	Business	48K	No	No	Most	RS-*32	Kalamazoo 021-475 2191

COMMENT: Four part system, 12" monitor, twin double sided, double density 5¼" disk drives (500K), keyboard and dot matrix printer.
SOFTWARE: Available for most business applications plus specialised trade packages for the motor trade, construction industry and hotels.

Rair Black Box 3/30 series	£3750-£4500	Business Education	64K	No	Yes	Most	RS-232C IEEE 488	Rair 01-836 6921

COMMENT: The Black Box uses an ingenious combination of a 5¼" hard disk for data storage plus a mini-floppy disk for back up and transferring data. The hard disk is 6Mbyte and the floppy disk 500K. This system uses the CPM and you need a monitor to complete the configuration. The 3/30A is single user and the 3/30B a two tier system.
SOFTWARE: Apart from the range of programs available on CPM, Rair have a range of compilers and assemblers available.

Kemitron K3000E	£3795	Business	64K	No	Yes	Most	Other	Kemitron 0244-21817

COMMENT: A micro system that can be linked in with up to four screens and printers. With twin 8" floppy disk drives and 12" monitor.

Nokia Frend	£3,999	Business	128-768K	No	No	Most	RS-232	Nokia UK Ltd 01-900-0421

COMMENT: The first Finnish micro-computer to become available in the UK. Using the Intel 80186 processor, the Frend can be expanded from a stand alone workstation to a multi-user system with the Nokia loca area network and up to 32 extra workstations. Floppy disk drives have 320K capacity and hard disks from 5-15Mbytes are available. The monitor is adjustable and has a 15" screen. The display is black characters on a white background. Standard typewriter keyboard with separate numeric keypad and special function keys. Five expansion slots available for CRT controller and mass memory controller boards. The system comes complete with printer.
SOFTWARE: Using MS-DOS as the operating system there's an increasing range of programs available plus the range available from Nokia.

£4,000-£5,000

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
SWTP	£4000 upwards	Business	64-128K	No	No	Choice	RS-232	SWTP 0733-234433

COMMENT: A single piece of business micro that has a 12" green screen monitor and 80 column display. Numeric function keys. High resolution graphics facility. 5¼" floppy disk drive, options include 8" floppy disk and Winchester hard disk systems. Multi-user options available.
SOFTWARE: Wide range of specialist packages available through the range of SWTP distributors in the UK.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Corvus Concept	£4250	Business	256K	No	Yes	Pascal, Fortran	RS-232C	Keen Computers 01-236 5682

COMMENT: 16 bit micro with unique bi-directional screen measuring 11 x 8½". Whole page being typed can be seen, when used for word processing. graphics facility and unusual type fonts can be displayed. Built-in Omninet interface so that extra work stations can be added just by connecting a twist-pair cable. Optional hard disks from 5.7 to 19.7 Mbytes for increased capacity.
SOFTWARE: CPM plus specialist business packages. Edword – a powerful word processor, Corvus Logicalc – an electronic spreadsheet. New Corvus software for launch in 1983 includes electronic mail, business graphics and a database manager.

Equinox Series 8000SX	£4250	Business Education	64K	No	Yes	Most	Other	Equinox 01-739 2387

COMMENT: Multi-user version of 5000SX. Uses the dual 8" double sided, disk drives. Selected by the government computer advisory service.
SOFTWARE: CPM plus Turbo-DOS to increase program loading and file processing speeds by up to five times.

Multicomputer 210	£4250	Business	64K	No	Yes	Most	RS-232C	Multicomputer 01-568 5272

COMMENT: Multi-user system expandable to 255 users. Hard disk (10Mbyte) plus 8" floppy disk. Monitor and keyboard extra.
SOFTWARE: Compatibility with CPM using the nStar system and wide range of specialised application programs.

Vector Series 803/12	£4275-£4995	Business	64K	No	Yes	Most	RS-232	Almarc Data Systems 0602-52657

COMMENT: This range has combination of hard and floppy disk drive systems. The 803 has a 3Mbyte hard disk with an 0.8Mbyte floppy disk at £4275. Top of the range the 812 with 12Mbyte hard disk and 0.8Mbyte.

Caltext 4/4A	£4457-£4657	Business	64-256K	No	Yes	Most	RS-232C	Computer Ancillaries Egham 36455

COMMENT: Includes 5¼" Winchester hard disk (15Mbytes) and 12" screen. Provision for link-up with IBM mainframe.

Cromenco System 3	£4495	Business Education	64-512K	Yes	Com-patible	Most	RS-232	Comart 0480-215005

COMMENT: Twin 8" floppy disk drives (1.2Mbytes) and extensive colour graphics giving 4096 shades.
SOFTWARE: CPM plus packages from Comart covering – Database, word processing, invoicing, payroll etc.

PBM 1000	£4500	Business	80K	No	Yes	Most	RS-232C	Terodec 0734-664343

COMMENT: Uses 5¼" Winchester hard disk and 5¼" floppy disk drives with separate bit-slice processor controls both disk drives so that 70% of the main processor is available for the Winchester disk transfer and 97% for the floppy disk transfers.
SOFTWARE: Using CPM wide choice of programs available including Wordstar. Especially as uses enhanced version of CPM.

Enterprise 1000	£4750	Business	64K	No	No	Most	RS-232C	Data General 01-572 7455

COMMENT: Single piece business micro supplied as a system including a printer. The twin 5¼" floppy disk drives have a capacity of 358KB formatted. Numeric keypad and 10 special function keys. The dot matrix printer included in the system is bi-directional and has an operating speed of 150 characters per second. You can print up to 132 columns with a choice of 6 or 8 vertical lines per inch.
SOFTWARE: Using Enterprise OS, MP/OS or BOS5 there is a wide range of specialised application programs available for the Data General 100.

Sord M223/V	£4795	Business	64K	No	No	Most	RS-232C	Sord 01-930 4214

COMMENT: Three part business system comprising 12" monitor, twin 8" floppy disk drives.
SOFTWARE: Not CPM but Sord claim packages easy to write using PIPS program generator.

Fortune System 2	£4950	Business	256K	Yes	No	Basic Cobol Fortran Pascal CBasic	RS-232C IEEE 488	Fortune 01-631 3383

COMMENT: A 16 bit super micro with 32 bit architecture, extremely similar to the Wang word processor. It is claimed up to 16 terminals can be used and the Unix operating system. Supplied complete with 2x800K 5¼" disk drives.
SOFTWARE: Database management and word processing but no CPM just Unix. Also available is Multiplan Business Accounting System – fully integrated single entry.

Wicat 150	£4995	Business	Up to 1.5Mb	Extra	Emula-tor	Most	RS-232C	Software Sciences 0252-544321

COMMENT: Single piece business micro using the Motorola 68000 16 bit processor having the monitor built-in plus twin 5¼" disk drives. Full typewriter style keyboard with numeric keypad. Operating systems UNIX, MCS, the CPM emulator and COS68000. 80 column display on the 12" monitor with high resolution graphics facilities available. Provision for video disk interface. Provision for extra Winchester hard disk systems, and a tape streamer back-up. Provision for local networking including IBM 2780, 3270 and 3780 protocols.
SOFTWARE: The progrms available include financial modelling, word processing, sales order processing, stock control and accounting.

Durango F85	£4995	Business	65.5K	No	No	Star Basic	RS-232C	Computer Ancillaries Egham 36455

COMMENT: The Durango incorporates the Micro Winchester technology with an integrated fixed disk for increased storage capability. The four elements in the system, keyboard, video display, disk drives and printer are integrated into a low profile package. The 9" screen of the monitor shows an 80 column display. Durango are one of the few brands to provide a complete outfit including the printer for a single price, something other companies should consider. A feature of all Durangos is the multi-tasking facility for better value from the system.
SOFTWARE: Star Basic is used by the Durango, with the Durango Executive operating system for initialising and housekeeping.

Sundance	£4999	Business	64K	No	Yes	Most	RS-232 RS-422	Keen Computers 01-236 5682

COMMENT: Single unit business micro that has built-in 6Mbyte Winchester hard disk and 10Mbyte cartridge tape back-up and program load. 12" non glare green phoshor monitor providing 80 column x 24 lines or 132 character display. Typewriter style keyboard with 67 sculptured keys, 18 key auxiliary numeric keypad with four programmable function keys. Keyboard detachable with 1.9m coiled cord connection.

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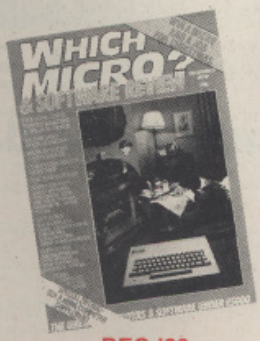
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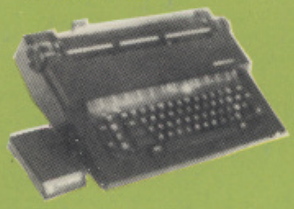
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