

# Practical Computing

June 1984  
Volume 7 Issue 6 **85p**

**The IBM PC  
and its  
look-alikes**

**Columbia,  
Olivetti,  
Compaq, Eagle  
... and more**

**Advance 86 -  
£400 IBMulator  
Wren - £1,000  
CP/M system  
Spectravideo 328,  
Commodore 64 Basics  
Word-processing packages  
for the BBC Micro  
New Sord IS-11 lap computer previewed  
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18 pages  
on the IBM  
PC and its  
compatibles

## PRACTICAL COMPUTING

JUNE 1984

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# Compact system for professionals

All-British 16-bit microcomputer



With a foot print just 12 inches square, the Casu Micro PX is one of the most compact 16-bit microcomputers available. Equipped with the enhanced 80186 processor, it is one of the first British designed and manufactured microcomputers to feature Concurrent CP/M 86, Version 3.1.

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Would-be authors are welcome to send articles to the Editor but PC cannot undertake to return them. Payment is at £35 per published page. Submissions should be typed or computer-printed and should include a tape or disc of any program. Hand-written material is liable to delay and error. Every effort is made to check articles and listings but PC cannot guarantee that programs will run and can accept no responsibility for any errors.

A fair deal

PSST! Wanna buy an Apricot, cheap? Didn't even fall off the back of a lorry...

In the U.K. the Resale Prices Act 1976 gives dealers the right to sell a micro for whatever price they like. It is unlawful for the manufacturer or distributor to pressure the retailer into selling at a specified or minimum price by withholding supplies or in any other way.

Of course, there is quite a remarkable similarity between the prices at which micros are sold by a wide variety of dealers. Often this is the recommended price advised by the distributor, which is perfectly legal and proper as long as it is freely done. However, the unspoken agreements that support this system are now beginning to break down. It looks as though we are in for another price war.

Last year there was a price war in home micros when Commodore dropped the price of the 64 from £340 to £229, and you could find them discounted to under £200. Resulting losses drove Texas Instruments and Mattel out of the home-computer business; both Atari and Coleco also suffered. Stability has since been restored, but home micro prices have still been halved in the last three years.

But during those same three years, the prices of office micros hardly dropped at all. Desk-top machines have become cheaper to make, so how can this be?

The point is that they have not become cheaper to sell. Dealers who used to sell micros from their front rooms now, if they are successful, generally have expensive shop fronts. Where before they had semi-amateur hobbyists as helpers, they now have to pay over the odds to get sales staff who actually know something about computing.

Where they used to sell to people who were either knowledgeable or willing to learn everything from scratch, dealers now have to cope with people who need hours of expensive training and support. Where they used to advertise cheaply in two or three real micro magazines there are now over 100, which deliver fewer results for more money.

Though the hardware may be cheaper to make, selling and supporting it is more expensive. The money must come from somewhere.

Probably every Practical Computing reader thinks that the cost of hardware should come down, as it obviously could. That is because each reader of this magazine represents one in a thousand, even among computer owners. While you can get by without the constant support of a dealer, what about the other 999?

With micros you cannot expect to get advice, your chosen machine installed, telephone help with running software, etc., — and the lowest possible price. Service costs money.

IBM's dealer supremo Nigel Henzell-Thomas told a trade conference that the cost of putting a PC into a small business was up to £10,000. He justifies the figures by including the cost of searching for the micro and software, with any systems-analysis and consultancy fees.

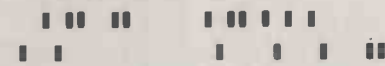
Then there are the hardware and software costs plus furniture, new stationery, storage and so on. Finally there is the time and money needed to hire and/or train staff and switch to the new computerised system. You needn't even include the cost of renting the office space — in Central London a wastepaper bin costs over £200 p.a.

Against the real costs involved, whether a 16-bit micro costs £2,195, or £1,995 discount, is pretty irrelevant. Far more money can be wasted through buying the wrong software, through inadequate training or a lack of support.

Of course there are a lot of problems in the computer industry. Some manufacturers do not adequately support their dealers. Others, desperate for shelf space, take on people they shouldn't. Some dealers are untrained and could not provide decent support if they wanted to. Some software publishers release bug-ridden programs with incomprehensible documentation. Worst of all, the average buyer is lamentably uninformed.

What we really want is lower prices from good dealers. The last thing we need is an influx of discounters who go bust, leaving behind a mass of desperately confused users.

5 Years ago ...



Three packages dominate the personal computer scene as far as word processing is concerned — the Electric Pencil, Word-Master\* and the CMC Word Processor — the latter because it is widely regarded as the fullest WP package yet to be made available for the Pet, the other two because they are offered on a wide variety of computers.

We also found a number of word processors which have received less exposure, ranging from the letter writer produced for the Nascom-1 by ICL Dataskill to the impressive specification of the Processor Technology systems. To produce the

list we shall be publishing, we telephoned as many potential suppliers as we could find, more than 100 companies. Many offer the same WP packages, of course. Those without a package include ITT, which says a word processor for the Apple-based ITT 2020 is "imminent".

Commodore says a number of British Pet owners have submitted word processor programs to its users' library but so far none looked good enough. Research Machines is to announce one. \*Word-Master later became WordStar

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## Code junkies

SOME PEOPLE are very concerned about the social and psychological changes that can occur when a person gets hooked on computing and becomes a code junkie. I am trying to discover if there really are any problems, and in what way they manifest themselves.

Code junkies can be of any age but seem invariably to be male. They usually have an above average intelligence with good logical, mathematical abilities.

Often the junkie is very happy with his life, but his family and friends seem to be the ones who suffer. They cannot understand the fascination that the computer holds, and may feel unable to compete with a machine for affection and attention.

I would like to hear from anyone who is, has been, or has experienced life with a computer junkie. Who are they, what type of person are they, how have they changed and how has this activity affected those around them?

All information will be treated confidentially.

**M A Shotton,**  
Dept. of Human Sciences,  
University of Technology,  
Loughborough,  
Leicestershire LE11 3TO.

## War games, again

I WAS fascinated by the letters in the April issue of *PC* on the subject of war games. Surely, the whole point of any game is competition. If one is to argue that some games are a bad influence on the players, then what one is saying is that competition is not desirable. I might well agree with this, were it not for the fact that the competitive instinct is the one which rules our lives more than any other.

Looking around, one sees competition on every side. It is lauded and encouraged in both business and education. The very computer industry has become so competitive that it is cutting its own throat with price wars, and every company is striving to undercut its competitors. It is thought widely that this is a good thing, and most people dislike a cartel or monopoly.

The position of chess in all this is most interesting. It seems that both Messrs Macphee and Kennaway are trying to persuade us that it is not a war game. My experience has been quite the reverse. Of all games I find chess the most vicious, and far more dangerous than any other war game. If one plays Eastern Front the concept is just as abstract as it is in chess. One

is really just playing God and moving thousands to their destruction.

No-one would seriously believe in their having the power to do this unless he/she was already a psychotic megalomaniac. Not so chess! Here there really is a chance to destroy another human being, and the participants of the game quite often take a vicious satisfaction in so doing.

As a boy I used to play a lot of chess, but stopped when I became mature enough to realise what this vile mini-war did to people. And, in chess, it goes right up to world championship level. There seems almost no dirty trick that has not been tried. At any level above the most frivolous chess ceases to be a game and actually is a war — of minds, admittedly, but none the less real for that.

The general overreaction to war games was saddening. They would be worth retaining if in the slightest way they channelled aggression into an unimportant mythical tank battle in the Sinai desert or something of the sort. Who would not prefer that to the real thing? I much prefer Bill Radcliffe's pragmatic and sensible approach. The editor, too, brings some semblance of responsibility to the discussion.

To attempt to discourage war games is to deny the basic

aggression of humanity, whence comes war. Man has always been the most dangerous and aggressive of animals — he owes his pre-eminent position on this planet to that very fact. Man is not likely to change.

The playing of war games might do much to bring the horror of war to the minds of those playing them, as chess did with me. But even if it doesn't and it manages to channel aggression towards a board or screen instead of the street, it is worth retaining. I would be very interested to know how many war gamers are arrested annually for crimes of violence — I should guess precious few.

However, I do not seek to ram my opinions down others' throats. I merely state them. I feel that the only people likely to be brutalised by war games are those whose genes carry a tendency towards brutality, or those who have been so restrictively nurtured that they need to strike out at someone or something in their frustration.

It may be that the computer might give society another release for its aggression. It must be, even by the lights of the anti-war-gamers, far better to figuratively rip the guts out of a machine enemy than to do it to a fellow creature.

Perhaps I should purchase a chess program and start playing again!

**P A S Craddock,**  
Walsall.

## Database comparisons

PAUL MYERSCOUGH'S article in your April edition failed to make clear the most important point relevant to comparisons of database products: because each has its strengths and weaknesses the pecking order will depend on the application.

Since I know Tomorrow's Office best of the three packages reviewed, I think I should point out to your readers that a review of Tomorrow's Office that refers to the Multi-file option in passing is like an article on the Cabinet that

merely mentions Margaret Thatcher. Multi-file may not compensate for some of the structural weaknesses of Tomorrow's Office but it increases its power and applicability by an order of magnitude.

Finally a question about transactional structure. How can you have a serious file-management system without it?

**P J Hartley,**  
Ferranti & Hartley Ltd,  
Basingstoke,  
Hampshire.

## Sticky problem

WE HAVE experienced difficulties with computer stationery. On the Sharp MZ-700 and other small printers a 4.5in. paper roll is standard, but so far we have been unsuccessful in obtaining a self-adhesive 4.5in. paper roll in order to print out business labels, or for the transferring of graphic designs.

If anyone knows where we can obtain supplies, could they please let us have the name and address.

**I G Oregon,**  
Fine Art & Jewellery,  
2 & 4 Station Approach,  
Birchington on Sea,  
Kent CT7 9RD.

## Printer driver

I READ with great interest the article "View printer driver" in your April issue of *Practical Computing*.

During Christmas I wrote a similar printer driver for the Epson FX-80 providing any or all the features of that particular printer. I have also written a View printer driver for the Juki.

On following the path T L Morris must have also taken, I found that it was better to write a general routine for any printer. Subsequently, I did just that and used both the Epson FX-80 and Juki printers as test machines. I believe it will work for any printer.

It comprises one driver program as with T L Morris's  
*(continued on next page)*

Our Feedback columns offer readers the opportunity of bringing their computing experience and problems to the attention of others, as well as to seek our advice or to make suggestions, which we are always happy to receive. Make sure you use Feedback — it is your chance to keep in touch.

(continued from previous page) program but uses an associated table of printer codes for the particular printer. You create the table of codes for your printer. I have subsequently written a utility program so that you can create your own table, thus having as many printers in use with the View chip as you wish.

You can create 16 highlight codes at present but this can easily be increased to any number you wish. I have found six to be a rough estimate of the more common facilities required i.e. underline, shadow, bold, subscript, superscript and proportional spacing.

**Simon A Towell,**  
30 Durham Road,  
Wigmore,  
Gillingham,  
Kent.

● **The editor adds:**

An enhanced version of T L Morris's program is now being sold by Clares — see Software News this month.

Simon Towell is willing to supply copies of his printer driver with example text/user guide, utility program and two printer tables for £9.95. If interested, write to him at the address given.

## Recurring phrases

MIKE LEWIS's contribution to WordStar wisdom in February's *Practical Computing* was very welcome. I had not picked up the particular trick of a forced search and replace but I have developed a technique to achieve a similar result in documents using frequently recurring technical phrases.

I am compiling a Calendar of Probates and Administrations for Hong Kong covering the period 1860-1904 and I have to

type a lot of recurring phrases such as "Administrator", "to the Official Administrator", "with the will annexed", "as attorney for" and so on. "Died at Hong Kong" I type in as

? HK

but most phrases are represented by symbols not normally used in my text. Symbols such as #, = and ^ can be used to represent phrases as long as WordStar will allow. Thus

# to ^ = \ <

replaces 15 words. When the file is complete, I do a global search and replace and that phrase comes out as "Administration to the Official Administrator with the will annexed as attorney for the Executor".

I am working on long files so that the time taken in that processing is considerably less than the time which would have been taken to type that phrase many times. Reformatting has to take place but that can be done as part of proofreading.

**Prof. D M E Evans,**  
School of Law,  
University of Hong Kong.

## BBC graphics

I WONDER whether anyone has experienced the same problems as myself while using the graphics window facility VDU24 on the BBC Micro.

In one particular program I repeatedly define a window using VDU24; execute some graphics which require the window to prevent the remainder of the screen being corrupted; then restore the default windows using VDU26 and update the graphics on the remainder of the screen. As such this procedure works OK. However, if while operating in the default window the origin is redefined using VDU29 the subsequent VDU24 command is

## QLMON

*Practical Computing* readers who have ordered a Sinclair QL have so far only been quoted two delivery dates. According to Sinclair Research orders placed in January and early February will be delivered "not later than the end of June", those placed later in February and in March will be delivered "not later than the end of July".

One reader suggests Sinclair should deliver the documentation now so we can all learn SuperBasic in the meantime.

If you have ordered a QL in the last couple of months please fill in the coupon on the right. With your help we will try to keep track of the waiting list as production builds up and deliveries begin.

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ignored and graphics continue to use the whole screen.

I have solved my immediate problem by completely avoiding the VDU24 command. Memory locations &300 and &30B contain the internal co-ordinates of the current graphics window and it is the contents of these locations which are changed using VDU24 or VDU26. Of course it is possible to write to these locations directly, and this is what my program now does without any possibility of interference from the VDU29 command.

It must be emphasised that internal co-ordinates are not the same as the external ones normally used with VDU24. But they can be found by executing VDU24 with the relevant co-ordinates in the immediate command mode then examining the contents of &300 to &30B with the ! indirection operator.

Unfortunately this cannot be viewed as a total solution to the problem because the way the operating system uses memory could be changed; but it does extricate my program from the need to be very much rewritten.

**S J Steward,**  
Department of HST,  
Umist,  
Manchester.

## Italian enthusiasts

WE ARE a group of university students who have founded a club for Commodore 64 users in Milan.

Is there anyone who might be interested in communicating with us?

**Claudio Ceroni,**  
C = 64 Club,  
Via Sorrento 24,  
20153 Milan,  
Italy. ☐

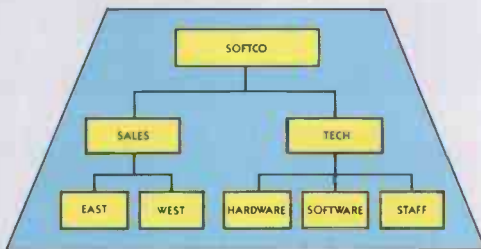




# Into a world of chaos, clutter and conflict-OZ brings control!

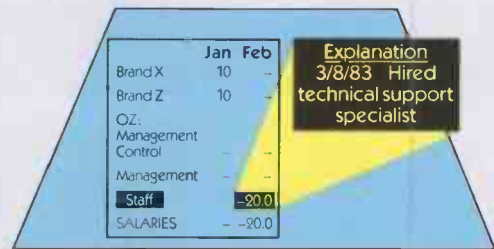
OZ combines sophisticated management techniques with utter simplicity to give you total control over your business. Whether it's for corporate managers, small businesses, line managers, financial analysts, controllers, sales managers, engineers or investors OZ will change the chaos, clutter and conflict into simple, effective and total control.

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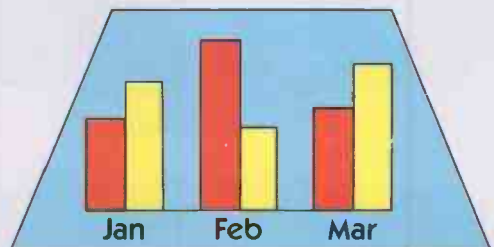
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Brand X	10	-
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OZ	20	10

With OZ, the profit and loss forecast is always up-to-the-minute because OZ will up-date it automatically whenever it's needed. Not only that, but also the annual budget is always available for comparison at the touch of a single key.

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To use OZ you must have IBM PC or XT with 256K memory  
 Retail Price: £330 + VAT.



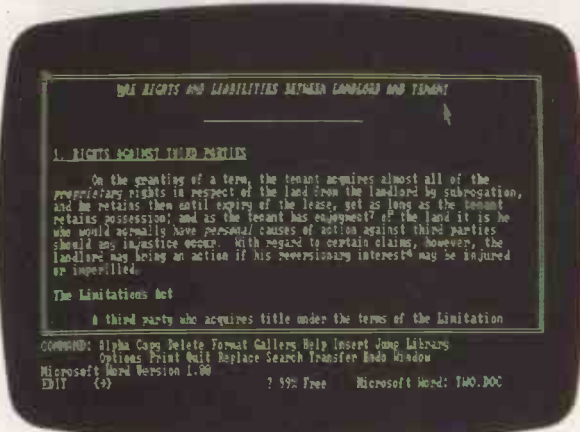
# MANAGEMENT CONTROL™

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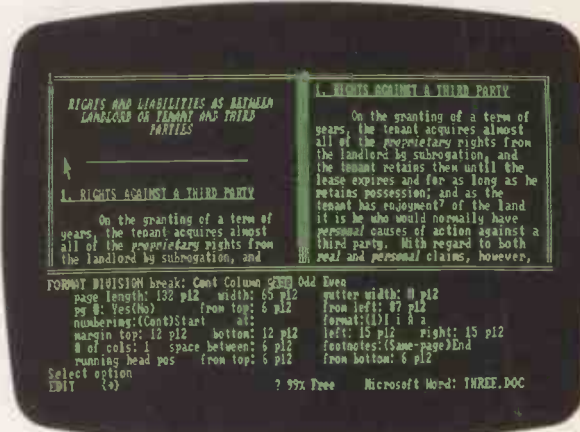


Fox & Geller (UK) Ltd, 17 Wigmore Street, London W1. Tel: 01-580 5816.

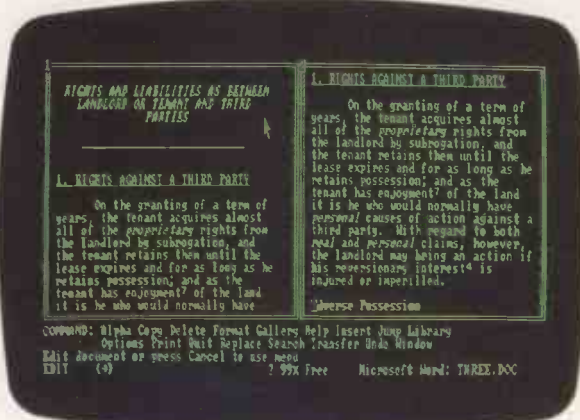
# Never under the power of



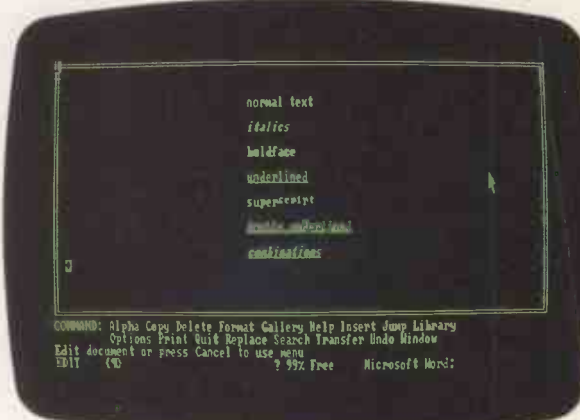
Format options.



Layout and commands.



Formatting with windows.



Print options.

Now there is a new product from Microsoft that has fundamentally redefined word processing.

It's called WORD.

Yet because it is so simple and straightforward to use, it tends to get underestimated.

People think nothing that easy can be that powerful. Wrong.

WORD has power and speed.

Power to let you do more than any other word processing program could before.

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And an unrivalled choice of characters from bold to italic, all shown on the screen *exactly* as they will print out.

# erestimate of the word.

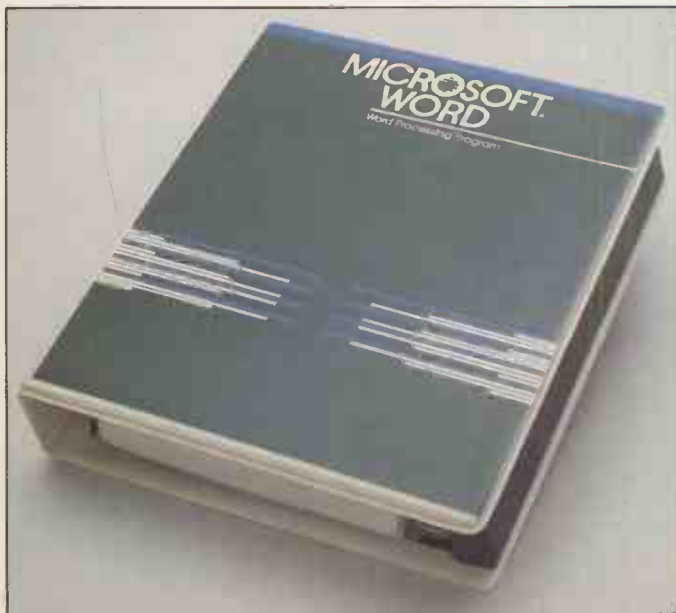
WORD lets you assign different styles to different documents.  
You say what. And when.  
All available for instant recall when needed.

## **A window on the world.**

Everybody knows about multiple windows.  
But eight windows?  
At a time?  
WORD lets you edit and compare, from window to window, document to document.

## **As quick as a mouse.**

WORD'S special mouse driven facility means you can move sentences around as quickly and as naturally as you move your hand.  
It's an optional extra.  
But get used to it and you'll never look back.



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The things your WORD could do are many. Indispensable facilities like automatic footnotes with their own window. The special horizontal scroll allowing a full 255 characters to be viewed at a glance. And the super efficient search command which will locate *one* word in a 250 page document. That's WORD from Microsoft. Simple, comprehensive and invaluable. Remember, WORD gives you the power. Then you take the glory.

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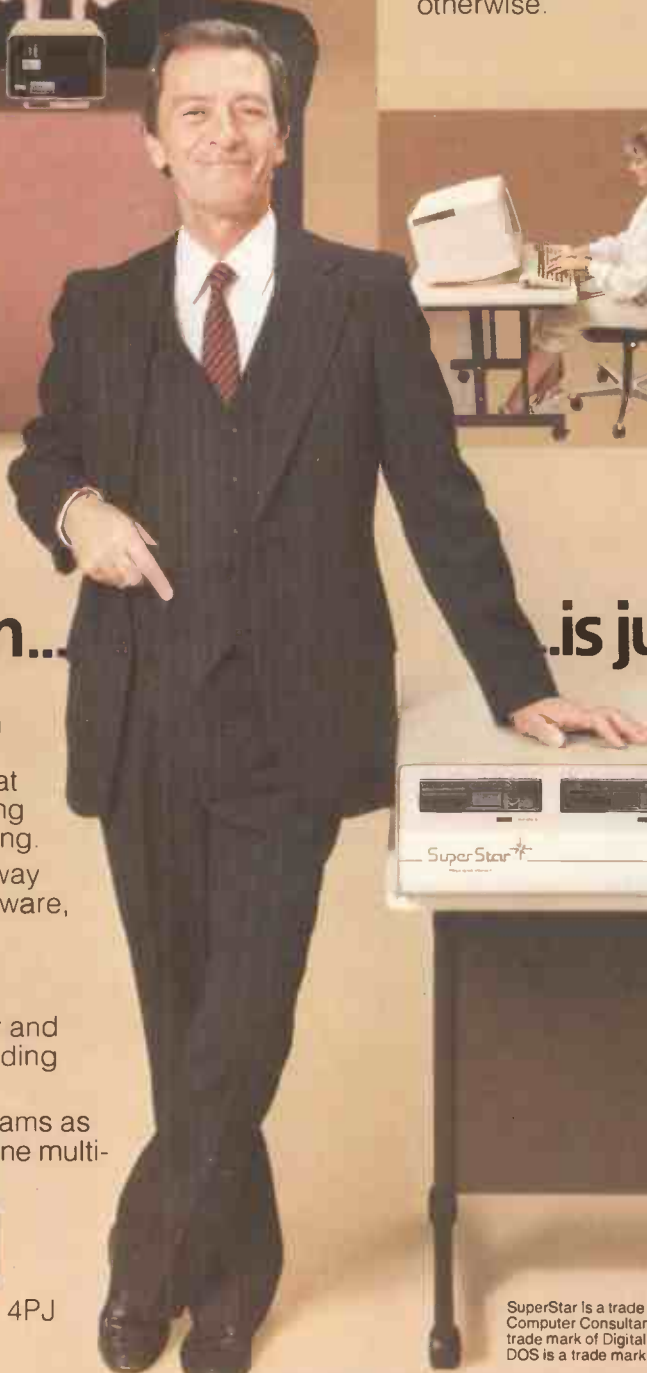
NOW WITH 16-BIT MASTER PROCESSOR

## Mini's too expensive

For a multi-user business system expandable to 16 screens you used to need a sizeable mini, say from **DEC** or **Burroughs**, with a hefty price-tag for hardware and software, with long time-scales.

## Micro's too small

Micros, like **Altos**, **Sage** and **Rair**, 8-bit or 16-bit, are doomed by CPU degradation, being based on the time-sharing principle. PCs, like **IBM** and **Apricot/Sirius**, just aren't in this league at all, networked or otherwise.



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...is just right

**SuperStar** is a multi-processor system in which up to sixteen 16-bit processors, each with up to 1Mb RAM, are integrated in an attractive desk-top unit. All users can work at full speed in genuine multi-user, multi-tasking mode with full file/record locking and spooling.

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SuperStar is a trade mark of Bromley Computer Consultancy. CP/M is a trade mark of Digital Research. MS-DOS is a trade mark of MICROSOFT.

SuperStar-16 has a 16-bit Master Processor which runs IMPOS (BROMCOM designed true 16-bit controlling operating system). IMPOS supports CP/M, MS-DOS and shortly Xenix 386 slave processors in any combination and it is fully upward compatible with ACTION DPC/OS, Televideo MmmOST and TurboDOS

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Further, while others offer only CP/M80 or CP/M86 compatibility, IMPOS® supports a much wider choice of the most popular operating systems for the slave processors i.e. CP/M80, CP/M Plus, CP/M 86, Concurrent CP/M 86, MS-DOS and XENIX all working simultaneously sharing common resources.

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ENVIRONMENT**

Same generic operating system (i.e. Digital Research vs MicroSoft) within the same system have full genuine multi-user facilities e.g. record/file locking.

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**SUPERSTAR 16™**

BROMCOM® SuperStar 16™ is the first implementation of IMPOS®. SuperStar™ is a desk top system with integral winchester of up to 80Mbyte and a tape streamer of 40Mbyte. Slave processors are Z80A with up to 128Kbytes or iAPX186 with up to 1Mbyte RAM. A total of 16 Slave processors can be accommodated in any combination while the current Master processor is an 8086 with up to 1Mbyte of RAM.

For more information ring 01-697 8933 and ask for Bob Bartlett.

# Amstrad's Z-80 bargain

AMSTRAD, the company that brought you the low-cost do-everything audio system, is now ready to try the same technique in computing. Early indications are that it is going to do it successfully, too.

The Amstrad CPC-464 is a Z-80 based 64K colour computer with a real keyboard and built-in cassette recorder. From June it will be available as part of an outfit which also includes a screen and can include a disc drive. The basic CPC-464 system has a monochrome screen and costs £229. With a colour screen the price is £329. With a monochrome screen, 3in. microfloppy-disc drive, CP/M and DR Logo the price is £429. Other outfits and/or an expanded machines may be offered later.

The CPC-464 is not a competitor for the Sinclair QL. It is not a state-of-the-art machine, the Z-80/64K RAM specification having been one of the standards of the micro industry since 1977. However, the Amstrad machine seems well made, and it really works.

The CPC-464 offers a lot of

facilities for the money. It has a 32K ROM which includes a fast Microsoft-type Basic from Locomotive Software. Commands include Window, and the newcomers After and Every. Some 42.5K of RAM is free for Basic programs.

Three-channel stereo sound is provided by the familiar AY-3-8910 chip. The graphics offers 27 colours and three text modes with 80, 40 and 20 characters by 25 lines, and 640 by 200 pixels. Sprites are provided in software.

The disc is the 3in. Hitachi microfloppy, as is supplied with the Oric and not, unfortunately, the 3.5in. Sony standard adopted by Apple, Hewlett-Packard, ACT and the Government's CCTA. But since the Amstrad uses a Z-80 and has access to CP/M — even though using a non-standard disc — should mean that lots of software quickly becomes available. Over 50 games are planned for the launch, with some 12 to 18 implemented so far, plus Hi-Soft's Pascal.

Sales will mainly be through High Street chains. Boots,

Dixons, Rumbelows and Comet have already bought the 200,000 machines that will be produced in Korea this year. Amstrad plans to sell 600,000 units in 1985.

The proposed sales figures do not seem unrealistic. Take the cost of a dedicated cassette deck and monochrome monitor off the outfit price of £229 and you have a 64K-RAM 32K-ROM micro with a real keyboard, which outperforms the Commodore 64 in virtually every department at around £100. The CP/M system is even more amazing value.

If Amstrad delivers then there does not seem to be a future for machines like the Acorn Electron, the Lynx and the Dragon. The long-delayed Enterprise — formerly the Elan — could find its market gone by the time it appears. The Amstrad could also attract disaffected would-be Sinclair QL owners — see separate story for the latest on Sinclair's wonder machine.

Contact Amstrad Consumer Electronics, 1/9 Garman Road, London N17 0UF.

## Casu Micro-PX

CASU has announced the Micro-PX range of computers, built around the Intel 80186 — fast becoming the chip to have. Its basic 256K of RAM is expandable to 1Mbyte, and 3.5in. microflops are used with a formatted capacity of 737K.

Two RS-232 ports are supplied as standard, and can be increased to six by adding expansion boards. There is no Centronics port. The current system has a clock speed of 6MHz, which will increase to 8MHz when the next generation of chips is available.

The prices include Concurrent CP/M version 3.1, now renamed Concurrent DOS version 4. Keyboard and screen are

available for an additional £450. The PX-S single-disc version costs £1,650; 20Mbyte Winchester model using 3.5in. Rodime discs comes at £3,450.

Details from Casu Electronics, Arundel Road, Uxbridge Industrial Estate, Middlesex. Telephone: 01-561 6820.

## More modems

AS MICROS themselves become generally accepted and widespread in their applications, it is communications that is proving the big growth area. To meet this demand for computer-to-computer links, the number of modems with British Telecom approval is



growing — as is the backlog awaiting the OK.

The BTAB has just approved an integral modem for the ACT Apricot. Other models to have passed the test recently include Answercall's MM-101, a mains-powered unit that plugs into the standard RS-232 port. Tech-Nel has launched the DM-2426, which can operate synchronously at either 2,400 or 1,200 baud, and the DM-1223.

The MM-101 costs £75 and is obtainable from Answercall, Kangley Bridge Road, London

(continued on page 15)

# Software for the IBM PC/XT

## A Buyer's Guide

### Start Here

First, ask yourself a few simple questions:

1. Do you want one of the best selections of software for the IBM at your disposal?
2. Do you wish to take advantage of some of the lowest prices available?
3. Do you need help, advice or technical support?

If you answer YES to any of the above, then move on.



When choosing the right software package to fit into your micro environment, you may require guidance. You need to contact a company with extensive experience of microcomputers and software.



Alternatively, you may know exactly what your requirements are and simply wish to take advantage of some of the lowest prices around, making that already over-stretched budget go just a little further.

### Choice



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SE26 5AH. Telephone: 01-659 1133. The DM-2426 costs under £350, and the DM-1223 costs under £300. Details from Tech-Nel at 8 Haslemere Way, Banbury, Oxfordshire OX16 8TY. Telephone: (0295) 65781.

## 68000 Apple

APPLE OWNERS now have a chance to steal a march on the thousands of ever-optimistic QL purchasers. Stellation Two has produced McMill, a co-processor card for all versions of the Apple II, which contains the same Motorola 68008 which will eventually be found at the heart of Sinclair's Quantum Leap.

Included with the McMill card is Fig Forth; optional software includes a 68000 cross-assembler. McMill is available at £200 plus VAT from P&P Micro Distributors Ltd, New Hall Hey Road, Rossendale, Lancashire BB4 6JG. Tel: (0706) 217744.

## New Epson printers

EPSON has announced several new products, including a £95 battery-powered thermal printer, a colour dot-matrix printer and a plotter.

The P-40 thermal printer uses 4.4in. thermal roll paper, printing across 40 columns at normal density or 80 columns in compressed mode. It is powered by built-in nickel-cadmium cells, which Epson says allow three hours continuous use from each recharging. The P-40 is aimed at both the home market and business users who need a portable printer. It should be available in August, priced at £95 plus VAT.

Epson's colour dot-matrix printer is the JX-80. It uses a four-colour ribbon, overprinting automatically to produce up to seven different shades. In ordinary use the JX-80 defaults to printing in black. It is very similar to the RX and FX-80 and accepts the same control codes.

The standard JX-80 model can handle standard fanfold, roll or cut-sheet A4 paper, and prints across 80, 132 or 160 columns, as required. Print speed

is quoted at 160 characters per second. Priced at £560 plus VAT, the JX-80 is 23 percent more expensive than Epson's monochrome FX-80. It should be available from July.

The HI-80, a four-pen colour plotter, is Epson's first plotter. It appears to work in a similar way to the HP-7470A, gripping the paper along two sides to move it as well as the pen. The HI-80 can plot on to overhead projection film as well as A4 sheet paper, and can handle text as well as graphics. Scheduled for availability in August, the HI-80 is very competitively priced at £400 plus VAT.

Epson has also announced a £160, 80-column thermal-transfer printer planned for October, and cut-sheet feeders for some of its existing printer range. More details from Epson (U.K.) Ltd, Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Tel: 01-902 8892.

## Computer shops

TWO NEW chains of computer shops are opening to give existing dealers and the Computerland chain a run for your money. Former Computerland European president James Minotto has opened the first Interface Network computer shop in Kingston-upon-Thames; 80 more shops are planned for the next five years.

chain of computer shops, the first of which has been opened on Piccadilly in London's West

End. Seven further shops will open in the next seven weeks — including five shops that were formerly Xerox shops — and the plan is to have 50 stores open in two years.

First Computer has £5 million backing and is headed by Sir Cyril Spencer, the man who turned round the Burton menswear chain. The products stocked will be the IBM PC and Compaq PCs, the touch screen HP 150 and the Apricot.

## Einstein arrives

THE NEW Einstein home-into-business and education micro, designed in Bradford and built in Bridgnorth, will be available from July. The machine has a 4MHz Z-80A processor, 64K of RAM, 16K of video RAM, 8K of ROM, 16 colours, three-channel sound, a real keyboard, and the ability to run CP/M.

In PC January news we predicted the machine would have a colour monitor, a 0.5Mbyte 3.5in. built-in disc drive and cost under £800. In fact it does not have a colour monitor, it has a Teac 3in. 0.5Mbyte drive, but it does cost £499 including VAT.

In runs Xtal-DOS and Xtal Basic 4, which will be familiar to readers with Sharp machines in particular. Just over 42K is free to Basic and the display RAM is separate. The bad news is that the 80-column display will be available later.

Contact Tatung (U.K.) Ltd, Bridgnorth, Shropshire WV15 6BQ.

(continued on page 21)



U-Com 2 is an Apple-type machine running under DOS 3.3, UCSD P-System and Apple-format CP/M. The price of £599 includes a 6502 CPU with 64K RAM, a separate keyboard with numeric pad and a built-in disc drive with 140K capacity. There are eight expansion slots; a further disc drive can be added internally and two externally. Details from U-Microcomputers Ltd, Winstanley Industrial Estate, Long Lane, Warrington, Cheshire WA2 8PR. Telephone: (0925) 54117.

## Shorts

- More price drops as the micro manufacturers slug it out. The Cal-PC is coming down from £1,995 to £1,495; details on (87) 36455. The new touch screen HP 150 from Hewlett-Packard, reviewed in last month's PC, is now £2,595 for the twin-floppy and £4,795 for the 15Mbyte Winchester versions; more on (0344) 77310. The Omnix micro price has been reduced by 32 percent to £5,900 for the 128K RAM, 10Mbyte Winchester version. Details on (0923) 771211.

- A buggy for use with the BBC Micro and the Micropulse Young Trainer robotics device is available from Northern Computers. The buggy costs £29. Further information from Northern Computers on (0928) 35110.

- Apricot joins the ranks of Apple, Sirius and IBM as a machine for which Simón Computers supplies a 640K RAM card. Only one expansion slot is used and the board costs £1,099. Details on 01-680 4646.

- Sweet-P Personal Plotter is the dinky name of a new product from Reflex Ltd. Capable of drawing at 6in. per second, Sweet-P costs £499 plus VAT. Details on (0734) 884611.

- A Spectrum motherboard from Currah Computer Components Ltd allows several Spectrum add-ons to be hooked up to the micro simultaneously. More information on the  $\mu$ -slot on (0632) 323535.

- The Colourjet 132 prints seven colours in 80- and 132-column formats. Software for screen dumps is available for the IBM PC, BBC Micro and Apple II. Price is £550 plus VAT. Telephone: (0283) 215432.

- The Alpha 10 removable disc drive is now available for the Apricot. Despite its name, the unit from APS Microsystems actually stores 20Mbyte. The price is £3,400. More information on (0273) 420195.

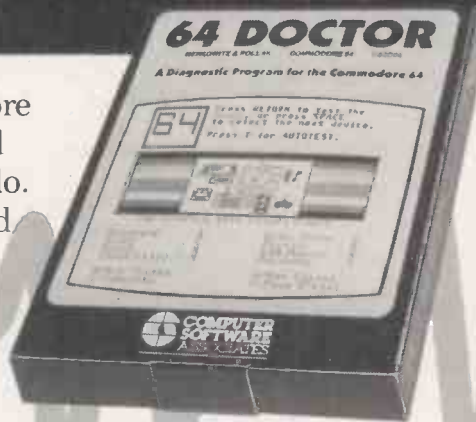
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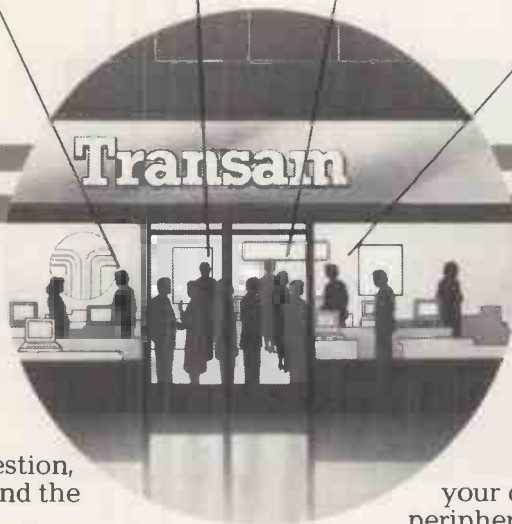
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## QL report

THE QL exists: that is official. In fact there are four units holed up in Sinclair Research's Cambridge headquarters. Select bands of journalists have been ferried up there in the official black Mercedes for intensive hands-on sessions.

First the good news. None of the machines crashed in six or so hours of continuous use. They became warm, though not on the Spectrum scale, and the Microdrives worked surprisingly well. However, it took anything from 30 seconds to a minute to load application packages; the time varied from machine to machine.

First impressions of the keyboard are that it is oddly sprung, and that the auto-repeat is too quick off the mark. But it proved suitable for word processing with the Quill bundled package.

The keyboard layout leaves something to be desired: for example the cursor keys are split inconveniently across the space bar. The Reset button is a boon, though; all we need now is an On/Off switch.

The bad news is that QDOS

## Benchmarks

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
QL — 68008	2.2	6.7	11.1	10.9	13.9	27.7	69.0	23.6	20.6
BBC Model B — 6502	1.0	3.1	8.3	8.7	9.2	13.9	21.9	52.0	14.8
Sinclair Spectrum — Z-80	4.8	8.7	21.1	20.4	24.0	55.3	80.7	253.0	58.5

and the bundled software's current implementation is what one of Sinclair's engineers described as "flakey". Even basic operations like retrieving specific bytes from Microdrives brought the system down. Several of the bugs thrown up in the session seemed new to Sinclair, and were noted with bemused interest.

Although it was comparatively straightforward to set up multiple overlapping windows, multi-tasking is only available via machine-code programming. However, QDOS is still evolving day by day, so it seems certain that the first QLs — now promised "definitely" for the end of May — will go out with EPROMs. The final ROM version could be a good many months after that.

SuperBasic is on the move too. Keywords are changing and commands are being added

and deleted. The standard Benchmarks show that the current version of the QL is twice as fast as the Spectrum but only 70 percent of the speed of the BBC. For all its 32-bit claims the new machine emerges about as fast as the slowest 16-bit — the Logica Vitesse — and faster than all eight-bits apart from the BBC Micro.

Even the bundled software from Psion proved disappointing. The Microdrive version is very slow in places and some of the bugs — still there after 18 months of development — were quite distressing.

In the low-resolution mode of Quill, bold and underline effects began to propagate insidiously even to command menus. It also appeared impossible to import or export data between different applications, a vital feature of any suite claiming even nominal

integration. By way of explanation, Sinclair said that revised versions from Psion were being biked up from London the afternoon of the session.

Apart from the question of speed, most of these problems are soluble. It is clear that even if machines are shipped in the next few months they will be provisional models; reasonably bug-free QLs will not be around for a good six months. The promised add-ons like RAM packs and hard-disc interfaces are further down the line.

Whatever other magazines may tell you, there is no point reviewing the QL in its current state, since it is hardly viable and will in any case be unrepresentative of later and, hopefully, improved versions. It may well turn out to be an advantage to be at the bottom end of the QL waiting list.

## EEPROM rub-out

ANYONE with the odd EPROM to erase may find the Uviper from Ground Control useful. Up to three EEPROMs can be erased at once when loaded into a conductive foam pad and inserted into the unit. Typical erasure times are 15 to 20 minutes.

The price is £19.95 plus £1.50 post and packing. Details from Ground Control, Alfreda Avenue, Hullbridge, Essex SS5 6LT. Telephone: (0702) 230324.

## Money worries

COLECO, maker of the Adam, has laid off a further 1,300 workers at its Amsterdam, NY factory and declared a third-quarter loss of \$35 million. *Practical Computing* is still waiting for the appearance of a real Adam, as opposed to an expansion unit for the Coleco-vision games machine.

Mattel has also continued its downward spiral, losing \$172.8 million in its third quarter end-

ing January 28. The full-year loss is around \$400 million. Meanwhile U.S. manufacturer Fortune Systems has reported losses of \$15.4 million for 1983.

In the U.K., Globe Business Machines has followed numerous other British micro firms into bankruptcy, but Memorex has invested £500,000 in Future Computers.

## Mindset

MICROSOFT'S own newsletter *OEM Update* asks "Who are

these guys? When Windows was launched last autumn, one company, Mindset, stood out from the others. No one knew who they were . . ."

In fact Mindset is a company formed by ex-Atari people and headed by Roger Badertscher, former head of the Atari computer division. The Mindset machine is semi-compatible with the IBM PC and uses an Intel 80186 and several super-graphics chips. It costs "under \$3,000".

Contact Mindset at 617N. Mary, Sunnyvale, Ca 94086, U.S.

## Computer Fair

LAST YEAR'S Computer Fair at Earls Court was the biggest show of the year, with almost 50,000 people attending. This year's show will be bigger still, as stand space has been increased to 3,000 square metres to cope with demand.

No one really knows what

will be on show, but Commodore, Sinclair, Acorn, Oric and Dragon — among others — have taken stands. You never know, there may even be hands-on sessions on the Sinclair QL.

The traditional highlight of the show is the a-maze-ing Micromouse competition, sponsored by *Practical Computing*. The winner will have the opportunity to represent the U.K. in the Euromouse competition in

Copenhagen on August 28-30, so there is everything to play for.

If you want to prove you are the cat's whiskers at micromousing, details of the contest and racing rules can be obtained from Dr John Billingsley, Portsmouth Polytechnic, Anglesea Road, Portsmouth PO1 3DJ. The "big cheese" among micromouse makers, Alan Dibley from Cheddar, will be giving a few hints in the

special section on robots in next month's *Practical Computing*.

The Earls Court Computer Fair will be held from June 14-17. June 14 will be a business/trade only day. Hours of opening are 10am to 6pm on June 14-16 and 10am to 5pm on June 17.

The exhibition is organised by Reed Exhibitions, Surrey House, Throwley Way, Sutton SM1 4QQ. Telephone: 01-643 8040.

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		HX20 available from stock.	

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# Multi-tasking with the Apple II

DARK STAR SYSTEMS has launched a product which lets you use several programs at one time without having to swap discs or reboot. Instant switching between spreadsheet, database, word processor and so on should be possible on the venerable Apple II. Such facilities are generally only available on the more sophisticated of the 16-bit machines.

Dark Star's Snapshot Shuttle is a hardware/software device which plugs into any of the peripheral slots on the Apple II, II plus or IIe. You will also need one disc drive, and at least 128K of RAM, which can be provided by any standard RAM card.

The more RAM you have the more programs you can have loaded at one time. In use, the Shuttle software is loaded into the 8K of RAM on the Snapshot Shuttle card itself. This then takes over disc booting, loading as many programs as the available RAM allows.

To interrupt a running program in order to run another

you press a hardware switch connected to the Shuttle card. Another press on the Shuttle switch returns you to your original program at exactly the point it reached when interrupted.

Dark Star says the Snapshot Shuttle supports DOS 3.3, Pascal, Prodos, and CP/M run with a Z-80 card. It costs £115 plus VAT, which includes

hardware, software and documentation. Existing users of the IIe version of Snapshot Copykit can obtain the Shuttle software, which is all they need, for £20.

Further details are available from Dark Star Systems (U.K.), 78 Robin Hood Way, Greenford, Middlesex UB6 7QW. Telephone: 01-900 0104.

## £10 Atari cartridges

IN THE PAST, high software prices have put off many potential buyers of the otherwise excellent Atari home-computer range. Now both Thorn-EMI and English Software have launched new £10 game cartridges, and Atari itself has announced price reductions.

Thorn-EMI's five new programs are Orc Attack, Carnival Massacre, Tank Commander, Submarine Commander and Computer War. Almost as bloodthirsty are English Software's offerings: Citadel Warrior, Dan Strikes Back, Neptune's Daughters, Adventures of Robin Hood and Atari Graphics Wizard. The programs are all priced at £9.95 including VAT.

English Software has also announced French, German, Spanish and Italian foreign-language learning packages based on the Gruneberg Linkword system. These will cost £12.95 and are supplied on cassette or disc, and should be available soon.

Atari's own price changes reduce some game cartridges by £5 and some by £10. Amongst those to fall in price are Donkey Kong and Ms Pac Man, now £24.99, while Star Raiders, Qix and Eastern Front drop to £19.99.

All the programs should be in the shops, but you can contact Thorn-EMI Computer Software, Creative Sparks,

Thomson House, 296 Farnborough Road, Farnborough, Hampshire. Telephone: (0252) 543333. English Software Company, Box 43, Manchester M60 3AD. Telephone: 061-853 1358.

## Epson HX-20 games

GAMES for the Epson HX-20 battery-powered portable computer are hard to come by, no doubt because with its four line by 20-character LCD and its unusual CMOS processor it must look unpromising to most fun-loving software houses. However, Software Riches of Irvington, New York, has sent us a catalogue with several HX-20 games in it.

Cavehunt contains animated LCD graphics and sound effects. To get to gold in the

cave you have to avoid bottomless pits and poisonous snakes. The Epson's built-in microprinter is used to keep the score. Galactic War is a shoot-'em-up game which uses the LCD screen, while Racer puts you in the driving seat of a racing car negotiating an obstacle-strewn circuit.

Cavehunt and Galactic War cost \$18, and Racer \$11, to which shipping costs will have to be added. Prices quoted are for microcassettes; the programs are also available on standard cassette for slightly less.

Contact Software Riches, Riverview Terrace, Irvington, NY 10533. Telephone: (914) 591-6470.

## BBC driver

THE EPSON FX-80 printer driver for View on the BBC Micro,

written by T L Morris and published in our April issue, is now available in a greatly enhanced form from Clares Micro Supplies. It costs £12 including VAT.

Clares can also supply drivers for the MX80/100 series, Juki 6100 and Brother daisywheel printers.

Contact Clares at 98 Middlewich Road, Rudheath, Northwich, Cheshire CW9 7DS. Telephone: (0606) 48511.

## Numeric database

FIGARO 64, for the Commodore 64, is a database package designed for numeric applications. Built-in statistical and calculating features, including seasonal forecasting, make the program suitable for a wide range of marketing, financial and technical tasks. Figaro 64 is supplied on disc and costs £86.25 including VAT.

Contact Saxon Computing, 3 St. Catherine's Drive, Leconfield, Near Beverley, North Humberside HU17 7NT. Telephone: (0401) 50697.

## DMS+

DMS+ is a new simplified version of Comsoft's DMS Delta database. Files produced with DMS+ can be used with the full DMS Delta system, and also with Lotus 1-2-3. It costs £195. Details from Comsoft Ltd, Hallams Court, Shamley Green, Guildford, Surrey GU4 8QA. Tel: (0483) 898545.



Above: Bloodthirsty games from English Software for under £10.

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The power of MTX NewWord is in its software – it doesn't need expensive disc drives and their supporting hardware even though it operates as if it had them. It is this feature that makes the program unique – it has disc sized power without a disc sized price. MTX NewWord was developed by the same team that created Wordstar – the powerful word processing system designed for the business environment.

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### COMMANDS AND FUNCTIONS

^A	cursor word left	^OR	go to document start
^B	align paragraph	^OY	delete to end of line
>>>	scroll down screen	^R	scroll up a screen
>>>	cursor right	^S	cursor left
>>>	cursor up	^T	delete a word
>>>	cursor word right	^U	escape
>>>	erase to the right	^X	line down
>>>	erase to the left	^Y	delete entire line
>>>	cursor to tab		
>>>	help		DOT COMMANDS
>>>	save file	.MB	set bottom margin
>>>	abandon changes	.MT	set top margin
>>>	save and resume	.OP	omit default page nos.
>>>	find/replace again	.PA	page break
>>>	carriage return	.PC	set page number col.
>>>	on-screen menu	.PL	set page length
>>>	centre a line	.PN	set page number
>>>	print control display	.PO	set page offset
>>>	set tab stop	..	comment line
>>>	justify on/off		OPENING MENU
>>>	set left margin	X	Exit
>>>	clear tab stop	J	Help
>>>	set right margin	D	Load a document
>>>	set line spacing	C	Create a document
>>>	margin release		
>>>	print controls menu		OTHER MENUS
>>>	bold print on/off	^O	Onscreen Format
>>>	pause in document	^Q	Quick menu
>>>	underlining on/off	^K	Save & printing
>>>	quick menu	^P	Print controls
>>>	find and replace	^J	Help pages
>>>	go to document end		
>>>	find		



# Software, from Newton to Nemo.....



## MEMOTECH EDUCATIONAL SOFTWARE

Memotech are currently producing two separate series of educational software. They are written for two age ranges; The **FIRST LESSONS** series covers ages four to seven years and the **MATHS** and **PHYSICS** series (each in four parts) cover seven years old up to "O" Level standard.

1st LESSONS is designed to teach younger children the basics of letter and word recognition, with option menus providing the parent or teacher with full control over the program's complexity and reward levels. The child is rewarded with full colour high resolution displays for the right answers.

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# More micros in small sizes

Sarah Underwood reports from Europe's biggest trade fair.

UNEARTHING new computers at this year's Hanover Fair made finding a needle in a haystack look simple. While 128,000 square metres of stand space were devoted to office and data technology, some of the latest micros were no bigger than this magazine.

Considering that micro-computers made their debut at the fair just seven years ago, the rate at which cumbersome machines have been shrunk into neat little packages is tremendous. Lap-held micros were in vogue this year with both Epson and Sord introducing new models, while Tandy, NEC, Olivetti and Sharp wheeled out the pint-sized wonders launched during the past year. Gavilan was also touting its model, but still is not prepared as far as selling it is concerned.

Epson's PX-8 should be in the shops by now with a price tag of around £1,000. Based on Zilog's Z-80 processor and Digital Research's CP/M operating system, its outstanding feature is business software. Portable versions of both WordStar and Unicac are included in the price. But early models of the PX-8 will have the software on microcassette, although Epson is planning to burn the programs into ROM chips.

The system comes with a standard 64K of RAM while optional RAM packs add a further 60K or 120K. An acoustic coupler is also on offer and a 360K 3.5in. floppy-disc drive unit should be available in the autumn. Epson is adamant that the QX-10 compatible PX-8 will not replace the existing HX-20 which, at half the price, has proved to be a best seller for the company.

The Hanover Fair is an extremely serious business,



Epson's PX-8 briefcase-sized portable runs CP/M software.

which perhaps explains the dearth of home computers. One new MSX machine from Kyocera was on show, but its chances of ever reaching the U.K. are slim since it has only been sold to one Japanese OEM so far. British-built home computers on show were the Dragon range, which did not attract much attention, and the Oric Atmos, which did. Oric's German distributor, MVB, claims sales volumes second only to those of Commodore.

Commodore itself introduced a plethora of machines at the fair but seemed as confused as the punters about which would be available in Europe and how much they would cost. For the home-computer user it introduced the C-116, a £100 16K system with a joystick cursor control.

Commodore added further confusion to the question of what it has developed and what it is actually going to sell, by introducing the Commodore PC. It looks suspiciously like Bytec's Hyperion, which is not surprising since that is what the system is based on, although as yet there seems to be no clear agreement between the two companies. This could be one of the ones that never reaches the

market. Commodore claims that it has redesigned the interior of the transportable Hyperion to make it more IBM compatible and that it will put its own casing on the Commodore PC this October.

The company also announced a Z-8000 multi-user system running an adapted version of the coherent operating system, Cohos, which is derived from Unix version 7. It will be on sale in Europe until next year and nobody was prepared to put a price on it. It has a Z-8000 processor, 256K RAM, 32K standard ROM, plus 128K of screen RAM; dual floppy-disc drives and an optional 10Mbyte Winchester; optional Z-8070 maths co-processor; a mouse port, two programmable RS-232 interfaces and an IEEE-84 interface for Commodore's existing range of peripherals, plus Basic, Pilot, assembler and an optional C compiler. There is no doubt that Commodore is on the right track with IBM PC compatible and multi-user Unix systems, but whether its products make the grade remains to be seen.

Other vendors showing Unix machines included Sharp with its 68000-based 8100 family and Altos, which offers not only

Xenix, Microsoft's version of Unix, but also Pick, M/PM-86 and Oasis 16 on its 586 and 986 multi-user Team computers.

Unusually, the Japanese manufacturers had very little of note to appeal to the business user. NEC featured its rather tired PC-8800B series, and Fujitsu the Micro 7 and 16-S, while Toshiba seemed to be more interested in selling photocopiers than computers. However, Mitsubishi International, the Japanese giant's trading company, did turn a few heads. On its stand was a PC-86, the micro designed and made in Britain by Future Technology Systems. Although a Mitsubishi salesman said that the PC-86 on show was the only one it had, he also said that it was doing a trial run selling the machine to OEMs in Germany. If the trial goes well worldwide distribution of the FTS range is possible.

Despite its recent troubles Osborne had a stand featuring its IBM PC - compatible portable. Similarly ill-fated Victor, which in Germany is still achieving very respectable sales, was showing the Vicki, first introduced at last year's Systems exhibition in Germany. Shipments of the portable Vicki started in Germany the week before the Hanover Fair but its progress on to the U.K. market is still in doubt.

Still reeling from the loss of its home computer business, Texas Instruments will have to do a better marketing job.

to the business-micro user. It appears to have made an agreement with Control Data and was showing a Professional computer linked to a CDC optical storage unit — perhaps the embryo of an optical-disc based retrieval system. If the system reaches the market Texas Instruments will have to do a better marketing job. M

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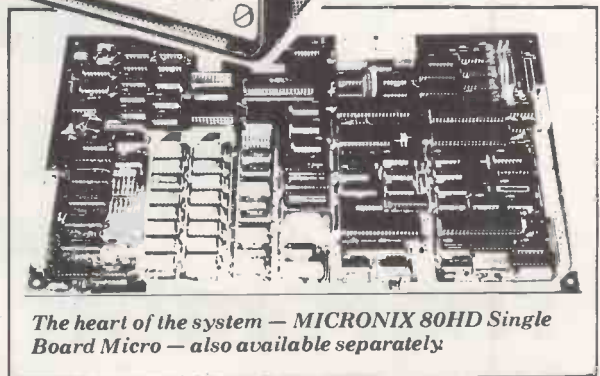
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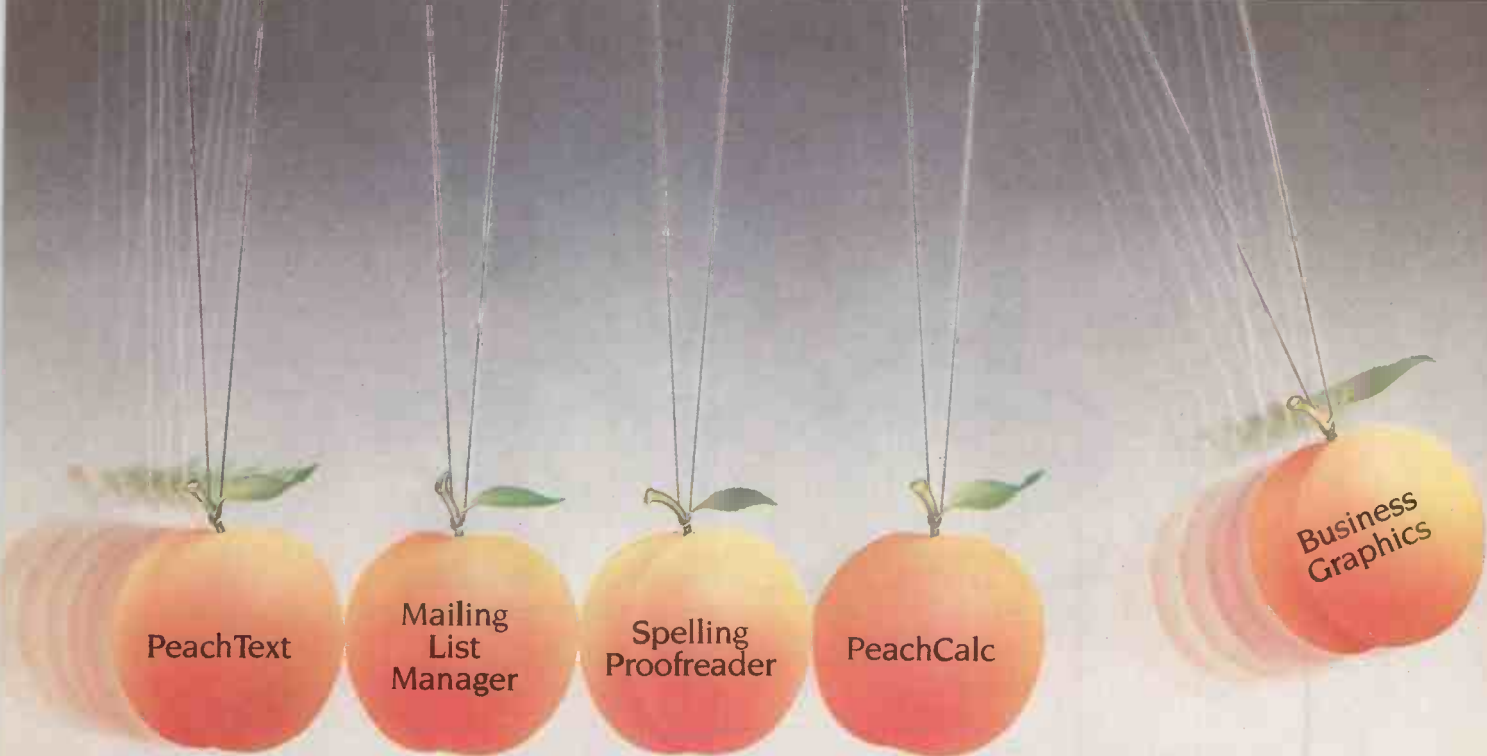
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PC6/84

● Circle No. 127





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# LOVE STORY

“ Gordon Baker had often thought about buying a computer, but his courage always failed him at the vital moment. "I'm not a technical man", he explained. "I need patience and understanding and when I saw Columbia in a recent issue of a computer magazine, it looked so attractive and uncomplicated that I just had to send for more details."

A package arrived from Icarus the following Monday. With trembling hands Gordon opened it and read through the letter and introductory brochure. It seemed too good to be true: Columbia embodied all that had been missing from his previous relationships.

A meeting was arranged.

Gordon passed that afternoon with his local Icarus dealer in a state of near ecstasy! Columbia was not only attractive to look at, but, as the dealer explained and demonstrated, proved extremely competent without being overly complicated.

Soon after that initial contact Gordon had to fly North on business and it was a fortnight before he could contact the dealer to fix another meeting. It was decided to bring Columbia round to Gordon's office to be introduced to the staff. It was vital to establish as soon as possible whether Columbia could operate efficiently in his own business environment.

Things could not have gone better. Columbia was a big hit with everybody; Accounts, Stock Control, Sales, Research and Forecasting were all of one accord: Columbia was terrific.

They enthused over the high resolution amber screen, were effusive about the choice of CP/M 86 and MS-DOS operating systems and IBM PC compatibility, and then became quite emotional over Columbia's floppy and Winchester disc configurations, its expandability up to 896K RAM and the access it gave to hundreds of 16 BIT 'off the shelf' software packages.

The dealer asked Gordon if he would like to see Columbia again. "Oh, please", said Gordon, "could it stay for just a couple more days?"

Within a week Columbia had moved in permanently, and Gordon was on top of the world.

"I'd just about given up hope of ever finding my perfect partner", he said, "until Columbia came along and changed my life!"

In the background, the warm glow from the amber screen seemed to indicate that Columbia too was well pleased with the situation . . .

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● Circle No. 129

# IBM accepts the PC

SO FAR IBM has been two computer companies: the megalithic Big Blue with its mini and mainframe computers, and the PC division, which has been kept separate. Now software is appearing to bring the PC into IBM's office automation strategy.

The three main programs are Display Write 2, Display Comm and IBM 5520/PC. All require PC-DOS 2.10.

Display Write 2 provides excellent word processing on the IBM PC to match that using Textpack 4 on the Display Writer dedicated word processor. It also produces documents in the same format as the IBM 5520 Administrative System and IBM 8100 Information System. This is the Revisable Form Document Content Architecture, RFDCA. Display Comm allows a PC to swap files with

Display Writer-type systems.

The 5520/PC attachment program allows Display Write 2 and PC-DOS files to be stored on a 5520 in this way, an IBM PC can also be attached to a System/34, System/36 or System/38 minicomputer. IBM plans to extend this to bring the PC into the IBM Distributed Office Support System, DISOSS, the master control program in IBM's electronic mailing and filing system for mainframe computers controlling a network of remote sites.

Thus a data processing department in a small business or giant corporation can buy IBM PCs as executive work stations and attach them to its

IBM Office Automation system in a way approved and supported by IBM. The PC is no longer just a stand-alone computer.

The company that has a number of PCs and wants to join them together might then be able to solve the problems of not having a network that works, or not having software that works on a network, or both.

Take a Compact System/36 with a 30 to 120Mbyte hard disc for example. It is small enough to fit under a desk, and quite affordable at around £12,000. It is supposed to support up to 22 local and 64 remote work stations, but for someone with 12 IBM PCs it could make more

sense as a fileserver than trying to implement Ethernet.

Of course, while DISOSS appears to be IBM's major strategy, it has been possible for some time to link IBM PCs to 3704, 4331 and 30XX mainframes running VM/CMS, which is the Professional Office System approach, PROFS. However, such a mainframe would be rather expensive as a fileserver.

One curiosity is that PROFS and DISOSS appear to be mutually incompatible products. Perhaps some kind and knowledgeable DP reader can explain the significance of this — at *Practical Computing* we do not believe in computers we cannot lift.

## Look-alike additions

ANOTHER CLUTCH of look-alikes has been hatched and are about to be put on to the market. This month's PCBulletin looks at some of the most interesting machines on offer.

### Zenith

THE PREVIOUS Z-110 dual 8/16-bit bit micro was semi-compatible with the IBM PC, but apparently that is no longer enough. Now Zenith has launched the Zenith PC and the Zip, a transportable version, claiming full compatibility.

The PC features an 8088 chip, 128K of RAM, 16-colour graphics as standard, one parallel and two serial ports. The price is very competitive at £1,995 plus VAT. A PC with only one floppy disc costs just £1,695 plus VAT, and the 10Mbyte hard disc

version costs £3,395 plus VAT.

The Zip has a built-in 9in. amber screen, one or two half-height floppy-disc drives, and can drive an external colour monitor. Its unusual design feature is pop-up disc drives.

Zenith has stuck to its improved keyboard, with no



Backslash key between the Z and Left Shift keys.

Contact Zenith Data Systems, Bristol Road, Gloucester GL2 6EE. Telephone: (0452) 29451.

## Future Technology Systems

FTS, the company that designed the Orion micro, tested in *Practical Computing* in May last year, has returned to the market with the PCi. This has an Intel 8086 run at 8 to 10MHz, 512K of RAM as standard, and is designed to run Concurrent CP/M-86 v.3.1. As for IBM PC compatibility, FTS is offering 25 percent off the



price if your PC-DOS software does not run on the PCi.

For details contact PCi Challenge, Future Technology Systems, 195 Knightsbridge, London SW7 1RG.

### Olivetti M-24

THE FINAL VERSION of the machine we reviewed in prototype form last month has now arrived. The ROM and MS-DOS have been upgraded since we reviewed it, the machine is even more IBM-compatible than before.

### Olivetti M-21

A TRANSPORTABLE version of the M-24. It has a built-in 9in. screen and weighs just under 31lb. Otherwise it has the same specification as the M-24, including 8MHz 8086-2.

## Seequa Chameleon Plus

A TRANSPORTABLE that has both an Intel 8088 for IBM compatibility, and a Z-80 for running CP/M-80. It has 128K of RAM, 9in. green screen and two floppy-disc drives, plus some free and some cheap software. Prices are from £1,995 plus VAT.

From Ferrari Software, Ferrari House, Station Road, Egham, Surrey TW20 9LB. Telephone: (0784) 38811.

## Sperry

A DESK-TOP machine with an Intel 8088, 128K of RAM, clock/calendar, two floppy-disc drives and the option of a 10Mbyte hard disc. It can alter the Intel 8088 from its normal IBM speed of 4.77 MHz to 7.16 MHz. It can be linked to IBM or Sperry mainframes.

It comes in 11 models. The single-disc monochrome Model 10 costs £1,371 plus VAT, and Model 50, with high-resolution colour graphics and 10 Mbyte hard disc, costs £4,679 plus VAT.

Contact Sperry Ltd, Computer Systems, Sperry Centre, Stonebridge Park, London NW10 8LS. Tel: 01-965 0511.



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# Tomorrow today

The first of a series looking at the advances in computer technology which are disclosed in British Patent Specifications.

MUCH HAS been heard recently of the problems in the Space Shuttle's computer systems caused by one of the several computers on board disagreeing with the results provided by another. In Toshiba's U.K. Specification 2,122,393 an arrangement is disclosed for dealing with this type of difficulty in any case where, for reasons of safety, two micros are used in parallel to monitor and control equipment such as an aircraft jet engine.

The suggestion is that the two processors should themselves be continuously monitored. Whenever a comparison of the two outputs shows a non-coincidence — indicating that one of the processors is faulty, or producing bad results — the monitoring circuitry forces both to take time off and run a test program. The monitor then selects only the output from the micro that passed the test for further use.

Also much in the news at the moment are the problems of protecting software against unauthorised copying, and the difficulties of doing this while allowing the authorised user to make backup copies. One answer is the provision of a dongle. It is typically a ROM chip inserted into a spare socket or port which holds some number that the program must match before it will run properly. This may deter the casual copier, but not the real pirate.

In the company's U.K. Specification 2,122,777 it suggests another answer, which is more secure but much more complicated and expensive. The Specification discloses the concept of having the software encrypted, and then using what might be described as an active dongle to help your computer decrypt and run the program. Open Computer Services proposes the use of a plug-in decryption unit, including a microprocessor and a limited amount of RAM, that effectively replaces the computer's own processor, and executes the instructions to run the program.

The whole decryption unit is really a self-contained micro in a sealed, tamper-proof module, bolted on to the side of your own machine. Combined with its own internal memory, which can be loaded with data from selected areas of the computer's memory, the module is said to permit program execution to occur without any

British Patent Specifications are usually published for the first time about 18 months after the filing date of either the relevant Patent Application or, if there is one, the British or foreign application from which priority is claimed. Though not widely appreciated, Patent Specifications are an excellent, if somewhat heavy going, source of information on all conceivable aspects of technology.

Each Specification normally contains explicit statements defining what the applicant thought was the relevant state of the art and its problems. It always includes a description of at least one embodiment of the invention, supposedly in such detail that a skilled reader could put it into practice from the description alone.

Each week the official journal *Patents* lists all the Specifications published that week, identifying them in terms of the U.K. patent classification system. Any person can use the classification index, available free of charge in the Science Reference Division of the British Library, to find the class covering the area in which they are interested.

If you look up "computer", for instance, you are directed via "computing apparatus" to "calculating". Look up the latter, and you are told that electrical apparatus for calculating, specifically digital apparatus, is in G4A, meaning Group G, Division 4, Heading A. Look up G4, and you will find that A is indeed electrical digital data-processing, while C is storage, H is selective signalling, and R is recognising characters, etc.

Look in each week's journal and you will find all the Specifications published that week and falling within G4A. If any. Copies of these Specifications may be seen, free of charge, at the library and may be purchased for £1.85.

sensitive data, such as decrypted program instructions, appearing either in the host computer's memory or on any accessible electrical conductors.

Micros have even invaded taking your temperature. According to Terumo U.K. Specification 2,122,748 it is now possible to have microprocessor-controlled clinical thermometers which allow the patient's

John Hooper is a Chartered Patent Agent who works in the electronics industry

temperature to be accurately measured far more quickly than does the old-fashioned mercury-in-glass variety. The thermometer continuously measures temperature over a short time, during which it gradually rises as the instrument gets nearer to the stabilisation point. It then predicts the final stabilised temperature in line with some predetermined function defining how the temperature is expected to vary with time. With luck you can take your temperature in five seconds as opposed to five minutes.

According to Terumo, the present electronic clinical thermometers are not sufficiently accurate, and are unnecessarily limited to applying a single temperature/time function which may well be inappropriate to the circumstances. It therefore suggests an improved version in which, using a first temperature/time function, the prediction of the final stabilised temperature is made twice on the basis of data gathered during two, possibly overlapping, time periods. If the two results are similar and within a predetermined range of, say, plus or minus 0.2°C then an average is accepted as the final temperature. If the results are quite different then it is assumed that the present function is inappropriate and another function is chosen. This procedure is repeated until matching results are obtained and the process could last no more than 30 seconds.

British Aerospace observes in U.K. Specification 2,123,189, how systems involved in data transfer between computers waste time in handshaking and similar routines. Instead it suggests that a plurality of computers may communicate via a page of extremely high-speed memory, with which each computer is connected in sequence for a time very much shorter than the computer's normal memory access time. In this way, British Aerospace asserts, none of the computers will ever realise that it is sometimes disconnected.

In addition, if the number of computers defeats even the fastest memory then any computer may be more permanently disconnected until it specifically requests memory access. A computer may be more frequently connected by arranging for the cyclic connection control mechanism to give it preferential treatment.

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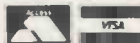
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# ATA



# Cheaper, simpler CP/M

Enhanced eight-bit processors will be the moneymakers for the next few years.

AS SEMICONDUCTOR technology continues to develop, so more and more circuit elements can be compressed economically on to single slices of silicon. The most obvious way to make use of this additional capability, and certainly the most glamorous, is to develop ever more sophisticated microprocessor chips, offering wider word architectures and software capability fit for a mainframe.

## Supporting cast

Examples of this approach include the Intel iAPX-386, the National 32032 and the Motorola 68020. They all offer exceptional 32-bit processing power and the virtual-memory support to enable them to replace large minicomputers in multi-user and multi-tasking applications. To be used effectively such powerful processors need a large supporting cast which must include megabytes of memory, expensive hard discs and equally sophisticated new software, which will ensure that demand develops relatively slowly.

The problem, of course, is that semiconductor sophistication is increasing faster than software and user sophistication. In response to this trend many chip manufacturers are seeking alternative ways of exploiting their dense chips. What they are striving for is a chip with the greatest possible market appeal for today's system designers.

One approach is to integrate a lot of I/O control logic on to the chip alongside a CPU which may already be popular but which currently needs external peripheral chips. Such improved chips do not require system designers to abandon their existing designs altogether, but they do open the way for simpler and cheaper systems with fewer components. The Intel iAPX-186 and iAPX-188 microprocessors are examples of this approach, and so are the so-called single-chip controllers such as the Zilog Z-8, which combines ROM, RAM and extensive I/O facilities in a single package used primarily for embedded control applications.

Realising that the sex-and-glamour field of advanced 32-bit processors has all the makings of a loss-leader enterprise at

the moment, American Microsystems Incorporated has brought its chip designers down to earth with a bump by getting them to produce a steam-powered eight-bit microprocessor with a built-in stone-age operating system. It is a combination which, surprisingly, will sell a lot more silicon than any newfangled wonder chip.

No doubt there were vigorous protests from the chip designers, eager to try out their fancy college knowledge. But under a grey-haired team leader, coaxed back from retirement with promises like "Z-80", "CP/M", "money", the job was completed.

Joking apart, the new AMI S-83 addresses a very real need in the microcomputer market. It holds out the promise of a cheaper and simpler route to no-frills microcomputers, the ones that sell like hot cakes despite being devoid of all hacker appeal. AMI has combined a Z-80 microprocessor with an on-chip ROM-based CP/M operating system and added a dash of improved dynamic-RAM interface circuitry. The whole thing has been squeezed on to a tiny silicon chip using the 3 micrometre VLSI design rules normally reserved for the 16-bit and 32-bit megachips.

## Popular

Although CP/M is by no means the best operating system, even for eight-bit applications, it is still the most popular. It has been around longer than the others and has a huge library of software support available. One problem the S-83 designers faced was the fact that standard CP/M is not suitable for ROM-based applications because it mixes in variables with the operating-system code. The solution was provided by Digital Research, the originator of CP/M, which has now produced a new variant called Personal CP/M. While it can run all existing CP/M software, Personal CP/M is also considerably improved and capable of ROM-based operation.

The 8K Personal CP/M operating system used in the S-83 has been rewritten to take advantage of the enhanced Z-80 instruction set; standard CP/M is restricted

to the 8080 instructions, which run as a subset on the Z-80. The result is a reduction in size and an increase in the speed of execution. While producing the new version Digital Research also got rid of the old-fashioned paper-tape interface driver and replaced it with one which handles more modern peripherals. Better still the unpopular and cryptic CP/M operator dialogue has been replaced with new user-friendly option menus and helpful messages. Despite these changes, Personal CP/M can still run all the old software.

## External logic

The Z-80 CPU based on the S-83 chip is quite standard as far as the programmer is concerned, but some hardware changes have been made to the interface circuitry to simplify the use of dynamic-RAM memory. All existing Z-80 chips offer an on-chip seven-bit counter for dynamic RAM refresh operations, but quite a lot of external logic is still required, particularly when modern 64K memory chips are used.

The S-83 has all the interface logic on-chip, furnishing a pre-multiplexed eight-bit address and the requisite RAS and CAS address strobes whenever external dynamic RAM needs to be accessed. External ROM or static RAM can also be accommodated and a non-multiplexed 16-bit address bus is available for this purpose.

In providing all these extra hardware features the S-83 designers have not been able to retain pin-compatibility with the basic Z-80, which is a shame. Instead the S-83 uses a new 48-pin package layout.

To encourage system designers to customise the S-83 Personal CP/M operating system to suit their own machine and its particular I/O requirements, AMI is also supplying the chip without the 4K BIOS section of CP/M. This allows a system programmer to develop a custom EPROM version for testing purposes before masked-ROM variants of the S-83 are ordered.

The S-83 is not going to be much use for upgrading old systems. What it should do is make possible the mass production of simple but businesslike personal computers. □



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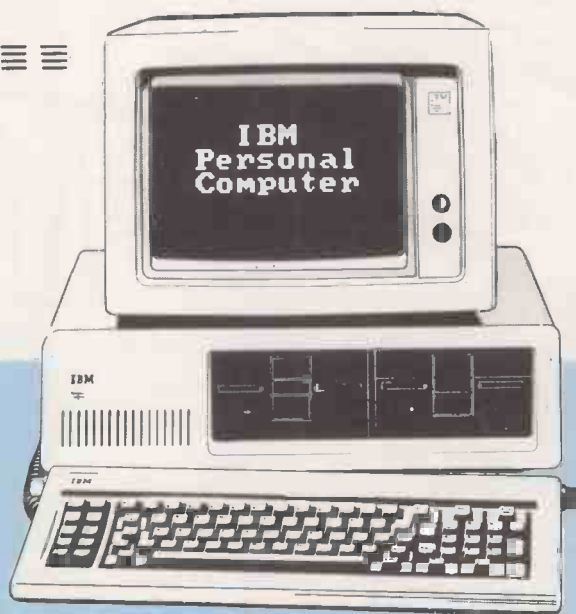
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# A quart in a pint pot

**ASCII may be a near universal code for representing alphanumeric characters but there are more efficient ways of storing large quantities of text.**

TEXT COMPRESSION is a useful art. Millions of gigabytes of disc space are devoted to storing letters, articles, reports and other word-processed text. But the basic inefficiency of the ASCII coding system can result in a doubling of the space needed to hold this text. It is not hard to see why programs which squeeze words and phrases into the smallest possible space are in demand.

The trouble with ASCII is that it was never designed for normal English writing. It is really a seven-bit code, but because of the almost universal use of the eight-bit byte in modern computers it is convenient to assign eight bits to each ASCII character. That provides 256 possible combinations even though there are just 95 printable characters.

Apart from this in-built redundancy, ASCII is completely blind to the different frequencies of characters in the English language. It uses as much space to store common letters like a and e as it does for the obscure symbols like curly brackets.

A good text-compression scheme can overcome both these problems, and can save 50 percent or more of storage space. These schemes take advantage of the structure of so-called "natural" English — a misnomer if ever there was one; the term really means ordinary, day-to-day English — although they can easily be adapted to foreign text or even to programming languages.

Of course, there is a price to pay for this saving. The compressed text cannot be used directly by any current editor, word processor or other software. You have to go through two conversion processes: once when you have finished using the text and again each time you want to get at it. Text compression is only really useful for security copies and long-term storage. Still, halving the disc space needed for all your backups might be a worthwhile aim.

There are two approaches to text compression. The first is to use a variable number of bits for each character. The four most frequent letters can each be held in two bits, the next eight letters in three bits, and so on. Morse code works this way, though it is not a true binary code. As well

as dots and dashes Morse uses a third signal: the short gap between characters. A similar system in a computer would need some form of header to delimit characters.

## Save half

Even so, using variable bit rates can lead to highly efficient compression. You can expect to save nearly 50 percent in the most favourable cases. The chief drawback is the complex programming involved. Most high-level languages are simply not geared up to dealing with bit streams.

The other approach is likely to run just as slowly but is easier to program. In this method some of the redundant ASCII

values are used as pointers to a list of the commonest English words. The first 50 words account for around 47 percent of normal English. If each of them is replaced with an ASCII character in the range 128 to 177 you get an immediate saving of about 22 percent. The longer the list, the greater the saving.

Unfortunately, a long list means that the time needed to look up every word becomes excessive, but happily there is a good compromise. Writing in the *Journal of the British Computer Society* volume 24, page 324, J Pike suggested a scheme based on four-bit characters. Pike's method is not only highly efficient, with low run-times

*(continued on next page)*

## Four-bit coding scheme

The four-bit coding scheme is based on strings of half-byte units. A unit is defined as four consecutive bits that either start or end on a whole-byte boundary. Units are combined into elements, each of which contains one, two or three units — four, eight or 12 bits. An element is used to store either a single character or one of the 205 dictionary words.

The first unit of each element defines the type of element, as follows:

Value of unit	Meaning
0	This unit and the next form an eight-bit word
1	This unit and the next form an eight-bit character
2	This unit and the next two form a 12-bit element
3-15	This unit by itself forms a four-bit character

four-bit elements	eight-bit characters	eight-bit words
0 eight-bit word	u	the
1 eight-bit character	p	of
2 12-bit element	g	and
3 Newline	m	to
4 space	h	in
5 e	y	that
6 a	f	it
7 i	b	is
8 s	v	for
9 r	w	be
10 t	k	was
11 n	x	as
12 o	j	you
13 l	q	with
14 d	.	he
15 c	,	on

The 67 rare characters and the remaining 189 dictionary words are coded as 12-bit elements.



(continued from previous page)

and space savings exceeding 51 percent, it is also relatively easy to program.

There are several requirements for a good text-compression program. Firstly, it must be reversible. The text that you compress today must be capable of being re-created identically tomorrow. And while you will probably want optimum results for normal English the system should also work for technical writing or foreign languages. All 95 printable ASCII characters must be catered for, and there must be no loss of efficiency if the text happens to be written entirely in capitals.

The four-bit system meets these conditions. It is based on elements made up of one, two or three half-byte units. A single four-bit unit is used to hold any of the 11 most frequent letters in English text — e, a, i, s, r, t, n, o, l, d and c — as well as Space and Newline characters. A two-unit element of eight bits holds most of the remaining letters and the comma and full stop symbols. The remaining 67 rare characters use three units or 12 bits.

## Common words

Given that the 11 common letters account for about 80 percent of English text, with the rare characters representing just two percent, this scheme gives an average of 4.88 bits per character or a saving of 39 percent. But you can go further and set up a dictionary of the 205 commonest English words. The spare eight- and 12-bit values can then be used as pointers into this list.

The whole thing is summarised in the box on the previous page. If the first half-byte unit in each element contains a value in the range 3 to 15, then this value fully defines the character. If the first unit contains 0 the following unit contains one of 16 eight-bit characters. If it contains 1 the following unit defines one of the 16 commonest words. And if the first unit contains 2 the next two units contain one of the remaining 67 characters or 189 words.

Pike showed that this system can compress English text to an average of 3.87 bits per character without too large an overhead for looking up the dictionary. Still higher savings could be achieved by increasing the size of the word list, but the run time would then start to reach unacceptable levels.

Each word in the dictionary is assumed to start with a space, unless it is the first word after a Newline. This means that "the" codes as an eight-bit value if it occurs in "theatre", but not in "lathe". Not only does this save having to store every space that occurs in front of a dictionary word, it also speeds up the processing by cutting down the number of look-ups.

So far it has been assumed that all common letters and words are written entirely in lower case, with the capital letters being considered as rare. To accommodate capitals you could impose the rule that the case of a letter is reversed if

it is the first letter after a full stop, the first letter in the text, a single letter l, or if the previous two letters are capitals. This last condition would allow text that is entirely in capitals to be coded just as efficiently as normal mixed case text.

The possibility of non-printable ASCII characters in the text should also be considered. The scheme already caters for the Newline character, and the fact that it is often stored as the two ASCII characters Carriage Return and Line Feed need cause no problem provided that it is compressed and expanded consistently. Many word processors store other control codes or escape sequences in the text to control printing; for example, Control-S is used in WordStar to initiate underlining. You can allow for them by adding them to the list of

rare characters in place of some of the dictionary words.

You must also be careful about word processors that use the high-order bits of text characters; again, WordStar is the best-known example. It can be a real problem because it forces you to recognise a further 95 characters, many of which are likely to occur very frequently. This is probably a way round it but it might be easier simply to avoid using right-justification in WordStar; the main cause of high-order bit setting.

The real beauty of Pike's four-bit scheme is its flexibility. If you write a lot of technical text, you might find you get better results by changing the dictionary to reflect your more specialised usage. It is worth experimenting with it, and you might find your bills for floppy discs going down. □

1	the	53	them	105	here	157	thought
2	of	54	her	106	good	158	each
3	and	55	war	107	make	159	far
4	to	56	your	108	most	160	home
5	a	57	any	109	many	161	put
6	in	58	more	110	much	162	again
7	that	59	now	111	those	163	always
8	it	60	its	112	way	164	nothing
9	is	61	time	113	see	165	present
10	l	62	up	114	world	166	between
11	for	63	do	115	know	167	going
12	be	64	out	116	day	168	money
13	was	65	can	117	never	169	per
14	as	66	than	118	did	170	once
15	you	67	only	119	new	171	peace
16	with	68	she	120	down	172	woman
17	he	69	made	121	even	173	year
18	on	70	other	122	long	174	another
19	have	71	into	123	years	175	away
20	by	72	men	124	country	176	cannot
21	not	73	must	125	business	177	fact
22	at	74	people	126	right	178	half
23	this	75	said	127	get	179	still
24	are	76	may	128	life	180	give
25	we	77	man	129	just	181	government
26	his	78	about	130	take	182	power
27	but	79	over	131	where	183	too
28	they	80	some	132	work	184	yours
29	all	81	these	133	things	185	found
30	or	82	two	134	part	186	few
31	which	83	very	135	through	187	possible
32	will	84	before	136	while	188	does
33	from	85	great	137	last	189	food
34	had	86	could	138	might	190	house
35	has	87	such	139	am	191	less
36	one	88	first	140	back	192	oh
37	our	89	upon	141	old	193	best
38	an	90	every	142	own	194	case
39	been	91	how	143	three	195	line
40	no	92	come	144	against	196	place
41	their	93	us	145	go	197	says
42	there	94	shall	146	think	198	since
43	were	95	should	147	came	199	ever
44	so	96	then	148	matter	200	himself
45	my	97	like	149	days	201	let
46	if	98	well	150	without	202	military
47	me	99	little	151	also	203	tell
48	what	100	say	152	public	204	why
49	would	101	because	153	today	205	big
50	who	102	being	154	yet	206	got
51	when	103	under	155	don't	207	until
52	him	104	after	156	same		

The 207 most commonly used English words, ranked according to frequency in typical text. In the four-bit compression scheme, a 205-word dictionary is used. The words "a" and "l", although ranked in the first 10, are excluded from the dictionary because they can each be coded more efficiently as a space and a letter.



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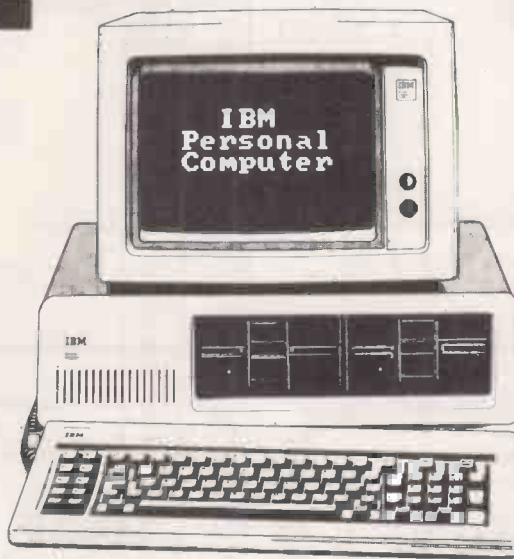
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**Combined TV/Monitors**

ITT RL2301	£280.00
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**Daisywheel Printers**

Juki 6100	£379.00
Silver Reed	£309.00
Daisy Step 2000	£289.00

**Daisywheel add-ons**

Juki Sheet feeder	£239.00
Juki Tractor feed	£109.00

**Dot Matrix Printers**

Seikosha GP50A	£109.00
Seikosha GP100A	£169.00
Seikosha GP250X	£209.00
Seikosha GP500G	£189.00
Seikosha GP550A	£259.00
Seikosha GP700A	£359.00
Star Delta 10	£365.00
KDC FT-5001	£259.00
Epson RX80	£249.00
Epson RX80 F/T	£279.00
Epson FX80	£379.00

**Serial Interface**

<b>Conversions</b>	
8143 - Epson	£30.00
8148 - Epson (2K buffer, XON/XOFF protocol)	£65.00
Juki	£55.00

**Single Disc Drives**

100K(200K) Single-Sided	
40 Track	£150.00
200K(400K) Double-Sided	
40 Track 3-inch	£190.00
400K(800K) Double-Sided	
80 Track	£219.00

**Double Disc Drives**

400K(800K) Double-Sided	
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800K(1.6M) Double-Sided	
80 Track	£409.00

**BBC Disk Interfaces**

Kenda Mighty Oak	£90.00
Kenda Professional (Double Density)	£130.00

**Acorn Products**

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BBC Model B with fitted disc interface	£469.00
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Dungeon Adventure	£9.00
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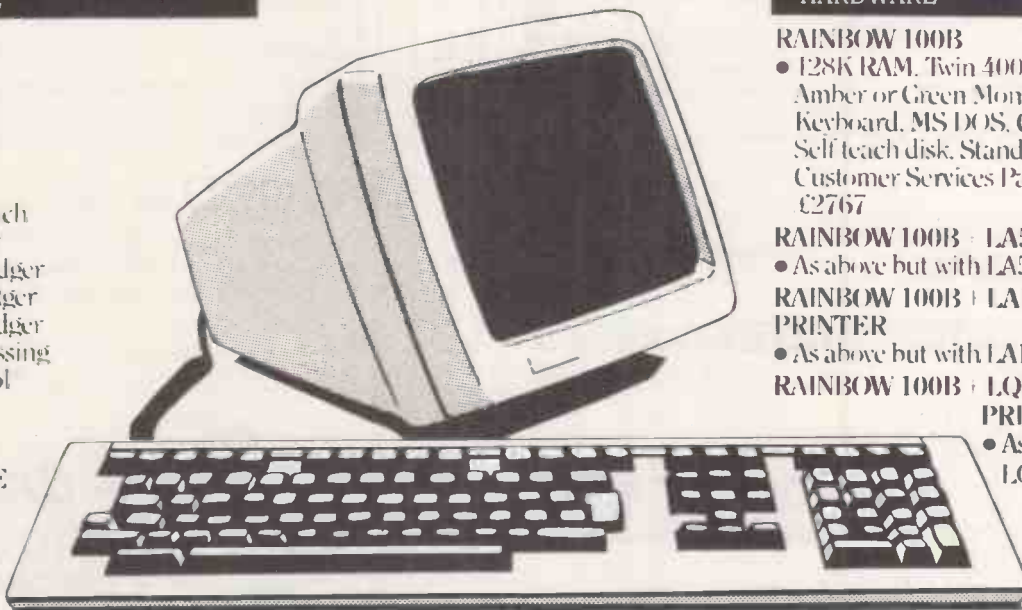
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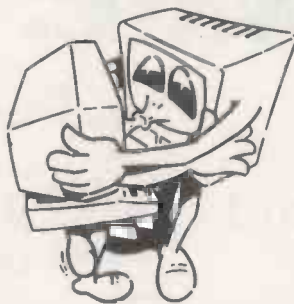
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APPLE	Daisy Wheel Printer	1332	995	SHINWA	CP80 Printer	289	189
APPLE	Matrix Printer	425	349	TEXAS	820 KSR	1500	1095
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DIABLO	Printer 630	1495	1150				
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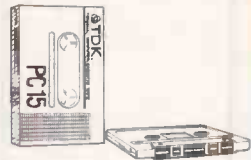
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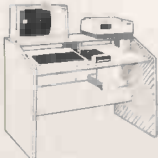
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ADA	Supersoft			
BASIC INTERPRETER	Microsoft			
BASIC COMPILER	Supersoft			
BASIC COMPILER V5.3	Microsoft			
BUSINESS BASIC COMPILER	Microsoft			
C COMPILER	Microsoft			
C COMPILER	Supersoft			
CBASIC	Digital Research			
CBASIC COMPILER	Digital Research			
CIS COBOL	Micro Focus			
COBOL COMPILER	Microsoft			
FORTH	Supersoft			
FORTHAN	Supersoft			
FORTHAN COMPILER	Microsoft			
LEVEL-2 COBOL	Micro Focus			
LISP	Supersoft			
muLISP	Microsoft			
muMATH/muSIMP	Microsoft			
PASCAL COMPILER	Microsoft			
PASCAL MT+	Digital Research			
PL/1	Digital Research			

## Low Level Languages

	CP/M	CP/M 86	MS-DOS	PC-DOS
MACRO-80	Microsoft			
PROGRAMMERS UTILS (RASM)	Digital Research			

## Program Development Tools

	CP/M	CP/M 86	MS-DOS	PC-DOS
ANIMATOR	Micro Focus			
BUG	Phoenix Software			
DISPLAY MANAGER	Digital Research			
FTNUMB	Micrology			
LEVEL II ANIMATOR	Micro Focus			
PDEVELOP	Phoenix			
PLINK	Phoenix			
PLINK II	Phoenix			
PLINK-86	Phoenix			
SID	Digital Research			
SPEED PROGRAMMING PACKAGE	Digital Research			
XLT-86	Digital Research			
ZSID	Digital Research			

## Utilities/System Tools

	CP/M	CP/M 86	MS-DOS	PC-DOS
CLIP	Keele Codes			
DESPOOL	Digital Research			
DIAGNOSTICS II	Supersoft			
DISK DDCTOR	Supersoft			
DISKED-2	Slogger Software			
DISK EDIT	Supersoft			
DISKMAN	Slogger Software			
DISKORG	Slogger Software			
DISKTOOLS-1 (DISKMAN & DISKORG)	Slogger Software			
DISKTOOLS-2 (DISKTOOLS-1 & DISKED-2)	Slogger Software			
dUTIL (FOR DBASE-II)	Fox & Geller			
FILESARE	Micro Focus			
DEC RAINBOW SERVICE S/W:	Silicon Valley Corp.			
(1) Format/Verify Service				
(2) Autorun Service				
(3) Function Key Service				
SERVICE S/W VOL. 1 (1, 2 & 3)				
SYSTEM CHECKER	Supersoft			
THE OPERATING GUIDE	Decision Systems			
UTILITIES I	Supersoft			
UTILITIES II	Supersoft			

## Sorting

	CP/M	CP/M 86	MS-DOS	PC-DOS
MSORT	Microsoft			
SUPERSORT	Micropro			

## Code Generators

	CP/M	CP/M 86	MS-DOS	PC-DOS
AUTOCODE	Stemmos			
FORMS-2	Micro Focus			
QUICKCODE	Fox & Geller			
SOURCEWRITER	Softwright			
THE LAST ONE	D.J. 'AI' Systems			
THE LAST ONE—COMPACT	D.J. 'AI' Systems			

## Telecommunications/Conversions

	CP/M	CP/M 86	MS-DOS	PC-DOS
BACDEBIT	Comley			
BACSCOPY	Comley			
BSTAM	Byrom Software			
BSTMS	Byrom Software			

## Telecommunications Cont.

	CP/M	CP/M 86	MS-DOS	PC-DOS
ICL CD3 EMULATION (Bulk)	Synchro Systems			
ICL CD3 EMULATION (Interactive)	Synchro Systems			
ICL CD3 EMULATION (Interactive & Bulk)	Synchro Systems			
REFORMATTER CP/M ↔ DEC	Synchro Systems			
REFORMATTER CP/M ↔ IBM	Microtech Exports			

## Word Processing/Text Editing/Editors

	CP/M	CP/M 86	MS-DOS	PC-DOS
CORRECTOR	Supersoft			
EDIT-80 V2.02	Microsoft			
FRIDAY	Ashton Tate			
MAILMERGE	Micropro			
MEMOPLAN	Chang Labs			
WORD	Microsoft			
WORD WITH MOUSE	Microsoft			
PARAGRAB	Focus			
PEGIT	Phoenix			
PMATE	Phoenix			
SPELLSTAR	Micropro			
STARBURST	Micropro			
STARINDEX	Micropro			
WORDMASTER	Micropro			
WORDSTAR	Micropro			
WORDSTAR PROFESSIONAL (WS - MM - SS - STAR INDEX)	Micropro			

## Databases/Data Management Systems

	CP/M	CP/M 86	MS-DOS	PC-DOS
DATASTAR	Micropro			
DBASE-II	Ashton Tate			
INFOSTAR	Micropro			
REPORTSTAR	Micropro			

## Financial Accounting

	CP/M	CP/M 86	MS-DOS	PC-DOS
INCOMPLETE RECORDS SYSTEM	MPI			
NOMINAL LEDGER	Padmede			
OPEN ITEM PURCHASE LEDGER	Padmede			
OPEN ITEM SALES LEDGER	Padmede			
PADMEDE BUSINESS CONTROL SYSTEM	Padmede			
PAYROLL	MPI			
PURCHASE LEDGER	Padmede			
SALES INVOICING	Padmede			
SALES LEDGER	Padmede			
TIME & COST RECORDING	Padmede			

## Financial Modelling/Problem Solving

	CP/M	CP/M 86	MS-DOS	PC-DOS
CALCSTAR	Micropro			
DECISION ANALYST	Executive Software			
LINEAR & GOAL PROGRAMMING	EAS			
MATHSPACK	MPI			
MICROPLAN	Chang Labs			
MULTIPLAN	Microsoft			
PLANTRAC 1	Computerline			
PLANTRAC 1 - PROFIT PLAN	Computerline			
QSTAT	Chang Labs			
STATSPACK	Pivotal Software			
TK! SOLVER	MPI			
TK! SOLVER PACKS	Software Arts			
FINANCIAL MANAGEMENT				
MECH ENGINEERING				

## Business Applications

	CP/M	CP/M 86	MS-DOS	PC-DOS
JOB COSTING	Heselline			
POLICY MASTER	CSA Micro Systems			
PRINT ESTIMATION	Software Mgmt Systems			
STOCK CONTROL	Padmede			

## Training Aids

	CP/M	CP/M 86	MS-DOS	PC-DOS
CP/M TUTOR	Syntax Software			
KEYBOARD MASTER	Anthony Ashpittel			
TYPING MASTER	Anthony Ashpittel			

## Graphics

	CP/M	CP/M 86	MS-DOS	PC-DOS
dGRAPH	Fox & Geller			
STATSGRAPH	Supersoft			



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The package has been developed by Hi-Yin Music, a company built around the talents of composer and arranger Per Hartmann. He has written the package to help arrangers prepare music manuscripts both quickly and easily. That however is just one of the capabilities available with Music

Mate. It can also be used to produce an arrangement of a melody for up to 14 instruments.

In its simplest role, Music Mate can be used to drive a matrix printer so that it can print out a full musical score. The composer enters the notes of a music score into the system by letter, ie A, B, C etc, with sharps and flats being shown by the # sign and lower case B (b) respectively. Rests are indicated by the letter P (bar pause) and note durations are designated numerically, with the smallest value being a sixteenth note. Octaves are shown numerically, with octave 0 being the lowest.

The system will request in addition, the names of the instruments to be scored, their clefs, and the key signature (if any) of the music.

From this information the system will then be able to drive a matrix printer to print out a complete score of the music. Each part will be identified for the instrument desired and be ready to play. It will save a great deal of time and effort in producing the written arrangements to a piece of new music.

Music Mate goes further, however. Using probabilistic techniques, the programme can be used to generate melodies itself or to provide arrangements to an existing

melody line. To stop the computer picking any notes, octaves, note durations and instruments at random, the user sets up a table of weighted probabilities. These set the likelihood of any particular note, duration, instrument or octave appearing in the score. Once the score has been produced by the computer, the package allows the composer the chance to modify and manipulate the music so that it can be tailored to suit requirements. The score can be transposed, for example, to a different key, or swap notes or octaves around.

Without doubt, Music Mate is truly a musical "word processor".

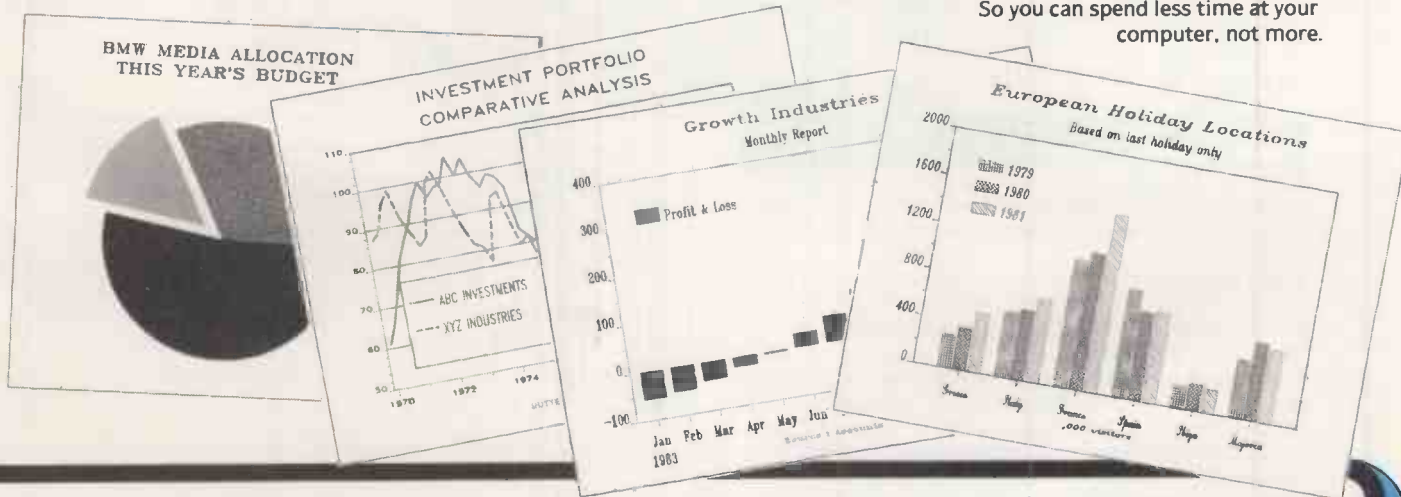
## DATA PLOT BUSINESS GRAPHICS from GRAFOX

Software whose every picture tells a story

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avoid the need to re-enter existing information when integrated into current systems. It can read data from local and remote sources, to include tabular data files, spread-sheet and database packages, and reporting programs. Using DATAPLOT you can download to your micro from a mainframe system, or link into a distributed processing network to receive additional data. The one thing it won't do is disrupt your existing systems! In fact, it could be worth your while spending a little of that valuable time finding out rather more about it...

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Write the codes for your choices here:

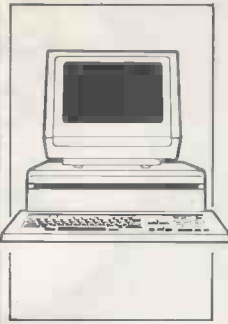
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## The Xerox 16/8 PC the two-in-one micro

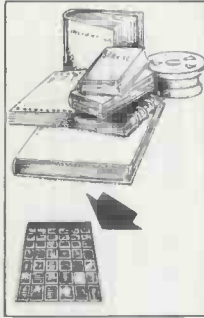
The Rank Xerox 16/8, by offering to you both 8 Bit AND through 16 Bit processing, is the two-in-one micro to meet your business needs now — and in the future. It can utilise all your existing 8 Bit data and programs and all the much faster processing 16 Bit software now becoming more widely available. It comes with three operating systems — CP/M®, MS-DOS™ and CP/M86. It is the micro designed to combat obsolescence so find out more by contacting me now.

**426 on enquiry card**

## To all hardware and software manual users

Send a section from your software/service/repair manual, parts list or even the magazine from your main-frame computer and Micromedia will prepare, free of charge and without obligation, a demonstration microfiche containing your information plus a comprehensive free quote to convert your parts manuals into easy to use microfiche. For the busy engineer on the road, some readers plug into a car cigar lighter socket enabling you to have your records to hand. Let me put you in touch with Bell & Howell.

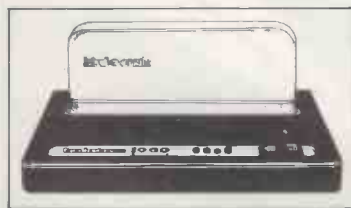
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## Why does this man look so bored?

Quite simply because he's waiting for his microcomputer colour printer to deliver fifty colour prints. You see, he understands the value of printing in colour but doesn't know how to go about it quickly. Now if he'd only thought to visit his local Xerox Copy Centre, he'd have all the quality colour prints he wanted — and in a fraction of the time. Ah! you say. But colour prints cost money. Well yes they do. But at the Xerox Copy Centre, far less than you'd think. Just £1 a copy, in fact. And if you contact me now you'll receive three £1 money-off vouchers!

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## The perfect binding system

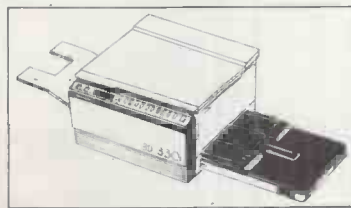
This simple desk top machine converts typed, printed and photocopied pages into prestige perfect-bound presentations in seconds. The Bind-o-Matic 2000 presents information in its most compelling form to command immediate attention. So easy to operate, stand it beside the copier where anyone can use it. And it's fast — 25 booklets in 40 seconds. Single documents even quicker. Above all, such beautiful results! Price lists, quotations, reports, etc in superb quality. A4 covers which can be printed with your Company name and logo. I have all the details.

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## Order in space

Funny-shaped space, crowded space, new space, refurbished space — frightening to organise when the buck stops with you. Put order into your existing chaos by discreetly adding screens to create private areas, channel traffic, and colourfully control acoustics. With no great upheavals. Or create an office in empty space, using modular screen-hung desks, storage, fittings and matching chairs. With minimum of fuss. Experienced designers from Open-Plan can even help you to plan the best layout. Why not find out more by circling this number?

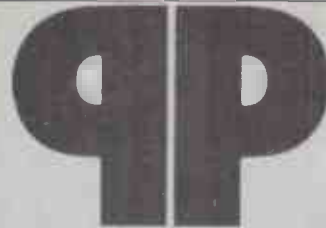
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## Full copier features for under £1,000

The Toshiba Copyboy will provide all the features normally expected of more expensive machines, but in a size suitable for users wanting copies from 100 to 3000 per month. Copyboy has big copier features, a straight through paper path which virtually eliminates paper jams, full edge to edge copying and a speed of 12 per minute. Lion Office Equipment, the sole UK distributor, see the Copyboy being used by small businesses and individual departments where speed, convenience and confidentiality are required. Contact me for full details.

**431 on enquiry card**

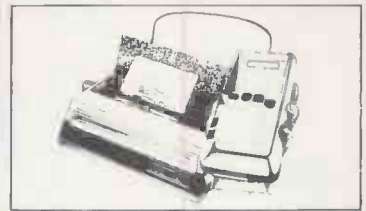


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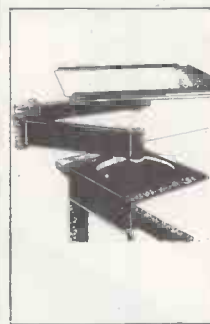
Truly personal word processing is now here. Microwriter can supply their amazing hand-held word processor with an SCM printer, the TPI. I can think of few professional people who wouldn't benefit from being able to produce perfectly edited reports, letters, etc, wherever they are and get them instantly into type without having to rely on the typist. Particularly when there's no need to learn to type. You can learn how to microwrite in less than an hour. Contact me for more information.

**432 on enquiry card**

## Twinlock's Multi-Stor

The 'paperless office' always seems to end up producing more paper than it replaces, and finding space to store vital computer printouts and tape reels is often a headache. The answer to this problem could be Twinlock's Multi-Stor. The system is designed to accept standard Multi-Stor fitments. It has a 75in high unit that takes five rows of Printout Binders. It will expand upwards, sideways and back to back. Contact me now for details of this flexible storage that grows with your needs.

**433 on enquiry card**



## Movable terminal arm for VDU screen

Screens are now common in offices and special desks are needed or existing space is lost. To solve this problem, Copyright Copyproducts have introduced a clever new idea. A 'Terminal Arm' is fitted to a desk enabling your screen to be easily moved, at an adjustable height, across a desk in any direction. The arm tilts up and down for optimum visibility and the screen pushes off the desk when not in use. Very strong rigid steel and most reasonably priced. Let me send you details.

**434 on enquiry card**

## The last word in dictation

The BM 550 portable dictator from Sony's MicroWorld range has all the features that enable easy and efficient dictation. This slim and sleek portable, weighing less than seven ounces has a slide switch for one hand operation, electronic indexing for better communication with the secretary and the micro cassette flexibility of up to two hours recording. Circle this number now and I'll be happy to send you all the details.

**435 on enquiry card**



## Telephone in private

Now available from Storacall is a colourful telephone booth that provides maximum privacy for telephone conversations by isolating background noise. There are five standard colours to suit most modern decors and Storacall can also supply special colours or company livery for identity conscious organisations. Reasonably priced, strong and stable in use, the model 1000 is weather resistant for outdoor locations. The booth is highly suitable for factories and industrial premises where it will brighten the working environment. Let me send you full details.

**436 on enquiry card**

More and more people are discovering how effective and productive personal computers can be in business administration and the professions.

You can find out how the new technology can help your business by visiting The Computer Fair at Earls Court, London. A section will be devoted to business computing applications so you can get

Earls Court  
June 1

# 'THE COMPUTER MEANS BUSINESS'

Budgeting, forecasting, financial modelling, VAT, sales, purchase and general ledger all become easy, routine operations, taking only a few hours a month. Information is immediately available whenever you want on cash flow, profit and loss – plus a host of other useful operations like word processing.

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**Computer**  
**Fair**  
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Small business systems





helpful, expert advice and see all the equipment under one roof, quickly and easily. In fact the first day of the show will be devoted to trade and business visitors only. Business visitors on June 14 will be admitted free, after presenting

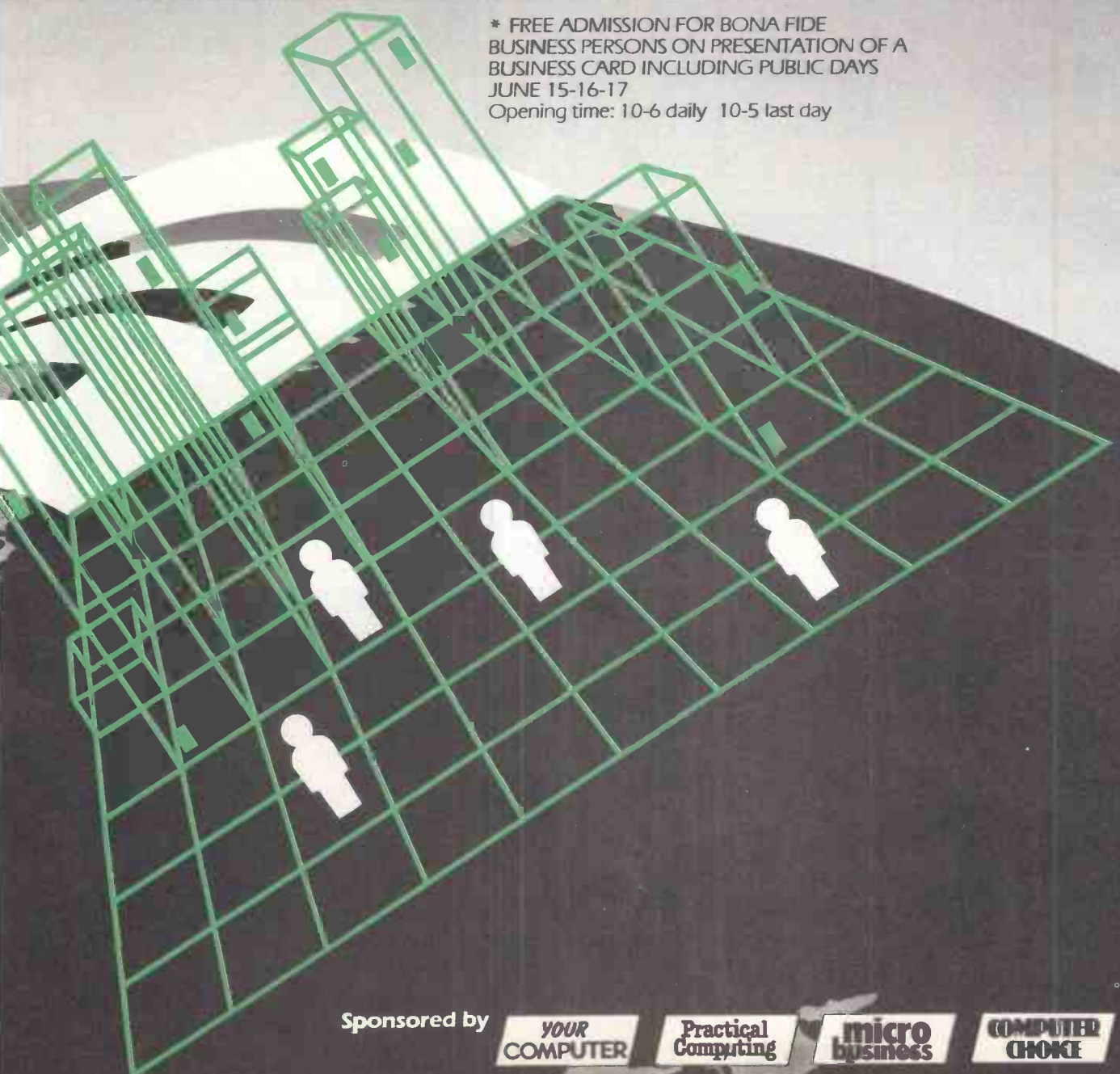
a business card and registering at the door.

Make sure of your visit to The Computer Fair on June 14 1984 Earls Court, London – you may find it to be the most productive day of the year!

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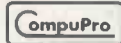
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DBMS III 7 new switch mode facility enables you to cross up to 12 different files (32000 records per file) pre-selecting any of up to 20 fields per record/file for display/print output (240 fields) in all. One massive enquiry can pass through 384,000 records

You might have two files whose records are directly related to each other, so that the first file (say containing names and addresses) refers to the second file (say financial and other information relating to the same record numbers in the first file) directly. Then you can simply choose that in file 1 you are interested in just the name and telephone numbers, whereas in file two, you are interested in the income, trading period and number of branches. Information. Your enquiry can then pass through both files highlighting that information only. Actually there doesn't need to be a strict correlation between the same record numbers in different files, and you can also just on JUMP command go to any record in any of the 32000 records in any one of the twelve files and carry on cross-referencing from there onwards

## DBMS'S MACROS WORK FROM THE MOMENT YOU INSERT THE 'TASK DISK' IN THE COMPUTER

Simply design your file, give its fields your words, set up 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 disc 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", "budgeting", "plus more?"

Not only does this program surpass most of its kind that you might buy elsewhere, but if you buy the hardware from us, then you get it — FREE... DBMS II (WITHOUT MACROS) AND DBMS III ARE FULLY IMPLEMENTED UNDER CPM 86 (tm) AND MS-DOS (tm) ie: < SIRIUS/VICTOR/IBM > DBMS II IS 395.00 (or 250.00 by mail order ex. training). DBMS II is 575.00 (or 295.00 by mail order ex. training).

Contains the highest state of the art software available today

FORMS/TEXT/CALC/DBMS IV — ALL IN ONE PROGRAM THE — "KEY" — @ 575.00.

When you budget for a complete system of software you eventually end up with a host of packages like, Sales, Purchases, Nominal Data, Text, Calc, Mailshot, Invoice, Order, Workflow, Personnel, and so on. The list is endless and the outlay several thousands of pounds.

**Features** Design a form as wide as a window of 250 characters, long as needed. Cursor movements are 'left, right, up, down, delete left, delete right, tab right, left-up-down'. Paint your form as you like directly on the screen. Write a letter as you see it on the screen, edit it then simply enter P to print. Set into the form, your data fields, "#####" and specific file-related activities, formulae and validation checks. Enter values and see the spreadsheet calculate itself.

**Text.** Write a letter as you see it on the screen, edit it then simply enter P to print.

**Calc.** Set into the form, your data fields, "#####" and specific file-related activities, formulae and validation checks. Enter values and see the spreadsheet calculate itself.

**Database.** Search files for data to be inserted to fields specified. All the features of DBMS III, explained elsewhere in our ad.

Here's an example of an invoice you might design for your stationery.... You could design your own spreadsheet, order form, statement, wage docket, or any other kind of form that is required to fit your existing stationery.

INVOICE				
To <1> #####	From: G. W. Ltd 55 Bedford Court Mans. Bedford Avenue London W.C.1. Tel: 01-636-8210			
<2> #####				
<3> #####				
<4> #####				
<5> #####				
Date <6> ###.##	Tax point <7> ####	Agent <8> ###		
Quantity	Description	Cost	Tax	Total
<9> ###	<10> #####	<11> ##	<12> ##	<13> ##
<14> ##	<15> #####	<16> ##	<17> ##	<18> ##
Total... <19> #####		Tax... <20> #####		

<??> items <1> to <5> internal command to request name, input, and then search an address file for details.  
<??> items <6> to <7> request date input and validate.  
<??> item <8> request agent number and validate range.  
<??> item <9> request quantity, validate range.  
<??> item <10> request description, search file, accept, and calculate fields <11> <12> <13>. If finished invoice then calculate fields <19> and <20>

Now comes the more valuable facility. You can provide the 'FORM' with file-related instructions, not only to request a 'console' input for file search against names, and stock, but after the invoice is finished, the fields you have selected may be passed to related files.

EG: Send fields <0>, <1>, <06>, <07>, <11>, <12>, <13>, <19>, <20>, to a sales ledger.  
Then send fields <9>, <10>, <11> to product analysis file.  
Then send fields <0>, <1>, <7>, <19>, <20> to V.A.T. file.  
Then send fields <10>, <11>, <12>, <13> to Nominal ledger. Do you see?

## POPULAR BRANDS OF EQUIPMENT WE SELL

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- PRINTERS** — Nec/Queme/Diablo/Okii/Epson/Olympia/Ricoh  
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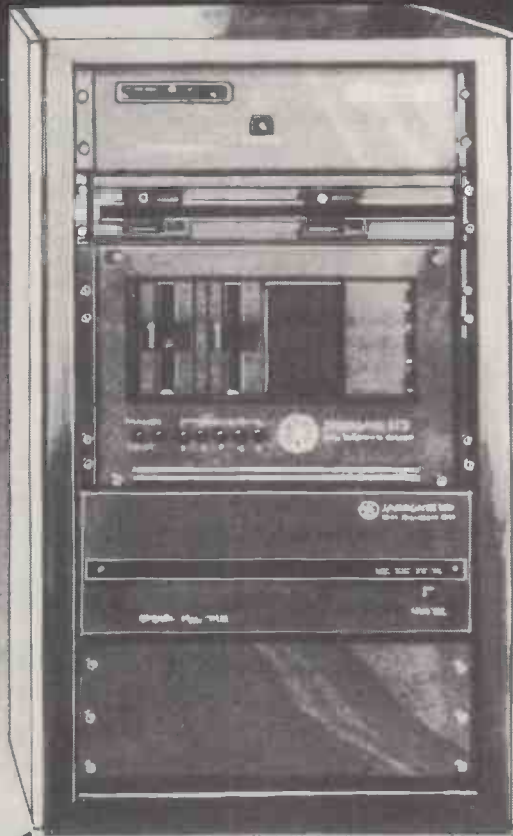
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Please note that the COMPUTER and PRINTER is transferrable to any other model that we stock. EG: IBM/TEXAS/CORONA/SIRIUS/ETC Also: delivery & training extra

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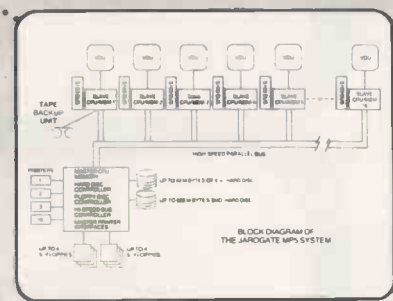
FROM 5 TO 600MB  
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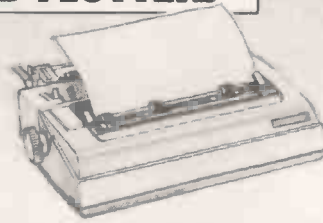
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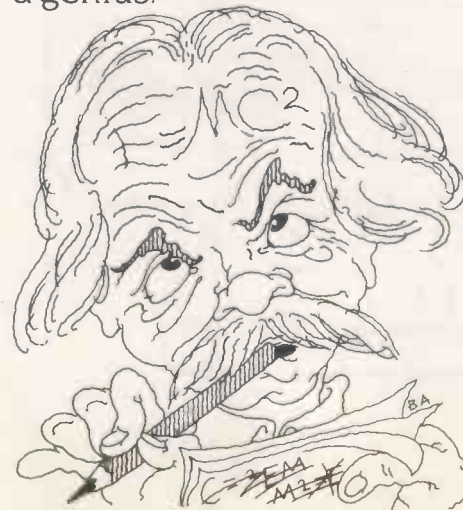
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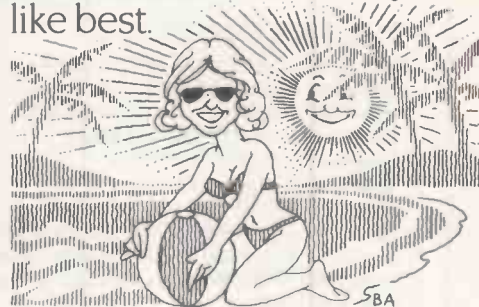
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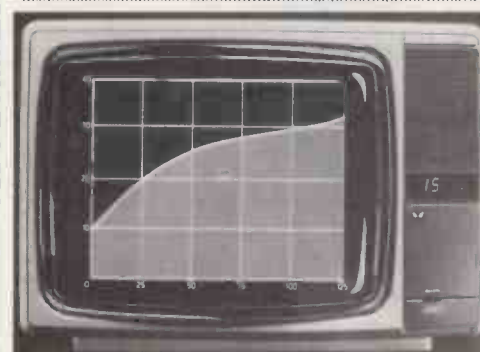
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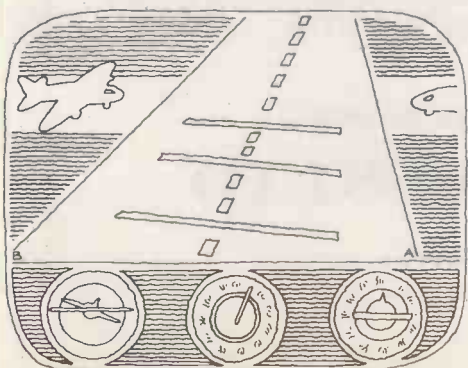


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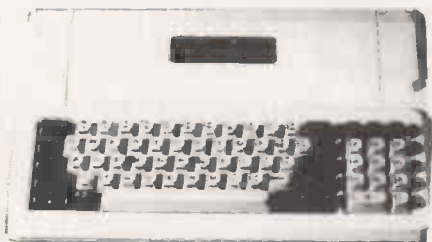
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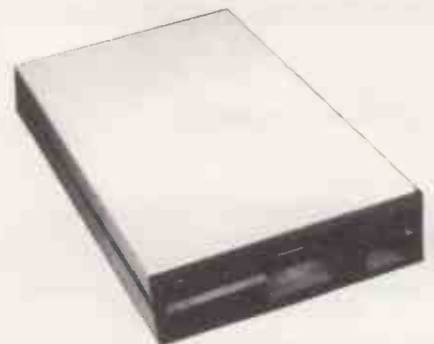
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# Setting the standard

Where IBM led, others have had to follow.  
Jack Schofield explains why.

EVENTS of the last couple of months have finally established the IBM Personal Computer in Britain as today's standard in the microcomputer business. The same happened over a year ago in the U.S., where it is estimated that over 750,000 IBM PCs have been sold.

First, IBM has reduced the price of its Personal Computer by around 22 percent even though it is having to limit the number dealers can sell. This follows the American trend, where IBM aggressively reduced its prices to maintain market domination. It confirms IBM's determination to succeed in the European market.

Secondly, Europe's leading computer manufacturer, Olivetti, has accepted the standard by producing two PC-compatible micros of its own, the M-24 desk-top and M-21 transportable models. Originally Olivetti was pursuing its own line with the M-20, which had a different microprocessor, the Zilog Z-8000, and a different operating system, PCOS.

Digital Research, whose CP/M operating system dominates the eight-bit business market, has also by implication conceded defeat in the battle, though not the war. Digital Research's latest 16-bit operating system, Concurrent CP/M-86 version 3.1, runs IBM PC software by emulating PC-DOS, the creation of its major rival Microsoft.

## Unchallenged

Thirdly, the Victor company, which built the Sirius 1, previously the U.K.'s leading business computer, has gone into liquidation. The U.K. distributor, ACT, should continue to do well with the Sirius to which it now owns manufacturing rights, and its own Sirius-compatible Apricot, but it cannot challenge the IBM PC as a standard.

Fourthly, very large numbers of IBM PC-compatible micros are now appearing from major manufacturers, or are just about to appear. Previously IBMulation had been pursued mainly by small or start-up companies. As well as Olivetti, the companies include Advance, whose machine is being made by Ferranti, Commodore, Compaq, Columbia, Corona, Dynalogue, Eagle, ITT, whose Xtra is sold by STC, OSM, Philips and Wordplex, with versions of the Corona, Rair, which sold its Black Box to ICL as the ICL PC, Tava, Vector Graphic, and many more.

IBM-compatible or semi-compatible machines are also here or coming from Canon, Fujitsu, Gavilan, Grid, Intertec, LSI, Osborne, Sanyo, Sperry, Texas Instruments, Tandy — the Model 2000 — and Zenith. There are at least 12 Far East companies, mostly in Hong Kong and Taiwan, producing IBM-compatible micros. Even the Apple and Atari micros can now be upgraded to IBM compatibility using third-party add-ons.

Almost every significant manufacturer has gone or is going down the IBM road.

Among the few holding out are the strong corporations with large numbers of existing users. Examples include Apple, DEC, Hewlett-Packard and Wang, but with the exception of Apple even they have micros with at least some compatibility with the IBM machine.

To make an IBM PC-compatible micro a manufacturer must use one of the same family of chips as the IBM's Intel 8088 microprocessor. It must run Microsoft's MS-DOS operating system — which is almost identical to IBM's PC-DOS — using the same disc format, the same screen addressing and, for preference, hardware expansion bus. The aim is to enable the IBMulator to run the same software as the IBM PC so as to capitalise on the huge amount of software that the IBM PC's success has generated.

Now, however, most serious programs become available first for the IBM PC, and for other machines, later or never. Some people do not like this, partly because they don't think the IBM PC is a state-of-the-art computer. That is true enough: it was launched in the U.S. in late 1981, and the art has undoubtedly moved on since then. But most consumers prefer standardisation to state-of-the-artfulness.

Anyway, the IBM PC implies an upgrade path, as its Intel 8088 psuedo 16-bit chip can be superseded by the full 16-bit 8086 or 8086-2. Upwards compatibility is then offered with the forthcoming Intel 80186, 80286 and 80386 range. Some PC-compatibles, such as the Olivetti micros, already use the superior 8086-2 and two British machines have appeared with the 80186: the Globe from ABS and Casu's Super PX.

Anyone who thinks that the IBM PC has only standardised the business micro market had better think again. The IBM PC and PC XT are only the first of a range of IBM machines running the PC-DOS version 2.1 operating system. Others on the way include the PPC portable model, a mainframe-terminal model designated 3270

PC, the XT/370 mainframe-on-a-desk model, a multi-user business model that is yet to be announced and two home computers under the PC Junior label. The PC thus takes you all the way from the simplest cassette-tape based micro to the mainframe level.

## Top-selling games

Right from the beginning the official IBM software catalogue included games. Now some 20 percent of the world's top-selling games, according to the distributor Softsel, run on the IBM PC. In the future, a similar if not stronger development will take place in the field of education, at least in America.

Of course, not everyone wants an IBM PC, and there are interesting alternatives. The 8086 family of chips has a strong rival in the Motorola 68000 family. These powerful and elegant processors are being used in a number of machines, including the Apple Macintosh and Sinclair QL.

While 68000-based micros currently have but a tiny share of the market, huge sales of the Macintosh and, with luck, the Sinclair QL could establish them as a viable alternative. The 68000 is already used in some IBM products and could even become the dominant processor of the late 1980s.

A 16-bit version of the ancient Mostek 6502 processor, used in first-generation micros such as the Apple II, Atari and Commodore machines, is now around in sample quantities. If it is adapted it could give the old stagers a new lease of life.

Though it looks likely that the IBM PC will set the standard for the next five years, that will not be the end of the story. Perhaps DEC will manage to put the power of its Vax super-minicomputer on a chip or three. The potential of Inmos's transputer is even more staggering. There must be similar research taking place within companies like Hewlett-Packard and, indeed, IBM itself. But for the moment, an IBM PC is definitely the thing to be. M

# Family affair

The IBM PC is a standard that has not only spawned look-alikes but new additions to IBM's own range of products. Jack Schofield takes a look at them.

THE IBM PC is a standard, but there is no standard IBM Personal Computer. The way it works is that you go to an IBM authorised dealer, you decide what you need, and if you can pay for it, that is what you get. As long as you are willing to accept some third-party components almost anything is possible. Anything from playing Frogger to controlling laboratory equipment, from telecommunications to reading credit cards, from processing words to digitising pictures.

When the IBM PC was first launched in the U.S. in August 1981, the minimum configuration was a cassette-based system with 16K of RAM. Nowadays 64K is the minimum, while two 360K floppy-disc drives, a keyboard and green screen are the norm. However, the construction is still modular. The essence of the PC is that it is flexible and configurable.

IBM itself has marketed a wide range of configurations to suit particular tasks and environments, though not all are available in the U.K. These start with the PC Junior and advanced Junior models, continue through the PC, the Portable PC, then the hard disc PC XT, to end with the 3270 PC and XT/370. In addition there are three ancillary products which are close to the PC family. These are the 5550, the 9000 and the Display Writer. Altogether a total of ten machines.

Future products which have not been announced by IBM are expected to include the Business Computer or IBM BC, a hard disc-based multi-user version of the PC built round the Intel 80186 chip, and a lap computer like the Tandy 100, NEC and Olivetti M-10 models.

## PC Junior

The IBM PC Junior, more commonly known as the PCjr, is the baby of the family, and was launched in the U.S. late last year. Like all members of the PC family, it comprises a system box containing an Intel 8088 processor and 64K of RAM, Microsoft Basic in 40K of ROM, plus a detached keyboard. The PCjr also has two cartridge slots, plus joystick and other ports.

The keyboard can be used completely detached, utilising an infrared link to the system box, or attached by a coiled cable. Colour graphics and sound are built in, and the PCjr can be plugged into a TV set to provide a 40-column text display. Graphics range from 640 by 200 pixels in two colours

to 160 by 200 pixels with 16 colours.

The PCjr is designed as a home/games computer, though it is rather expensive at \$699 — about £460. However, it is expected to have a strong appeal in the education market too.

## Advanced PCjr

The advanced version of the PCjr is much the same as the PCjr except that it has 128K of RAM, a built-in 5.25in. floppy-disc drive, and costs \$1,269, about £875. The disc operating system is PC-DOS version 2.1, the same as on the larger PC and PC XT micros.

The advanced PCjr is designed as a home/personal system. Added to its games-playing facilities is an 80-column text mode, and the facility to run over 30 of the IBM programs for the larger PCs, and share data files with others. However, it still lacks the full PC keyboard and has no function keys or numeric keypad, so software customised for the PC will require different key combinations making it trickier to use.

Another limitation of the PCjr keyboard is that it has rubber-capped keys rather than typewriter keys, which are not suitable for extended typing sessions. However, alternative keyboards will probably become available after the PCjr is launched.

The advanced PCjr can be used for games and education. It is also intended for the executive who has an IBM PC in their office to use at home with the same program — floppies are easier to transport than transportable micros. Alternatively, the Personal Communications Manager program provides access to data with a

modem and the telephone line. However programs written to exploit the PCjr's extra colour-graphics facilities will not be usable on the Senior systems.



Solid, reliable and debugged: the IBM PC.

## The IBM PC

When first launched in the U.S. the IBM PC was considered a revolutionary machine. By now the specification of the IBM PC is perhaps too familiar to dwell on. Basically it comprises a system both with one or two 320/360K 5.25in. floppy-disc drives, a detached keyboard and either a green screen or a colour monitor. Expansion is via a series of slots on the motherboard — just like the old Apple II. The operating system, PC-DOS, is IBM's proprietary version of Microsoft's MS-DOS.

The three key points of the IBM PC are the keyboard, the screen and the PC-DOS version 2.1. The keyboard is exceptionally good: low profile, sculpted keys, good typing angle, excellent touch. The green screen provides a sharp, stable, legible image which is outstanding.

PC-DOS version 2 is a large, powerful operating system that was originally modelled on CP/M, which was version 1, but has since moved towards Unix. It is not a bad compromise, being friendlier and less obscure than the former, and more informative and less enigmatic than the latter. Its numerous commands like CIs,



The advanced PCjr home/personal system.

Echo and If, and its Unix-like redirectable I/O pipes, enable it to be used as a kind of high-level language. Keeping PC-DOS programs as Batch files saves a lot of work.

The standard IBM PC is not the fastest or most advanced micro on the market, but it has a certain elegance and is a good, well made machine if you want something to use day in and day out.

## PC XT

The PC XT is the same as the PC except that floppy drive B is replaced by a 10Mbyte hard disc, C. There are other differences in the expansion slots and the size of the power supply and so on, but these are of little concern once the system is installed.

It is with the XT that PC-DOS 2 really comes into its own, since an Autoexec. Bat file can be used to boot the system into the required application on powering up. With the hard disc it is also essential to pre-plan the file structure and utilise the tree-structured directories provided by DOS 2.

In use the XT offers a further considerable advantage, in that loading and saving programs is much quicker. Also very large programs such as Open Access, Silicon Office and Tomorrow's Office can be run from the hard disc, instead of using two, three or more floppy discs. Some very large pieces of software such as PC/IX, an implementation of Unix, can only be run on the PC XT.

The one flaw with the hard disc is that IBM provides no recommended means of backing it up, except on to a large number of floppy discs — no streaming tape. Again a third-party product such as Alloy's PC-Stor can be used instead.

The PC XT should be most popular as an executive work station, and of all the PC range is definitely the best buy for anyone who can afford it.

## Portable PC

When the IBM PC came out in the U.S. it soon emerged that 35 percent of them were used in the home. Also, a large proportion of machines made regular trips between home and office, even though the PC was hardly portable. Further, the Osborne 1 transportable was selling like hot cakes.

It was obvious that a portable version of the PC would sell extremely well and numerous companies rushed to supply the demand, including Compaq, Corona, Columbia, Dynaloc, Seequa, Colby, Osborne and others. Suddenly Compaq had sold over \$100 million worth of machines in a year, and IBM recognised this was not good business for IBM. Hence the recent launch in the U.S. of IBM's own Portable PC.

The PPC is a mains-powered transportable with a built-in 9in. amber screen and one or two 5.25in. floppy-disc drives. It weighs about 30lb. and comes with a carrying bag. As with the Compaq,

you can plug in an external colour monitor.

Again the PPC has few differences from the standard PC. The major ones are that like the PCjr it uses half-height floppies and has a built-in colour graphics/monitor adaptor. The main board is like that in the XT, but has only three full-size expansion slots. There is 256K of RAM on the motherboard, but with only one spare long slot, maximum RAM is theoretically 512K. The keyboard follows the standard layout, but has a hole in the top to keep the connecting cable out of the way.

It is not known when the PPC will be launched in the U.K. However, as it has a universal power supply switchable to 115 or 230V, unofficial imports can be expected to appear.

## 3270 PC

The IBM 327-X family of terminals is designed for connection to IBM mainframes, and so has become one of the most popular terminals in the world. But what about the people who really want a PC, but for corporate reasons need to be hooked into a mainframe? The obvious solution is to buy a PC and a BSC 3270 terminal emulation program and adaptor card. If you just want to download files from a mainframe that is not difficult, but a PC cannot really do the job as well as a real 3270 work station.

IBM's solution is the 3270 PC. It has the ability to display up to seven windows on screen at once, showing various sets of data from its own memory or from different parts of the host mainframe. You can have four windows into the mainframe, two notepad windows and one working window, and you can move data between them.

While the system box looks the same, the 3270 PC comes with a colour monitor which displays eight colours, and an enlarged keyboard. This has two sets of function keys, to cater for both PC and 3270 modes.

The 3270 host key-tops are labelled in black and the PC ones in blue.

There are three models of the 3270 PC. Each has from 320K to 640K of RAM and one 5.25in. floppy-disc drive. The options are twin-floppy and 10Mbyte hard disc versions.

The 3270 PC will be made in Greenock, Scotland, and available at very competitive prices towards the end of this year.

## XT/370

The XT/370 looks exactly like a PC XT, but inside it has three very exceptional expansion cards. One card provides 3277 communications, so the XT/370 can be used as a terminal to an IBM mainframe. The other two cards are a mainframe; effectively a personal IBM 370 running VM/PC, a version of the interactive mainframe operating system Virtual Machine/Conversational Monitor System, VM/CMS.

One expansion card has 512K of RAM, which expands the total RAM to 640K in PC XT mode. However, it acts as 4Mbyte of virtual memory in XT/370 mode. The second card carries three microprocessors: a standard Motorola 68000, an IBM-microcoded custom 68000, and an IBM custom chip based on the Intel 8087. The first two chips execute the most common System/370 instructions, while the third handles the floating-point maths.

Unlike the 3270 PC, the XT/370 is obviously not going to be a best seller. However, for any mainframe hacker or 370 programmer it must represent unbeatable value. The average 370 installation, when they were current used to be little short of a million pounds. The XT/370 at £8,228 plus VAT, plus £919 for software, offers around 90 percent of the power for one percent of the cost.

Like the 3270 PC, the XT/370 is being made at Greenock and deliveries are expected from September.

## Other products

The three remaining IBM micro-computer products are all dedicated to specific markets. The most famous is the Display Writer, which uses an Intel 8086 and is a top selling dedicated word-processor. This is associated with the PC family through Display Write 2, which is a PC version of the Display Writer software. Using this, text files can be swapped between PCs and Display Writers for correction, filing and pringing.

The IBM 5550 is also an 8086-based micro, and in styling is not dissimilar from the Display Writer. However, the 5550 is made for IBM by Matsushita in Japan, and carries the IBM PC flag in that country.

In fact, the IBM 5550 has greater power than the PC. The full 16-bit 8086 runs at 8 MHz, it has a minimum 256K of RAM, and 1,024- by 728-pixel graphics. This is necessary to provide a 16- by 16-character matrix, which is about the minimum for Japanese kanji characters.



IBM enters the laboratory with the 9000.

Finally, the IBM 9000 Instrumentation Computer is a 68000-based micro designed by IBM Instrument Inc. for scientific and laboratory use. Apart from the standard PC keyboard it is weird looking, but it does offer 128K of ROM, 128K of RAM expandable to 5Mbyte, extra 57-key pressure-sensitive keypad, and 768- by 480-pixel bit-mapped graphics. 4

# Sisters under the skin

Robert Piper surveys the look-alikes which offer access to all that lovely software written for the IBM PC without you having to pay for IBM hardware.

AS IT BECAME obvious the IBM PC was going to be a runaway success the software houses and accessory manufacturers turned on it in a big way. Other microcomputer manufacturers then saw the size of the market on which they were missing out and set about designing machines which could take advantage of this wealth of software and hardware but undercut IBM on price.

One way to attract customers is to bundle software in with each machine. This practice has become popular among manufacturers because they only pay a fraction of the advertised retail price for the software, enabling them to keep their profit margins reasonably high and still sell a complete package at a competitive price. The entry of the big corporations such as Olivetti on to the IBM-compatible scene may see this practice dying out as they can offer other advantages like improved hardware or additional memory.

The true PC compatible should be able to run any applications package released for use on the IBM PC. Furthermore it should be possible to plug in and operate any of the hardware expansion cards currently available for the IBM PC. To achieve this ultimate goal most manufacturers have simply copied the IBM hardware as closely as they dare.

The firmware located in the PC ROM is copyrighted, and IBM has recently taken Eagle and Corona to court for infringing it.

This firmware, commonly referred to as the basic input/output system or BIOS, performs the system checkout and testing, and the initialisation of memory-interrupt vectors and flag values. It is interrogated by the operating system when the machine is booted up and can also be called by applications packages. Compatible manufacturers have to provide software which will mimic the IBM ROM as closely as possible, but will avoid copyright problems.

Another problem is that IBM commissioned its own version of MS-DOS from Microsoft and renamed it PC-DOS. There are differences between the two, especially concerning calls to the BIOS area of ROM.



The genuine article, the IBM PC.

In the U.K. some manufacturers can only offer MS-DOS version 1.25 whereas PC-DOS has been updated from version 1.1 — the equivalent to 1.25 — to version 2.0 as originally launched to support the hard-disc IBM XT. As many of the better software packages available for the IBM will only run under PC-DOS 2.0 they will not work on PC compatibles.

MS-DOS 2.0 is slowly becoming available, but in the meantime users can go out and buy PC-DOS 2.0 over the counter of any IBM dealer for £53. It will not only enable them to run the latest generation of software, it will also improve their overall compatibility. Better still, wait for the latest version of both, which are both designated 2.1.

We have taken a look at six machines claiming to be IBM compatible and tested them with many different types of IBM software. The table on page 72 and 73 summarises the machine specifications and details what software we found would run and what would not. Potential buyers should always check that the IBM software they intend to use on a compatible does in fact run correctly. Some of the more sophisticated software listed in our compatibility test would not run on the configurations we created for comparison purposes; many require 256K minimum and some require colour graphics cards as well.

## COLUMBIA MPC

COLUMBIA DATA PRODUCTS was one of the first companies to produce IBM PC compatible micros in the United States. The range now includes the VP portable but probably the most famous is the MPC 1600-1, distributed in the U.K. by Icarus Computer Systems.

Monitor, processor and keyboard are housed in three separate boxes, as with the IBM PC itself, but the system unit is 4in. longer than the IBM. Inside there is an 8088 running at 4.77 MHz coupled to 32K of ROM and 128K of RAM on the base model. A monochrome graphics board is included in the asking price as are two serial ports and one parallel port.

The two 320/360K disc drives are

identical to those on the IBM. A real plus point is the inclusion of a hardware Reset button. The monitor now used is the Amdek 310A, which has an orange phosphor and produces a display which is very hard to fault. It cannot be angled or tilted towards the user as its fixed base simply sits on top of the processor unit.

The keyboard is manufactured by the Keytronics company and is a copy of the IBM's except for the addition of LEDs on the Num Lock and Caps Lock keys. Keytronics units give the impression of being far flimsier than the IBM, but key action is acceptable and much quieter than IBM's.

The Columbia is supplied with both MS-

DOS version 1.25 and CP/M-86. At present there is not as much IBM software available to run under CP/M-86 as under MS-DOS, and the situation shows little sign of improving. A diagnostics disc is included, and an asynch comms package is provided to enable the serial ports to be used with a modem.

An imposing array of bundled software starts with Perfect Writer and Perfect Speller word-processing programs, the Perfect Filer database and Perfect Calc. None of these packages has built-in graphics, so the MPC 1600-1 is also provided with Fast Graphs, which converts ASCII data files into pie charts, bar charts or graphs as required. The Home Account-



tants package which is included is a best seller in America but does not lend itself too well to the average British household budget.

The Columbia MPC 1600-1 ran most of the IBM packages we had available with no major problems. Most IBM peripheral cards should also slot in and work to spec. The MPC 1600-1 has seven vacant IBM slots available and has the most impressive expansion possibilities of the group. Up to 1Mbyte on-board RAM is possible, and an 8087 arithmetic co-processor is also available to speed up complex calculations.

## Conclusions

- The MPC 1600-1 is a competent machine with better than average compatibility and an impressive amount of free software.
- However, the current retail price of £3,150 is not competitive when compared to the £2,300 asking price of a similar spec IBM PC with no software. The £850 difference hardly covers the value of the free software, let alone the risks involved in buying a compatible whose future compatibility cannot be guaranteed.
- The Columbia has the best potential for expansion because it is physically larger than the rest of the group.
- The monitor display was the most pleasant to use of the group.

# EAGLE PC PLUS

EAGLE COMPUTERS is far better known on the other side of the Atlantic than in the U.K. At the end of last year, however, Geveke Electronics was appointed sole European distributor and is now marketing a range of Eagle products in the U.K. Most are PC compatible micros and include dual-floppy and hard-disc desk-top PCs and portables based on the Intel 8088 and 8086. The Eagle Plus 2 is a revamped version of the PC-2 brought out to meet the demand for a machine with an IBM-type keyboard.

The system unit has an Intel 8088 CPU, 128K of RAM and 16K of ROM. To support printers and comms there are two serial ports and one parallel port.

The original keyboard imported with the PC-2 did not follow the IBM layout and consequently posed immediate compatibility problems concerning the location and number of function keys. The revamped model, however, uses an exact copy of the IBM except for the provision of LEDs on the Num Lock and Caps Lock keys. The keyboard is manufactured by Keytronics and is of acceptable quality, though not as good as the IBM unit. It slides into the base of the processor box when not in use.

The green-screen monitor simply sits on the top of the processor box and has no built-in mechanism for tilting or swivelling. The persistence of the phosphor is rather

too long, causing characters to ghost while the display is scrolling. The screen is updated in an unusual manner, and this too made it tiring to use over long periods. We understand that the screen-control ROM is being revised to cure this shortcoming.

MS-DOS version 1.25 is supplied with the Eagle Plus 2, along with the advanced Basic interpreter GWBasic, or Basica in IBM parlance. CP/M-86 was originally supplied, and although now deleted from the standard OS list is still available as an optional extra. Supercalc 3 with an as-yet unknown financial-planning enhancement is bundled with the machine.

At the time of testing, the Eagle displayed a similar level of compatibility to that of the Columbia. IBM has since taken



legal action against Eagle Computers for copyright infringements of the IBM PC ROM listings, as a result of which Eagle is revising the BIOS to be more acceptable to IBM. To the Eagle end-user this will probably mean it is also less compatible.

As the Eagle is a compact, lightweight unit its expansion possibilities are below average. The standard Plus 2 has three expansion slots, of which two are already filled with the mono graphics board and the disc-interface controller. Memory can be expanded to 512K and an 8087 co-processor added by simply plugging in extra chips into sockets on the main board, so most users should still find themselves with one spare slot. Communications should be possible by using one of the serial ports but no software is included in the standard package.

## Conclusions

- The Eagle Plus 2 at £2,305 including MS-DOS, GWBasic and Supercalc 3 is reasonable value for money.
- It is very easy to use and its silent running make it pleasant to use in quiet environments.
- Question marks hang over the quality of the monitor display and the machine's future IBM PC compatibility, both of which are in the hands of the Eagle designers at present.

# FUTURE FX-20

FUTURE COMPUTERS is a British company which launched the FX-20 around the middle of 1983. Though it is not a true IBM compatible, it can be linked to IBM PCs and can read PC data files.

The system unit has a very large footprint but is unusually low. It houses an Intel 8088 CPU running at 8MHz. Coupled to the use of special dynamic-RAM refresh circuitry, this high clock speed makes the FX-20 one of the fastest 8088-based machines around.

The dual Toshiba disc drives have a capacity of 800K each. The standard machine is supplied with 128K of RAM.



Three communications ports are provided for connection of serial printers and modems. Additional special ports allow the FX-20 to be used in a variety of networks. No parallel port is provided, preventing the use of simple Epson-type dot-matrix printers without serial interfaces. There is no Reset button either; for a reset you press a combination of Shift and Brk keys twice.

The unusually shaped monitor has a green monochrome display of 80 by 25 characters. Brightness is controlled from the keyboard by pressing the Shift key and one of the function keys F1 to F7

	IBM PC	COLUMBIA MPC 1600-1	EAGLE PC PLUS	FUTURE FX-20	OLIVETTI M-24	TAVA PC	COMPAQ
<b>SYSTEM UNIT</b>							
CPU	Intel 8088, 4.77MHz	Intel 8088, 4.77MHz	Intel 8088, 4.77MHz	Intel 8088, 8MHz	Intel 8086-2, 8MHz	Intel 8088, 4.77MHz	Intel 8088
Co-processor	Intel 8087 (optional)	Intel 8087 (optional)	Intel 8087 (optional)	Intel 8087 (optional)	Intel 8087 (optional)	Intel 8087 (optional)	Intel 8087 (optional)
ROM	40K	32K	16K	4K	8K, expandable to 32K	Unknown	Unknown
RAM	128K	128K	128K	128K	128K	128K	256K
Maximum integral RAM	640K	1Mbyte	512K on motherboard	1Mbyte	640K	640K	640K
Clock/calendar	Not standard	Not standard	Not standard	Not standard	Yes, standard	Not standard	Not standard
Disc Drive — type	Dual 5.25in.	Dual 5.25in.	Dual 5.25in. Teac half-height	Dual 5.25in. Toshiba h/h	Dual 5.25in. Toshiba h/h	Dual 5.25in. Nat Pan/M'Bushi	Dual 5.25in.
— capacity	320/360K	320/360K each	320/360K each	800K each	320/360/640/720K	320/360K each	320/360K each
Spare expansion slots	2	7	1	2	1; 7 with optional extender	3 full, 4 internal only	3
Colour graphics card	Optional extra	Optional extra	Optional extra	No	Optional extra	Optional extra	Yes, included as standard
Serial ports	1	2	2	2 RS-232, 1 RS-422	1	2	1
Parallel ports	1	1	1	None	1	1	1
Dimensions H x W x D	140 x 508 x 406	52 x 584 x 381	146 x 520 x 330	94 x 490 x 400	165 x 375 x 380	140 x 495 x 381	216 x 508 x 406
<b>MONITOR</b>							
Screen diagonal (in.)	11.5	11.5	11.5	11.5	12in. anti-glare	11.5	9
Display phosphor	Green P-39	Amber P-134	Green, P-39	Green P-39	Black/white	Green	Green
Controls	Brightness, contrast	Brightness, contrast	Brightness, contrast	Brightness from keyboard	Brightness	Brightness	Brightness
Tilt/swivel base	No	No	No	Yes	Yes	No	Portable with integral screen
Resolution	640 x 200	640 x 200	640 x 200	880 x 400	640 x 400	640 x 200	640 x 200
Character display	80 x 25	80 x 25	80 x 25	80 x 25	80 x 25	80 x 25	80 x 25
<b>KEYBOARD</b>							
IBM layout	Yes	Yes, Num and Cap Lock LEDs	Yes, Num and Cap Lock LEDs	No	Yes; Olivetti type optional	Yes; Num and Cap Lock LEDs	Yes
Number of keys	83	83	83	109	83	83	83
Number of function keys	10	10	10	20	10	10	10
Facility to tilt	Yes	No	Yes	Yes	Yes	Yes	Yes
<b>SOFTWARE</b>							
Programming languages	ROM Basic, Disk Basic, Basica	Basic 86 Basica	GWBasic	Basic optional extra	GWBasic supplied with MS-DOS	GWBasic optional	Basica/GWBasic



simultaneously. The unit can be tilted and swivelled.

Future has decided to go completely its own way with the design of the keyboard. Anyone used to other types will take a long time to become accustomed to the FX-20's unit. There are no less than 20 function keys along the top of a standard QWERTY, cursor-control and numeric keypads. Several keys, including the Caps Lock, are provided with LED status indicators. Key action is a bit dead, and because the key tops are so close together it is easy to hit two keys at once.

Future offers Digital Research's CP/M-86 and, when available, Concurrent CP/M-86 as standard operating systems. To exploit PC compatibility you can buy

MS-DOS 2.0, which is supplied as an optional extra. It is possible to read IBM data files with a CP/M-86 utility but the files have to be in CP/M-86 format, making the whole process complex and tedious. The Spellbinder word processor is supplied as standard but Basic is not.

The FX-20 did not run any of the IBM applications packages we tried, though it did read data files created on an IBM PC running a word processor or spreadsheet. However, unless the files are pure ASCII then the FX-20 has to be running the same application package to be able to interpret them. This facility is accessed by using the Floppar utility available with MS-DOS 2.0.

On-board memory can be expanded to 1Mbyte on the FX-20, and an 8087

co-processor added simply by plugging in extra chips. There are two bus expansion slots for PC-type boards, but in view of the FX-20's inability to run IBM applications software they are unlikely to prove useful.

## Conclusions

● At £1,875 the Future FX-20 is a competitively priced business machine which is fast, modern and has large-capacity disc drives.

● It is not an IBM PC compatible, but its ability to read IBM data files could be useful.

● The FX-20 can be expanded cheaply and simply to operate in many levels of multi-user environment.

	IBM PC	COLUMBIA MPC 1600-1	EAGLE PC PLUS	FUTURE FX-20	OLIVETTI M-24	TAVA PC	COMPAQ
SOFTWARE CONTINUED							
Operating systems	PC-DOS version 2.0	CP/M-86 MS-DOS v.1.25	MS-DOS v.1.25	CP/M-86 standard Concurrent CP/M-86 standard, when available CP/M-80 emulation MS-DOS optional extra	None standard but MS-DOS 2.0, CCP/M-86, UCSD-p, and PCOS are optional extras	PC-DOS 2.0	MS-DOS 2.0
Applications software	None	Perfect Writer Perfect Speller Perfect Calc Perfect Filer Home Accountant Plus Fast Graphs Diagnostics	Supercalc 3 plus financial-planning template	Spellbinder word processor	None	Systematics WPI Administrator ESP Advisor Expert System ASI Software Sampler	None
IBM COMPATIBILITY							
Microsoft Flight Simulator	Yes	Yes	Yes	No	Yes	Yes	Yes
Microsoft Windows Demo	Yes	No	No	No	No	Yes	Yes
Micropro WordStar	Yes	Yes	Yes	No	Yes	Yes	Yes
Ashton-Tate dBase II	Yes	Yes	Yes	No	Yes	Yes	Yes
Fox & Geller Oz	Yes	No; requires MS-DOS 2.0	No; requires MS-DOS 2.0	No	Yes; minor graphics problems	Yes; minor graphics problems	Yes
SPI Open Access	Yes	No; requires MS-DOS 2.0	No; requires MS-DOS 2.0	No	Yes; function keys inoperative	Yes; function keys inoperative	Yes
IBM diagnostics	Yes	Yes	No All tested on original BIOS	No	No	No	50%
DOCUMENTATION	Guide to operations manual DOS manual Basic manual	Perfect Writer/Speller manual Perfect Calc/Filer manuals Home Accountant, Fast Graphs Basic and GWBasic manual Operations manual Asynch Comms manual MS-DOS and CP/M-86 manuals Icarus Computer Systems	User Guide MS-DOS manual Supercalc 3 manual	FX-20 user manual CP/M-86 or MS-DOS manual	User manual Basic manual Technical manual MS-DOS manual	PC-DOS manual User manual Expert system manual WP/Admin manual	User guide A5 MS-DOS manual A5 Basic manual A5
DISTRIBUTOR	IBM	Icarus Computer Systems	Geveke Electronics Ltd	Encotel	Currently being appointed	Compushack Ltd	Compaq Computers Ltd
NUMBER OF U.K. DEALERS	130	32	Unknown	Not available	Not available	Currently being appointed	100 intended
COUNTRY OF ORIGIN	Greenock, Scotland	U.S.	U.S.	U.K.	Italy	U.S.	U.S.
WARRANTY	12 months	6 months	12 months	24 months	No details available	120 days parts and labour 1 year parts	6 months
MAINTENANCE	approx 6 percent hardware pa	7-19 percent hardware pa	15 percent hardware pa	Details not available	No details available	Yet to be decided	To be decided
PRICE OF ABOVE CONFIGURATION	£2,236	£3,150	£2,305	£1,875	Not yet decided	£1,949	£2,280

# TAVA PC

MANUFACTURED by the Tava Corporation in the U.S., the Tava PC is being marketed in the U.K. on a mix-and-match basis where the customers are invited to specify the system which best suits their requirements. Compushack has sole rights to the machine in Europe.

The Tava system box houses an Intel 8088 running at normal speed, two half-height 320/360K disc drives manufactured by National Panasonic or Mitsubishi and 128K RAM. Internally the machine is beautifully laid out with impressive attention to detail. Two serial ports and one parallel port are fitted as standard.

The monitors that Compushack intends to offer with the Tava are manufactured in America by Dyneer. The review machine used a medium-resolution RGB colour monitor which produced a clear, stable display.

Unlike nearly all other compatible manufacturers Tava uses a keyboard of its own manufacture. Status LEDs are included on the Num Lock and Caps Lock keys. It is more substantial than the Keytronics unit, though the key action feels slightly too soft.

Compushack intends to sell the Tava in the U.K. with IBM PC-DOS 2.1 as opposed to the MS-DOS version 1.25 offered by many other compatible manufacturers at the moment. It will offer far better compatibility and enable the Tava to run the more sophisticated software becoming available. How things will stand legally with IBM remains to be seen. No Basic interpreter is

included as standard, but GWBasic is available as an optional extra.

In a major break with tradition, Compushack is bundling in ES/P Advisor by Expert Systems Ltd as well as a more conventional combined word processor and database from Systematics International called WP/Administrator. There is also a sampler package which runs through a few sample screens from popular software packages.

Running PC DOS 2.0, the Tava proved to be impressively compatible with the IBM PC. It ran everything we could find with the



exception of the IBM diagnostics package. If Compushack is forced to market the Tava with MS-DOS version 1.25, compatibility will undoubtedly diminish until MS-DOS 2.0 becomes available, when it would be restored to around 95 percent of its previous level.

The Tava has three empty expansion slots available for use where external connections to the cards are required, and a further four available for internal use only. The maximum memory of 640K could be installed along with an 8087 arithmetic co-processor without using any of the three external slots. Compushack is placing great importance on the ability of the Tava to support serial communications, and is offering a thoroughly debugged communications package which includes the necessary software and modem as an optional extra.

## Conclusions

- The Tava PC at £1,949 for a medium-sized system is excellent value for money: definitely the best of the group.
- As far as compatibility is concerned the Tava runs a close second to the Compaq; the differences between the two would not be detectable by most end-users.
- The facility to build a system to meet specific requirements, as can be done with the IBM, can save money by ensuring that only the features needed are actually supplied.

# OLIVETTI M-24

THE LAUNCH of the M-24, unmistakably an IBM compatible, must have caused Olivetti considerable corporate embarrassment. Not once does the launch literature mention the name "IBM", referring instead to the "industry standard" when talking about compatibility to the IBM PC.

To be fair, the M-24 is a compatible with some significant technical improvements, the most notable of which is the use of a full 16-bit 8086-2 CPU running at 8MHz. It makes the PC feel very sluggish by comparison. Twin Toshiba drives are housed one on top of the other above the hardware Reset button, which doubles as Power On indicator. The drives have a standard capacity of 320/360K but can be used in quad-density mode to double that.

At the rear of the unit there are the On/Off switch, monitor and keyboard connections, mains socket, one parallel and one serial RS-232C port. The M-24 features a built-in clock, something that is invariably an extra on the PC itself and on other compatibles, and 128K RAM as standard.

The monitor's highest resolution is 640



by 400, or double that of the IBM in the vertical axis. The black-and-white monitor on the review-machine produced a clear display on its non-glare surface and did not prove fatiguing to use over long periods;

green and orange phosphors are also available.

Olivetti offers two keyboards for use with the M-24. One type uses an Olivetti layout and the second is an exact copy of

the IBM PC layout. Both can be configured for different national languages. The keyboard supplied for review was a prototype and did not have as good an action as the IBM.

Although pricing policy on the M-24 has yet to be published, it looks as if operating systems will be purchased as required by the user.

Four operating systems will be available for the M-24, including MS-DOS version 2.11, Concurrent CP/M and UCSD p-System. Olivetti's own PCOS requires the addition of a Z-8000 card to run on the M-24. GWBasic version 2.0 is included with MS-DOS. Pricing policy has yet to be published, but it seems likely that no one operating system will be supplied as standard; users will buy whichever suits

them best. Olivetti is officially offering Micropro and Peachtree software for use with the M-24.

Olivetti has ensured a reasonable degree of compatibility by using MS-DOS 2.0 as the operating system. The M-24 ran all PC-DOS packages detailed in the chart with the exception of the Microsoft Windows demo and the IBM diagnostics. The sheer speed at which the M-24's processor operates may catch out people who are used to the tardiness of the IBM, and certain IBM packages did produce a lot of snow on the screen when producing fast-moving graphics.

An additional 128K of RAM can be added on the motherboard to provide 256K, and a total of 640K can be reached using extra boards. There is only one expansion slot on the motherboard as

standard but an integral bus expansion chassis can be added to provide a further seven. An 8087 option is planned, as are a colour-graphics board and additional serial interfaces. Omninet and Ethernet boards will also be available to enable the M-24 to operate in a network.

## Conclusions

- The M-24 displayed a high level of compatibility with the IBM PC.
- Operating speed is noticeably faster than all the machines in this group.
- Unlike many of the PC compatibles in the group the M-24 will be backed by a large multi-national company already well established in the office-equipment and computer markets.

# COMPAQ

UNLIKE the rest of the group the Compaq is a portable, but it is beautifully packaged and displayed the highest possible levels of compatibility in our tests. At a bare hardware price of £2,195 for a dual-drive machine with integral colour-graphics card and 256K RAM it should sell in large numbers. Compaq Computers Ltd is to handle sales and support of the machine.

In transportable mode the keyboard clips over the screen and the disc drives and forms the base of the unit. A comfortable handle is located in the middle of what is normally the rear of the computer to enable you to carry the 29lb. machine.

Connections are made through the sliding hatches located towards the rear of either side of the polycarbonate casing. The left-hand hatch houses the mains cable when it is not in use, the mains socket, On/Off switch and fuse; the right-hand hatch conceals the printer ports, RGB and composite-video outputs and three spare expansion slots.

Removing the keyboard reveals a 9in. green-screen monitor and two 320/360K disc drives. The keyboard cable cunningly coils into a tube while the machine is in transit. Inside the processor box is the ubiquitous 8088 chip, a useful 256K of RAM and a colour-graphics driver card.

The dual 320/360K drives have very stiff drive doors, probably more indicative of the age of the machine than a design fault. A glaring omission is an RS-232C port; it is

listed as an option and is included in our price for comparative purposes.

The green-screen monitor has a really excellent display. The font used is similar to that of the Sirius — which is noted for its excellence in this area — and is one of most legible displays in the group. A combined brightness/contrast control is located on the front face next to the screen. The persistence of the phosphor is too long, making the characters ghost slightly on a changing display.

Although the keyboard is commendably light it still imparts a feeling of quality. The layout is pure IBM, even down to the irritating omission of LED status lights on the Num Lock and Caps Lock keys. The keys have a dual-rate spring behind them to provide some tactile feedback, but their action is not as good as that of the IBM. One other shortcoming concerns the £ sign. There is a £ sign on the Compaq keyboard, but there is no software utility to make it produce a £ sign on the screen. Compaq says this will be included on U.K. systems discs when the machine is delivered to end-users.

To use the Compaq as a proper desk-top machine with a colour display all that is needed is an RGB monitor. With one sitting on top of the system box you have an IBM PC colour desk-top/transportable compatible, with dual discs and 256K RAM for around £2,600.


For the moment, the Compaq is only

going to be offered in the U.K. with the MS-DOS version 2. As with the Olivetti, this version is equivalent to IBM's PC-DOS 2.0 and should run the latest integrated software packages. Basic is supplied on the system disc in the form of Basica, which is equivalent to GWBasic. The system manual gives specific details on how to run programs written in IBM's Basica on the Compaq so as to avoid illegal ROM calls.

Right from the moment you first switch the Compaq on, its screen display and reaction to the keyboard are indistinguishable from the IBM. Hardly surprising then that it should display such a high level of compatibility, running all the PC-DOS software we tried and even getting half way through IBM's own diagnostic disc.

The Compaq can be purchased with a single disc drive and 128K RAM; this can be expanded to 256K by additional chips, and a second disc drive can be added. Memory expansion to 640K requires using a slot, of which there are three on the expansion bus. A hard disc can be added — its controller will take up one more slot — and a serial comms card will take up the last slot. As a colour-graphics card is standard the machine should now meet most users' requirements. An 8087 co-processor is available to plug on to the motherboard.

## Conclusions

- Compaq has chosen to offer hardware extras in place of the software offered by many other PC compatible manufacturers to undercut the IBM.
- At £2,280 the Compaq, with 256K RAM and a colour graphics card included as standard, offers good value for money when compared to a similar spec IBM which would cost £2,630.
- Compatibility with the IBM PC was the best of the group.
- The Compaq is a well finished portable which can double as a desk-top machine. 





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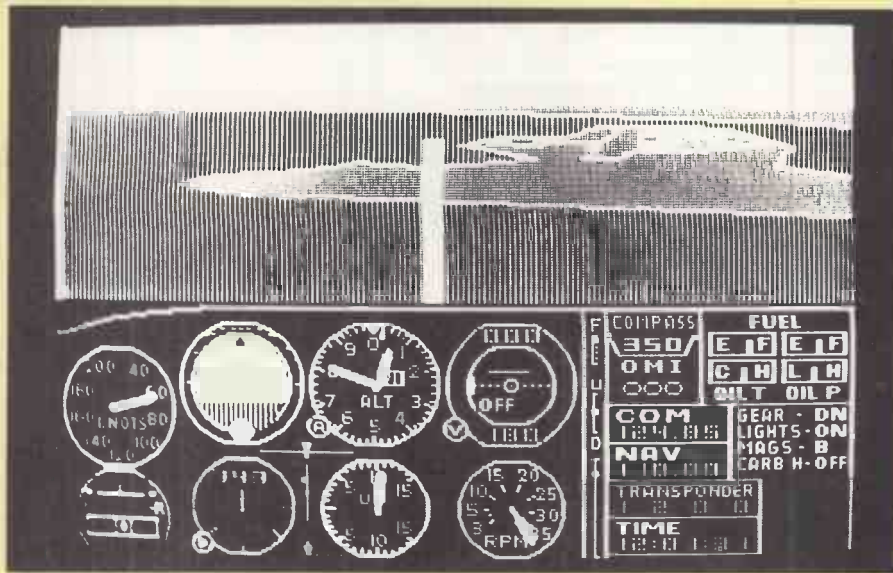
The overwhelming success of the IBM PC is convincing many software houses that this is the machine to cater for first. Glyn Moody has been investigating some of the thousands of packages available so far.

THREE QUITE DISTINCT bandwagons have rolled through the micro world. Apple began it all, almost by accident: by providing a micro with real power at affordable prices it created a huge new software-hungry market. Suddenly everyone was writing for the Apple II, and the more that was written, the stronger the reason for buying even more Apples.

The next stage was CP/M. Again almost by chance, a product appeared that met a hitherto unsuspected need — that of a standard operating system which allows software to run on a wide range of different machines. Potentially it opened up an even bigger market than that created by Apple's single machine.

The third snowball could well prove the biggest and even, according to pessimists, the last. For IBM's runaway success with its PC is distinguished by the fact that much of it was planned. Backing up shrewd analyses with sheer marketing muscle — a company with an annual turnover of \$40,000 million can be right even when it's wrong — IBM looks set to clear the board in the personal computer stakes. Apart from local aberrations like Sinclair, the only real challenger will be Apple, particularly through its Macintosh.

For everyone else, it is IBMulation all the way, and software houses have not been slow to follow. In terms of purchasing patterns the market is increasingly software driven — you choose your package then



A look past the tail at the Great Lakes in Microsoft's Flight Simulator.

find the hardware — but the scale of IBM's success has meant that software houses nearly always write for the PC first, MS-DOS second and the rest later.

As a result, the software library of the PC is growing at a rate second to none. In the last issue of *PC World's Annual Software Review* over 1,200 programs for the IBM PC were listed. The Apple II still leads in terms of range and sheer number of packages available, but it can only be a

matter of time before it is overtaken in both courts.

Of course, only a small proportion of the PC library represents anything new in terms of programming. The vast majority of products are of the "me too" type: yet another Calc, yet another WP program. The *PC World Annual Software Review* lists 43 Calcs and 125 WP packages.

The selection of software described in  
(continued on page 79)

## Software best sellers on the IBM PC

### Business packages

Position	Weeks	
1	1	59 1-2-3 Lotus
2	3	80 PFS:File Software Publishing
3	2	74 Multiplan Microsoft
4	4	33 Tax Preparer Howard
5	7	78 WordStar Micropro
6	5	36 PFS: Write Software Publishing
7	8	79 PFS: Report Software Publishing
8	10	4 Open Access SPI
9	6	78 dBase II Ashton-Tate
10	9	35 Multimate Softword Systems
11	14	79 PFS:Graph Software Publishing
12	13	80 VisiCalc Visicorp
13	12	13 R:base 4000 Microrim
14	11	19 Word Microsoft
15	16	30 Supercalc 2 Sorcim

### Games

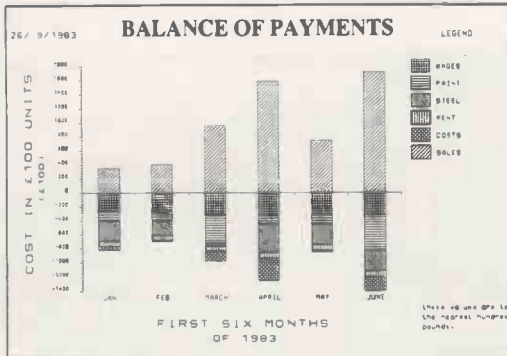
Position	Weeks	
1	1	78 Zork 1 Infocom
2	4	15 Donkey Kong Atarisoft
3	5	22 Millionaire Bluechip
4	2	33 Lode Runner Broderbund
5	9	49 Pacman Atarisoft
6	7	65 Flight Simulator Microsoft
7	11	26 Dig Dug Atarisoft
8	12	44 Centipede Atarisoft
9	3	78 Frogger Sierra On-Line
10	10	76 Zork II Infocom
11	8	78 Deadline Infocom
12	13	17 Sargon III Hayden
13	6	78 Temple of Apshai Epyx
14	—	9 Murder by the Dozen CBS Software
15	—	22 Defender Atarisoft

These tables are taken from Softsel's weekly report on sales of software packages throughout its 6,500 retail outlets in over 30 countries. The first column gives the relevant position for the week of March 19, 1984, with corresponding figures for the previous week in the second column; the third column shows the number of weeks the package has figured in the table. Further information on all the software listed here may be obtained from Softsel on 01-844 2040.

£295

# ESSPLOT 2

THE GRAPHICS PACKAGE ON  
IBM PC, APRICOT, RAINBOW, SIRIUS SAMURAI  
AND OTHER INTEL 8088/86 COMPUTERS.

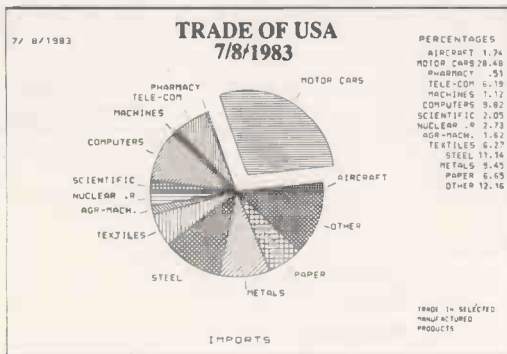
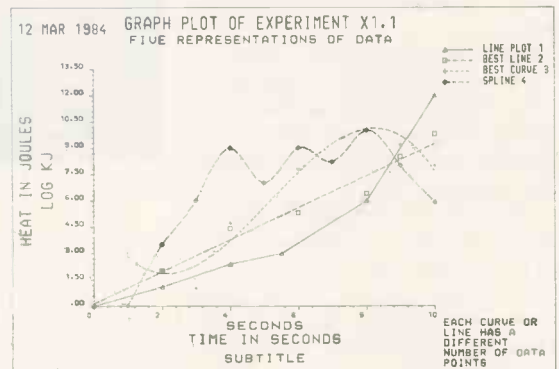


## BAR CHARTS

- \* STACKED BAR CHART
- \* SIDE BY SIDE
- \* THREE DIMENSIONAL
- \* SPLIT AND LINE
- \* UP TO 20 BARS
- \* UP TO 6 VALUES EACH

## GRAPH PLOTS

- \* SPLINE CURVE
- \* BEST CURVE
- \* BEST LINE
- \* SHADED LINE PLOT
- \* SCATTER PLOT
- \* 6 LINES/CURVES
- \* LINEAR/LOG/NLOG SCALES



## PIE CHARTS

- \* UP TO 4 PIES PER CHART
  - \* 20 SLICES PER PIE
  - \* PERCENTAGES
- ## SLIDE SHOW
- \* FULL SLIDE SHOW FACILITIES
- ## DATA FILES
- \* DIF, MULTIPLAN LINK AND ASCII
- ## INTERFACES
- \* COLOUR CARDS eg PLUTO
  - \* A RANGE OF GRAPHICS PRINTERS

## PLOTTERS

HEWLETT PACKARD: COULD BRYAN: C-ITOH: WATANABE: TEKTRONIX HILOT  
CAL-COMP: NICOLET ZETA: DIGILOT: MANNESMAN TALLY: ROLAND: HITACHI.

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DEMONSTRATION PROGRAM is available on Request for up to 14 days. This is a full program with just the words DEMONSTRATION PROGRAM inscribed on the graphics, for you to assess the full capabilities of the product in your own environment.

(continued from page 77)

this article represents only a small fraction of what is available. The aim is to give a representative selection of leading packages, with the emphasis more on the standard business applications than vertical markets. In the U.K. the IBM PC remains the corporate machine *par excellence*: very safe and very boring. Companies are not in the business of gambling in the micro market; and judging by their pell-mell rush to supply the PC owners' every need, neither are the software houses.

## Operating systems

Concurrent CP/M, the main rival to PC-DOS, is available from dealers from about £250; details from Digital Research on (0635) 35304. Other operating systems include BOS, £200 from MPSL on 01-831 8811; and Pick I, £850 from Interactive Data Machines on (0302) 786677. For those who hanker after something farther reaching than an operating system, Visicorp's operating environment Visi On costs £80 and is distributed by Rapid Terminals; details on (0494) 26271.

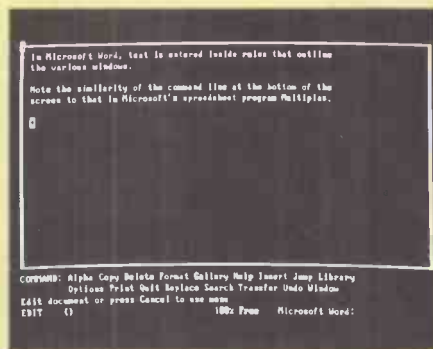
## Languages

Fortran and Pascal are two popular languages available from Boeing Computer Services and running under its UCSD-derivative Bits operating system; both packages cost £275, details on 01-631 0808. Other mainstream languages available are APL, £165 from IBM dealers; Level II Cobol, £965 from Micro Focus on (0635) 32646; and Personal Cobol, £250 from IBM dealers.

Aspiring expert-system programmers may care to acquire Mulisp, £159 from Microsoft on (07535) 59951; Prolog, £390 from Expert Systems on (0865) 242206; or Forth £80 from DCC International on 01-891 4061. If you are unworried by the fact that it was developed as a real-time weapon-system language, Ada could be for you at £200 from Micro Technology on (0892) 45433. Otherwise, the ultimate trendy language has to be the Transputer's very own Occam, £175 from Inmos on (0272) 290861.

## Integrated packages

Integrated software is very much the up-and-coming thing for your PC — see last month's issue of *Practical Computing*. As the table of best sellers shows, Lotus 1-2-3 leads the field at £375; details from Reflex on (0734) 884611. It is being hotly pursued by The Incredible Jack, £365 from Pace on (0274) 729306; in the U.S. by Jane at \$294 from Arktronics (U.S. area code 313) 769-7253. Other systems offering various



For a mouse and/or menu-driven word-processing program with windows and on-line Help there is Microsoft's Word, launched for the IBM PC in November.

degrees and interpretations of integration are Context MBA, £422 from Ferrari on (87) 3811; a re-jigged Supercalc 3, £295 from Xitan on (0703) 871211; and KnowledgeMan, £450 from Tamsys on (07535) 56747.

## Spreadsheets

VisiCalc more or less began the whole business-micro explosion, but in the face of later rivals which have built on its ideas and success, you will probably only buy it today out of a sense of piety or historical curiosity. There is, however, VisiCalc 4, which offers some of the features of integrated packages at £199 from Rapid Terminals on (0494) 262271.

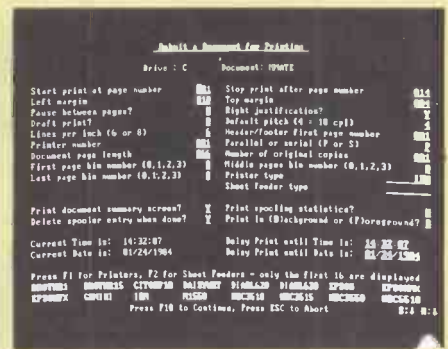
Supercalc 2 and 3 cost £126 and £190 respectively from Xitan on (0703) 871211. Other Calcs for the PC include Multiplan, £183 from IBM; Sapphire Mars, £395 from Sapphire Systems on 01-554 0582; Perfect Calc, £166 from Perfect Software on (0908) 660466; Microplan, £345 from Vector International on 01-943 1257; and Bitscalc, £200 from Boeing Computer Services on 01-631 0808. Visi On Calc requires the Visi On operating environment and costs £295 from Rapid Terminals on (0494) 26271.

## Word processing

WordStar, that old workhorse of word processing, is still going strong at £295 from dealers such as Pete & Pam on (0706) 217744. But increasingly it is being superseded by packages with a more modern approach, and without the dreaded control-character codes. Among them are Microsoft Word, £299 from Microsoft on (07535) 59951; Multimate, £350 from Ferrari on Egham (0784) 38811, Easywriter, £153 from IBM; Myword, £295 from Software City on (0306) 886442; Volkswriter Deluxe £264 from CACI on 01-631 0808. Visi On Word requires the full Visi On environment and costs £285 from Rapid Terminals on (0494) 26271.

## Databases

The leading contender is probably dBase II at £437 from Ashton-Tate on (0908) 568866. Other packages available include



If you want Wang-style dedicated word-processing with document summary screens and every keystroke counted, then Multimate provides it on the IBM PC.

Ashton-Tate's £190 Friday, reviewed on page 110 of this issue; Delta, £495 from Compsoft on (0483) 898545; Rescue, £295 from Qudos Systems on 01-253 3998; Cardbox, £195 from Caxton on 01-739 6502; Sensible Solution, £545 from Offshore on (0707) 4447; Bits Database Workstation, £350 from Boeing Computer Services on 01-631 0808; and Visi On Query, £285 from Rapid Terminals on (0494) 26271.

## Graphics

Business graphics are tipped as being one of the hottest growth areas in micro software. Packages for the IBM PC include 4 Point Graphics, £195 from Tamsys on (07535) 56747; and PFS Graph, £89 from Pete and Pam on (0706) 217744; both need the colour/graphics board. Other packages are Bitsgraf and Business Graphics at £400 and £200 respectively from Boeing Computer Services on 01-631 0808.

## Miscellaneous

Alongside the mainstream packages there are a number of utilities and other products that fail to fall neatly into one of the standard categories. For example, TK!Solver is conceptually quite different from a spreadsheet although written by the authors of VisiCalc. It costs £350 from Marketing Micro on (0473) 462721. Additional options for the PC are Micromail, £350 from Riva Terminals on (04862) 710010; and the Norton utilities, £53 from Save-On Software on 01-729 1411. PC Pal provides an introduction to the PC keyboard, Basic programming, Calcs and word processing and costs £35 from MBS Soft on 01-964 3865. There is no shortage of games for the IBM PC though as yet few have been designed specifically and originally for the machine. An exception is the £45 Flight Simulator from Microsoft on (07535) 59951 which has become a touchstone of IBM compatibility.

To end this overview of IBM software it seems only appropriate to mention the Directory of Software produced by *PC User*. It is distributed on disc complete with a read-only version of Cardbox and costs £35 from *PC User* on 01-242 6552.

# Getting it all together

Jack Schofield sees how incredible The Incredible Jack and Jack 2 are in their efforts to provide integration.

THE CURRENT DREAM is to turn on the micro in the morning, load one program from one disc and use it all day. The Incredible Jack and Jack 2 provide such a facility if you have an Apple II for the former or an IBM PC for the latter.

The single program provides word processing, calculations, database management and simple charts and graphs all as one whole rather than through using an integrated suite of sub-programs like, say, Open Access.

However, Jack is not equally strong in each department. Its claim to offer spreadsheeting is stretching the truth a little since although you can construct spreadsheets it does not really replace Multiplan or Supercalc, either in power or ease of use. Also Jack performs each task at a lower level than is offered either by individual programs or the integrated Open Access, though its database facilities are quite strong and it provides excellent mail-merge facilities. Nevertheless, Jack does do things more than adequately for most purposes, and the data integration offers a lot of extra power.

## Limitation

In fact, Jack's major limitation is that it runs under the UCSD-p operating System, instead of MS-DOS. The problem is that while most IBM PC look-alikes have little trouble running MS-DOS programs, few can cope with UCSD-p. The Compaq used for this review would only boot the Jack disc about one time in three, though after a few tries it always booted in the end. On the other hand the Olivetti M-24 booted it first time. However, before buying for an IBMulator, check it will run.

Further, Jack requires two disc drives and 128K of RAM. One disc is not enough as the Jack program disc is required in drive one most of the time. A version is available for the IBM XT; the hard disc must be partitioned for the different operating system.

Jack 2 comprises three discs, three small spiral-bound books and two booklets, all packed inside two plastic disc-boxes, which are contained in a slip case.



The Incredible Jack is a well presented software package.

Most of the package consists of tutorial material. You begin with a booklet labelled Start Here, then work your way through the Tutorial disc. After that you work through one of the books, *Tutorial Guide*, utilising the Jack program disc and six lessons stored on the data disc supplied.

The tutorial material is excellent, and although you would not be exploiting it to the full, it is possible to start using the program after only a few hours. The data disc also includes a number of pre-written forms for handling simple invoices, cheque records, a diary, school marks and similar applications, to which the *Tasks and Applications* book offers a guide. The last of the material supplied comprises the indexed *Reference Manual*, and the *Keycard and Quick Reference Guide*.

Jack is a picture and window-orientated program with five main levels. These are discs, envelopes, contents, forms and records. Menus are positioned across the top of each screen and are consistent from level to level. The Zoom command is selected to move down the tree and the Esc key to move back up to it.

In many respects the menu system works like that of Multiplan. A command can be selected either by moving the spacebar to position the cursor over it, then pressing Return; or, more quickly, by hitting the first letter of the command. For example, the Envelope menu offers Zoom, Find, Copy, Erase and Rename. You can select Erase by hitting E. The menus are

superior to those in Multiplan since highlighting a command brings up a comment that explains what it does. For example,

Erase the entire contents of an envelope would describe the function of Erase.

Once the bottom levels, namely forms and records, have been reached, commands are liable to call up either sub-menus or windows which are superimposed on the screen. Generally these offer a large selection of alternatives in tabular form. For example, the Margins command offers the opportunity to set tabs and columns, plus justification, page breaks, centering, line spacing, number of lines left at the top and bottom of the page, field blanking, header, footer, page length and width, offset, continuous forms or single sheets, and to link to the next form for printing.

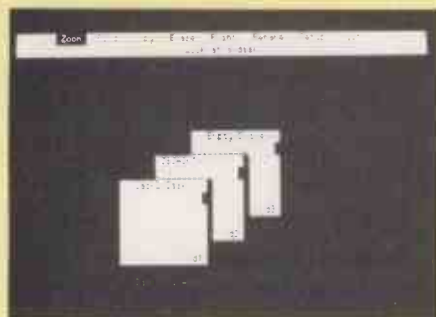
But the user does not spend a lot of time filling in parameters. A great many are supplied with default values, or Jack remembers what you did last and supplies that, or else lack does it for you. For example, if you label then define a field

Name:

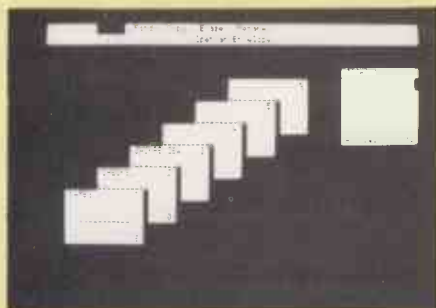
Jack reads to the left of the cursor where you want to start the field and enters it as the default field name. If you leave the specifications blank for graphing, Jack will supply axes scaled to fit.

Overall the system employed is a good one since you can have control when you want it by changing each individual value at the time. However, if you do not wish to do





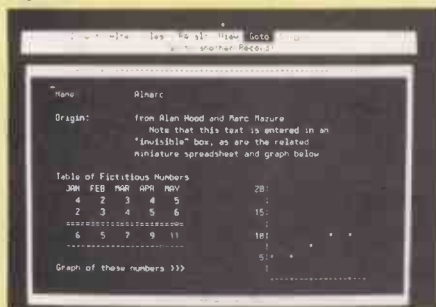
Jack starts with the Disc screen. Note our Olivetti M-24 has three drives.



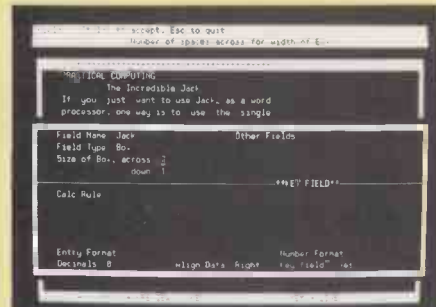
Zooming on data disc JSJACK1 takes you to the Envelope screen; 50 envelopes allowed.



Zooming the Names envelope reveals the record cards, starting with the blank Form.



Zooming the Almarc card shows the actual record with WP, calc and graph elements.



A new Field is created using a menu which appears as a window on the Form screen.

anything out of the ordinary, Jack usually takes care of problems for you.

Jack's care runs to prompting when you engage in destructive actions, and also provides warnings

Throw away changes since last save? (Y/N)

before exits and entrances. When using the cursor to erase text, reversing the cursor movement handily restores what you just erased. Usually you can make changes to form a record, then either junk them by pressing Esc or accept and save them to disc by pressing Control C.

At the top level, Jack provides the Disc screen which consists of a picture of two discs, the program disc and a data disc. The program disc provides the structure and the data disc holds the data.

Zooming on the data disc reveals the Envelope screen which shows a set of up to 50 envelopes, each normally with a name. A number on the top right of the envelope gives its position in the sequence of envelopes, and a number on the bottom right indicates how many records it contains.

## Envelope records

A particular envelope is selected by pressing the Up or Down arrow, and/or the Page Up/Page Down keys so as to point to it; or, if its name is known, by using the Find command. Zooming on the envelope presents a similar display but of the records inside the envelope, if any. This is the Contents screen. The first record always consists of the Form. Then follow the named records, with the name being the first 12 characters of the key field. Finally there is a form labelled Blank Record. Any individual record can be selected by pointing to it and Zooming, or by using Find.

Moving about inside Jack may sound tedious but actually it is very clear. Nor is it slow since returning to the Jack review, composed on a form on my own data disc, just meant pressing Return three times very quickly, keystrokes being stored in the buffer. Thus moving from the disc to the text only took about three seconds.

However, correcting a text is a slow process, because you have to back up to the command line each time to get from, say, the Insert mode to the Alter or Overwrite mode. Further, moving blocks of text is very complicated.

When entering or browsing through records the tree structure is bypassed altogether. The hard route is Esc — back to command line; plus Esc — back to contents screen; plus Arrow — move to new record; plus Zoom — call next record; and finally, Insert — move to data field — a hefty total of five keystrokes. The easy way is to hit G for Goto, and this offers a choice of Next, Previous, First, Last, and a blank or a numbered record. Also, completing the data in one record automatically fetches the next blank record.

When you create a field on a form, this specifies a reversed-out area of a particular size and type. Fields in Jack 2 can be variable, box, row, column and graph. A box is what it sounds like; you define the width and number of lines, and then you can type anything you like in it. A variable field is the same, except it starts one character in size and expands to accept your data. This is important for mail-merge applications where the name to be slotted into the blank text might range in size. Row and column fields allow you to specify the size and number of cells required. They are thus the building blocks for spreadsheet-type calculations.

In all cases it is possible to specify the type of character that is accepted in a field, the format — as with Print Using in Basic — and the alignment. Every field must have a name, which is usually used for calculations. This means entering a calc rule such as

Sales\*Price  
for a field called Turnover. The calc rule can be up to 255 characters long.

As with spreadsheets, a number of useful functions are built in. These include Abs, Average, Choose, Count, Cumulative, Grow — geometric progression, IRR — internal rate of return, Join, Log, Lookup, Max, Min, NPV — net present value, Step — arithmetical progression and Sum.

As mentioned, it is a long and tedious procedure to set up anything like a spreadsheet. However, using the database and calc facilities, setting up invoices, record cards and similar small business tasks is extremely easy.

One major advantage Jack offers is the facility to change the layout of the form, and even the number of fields, after you have set up the database. Rearrange the form and Jack still picks up the existing data and happily displays it for you to add the new.

## Conclusions

- Jack is a genuinely integrated program which offers a range of facilities and a considerable amount of convenience.
- The tutorial material is excellent making Jack easy to learn and genuinely easy to use.
- Its real strengths are record keeping and mailing-list management, with word processing and graphing as useful extras.
- Authors and real financial managers will probably prefer to stick to their existing specialised programs.
- Jack represents a real step forward and anyone with a small business would find it useful. It would, be even more useful if it ran under MS-DOS or PC-DOS instead of UCSD-p, and had the facility for easy file exchange with other popular programs.
- Jack is produced by Business Solutions Inc., 60 East Main Street, Kings Park, New York NY 11754. Our review sample was supplied by Pace Software Supplies, 92 New Cross Street, Bradford BD5 8BS. Telephone: (0274) 729306.

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# All aboard

Neville Ash samples some of the expansion cards which are available to tailor the PC to your specialist needs.

ONE OF the major features of the IBM Personal Computer is its open architecture. The design encourages you to take the lid off and add extra printed-circuit boards, otherwise known as expansion cards, to customise the machine to your own requirements. In this, as in many other areas, the IBM PC is the true heir of the Apple II. And as with the Apple, there are hundreds of boards from third-party manufacturers to choose from.

Where the IBM PC market is different from the Apple II market is the number of multi-function cards for the IBM PC. The IBM has only five expansion slots, compared with Apple's eight. As two of the IBM slots are filled by a disc controller and the monitor/printer driver card, this leaves only three for the user. A multi-function card can be an advantage in leaving more slots free for other uses.

Most IBM expansion cards are imported from the U.S., where there are over 170 manufacturers in the market. However, an increasing number of U.K. companies are now becoming involved. The list of expansion cards presents a cross-section of what is available.

Many IBM PCs are purchased with 64K of RAM, which is sufficient for games and educational programs. Business programs, however, often require 128K, sometimes 256K or more. Programs which require

128K include 4-point Graphics, Data Ease, Perfect Filer, PFS File, Sensible Solution, Microsoft Word and the Pulsar accounts packages. At least 256K is needed for Officemate, Busifile, Silicon Office and Micro Rapport, the same is required for Concurrent CP/M and Pick, while Visi On needs 512K and Telesoft Ada 576K.

There may be empty sockets on your PC main board which allow the RAM to be expanded by plugging in chips, but after that a RAM expansion card or multi-function card is required. These cards are usually supplied with 64K and with empty sockets for expansion to 256K or even 512K of extra RAM.

Extra RAM may also be useful as a silicon disc, where a section of RAM is treated by the operating system as though it is a disc drive. This does not provide a way to store data permanently, but it speeds up the operation of programs like WordStar.

There are a few cards available to supply a second processor. For example, the PC Express accelerator card carries an Intel 8086 chip which replaces the PC's 8088 and therefore makes it go faster. There are several cards which carry a Z-80, such as Baby Blue, and one with a 6502, the Quadlink card. They provide access to many of the large number of programs available for eight-bit CP/M and Apple II computers respectively.

Other cards can provide interconnections of various kinds. A card for attaching a mouse is now becoming popular. Other cards provide RS-232C, IEEE-488 or other ports for connecting a PC to a peripheral, to another computer or to a piece of laboratory equipment.

Probably the most popular single card is now the Hercules graphics card. One of the problems with the IBM PC is that it drives a green screen from the IBM monochrome screen/printer adaptor card, but this screen does not provide graphics. The solution is not to buy the IBM colour-graphics card, because that card will not drive the IBM's green screen. To run a program like Lotus 1-2-3 requires both a colour graphics card and a colour monitor, which is not a cheap option. The Hercules card provides, instead, a graphics driver which works with the standard green screen.

As well as expansion cards there are numerous other add-ons for the IBM PC. People who dislike the keyboard layout have a number of alternatives, and if you run out of expansion slots you can add an expansion chassis. There are also more abstruse devices such as magnetic card readers.

With all such boards, add-ons and expansion gadgets, it is wise to check first that the particular software you want to run is compatible with it.

## Memory expansion cards

### APPARAT

64K RAM card expandable, £159, 64K upgrade, £72. Pete & Pam

### IBM HYPERAM

64K RAM card expandable to 512K, Hyperdrive and Hyperspool software supplied free with 384K and 512K boards, from £167 to £649. Intelligence Research

### IBM SUPERAM

From 64K to 512K, includes Magic Memory, from £215. Dataflex

### IDEABOARD

From 64K to 256K, from £170 to £320. KPG Hardware

### MICROSOFT

64K RAM card expandable, £245, 16K upgrade, £19.50. Pete & Pam

### PERSYST RAMPAKS

Expansion modules for Time Spectrum multi-function boards, from 64K to 256K, from £134 to £379. Micro Technology

### PURE DATA

PD-128/384 bubble-memory expansion boards; choice of 128K or 384K of bubble memory; features non-volatile memory, disc emulation and password protection option; 128K for £610, 384K for £1,550. Garingdell Systems

### PURE DATA

PD-1256 expandable from 64K to 256K, from £216. Garingdell Systems

### QUADRAM

Memory expansion from 64K to 192K, from £200 to £310. Interquadram

### SIMON

Memory expansion from 64K to 256K with asynchronous serial port, from £180 to £305. Simon Computers

### TECMAR DYNAMIC MEMORY

Memory expansion from 64K to 256K of RAM, from £305 to £545. Comart

## Speed increasing cards

### PC EXPRESS

Enhancement board for the PC which exchanges the normal Intel 8088 processor for the true 16-bit 8086; comes complete with its own RAM memory; up to 640K of RAM can be fitted; a socket for the Intel 8087 numerical-processor chip supplied with 128K as standard; from £693 to £1,150. Intelligence Research

## Alternative operating systems processors

### BABY BLUE

CP/M emulation with 64K RAM, £425. Ferrari

### BIG BLUE

CP/M emulation with 64K RAM, serial and parallel ports; clock/calendar and hard-disc interface; £475. Ferrari

### IBM 80

CP/M card with 6MHz Z-80 processor, £295. Small Systems Engineering

### QUADRAM QUADLINK

For running Apple II software on the IBM PC, with 64K RAM, games port, display adaptor, £500. Interquadram

### Z PLUS

CP/M emulation with Z-80B chip, RS-232 port. Pete & Pam

## Multi-function cards

### AST MEGAPLUS

Has maximum of eight features, memory expandable from 64K to 512K; serial port, clock/calendar, parallel printer port, serial port 2, Superdrive and Superspool software; from £275 to £603. CPS Data Systems

### AST SIXPACK

From 64K to 384K of RAM; serial port, IBM-compatible printer port, clock/calendar, optional game adaptor; utility disc software; from £310 to £670. CPS Data Systems

(continued on page 85)

# Get the Connection?



## ACT Pulsar 'File Transfer'

It's easy to get the impression that the differences between micros are there to tie you down. How do you upgrade from 8-bit Apple to today's 16-bit micros, or copy files between different 16-bit machines, without hours or even days of laborious data re-entry – and all the dangers that entails?

The answer is Pulsar File Transfer. It puts Apple, Sirius, Apricot and IBM straight onto the same wavelength, transferring file type, text, binary or graphic information directly at up to 9,600 bits per second.

With the correct combination of Pulsar File Transfer packages you have access to complete software freedom between IBM-PC, Sirius and Apricot and instant transfer of data from Apple. Multiple files can be sent or received with a single command, while an in-built error-checking facility guarantees absolute accuracy.

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## PULSAR SOFTWARE

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ADDRESS

PC/8/84  
TEL:

(continued from page 83)

## DAVONG

From 64K to 256K and two serial ports, from £395. Ferrari

## EASITECH

Up to 256K of RAM, Centronics parallel port, RS-232, clock/calendar, printer buffer, up to three high-speed solid-state drives; from £225 to £450. Ferrari

## IDEAPLUS

Memory expansion from 64K to 256K; choice of serial interface, parallel printer interface and parallel disc interface; software includes RAM disc, spooler, ISWAP swap and clock/calendar; from £235 to £425. KPG Hardware

## IBM MULTI

Memory expansion from 64K to 256K, expandable to 512K with 256K DRAMs; clock, diary software; parallel port, serial port, optional second serial port; Magic Memory speed increase software; from £295. Dataflex

## IBM TRIO

Memory expansion from 64K to 256K, one serial port for RS-232 or current loop as standard, optional second serial port; from £215. Dataflex

## KENSINGTON

From 64K to 256K, serial and parallel port, games adaptor, clock/calendar, RAM disc, spooler, piggyback to 512K; from £299. Ferrari

## MULTI-FUNCTION

Two cards, first has two RS-232 ports, parallel printer port, up to 256K RAM and EMMS software with disc cache, RAM disc, buffering, diary and clock/calendar; second version has facility to enable ports to be switched to operate in current loop mode to connect teletypes, terminals etc; from £290. Intelligence Research

## MAYNARD SANDSTAR

Range including multi-function card, add-on memory, parallel port, serial port, clock/calendar and games adaptor options; £59. Compushack

## PERSYST TIME SPECTRUM 384

Memory expansion up to 384K, serial communications port, parallel printer port, clock/calendar, Insta Drive facility, spooler facility, optional games port; from £303 to £687. Micro Technology

## PERSYST TIMEPORT

Calendar/clock, one or two asynchronous serial ports and parallel printer port; up to 2K static RAM or 2K EPROM support; from £173. Micro Technology

## PROFIT ADDRAM

Elite model expandable from 64K to 512K, asynchronous comms adaptor, clock/calendar, parallel printer adaptor, software for running up to nine tasks concurrent RAM disc and spooler; from £349. Pete & Pam

## PURE DATA PD1208SS/SP

Real-time clock, disc emulator, background print spooler, accessories, £216; version with parallel I/O, £208. Garingdell Systems

## PURE DATA PD1464SS/SP

Up to 256K RAM, real-time clock, serial I/O, parallel I/O, P disc emulator, background print spoolers and accessories; SP from £325, SS from £379. Garingdell Systems

## QUADRAM QUADBOARD

Expandable from 64K to 384K RAM; parallel port, serial port, chronograph, game port,

I/O bracket; plus menu-driven software which includes diagnostics and RAM disc, spooling and QSwap; nine different functions; from £295 to £595. Interquadram

## QUADBOARD 11

Up to 256K RAM, from £275 to £435. Interquadram

## QUAD 512+

Four-function combination card, up to 512K RAM, RAM disc, spooler, serial port, from £240 to £655, Interquadram

## QPLUS 11

Memory expansion RAM 64K to 256K clock/calendar, asynchronous RS-232C serial port, Qubie Plus software; options include second RS-232C, parallel printer port, game port on plug-in board, choice of 128K or 256K memory expansion packs; from £319 to £529. Qubie Distributing

## SIXSHOOTER

Up to 384K of RAM, clock/calendar, asynchronous port, parallel printer port, Qubie Drive and Qubie spool software, optional games port adaptor; from £319 to £669. Qubie Distributing

## TECMAR FIVEINONE

Memory from 64K to 256K, serial port, parallel port, clock/calendar, circuitry to accommodate programmable array logic chip, RAM spooler utility; £455 to £665. Comart

## TITAN

Memory expansion from 64K to 576K, two serial ports, parallel printer port, hard disc interface, real-time clock/calendar, RAM disc facility; from £449. Pete & Pam

## TRUMP

256K of RAM, games I/O and serial I/O, £299. Compushack

## TRUMP II

512K of RAM, £399. Compushack

## U MICRO BUSINESS CARD

64K of RAM expandable to 256K, serial and parallel interfaces, clock/calendar; from £249 to £429. U Microcomputer

## Communications of all types

### BABY TALK

Communications management interface-adaptor providing true 3278-2 emulation using a direct co-axial connection to an IBM 3274/76 cluster controller, £695. Ferrari

### BLUE LYNX S34-38

Hardware/software combination allowing IBM PC to be connected to IBM System 34, 36 or 38 for interactive communications or as direct replacement for a 5251 model 12 remote work station with 5256 printer; from £450 to £760. Techland Systems

### BLUE LYNX 3270 BSC

Hardware/software combination allowing IBM PC to be connected to IBM mainframes as direct replacement for 3270 series work station with attached printer, £560. Techland Systems

### BRAID TELEX MANAGER

Harnesses the IBM PC to a telex line and allows users to compose and send messages direct from the VDU; includes a combination of BT approved hardware and software; £1,700. Braid Systems

### FORTE PC78

Emulation of IBM 3278/9 display terminal, plus emulation of the IBM 3279 model 3B; availability of mainframe resident software to operate under TSO, CMS or CICS: option

for full model S-3G graphics emulation with resolution of 720 by 396 dots; £925. Accent Computers

## IDEACOM

YPR-XXX-mini-combination card with options of serial ports, parallel ports and clock/calendar with battery, from £125 to £210. KPG Hardware

## IDEA 3276

Range of cards, each providing 3276 emulation and supports three to 12 PCs as 3278 display stations; from £999 to £2,416. KPG Hardware

## IDEA CPR 1200

1200/1300 baud integral modem card, £429. KPG Hardware

## IDEASHARE

Allows up to four IBM PCs to share a hard disc and printer facilities, £595. KPG Hardware

## IRMA

High-speed microprocessor based interface which fits inside the PC and provides total protocol compatibility with IBM 3278 terminals, so an IBM PC can be connected to an IBM 3270 network; £925. KPG Hardware

## PCOX

Hardware/software package which creates an emulation of IBM 3278 models 2, 3 or 4, or IBM models 2A or 3A; £975. GCS Engineering

## PERSYST DCP/88

Claimed to be most advanced front-end processor as supplied with Intel 8088 chip; handles all communications for PC: both PC HASP and PC/3780 can be executed; plus 64K dual ported RAM; also runs IBM 3270 communications; from £533 to £735. Micro Technology

## PERSYST MPC

Multiple protocol card with high-speed synchronous/asynchronous port; £229. Micro Technology

## PLAN 2000

Network system based on Datapoint's ARCnet technology; Plan 2000 supports DOS 2 and conforms to Xerox network systems sequenced packet protocol; starter kit for linking two PCs; £1,475. Zynar

## TEMPUS LINK

Communications between all IBM mainframes with most communications methods; protocol converters include IBM 3270 SNA/LDC, BSC; uses concept of extra virtual disc drives; £945. West Surrey Computers

## TECMAR SCRIBEMASTER

Provides high-speed communications with three serial ports, with speeds up to 250Kbaud, and three eight-bit parallel ports; £370. Comart

## VLSI 1553-NET

Sophisticated networking product available in a number of configurations. Accent Computers

## Video and graphics cards

### ABM

Graphics interface module allows for graphics on IBM monochrome display when connected to IBM colour graphics card, £100. Ferrari

### COLMON

Connects colour adaptor to IBM

(continued on next page)

(continued from previous page)

monochrome display and allows graphics without using an extra slot, £95. KPG Hardware

#### HERCULES

Single card which allows text and graphics to be displayed on standard PC monitor, £395. Reflex

#### IDEAGRAPH

Family of colour graphics cards available in range of resolutions and colour capabilities, from £699 to £1,486. KPG Hardware

#### PARADISE

Can connect both a colour and monochrome monitor to the PC system with hardware or software switching between the two; sufficient display RAM to contain two screens of high-resolution graphics, £400. Accent Computers

#### PERSYST COLOR

Colour graphics board like IBM card; £187. Micro Technology

#### PLANTRONICS

Colour graphics adaptor, parallel port; £375. Ferrari

#### TECMAR

Colour graphics adaptor, high-resolution; £445. Comart

### Environments and mice

#### MICROSOFT

Mouse to go with their new and future programs, £140. Microsoft

#### SMALLTALK

Implementation of Xerox Smalltalk for the PC, £495; mouse, £275. Asolv

#### VISI ON

Mouse with spreadsheet, graphics applications software, £735. Rapid

### Industrial and scientific cards

#### CAPITAL

IEEE-488 interface board, with system

controller, transfers commands and data, performs serial and parallel polling; resident firmware interpreter accepts Tektronix standard codes and formats; uses 16 bytes of RAM. Yorkshire Microcomputers

#### 3D

12-, 14- or 16-bit digital to analogue converters; analogue to digital converters; multi-channel amplifiers and analogue multi-plexers; wide range of interfaces for local or remote applications, from £350. Digital Design and Development

#### TECMAR DADIO

Digital to analogue converter; four channel, 12-bit digital to analogue converter with a five microsecond conversion rate; £370. Comart

#### U COMPUTERS SCIENCE CARD

Eight differential channels as standard with 16-channel single-ended input option; 12-bit resolution; software-controlled gain switching; 48-line parallel I/O interfacing; timer functions, interrupts supported, from £405. U Computers

#### ZT1488

Multi-function GPIB interface for controlling IEEE-488 compatible test and measurement equipment, with real-time clock/calendar and a socket for optional multi-mode I/O board, £492. Data Translation

### Image processing cards

#### MICRO-SCALE

Image analysis for the IBM PC with object area measurement; perimeter measurement to user-defined scaling; user definable and standard windows; disc and printer dumps; dimensioning and object counting; £1,950. Digithurst

#### PC VISION

Frame grabber is a real-time video digitiser and display module; with digitisation up to six bits per pixel; frame memory to 512 x 512 x 8; frame memory is mapped into the IBM PC address space in 64K segments; £2,200. Data Translation

#### TECMAR

Video Van Gogh video digitiser converts the image from any standard black and white video for storage in system memory; pixel-by-pixel digitiser, which digitises a frame in approximately four seconds; resolution 256 x 256; up to 256 grey levels; £300 including software. Comart

### Alternative keyboards

#### ELECTRONE DIN-106

Solid-state keyboard with electronics controlled by 8048/8748 microprocessor; users select from six different interface options; PROM programming is provided for alternative encoding; 32 function keys, with the additional 21 in a row at the top of the keyboard; Caps Lock and Num Lock keys have LEDs to indicate status; £195. Electrone

#### KEYTRONICS

A keyboard already fitted to many PC look-alikes; the Caps Shift and Slash are moved to more logical positions; while the # key is placed in the normal position; illuminated lights show Caps Lock and Num Lock; the Return key is back with the conventional setting; £195. Qubie Distributing

#### KEYTRONICS DE LUXE 5151

Yet to be launched keyboard for the PC, with separate cursor keys, top row function-keys with removable template. Qubie Distributing

### Expansion chassis

#### BUSBOARD MOTHERBOARD

Allows for the addition of different modules and additional processing power through co-processor bus; the range of modules includes Z-80A module CPM-80; parallel printer I/O module, clock/calendar, games, direct connect modem, A/D and prototyping facilities; £219.95. Compushack

#### TECMAR PC MATE

Increases the available system slots to 11; has its own switching power supply and space for the PC Mate Winchester option; £635. Comart

## IBM PC EQUIPMENT SUPPLIERS

Accent Computers Ltd, 3A Munster Green, Haywards Heath, West Sussex RH16 4AP. Telephone: (0444) 451324

Asolve Ltd, 12-14 Church Street, Basingstoke, Hampshire RG21 1QH. Telephone: (0256) 795746

Braid Systems Ltd, 130 Buckingham Palace Road, London SW1W 9SA. Telephone: 01-730 0736

Comart Ltd, Little End Road, Eaton Socon, St. Neots, Huntingdon, Cambridgeshire PE19 3JG. Tel: (0480) 215005

Compushack Ltd, 12 Nottingham Place, London W1M 3FA. Tel: 01-935 0480

(CPS) Data Systems Ltd, Arden House, 1102 Warwick Road, Acocks Green, Birmingham B27 6BH. Telephone: 021-707 3866

Dataflex Ltd, The System Centre, 238-246 King Street, Hammersmith, London W6 0RF. Telephone: 01-748 4176

Data Translation Ltd, 430 Bath Road, Slough, Berkshire SL1 6BB. Telephone: (06286) 3412

Digithurst Ltd, Leaden Hill, Orwell, Royston, Hertfordshire SG8 5QH. Tel: (0223) 208926

Doxiver Ltd, Unit 16, Wroslyn Road Industrial Estate, Freeland, Oxfordshire OX7 2HH. Telephone: (0993) 883166

Electrone Ltd, Haywood House, High Street, Pinner, Middlesex HA5 5AQ. Tel: 01-429 2433

Ferrari Software, Station Road, Egham, Surrey TW20 9LB. Telephone: (0784) 38811

Garingdell Systems Ltd, 16/17 Misbourne House, Chiltern Hill, Chalfont St. Peter, Buckinghamshire SL9 9UH. Telephone: (0753) 883036

GCS Communications, 12 Mount Road, Hanworth, Feltham, Middlesex TW13 6JG. Telephone: 01-898 2121

Intelligence Research Ltd, Network House, Wood Lane, London W12 7SL. Telephone: 01-740 5758

Interquadram Ltd, Auriema House, 442 Bath Road, Slough, Berkshire. Tel: (06286) 63865

KPG Hardware House Ltd, 578-586 Chiswick High Road, London W4 5RP. Telephone: 01-995 3573

Microsoft Ltd, Piper House, Hatch Lane, Windsor, Berkshire SL4 3QJ. Tel: (07535) 59951

Micro Technology Ltd, 51 The Pantiles, Tunbridge Wells, Kent TN2 5TE. Tel: (0892) 45433

Pete & Pam Computers, 103-5 Blegborough Road, London SW16 6DL. Tel: 01-769 1022

Qubie Distributing Ltd, Tempo House, 15 Falcon Road, London SW11 2PH. Tel: 01-223 7662

Rapid Terminals Ltd, Rapid House, Denmark Street, High Wycombe. Telephone: (0494) 38525/26271

Reflex Ltd, Wellington Industrial Estate, Basingstoke Road, Spencers Wood, Reading RG7 1AW. Telephone: (0734) 884611

Small Systems Engineering Ltd, 2-4 Cartfield Place, London NW6 3BT. Tel: 01-328 7145

Simon Computers Ltd, 28 Lower Addiscombe Road, Croydon, Surrey CR0 6AA. Telephone: 01-680 4646

Techland Systems Ltd, Wybridge House, Covens End Road, Bourne End, Buckinghamshire. Telephone: (06285) 26754/26535/27312

3D Digital, Design and Development Ltd, 18/19 Warren Street, London W1P 5DB. Telephone: 01-387 7388

U Computers Ltd, Winstanley Industrial Estate, Long Lane, Warrington, Cheshire WA2 8PR. Telephone: (0925) 54117

Yorkshire Microcomputers, Standard House, James Street, York YO1 3BU. Telephone: (0904) 642941

# HOW TO IMPROVE YOUR IBM PC AND XT



## AMERICA'S MOST POPULAR ENHANCEMENTS FOR IBM PC AND XT

### MAKE YOUR COMPUTER WORK HARDER FOR YOU

If you have purchased the IBM PC or XT then you are the owner of a very fine computer.

But like everything else it can be improved to work harder for you. It took a company like Qubie' to do it.

Qubie' can supply either the SixShooter or the Q Plus II to up-grade your IBM PC or XT. Both are engineered to match the IBM quality stamp.

While only occupying one slot in your computer these

two boards boost your PC or XT's capability with a selection of essential features.

### SIXSHOOTER - IDEAL FOR PC OR XT

For most customers the SixShooter offers all that you require from a multifunction board. 64K of Ram (socketed up to 384K), a serial port, a parallel port, automatic clock/calendar with battery back up are all standard. An IBM compatible games port adaptor is optional.

### Q PLUS II - MORE OPTIONS

Corporate customers and those with special needs will appreciate the ability of the Q plus II. Ram is expandable from 64K all the way to 512K. Add two serial ports, a parallel port clock/calendar and a games port to give 4 I/O connections from one slot.

IBM is the registered trademark of International Business Machines.

### QUBIE' PAK SOFTWARE SPEEDS THINGS UP

Free with each board are the custom-made Qubie' drive™ and Qubie' spool™ programmes.

Qubie' drive™ disk emulation software allows you to create up to three "electronic disk drives" in memory which access your programmes at the speed of RAM memory.

Qubie' spool™ is a

programme which allows you to assign a portion of memory to act as a print spooler.

### QUALITY BACKED BY WARRANTY

Both boards are backed by our one year parts and labour warranty.

Visit your local dealer and pick up a brochure with the full details. If he does not have the information contact us.

It's the best way to improve your PC.

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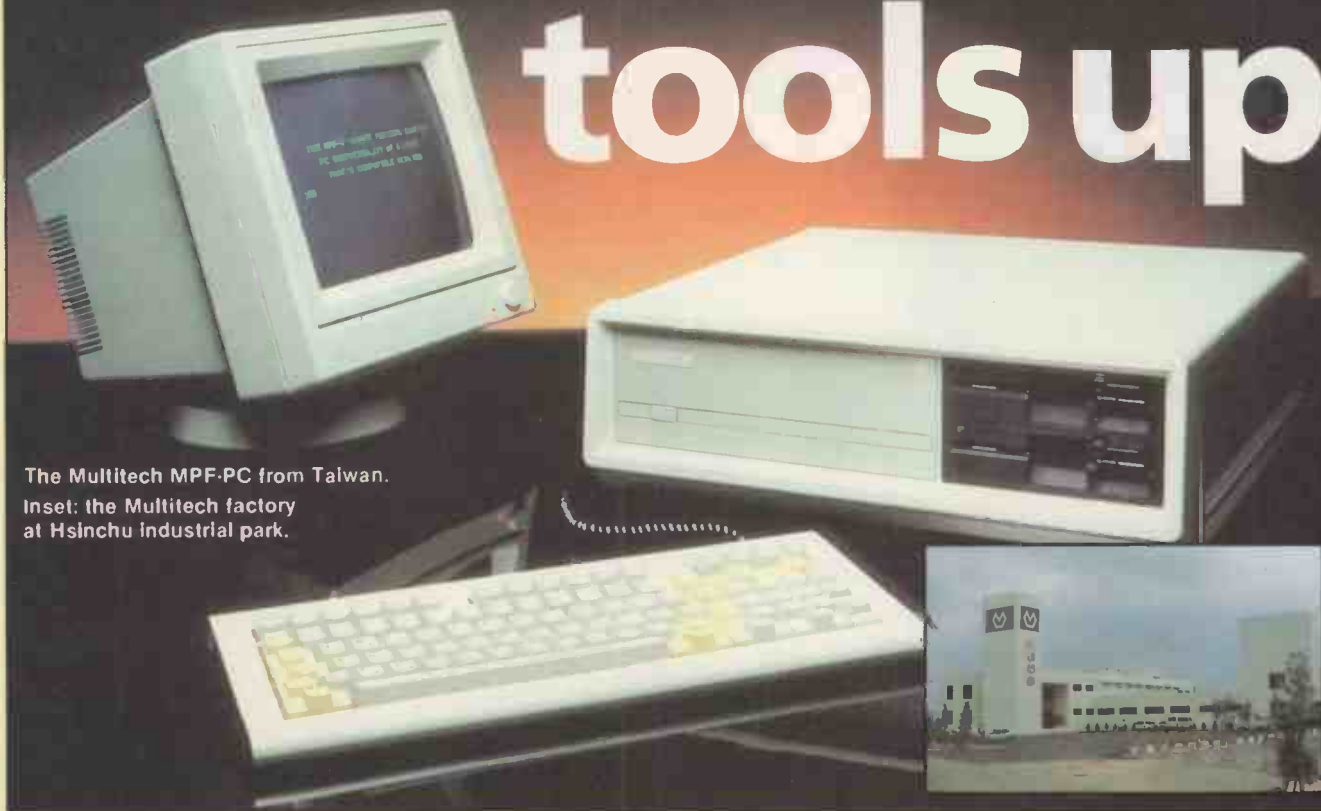
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CA 93010, USA.  
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● Circle No. 155

The South-East Asian builders of look-alikes have learnt to comply with the copyright and patent laws. Peter Bibby looks at what is now on offer.

# Taiwan tools up



The Multitech MPF-PC from Taiwan.  
Inset: the Multitech factory at Hsinchu industrial park.

## Models and manufacturers

	Features	Manufacturer
<b>Andes AD-5000</b>	8088 with 64K RAM, 2K-32K ROM; Portable version also	Tyong Sheng, 14 Lane 215, Chung Po S Road, Taipei, Taiwan
<b>Amigo 1600</b>	8088 with 128K RAM; Shugart drives, Keytronic keyboard	Surwave Electronic, PO Box 91-58, Taipei, Taiwan
<b>Aviette PC-16</b>	8088 with 64K RAM or hard-disc version with 128K	Aviette Computer, PO Box 7-12 Peitou, Taipei, Taiwan
<b>Genie 7-PCB</b>	8088 with 64K RAM; 40K ROM	EACA International, 13 Chong Yip St, Kwun Tong, Kowloon, Hong Kong
<b>Leo-123</b>	8088 with 128K RAM, 8K ROM	First International, Hong Kong
<b>MPF-V</b>	IBM PC compatibility	Multitech, 315 Fu-Hsing N Road, Taipei, Taiwan
<b>PC-301</b>	8088 with 128K RAM	Copam Electronics, PO Box 48-501 Taipei, Taiwan
<b>PC-5500</b>	8088 with 128K-1Mbyte RAM; hard disc optional	Inventa, Inventa Bldg, 66 Hou Kant Street, Shih-Lin District, Taipei, Taiwan
<b>Rakoa III</b>	8088 with 128K, expandable to 1Mbyte 8K-48K ROM	Rakoa Computer, 43 Sec. 1 Fu-Hsin S Road, Taipei, Taiwan
<b>Sesame</b>	8088 and 6502, 128K-384K RAM; Apple and IBM compatible	JE Computer, PO Box 12205, Taipei, Taiwan

Most machines feature built-in colour graphics, two 5.25in. disc drives, Centronics printer port, two RS-232C serial ports and space for an 8087 arithmetic co-processor.

THE FAR EAST is poised to take a large slice of the 16-bit microcomputer market with feature-packed models aimed to sell at about \$2,000. The centre of the IBM-compatible industry is Taiwan.

One maker will ship a basic unit for \$1,200. Its specification includes 128K RAM motherboard, timer, parallel port, two RS-232 serial ports, disc-drive controller, colour/graphics adaptor, power supply for hard-disc drive, case and keyboard. An 8K 2764 EPROM BIOS interfaces hardware and MS-DOS or CP/M-86.

These units will all work, they will get past customs and you will not end up in court for buying pirate goods. And they will run on all IBM software.

The Taiwanese have learned their lesson from the Apple court cases which ended with fake Apples impounded and their makers losing large amounts of money. The industry in Taiwan stepped back and looked at the micro scene very carefully. Their reasoning ran as follows: If we can

Peter Bibby is managing editor of the Hong Kong based *Asian Sources Computer Products* magazine, which specialises in computer equipment made in the region.





First International Computers' Leo-123

manage to make Apples better than Apple, why can't we go fully legitimate with micros which can handle the software from the big boys, yet which clearly break no patent laws?

Talks therefore began between several firms and Microsoft for MS-DOS licences. Digital Research executives were contacted and licence fees were negotiated for use of CP/M-86.

Though all was going well, a fundamental problem remained. MS-DOS can handle a lot of the IBM PC software, which uses PC-DOS, but several programs make use of the IBM BIOS. That BIOS is definitely copyright, so the Taiwanese makers had to find a way of making their machines fully compatible with all IBM PC software without infringing the BIOS protection.

Five companies contacted the Electronics Research and Service Organisation, set up in 1974 under a government-affiliated body to co-ordinate computer and semiconductor development in Taiwan. ERSO has now successfully completed its brief to design an operating system to interface MS-DOS and IBM-compatible hardware designed in Taiwan. The new BIOS is said to make all IBM PC software fully compatible with Taiwan's 16-bit micros.

The outcome is a wide range of thoroughly IBM-compatible machines. They can be freely exported without fear of breaking patent or copyright laws, and yet they will run all IBM PC software.

JE Computer, a former TV game maker, put six months of research and development into the Sesame CPU. It has no less than three CPUs on board: an 8088, a 6502 and an optional Z-80. The Sesame is claimed to run software based on Applesoft, Apple DOS, MS-DOS, CP/M-86 and USCD p-System.

The company does not handle retail sales so a final shop price has not been set. But the sample price of the microprocessor-packed Sesame is under \$1,200. For that you get two 5.25in. floppy-disc drives with Tandon mechanisms, an IBM-compatible 83-key detachable keyboard and the basic

unit. JE Computer is already making about 600 units a month, though this is small fry by Taiwan standards, where manufacturers are geared up to building 6,000 units a month and more of their various models.

Mitac Incorporated and Multitech Industrial Corporation are two of the industry leaders in Taiwan, and both have fully IBM-compatible units being mass-produced. Mitac can make 6,000 units a month, Multitech 3,000. Mitac has more than 200 computer engineers and uses advanced CAD/CAM systems and high-speed ATE facilities. The firm is one of the few manufacturers of Shugart disc drives.

Six months R&D were put into the MPC-160 series of microcomputers, which are compatible with the IBM PC and XT. The MPC-160 has a speaker port and nine plug-in slots. The MBC-ESC support card has 256K RAM, parallel I/O port, RS-232 serial port, game control adaptor and real-time clock with battery backup. An MBC stack card, added to the MBC-ESC, adds another 256K RAM and a second RS-232 port. While the IBM PC has monochrome and colour/graphic adaptors on separate boards, the MPC-160 puts all functions on a single CRT controller.

Nine plug-in slots, connected by a system bus, allow for further expansion with four left empty and five occupied by CPU, MBC-ESC, CRT controller, floppy-disc drive adaptor and hard-disc drive adaptor. The keyboard is from Keytronic, housed in a Mitac cabinet. The floppy drives use a Shugart SA-455 mechanism. MS-DOS is licensed from Microsoft, and licensed CP/M-86 is available as an option.

Mitac executives claim all languages and applications software for the IBM PC or XT can be run without alteration. An MPC-160 with console, keyboard and two built-in 360K floppy-disc drives has a suggested retail price of \$2,400. An extra \$500 brings a 10Mbyte Winchester drive in place of one of the floppies. Multitech's MPF-PC retails at about \$2,495 and is available with GWBasic licensed from Microsoft.

## Science park

Mitac and Multitech are among a growing number of high-tech firms in Taiwan's answer to Silicon Valley: the Hsinchu science-based industrial park. Occupying 2,100 hectares of land 70km. south of Taipei, it is dedicated to attracting and developing high technology. ERSO is only 10 minutes by car from the park and has many park residents as its clients. Already more than 210 hectares have been developed, with 80 standard factory buildings, 44 housing units and an eight-storey administration building.

The project is down for completion by 1990, when up to 200 companies are expected to be in production, many of them making microcomputers and peripherals. Mitac's factory alone is being expanded from 836 to 4,186 square metres this year,

and the work force will be more than doubled from the present 52. Some 70 staff will be devoted solely to product development. About a million dollars has been earmarked for new equipment.

Meanwhile, Japanese manufacturers are very reluctant to be linked with IBM compatibility and few will talk about the BIOS they are using — the IBM-Hitachi case is still in the minds of many. More than 20 firms are using or have plans to use MS-DOS in their 16-bit machines but the Japan Electronic Industrial Association puts total exports so far at only 40,000 units, hardly a formidable challenge to IBM.

One problem lies in language. Standard Japanese marketing policy for electronic goods is to establish a strong domestic market and then look to exports; for computers that means software handling Kana, Romanji or Chinese characters. The operating system, and the BIOS in particular, is therefore made compatible with domestic software, not with the whole range of software, for that operating system in the rest of the world.

## Initial problems

Leading makers such as NEC, Hitachi, Fujitsu, Toshiba, and Matsushita also admit to problems with marketing, distribution methods, customer support and after-sales service. The existing VTR dealers and hi-fi importers are, not sufficiently well versed in computers and new networks have not yet been established.

Matsushita's Panasonic division has been producing 1,500 to 2,000 units a month of a machine equipped with MS-DOS and CP/M-86. Some units have been exported, but the design is not very competitive on foreign markets. OEM sales seem more promising. Seiko has the 8600 series of 16-bit machines with CP/M-86, MS-DOS, Oasis-16, Mbos and Unidol. The series, reviewed in the February issue of *PC*, has multi-user and multi-tasking capability with standard 640K 5.25in. floppy drives or a 10Mbyte hard-disc driver. However, it is almost twice the price of an IBM PC.

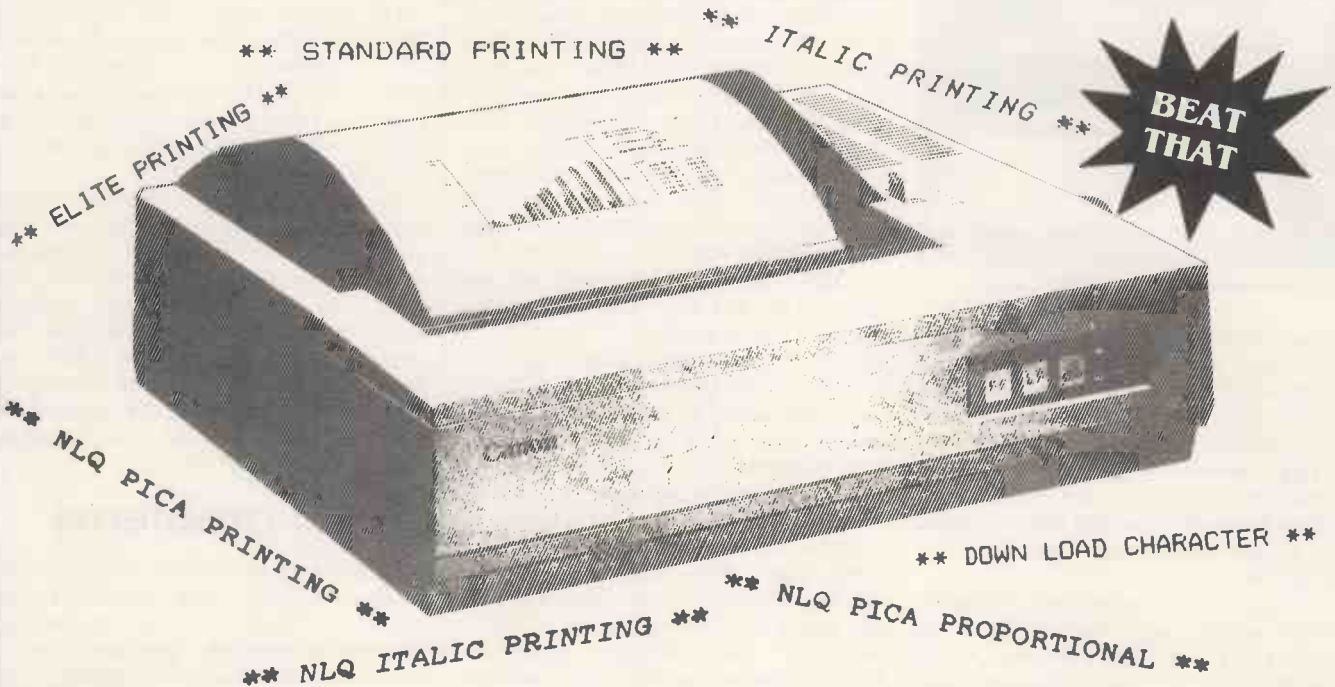
Some smaller makers are more adventurous and are going for full IBM compatibility. For example, Tomcat Computer Incorporated started developing fully compatible products two years ago and has just launched the Tomcat 3200. This bus-structured unit, with the 8088 on a card, is selling at about \$1,300 to large-scale buyers, so would probably retail at more than \$2,000. About 10,000 units are expected to be sold this year.

It seems unlikely that Japan will make a major impact, at least in price terms, on the IBM-compatible market in the West this year. Developments in Taiwan should be felt before too long, and already sales to the United States are building up. Makers in the Taiwanese market are now developing outlets in the West, and machines should be available in the High Street soon. □

**A Printer with Flexibility and Real Impact—  
The PW-1080A from Canon**

**Canon**  
**PW-1080A**

**SCI(UK) PRICE ..... £319 + VAT = £361.10**



**FEATURES**

- High-speed printing: 160 characters per second
- Bi-directional, logical seeking
- Quiet operation: less than 60 dB
- High-resolution graphic printing: N x 16 dot matrix
- Down loading for user-optional characters
- Near-letter-quality (NLQ) printing (23 x 18 dot matrix, pica font; italic, gothic and orator fonts optional)
- 4 character styles printable on the same line
- Superscript and subscript available
- International character sets selectable
- Selectable line feeding: 1/6" and programmable
- Handles various forms: roll paper, fanfold, single sheet and multipart copy paper

The Canon PW series was developed to satisfy users in need of high-speed, high-quality printing in one compact unit.

The PW-1080A can print 80 characters per line at a rate of 160 cps, yet it produces a noise level of less than 60 dB during operation, a key factor in maintaining a productive work environment. It is equipped with a special down-loading function that can be used to register character fonts defined or created by the user via the host computer. The user has a choice of four different character styles and enlarged or condensed characters, most of which can

be printed on a single line if necessary. And an optional ROM not only contains special fonts (gothic, orator and italic), it also boosts the near-letter-quality (NLQ) printing capabilities of the PW-1080A past the standard pica NLQ to make several NLQ modes possible.

Various paper forms can be handled by the PW-1080A: roll, fanfold, single sheet and even multipart copy paper. And since RS-232C and current loop interfaces are also available, the PW-1080A is sure to add to your computer system's power and flexibility.

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# MINSTREL 68K

a truly sophisticated model  
that gives the power you need



## MC68000

HMSystems is supporting the 68000 processor on the Minstrel 68K for its enhanced processing power. Motorola's superb chip has 32-bit internal architecture, with 17 32-bit registers, a 16-bit data bus and a 24-bit address bus. Running at 8 MHz, the Minstrel 68K can address up to 6 Mbytes of DRAM, and can perform floating point arithmetic almost as fast as the 8086 with 8087 co-processor.

## UNIX System III

The Unix operating system is fast becoming a standard for 68000 users: Xenix, MicroSoft's full implementation of Unix System III is supplied complete with an extensive range of software tools and utilities and:

- ★ full C compiler
- ★ Pascal
- ★ Assembler

## 6 Mbytes RAM

The Minstrel 68K is supplied as standard with 256 Kbytes of DRAM, and additional RAM is available up to a total of 6 Mbytes.

## S-100 bus

The S-100 data bus has become the industry standard, having been adopted as an official standard by the IEEE. S-100 is by its nature future proof, every major new processor, CP/M and floppy discs, has been available on the S-100 bus before they have been ready for other systems.

## 16 Users

The Minstrel 68K comes with two user ports as standard, and can easily be expanded with multiple I/O boards to a total of 16 users.

# HMSystems

## HMSystems Limited

69 Loudoun Road, London NW8 0DB  
Telephone: 01-328 8737/8  
Telex: 266828

## Price v Power

The Minstrel 68K starts at £6995 (plus VAT) in its standard form, including Xenix, 8 MHz memory-management unit and 20Mb Winchester.

### The Minstrel 68K offers the following features:-

- ★ 32-bit internal architecture
- ★ 8Mhz operation using 256K RAM cards
- ★ Memory mapped I/O
- ★ Boot PROM with system confidence test
- ★ Programmable real-time clock
- ★ Time of day clock with battery back-up
- ★ IEEE 696 I/O and on-board I/O may be mapped to any 64Kb block
- ★ Seven autovectorred interrupts
- ★ Full 24-bit addressing

# OKI Microline 92

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NLQ = Near Letter Quality.

It's just one of the many outstanding features which put the OKI Microline 92 matrix printer at the top of the 80 column league. Add to this standard print at 160 cps, high resolution graphics, downline-loadable character sets, subscript, superscript and underline capability, and you will see why the Microline 92 is an unbeatable price/performer.

The Microline 93 offers the same unrivalled specification to users requiring a full 136-column format.

And if all this is not enough, both machines are available with our unique IBM Plug 'n' Play Kit, ensuring full compatibility with the IBM PC.

An even more impressive feature list, including a print speed of 200 cps, defines the 136-column Microline 84. In addition to its increased throughput capability, the optional Automatic Cut Sheet Feeder permits maximum use of the near-letter-quality print mode.

Quality, reliability and unbeatable price/performance are of course hallmarks of the entire OKI Microline range, including the ever popular Microline 80, still a best-selling entry-level printer.

The range is completed by the Microline 82A (80 col) and the Microline 83A (136 col) which offer a print speed of 120 cps amongst a host of other features.

OKI Microlines - the unbeatable printer family!



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# MINSTREL Turbo

real multi-user networking that offers so much more



## Networking

Each user has their own 8-or 16-bit computer, networked together inside the Minstrel, to run CP/M-80 or CP/M-86 compatible software.

## Compatibility

Record-locking compatibility with MP/M means standard multi-user languages and packages are suitable for Minstrel TurboDOS systems.

## Expandability

Using the ARCNET local area network up to 256 Minstrels of up to 6 terminals each may be linked together. Each Minstrel system may have up to 160Mb of Winchester storage.

## Sophistication

The Minstrel Turbo is a true networking system with resource-sharing. Up to 9 spooled printers per Minstrel are accessible from any processor.

## Versatility

A Winchester drive and 5" floppy disk drive are standard, 8" floppy drives are optional, as are tape cartridge drives, and IBM and ICL mainframe communications.

## Telex

The Minstrel package adds telex facilities to the Minstrel Turbo and features automatic send and receive, call logging, conversation modes.

### Prices/Details

2-user system with:  
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# The Flagship...



In keeping with a long tradition of producing fine quality dot matrix printers, Epson have now launched their new flagship. The LQ-1500 is a new breed of printer, that will give you the best of both worlds. A dot matrix printer, although capable of 200 CPS in draft mode, can be set to produce letter quality at 66 CPS by simply flicking a switch.

Like all Epson products, versatility has been a primary consideration of the LQ-1500, incorporating friction feed as standard with optional tractor and hopper feed and a carriage width of a full 15".

You now have at your fingertips

all the advantages of a daisywheel machine, in terms of quality, together with the added benefits of condensed or enlarged characters and proportional spacing, plus very high speed when set to operate in draft form.

Having superb graphics capabilities and optional 8-bit parallel (Centronics) RS 232 and IEEE interfaces, the LQ-1500 has taken

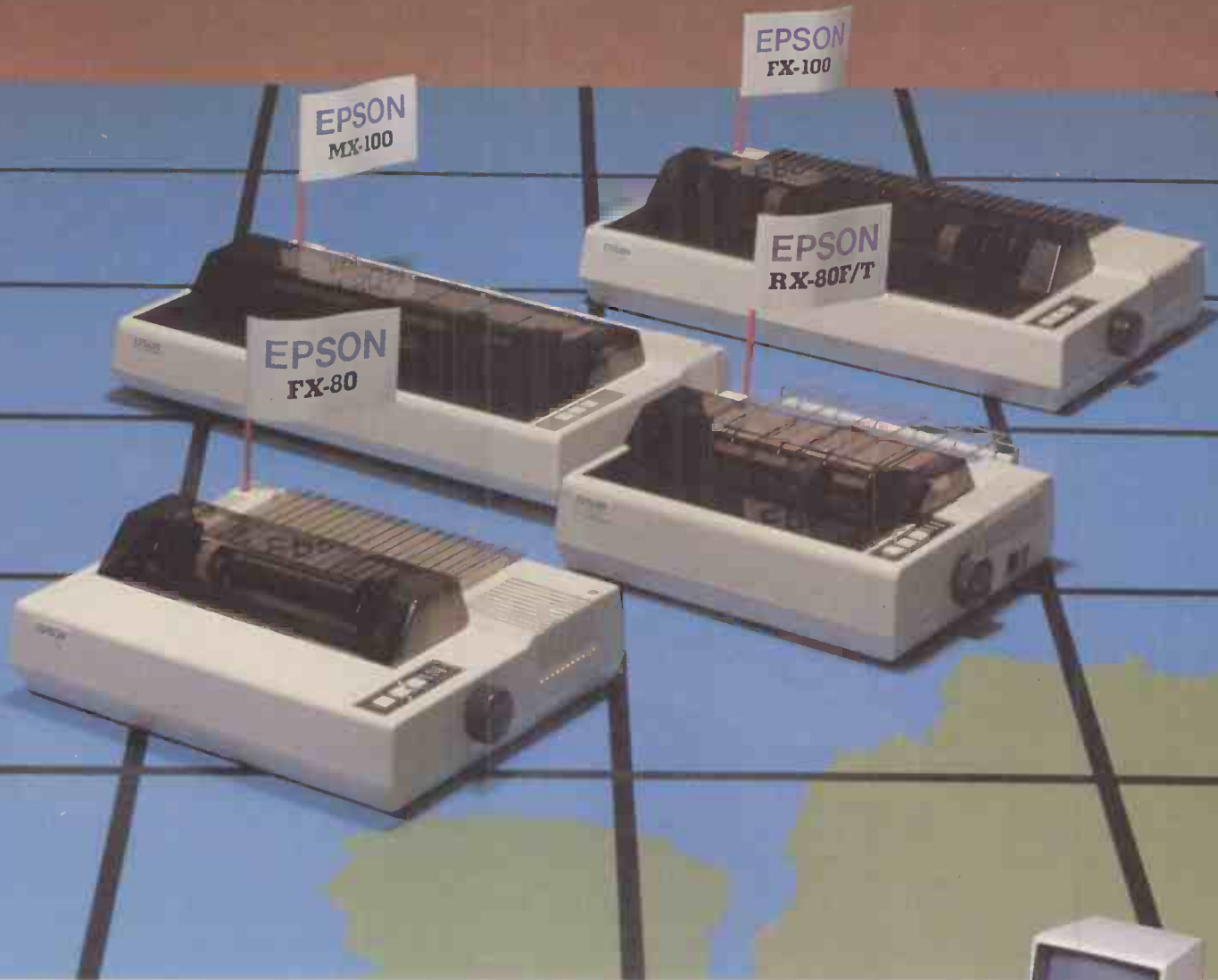
its rightful place at the head of the Epson fleet of fine dot matrix printers.

Epson have been leading the field in the design and production of printers for many years. Printers that are now successfully operating in all kinds of business environments, like the ever popular RX-80 and FX-80. With speeds of 100 CPS and 160 CPS respectively, dot addressable graphics and optional tractor feed available on the FX model, these two machines are extremely reliable and widely used.

The RX-80F/T has the same



# The Fleet



advanced features as the RX-80 but having both friction and tractor feed as standard, it's a totally versatile machine at a thoroughly realistic price.

With an ever watchful eye on the changing face of the printer market, Epson have identified a growing need for a high speed printer with the ability to accept wider paper. Thus was born the FX-100, again including all the advantages of its predecessors.

Epson are always looking for ways to improve products, a policy which has kept us one step ahead during a lifetime of being the first name in printers.

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# ADVANCE 86

More than six months after it was announced, this low-cost British-made IBM-compatible is starting to filter through to U.K. customers. John and Timothy Lee describe how they fared with one of the early production machines.

FEW BRITISH MICROS have attracted the widespread attention that followed the preview of the Advance in *Practical Computing* last autumn. Based on the 8086 CPU, with 128K RAM as standard, and colour and graphics built in, it is a proper computer capable of real work. Most important of all, it is IBM-compatible, and the price is so low that it could well trigger price cuts among its competitors.

The Intel 8086 is a true 16-bit chip. While it is compatible with the 8088 used in the IBM PC itself, it should run considerably faster. Basic is supplied as standard with the Advance and the highest graphics resolution is 640 by 200 pixels, comparable with the 640- by 256-pixel graphics of the BBC Micro.

Entry price is £400, including VAT, for the most basic model A, which works with a domestic cassette recorder. The model A may be upgraded later to a model B with two disc drives for a further £902.18 plus VAT. The BBC Model B, at virtually the same price as the Advance model A, has only 32K of memory, much of which is used for the video display.

## Wide choice

The claimed software compatibility with the IBM PC which means that there is a lot of software already available, and plenty more to come. Hardware compatibility between the expansion slots of the model B and those of the IBM PC ensure that there is already a wide choice of extra boards to plug in should you want to upgrade the machine. The Advance uses the same disc format as the IBM PC, so disc software should run without modification.

It is common practice in the computer industry to advertise goods long before they can be supplied, and often before they are in production. There were considerable delays with the ZX-81, BBC Micro and others, and promised delivery on the Sinclair QL has stretched from 28 days to five months. Our Advance model B was ordered in early November, and delivered towards the end of February.

The Advance model A is housed in a large black box 21in. wide by 16in. deep by 4in. high. There is space inside to store the keyboard when it is not being used, but normally it is connected to the front of the system box by a five-pin DIN plug and a 20in. coiled telephone-type cable. The only switch on the box itself is the illuminated mains power switch on the front right hand corner.



At the back of the box there are sockets for a domestic TV, a composite video monitor and an RGB monitor. It should thus be possible to connect any type of video device. There are also sockets for a domestic cassette recorder, two joystick games paddles, a Centronics-compatible parallel printer, and a mains power outlet to connect to other apparatus.

The choice of a monitor is a vital factor in the performance of the system. We compared four different monitors: two

monochrome and two colour. The 12in. Sanyo DM-8112CX has a high-resolution green screen and costs about £100; the 12in. Kaga-12NBYN has a high-resolution orange screen and costs about £130. Both sets ran on the composite video output and gave satisfactory results on both 40- and 80-character lines.

The first colour monitor we tried was a 14in. Microvitec Cub 1431 with a standard tube running on the RGB output and costing about £250. It gives superb results

## Benchmarks

The standard Benchmarks were run using Advance Basic, which is the equivalent of Microsoft GWBasic and Basica on the IBM PC. The 8086-2 in the Olivetti M-24 runs at 8MHz instead of the usual 4.77MHz.

Machine	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Advance 86 — 8086	0.8	3.3	7.3	7.4	8.1	14.6	23.9	26.0	11.4
Olivetti M-24 — 8086	0.5	2.0	4.6	4.7	5.2	9.4	14.8	15.9	7.1
ACT Apricot — 8086	1.6	5.2	10.6	11.0	12.4	22.9	35.4	34.4	16.7
IBM PC — 8088	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30.0	16.8

for 40-character lines but barely readable output for 80-character lines. A 14in. Microvitec Cub 1451 with a medium-resolution colour tube was completely satisfactory, but nearly £100 more expensive.

The display on all of the monitors is slightly squashed vertically. The Advance is IBM compatible, and the American standard produces 60 frames a second rather than the 50 frames a second that is usual in the U.K. A red DIP switch inside the model A determines whether the picture is 50Hz or 60Hz, but though the 50Hz setting corrects the height in character mode it may give problems in graphics mode and the 60Hz setting is recommended by Advance. The vertical squashing can be corrected by adjusting the height control on the monitor.

The keyboard is well made and has 84 moving keys, comprising the QWERTY alphanumerics, 10 function keys and a numeric/cursor pad. There are two standard-sized Shift keys on either side of the letters. A key labelled Alt occupies the position where you would expect the left Shift key to be, which takes a little getting used to. However, the Backslash key which causes so much difficulty on the IBM PC is placed out of harm's way at the top right-hand corner of the main keypad.

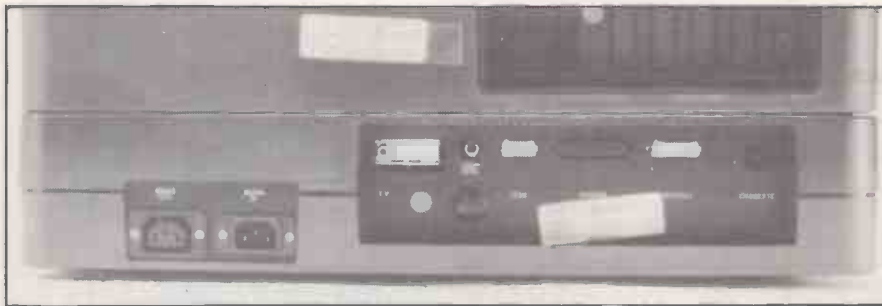
The key labelled Shift Lock toggles on and off but has no warning light to show which state the machine is in. Similarly the Num Lock key which changes the numeric pad into a cursor pad and back again also lacks a warning light to indicate the current state. The keys are silent and have a positive feel, and there are legs at the back of the keyboard giving you the choice to incline the keyboard or leave it flat.

## Any sequence

The 10 function keys are defined for use under Basic and MS-DOS, and they can be redefined to any sequence of characters you choose. There appears to be a type-ahead buffer of 31 characters, but this is not mentioned in the documentation. The machine can be reset by typing Control, Alt and Del simultaneously.

The model A motherboard carries 18 LSI chips as well as numerous small ones. The 8086 CPU runs at 4.77, and there are nine uncommitted-logic arrays made by Ferranti, a character generator and two ROMs containing a cassette version of Microsoft's GWBasic.

When the machine is switched on it first performs an integrity test to determine that all the circuitry is working. If an error occurs it beeps in one of a variety of different ways, but if all is well there is a delay of 12 seconds before the Microsoft copyright message appears informing you that 62,570 bytes are free for programs and data. You can expand the standard 128K of RAM to 256K simply by plugging extra chips into the motherboard, but Microsoft Basic cannot access more than 64K, so if you only intend to use the Basic supplied



The model A has sockets for a TV, a composite video monitor and an RGB monitor.

with model A there is no point in expanding it.

The screen displays nicely formed characters on a 25-line by 40-column display, and the cursor is indicated by a flashing underline. The character generator provides 244 different characters, including

## Specification

### MODEL A

**CPU:** 8086 running at 4.77MHz; optional 8087 arithmetic co-processor

**RAM:** 128K or 256K with parity plus 16K video RAM

**ROM:** 64K with Microsoft GWBasic, cassette OS and diagnostics

**Other ICs:** nine Ferranti ULAs

**Display:** plugs into TV, RGB or composite video or monochrome monitor, 80- or 40-character text by 25 lines; 640 x 200 or 320 x 200 graphics, 16 colours available

**Keyboard:** full-size detached QWERTY with 84 keys including 10 function keys and numeric keypad; layout follows IBM Selectric typewriter

**Sound:** single tone via built-in speaker

**Interfaces:** cassette port, light-pen/joystick port, Centronics printer port

**Size:** 527mm. (21in.) wide x 413mm. (16in.) deep x 108mm (4in.) high

**Price:** £347.82 plus £52.17 VAT plus £5 carriage

### MODEL B as model A, except

**RAM:** 128K to 768K with parity plus 16K video RAM

**Disc drives:** two 360K IBM PC compatible Shugart 5.25in. floppy-disc drives

**Expansion bus:** four IBM PC compatible eight-bit expansion slots plus two 16-bit slots

**Interfaces:** RS-232C serial port also included

**Software supplied:** MS-DOS version 2.11 plus Perfect suite of software comprising Writer, Speller, Calc and Filer

**Other features:** one-year on-site service from National Semiconductor

**Price:** £1,250 plus £187.50 VAT plus £10 carriage

**Size:** as model A except 146mm. (5.5in.) high

**Availability:** manufactured in the U.K. by Ferranti and distributed in 46 countries worldwide

**U.K. distribution:** Advance Technology (U.K.) Ltd, 8A Hornsey Street, London N7 8HR. Telephone: 01-609 0231

the full ASCII set, European letters, graphics lines, maths symbols and some Greek letters. The 25th line displays the current settings of the first five function keys F1 to F5. The other 24 lines display text, which scrolls in the usual way. A Basic program can use the 25th line to display non-scrolling text rather than the function-key definitions.

The Basic command Width 80 clears the screen and changes the length of line displayed to 80 characters. A domestic TV will display 40-character lines reasonably well, but a monitor display is sharper and is essential to display 80-character lines. The display is stable, but flickers during scrolling and whenever you press Return. The flicker is much more noticeable with 80-character lines than with 40-character lines and it only occurs in text mode, not if graphics mode is used.

Basic programs may be entered in the usual way. Upper- or lower-case letters can be used, and variables may be up to 40 characters long. A space is needed between variables and keywords such as For and If. Lines can be up to 240 characters long and screen editing is as on the IBM PC.

## Default precision

The Basic provided 48 error messages and lists the faulty line so that you can correct it. However, lines are not necessarily listed exactly as entered; for example

```
10 PRINT 0.8 + 8.1 + 26.0
```

is listed as

```
10 PRINT .8 + 8.10001 + 26!
```

The 8.1, which is a non-terminating binary function, has been rounded to 8.10001, and 26.0 has been written as 26!, the ! signifying that it is an integer. The default precision gives about six significant figures. Variables can be declared as integer, real or double-precision real; undeclared variables default to being reals.

Advance Basic is typically 30 to 40 percent faster than the IBM PC's. A variety of different display modes available. Text mode allows 80-by-25 or 40-by-25 character displays. Each letter may be in one of 16 different colours on one of eight different background colours, and may or may not be flashing. There is also a choice of four different colours for the border round the edge of the screen.

In addition to the 128K main RAM there is 16K of dedicated video RAM. To store

(continued on next page)

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the permutations of colour for each character the Advance uses two bytes for each character on the screen so an 80 by 25 display occupies 4K. Four separate pages of 80 by 25 characters or eight pages of 40 by 25 characters can therefore be held.

Using the Screen statement you can choose a page, and all subsequent Print statements change that particular page. You can also choose which page is to be displayed on the screen; it need not be the same page as the page currently being updated.

Basic supports two graphics modes. Mode 1 gives a resolution of 320 by 200 in four colours; and mode 2 gives a resolution of 640 by 200 in black and white. Two different colour palettes for mode 1 are available, and text is allowed in either mode. When the cursor is over graphics rather than text it changes from a flashing underline to a block in the inverse colour. A monitor is needed to use mode 2 graphics.

The graphics seem to be, as claimed, compatible with the IBM colour/graphics adaptor. Basic has functions for setting pixels in any of the available colours or for resetting pixels. A Line function allows rectangles to be drawn and lines or rectangles filled in. A pair of functions, Get and Put, enable sections of the display to be read into an array, or the contents of an array to be displayed on the screen. A program can thus save a screen image on cassette and recall it later.

The model A can produce music through an internal speaker. A single note can be played using the Sound statement by specifying its frequency and duration. The program continues executing while the sound is being produced, but it will pause if another Sound statement is executed and waits for the first sound to finish. Seven octaves are available. There is also a Beep statement which has the same effect as printing ASCII 7.

The Advance model B is nothing more than a model A with an extra box sitting on top of it, so upgrading is simplicity itself. The 5.5in. high expansion unit contains two Japanese-built half-height Shugart SA-455 drives, a power supply and a large motherboard with a serial interface and four standard IBM expansion sockets. One socket is occupied by the disc controller board, leaving three for further expansion.

While the 8088-based IBM PC can only communicate over an eight-bit data bus, the Advance's 8086 processor is capable of handling data 16 bits at a time. Two sockets are therefore provided for 16-bit expansion boards, though few 16-bit plug-in boards are available at present. There is space within the box for another two SA-455 drives or a 5.25in. hard disc. The serial interface is connected to a male RS-232 plug; most computers have female RS-232 plugs so a special serial printer cable is needed for the Advance.

Removing a panel from the left-hand side of the system box reveals two sets of



There is space inside the model A to store the keyboard when not in use.

contacts on the edge of the motherboard which access a pair of ribbon cables hanging down from the disc box. A similar procedure is followed with a panel on the right-hand side to make the mains connection. Resetting a DIP switch on the main motherboard completes the changeover from model A to model B.

MS-DOS loaded from disc displays the familiar A> prompt with a flashing double-underline cursor. It is an improvement on the flashing single-underline from the cassette Basic, which is hard to see under lower-case characters with descenders. Under MS-DOS Control-Break and Control-Num Lock perform the same function as in cassette Basic, aborting the current command or suspending output temporarily.

Each floppy disc stores a total of 354K, 314K for your programs or data on top of MS-DOS. Unlike CP/M, which reserves tracks for the operating system, the entire 354K is available for your programs and data if you do not put the operating system on the disc. Advance is currently offering free Perfect Writer, Perfect Speller, Perfect Calc and Perfect Filer free with the model 13. The system disc provides MS-DOS and the following utility programs: Basica.Com, Chkdsk.Com, Command.Com, Diskcopy.Com, Debug.Com, Edlin.Com, Exe2Bin.Exe, FC.Exe, Find.Exe, Format.Com, Link.Exe, More.Com, Print.Com, Recover.Com, Set40.Com, Set80.Com, Sort.Exe and Syst.Com.

Basica, the disc version of Microsoft's GWBasic, occupies 59,392 bytes and loads in five seconds. When loaded, Basica gave 61,466 bytes free on our 256K computer — slightly less than for cassette Basic, probably as a result of different file-buffering techniques. The Advance ROM is different from the IBM PC ROM, and two disc Basicas are also different. However, if in each case the disc routines are added to the ROM routines, the end result appears to be the same.

Once the backlog of orders has been met, the Advance will be supplied through dealers and through W H Smith, who will plug the two boxes together, check that they work and sort out any initial difficulties. Ferranti will also be marketing the machine itself. The Model B comes with a comprehensive 12-month on-site warranty covering all parts, labour and

travelling during normal working hours. This level of service must be worth several hundred pounds, and puts the Advance ahead of almost every other micro, except the DEC Rainbow.

Ultimately the Advance B will stand or fall on its claimed compatibility with the IBM PC. Ferranti is sufficiently confident that the Advance will run IBM software that several prospective buyers have been asked to run their IBM discs on the Advance. So far they have all worked!

We ran WordStar taken from an IBM PC running PC-DOS version and a colour version of WordStar. The Microsoft Flight Simulator, which relies heavily on graphics, runs on the Advance in both black and white and in colour. We were also able to read and write files on the IBM disc and have run the IBM PC demonstration disc, including numerous colour drawings, pie charts, mortgage calculations, games and computer music. Though we did not test it, Lotus 1-2-3 is reliably claimed to work on the Advance.

The documentation supplied with the machine was labelled "preliminary", and comprises about 260 sheets of A4 in a ring file. It seems comprehensive, except that all of the diagrams are missing. We subsequently found that we had not been sent the technical manual, or the software or manuals for the bundled software. Advance has promised that they will be provided later.

## Conclusions

- There were the usual teething problems with a new computer. However, Advance and Ferranti appear to be tackling these problems and there is every indication that current production is satisfactory.

- At £400 the model A offers considerable advantages over the BBC Model B, especially the access to an industry-standard advanced Basic and considerably more memory. It also offers a clear and logical upgrade path to a professional system, which the BBC Model B fails to do.

- While the model A will initially be short of software on cassette, sales through W H Smith will encourage its growth. The Advance should be helped by the eventual arrival of the IBM PCjr.

- The Model B is bulky but good value at £1,250 plus VAT, especially as the price includes MS-DOS, Basica, the Perfect software suite and a year's on-site service provided by National Semiconductor.

- The long-term success of the model B depends rather on its compatibility with IBM PC software. Early trials suggest there are no problems running MS-DOS programs loaded from discs supplied for the IBM PC.

- The editor adds: Since Messrs Lee reviewed the Advance 86, diagrams have been added to the completed ring-bound manual. Further, Mode is included in the new DOS. □

I'M NOT asking two thousand, I'm not asking one thousand five hundred. Here it is, ladies and gents — 7in. amber screen, two disc drives, full-sized keyboard, the latest CP/M Plus operating system. I'll throw in a built-in 75/1200 modem — yes, sir, it is auto-dial and fully supported by the communications software supplied. Word-processing software? How about Perfect Writer, madam, and we're bundling in Perfect Calc and Perfect Filer as well. EX-VAT price not a penny more than one thousand nicker. Thank you, sir. And you, sir. And how many for you, madam. . . .?

At this price Wren is one of the most interesting micro propositions of 1984, but at the time of writing there is one very serious catch. The suppliers were anxious to have the review machine back after an all-too-short loan because, for the moment, there appear to be only two or three of them in existence. Reviewers are used to having to deal with early production models, but this one was a prototype, with a front panel attached with sticky tape and a three-bar logo cut out from coloured glossy paper and pasted on by hand. It was little more than a mock-up that happened to work.

## Production delay

The production of the Wren is delayed, so it is rumoured, not by the usual operating-system bugs or nasty last-minute hardware surprises but by a miscalculation in the size of the casing. It turns out to be millimeters too small for the chassis — or *vice versa* depending on who is telling the story. I am assured that by the time you read this, Thorn-EMI should be hatching out Wrens in quantity, but in computer manufacture nothing is certain.

The press is starting to hate Sinclair-style launches, with glossy brochures and pizzazz up front and the product way behind. Given the hideous financial realities of a market where the cost of entry is so high, manufacturers still judge them necessary.

# WREN

At £1,000, including a suite of office software, comms and Prestel, this micro is a bargain, but Chris Bidmead wonders if it is enough for it to succeed.



The combined screen and disc unit slide back to reveal the Wren's keyboard.

Though designed and implemented by Transam, the Wren is the inspiration of ex-journalist Richard Hease, chairman of Prism, the company that supplies the retail trade with Sinclair Spectrums. If Prism pulls it off this time, it is going to have to sell Wrens by the flock to succeed at this sort of price.

The Wren arrives in a handsome black padded shoulder bag, a humpable but not particularly portable package weighing

around 13kg. The machine is extracted from the bag by lifting its ballet-school bar handle, which is useful when swinging it from site to site around the office.

The handle is at the rear of the machine, so during transportation the screen points directly downwards. The bottom of the carrying bag has nothing more than padding to protect the glass, but the screen is well recessed and you would have to be

*(continued on next page)*

## Prestel

The trusting people at Prism kindly gave me the use of their Prestel account number and personal code, provided I promised to forget it once the review was done. In fact they need not rely on my scrupulous honesty; all they have to do is alter the personal codes on each computer next week.

Of course if I were really unscrupulous I could alter the personal codes myself, shutting out Prism from the system. This is quite a serious hole in the security: if an unauthorised person gets hold of your account number and changes your personal code you have no defence but to phone the system supervisor and beg to be allowed back on. Prestel lacks the comprehensive security provided by Unix, which confines the systems operations like changing personal codes to a super-user.

Of Prestel's reported hundreds of thousands of pages, a very high proportion seem to be indexes of the other pages. The stock market reports were certainly up to date; some of the more expensive pages are refreshed every 20 minutes. But others seem little cared

for by their owners, the so-called information providers. One IP offered facilities for sending a Valentine's card — handy, but March is leaving it a little late — and another gave advance notice of some long-gone exhibition.

For lonely hearts there is Simpatico, its pages crammed with distress signals from males seeking female companionship in vain. Micro fans will have more luck browsing through the Sales and Wanted pages of Micronet's Hobbyist's Corner, but they run the risk at every node of being diverted by games advertisers.

Perhaps users who know it better have come to think more highly of Prestel, but for me the general effect was very like wandering through a necropolis pasted with garish posters. There are some interesting opportunities to cross over on to other computers — Baric, for example, invites guests to try its not very taxing mortgage program. Private viewdata can also be a boon, for example for firms to keep in touch with remote employees. But if accessing Prestel were all the Wren could do there would be little to get excited about.

# WREN

(continued from previous page)

very unlucky to damage it by putting the bag down on uneven ground.

When you lie the Wren down on the desk the keyboard is invisible, and has to be brought into play by sliding the combined screen and disc unit backwards until its rear part nestles up against the carrying handle. This was a rather awkward manoeuvre on the review model because the top unit tended to judder on the runners, but there seems to be no fundamental reason why this should not be smoothed out on the production model. The problem may have been partly that our Wren did not sit flat on the desk as one of the four rubber feet was missing.

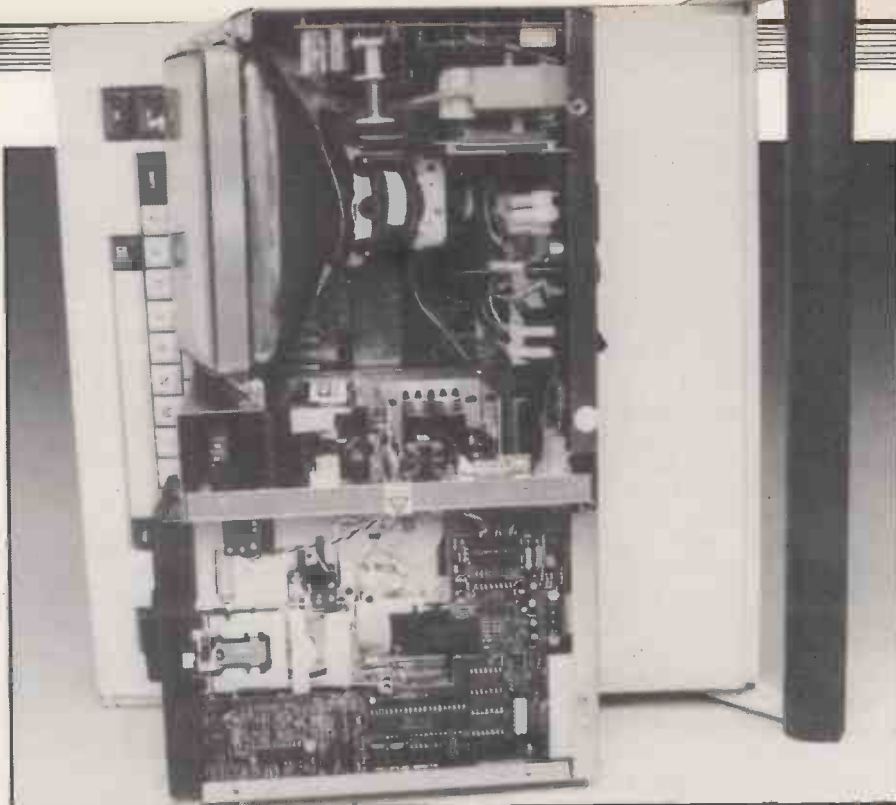
Opened up like this the Wren has all the usual advantages and disadvantages of a small desk-top system. It occupies 16in. by 18in. of desk space, allowing for projecting cables at the rear, and stands no more than 9.5in. high. This makes it very suitable for desks where using the computer is not the main business of the day. It leaves plenty of surface area for paperwork, and does not invade the air space across the desk needed for interviewing and meetings.

The 67-key keyboard is uncluttered, with a sensible layout and the Return key in the right place. The five function keys, the cursor keys and the special keys like Esc and Del are dark brown with the rest of the keyboard in ivory. An unusual addition to the brown keys are an extra \* and # positioned just above Return. At first sight these appear to be duplicates, as the same characters appear in their usual places on the QWERTY layout, but on investigation they turn out to be special keys that play a large part in Prestel activities.

## Keyboard touch

The touch of this rather flimsy keyboard was not particularly inviting — a little like tapping plastic Scrabble tiles. The keyboard PCB was not properly secured on the review model, and bent rather alarmingly when the keys in the top right-hand corner were hammered. But the part comes from a reputable supplier, Cherry, and should stand up to a lot of use.

The pleasant amber screen is set back at an angle in its recess to the left of the front panel. This positioning affords some shading from overhead lighting and helps the user to look squarely down at it without getting a crick in the neck. As on all small machines that have an integral keyboard and screen, if you position yourself correctly for the keyboard, the screen is too close; if you sit where you can see the screen best you have to sacrifice the official touch-typing relationship with the keyboard. As the machine is obviously designed for intermittent rather than continuous use this should not cause too much



The roomy interior permits the machine to be completely convection cooled.

of a headache, literally or otherwise.

The horizontal linearity on the review machine was rather skewed, fattening the characters towards the left-hand side of the screen and starving the ones on the right. But the standard character set was clear and surprisingly easy to read, considering the size of the screen. The display seemed completely immune to jitter and swim, and remained steady during disc access.

To the right of the front panel are the two slim-line disc drives, set somewhat crookedly on the review model. The disc latch works by squeezing together a couple of large protruding lugs at the front of the drive. It is simple to use, needing only one squeeze to lock the disc in position and a second one to eject it neatly into the hand.

The design of the machine makes it very simple to service. To get to the main board you simply turn the machine on its side and unscrew a pair of bolts at the bottom. This allows the whole base cover, with its attached ballet-bar handle, to be slid off after the frame earthing wire has been unbolted. The system board can then be hinged out for inspection.

The system board bears the name Wren Computers and appears to have been made in the U.K., although the rat's nest of jumper wires on the review machine testified that the design had yet to gel, as you might expect on a prototype. In addition to the dynamic RAM there is some additional CMOS RAM supported by a Varta rechargeable battery. One interesting component is the flat capacitance-type speaker, some 2mm. thick.

The external edge of the board holds the real-world interfaces: an RS-232 port, a Centronics port embodied in the unusual form of a 15-way D-type connector, an output to a colour TV, a Winchester interface, and the modular modem socket. Surprisingly on a business system, there is

also a pair of six-pin DIN sockets labelled Left and Right Paddle Controls and containing the six analogue to digital converters directly accessible from the Basic. Mounted on the same edge of the system board is the small Reset button, which though accessible is well protected from accidental use.

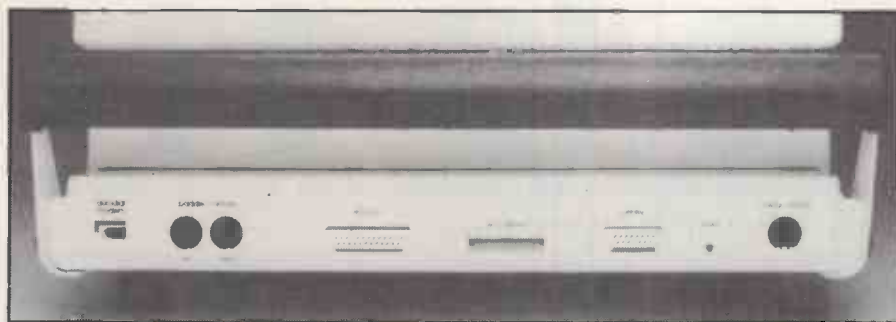
The rest of the interior can be reached independently, with the machine upright, by removing a couple of bolts in the top case. After a certain amount of discreet bending to clear the lugs protruding from the front of the drives, the cover comes away to reveal a very neat, well designed chassis. As well as the 7in. CRT and its associated board, there is a switching power supply unit from the British manufacturers Astec and the disc drives.

## Metal cage

The drives are half-height 5.25in. single-sided floppies, made by the camera manufacturer Chinon. A perforated metal cage shields them from the power supply and they are well spaced, suggesting that there may be a thought of replacing one of them with a 5.25in. Winchester in later versions. Each drive is somewhat skimpily mounted, with only a pair of bolts securing the right hand side. The discs are turned by extremely flat motors from JVC, which probably work on the linear principle.

At the back of this chassis, concealed by a hinged flap when the cover is in place, is the mains inlet, the On/Off switch and two unobtrusive controls for the CRT brightness and contrast. There is no cooling fan as the uncramped interior allows the machine to be convection cooled.

On start-up the Wren prompts for a system disc in drive A. The disc boots into a graphic menu that displays an array of labelled application pages. Functions are



Interfaces include RS-232, Centronics and Winchester ports, an output to a colour TV, and a modular modem socket.

selected by moving the cursor to the appropriate page.

Selecting an application or utility causes that program to be loaded if it is on the current disc, or if not throws up a message of the form:

Insert your communications disc and press Return.

If you feed in the wrong disc the system repeats the request until you comply with the correct one.

You can use this front end, which is called Wrenmenu, to do all the usual things like formatting and copying discs and running general application programs. The facility is supplemented by the function keys, which are also set up to do things like display the directory or set the date and time. I particularly liked function key 5, and I suspect other users will after they have kicked Wrenmenu around for a while: it jettisons the fancy menu system and drops you into CP/M Plus.

## Tried and tested

Perfect Writer is a very clever virtual-memory word processor with a useful talent for juggling several different text files in memory at once. While Perfect Calc is in most respects a middle-of-the-road Visiclone, it is also remarkable for being able to do the same thing, running calculations across a number of different files at the touch of a key. Perfect Filer is an ordinary flat-file management system and a far cry from a well implemented dBase II application, but very simple for the beginner to set up. The three of them would not be my first choice for a dual-floppy system but they are tried and tested, and together are certainly good value.

I am less sure of Executive Desktop. This comprehensive time and data-management system has some uncomfortable corners that lead me to believe it may still be in the pre-release stage. As with Wrenmenu, functions are selected by moving a cursor across an array of options, but if you make a perfectly ordinary error — like attempting to print labels without having hooked up the printer — an error message scrolls the screen up a line and shifts the options out of position.

Apart from its implementation, some aspects of the design are rather questionable. For example, there appears to be no way of printing out anything like

## Specification

**CPU:** Z-80 eight-bit

**Memory:** 64K RAM

**Dimensions:** 419mm. (16.5in.) × 457mm. (18in.) × 241mm. (9.5in.)

**Display:** 80-character × 24-line amber LCD display

**Keyboard:** Standard QWERTY 67-key keyboard, with five function keys and two Prestel keys

**Interfaces:** Parallel printer port, programmable RS-232 serial interface, 75/1200 auto-dial modem, six analogue to digital converters with eight-bit resolution, Winchester interface

**Discs:** two Chlnon single-sided floppies with 190K capacity

**Operating system:** CP/M Plus

**Bundled software:** Perfect Writer, Perfect Calc, Perfect Filer, Executive Desktop, BBC Basic, Prestel communications  
**Manufacturer:** Wren Computers Ltd, 18-29 Mora Street, London EC1  
**U.K. distributors:** Wren Computers, Prism, Transam

a recognisable diary with all your appointments and events in one combined listing. The filing routine is full of almost entirely incomprehensible prompts. There are some marvellous subtleties about Executive Desktop, but it needs a clear and comprehensive manual; the provisional documentation supplied with the review model left me a gibbering wreck.

BBC Basic has been transported across to the Z-80 by Richard Russell, the original author. There are some necessary variations from the familiar 6502 version. They are listed in the Wren manual, but no BBC manual was provided. The sound generator in the Wren is not as sophisticated as the BBC, and there are only eight pre-defined shapes for the envelope.

By way of compensation Advcal returns analogue input from each of six channels instead of the BBC's four. Including six analogue to digital converters in the price helps to make this machine a real bargain for the scientific community, although its eight-bit resolution may not be sensitive enough for many applications. Though the Mode commands appeared to be similar to the BBC, the resulting screen definitions are slightly different and anyone buying a Wren to run standard BBC packages should check compatibility first.

The Wren's purchase price also buys a three-month subscription to Prestel. All you need is a BT-approved modular jack socket to fit the connecting lead that comes with the Wren. The built-in autodial modem and the software on the communications disc supplied with the package will do the rest. Wrenmenu guides you to the right program, or you can run Preterm.Com from the command level to put the screen into Viewdata mode. A menu is displayed from which you can log on or off as well as save or print captured viewdata frames

The Log On option takes you into a second menu that has a branch allowing you to set up the Prestel identity number under which the system is registered. The identity number is stored in battery-backed CMOS RAM, which keeps it safe even when the machine is switched off. Thereafter it is sent out automatically every time you need to log on, which is handy as it is 10 digits long.

The LogOn option produces yet another menu, this time a selection of numbers for the various Prestel computers. Like the Prestel code number, these numbers also reside permanently in battery-backed CMOS RAM. The option to change them is also part of this menu, together with the choice of dialling manually.

## Conclusions

● Compact and completely silent in operation, with Prestel and software to do just about anything, the Wren is an ideal office computer. It is a knock-down bargain that undoubtedly points the way ahead to the sort of sensible prices we are going to see in the next year or so.

● Unfortunately the marketing question will not go away. Prism, Transam and Thorn-EMI, who together are the inspiration and embodiment of the Wren, are solidly established British computer companies but the crucial marketing side of this venture is new to them. The Wren is flying in skies that belong to other manufacturers who are hawkish and rich, and where talons count for more than talents.

● £1,000 is splendid value for the customer, but a very awkward figure for the sales manager. A machine selling at around £300 through the big chain stores can make good profits all round on a "pile-'em-high, sell-'em-cheap" basis. A business computer at twice the Wren's asking price would give individual retailers something like £600 on each sale, which just about pays for their time and expertise — anything much less and they might be better off selling life insurance.

● Putting aside the question of marketing, the Wren is an outstanding machine. I do not know of anything that can do as much as the Wren does even at twice the price.

# SORD IS-11

Ian Stobie sees how close this new battery-powered portable is to encroaching the domain of the office-based micro.

SORD'S NEW IS-11 takes the battery-powered portable computer a step closer to matching the performance of desk-bound office micros. The 4.4lb., A4-sized IS-11 is built around a fast CMOS version of the eight-bit Z-80 processor and can be upgraded to run standard CP/M software.

The IS-11 is due in the U.K. in July, and will probably cost between £700 and £1,000. CP/M is expected to be available later, probably in the form of a plug-in ROM cartridge. The pricing places the IS-11 further up the market than similar battery-powered portables like the Epson HX-20, Tandy 100, NEC PC-8201 and Olivetti M-10, which are priced around the £500 mark.

What you get for the extra money, apart from the faster processor and optional CP/M capability, is improved specification and plenty of software bundled in with the system. The standard IS-11 has 64K of built-in ROM, containing text editing, communications, spreadsheet and record-handling software as well as Sord's own operating system.

According to Sord, the company holds the number two position in the personal computer market in its native Japan; Sord takes about 13 percent of sales behind NEC's 35 percent. The company has been selling a range of eight and 16-bit machines in the U.K. for some time, and manufactures some machines in Ireland, but the IS-11 is Sord's first truly portable offering in the U.K.

## Similarity

Physically the IS-11 closely resembles the Epson HX-20 and Tandy machines. The three machines have almost identical external dimensions, all have good quality full-size keyboards, and the Sord is only marginally heavier at 4.4lb. Sord has adopted the built-in microcassette pioneered by the Epson HX-20. The Sord's eight-line by 40-character liquid crystal display matches that of the Tandy 100 in size and betters the rather limited four-line by 20-character display of the Epson HX-20.

The real differences are inside the machines, and reveal the Sord as a much more powerful system. The IS-11 is built around a Hitachi CMOS version of the eight-bit Z-80 processor which runs at 3.4MHz, making the Sord much quicker than most of its rivals. Since Z-80s running at 1, 2 or 4MHz, provide the processing power for most eight-bit mains-powered office micros, the IS-11 is in theory at least the equal of many desk-bound machines.



The IS-11 packs full-size keyboard, LCD display and microcassette drive into a compact A4 size battery-powered unit.

The IS-11 does face a few battery-powered portable rivals which also use versions of the Z-80 chip, but the machines already on the market seem to be aimed at specialised outdoor and industrial users and are more expensive. Examples are the Husky and the Fieldwork Fifty, which can both run CP/M programs and have the advantage of being very tough, but prices start at around £1,000.

The only machine likely to compete directly with the Sord IS-11 in the general executive-portable market is the new portable machine which Epson has just shown for the first time at the Hanover Fair, the PX-8. Reportedly this also runs CP/M and is based on a Z-80 look-alike processor.

When you turn on the IS-11 the system displays a menu of all the files in memory; these include your own data files and the programs immediately available to run. The software provided in ROM includes a simple text-editor, a program to make the IS-11 into a powerful desk-top calculator, and a version of Pips, Sord's own spreadsheet cum record-handling software. No Basic is provided, but one will be optionally available on ROM cartridge. A full scale word-processing package on ROM cartridge is also promised.

Pips is the most substantial of the packages that come with the machine. You can enter data either as continuous text as if on to record cards, or into cells organised in rows and columns like a conventional spreadsheet. You can selectively search,

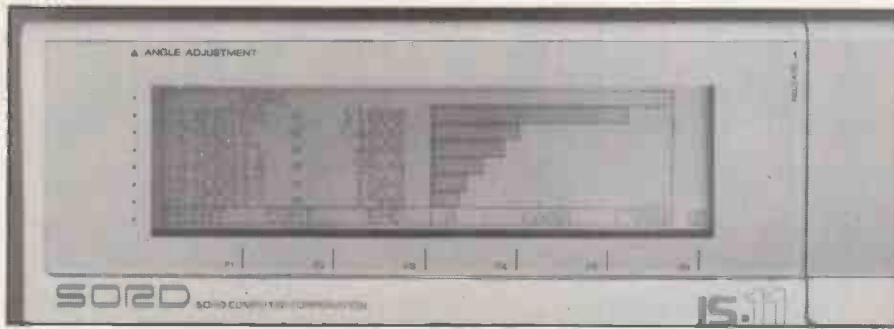
copy and sort both whole records and groups of cells specified by row and column number, and you can do all the usual spreadsheet manipulations. The IS-11 version of Pips also lets you produce bar or pie graphs with your data.

Pips is a good deal easier to use than most spreadsheet packages. Commands are entered on a separate command line rather than into cells, and you can review the most recent commands you have typed in. You can also build up long sequences of commands and store them to run later as programs. Pips has printing and storage commands too so you could use it as a simpler alternative to Basic.

Pips and other Sord software use the built-in microcassette drive for data storage. This provides you with 128K on the two sides of a standard dictation-machine C-30 cassette. Everything happens without user intervention; there are no tape controls and no tape counter on the machine like you have with the Epson HX-20. The operating system keeps track of where you file a particular record, and maintains a directory on each tape relating file names to their location. In fact the IS-11 microcassette is organised in a similar way to a disc drive, although of course it is still far slower than a disc drive.

Sord says it plans to offer a 3.5in. Sony microfloppy-drive unit and a battery-powered thermal printer. The printer prints across 40 columns on to 80mm. wide paper-rolls. Sord is also developing a display adaptor to allow the IS-11 to be used with a

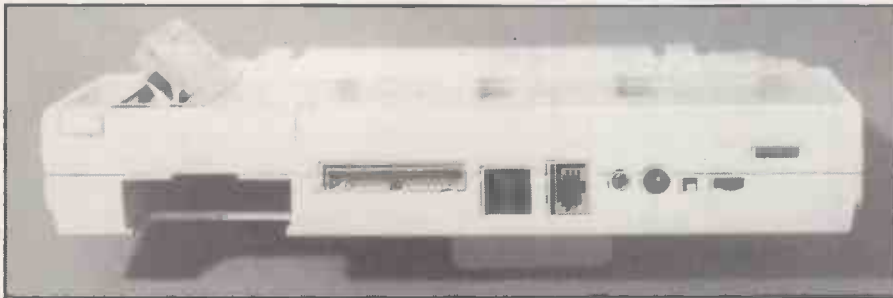




The eight line by 40-character liquid crystal display can also show graphics, here produced with the Pips software.



The built-in microcassette drive can store 128K of data on a standard dictation-machine-style C-30 cassette.



From the left: ROM cartridge slot; disc/expansion, RS-232C and second serial ports; bar-code reader interface; AC adaptor socket; reset, On/Off switches; LCD angle adjustment.

full-size external monitor. No plans have been announced for a direct-connect telephone modem for the U.K. market, but dealers are likely to offer acoustic coupling modems.

Initially software for the IS-11 will mostly come on ROM. The ROM slot at the back of the machine can take cartridges holding up to 32K of ROM. Given that the IS-11 uses a non-standard operating system the range of applications is likely to be fairly limited. Once the Sony microfloppy-disc drive arrives, and with it CP/M the situation should improve dramatically, but Sord could give no date for this development. The disc-based system is also likely to need mains power, so some portability would have to be sacrificed.

Sord says that the IS-11 in its portable, discless form can read and write standard ASCII files produced on CP/M systems, but we had no opportunity to try this. This would be very useful for instance where data needs to be collected in the field with the fully portable machine then saved to disc and further manipulated back at base. Sord also hopes to give the IS-11 a similar ability to read and write data produced on MS-DOS systems, but details of what

exactly the IS-11 will be able to do in this respect are not certain at the moment.

## Conclusions

- The Sord IS-11 packs more processing power into a fully portable, A4-size package than yet seen for a product in this price range.

- The IS-11 is a complete data-processing system in battery-powered portable form. The full-size keyboard is of good typing quality, the eight-line by 40-character liquid crystal display is adequate, and the built-in microcassette drive allows useful quantities of data to be stored.

- Pips is an extremely flexible software package. It provides good basic record-handling and spreadsheet facilities. The built-in text editor is rudimentary but can be replaced by a word processor on ROM cartridge if required.

- The number of software packages to run under the IS-11's own brand operating system is likely to be low unless the system becomes a best seller. Sord promises CP/M for the system, which would probably require an add-on disc drive but would greatly improve software availability.

## Specification

**CPU:** eight-bit Z-80 look-alike made by Hitachi, running at 3.4MHz

**RAM:** 32K expandable to 64K

**ROM:** 64K containing Sord operating system, text editor, Sord's Pips spreadsheet/database program, and communications software

**Weight:** 2Kg. (4.4lb.)

**Dimensions:** 300 x 215 x 48mm. (11.8 x 8.4 x 1.4in.).

**Power supply:** powered by internal rechargeable nickel-cadmium batteries providing a claimed eight hours of continuous operation

**Display:** eight-line by 40-character LCD with contrast adjustment, 64- by 256-dot graphics

**Keyboard:** full-size QWERTY layout with total of 72 full-travel keys and six function keys, numeric keypad is simulated with numeric Shift key

**Mass storage:** built-in microcassette drive storing 128K on dictation-machine style C-30 cassette

**Interfaces:** ROM cartridge slot; Centronics-compatible parallel printer port, RS-232C serial port, parallel expansion port for optional disc and display units; bar-code reader port, socket for optional numeric keypad

**Software:** in addition to 64K software in ROM, U.K. version of IS-11 will probably come with Desk Organiser package, which includes diary, phone index and notebook functions; Basic does not come with the machine but a Sord Basic will be available on cartridge; CP/M is promised on cartridge

**Hardware options:** clip-on battery-powered 40-column thermal printer, clip-on numeric keypad, acoustic coupling modem, car battery adaptor; options under development include Sony 3.5in. Sony microfloppy-disc drive unit, and interface box to drive a full-size external display unit

**Manufacturer:** Sord Computer Corporation, made in Japan

**U.K. price:** not yet announced, but likely to be between £700 and £1,000 for the standard 32K RAM machine including built-in microcassette drive

**U.K. availability:** July 1984

**U.K. distribution:** Socius Computer Systems (U.K.) Ltd, Kurkman House, 12-14 Wheatfield Street, London W1P 5RD. Telephone: 01-631 0787

- Few details are available of the form CP/M will take on the IS-11 or its likely time of arrival, so it would be wise to get the very latest information before buying the system if CP/M is a key requirement for you.

- Specialist software houses may find the IS-11 an attractive machine to develop industry-specific applications for. The IS-11's processor uses the Z-80 instruction set, the ROM cartridge slot provides an appropriate form of program storage, and the microcassette drive makes the Sord machine suitable for tasks involving data capture in the field.

# SPECTRAVIDEO

SPECTRAVIDEO is a subsidiary of Coleco, the company responsible for the very successful Colecovision games system. It is entering the U.K. small-micro market with two new machines, the SV 318 and SV 328. They are both almost, but not quite, MSX-standard machines. Spectraideo was one of the original 14 companies involved in setting up the MSX standard with Microsoft.

The SV 328 is based on a Z-80A chip coupled with a 9918A display controller chip enabling sprite graphics. It also contains, as per MSX preference, the ubiquitous AY-3-8910 three-channel programmable sound generator. The MSX standard also specifies the I/O systems, provision being made for two joysticks, cartridge, cassette and disc peripherals.

The Spectraideo machine departs in one major way from the MSX specification: its cartridge system is not MSX compatible. This really strikes at the root of the appeal of MSX to the user, which is a potentially large software base. Spectraideo is now promising an optional adaptor to overcome the problem, which should enable you to run cartridge software produced for other MSX machines. It will probably cost around £30.

In other respects the SV 328 sticks fairly closely to the MSX specification. The cassette operating system and tape format, for instance, are standard. The Basic generally seems close to the MSX specification, although there are some differences in the way graphics are handled.

The SV 328 has a pale cream casing, not unlike the colour of the Apple II. The footprint is quite large for a low-cost micro at 15.5in by 8.5in. Alphanumeric keys are light grey, and all the others are finished in dark grey.

The keyboard generates upper- and lower-case characters and there are five function keys. Each one can be used shifted, giving a possible 10 user-definable functions. There is a numeric key pad to the right of the main keyboard and a number of special screen-editing keys. Provision is made for special function keys. Select and Print, such as might be used by particular software applications.

The keys have an excellent feel to them, and all in all the keyboard is one of the best to be found on a micro in this price range. By contrast the other Spectraideo machine, the SV 318, has a very tacky keyboard indeed. In other respects the two micros are similar.

The cartridge slot is positioned above the keyboard and to the right. Interfaces for two joysticks are mounted on the right-hand side of the machine, while on the back are video output, cassette and system-expander interfaces. The UHF modulator



is not built-in but is supplied as a separate box. The system expander slot is designed to take a wide range of interface modules for a printer, memory expansion and so on.

The SV 328 Basic seems to be a fairly complete implementation of the Basic outlined in the MSX specification. Microsoft will be supplying fundamentally the same Basic on other MSX machines. It is contained in 32K of ROM and there is 80K of RAM installed on an unexpanded system, of which the video chip takes some 16K. The Basic follows the MSX protocol on memory banking. Memory can be expanded upwards in blocks of 64K which can be accessed from Basic without the user having to worry about the mechanics of memory-bank manipulation.

Three levels of variable precision are supported: double- and single-precision variables and six-digit integer variables. The double-precision standard runs to 16 significant digits. Default type is double precision, which can run somewhat slowly.

The Basic allows easy manipulation of high-resolution graphics and of sound output. The highest screen resolution is 256 by 192, and 16 colours are possible. Text screen resolution is 32 by 24, and 64 by 48 low-resolution graphics are also available.

MSX Basic supports a series of sub-commands rather portentously known as Graphics Macro Language. It constitutes the familiar procedure, also found on the IBM PC, of following a Draw command with a series of shape specifications contained in a string. Functions such as shape rotation, scaling and area filling are all supported.

There is an excellent Circle command, which allows ellipses and chords to be drawn. There are several controlling statements for the sprite graphics. Up to 32 sprites can be displayed and moved, and their collisions detected using the On Sprite Gosub statement.

Sound manipulation involves something called Music Macro Language which one

## Benchmarks

The table shows the time in seconds to run eight standard Basic routines. Our Benchmark routines test out various typical tasks, each repeating an appropriate set of Basic statements 1,000 times. The Spectraideo is rather faster than these figures suggest, as its MSX Basic uses double-precision numeric variables unless instructed otherwise. MSX Basic also supports single-precision and integer variable types, and you could speed things up by specifying them where appropriate. For comparison we give integer Benchmark timings.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
BBC Model B—6502	1.0	3.1	8.3	8.7	9.2	13.9	21.9	52	14.8
Yamaha YIS-503									
MSX—Z-80A look-alike	2.1	6.0	16.6	18.4	19.0	31.7	44.9	216	44.3
Spectraideo SV 328									
MSX—Z-80A (default)	2.2	5.8	18.2	20.1	20.9	32.8	45.2	236	45.7
(integer)	1.3	3.8	19.6	18.9	19.8	26.3	36.3	N/A	N/A
Spectrum—Z-80A	4.8	8.7	21.1	20.4	24.0	55.3	80.7	253	58.5

## 328

Fin Fahey looks at a newcomer to the work-and-play market which comes close to the MSX standard.



Above: Games packages include the shoot-'em-up game Cross Force and the pretentiously packaged Space Invaders game, Spectron. Right: A costly special cassette deck is required.

again is a fairly familiar concept dressed up a little. It involves specifying note parameters as part of a string which follows a Play statement. In combination with the three-channel programmable sound generator this adds up to a very powerful sound capability, which includes control over sound envelope shape and duration.

## No chore

Programmers will be pleased to see that MSX Basic supports a good range of system commands. There are built-in renumber, block delete, program merge, and automatic line-numbering commands. Program editing is no great chore, either. The SV 318 has a full-screen editor. Using the Paste and Cut keys you can insert characters or remove them from the middle of program lines, which is an unusual feature on a low-cost micro.

The SV 328 comes with a rather brief manual plus a quick-reference Basic format card. The manual as it stands is great from a first-time user's point of view. It approaches the machine slowly and lucidly. But when it reaches a certain programming level it just stops.

There comes a point when even the most inexperienced user needs to know the difference between single- and double-precision variables, or how to use an On Error Goto statement, or how to use I/O statements. The manual explains none of these, although it does go into graphics and sound programming at some length.

An odd anomaly is the way the manual explains the PSG interfacing in advanced detail. Even so, non-beginners will find it very disappointing and will probably place a heavy reliance on the format card. The

way you redefine the function keys remains a total mystery. There is not even an index.

An unexpanded SV 328 will set you back £263, but there are a wide range of add-ons already available in the U.K. which could push up the price of a system considerably. The Spectravideo machine requires a £39 matching cassette deck, the SV 904. There is nothing special about the deck, and Spectravideo is simply adding a hidden cost to the machine.

Ordinary Atari joysticks work adequately, or you can buy Spectravideo joysticks at £8.65 each. To expand the range of games software available you can get a Coleco game adaptor for £66 to run the range of popular Colecovision games packages on the SV 328.

Other peripherals all seem reasonably priced. Two qualities of dot-matrix printer are available at £215 and £285. A 5.25in. disc drive is also available at £199 but it will only work if you also buy a £66 interface cartridge as well. An additional 64K of memory, giving a total capacity of 128K, will cost £89 and an 80-column interface is also available at £99.

A small business system with two disc drives, a printer and 80-column capacity would be usable for, say, word-processing or database applications. It would cost around £1,000 which is a fairly reasonable proposition.

The review system came with several packages, mostly games. Of most immediate use were two utilities: a font editor and a sprite editor. Both are fairly basic. Characters and sprites are both created by setting or unsetting points in a graphic matrix, and a few transforms such as rotation, inversion and mirroring could have been incorporated with very little

## Specification

**CPU:** Z-80A eight-bit  
**RAM:** 64K with extra 16K devoted to graphics; max. RAM 192K  
**ROM:** 32K

**Display:** external UHF modulator for TV and standard RGB output; text 32 x 24, low-resolution graphics 64 x 48, high-resolution graphics 256 x 192, all in 16 colours; up to 32 sprites supported

**Keyboard:** full QWERTY layout; numeric keypad, cursor control and screen-edit keys; five user-definable function keys available; upper- and lower-case and graphics characters generated

**Sound:** three channels, eight-octave range; white noise

**Interfaces:** MSX cartridge slot, cassette I/O, two joystick ports, system

expander slot for other peripherals  
**Dimensions:** 390mm. (15.5in.) x 220mm. (8.5in.)

**U.K. price:** £262.20 including VAT for 64K machine; £39 dedicated data cassette

**Manufacturer:** made in Hong Kong by Spectravideo International Ltd

**U.K. distributor:** CK Computers Ltd, 6 Devonia House, High Street, Worle, Weston-Super-Mare, Avon. Tel: (0934) 516246

trouble. Still, the sprite editor allows the user to get to grips with sprites in a very direct way.

None of the games displayed much by way of quality or imagination. Still, you can always get the Colecovision adaptor.

## Conclusions

● The SV 328 is a very pleasant machine. Its keyboard and screen editor will delight programmers.

● The graphics and sound capability are excellent. Three channels of sound and up to 32 sprites in 16 colours gives a lot of scope for games, not to mention the massive memory size.

● MSX Basic is very powerful and easy to use, particularly for graphics programming.

● The machine documentation is patchy, and the manual does not go far enough. As a result, some people will have trouble realising the potential of the machine.

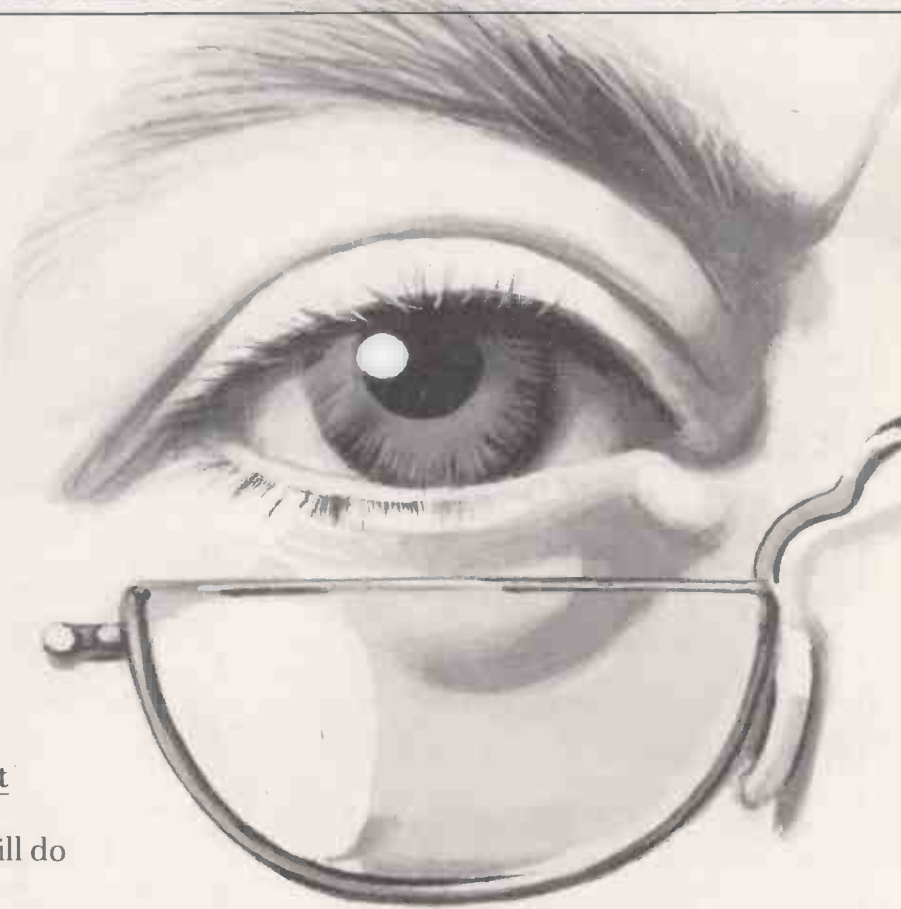
● The need to buy a special cassette deck is annoying, and passes an unfair extra cost on to the consumer.

● The Spectravideo cartridge system is at present not MSX compatible. Until this is sorted out software availability is not likely to be good.

● The software packages provided on launch are uninspiring.

● The quality of the keyboard and range of cheap peripherals available could make the SV 328 a very plausible candidate for low-cost business and word-processing systems. This is, of course, contingent on suitable software becoming available, but if the MSX standard becomes established there should be no problem. ■

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2000 cells.  
Graph function.

	MONTHLY	YEARLY	YEARLY %
REVENUE	1000.00	10000.00	100.00%
EXPENSE	400.00	4000.00	40.00%
TOTAL	600.00	6000.00	60.00%
MORTGAGE 1000.00 1000.00			
UTILITIES 100.00 100.00			
INSURANCE 50.00 50.00			
AUTO 150.00 150.00			
PROP. 75.00 75.00			
TRAVEL # EN 200.00 200.00			
TOTAL	1675.00	16750.00	167.50%
DISPERSED	1000.00	10000.00	100.00%

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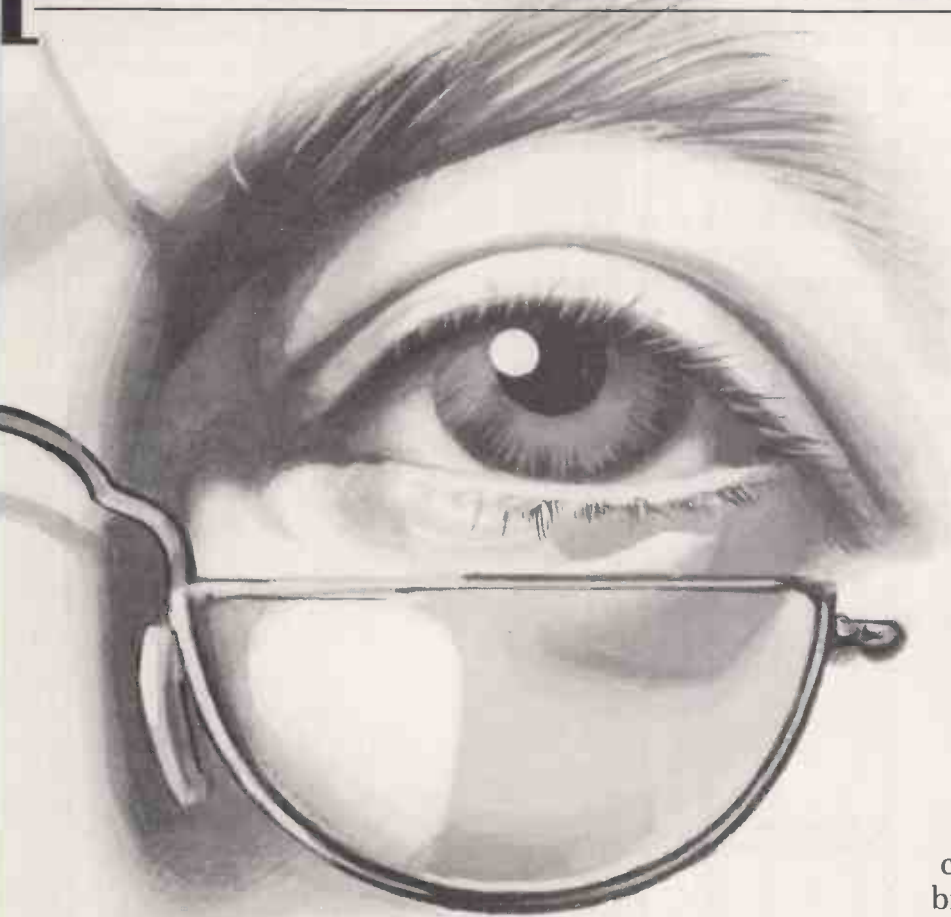
Each file on the program is able to handle 3,800 record entries, and Practifile can sort the files it contains by number or letter in less than a second.

The system is so flexible that you can add, subtract, multiply or divide within individual files, which its use with a word-processing system means that you

Sorts files by number or letter in less than one second. Fully compatible with Practicalc 64.

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DIRECT FILE MAINTENANCE
BATCH ENTRY
CALL LABELS
REPORT WRITER
CREATE SEQ FILE
LOAD FROM SEQ FILE
ALPHABETICAL REORDERING
FILE CALCULATIONS
RETURN TO DISK MENU

# Software from a point of view.



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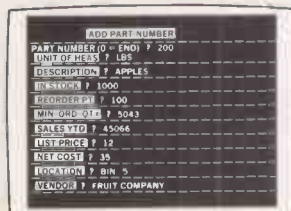
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● Circle No. 163

ASHTON-TATE'S new filing and retrieval package is called Friday. A review copy arrived on my desk at an ideal moment since two projects that I had long meant to deal with involved the type of information handling that Friday is claimed to be good at.

The first project proved to be a natural for Friday. I have several box files full of technical articles, reviews and advertisements that I have clipped from computer magazines over the years. I wanted to set up an index to these files, and then to do searches based on titles and subject keywords.

Friday is a one-file-at-a-time-system, so I designed the application accordingly. My articles file had fields for author, title, name of journal, publication date, and so on, as well as a free-format field to hold a variable number of keywords.

# FRIDAY

## Mike Lewis tries out dBase II's little brother on two long-standing problems.

The first thing that occurred to me when setting up the application was the close resemblance between Friday and dBase II. In fact Friday is written in the dBase language, and comes as a set of 31 dBase programs, together with the dBase run-time package. But there is an important difference between the two packages. When you invoke dBase II, you are

presented with nothing more informative than a single dot and a flashing cursor, after which you are on your own. Friday goes to the other extreme of menu madness with menus, sub-menus, prompts, questions and confirmations every step of the way. Although this approach usually drives me crazy after the first 15 minutes, it did allow me to set up an entire application

```

File: ARTICLES                               SCREEN LAYOUTS                               009

      Name                                     Description
=====
A [FridayForm] <==> [A general purpose Screen Layout           ]
B [ARTFORM      ]   [A screen layout for my articles file           ]
C [MEMBERS     ]   [Form for entering names, etc. of new members       ]
D [PAYMENTS    ]   [Use this to record details of cash received         ]
E [MIKEFORM    ]   [My own general layout for names and addresses       ]
F [            ]   [                                                    ]
G [            ]   [                                                    ]
H [            ]   [                                                    ]
I [            ]   [                                                    ]
J [            ]   [                                                    ]
K [            ]   [                                                    ]
L [            ]   [                                                    ]
M [            ]   [                                                    ]
N [            ]   [                                                    ]
O [            ]   [                                                    ]

A-Create      X-Delete      C-Choose      M-Main Menu
E-Edit        L-Print List  SCREEN LAYOUT P-Previous

<RETURN> to use FridayForm                    Choose an option letter [ ]
The screen from which you select a layout for data entry.

File: ARTICLES                               ENTER DATA View Record: 47                               150

      Author                                     [Stobie, Ian           ]
      Title                                      [Fast Post             ]
      Name of Journal                            [Practical Computing  ]
      Date Published                             [Nov 83                ]
      No. of Pages                               [A]
      Key Words                                  [Micromail Communications Sirius]

A-Add         X-Delete      J-Jump         V-Video Off    >-Forward
E-Edit        U-Undelete    F-File Menu   D-Ditto Off    <-Backward
              C-Compute    L-Layout Menu M-Main Menu    Choice [ < ]

A user-designed data-entry screen.

```

without any reference to the manual.

Setting up the system consisted of three main tasks. First I defined the file structure, which involved naming the fields and giving each one a length and a type. There are three such types: Anything, Math or computational, and Yes/No for logical. This is achieved through questions and answers, and is fairly foolproof if slow.

Secondly, I specified the layout of the data-entry screen. This is where it began to get boring. Instead of the electronic black-board approach of competing products like Micropro's FormGen or Fox & Geller's Quickcode, Friday demands that you type row and column co-ordinates for every label and field in turn. So it took me a while to get the screen looking the way I wanted it to. The final result was not enhanced by the fact that labels and fields must be on the same line, and that you cannot include your own headings, instructions or messages on the screen.

However there is a short cut which you can take for quick jobs where screen appearance is not a priority. This is to use the default screen layout, called Fridayform. It can be used with any file structure and so allows you to start entering data without the aggravation of designing your own screen.

The third step was to design a report layout for the articles index. I used the Quick Report feature, which is similar to the Report Form command in dBase, but unlike the dBase version is easier to alter later on. You can have several different report layouts for the same file.

If setting up the system was tedious, using it was not. Entering new data was quick and easy, helped by the WordStar-style cursor-control and editing keys. To move forward and backward between records, you use the > and < symbols.

Deleting and altering data was also straightforward.

A keyword search, which was one of the end-products of my articles system, was slightly more complicated. The difficulty is that you have to specify the search criteria as a conditional expression, using relational and Boolean operators. To find an article which included the keyword Database, I had to type

"DATABASE"\$!(KEYWORDS)

The \$ is a substring operator, and ! tells Friday to treat the contents of the field Keywords as a string of capital letters, to avoid problems caused by the differences between upper- and lower-case characters.

I was well satisfied with Friday for my articles index. Screen messages are polite and informative, control keys and menu options are used in a highly consistent way, and you are never left wondering what is going on. Whenever a process is likely to take more than a few seconds, Friday keeps you informed with messages like

One moment while the data file is loaded.

The package does have some quirks. The Setup program gives you the option of entering dates in the European DD/MM/YY style. Yet even with this option in force, Friday's prompts still ask you to use the American MM/DD/YY format. Setup also asks

Are full screen operations required?

The question arises because it is part of the dBase run-time installation process. You must always answer Yes, otherwise Friday will crash, but neither the screen display nor the manual gives any guidance on this point.

Such minor problems apart, Friday is a powerful piece of software, and my articles index barely scratched its surface. Among its other features are a full-page report generator, an address-label function, and

the ability to swap data with many other software products including Mailmerge, Lotus 1-2-3 and dBase itself.

My second project was less successful and I had to abandon it. I wanted to set up a simple membership and subscription system for a local society I am involved in. Some of the members pay their subscriptions in monthly instalments, and others pay when they feel like it. I wanted to keep track of who owes what, and to print reminders to tardy payers.

There was no problem in using Friday's Math fields to add up individual payments, and the sub-totals and total in the Quick Report function were useful in calculating control figures. The fatal problem proved to be Friday's lack of a global update feature. The society has four grades of members, each of which pay a different annual amount. I wanted to be able to set the amount payable in each member's record every time new rates are fixed. This turned out to be impossible, although it's fair to say that very few of Friday's competitors seem able to handle this apparently simple task either.

## Conclusions

● Friday is a well designed and well packaged filing and retrieval system that offers some, but perhaps not enough, of the features of its big brother, dBase II. It is aimed at the first-time user.

● Since Friday is menu-driven to the nth degree, it is easy to use without referring to the manual. But after a while the constant need to answer repetitive questions and to confirm every action will drive you mad.

● Friday is published by Ashton-Tate, the dBase company. It is widely available from computer shops and software vendors at a recommended retail price of £195. □

File: ARTICLES

RETRIEVAL RULES

603

Field	Type	Field	Type	Operations
1 AUTHOR	Anything			< Less Than
2 TITLE	Anything			<= Less Than/Equal To
3 JOURNAL	Anything			= Equal To
4 DATE	Anything			> Greater Than
5 NO:PAGES	Math			>= Greater Than/Equal To
6 TYPE	Anything			# Not Equal To
7 KEYWORDS	Anything			\$ Item 1 in Item 2?
				! Convert to Capitals
				.OR.
				.AND.
				.NOT.
				( ) Use for Precedence
				" " Use on Anything data

[

]

Enter your retrieval rule within the brackets.

Before searching you define retrieval rules in terms of relational operators, then enter them for this screen.

## Extra commands

BC Basic

Simons Basic

### Graphics Commands

MODE  
CLG  
PMODE

BORDER  
PAPER  
INK  
SETCOL  
GCOL

PLOT  
POINT  
DRAW  
DRAW TO  
HPRINT  
SCRWAIT

CHARSET  
COPY  
DEFUSR

HIRES  
MULTI  
NRM  
BCKGNDS  
CSET

COLOUR  
LOWCOL  
HICOL

PLOT  
TEST  
LINE  
REC  
BLOCK  
CIRCLE  
ARC  
ANGL  
PAINT  
DRAW  
TEXT  
CHAR

MEM  
DESIGN

### Sound Commands

ADSR  
WAVEFORM  
PITCH  
PWM  
VOLUME  
ATTACK  
RELEASE  
FILTER  
CUTOFF  
FMODE  
RESONANCE  
RINGMOD  
SYNC  
CH3  
ENV3

ENVELOPE  
WAVE  
MUSIC  
PLAY  
VOL

### Sprite Commands

SPRCLR  
DEFSPR  
SPRPOINT  
SPRINK  
SPRPAPER  
SPRMODE  
SPRGCOL  
SPREXP  
SPRON  
SPRPOS  
SPRX  
SPRY  
SPRSPR  
SPRGO  
SPRV  
SPRTI

MOBSET  
DESIGN  
CMOB  
MOB OFF  
RLOC  
MMOB  
DETECT  
CHECK

### Screen functions

MSAV  
PRINT AT  
CODE

SCRSV  
SCRLED  
PRINT AT  
USE  
CSET  
FLASH  
BFLASH  
FILL  
FCHR  
FCOL  
INV  
MOVE  
LEFT  
RIGHT  
COPY  
HRDCPY

# A tale of

BC Basic

Simons Basic

### Input/output commands

JOY  
JOYX  
JOYY  
PADDLE  
PORT  
KEY  
KEY\$

JOY  
POT  
PENX  
PENY  
FETCH  
INKEY  
KEY  
DISPLAY  
ON KEY . . . GOTO  
DISABLE  
RESUME

### Structured programming

DEF PROC-  
ENDPROC  
PROC  
LOCAL

PROC-ENDPROC  
CALL  
EXEC  
LOCAL  
GLOBAL

REPEAT-UNTIL  
IF-THEN-ELSE

REPEAT-UNTIL  
IF-THEN-ELSE  
RCOMP  
LOOP-ENDLOOP  
EXIT

RESTORE  
POP

RESET

### Arithmetic functions

% binary  
\$ hex  
BIN\$  
@ convert to hex  
two-byte  
PEEK/POKE  
! four-byte  
PEEK/POKE

% binary)  
\$ hex)  
MOD  
DIV  
FRAC  
EXOR

### String manipulation

INSTR

INSERT  
INST  
DUP  
PLACE  
CENTRE

### Aids

TRACE  
FINE  
DUMP  
DISAPA  
SECURE  
AUTO  
RENUMBER  
CGOTO  
PAUSE  
OLD  
COLD  
MERGE  
PAGE  
OPTION  
DELAY  
DIR"\$"  
DISK  
ON ERROR GOTO  
OUT  
NOERROR  
ERRLN  
ERRN

The Commodore 64 is a powerful micro with a notoriously awful Basic. Mike Todd compares two expanded Basic ROMs which aim to make programming less pain.

THE GRAPHICS and sound capabilities of the Commodore 64 are very advanced, yet its Basic is incapable of taking full advantage of them as programmers have to resort to cumbersome Peeks and Pokes. Two major packages have been produced in an attempt to overcome this problem and both are supplied in cartridge form.

The official Commodore product was written by David Simons and is called Simons Basic. It boasts a total of 114 extra commands while its rival, written by Brian Candler and known as BC Basic, has just under 100.

The high-resolution mode on the 64 can display 320 horizontal and 200 vertical points but allows only one colour in each eight-by-eight cell on the screen. The multi-colour mode allows more colours but reduces the horizontal definition to 160.

Both packages support both modes. Simons Basic changes the co-ordinate range to match the mode being used while BC Basic retains the same range regardless.

BC Basic uses the Mode n command to select the appropriate graphics mode. Simons Basic has commands such as Hires, Multi and Bckgnds, the plotting colours being set as parameters to these commands; NRM returns to text mode.

Because BC Basic does not set colours as part of the mode selection, there are additional commands such as SetCol, GCol, Border, Paper and Ink for setting them. Simons Basic has colour-selection commands for setting border and screen colours and to amend the graphics colours once they have been set. Both packages provide the minimum capability to plot lines and points in high-resolution mode but only Simons Basic has more advanced commands such as Circle, Arc, Paint, Rec, which draws a rectangle, and so on.

Graph plotting normally assumes that the origin is at the bottom left of the screen, which it is in BC Basic. Simons Basic has it at the top left, so extra work is needed to turn it up the right way. Attempts to plot points which are out of range and therefore off the screen can cause difficulties. BC Basic handles this well by not performing the operation and setting the status variable ST to indicate that this has occurred. Simons Basic does allow out-of-range co-ordinates and even tries to plot them.



# two Basics

It is possible to have two screen areas available for graphics work on the 64. BC Basic provides an easy way of selecting either of the two and you can flip between them at will. It also allows plotting to the screen not being displayed. Screen flipping is time critical if you want to avoid odd flickering effects. BC Basic has the special ScrWait command, which waits until just the correct moment and so avoids this.

Both Basics allow the character set to be transferred into RAM so that it can be altered. Simons Basic does so with one simple Mem command. BC Basic provides two commands: Charset tells the 64 that the character set has moved and Copy then selectively copies the ROM character set into RAM.

Once this has been done, characters can be redefined. Simons Basic uses the Design2 command followed by the RAM start address of the character to be defined. It is followed by eight consecutive program lines of character definition using decimal points as blanks and B for dots. For changing large numbers of characters this can be awkward and takes up a great deal of program space.

BC Basic adopts a much more versatile approach. The DefUSR command takes the character code and the row number and is followed by the binary image of the row. Because this image is a number it can be in decimal, binary or hex and can be read from disc or cassette if required.

Sprites are one of the great graphics attractions of the 64, and both packages provide a good range of commands to manipulate them.

## Sprite collisions

Moving sprites in Basic is slow, and so both packages allow sprites to be moved as part of a single command. Simons Basic only allows one sprite to be moved at a time and pauses in the program until the move is complete. BC Basic can do this under interrupt control so that the program can continue execution while any number of sprites are being moved. Both provide methods of detecting sprite collisions.

Both packages provide for control of the Commodore 64's sound chip although Simons Basic does so rather clumsily. For instance, the Wave command is really only another way of Poking the appropriate control register. A binary image of the register has to be set up every time a sound envelope is to be triggered or turned off. BC Basic has individual Waveform, Attack and Release commands.

Both Basics can set up the individual sound envelopes and the overall volume. Simons Basic allows single-voice tunes to be played with the Music and Play commands.

BC Basic has a comprehensive range of commands for setting all sound parameters including the Pitch and filter.

The ability to use local variables within a procedure and not affect similarly named variables in the rest of the program is a feature that makes structured programming easy to understand. Both Simons Basic and BC Basic can define Local variables explicitly, and both provide for procedures. Simons Basic simply replaces Goto and Gosub with Call and Exec to a named procedure. It has no capabilities to pass parameters to these procedures. Parameters can be passed to a procedure in BC Basic.

## Useful command

Both Basics provide Repeat-Until and If-Then-Else structures. Because Else must be on the same line as If-Then Simons Basic provides a useful additional command RComp which remembers the result of the previous If condition and can replace the If condition test on subsequent lines.

Simons Basic also has a Loop-Endloop structure, which allows the loop to be left under specified conditions with the Exit If command. Both provide computed Goto and Restore commands, called CGoto and Reset in Simons Basic, but only BC Basic provides a computed Gosub.

In personal computers with direct access to the inner workings through Peek and Poke it is often useful to be able to work in binary or hex. This has been provided for in both the packages. Binary numbers are prefixed by % and hex numbers by \$.

Unfortunately, Simons Basic limits the binary numbers to exactly eight digits and hex to exactly four, while BC Basic allows up to eight hex or 32 binary digits to be given with leading zeros suppressed if necessary. BC Basic also provides for conversion of numbers to hex and binary with options for leading zeros to be included or suppressed and, in hex numbers, replaced by some other character. Binary numbers can have the zeros and ones replaced by other specified characters.

With all this hex and binary manipulation in BC Basic it is good to have the additional facility of two- and four-byte Peeks and Pokes. Simons Basic has a couple of extra arithmetic commands for extracting the remainder of a division, the integer part of a division, the fractional part of a number and the logical Exclusive Or of two numbers using the Mod, Div, Frac and ExOr functions.

Reading joysticks and paddles is provided for with both packages but Simons Basic only caters for one joystick and one paddle pair. BC Basic can read both joystick ports and both pairs of

paddles. Simons Basic has commands for accessing the light-pen input while BC Basic allows simple access to the user port.

Both packages allow the function keys to be defined to produce a sequence of characters when pressed. Simons Basic has commands to limit the number and type of characters that can be accepted during input.

Simons Basic has a variety of string commands, allowing strings to be inserted into others and duplicated many times. The Place command allows a string to be searched for another and returns the position where it was found. BC Basic only provides an Instr function, similar to Simons Basic's Place.

Simons Basic has a number of commands for use during program development, and they can make the task of debugging significantly easier. Auto produces line numbers automatically, and while Renumber rennumbers the lines it does not renumber Goto or Gosub references. The Dump command displays all ordinary variables currently defined, Trace displays line numbers as they are being executed and Find searches the program for specified characters.

Limited disc access is available too using Disk to send commands to the disc, and Dir"\$" to read back the directory. There are no commands to read the error channel or for direct loading or saving to disc. Finally, there is an On Error facility which will jump to a specified program line as soon as an error occurs; once there, the line number and type of error can be identified. This can be extremely useful for trapping unexpected errors during program execution but it does not allow the Run/Stop key to be trapped.

## Conclusions

● Both packages provide a useful range of commands. Simons Basic has a larger number and wider range of commands but those provided by BC Basic are more carefully thought-out and more versatile.

● One feature of BC Basic that makes it stand out is its reliability. It is no good having a huge range of commands if some of them do not work or will crash the computer under certain circumstances. Simons Basic suffers badly on both counts.

● Some of the problems of Simons Basic may be attributable to the handbook, which contains many serious errors and omissions.

● Although BC Basic does not have such a wide range of graphics and structured-programming facilities, and has no programming aid commands, it makes up for it by being versatile and easy to use. □

SURPRISINGLY, in view of its early uses in education and marketing as a serious computer, it has taken the BBC Model B over a year to acquire a reasonable variety of good-quality word processors. For its early months two packages, Computer Concepts' Wordwise and Acorn's own View, had the field to themselves. Only since late 1983 has some real competition emerged in this field.

The advantage of the BBC Model B for word processing is that it has a good professional keyboard and availability of an 80-column screen. Amongst the most pressing disadvantages for those with a fair amount to write at any one time is the memory available when the full screen is in use. At best, in mode 3, for example, you have only 9.7K to play with. Mode 0, giving a text line of 76 characters and 31 lines per screen, takes the memory down to less than 5.6K, which is not even enough for four full A4 typed sheets.

One solution, particularly if you are using a TV which cannot give proper resolution to letters in these modes, is to use text in mode 7, giving 25K of memory with 34 characters on 24 lines. This is workable but means that you have to scroll text sideways across the screen — an irritating factor if you have a monitor and would like to see the whole page in front of you. Currently there are two solutions to the problem, depending on which word processor you select. Both Cambridge Computer Consultants, with its Aries B-20, and Solidisk Technology produce memory expanders for the BBC which can be plugged on to the BBC board without soldering.

The Aries B-20 gives a useful 25K in mode 3, which suited me for an article like this and almost lived up to its advertisement for easy fitting in five minutes with a screwdriver. It is easy to bend one of the legs of the 40-way connector which plugs into the socket normally occupied by the 6502 processor chip, but once this operation is out of the way, you just plug the accompanying ROM chip in an empty socket and you're away. If you are using a ROM extension board check before you get an Aries since it occupies the same space as most of them. Cambridge Computer is producing a compatible one of its own.

The Solidisk option is more complex to fit, but can boost memory by up to a mind-boggling 128K. Both 32K and 16K versions are available. Most ROMs should work once the base unit is installed. The relevant chip fits into a special mini-ROM cartridge, and the sideways RAM card slotted in. Check for compatibility with your BBC operating system since there can be problems with early versions.

## View

The Acorn package, View, has a love/hate relationship with many users. It has massive documentation since its workings are so user-indifferent that even

# BBC WWP

Barbara Conway examines some of the word-processing packages on offer for the BBC Model B.



after having used it for several weeks, a few days absence means that you virtually have to learn again from scratch. Further, the instructions are far too involved to remember for any length of time.

Under the circumstances it comes as a surprise to realise that View is almost indispensable for extensive professional use. The fact is that the ROM-based package has an astonishing variety of features which are too useful for a full-time writer to do without.

View starts up with white text on a black background and lets you choose the screen mode. The opening screen is for use in matters such as disc operation, system calls, etc. On powering-up, typing New and then Escape gives you the text screen. You load the driver for your printer on the start-up screen. View has a default printer mode but there are special drivers, which can be purchased separately on tape, for most well known makes and these are easily saved to disc. The initial screen will also keep tabs on remaining memory.

The text screen opens with a text ruler at the top giving the screen line-length with tab marks every eight characters. The ruler can be changed via the BBC's 10 function keys. A three-tier reference sheet slots under the clear plastic above the function keys, and shows you how to insert and delete characters, manipulate blocks of text, give special print and other instructions, set rulers and format text.

View is largely WYSIWYG — what you see is what you get — with wordwrap coming into effect when each line typed in

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reaches the end of the screen. However, this does not apply immediately in areas such as instructions for a printer to centre a heading. But once the text is saved a separate command will show such features. Text is automatically justified at the right-hand margin unless you opt otherwise.

Formatting text with View requires special edit commands running at one to a line. The default value of a page is 66; setting a different value requires an edit command of PL plus the number of lines. Although the edit commands appear clumsy at the start of, or within, a document, actually they are very sophisticated. View caters fully for headers, footers, page numbering and so on. It will even allow for layouts such as two-sided documents where the TS code will tell the program to reverse the order of two headings on alternate pages.

Special print instructions are given via either edit commands or through the highlight functions on shifted function keys 4 and 5. These provide bold and underlined print for default printers.

A form of mail-merge facility is available using macros. You use the @ character plus and identifying number giving @1.@2 for example. After the letter is loaded the various macros can be modified for different names, dates, stock items and numbers, and the like. If you want to repeat a block of text at various points, define it as a macro DM with an identifying two letters, and then use the identifier wherever you want the block.

As a safety precaution, text can only be printed from disc, thus ensuring that you remember to save it first. However, disc operations can be carried out easily using the opening screen. The only risk of losing text is if you load in a new file forgetting that there is already one in memory. When you save a file key

save filename

If you want to check that all is in order before printing, key

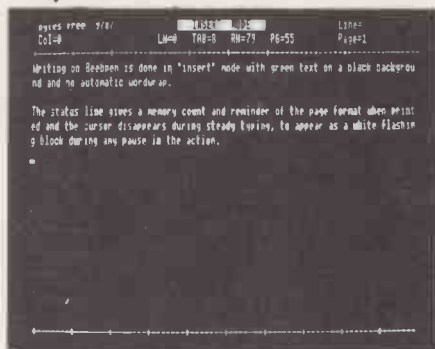
screen filename

and you can view it first.

Most normal disc operations and relevant system calls can be handled from the start-up screen without disturbing memory. Disc operations which imperil memory include loading files and compacting discs to make more room. As a partial solution to the memory problem View can process files continuously via disc through the edit procedure. This involves temporarily creating a new file name but is a convenience if memory is at a premium.

## Beebpen

Braintech's Beebpen takes a different approach and is probably aiming at a different type of user. There is no choice of screen mode and the Beebpen ROM obviously objected to the Aries B-20 memory booster. This leaves a basic 10K of memory available, which is limiting for heavy use.



The Beebpen opening screen is in the central command mode from which all other operations are accessed. The screen is green text on a black background with a flashing white cursor which vanishes during steady typing and reappears when the action pauses. The command screen, which can be recovered by keying in Ctrl-Z, is changed to text by typing I to put it back into insert mode. The screen shows a text space between two 80-column rulers and status lines above the top ruler giving memory and line counts and the current page. Default values give the full 80-column text and 55 lines of text per page as well as the usual tabs at eight-character intervals. All of these can be changed.

Beebpen does not format immediately on screen although correction within blocks is very easy. If you miss out a letter or a phrase you can insert it by positioning the cursor appropriately and typing it in. The text will then expand or contract as required to fit it in. Replacing text requires overwrite mode, which is achieved by keying in Ctrl-Z and then O. The status prompt then reminds you which mode you are in. A warning beep sounds if you press an inappropriate key in command mode.

Saving to disc or tape involves using W from the command mode, which gives a screen prompt for a file name. If you are

using disc it will also give you a screen catalogue so that you see what you have and how much room is left. Saving text does not interfere with memory and, amongst safety measures, is the option for a warm start to preserve memory from the command screen when needed.

Formatting and other instructions are detailed in the 40-page manual but a help function will give you a reminder if needed. Page widths can be set through keying S and changing the margins, which then show new values on the status line. The left and right cursors are used to increase or decrease the default values. Once a satisfactory format has been agreed, you press F, with an option to justify the right margin if required. If there is a long word at the end of the line while formatting blocks, the program will give a screen prompt asking if it is to be hyphenated and, if so, at which point.

Features include a find and replace facility for strings up to 255 characters long, which will act globally throughout a file or will stop at each instance for you to decide. Text blocks can be moved, copied or deleted while in insert mode using the / symbol as a marker. Text can also be killed from specified points to the end or beginning of a file.

Before printing you have to enter page lengths, widths and numbers of copies, and whether page numbering is required. Special printer functions can be used with the aid of the relevant manual. Beebpen gives a form of macro by allowing you to program the function keys to reproduce the relevant words. For example

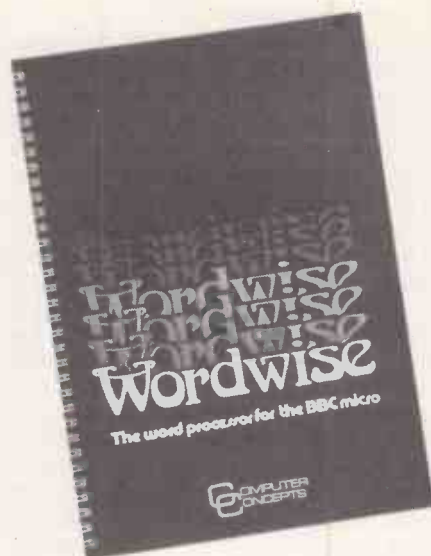
\*KEY3 sprocket

will print "sprocket" when you press the appropriate key. Up to 256 characters can be used per key.

The manual is well thought-out although it suffers from lacking an index. Overall the program is very easy to get to grips with.

## Wordwise

Wordwise, a ROM-based program, was available before View. It has won a devoted fan club because of its flexibility and ease of use. Despite its veteran status, it still stands up well against the competition. Again, Wordwise will not work with Aries B-20, but does accept extra memory from



the Solidisk add-on. Without this, using a 40-column screen, the available space is an effective 27.4K, but this comes down below 12K in an 80-column format.

Wordwise is at its best with a colour TV or monitor since different features are distinguished by colours. The text typed in is white between red start and end markers, format instructions are green, and status lines in blue. There are two modes, the entry menu mode and edit, and you toggle between them using the Escape key.

On start-up Wordwise checks that you do not need to save any existing text in memory and then offers an eight-option menu. The first four options deal with loading and saving text via disc or tape. Text can be saved as a whole or from a marker, and can be loaded again either from scratch or appended to existing memory. The fifth choice is for search and replace, either selectively or globally. Options 6 and 7 provide for outputting formatted text to screen for a preview or to printer. Option 8 deals with spooling, saving unformatted text complete with embedded commands so that it can be used by a recipient without Wordwise in their machine.

Going into edit mode gives a blank screen with two status counts, of words and of remaining memory, at the top. Text is wordwrapped as you type. If held down, all

(continued on next page)

	Headers and footers	80 columns	Macros	Continuous processing	Page number	Numeric mode	Background printing	Word count	Unexpanded max memory	Justify	Price	Supplier
Beebpen	Y	Y	Y	N	Y	N	N	N	10K	Y	—	Braintech 81 Rydale Crescent, Perivale, Middx UB6 8DZ
Scribe	Y	Y	N	N	N	N	N	Y		Y	£59.95	Merlin Computer Products (0792) 467980
View	Y	Y	Y	Y	Y	N	N	Y	25K	Y	£59.80	Acornsoft (0223) 316039
Wordwise	Y	Y	Y	N	Y	N	N	Y	27K	Y	£46	Computer Concepts (09277) 69727
Wordsworth	N	N	Y	Y	N	Y	Y	Y		N	£22.71	Ian Copestake (0486) 74755

All packages offer wordwrap, centring, block manipulation, and search and replace facilities. Prices are for disc software. Wordsworth is available on cassette for £17.54.

(continued from previous page)

keys operate auto-repeat. The cursor operates normally with the cursor keys and, if the Ctrl and Shift keys are used, can hop from the top of text to the end. As in Beebpen, the edit screen is automatically in insert mode and function key 0 is used to switch to overwrite. Again, the function keys are used liberally, allowing the placing of markers for manipulating blocks of text, large-scale deletion, block word counts, etc. Where a large area of text is likely to be affected by the operation a screen prompt asks "are you sure?" as a safety measure.

Format commands are signalled by function key 1 and ended by function key 2. A line can contain multiple format instructions. Apart from provisions such as page and line length, tabs, line spacing and so on, the 31 commands available include some more esoteric options. For example the DP command allows for printers such as the Epson which do not use the normal BBC ASCII code for the £ sign, and lets the user redefine it to code 35.

View-type continuous processing is not available and the macro element is limited to the ability to use the system call \*Key to get the function keys to produce specified words and phrases. Special printer functions are accessed using the embedded command OC for outputting control codes, and all disc operations and system calls are carried out in menu mode. Text is printed straight from memory.

Wordwise is straightforward, friendly and excellent value.

## Wordsworth

Produced and marketed by Ian Copestake, Wordsworth is available on disc or tape. It is an astonishing blend of glaring gaps mixed with some of the most advanced facilities yet available on a word processor for the BBC Model B.

Wordsworth opens with a master menu screen. The first option available, Help, gives a series of explanations on a screen equivalent of yellow ruled paper. The explanations prove a useful supplement to the documentation. The second option, labelled Main Program, produces the document. The third option is for text storage and the fourth for viewing formatted text. You key in ordinary numbers to select the options and can return to the master menu via function key

0. Returning to the master menu while text is in place will destroy the text — a screen prompt gives a reminder of this — so the file must be saved first.

The main program screen display has a top status line showing the number of lines entered so far and the number of the line at the top of the screen. Text cannot be entered in 80-column form, which is a drawback for the serious user, since this is done on the teletext screen. The manual asks you to treat the display as if every two 40-character lines are actually one full-size line. This accounts for the fact that wordwrap only occurs at the end of every second line.

Only 10 text lines are displayed at a time and when the words reach the lower ruler, half the screen scrolls upwards to make room. On first entry into the main program the text options are displayed at the bottom of the screen. Options are selected using function keys. Pressing function key 1 allows you to get started, and once typing commences the other options vanish. The options can be brought back, and the usual strip of cribbing paper is provided to go above the function keys to show which key does what.

Among the options available are search and replace, block copying of text and text manipulation. One of the advanced features of the package is a decimal tabbing function which provides automatic totalling of columns of figures.

One of the real beauties of Wordsworth comes into play during printing which, like the other major functions, involves liberal use of screen prompts. Printing is of saved copy; disc users can use continuous processing, as in View, but Wordsworth goes further than that. It allows for background printing whereby once the print run is set up and in progress, you can return to the main program and get on with your work.

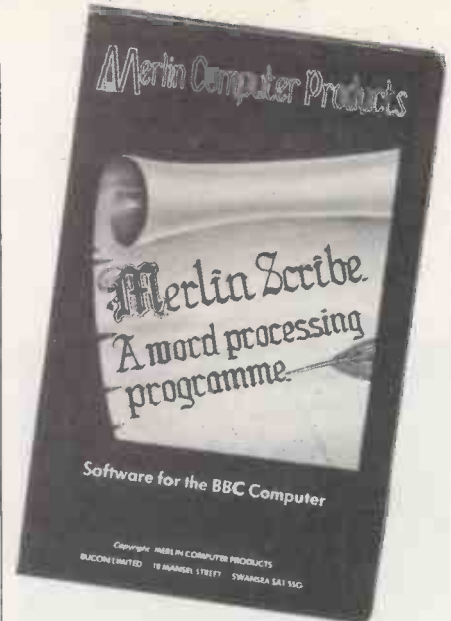
Some options look good but are less appealing in practice. Prominent amongst these is the word-count facility, which is slow and will only suit either those with very short documents or those willing to waste precious minutes gained from the background printing.

Wordsworth is a mixed offering, but where it is good it is very good. A separate utilities disc is available for £8.63 which provides right justification and gives proportional spacing for the Epson FX-80 printer. It is difficult to identify the market Ian Copestake is aiming at, but at the price domestic and light business users will not go wrong.

## Scribe

From Merlin Computer Products, Scribe is a ROM and disc package, with the main menu on the disc. This word processor has taken particular care in "idiot-proofing" throughout, which is admirable but can result in some pauses in the action.

The main menu gives the choices of creating, editing, printing or changing a



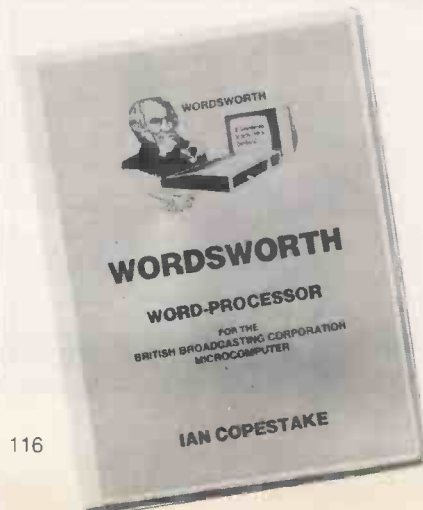
document plus access to utilities and the disc commands. To create a new document you have to answer questions concerning the number of lines per page, length of document lines and so on, and choose between a 40-column or 80-column display. You allot a name to the document and put your document disc in the drive.

Scribe will compact the files already on disc and display how many pages there is room for on the format you have selected. You can then choose the maximum number of pages you are likely to need and wait while the program creates each page on the disc, which is a fairly lengthy procedure. Once this is completed you go back to main menu and the edit option. Pages can be added or subtracted later.

The text screen has an upper ruler above which the status line gives the document name, the current modes, the position of the text on each page, the page number and the number of lines remaining in the space created. Text is wordwrapped on screen and the function keys are used for special formatting as well as other functions.

Returning to the main menu involves automatically saving text in memory to disc. This is not explained clearly in the manual and you may wonder what the delay is. Printing requires the systems disc to be replaced in the drive. Since the printer routines are on the disc, documents written with Scribe can be printed even on a BBC without the Scribe chip as long as the user can borrow the disc. Printer routines are straightforward, with provision for sending specified codes if required. The printer configuration is stored with the document.

Scribe operation is one of the safest when it comes to protecting unsaved text, although it is not as easy to get on with as Wordwise and lacks the advanced features of View. The manual is well presented, but in my version it seemed that the program itself has already outgrown the documentation: several facilities, for example in the printer section, were not referred to in the manual at all. There are plans to introduce a disc-based database to link in with the package.



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### JUKI 6100 PRINTER

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- Apple parallel interface & cable **£72**
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To look at, the processor was merely a disc about 160mm. in diameter and perhaps 60mm. thick. Somewhere beneath its mirror-polished surface was a power source wringing out the last of its energy after an eternity in space.

One of the disc's surfaces was more glassy than the others and when observed through an infrared viewer it scintillated delicately as though sprinkled with "stardust". Every few minutes pictures would form, as if it were a high-resolution dot display, but the graphics meant nothing to any scientist present. Most of the time the millions of optical fibres twinkled randomly with single bits of data.

State-of-the-art technology had been clumsily applied to the magic surface in an attempt to interface it to the supercomputer that towered alongside. The hastily constructed optical interface was of the highest resolution achievable, yet each of its fibres blotted over some 10,000 or 15,000 of the disc's tiny pixels. It had taken engineers 18 months to prepare for what could turn out to be the most amazing dialogue or the greatest anticlimax in history.

"It's like trying to couple an antique clockwork mechanism to a naked microchip but this is the best we can do." The resigned comment came from Professor Jim Hamner, who was on attachment to the Department of Defence.

The President was tired and dishevelled. It would soon be dawn and there had been nothing to see yet. His ebony-spectacled bodyguards checked the presence of their guns, which they hid beneath perfectly tailored suits. "Well, apart from nearly triggering off a war, what else is there to know about this thing?" the President asked.

The mysterious processor had arrived from deep space, borne on a vehicle no larger than the average satellite, and had slipped into a declining orbit. A shuttle had been called out to retrieve the visitor only after all the powers with space capability had denied they had anything to do with it.

Hamner broke his gaze. "Nothing else to know yet, Mr President. But with the country's top programmers and some lateral thinking, we hope to achieve communication with the disc. It just might be possible using our own supercomputer and the makeshift interface you see before you."

"In the short then, Jim, all we know is that this disc is some kind of computer and it's extraterrestrial?" The President was looking for a summary of the situation, as usual.

Hamner agreed, and appended an afterthought ruefully. "And that its designers were hundreds of years in advance of our own even when they built this thing. What level of civilisation must they have reached by now?"

"We have not ascertained its origin then, Jim? No guesses, eh?"

"It could have popped right out of a

# The Disc

by Michael Abbott

black hole for all we know, Mr President."

The President prepared to leave. The unimpressively small device had been playing havoc with his engagements. "Keep me posted," he barked.

Five meaningless rows of characters flashed on to the supercomputer's screen. The President pulled back his chair and sat on it cowboy-style. For several minutes the two men watched the cyphered data incredulously, until the President became irritated by the regimented nonsense that paraded before him.

Hamner was more calm. He lit his pipe and nodded knowingly. "We may not need those programmers after all, Mr President. It looks like the disc has its own ideas about driving our computer."

Still more jumbled tabulations marched across the screen but not a single meaningful word appeared.

"Different civilisation, different language!" Hamner declared.

"No interpreter I use can handle that lingo. Couldn't even pronounce it," said the President. "The disc could be trying to tell us something. How do we translate it?"

"They're not words," Hamner laughed. "They're a kind of bastard, halfway translation. If we are patient, I think we might get to see something that'll really tax the imagination."

By now, the entire scientific team had gathered around the computer. Security cameras were rolling already to record everything and a third computer running in the background was set up to record all data exchanges.

Then, astonishment! A silent almost matter-of-fact conversion to intelligible read-out had taken place. The screen cleared, leaving these words:

Good day. I am friend.  
Interface reconfigured at 1.5 percent resolution.  
Parallel bi-directional mode.  
Language algorithm 48 percent efficient.  
Therefore please re-educate on error.

The President clawed his thinning hair in bewilderment.

"Oh, it's nothing to do with our machine, sir. That's the disc speaking."

Like any polite, unsolicited caller, the disc began to explain the reason behind its visit.

My name translates Envoy Sixty.  
Planet of origin negative on translation to your language. Approximates: Blackstuff. Will relate celestial position once interface with your astronomy database affected. As yet insufficient data source for terminological translation. Read more.

The scientists were still smiling at the disc's struggle with their illogical language when the President announced his suspicion that the whole thing was a hoax aimed at his administration. Defiantly, the screen cleared and began a fresh message.

My journey: Two million your years.  
Velocity: Marginal sub-light speed.  
Purpose: Contact other civilisations.  
100 launches total. Envoy Sixty targeted your galaxy. On arrival, local radio signals indicated high life probability this planet.

Hamner signalled his assistant to organise the database linkups. "Get the astro-database laid on first. It'll take time to rotate through the billions of stars necessary to match a completely alien map of the universe with our own. The civilisation that spawned this machine observes the heavens from a totally different viewpoint and has different names for everything in it. It could even exist in space that's uncharted by us. There's a thought! There might be nothing to match!

"Then extend the general database. The disc's ability to communicate with us freely will depend upon its knowledge of our language, culture and environment." Hamner was clear about how he wanted the situation handled. He knew it was no hoax.

For decades sensitive receivers had been listening for unnatural radio signals from outer space, signals which might have come from a distant civilisation. Latterly, the broadcasting of mathematical patterns had, so scientists claimed, given distant civilisations a greater chance of discovering that they were not alone in the universe too. It was obvious the disc's creators had long since gone one stage further by launching numerous intelligent pods towards promising galaxies. They could not dispatch people, so instead they sent their most intelligent machines as envoys.

Hamner sat at the keyboard and set down his pipe. The disc was doubtless loaded with fantastic information about a far-off people, their civilisation, technology and culture. He typed in a restrained question.

Have you the means to notify your home planet of your discovery of life?

The screen cleared for the reply, then came

Affirmative.

Nothing was added. Hamner tapped at the keyboard again.

Have you notified your home planet that you have discovered life?

Another word appeared casually below the last.

Negative.

Again there was no follow up. No explanation. The President offered his own explanation. "Maybe they don't wanna know back home two million years later. They've probably invented a faster way to travel and overtook the thing before it got

here. There are enough UFO sightings to support that possibility."

But Hamner was not satisfied. He typed in a simple question.

Why not?

These chilling words appeared on the screen:

Launches were automatic. Last 42 were post-war. No one to notify.

A great deal of silence filled the room. The President's bodyguards glanced at each other with rare animation. No one spoke: there is no suitable comment for such an occasion.

Immediately the databases were on-line the visual display began to wriggle with merging stellar patterns. The disc had assumed control over the matching process and was throwing up observations of interest as it proceeded.

"Looks like we've got a bright new boy on the team," the President said. The VDU patterns were reflecting in his eyes in the half-light.

"It's a pretty versatile machine," Hamner agreed. The disc was simultaneously managing to access the general database.

The scientist wandered across to the laboratory's small window and gazed wistfully through the glass. Quite suddenly, the desire to know where Envoy Sixty came from, and to discover what its creators actually looked like, was stronger than the desire to plunder its data bank. There seemed to be an element of bad taste in taking privileged information from a civilisation that had died since making the offer. But he was fatigued. Perhaps matters would assume different proportions after some sleep — whenever that would be. Then Hamner raised a stubby finger towards the sky. "My God!"

The President was preoccupied reading aloud the facts coming up on the screen. "It says they called this galaxy the M31 nebula. The disc claims to come from a spiral galaxy like ours. And look! Apparently we have 150,000,000,000 suns out here."

A fresh-faced young technician, awed by the President's company, stepped forward. "All galaxies have mind-boggling numbers of suns, Mr President, sir. Each one at the centre of an entire planetary system. The numbers of planets involved is countless and the chances of life extreme."

Hamner was still observing the sky. A shaft of light sprang across his sunken eyes as an immense golden orb climbed away from the city's jagged skyline, followed by a smaller sun that threw off an intense blue light.

"I don't believe it!" Hamner grunted. "It's morning already."

"And a beautiful one at that," the President added before returning his attention to the VDU.

The young technician cleared his throat. "And of course, Mr President, they're not all binary systems like ours."

The President interrupted, "Ha! It now says a closer translation for the name of its home planet is Earth. Cute name for a planet, don't you think, son?"

The President cast his shadow across the glassy disc. "Well, old traveller, your home is Meeson now, and you're most welcome. Perhaps you'll help us avoid the same mistakes your folks made." □



PREOCCUPATION with filthy lucre is a condition to be avoided at all costs. Any personal-finance control system should provide the greatest possible amount of information on your financial affairs and require the smallest possible amount of time to operate it.

The micro is an ideal tool for managing home finances as it can be used for data storage, calculation and presentation of accounts. This home-discounts program for the Sinclair Spectrum monitors a current account, a credit-card account and savings accounts. It is written in Basic for a 48K machine with a ZX printer.

Most of the data in the program is stored in early arrays. Using Goto 100 rather than Run after the first use of the program ensures that these arrays are not cleared of data, and line 5010 allows the program to be saved in such a way that it will automatically start with a Goto 100.

On entering and running the program you will be presented with the main menu, as in figure 1. Selecting the Current Account option by keying will display a second menu, as in figure 2.

When you first use the program it is best to begin by selecting Standing Orders file, option 4 from the Current Account menu. To start with it contains no entries and will invite you to make any changes. Pressing the Y key generates a prompt from the computer asking if you wish to make any deletions. Pressing N brings the question

Any additions?

The ensuing questions enable you to enter

# Money manager

Paul Cobb presents the first program from his suite of home-accounts software for the Sinclair Spectrum.

all your standing orders into this file.

The computer generates reference numbers which let you alter standing orders as necessary. This is done by deleting the old record and adding the new one in response to prompts from the computer. Once entered into this file standing orders are deducted automatically from the current-account balance on the appropriate day of the month.

The Monthly Setup section of the

1	Current Account
2	Savings Accounts
3	Budget Account
4	Credit Card
5	Exit

Figure 1. Main menu.

program, reached by option 1 from the Current Account menus lets you clear the arrays at the end of the month, ready to receive the next month's data. The balance of the account is carried forward to the next month, and there is the opportunity to adjust this balance if necessary.

When you first use the program there is no previous month's data to delete, but by responding to the computer's prompts you can enter the month and balance. This part

1	Monthly Setup
2	Update Account
3	Display Account
4	Standing Orders file
5	Return to main menu

Figure 2. Current Account menu.

```

10 REM ...Personal Accounts
20 REM ...© P. H. Cobb
30 DIM s$(31,5)
40 DIM o$(31,5,8)
50 DIM x$(10,6): DIM x(10)
60 DIM a$(31,5)
70 DIM d$(31,5,8)
100 GO SUB 9000: CLS: PRINT AT
110 PRINT AT 4,3;"1...Current A
account"
120 PRINT AT 8,3;"2...Savings A
ccounts"
130 PRINT AT 12,3;"3... Budget
Account"
140 PRINT AT 16,3;"4...Credit C
ard"
150 PRINT AT 20,3;"5...Exit"
160 IF INKEY$="" THEN GO TO 140
170 IF INKEY$="1" THEN GO TO 10
00

```

Lines in the listing with reversed characters should read as follows:

1000 — "SELECT YOUR OPTION"  
1000 — "CURRENT ACCOUNT"  
1100 — "MONTHLY SETUP"  
1110 — "MONTHLY SETUP"  
2000 — "UPDATE ACCOUNT"  
3000 — "CURRENT ACCOUNT"  
3010 — PRINT AT 3,1; "Date"; PRINT AT 3,14; "Amount"; PRINT AT 3,23; "Balance"  
4000 — "STANDING ORDERS"  
4002 PRINT AT 3,1; "Ref No."; PRINT AT 3,10; "Payee"; PRINT AT 3,20; "Amount"  
6000 — "SAVINGS ACCOUNTS"  
7000 — "BUDGET ACCOUNT"  
8000 — "ACCESS ACCOUNT"  
8400 PRINT AT 4,1; "Date"; AT 4,16; "Amount"; AT 4,24; "Balance"

```

150 IF INKEY$="2" THEN GO TO 60
00
185 IF INKEY$="3" THEN GO TO 70
00
187 IF INKEY$="4" THEN GO TO 80
00
190 IF INKEY$="5" THEN GO TO 50
00
195 GO TO 100
1000 BORDER 7: CLS: PRINT AT 1,
7;"
1010 PRINT AT 4,9;"SELECT FROM"
1020 PRINT AT 8,3;"1...Monthly S
etup"
1030 PRINT AT 11,3;"2...Update A
ccount"
1035 PRINT AT 14,3;"3...Display
Account"
1040 PRINT AT 17,3;"4...Standing
orders file"
1041 PRINT AT 20,3;"5...Return t
o main menu"
1042 IF INKEY$="" THEN GO TO 10
42
1045 IF INKEY$="" THEN GO TO 104
5
1060 IF INKEY$="1" THEN GO TO 11
00
1070 IF INKEY$="2" THEN GO TO 20
00
1075 IF INKEY$="3" THEN GO TO 30
00
1078 IF INKEY$="4" THEN GO TO 40
00
1080 IF INKEY$="5" THEN GO TO 10
00
1085 GO TO 1000
1090 CLS
1100 LET b=VAL b$: CLS: PRINT AT
11,5;"
1101 FOR i=1 TO 31
1102 FOR u=1 TO 5
1103 LET b=b-s(i,u): LET b=b+a(i
,u)
1104 NEXT u: NEXT i
1105 PRINT: PRINT: PRINT: PRI
NT "This part of the program cle
ars the current account for
"m$,."
1106 PRINT #1; AT 0,1;"Do you wis
h to continue?"
1107 GO SUB 9500
1108 IF INKEY$<>"y" THEN GO TO 1
000

```



DATE	DESCRIPTION	AMOUNT	BALANCE
1	Salary	650.23	650.23
3	SEGRS	-540	990.85
5	SEEBORD	-40	450.85
6	4354561	-25	410.85
6	3456545	-25.54	385.85
7	3456545	-54.21	368.51
14	CAR LOAN	-23.23	385.5
15	BONUS	120.03	283.07
15	MORTGAGE	133.55	153.04
15	3456547	-153.33	298.5
17	3456458	-24.13	155.27
		-23.31	139.14
			115.85
Balance allowing for remaining standing orders=£55.31			

Figure 3. Current Account display.

of the program clears the data arrays so it is wise first to obtain a hard copy of the current account by selecting Display Account, option 3 from the Current Account menu.

## Credits and debits

Day-to-day credits and debits of the account are recorded by the Update Account part of the program, section 2 from the Current Account menu. The computer asks if you wish to debit or credit the account and for details of the amount. It also lets you add an eight-character description of the transaction, which can be used to record the cheque number for debits and the payer for credits.

The first question asked when you select

option 3, Display Account, is whether you require hard copy. Answer N if you do not have a printer. You then enter the day, and the computer displays the various transactions and the balance of the current account up to and including that day. The computer also calculates and displays the balance, allowing for the remaining standing orders to be deducted in the month. A typical printout is shown in figure 3.

Option 5 from the Current Account menu returns you to the main menu. Option 2 then lets you keep a record of any savings accounts that you hold. By

answering the prompts on the screen you can open new accounts, close accounts or change the balance in existing accounts.

With option 4 from the main menu you can move to the Credit Card account. The program is written for an Access account, but can easily be modified by editing line 8000. When you first use the program press Break at this point and enter the date and amount of your last payment, and the current balance of your account into the variables L\$ payment and BAL respectively. For example

```
BREAK
LET L$ = 8/1/84 : LET payment = £150 : LET
BAL = -£500
ENTER
Goto 100 will restore the main menu.
```

The program then asks if a repayment has been made and invites you to enter details of any bills you have paid by credit card since your last repayment. Selecting option 3 from the main menu gives a message reminding you to save the updated accounts program before proceeding to load the Budget Account program.

After amending the date in the program you have to save the updated version. To avoid confusion it is best to rewind the tape and record the new version of the program at the beginning of the tape, over the top of the old version. The program is saved by selecting option 5 from the main menu and following the computer prompts.

Throughout the program the computer beeps when you press a key. To silence the beep, delete the Gosub 9000 statement from line 100.

```
1110 CLS : PRINT AT 1,5;"MONTHLY
1120 INPUT AT 3,1;"Enter month (
e.g. December) ... ";m$
1140 LET b$=STR$ b
1145 PRINT AT 5,1;"New month - "
; FLASH 1;m$
1150 PRINT AT 15,1;"New balance:
£";b$
1160 PRINT #1;AT 0,1;"Is this in
formation correct?"
1162 GO SUB 9500
1165 IF INKEY$<>"y" THEN GO TO 1
180
1170 GO TO B0
1180 INPUT "New month? ... ";m$
1190 INPUT "New balance ...£";b$
1195 CLS : GO TO 1145
2000 CLS : PRINT AT 1,5;"UPDATE
ACCOUNT"
2005 LET g=1
2010 INPUT "Enter day (e.g.12) .
...";z
2012 CLS : PRINT AT 3,5;"TRANSACTIONS
(max. of 5)"
2026 FOR i=1 TO 5
2027 IF a(z,i)=0 THEN GO TO 2029
2028 LET g=g+1
2029 NEXT i
2030 PRINT #1;AT 0,1;"Do you wis
h to debit or credit the accoun
t?(d or c)": GO SUB 9500
2032 LET k$=INKEY$
2035 INPUT "Enter amount ...£";a
(z,g)
2037 IF k$="d" THEN LET a(z,g)=-
a(z,g): GO TO 2040
2038 IF k$="c" THEN GO TO 2040
2039 CLS : FOR i=1 TO 5: LET a(z
i)=0: NEXT i: PRINT AT 5,6;FLA
SH 1;"INCORRECT ENTRY": GO SUB 9
000: GO TO 2000
2040 INPUT "Enter a description
of this transaction (max. 6
letters) ...";d$(z,g)
2043 PRINT : PRINT
2045 PRINT d$(z,g);a(z,g)
2047 IF g=5 THEN GO TO 2070
2050 PRINT #1;AT 0,1;"Any more t
ransactions on
...?": GO SUB 9500
2060 IF INKEY$="y" THEN GO TO 20
25
2065 GO TO 1000
2070 PRINT "No more transaction
s permitted on this date": GO SU
B 9000: GO TO 1000
3000 CLS : PRINT AT 1,4;"CURRENT
ACCOUNT"
3005 LET b$=0
3010 PRINT AT 3,14;"Balance: £";b$
3012 BORDER 4
3015 PRINT #1;AT 0,1;"Hardcopy r
equired?": GO SUB 9500: LET q$=I
NKEY$
3016 INPUT "Enter day (e.g. 5)...
...";d
3017 LET b=VAL b$
3018 LET n=4
3020 FOR i=1 TO d
3030 FOR u=1 TO 5
3040 IF s(i,u)=0 THEN GO TO 3055
3050 LET b=b-s(i,u)
3052 PRINT AT n,1;i: PRINT AT n,
5;0$(i,u): PRINT AT n,14;"-";s(i
u): PRINT AT n,23;b
3053 LET n=n+1
3055 IF a(i,u)=0 THEN GO TO 3100
3060 LET b=b+a(i,u)
3070 PRINT AT n,1;i: PRINT AT n,
5;d$(i,u): PRINT AT n,14;a(i,u):
PRINT AT n,23;b
3080 LET n=n+1
3085 IF n=21 THEN GO TO 3087
3086 GO TO 3100
3087 IF q$<>"y" THEN GO TO 3090
3088 COPY
3090 PRINT #1;AT 0,1;"Continue?"
3092 GO SUB 9500
3095 IF INKEY$<>"y" THEN GO TO 1
00
3096 CLS : LET n=4
3100 NEXT u
3110 NEXT i
3112 FOR y=d+1 TO 31
3115 FOR e=1 TO 5
3120 IF s(y,e)=0 THEN GO TO 3140
3130 LET b=b-s(y,e)
3140 NEXT e
3141 NEXT y
3145 PRINT
3150 PRINT "Balance allowing for
remaining standing orders=£";b
```

(continued on next page)

(continued from previous page)

```

3155 IF b>=0 THEN GO TO 3158
3156 BORDER 2
3157 GO SUB 9451
3158 IF q$="y" THEN COPY
3160 PRINT #1; AT 0,1; "Continue?"
: GO SUB 9500
3170 IF INKEY$("<" THEN GO TO 1
000
3175 BORDER 7

3180 GO TO 100
4000 CLS : PRINT AT 1,7; "*****
*****"

4002 PRINT AT 3,1; "Re: "; PRIN
T AT 3,10; "Payee: "; PRINT AT
3,20; "Amount: "
4005 LET n=4
4010 FOR i=1 TO 31
4020 FOR u=1 TO 3
4025 IF s(i,u)=0 THEN GO TO 4040
4030 PRINT AT n,1; u; " "; i; PRINT
AT n,10; o$(i,u); PRINT AT n,20;
s(i,u)
4035 LET n=n+1
4040 NEXT u
4050 NEXT i
4100 PRINT #1; AT 0,1; "Any chang
es?"; GO SUB 9500
4110 IF INKEY$("<" THEN GO TO 1
000
4120 PRINT #1; AT 0,1; "Any delati
ons?"; GO SUB 9500
4130 IF INKEY$("<" THEN GO TO 4
200
4140 INPUT "Enter reference no.
of S.O. to be deleted ... "; r$
4150 LET b=VAL r$(1); LET v=VAL
r$(3 TO )
4160 LET s(v,b)=0; LET o$(v,b)="

4170 GO TO 4000
4200 PRINT #1; AT 0,1; "Any additi
ons?"; GO SUB 9500
4210 IF INKEY$("<" THEN GO TO 1
000
4220 INPUT "Enter day of debit (
e.g. 5) ... "; j
4230 INPUT "Enter payee (max. 8
letters) ... "; f$
4240 INPUT "Enter amount ... £"
: u
4245 LET c=0
4250 FOR i=1 TO 3
4255 IF c=1 THEN GO TO 4370
4260 IF s(j,i)=0 THEN GO TO 4265
4263 GO TO 4270
4265 LET s(j,i)=w; LET o$(j,i)=f
$
4267 LET c=1
4270 NEXT i

4290 GO TO 4000
5000 CLS : PRINT #1; AT 0,1; "Have
you made any changes?"; GO SUB
9500
5001 IF INKEY$("<" THEN GO TO 5
010
5002 CLS : PRINT " GOODB
YE"
5003 STOP
5010 PRINT "Before saving the up
dated accounts disconnect
the computer "EAR" lead"; SAVE
"accounts" LINE 100
5011 CLS : PRINT AT 10,10; FLASH
1; "GOODBYE"
5012 STOP
6000 CLS : PRINT AT 1,4; "*****
*****"

6010 LET l=1; PRINT : PRINT
6020 FOR i=1 TO 10
6025 IF x(i)=0 THEN GO TO 6037
6030 PRINT i; " "; x$(i); "£"; x(i)
6035 LET l=l+1
6040 NEXT i
6050 PRINT #1; AT 0,1; "Any change
s?"; GO SUB 9500
6060 IF INKEY$("<" THEN GO TO 1
000
6070 PRINT #1; AT 0,1; "Open new a
ccount?"; GO SUB 9500
6080 IF INKEY$("<" THEN GO TO 6
120
6085 IF l<>11 THEN GO TO 6090
6086 CLS : PRINT "A program modi
fication is necessary to a
ccept more than 10 accounts"; GO
SUB 9000

6088 GO TO 6000
6090 INPUT "Enter name of new ac
count (max. 8 letters)... "; x$(l
)
6100 INPUT "Enter balance ... £";
x(l)
6110 GO TO 6000
6120 PRINT #1; AT 0,1; "Close an a
ccount?"; GO SUB 9500
6130 IF INKEY$("<" THEN GO TO 6

```

```

150
6140 INPUT "Enter no. of account
to be deleted ... "; i; FOR
w=i TO 9; LET x(w)=x(w+1); LET
x$(w)=x$(w+1); NEXT w; LET x(10)
=0; LET x$(10)="

6145 GO TO 6000
6150 INPUT "Enter no. of account
to be updated ... "; i
6160 INPUT "Enter new balance ..
. £"; x(i)

6170 GO TO 6000
7000 CLS : PRINT AT 1,5; "*****
*****"

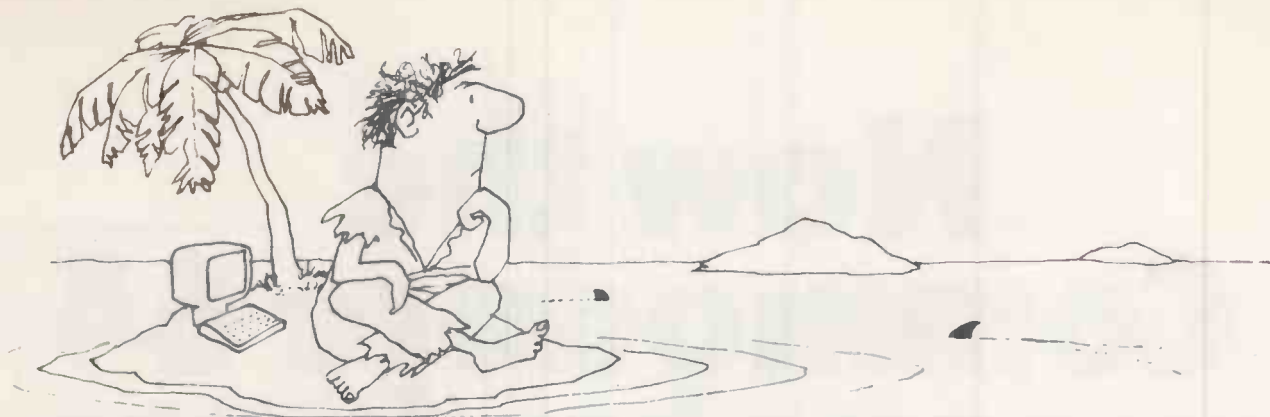
7010 PRINT AT 7,1; "Before loadin
g the BUDGET prog you should com
plete transactions with the ACCOU
NTS prog"
7020 PRINT #1; AT 0,1; "Press n/b
(ACCOUNTS or BUDGET)"
7030 GO SUB 9500
7040 IF INKEY$="n" THEN GO TO 10
000

7050 GO TO 5000
7980 LET u=0; LET payment=0; LET
l$=""; LET bal=0
7990 DIM c(20); DIM y$(20,5); DI
M p$(20,8)
8000 CLS : PRINT AT 1,5; "*****
*****"
8010 PRINT "Last payment £"; paym
ent; " on "; l$
8020 PRINT AT 3,6; "Balance B/F £
"; bal
8040 PRINT AT 4,1; "Enter date of
last payment (e.g. 12/12/83)"; l$
8045 LET l=1; LET n=l+4
8055 LET u=bal
8060 FOR i=1 TO 20
8065 IF c(i)=0 THEN GO TO 8550
8070 LET u=u-c(i)
8075 PRINT AT n,1; y$(i); AT n,7; p
$(i); AT n,16; c(i); AT n,24; u
8080 LET l=l+1; LET n=l+4
8085 NEXT i
8090 PRINT #1; AT 0,1; "Have you m
ade a repayment?"; GO SUB 9500
8095 IF INKEY$("<" THEN GO TO 8
120
8100 PRINT #1; AT 0,1; "Any deduct
ions?"; GO SUB 9500
8105 IF INKEY$("<" THEN GO TO 1
000
8110 INPUT "Enter date eg 21/4 .
."; y$(l)
8115 INPUT "Enter payee (max. 8
letters) ... "; p$(l)
8120 INPUT "Enter amount ... £";
c(l)
8125 GO TO 8060
8130 IF q$("<" THEN GO TO 100
000
8135 INPUT "Enter repayment ... £
"; payment
8140 INPUT "Enter date of paymen
t (e.g. 12/12/83) ... "; l$
8145 LET bal=bal+payment
8150 IF bal<.01 AND bal>-.01 THE
N LET bal=0

8850 GO TO 7990
9000 LET w=INT (1+(RND*4))
9005 GO TO (9000+(100*w))
9010 BEEP .3,0; BEEP .2,5; BEEP
.2,4; BEEP .2,2; BEEP .2,1; BEEP
.2,0; BEEP .2,9; BEEP .2,9
9015 GO TO 9450
9020 BEEP .2,5; BEEP .2,7; BEEP
.2,6; BEEP .2,7; BEEP .2,5; BEEP
.2,7
9025 PAUSE 20
9030 PAUSE 20
9035 BEEP .2,6; BEEP .2,7; BEEP
.2,5; BEEP .2,7
9040 PAUSE 20
9045 BEEP .2,6; BEEP .2,5; BEEP
.1,8; PAUSE 10; BEEP .3,8; PAUSE
.10; BEEP .2,5
9050 GO TO 9450
9055 BEEP .2,5; BEEP .1,7; BEEP
.2,9; BEEP .1,7; BEEP .2,5; PAUS
E 5; BEEP .3,5; PAUSE 5; BEEP .5
,5; PAUSE 10; BEEP .1,5; BEEP .2
,9

9310 GO TO 9450
9400 BEEP .4,3; BEEP .2,6; BEEP
.2,6; BEEP .4,6; BEEP .4,10; BEE
P .4,8; BEEP .2,6; BEEP .2,8
9450 RETURN
9451 BEEP .5,5; BEEP .2,3; BEEP
.5,2; BEEP .2,3; BEEP .5,5; BEEP
.5,6; BEEP .9,3
9452 RETURN
9500 IF INKEY$("<" THEN GO TO 95
000
9510 IF INKEY$="" THEN GO TO 951
00
9520 PRINT #1; AT 0,1; "
9530 RETURN

```



# Feel like you're marooned?

The micro world has several islands that are good to live on for a while. The 8-bit CP/M island is well-established and comfortable, but plenty of people are now realising that the 16-bit islands called CP/M-86 and MS-DOS offer greater prospects. But moving from 8- to 16-bit can be hazardous — and which 16-bit destination do you choose?

For the software developer or serious programmer, Pro Pascal and Pro Fortran are passports for these three islands. Programs can be transported smoothly from one to the other, and in each environment the acknowledged efficiency of the compilers ensures that programs make optimum use of the facilities available.

## Pro Pascal

- First-ever Pascal for micros to be officially validated to BS 6192/ISO 7185
- Separate compilation facility allows large programs to be subdivided into manageable segments
- 64-bit and 32-bit real arithmetic
- 9-digit (32-bit) integers
- String handling extensions
- Random access file handling

## Pro Fortran

- Complete implementation of the widely used ANSI 1966 Standard
- Very fast REAL, DOUBLE PRECISION and COMPLEX arithmetic and functions
- INTEGER is 32-bits, but 8-bit and 16-bit integers are also provided
- File handling extensions from Fortran 77 include random access, error trapping and end-of-file detection

Each is a true compiler, generating binary machine-code programs which make full use of the capabilities of the machine. The compiled code is re-entrant, enabling ROM-based applications to be developed. Files can be interchanged between programs coded in the two languages. Mixed language programs can be written, and Assembler-coded modules can be linked in to object programs, using the linker and run-time library supplied as part of each package.

The 16-bit Pro Pascal and Pro Fortran compilers run on 8086/88-based micros with 86K physical RAM and CP/M-86 or MS-DOS, and each cost £320 + VAT. The 8-bit Pro Pascal and Pro Fortran compilers run on Z80-based micros with at least 56K physical RAM and CP/M, and each cost £220 + VAT.

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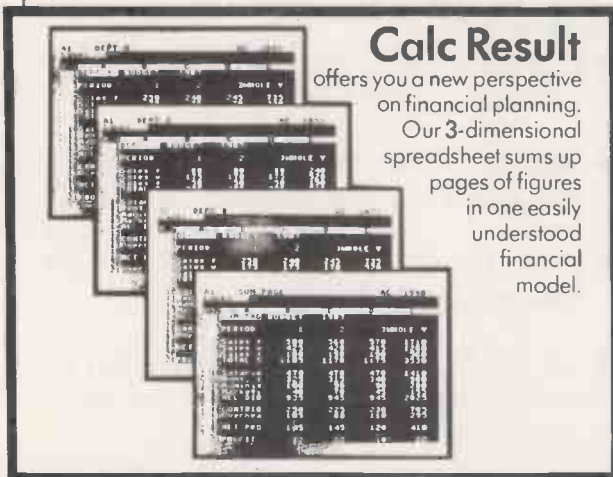
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Thinking ahead

# Shoestring systems

Ian Stobie introduces our selection of good-value business machines.

ALMOST ANY cheap computer can be described, however implausibly, as a business machine, and many are. But for this survey we are only including machines which have proper disc drives and which run one of the top operating systems. The prices given are for twin-drive systems because most business users will want to be able to take backups of their data easily.

A business machine has to meet different standards to a home machine. Above all, a business machine must be reliable; many home computers are not. Where someone's livelihood is at stake, a system which occasionally corrupts data or goes out of commission for a few days is not acceptable.

## Initial outlay

Since the true cost of a computer disaster can be very high it can never be safe to make the cost of initial outlay the overriding factor in buying a business computer. It is as important for the business user to have confidence in the machine's supplier as in the machine itself, because if anything does go wrong the dealer is responsible for support. A maintenance contract, or alternatively an insurance agreement covering equipment repair and perhaps also loss of data, is well worth the money. Some machines have the cost of the first year's maintenance included in the purchase price, which is a worthwhile bonus.

The best value business system for anyone on a low budget is the one which can do the job most cheaply, which really means the one with the lowest and most predictable cost of ownership rather than the lowest purchase price.

## Wide range

Since business users generally do not write their own programs they need a wide range of ready-written packages to choose from. This excludes any machine only available with an obscure operating system. In this survey the machines we have included all run either CP/M, MS-DOS or Apple DOS, which are respectively the first, second and third most widely used micro operating systems, and are very well supported with software.



The Advance 86B is one of the machines recommended for its good specification at a reasonable price and 12-month on-site servicing warranty.

While the most comfortable way to travel on business is via a large car, it is true that for some purposes a moped or push-bike would suffice, and perhaps do even better. So in the survey some machines which have proved genuinely useful in more circumscribed business roles have been ignored, and the low-cost general-purpose business micros have been focused on instead.






## Other machines

Machines like the Tandy 100 and Epson HX-20, portable, battery-powered, A4-sized and weighing approximately 4lb., are very successful business machines in their own specialised way — see our March 1984 survey of portable machines. For some occasional business uses, with non-critical data, an expanded home-machine may be adequate — see our May 1984 issue.

The biggest area of overlap between the machines covered both here and in previous surveys is the mains-powered transportable survey, which appeared in the April 1984 issue. All mains-powered transportables are intended for a business role and some are very reasonably priced. Consequently to avoid complete duplication we only include a representative selection in this month's survey, choosing instead to highlight some other good value but non-portable machines.

## Suppliers

- Advance 86B:** Advance Technology (U.K.) Ltd, 8A Hornsey Street, London N7 8HR. Telephone: 01-609 0061.
- Apple IIe:** Apple Computer (U.K.) Ltd, Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ. Telephone: (0442) 60244.
- Kaypro:** Kaypro U.K. Ltd, Unit 4, 19 Elmshott Lane, Chippenham, Slough, Berkshire. Telephone: (06284) 75575.
- Lynx Laureate:** Computers, 33A Bridge Street, Cambridge CA3 4AB. Telephone: (0223) 315063.
- Memotech:** Memotech Ltd, Station Lane Industrial Estate, Witney, Oxfordshire OX8 6BX. Telephone: (0993) 2977.
- Micronix MX-800:** Micronix Computers Ltd, Suite 2, 26 Charing Cross Road, London WC2. Telephone: 01-240 0213.
- Osborne:** Osborne Computer Corporation (U.K.) Ltd, 38 Tanners Drive, Blakelands, Milton Keynes, MK14 5LL. Telephone: (0908) 615274.
- Pied Piper:** Semi-Tech Microelectronics (Europe) Ltd, 145-147 Ewell Road, Surbiton, Surrey KT6 6AW. Telephone: 01-390 6177.
- Sanyo 555:** Sanyo Marabeni (U.K.) Ltd, Sanyo House, 8 Greycaine Road, Watford, Hertfordshire WD2 4UQ. Telephone: (0923) 46363.
- Wren:** Prism Business Systems Ltd, Prism House, 18-29 Mora Street, London EC1V 8BT. Telephone: 01-253 2277.

	<p><b>ADVANCE 86B</b> £1,250</p> <p>Reviewed on page 98 of this issue, the Advance has a very good specification for the price. Highlights include an 8086 16-bit processor, 128K of RAM, twin 360K 5.25in. floppy drives, MS-DOS and four software packages from the Perfect range bundled-in, word processor, calc, database and spelling checker. Advance claims a high degree of compatibility with the IBM PC, which our review bears out. Built by Ferranti in the U.K. and using good-quality Shugart drives the hardware should be reliable, but as a brand new machine with no track record it is impossible to say more as yet. The inclusion of a 12 month on-site servicing warranty in the system price is a major bonus and should help overcome any doubts.</p>	<p><b>For.</b> IBM PC compatibility. Bundled software. Free maintenance for one year. Good spec.</p> <p><b>Against.</b> New. Bulky design.</p>
	<p><b>APPLE II E</b> £1,186</p> <p>During its five year life the Apple II has become established as one of the dominant low-cost business systems in the U.K., despite a few shortcomings in its design. The standard Apple II floppy-disc drives allow no more than 143K per drive, and the whole system fits together in a messy and difficult way. But the current Apple model, the IIe, is still a strong contender, especially for applications demanding peculiar hardware add-ons. A wide range of software runs under Apple DOS. The Apple II is built around the eight-bit 6502 processor. The full list price is quoted for the Apple IIe with 64K of RAM, twin disc drives, 80-column card, and green screen monitor; application software is extra. Major price changes and additions to the Apple II computer range are imminent.</p>	<p><b>For.</b> Broad software base. Vast number of hardware add-ons.</p> <p><b>Against.</b> Untidy hardware. Current price uncompetitive.</p>
	<p><b>KAYPRO</b> £1,095</p> <p>Although inelegant, the Kaypro demonstrates what extremely good value some of the mains-powered transportable computers are, providing a complete system with good-quality software packages included in the price. Based around the eight-bit Z-80A, the Kaypro is a 26lb. mains-powered machine with a built-in 9in. green screen, 64K of RAM and twin discs. The £1,095 Kaypro II offers two 191K 5.25in. floppy drives. The £1,595 Kaypro 4 has two 392K drives and the Kaypro 10 has one 8.9Mbyte hard disc and one 392K floppy drive, all for £2,295. All models come with CP/M 2.2, WordStar, the Word Plus spelling checker, Supercalc, dBase II, Microsoft Basic and some other programs. Purchasers also get free loan of ATI training programs from their Kaypro dealer.</p>	<p><b>For.</b> Value for money. Good software. Other disc options.</p> <p><b>Against.</b> Keyboard over-sensitive. Tinnily-looking.</p>
	<p><b>OSBORNE 1</b> £945</p> <p>Adam Osborne got the concept of the budget business system off the ground when he started bundling in free software with his pioneering mains-powered transportable. The original Osborne machine, called the Osborne 1, is still available. It has a 5in. screen displaying text across 52 columns, two built-in 200K drives, a Z-80A processor and 64K of RAM. It comes with CP/M 2.2, WordStar, Mailmerge, Supercalc, the UCSD p-System and various other software packages in the price. The disc drives can be upgraded to 400K per drive for £495, and an add-on card to make the screen display across 80 columns is available for £225.</p>	<p><b>For.</b> Good-quality software.</p> <p><b>Against.</b> Small screen.</p>
	<p><b>PIED PIPER</b> £1,396</p> <p>The Pied Piper's high-capacity disc drives make it reasonable value for money. A Canadian machine, it is unconventionally packaged with one 784K 5.25in. floppy drive positioned next to the keyboard, under which lives the Z-80A processor and 64K of RAM. The display is not included in the price, but the Pied Piper works with any standard monitor and for £25 can be fitted with a TV adaptor. The second drive is boxed separately. Also available are 5 and 10Mbyte hard discs. The Pied Piper runs CP/M software, and comes with Perfect Writer, Perfect Speller, Perfect Calc and Perfect Filer. The CP/M has been implemented so that the Pied Piper can read discs produced on a variety of other systems. The twin-drive system costs £1,396.</p>	<p><b>For.</b> Compact. High-capacity floppy discs.</p> <p><b>Against.</b> Limited RAM expansion. Price.</p>

# Budget business: top 10

## SANYO 555

£999

Very competitively priced for a twin-drive 16-bit computer, the Sanyo 555 also comes with good-quality bundled software. Built around the 8088 processor, the Sanyo 555 has a standard 128K of RAM expandable to 256K, twin 160K 5.25in. floppy-disc drives, and keyboard. The display unit is not included in the price and any standard monitor can be used, although Sanyo offers a green monochrome one for £127 and a high-resolution colour model for £499. The Sanyo 555 generates an eight-colour display signal, showing 25 lines of text across 80 columns or 640- by 200-dot graphics. It comes supplied with MS-DOS, WordStar, Mailmerge, Spellstar, Calcstar, Infostar and Basic. The Sanyo 550 model has one disc drive and comes with WordStar and CalcStar in its £749 price.

**For.** IBM PC compatibility. Bundled software. Free maintenance for one year. Good spec.

**Against.** New. Bulky design.

## WREN

£1,000

Another very competitively priced mains-powered transportable, the Wren also boasts a British Telecom approved direct-connect modem. Built around the faster Z-80B version of the Zilog processor chip, the system runs CP/M software and comes with CP/M Plus, Perfect Writer, Perfect Filer, Perfect Calc and several other packages included in the price. Supporting the modem is software for computer to computer communications down the phone line, and for using the Micronet 800 database on Prestel. Weighing 20lb., the Wren packs a 7in. amber graphic screen and two 200K 5.25in. floppy discs into its metal case. Standard RAM is 64K, expandable to 256K. Reviewed on page 101 of this issue.

**For.** Broad software base. Vast number of hardware add-ons.

**Against.** Untidy hardware. Current price uncompetitive.

## LYNX LAUREATE

£943

The Lynx was first launched as a home micro over a year ago, and its considerable flaws secured it much hostile comment at the time. However, in its 128K Laureate form, it deserves reconsideration. By straight purchase or Lynx upgrade it becomes an 80-column eight-bit 64K CP/M micro running Microsoft Basic and other standard software, and snappily, too, thanks to its 6MHz Z-80B. The Laureate Business System includes two 5.25in. disc drives, CP/M, the Perfect suite of software and a parallel printer interface, all for £870 excluding VAT. Thus with a monochrome or colour monitor the system is ready to go. It is one of the cheapest real CP/M systems on the market.

**For.** Value for money. Good software. Other disc options.

**Against.** Keyboard over-sensitive. Tinny-looking.

## MICRONIX MX-400

£1,009

Not an upgraded home micro, but a straightforward professional CP/M crate at a low price. Like all Micronix micros it uses the Micronix 80HD board with a 4MHz Z-80A, 64K or 128K of RAM, 8K of ROM, 80-column video controller, Teletext graphics, floppy- and hard-disc interfaces, two parallel ports, RS-232C port, keyboard port and real-time clock with battery backup. The cheapest configuration, at £799 plus VAT, being two 200K 5.25in. floppies in the MX-400. High-density floppies, 11 and 21Mbyte hard discs are also available. You can use the MX-400 with a terminal, or Micronix can supply a suitable 102-key keyboard for £125 plus VAT, and monitor at £85 plus VAT.

**For.** Good-quality software.

**Against.** Small screen.

## MEMOTECH FDX

£1,083

The Memotech MTX-512 was launched as a 64K home micro, with 16K of separate video RAM, at £274 excluding VAT. The CPU is a Z-80A running at 4MHz. One of the machine's best points is its large, solid keyboard with 79 keys, including eight function-keys and a numeric keypad. The FDX is a CP/M version of the same computer expanded by adding an 80-column colour card, two RS-232C interfaces and a controller to support two 5.25in. floppies — 347K formatted — or 8in. floppies, or a 5, 10 or 20Mbyte hard disc. The RAM is expandable to 512K, and four 256K silicon discs can also be supported. RGB monitor and monochrome composite video outputs are provided for adding the monitor that completes the system.

**For.** Compact. High-capacity floppy discs.

**Against.** Limited RAM expansion. Price.

# Structured

```

LIST
10
20 REM Structured Program Renumberer
30 REM Copyright (c) Mark Callaway 1983
40
50 REM Locate in any spare 500 bytes of memory.
60 REM The location of the machine code is set at line 220. Call that locati
on when you want to renumber your program.
70
80 REM If the program replies 'failed' when you Call it, use the basic Renumb
er command to find the offending lines.
90 REM See BBC User Guide, page 335, paragraph 2.
100
110 BYTE2=&70:REM stores line numbers in two byte format HI-LO
120 BYTE3=&72:REM stores line numbers in peculiar 3 byte format
130 RPTR=&75:REM Points to line numbers within statements
140 LPTR=&77:REM Points to line numbers at front lines
150 PG=&79:REM stores value of page ie start of basic program
160 LD=&7B:REM stores translated current line number format LO-HI
170 DIFF=&7D:DIFF=&10:REM renumbering increment
180 START=&7E:START=0:REM initial line number minus DIFF
190 BUMP=&80:IBUMP=1000:REM line number is rounded up to the nearest 'BUMP' wh
en a definition is found. Make sure Bump > Start.
200 RBUMP=&82:REM running difference between current line number and number me
ntioned above
210 FORPASS=0T03 STEP3
220 PX=&3000
230 LOPTPASS
240 .REN \ start of main program
250 LDA&1C:STA PG:LDA&1D:STA PG+1 \ copy page to PG & PG+1
260 LDA PG:STA RPTR:LDA PG+1:STA RPTR+1
270 .NXTLINE LDY&3:LDA(RPTR),Y:TAX:TAY \ X and Y contain length of this line
280 .NXTCHAR DEY:LDA (RPTR),Y:CMP&8D:BEQ T12:JMP NT&D \ look for line numbe
r flag thing
290 .T12 TXA:PHA \ save line length
300 .T13 TYA:PHA \ pointer to embedded line no.
310 LDY&0
320 .T1 INY:LDA (RPTR),Y:STA BYTE3,X:INX:CPY&3:BNE T1 \ transfer line nu
mber to BYTE3
330 JSR CONVERT&T02
340
350 \ look for this line and calculate new line number
360 LDA PG:STA LPTR:LDA PG+1:STA LPTR+1
370 LDA START:STA LD:LDA START+1:STA LD+1 \ set translated line number
380 LDA BUMP:SEC:SBC START:STA RBUMP:LDA BUMP+1:SBC START+1:STA RBUMP+1
\ initialise running bump
390 .ADD10 \ add 10 to translated line no.
400 CLC:LDA LD:ADC DIFF:STA LD:LDA LD+1:ADC&0:STA LD+1
410 \ subtract 10 from RBUMP
420 SEC:LDA RBUMP:SEC DIFF:STA RBUMP:LDA RBUMP+1:SBC&0:STA RBUMP+1:BPL T
11
430 \ RBUMP has become negative so -
440 CLC:LDA RBUMP:ADC BUMP:STA RBUMP:LDA RBUMP+1:ADC BUMP+1:STA RBUMP+1
450 .T11 LDY&4:LDA (LPTR),Y \ A contains first token on this line
460 CMP&8D:BNE T2 \ is a function/procedure definition
470 \ bump line number up to next thousand
480 CLC:LDA LD:ADC RBUMP:STA LD:LDA LD+1:ADC RBUMP+1:STA LD+1
490 LDA BUMP:STA RBUMP:LDA BUMP+1:STA RBUMP+1 \ initialise running bump
500 .T2 LDY&1:LDA (LPTR),Y:CMP BYTE2:BNE T4
510 INY:LDA (LPTR),Y:CMP BYTE2+1:BEQ FOUNDLN
520 .T4 LDY&3:LDA (LPTR),Y:CLC:ADC LPTR:STA LPTR:LDA LPTR+1:ADC&0:STA LP
TR+1 \ update LPTR
530 LDY&1:LDA (LPTR),Y:CMP&FF:BNE ADD10
540 \ failed to find line no.
550 LDY&8:.T15 LDA FAILMESS,X:JSR &FF&E:DEX:BPL T15:LDA&0:STA LD:STA LD+
1
560 .FOUNDLN LDA LD:STA BYTE2+1:LDA LD+1:STA BYTE2:JSR CONVERT&T03 \ con
vert translated line no to 3 bytes
570 PLA:TAY:PHA \ Y now points to the &8D
580 LDY&0
590 .T5 INY:LDA BYTE3,X:STA (RPTR),Y:INX:CPY&3:BNE T5 \ transfer new lin
e no into right hand side of prog
600 PLA:TAY \ Y now points to the &8D
610 PLA:TAX \ X is length of the line
620 DEY
630 .NT&D CPY&4:BEQ T6
640 JMP NXTCHAR
650 .T6 \ start looking on next line
660 TXA:CLC:ADC RPTR:STA RPTR:LDA RPTR+1:ADC&0:STA RPTR+1
670 LDY&1:LDA (RPTR),Y:CMP&FF:BEQ T7
680 JMP NXTLINE
690 .T7
700 \*****
710 \ Now update all line numbers on left hand side of program
720 LDA PG:STA LPTR:LDA PG+1:STA LPTR+1
730 LDA START:STA LD:LDA START+1:STA LD+1 \ set translated line number
740 LDA BUMP:SEC:SBC START:STA RBUMP:LDA BUMP+1:SBC START+1:STA RBUMP+1 \ in
itialise running bump
750 .nextline \ add 10 to translated line no.
760 CLC:LDA LD:ADC DIFF:STA LD:LDA LD+1:ADC&0:STA LD+1
770 \ subtract 10 from RBUMP
780 SEC:LDA RBUMP:SBC DIFF:STA RBUMP:LDA RBUMP+1:SBC&0:STA RBUMP+1:BPL T14
790 \ RBUMP has become negative so -
800 CLC:LDA RBUMP:ADC BUMP:STA RBUMP:LDA RBUMP+1:ADC BUMP+1:STA RBUMP+1
810 .T14 LDY&4:LDA (LPTR),Y \ A contains first token on this line

```

(listing continued on page 130)

GOOD PROGRAMMERS working on the BBC Micro try to make the most of the structured features of BBC Basic. One of the ways of doing so is to separate procedure definitions from the main part of the program in which the procedures are called.

A useful scheme is to start the main program at line 10, the first procedure definition at line 1000, the second procedure definition at line 2000, and so on. Each chunk of the program then has its own set of line numbers which are easily identifiable and make debugging easier.

A problem arises when you want to renumber a program that has been written in this way. The BBC Basic Renumberer function will only renumber program lines in a regular sequence — usually 10, 20, 30, etc. The Structured Program Renumberer presented here allows you to keep each procedure and function definition to an identifiable set of line numbers.

The key to the operation of the program is to bump up the line number whenever it accounts a Defproc or DefFN. If you select a bump of 1000 the renumberer starts the line numbers at the next round thousand for each definition. It also allows you to choose the starting line number and the gap between successive line numbers.

The BBC Micro stores a line of Basic in the following way: byte 1 is set to 13; byte 2 contains the line number Div 256; byte 3 holds the line number Mod 256; byte 4 is set to the total length of the line; and bytes 5 and 6 hold the Basic tokens. There is no byte to signify the end of the line.

As well as renumbering the line numbers stored in bytes 2 and 3 of each line the renumbering program has to renumber all the line numbers stored after Goto, Gosub, Then or Else statements. These line numbers are easily found because they are all preceded by a &8D; they are stored in three bytes which are formed in an unusual way.

(continued on page 130)

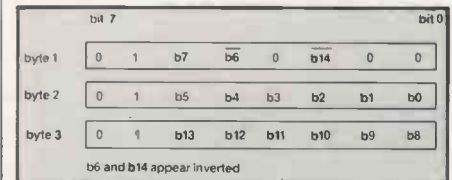


Figure 1.

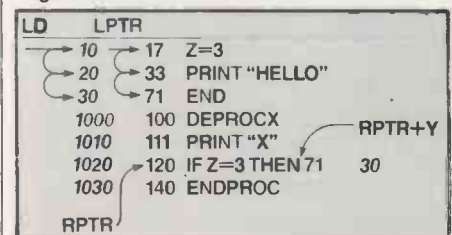
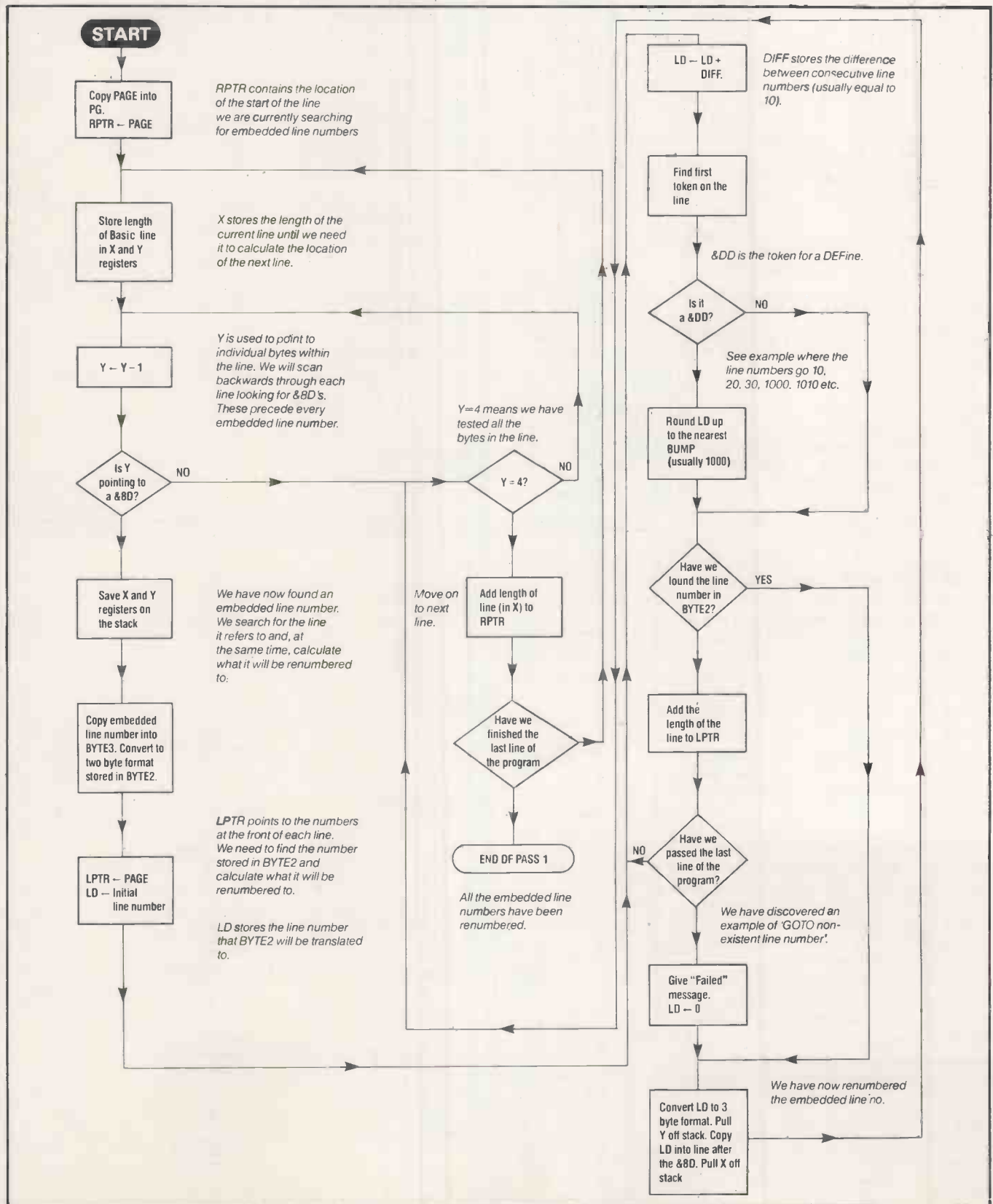


Figure 2.



# Renumber

Mark Callaway's utility for the BBC Micro reserves a separate block of line numbers for each function and procedure definition.



(continued from page 128)

The line number is a 15-bit binary number; bit 0 is the least significant bit and bit 14 the most significant. The three byte code is formed as shown in figure 1. Subroutines at the end of the renumber program convert conventional binary numbers into and out of this format.

The first byte of the basic program is stored at Page. 1 found a copy of Page at locations &1C and &1D on my OS 0.1 machine. These locations tell the renumberer where to find your Basic program. The end of the program is denoted by two bytes 13 and &FF at the end of the final line of the program. These two bytes are not counted when Basic calculates the length of the final line.

The renumber program works in two parts. The first pass renumbers the embedded line numbers within the lines of Basic, such as Goto and Gosub arguments. The second pass renumbers the line numbers at the front of each line. Each line can be divided into two parts: the line number on the front or the left-hand side, and the rest of the line or the right-hand side. This explains how the variables LPTR and RPTR got their names.

Figure 2 shows what happens when an embedded line number is found. The embedded line number at line 120 has been found, RPTR is pointing to line 120 and the Y register is pointing to 71. The value 71 is decoded and stored in Byte 2, and LPTR searches through the line numbers until it finds line 71. Meanwhile, LD has reached 30, establishing that line 71 is to be renumbered to 30. The 71 in line 120 is replaced by 30 and the search for embedded line numbers continues.

Having entered the program you should first save a copy of the assembly language on tape. You then have to decide where to locate the machine code, which is 470 bytes long. Page 502 of the BBC *User Guide* should help you unless you are using a second processor. Change line 220 accordingly, which tells the computer where to locate the machine code. Locations &900 to &CFF are usually worth considering.

Now run the program and load in the Basic program which you want to renumber. Finally, call the start address of the machine code. The renumber program only gives the simple message Failed when it finds a state it is unable to renumber. To discover which line has caused the error, use the Basic Renumber command.

If at any time you want to change the way in which the machine code renumbers your programs, you can Poke the locations shown in figure 3.

	Location	Number of bytes	Default
Diff	&7D	1	10
Start	&7E	2	0
Bump	&80	3	1000

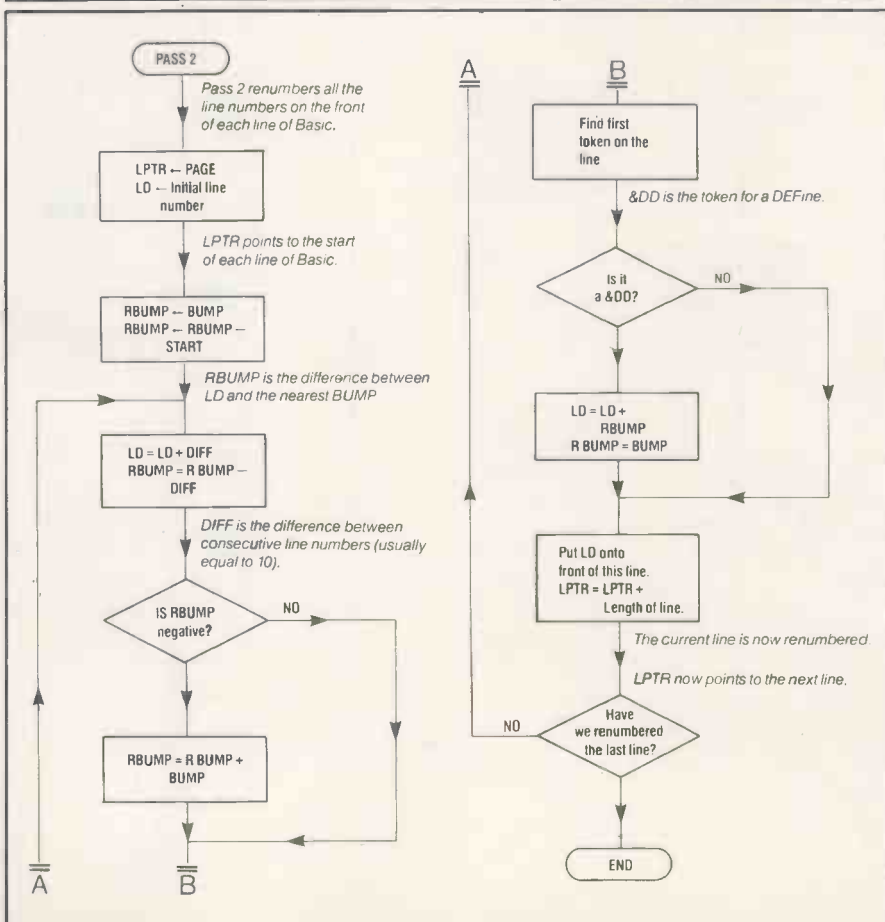
Figure 3.

(listing continued from page 128)

```

820  CML&DD:ENE T9 \ is a function/procedure definition
830  \ bump line number up to next thousand
840  CLC:LDA LD:ADC RBUMP:STA LD:LDA LD+1:ADC RBUMP+1:STA LD+1
850  LDA BUMP:STA RBUMP:LDA BUMP+1:STA RBUMP+1 \ initialise running bump.
860  T9 LDY&1:LDA LD+1:STA(LPTR),Y:INY:LDA LD:STA(LPTR),Y \ put new line num
ber in
870  LDY&3:LDA (LPTR),Y:CLC:ADC LPTR:STA LPTR:LDA LPTR+1:ADC&0:STA LPTR+1 \ u
pdate LPTR
880  LDY&1:LDA (LPTR),Y:CML&FF:ENE nextline
890  RTS
900  \*****
910  .CONVERT2T03 \ Convert 2 byte line number to 3 byte format
920  LDA BYTE2+1:AND&63:OR&64:STA BYTE3+1 \ decode bits 0 to 5
930  LDA BYTE2:AND&63:OR&64:STA BYTE3+2 \ decode bits 8 to 13
940  LDA BYTE2:AND&64:EOR&64 \ NOT bit 14
950  ADC&254 \ put in carry
960  LDA&0:ADC&3:AND&4 \ put in bit 2
970  STA BYTE3
980  LDA BYTE2+1:AND&192:EOR&64:SEC:ROR A:ROR A \ set bit 6 and take bit 7 an
d NOT 6
990  CLC:ADC BYTE3:STA BYTE3:RTS
1000  .CONVERT3T02 \ Convert 3 byte line number to 2 byte format
1010  LDA BYTE3:AND&48:ASL A:ASL A:EOR BYTE3+1:STA BYTE2+1 \ bits 0 to 7
1020  LDA BYTE3:AND&4:ASL A:ASL A:ASL A:ASL A:EOR BYTE3+2:STA BYTE2 \ bits 8 t
o 14
1030  RTS:J
1040  ?PZ=7:(PZ+1)=10
1050  *(PZ+2)="deliaF":PEM 'Failed' backwards
1060  FAILMESS=PZ
1070  NEXT
1080  END
2000  DEFPROC M
2010  PRINT "These silly bits show that the machine code can renumber the most di
fficult programs."
2020  PRINT "To keep the program reasonably fast, it ignores any DEFPROCs or DEFF
Ns not at the start of a statement."
2030  ENDPROC
3000  DEFPROCHI
3010  PRINT "Hi to all the members of the RGS Computer Society."
4000  DEFPROCHELLO
4010  PRINT "Hello to everyone who survived the Lake District camp in Dalston 198
3":ENDPROC
5000  DEFPROCSILLY
5010  IFA=1THEN3010
5020  ENDPROC
6000  DEFPROCTEST
6010  ONX GOTO3000,4000,5000,6000
6020  GOTO0:GOTO6020:GOTO0
6030  GOTO0
6040  ENDPROC
>

```



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TELESOFTWARE broadcast via radio and TV automatically commands a mass audience and, in the case of Basicode transmissions, requires no additional equipment. But there is a limit to the amount of software that can be transmitted by radio, and even using the expanded Ceefax system a large software library means long wait times for downloading.

Micronet 800, available on British Telecom's Prestel, avoids all these problems as it uses the telephone lines. Micros with an RS-232 port can be hooked up to the viewdata system via standard modems to access 30,000 pages of programs and information. You can also use Micronet to access ordinary Prestel pages.

Machines for which the Micronet 800 software is available include the BBC Micro, Spectrum, Commodore 64, Dragon and Apple. Systems are under development for the IBM PC and ACT Sirius, and the Acorn Electron and Sinclair QL will probably be added later this year. For the Apple and Commodore 64, an additional card, supplied with the Micronet software, makes good the missing RS-232. Software for the BBC Micro is supplied on a plug-in ROM.

The Sinclair Spectrum possesses neither serial port nor expansion slots so a separate unit, the Prism VTX-5000, is provided to house both modem and software. Standard Spectrum edge connectors link the modem to the micro and other peripherals to the modem, allowing the Spectrum to function normally with the Micronet 800 unit attached. The Spectrum sits neatly on top of the adaptor, but a problem with this arrangement is that the heat generated by the micro tends to build up between the two outer casings; this may have been responsible for the review system crashing a number of times.

An ordinary telephone is used to call up teleshare pages. The adaptor is plugged into the telephone socket, and the telephone itself into the back of the unit. Each adaptor contains a 10-digit identification number, and before using

# Dial a program

With its huge potential information base, Prestel makes the ideal vehicle for teleshare.

Glyn Moody investigates the possibilities.

Micronet 800 you must first log on. After selecting the Log On or Off option from the Micronet main menu you enter the number. It is retained by the adaptor while the computer remains switched on and can be sent to the host Micronet 800 computer at any time for subsequent logging on.

## Call charges

With the adaptor set off-line, the telephone is used to call one of the Prestel numbers supplied with the system. Call charges are incurred all the time the system is accessed, and there are also frame charges and an overall rental fee for the Micronet 800 and Prestel services. About 95 percent of the U.K. population is able to access Micronet 800 using only local calls.

When the high-pitched continuous tone of the carrier is obtained you switch the adaptor on-line and replace the telephone receiver. The computer can then function as a Micronet terminal.

The Micronet pages have a nested tree structure like Prestel's. Successive menus are used to call up relevant pages and movement through them can be slow. A particular page on Prestel and Micronet 800 can be called up more directly by pressing Symbol Shift on the Spectrum, which then appears on the screen as # followed

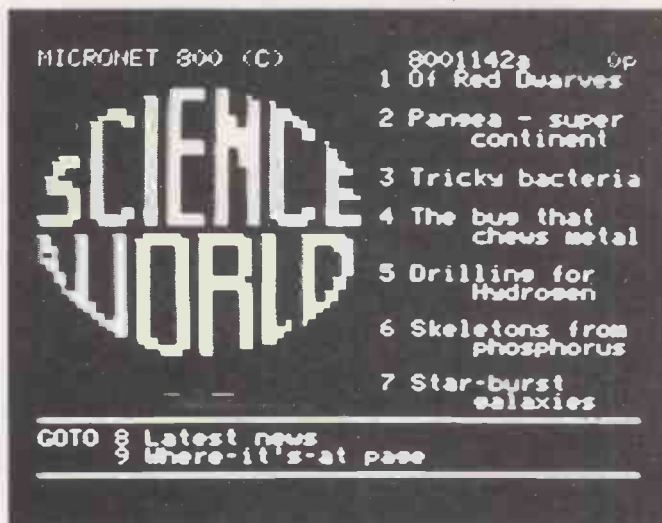
by the appropriate page number.

Micronet offers computer news and information on software and hardware developments, as well as Prestel's general news service. There are electronic mail facilities, letters and members' classified pages as well as teleshopping. Advertisers can buy pages on Micronet; current clients range from Acorn down to local computer shops. Access to these pages is free to users.

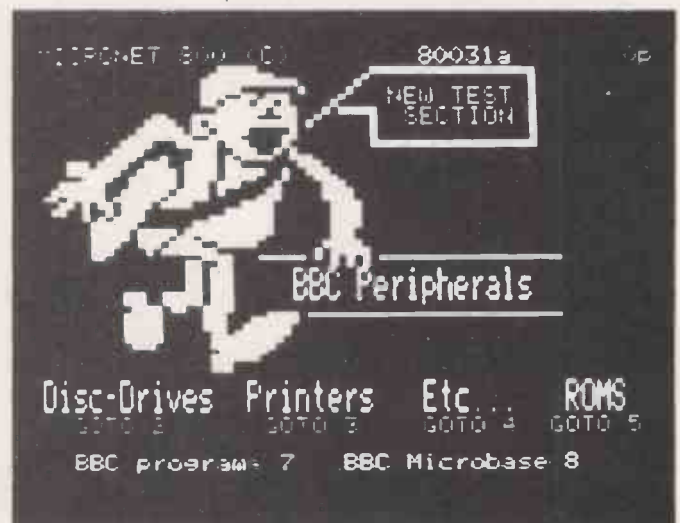
The teleshare section offers software for the machines currently supported. Some programs are free, others can cost up to £8. Once the software has been downloaded Micronet allows it to be saved to disc or tape. Programs are provided by Micronet users themselves as well as by established software houses.

Micronet 800 is a joint venture between Prestel and Telemap, which is mainly owned by the East Midlands Allied Press group, and was set up in March 1983. It grew out of work done by the Council for Educational Technology, which investigated the possibility of adapting micros to function as Prestel terminals in schools. From this research emerged a protocol for file transfer with error checking.

It is this which now forms the basis of Micronet 800 and looks set to become the *de facto* standard for such teleshare in



The news services give bulletins on what's new in science.



A typical machine-specific review section.

the U.K. and abroad. A number of countries with Prestel-type viewdata services are in discussion with Micronet 800 about the possibility of implementing telesoftware systems on their networks.

A number of further developments are planned for the Micronet 800 service. Already it is moving in the direction of more general information provision, and towards supporting a wider range of machines. It is also hoped to start exploiting one particular advantage enjoyed by this form of telesoftware over broadcast programs: interaction.

With a permanent connection between the user's micro and the mainframe which runs Micronet there are opportunities for real-time exchanges. Micronet 800 already operates an electronic-mail system allowing messages to be sent, stored and retrieved from computer postboxes. Discussions are under way with Prestel for a direct micro-to-micro link via the central computer and Micronet.

Interactive games are one exciting possibility; already the Starnet service allows up to 1,000 players to take part in a huge multi-player game, though only by means of individual moves that are then batch processed. It is hoped to implement this kind of game fully interactively so that it responds instantly to the decisions of hundreds of separate players.

A new educational service, provisionally called Schoolink, is also being planned. Prestel's page 165 already provides an extensive index to educational matters; Schoolink is the result of Prestel's desire to extend this to include fuller educational information and telesoftware programs for schools. Initially the service will be aimed at secondary schools and cater for the approved machines: the BBC Micro, Research Machines 380Z and 480Z, and the Spectrum. The eventual target is for 3,000 to 5,000 Schoolink pages, and although it will not be part of Micronet 800 it will also come under the Emap group.

Telemap is also beginning to provide telesoftware-type services for other distribution media. Micronet is to supply

software to the Gamestar Project, handled by British Telecom's Cable Interactive Services and Rediffusion has announced that its cable network will be offering Gamestar as one of its services.

The Rediffusion cable systems are a hangover from the time when certain localities were unable to receive ordinary TV signals of sufficient strength. They do not form part of the new franchises awarded by the government last year. With improved broadcasting technology these lines no longer fulfil their original function and Rediffusion is offering new services in an attempt to maintain this user base, and with it a return on its investment.

One problem with this old cable system is that it is not interactive. So while Micronet 800 users actively download software, and so can be charged for it directly, this is not possible with the Rediffusion network. Instead a carousel of 20 programs is sent every three minutes and the user can access any of them in turn. The pricing structure is based on a monthly subscription rather than per access. The Rediffusion scheme uses an adapted Spectrum as the terminal, which is included in the rental fee.

Some of the new cable franchises have

been looking at Gamestar for possible inclusion in their programming. Another source of cable telesoftware is a computer-games channel called The Games Network from W H Smith, which is moving increasingly into the software field. It offers a 24-hour interactive software channel with a library of some 2,000 titles, including games, educational and application programs. W H Smith has linked up with American and Canadian companies to acquire exclusive cable rights, commission new software and produce two specially designed micros, which are being made in Japan. These 6502-based machines will be available with either 64K or 128K of RAM. Users will pay a fixed monthly charge, with extra costs for additional software. A typical monthly software and hardware charge will be about £11.

It is planned to test-launch new software on The Games Network, and popular programs will then be released through traditional distribution methods. The telesoftware system has parallels with the U.S. MTV video cable channel which acts as a showcase for new singles and bands.

Micronet 800 is already the big success story of Prestel. Since July 1983 it has consistently recorded the highest number of accesses of any information provider, topping 3.5 million in January 1984. At present it has 8,000 subscribers, and Micronet hopes to raise this figure to 20,000 by the end of the year.

The future of cable is far less certain. Already there have been mergers between channel programmers, and cable franchise holders have been muttering darkly about the costs of wiring up and the low likely returns. It could be 1990 before the cable audience in the U.K. reaches 1,000,000.

Yet the advantages of interactive telesoftware are enough to make it certain that telephone-based systems will continue to expand. Already a TV programme from Yorkshire Television, called *The Game*, is investigating the possibility of an interactive computer game show where viewers can use a micro connected via BT lines to join in from their homes. □

## Prices

**Spectrum:** The Prism VTX-5000 unit costs £99.95 including VAT. Alternatively the adaptor can be rented for £11 per month, which also covers service charges.

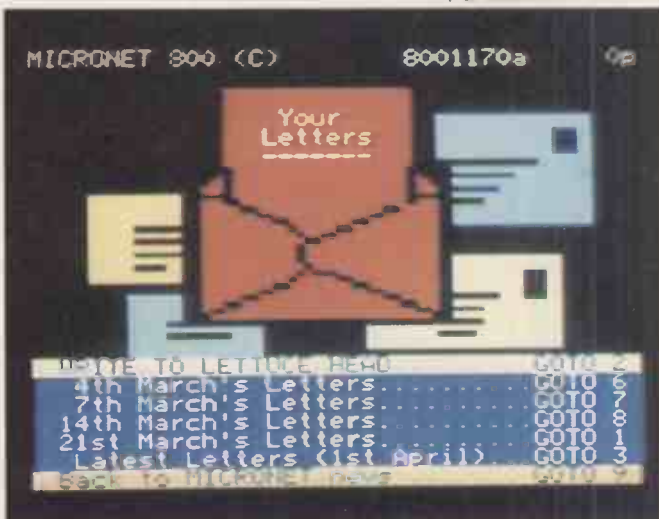
**BBC Micro:** The ROM costs £19.95, and the Modem 1000 £69.95.

**Apple:** The Modem 2000 unit costs £84.95, and the RS-232 communication card with disc-based software costs £49.95.

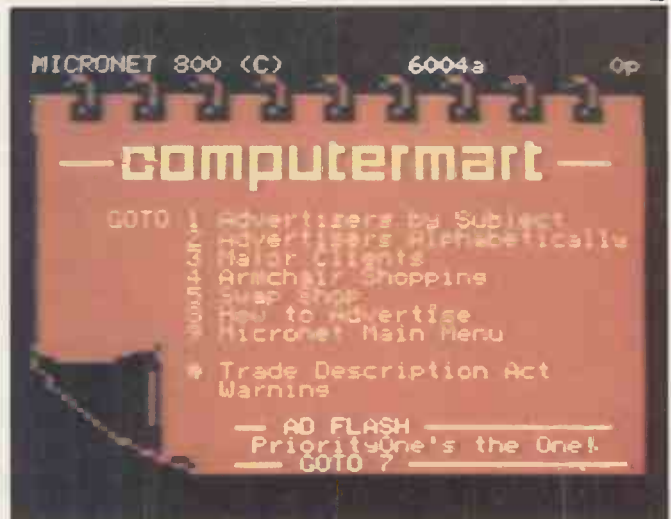
Prices for the Commodore 64 and Dragon systems have yet to be announced.

A rental of £13 per quarter is charged for Micronet and Prestel services.

Details on all these products can be obtained from Prism Business Systems. Telephone: 01-253 2277.



Open letters can be sent via Micronet.



Micronet's main advertising menu.

FOR £150 you can become the proud owner of a Commodore Vic-20, a dedicated cassette recorder, four free cassette programs — not to mention the manual. Perhaps you may demonstrate a tendency to withdraw suddenly from the room if someone mentions that they have a Commodore 64. Worse, you may be afflicted with feelings of inadequacy on meeting an IBM or Apple owner.

What is awkward about the Vic-20 is that it has only 3K of on-board memory. So attempts to implement arcade classics on the unexpanded machine are embarrassing. One expensive way round the problem is the cartridge. Just jam the magic box into the back of the Vic and you have instant flicker-free scrolling graphics, colour and sound — well, not exactly, but certainly an improvement.

## Choplifter

Choplifter is a classic computer game, which I first encountered on the Apple II, and for £24.95 it translates well to the Vic-20.

Perhaps based on a deep-seated disappointment in the U.S. Marine Corps' failure to snatch American embassy officials from the clutches of Iranian extremists, the goal of the game is to fly your chopper into enemy territory and rescue little men running about on the ground and waving most pathetically. When you land they automatically run to the helicopter and clamber in. Then you cry out "Okay, buddy, we're goin' home" just like on the movie posters — and with one bound they are free. Meanwhile aircraft and tanks attack you, together with a strange flying blowlamp which sounds as if it is making mincemeat out of you.

## Astro Blitz

Tom Griner gets the credit for bringing Choplifter to the Vic-20, as he does for the cartridge game, Astro Blitz.

Airmobility or at least space mobility would seem to be the common theme.

As the commander of a crack squadron of five ships you must penetrate the enemy defences and destroy all the ground installations and aircraft. The only good alien is a dead one; forget all that stuff about seeking out new forms of life.

Although it is incredibly fast and quite addictive, as you pilot your cosmic fighter across the increasingly bleak urban landscape, you feel that something is missing, motivation, perhaps. The game looks like a Defender avatar, but there is no one to save.

## Defender

So you turn to Atarisoft, whose avowed intention is to make the world a better place by providing the world's most

# Vic on the draw

Paul Bond selects some colourful games you can play on an expanded Vic-20.



In Choplifter you save your buddies while dodging aircraft and tank fire.

Name	Format	Distributor	Price	Rating
Choplifter	cartridge	Audiogenic	£24.95	14/20
Astro Blitz	cartridge	Audiogenic	£24.95	7/20
Defender	cartridge	Atarisoft	£20	13/20
Hell Gate	cassette*	Llamasoft	£6	11/20
Creepers	cassette*	Virgin	£5.95	12/20
Serpentine	cartridge	Audiogenic	£24.95	13/20

\*Hell Gate requires expansion to 8/16K and Creepers to 3/8K.

popular video games to be played at home in the bosom of the family.

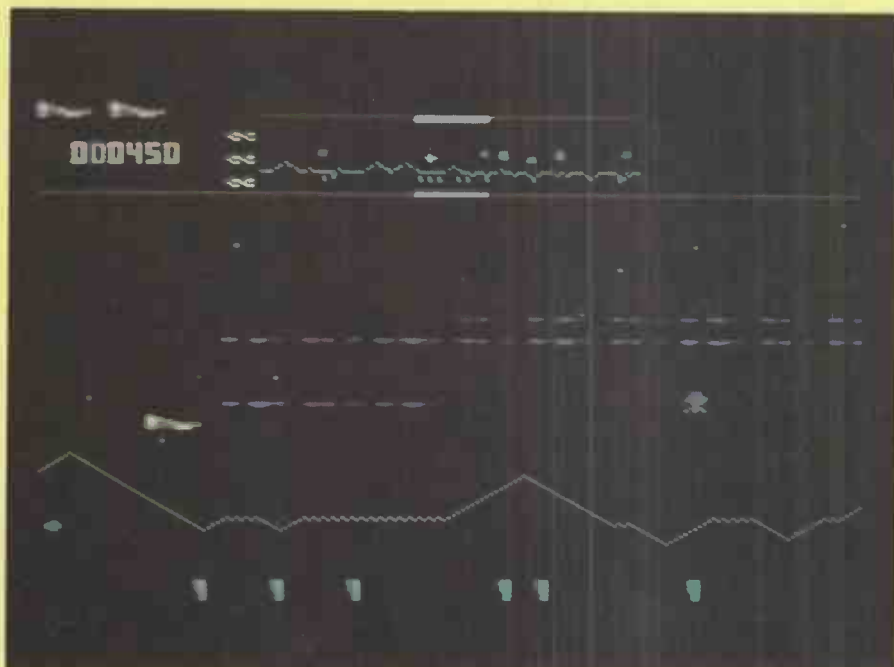
The Defender cartridge brightens up the unexpanded Vic-20, especially in comparison to some of Atari's other attempts such as their implementation of Centipede for the Vic. But £20 is a lot of money for just one game, an Atari user would have to pay £30 for the same program, so Vic users are getting a bargain.

However, this program does stand comparison with Acorn's Planetoids, though it is not as strong in the super-smooth scrolling department. The alien attack has come, and defeat at the hands of the crazed invaders is about to overwhelm the helpless humanoids. Their only hope is the spaceship Defender, a

craft beside which even a Porsche 924 pales into insignificance, with its smart bombs and the ability to shift into hyperspace. The sting in the tail is that the humanoids who do get dragged off on an impromptu tour of the outer limits come back as killer mutants.

## Hell Gate

Jeff Minter, the *eminence grise* of Llamasoft and creator of Gridrunner, has rushed out another game, Hell Gate, for the Vic-20 with 8K or 16K expansion. It is dedicated to those who like zapping and goats. We are informed that "all hell has broken loose" and that we should "prepare to die" — and I thought it was



The Defender spaceship is the only hope for the humanoids against enemy attack.



You pilot your cosmic fighter across the bleak urban landscape in Astro Blitz.

just humidifier fever I was suffering from.

You are given simultaneous control of four laser cannons and automatic smart bombs, together with a seven-place high-score table, plus full Attract mode. The latter sounds like it might come in handy at a party.

The laser cannons move along all four sides of the screen firing into the centre. You control the yellow cannons on the bottom and left-hand tracks; the opposite ones are slaves which perform reflections of your motions, so if you move the base cannon left, the top one will go right. This enables you to provide a fearsome field of fire around the Planar Warp Field, or Hell Gate, as it is more popularly known, through which the

noisome Zzyaxian Bugships plan to force entry to the local galaxy.

You have to keep the cannon moving or else it will heat up and destabilise. If a droid gets on the same track as your cannon, you have to adopt all kinds of quick strategies to do away with it, which is the intelligent part of the game. The non-intelligent part of the game is that you never have to stop firing, but have to avoid hitting stray galactic goats near the Hell Gate.

## Creepers

Creepers from Virgin Games is different to what its name might suggest. You control the last fighter defending your subterranean city's energy supply.



Hell Gate is for zapping and goat addicts.



You alone defend your city in Creepers.




Snakes and frogs abound in Serpentine.

The aliens cling to the roof above you and drop down to gobble up your energy blocks consisting of a thin layer at the base of the screen. If they eat their way through, they draw back in preparation to smash into you.

The aliens move erratically in terms of speed, so you can never gauge what they are going to do and have to rely on your reflexes. It is not exciting graphically, but does build up tension.

## Serpentine

If people keep saying you're a snake, here is your chance to see how you would make out. Serpentine is a cartridge game from Creative Software, marketed by Audiogenic. All the action takes place in a maze wherein you are a blue snake pitted against red snakes. Your objective is to survive long enough to lay eggs and raise your young. You do this by sneaking up on the red snakes and chewing away at them until they become shorter than you. When this happens they turn green and can be attacked from the front.

The serpents all lay eggs which frogs like to eat. The frogs themselves do not realise their potential as fast food for passing snakes until it is too late. They are worth 500 points and one new body segment. 

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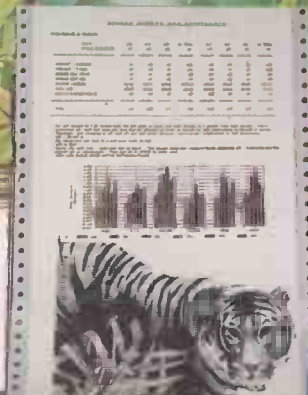
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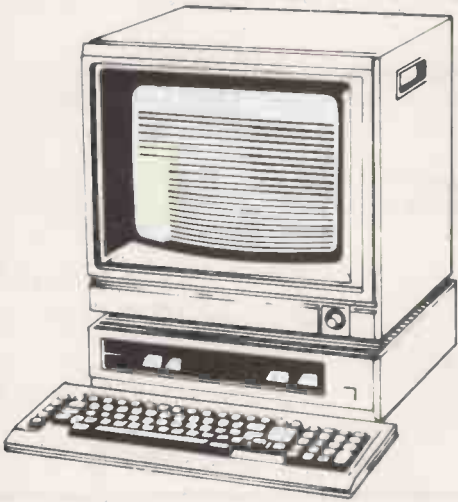
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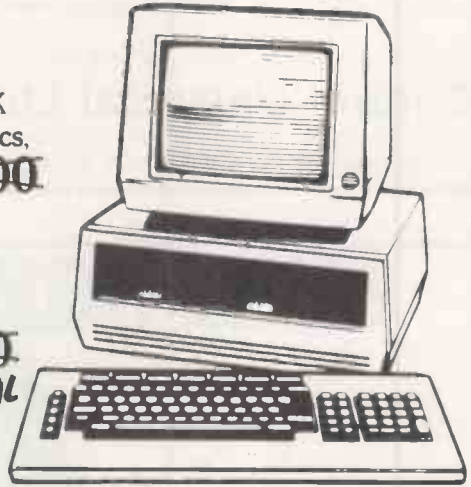
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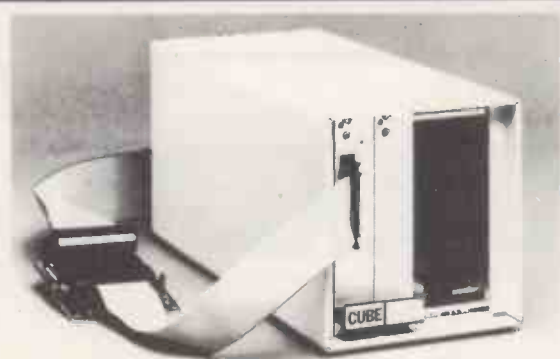
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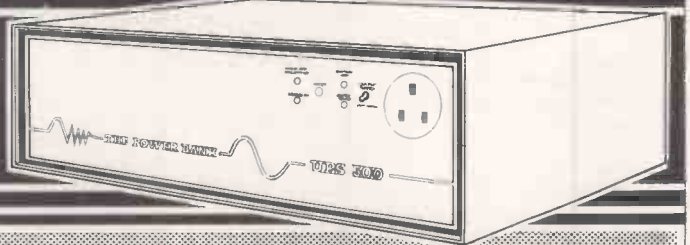
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# bit business software



# DASH-80

## SOFTWARE INCLUDED

CP/M 80<sup>1</sup>  
 CP/M utilities  
 System utilities  
 WORDSTAR<sup>2</sup>  
 CALCSTAR<sup>2</sup>  
 PERSONAL PEARL<sup>3</sup>  
 On line HELP file

## HARDWARE DESCRIPTION

6mHz Z80B processor  
 128k RAM  
 Ultra fast 'cache' disks  
 One/two 5 1/4" disk drives  
 Up to 1568k disk storage  
 Two RS232 serial ports  
 Parallel printer port



The DASH-80, designed and assembled in Great Britain to exploit the vast range of CP/M based application software, provides a processor performance that exceeds that of most current 16-bit systems and floppy disk access times as fast as those of many hard disks.

The DASH-80 comes complete with a selection of powerful software tools including:

**WORDSTAR**, the world's most popular word processor software,  
**CALCSTAR**, wordstar compatible electronic spreadsheet,  
**PERSONAL PEARL**, a powerful data base application generator.

DASH-80 processor prices (inclusive of software) start at — £1084.00 (RRP, excl VAT),  
 DASH-10 terminal shown above — £ 560.00 (RRP, excl VAT).

For further information on the system, and for details and listings of disk and processor benchmarks, telephone or write to the address shown below:

### PROCESSOR BENCHMARKS

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8
DASH-80	.73	2.4	6.6	6.5	7.0	12.7	20.2	34.3
IBM PC	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30.0
APRICOT	1.5	4.8	10.4	10.8	12.2	22.8	35.5	34.0
SIRIUS	1.7	5.4	11.1	11.5	13.6	26.2	40.1	29.0

### DISK BENCHMARKS

	DBM1	DBM2	DBM3	DBM4	DBM5
DASH-80	0.6	4.3	4.2	3.8	3.7
IBM PC	3.8	21.2	20.8	12.7	10.4
APRICOT	3.0	9.5	14.0	8.0	7.5
SIRIUS	2.5	37.0	37.0	12.0	12.0

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# >OPEN FILE

PRACTICAL COMPUTING

JUNE 1984

## Open File monitors

Apple ..... John Harris  
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BBC ..... Nicholas McCutcheon  
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Dragon ..... Ian Stobie  
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IBM PC ..... Jack Schofield  
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Open File is the part of the magazine written by the readers of *Practical Computing*. All aspects of microcomputing are covered, from games to serious business software and utilities. Fully-debugged programs can be submitted for any micro, and for standard CP/M machines such as the Osborne and Superbrain. Programs can be in machine code or any language, including Forth and Pascal.

Submissions should include a brief description which explains what your program does, and how it does it. If possible it should be typed, with lines double-spaced. We need a printed program listing. Hand-written listings cannot be accepted. A tape or disc of the program helps if it is in a standard format.

When printing listings, please remember to use a new ribbon or double-intensity printing — faint listings reproduce badly. Use plain paper only, and try to list the program across either a 35-character or a 70-character width. Also, make sure all special graphics or inverse-video characters are either listed correctly or else include Rem statements to explain them fully.

Each program listing, tape or disc must have your name and address on it, or we cannot promise its safe return. A stamped addressed envelope is appreciated.

If you write in with a comment, correction or enquiry please remember to state the machine and the program title.

We pay at least £10 for any programs used, or £35 per page and pro rata for part pages.

### >SHARP

**146 FLASHING CURSORS**  
Richard Lee's program enables you to provide a flashing cursor to remind the user to take action when they need to press a single key to progress to the next stage of a program.

**146 IN-CAR COMPUTING**  
From Alison Berks comes a program for use on the move.

### >APPLE

**147 PLAYING WITH WORDS**  
An unusual word-game for one to six players by T J Morris.

**148 DUCK SHOOT**  
A tidy and compact game from Peter Brown.

### >BBC

**153 ASTEROID BELT**  
A game to run on the BBC Model B in Mode 1.

**154 COWBOY**  
You hit the Wild West with Paul Gautrey's game written for use with joysticks. It is for two players, represented by gun-slinging cowboys who shoot at each other while dodging behind a row of cacti.

### >SINCLAIR

**155 COLLECTORS AID**  
A program supplied by Mike Coombs, which can be used by hobbyists to file and read records.

**156 3-D GRAPHS**  
A Hill offers a routine to produce a variety of bar graph.

**156 POLYGON DRAWER**  
A program to overcome the Spectrum's habit of stopping with an error when a draw line runs off the edge of the screen.

### >EPSON HX-20

**161 TAPE DIRECTORY**  
Two programs to LPrint a directory of a tape on integral and external cassette recorders.

**161 CLOCK/CALENDAR**  
How to make the HX-20 into a time-keeper.

**161 RANDOM NUMBERS**  
Solve the problem of seeding a random series of numbers.

**161 CHARACTER DESIGNER**  
Correction to the character definition program which appeared in the January issue.

### >COMMODORE

**162 PET SCREEN PRINT**  
A Peake provides a short program to dump the Pet screen on to an Epson printer.

**162 LETTER WRITER REVISITED**  
Modification to the Letter Writer program which appeared in December's Open File.

**162 CRASHPROOF INPUT**  
Prevent the Pet from aborting programs when the Return key is pressed without any input.

**164 SHUTTER SPEED**  
Use your computer to check the shutter speed of a camera.

### >END OF FILE

**165 COUNTING THE COST**  
An Oric program to calculate the cost of running a vehicle.

**165 3-D PLOTTER**  
Three dimensional plotting for the BBC Micro, ACT Sirius and Sinclair Spectrum.

Send your contribution to:

Open File, Practical Computing,  
Quadrant House, The Quadrant,  
Sutton, Surrey SM2 5AS

# Flashing cursors

IN THE April 1983 issue of *PC* the listing entitled subroutine calls was not connected to the editorial of the same name. The listing appears again here with the correct instructions.

You will occasionally want to have a user of your programs press a single key to progress to the next stage. A Get statement deals with this, but it is nice to provide a flashing cursor to remind the user to take some action; since unlike the Pets the Sharp Get does not display the cursor. You could program round this by writing a loop of

code to Print an imitation cursor into place, and then Print a space on top to wipe it out, and so on until a key is pressed.

But there is a much better way. In his Composer program, Richard Lee makes use of the SP-1002 monitor routine at 09B3 hex, where the monitor goes round and round blinking the cursor and scanning the keyboard. As soon as a key is pressed it returns to wherever it was called from.

An example is shown in the listing. A Yes/No answer prompt is Printed on the screen and the USR(2483) command puts a

flashing cursor in position and awaits a key-press which the Get command places straight into K\$ for subsequent use. The Poke erases whatever key value was last retrieved and stored in 45A4. You could Poke 0 into 28A7 instead.

```
100 REM 'FLASH' ANSWER SUBROUTINE
105 REM -----
110 REM To be used as a GOSUB following
120 REM a V(es) or N(o)-type question like...
130 PRINT "Do you agree (Y/N)? ";
135 REM Here's the routine
140 POKE 17928,0:USR(2483):GET K$
150 IF ((K$="Y")+1)*((K$="N")+1) THEN 140
160 RETURN
```

## In-car computing.

```
005 REM MILEAGE
010 BEEP 2:PAUSE "USE 24 HOUR CLOCK -
    HH.MM"
020 "SMILES":U=0:W=0:X=0:INPUT "MILEAGE
    AT START? ":A:S=A
030 "STIME":INPUT "START TIME HH.MM? ":
    B:IF (B<0)+(B>24) GOSUB "RUBBISH":
    GOTO "STIME"
040 B=DEG B:T=B
050 "DISTGO":INPUT "DISTANCE TO GO? ":C:
    C=C+U:IF (C<=0)+(C>1000) GOSUB
    "RUBBISH":GOTO "DISTGO"
060 IF U>0 THEN BEEP 2:PAUSE "TOTAL DIST
    TO GO =":C
070 "ETA":INPUT "ETA HH.MM? ":D:IF (D<0)
    +(D>24) GOSUB "RUBBISH":GOTO "ETA"
080 D=DEG D:IF D<=B GOSUB "TOMORROW":IF
    E$="N" GOTO "ETA"
090 IF (X>0)+(G>X) LET X=D:GOTO "CALC"
100 IF (U>0)+(F=U+A) GOTO "TNOW"
110 "MNOW":INPUT "CURRENT MILEAGE? ":F:
    IF (F<=A)+(F>S) GOSUB "RUBBISH":GOTO
    "MNOW"
120 IF F>A+C LET U=F-A:GOTO "DISTGO"
130 IF F=A+C GOSUB "ARRIVED":IF E$="N"
    LET U=F-A:GOTO "DISTGO"
140 "TNOW":INPUT "CURRENT TIME? ":G:IF
    (G<=0)+(G>24) GOSUB "RUBBISH":GOTO
    "TNOW"
150 G=DEG G:IF G<=T GOSUB "RUBBISH":GOTO
    "TNOW"
160 IF G>D LET X=D:GOTO "ETA"
170 IF (G=D)*(W=0) GOSUB "ARRIVED":IF E$
    ="N" GOTO "ETA"
180 "CALC":H=G-B:H=DMS H:J=F-A
190 PRINT "MILES SO FAR:":J:PRINT "TIME
    TAKEN:":USING "###.##":H:" HRS.MINS"
    :USING
200 I=G-T:K=D-G:L=C-(F-A):N=(F-S)/I:N=
    INT N:IF W=0 LET M=L/K:M=INT M
210 PRINT "PRESENT AV SPEED:":N:"MPH":IF
    W=1 GOTO 260
220 PRINT "SPEED FOR ETA:":M:"MPH"
230 Q=L/N:R=G+Q:R=R-24*(R>24):R=DMS R
240 PRINT "NEW ETA:":USING "###.##":R:
    " HRS.MINS":USING
250 S=F:T=G:GOTO "MNOW"
260 BEEP 3:PRINT "YOU HAVE ARRIVED!"
270 END
300 "RUBBISH":BEEP 2:PAUSE "RUBBISH!!":
    BEEP 1:RETURN
310 "TOMORROW":BEEP 2:PAUSE "THATS
    TOMORROW! ":INPUT "SURE (Y/N)?":E$:
    D=D+24*(E$="Y"):RETURN
320 "ARRIVED":BEEP 2:INPUT "YOUVE
    ARRIVED (Y/N)? ":E$:W=(E$="Y"):
    RETURN
```

## In-car computing

The Sharp PC-1211, PC-1251 and PC-1500 are designed as real pocket computers and are indeed truly portable. They can be used to run conventional programs of the word-processing, spreadsheet database or even Space Invaders variety, but why not have at least some programs intended for use on the move?

Hence Alison Berks from Ipswich proposes her Mileage program for the 1211 or 1500. It enables the chauffeur-driven Rolls-borne tycoon or the humble Escort-driven rep to work out exactly how late they

are going to be for their next appointment.

The program prompts for the mileage from the car's odometer, the time at the start, the distance to go and the estimated time of arrival. It then loops round a cycle of inputting the current mileage and time, and outputting the miles covered, the time taken so far, the average speed since the last input, the average speed needed to make the ETA, and the ETA predicted on the basis of the present average.

All the Gotos and Gosubs are to labels, so the program may be renumbered without any problem. The time inputs are checked for validity and if the ETA is less than the start time you are asked to confirm

that you do really mean to arrive tomorrow. If the current mileage is the same as the destination mileage or the current time the same as ETA the program asks if you have arrived. If you have not you can update the distance to go or ETA as appropriate.

The conversion of time between hours/minutes and decimal hours using Deg and DMS appears to be rather inaccurate over small periods but the errors are not cumulative. Owners of PC-1211s, who may have trouble squeezing in the program, can save a lot of space by curtailing the prompt messages, shortening the labels to one or two characters or even leaving out some of the error checks. □

# Playing with words

AN UNUSUAL game for one to six players has been submitted by T J Morris of New Malden, who last contributed to this column with a high-resolution picture-file print utility.

Words of up to 16 characters have to be constructed. The computer insists that at least three of them are provided by itself, in positions dictated by the player after he or she has seen them. It then offers to provide more letters for the word for increasing points on each occasion. This is on the condition that having been accepted for inclusion unseen, the player must find a place for the letters. The player can at any time stick with the word constructed and claim the appropriate number of points.

```

100 REM COPYRIGHT T.J.MORRIS
110 HOME : VTAB 10: HTAB 3: INPUT
"DO YOU WANT THE INSTRUCTION
S (Y/N)";AN$
120 IF AN$ = "Y" THEN GOSUB 171
0
130 GOTO 160
140 INPUT "WITH THE SAME PLAYERS
? (Y/N)";Z$: IF Z$ = "N" GOTO
160
150 IF Z$ < > "Y" GOTO 140
160 X = RND ( - PEEK (7B) - PEEK
(79) * 256)
170 HOME
180 IF NG > 0 GOTO 210
190 VTAB 12: HTAB 11: PRINT "ONE
MOMENT PLEASE"
200 GOSUB 390: REM SET UP LE
TTERS TABLE
210 IF Z$ < > "Y" THEN GOSUB 5
20: REM PLAYERS' NAMES
220 IF Z$ = "Y" THEN GOSUB 620
230 GOSUB 640: REM SET UP BOARD

240 FOR ZR = 1 TO ROUNDS
250 X = RND ( - RND (1))
260 GOSUB 810: REM SET BOARD-NE
W ROUND
270 FOR ZP = 1 TO ANZ
280 GOSUB 860: REM SET BOARD
-NEW PLAYER
290 VTAB 22
300 GOSUB 920: REM PLAY
310 NEXT
320 NEXT
330 GOSUB 1480: REM WINNER DISP
LAY
340 VTAB 23: INPUT "WOULD YOU LI
KE TO PLAY AGAIN?(Y/N)";AN$
350 IF AN$ = "Y" THEN GOSUB 166
0:NG = NG + 1: GOTO 140
360 IF AN$ < > "N" GOTO 340
370 END
380 FOR N = 1 TO 16:W$ = W$ + KW
$(N): NEXT
390 REM SET UP LETTERS TABLE
400 DIM L$(42B): DIM S$(26): DIM
KP(16): DIM KW$(16),FW$(16)
410 FOR N = 1 TO 26
420 READ N1
430 FOR N2 = 1 TO N1
440 N3 = N3 + 1
450 L$(N3) = CHR$ (N + 64)
460 NEXT
470 NEXT
480 FOR N = 1 TO 26
490 READ S$(N)
500 NEXT
510 RETURN
520 REM PLAYERS' NAMES
530 VTAB 4: CALL - 95B: PRINT "
": INPUT "HOW MANY PLAYERS A
RE THERE? (1-6)";ANZ
540 PRINT
550 IF ANZ > 6 OR ANZ < 1 GOTO 5
30

```

```

560 FOR N = 1 TO ANZ
570 PRINT "NAME OF PLAYER NO. "N
": INPUT P$(N)
580 PRINT
590 IF P$(N) = "" GOTO 570
600 P$(N) = LEFT$(P$(N),10)
610 NEXT
620 PRINT : PRINT : INPUT "HOW M
ANY ROUNDS DO YOU WANT TO PL
AY?";ROUNDS
630 RETURN
640 REM SET UP BOARD
650 HOME
660 VTAB 1: HTAB 1: PRINT "LETTE
RS PLAY"
670 VTAB 4: HTAB 29: PRINT "WORT
H PTS"
680 VTAB 1: HTAB 26: PRINT "ROUN
DS TO GO"
690 VTAB 4: HTAB 1: PRINT "YOUR
LETTER IS "
700 IF NG = 0 THEN FOR N = 1 TO
16:U$ = U$ + CHR$(95) + "
": NEXT
710 VTAB 8: HTAB 3: PRINT U$
720 VTAB 10: HTAB 3: PRINT "1 2
3 4 5 6 7 8 9 1 1 1 1 1 1"

730 VTAB 11: HTAB 21: PRINT "0 1
2 3 4 5 6"
740 VTAB 14: HTAB 31: PRINT "PTS
TOTAL"
750 FOR N = 1 TO ANZ
760 VTAB N + 15: PRINT N;" ";P$(
N)
770 NEXT
780 VTAB 21
790 POKE 34,22
800 RETURN
810 REM RE-SET BOARD - NEW RO
UND
820 IF ZR = ROUNDS THEN VTAB 1:
HTAB 26: PRINT SPC(5);:
INVERSE : PRINT "LAST ROUND":
NORMAL : GOTO 850
830 ZR$ = STR$(ROUNDS + 1 - ZR)

840 VTAB 1: HTAB 40 - LEN(ZR$)
: PRINT SPC(1);ZR$
850 RETURN
860 REM SET BOARD-NEW PLAYER
870 IF ZP = 1 THEN VTAB 15 + AN
Z: HTAB 3: PRINT P$(ANZ): GOTO
890
880 VTAB 14 + ZP: HTAB 3: PRINT
P$(ZP - 1)
890 FLASH : VTAB 15 + ZP: HTAB 3
: PRINT P$(ZP): NORMAL
900 VTAB 8: HTAB 3: PRINT U$
910 RETURN
920 REM PLAY ROUTINE
930 CT = 0: FOR N = 1 TO 16:KP(N)
= 0:KW$(N) = "": NEXT :RMZ =
0:W$ = "":RS = 0:
940 CT = CT + 1
950 LN = RND (9) * 42B + 1:LN =
INT (LN)
960 FLASH : VTAB 4: HTAB 18: PRINT
L$(LN): NORMAL
970 SC = S$(ASC(L$(LN)) - 64): IF
CT > 3 THEN SC = SC * (CT -
2)
980 SC$ = STR$(SC):RS = RS + SC
:RS$ = STR$(RS):VTAB ZP +
15: HTAB 30: PRINT SPC(4 -
LEN(RS$));RS$
990 IF LEN(SC$) = 1 THEN SC$ =
" " + SC$
1000 IF LEN(SC$) = 2 THEN SC$ =
" " + SC$
1010 VTAB 4: HTAB 34: PRINT SC$
1020 PRINT "": VTAB 23: CALL -
95B: INPUT "IN WHICH COLUMN
DO YOU WANT IT?(1-16)";COX
1030 IF COX > 16 OR COX < 1 GOTO
1020
1040 IF KP(COX) = 1 GOTO 1020
1050 KP(COX) = 1:KW$(COX) = L$(LN)
)

```

```

1060 VTAB 8: HTAB COX * 2 + 1: PRINT
L$(LN)
1070 IF RMZ < COX THEN RMZ = COX

1080 IF CT < 3 GOTO 940
1090 IF CT > 15 THEN VTAB 4: HTAB
18: PRINT " ": HTAB 35: PRINT
" ": GOTO 1140
1100 VTAB 4: HTAB 18: PRINT " ";
: HTAB 35: PRINT " "
1110 PRINT "": VTAB 23: CALL -
95B: INPUT "DO YOU WANT ANOT
HER LETTER?(Y/N)";AL$
1120 IF AL$ = "Y" GOTO 940
1130 IF AL$ < > "N" GOTO 1110
1140 FOR N = 1 TO 16:FW$(N) = ""
: NEXT
1150 PRINT "": VTAB 23: HTAB 1: CALL
- 95B: PRINT "WHAT IS YOUR
WORD?(CNTRL Z TO GIVE UP!)"
1160 VTAB 8
1170 FOR N = 1 TO 16
1180 HTAB 2 * N + 1
1190 GET A$
1200 IF A$ = CHR$(26) THEN GOTO
1410
1210 IF ASC(A$) = 13 AND RMZ <
N THEN N = 17: GOTO 1270
1220 IF ASC(A$) < 65 OR ASC(A
$) > 90 THEN A$ = KW$(N)
1230 IF A$ = "" GOTO 1180
1240 IF KW$(N) < > "" AND A$ <
> KW$(N) THEN A$ = KW$(N)
1250 PRINT A$;
1260 FW$(N) = A$
1270 NEXT
1280 VTAB 23: HTAB 1: CALL - 95
B: PRINT "TYPE Y TO CONFIRM
OR N TO RESTART";: INPUT AN$

1290 IF AN$ = "Y" GOTO 1380
1300 IF AN$ < > "N" GOTO 1280
1310 VTAB 8:
1320 FOR N = 1 TO 16
1330 HTAB 2 * N + 1
1340 B$ = KW$(N): IF B$ = "" THEN
B$ = CHR$(95)
1350 PRINT B$;
1360 NEXT
1370 GOTO 1140
1380 VTAB 23: HTAB 1: CALL - 95
B: PRINT "ANOTHER PLAYER SHO
ULD TYPE Y TO AGREE WORD (
OR N TO DISAGREE!)": INPUT
AN$: VTAB 23: HTAB 1: CALL -
95B
1390 IF AN$ = "Y" GOTO 1420
1400 IF AN$ < > "N" GOTO 1380
1410 RS = - 10: PRINT "": VTAB 2
3: HTAB 1: PRINT "OH DEAR!";
SPC(31)
1420 FOR N = 1 TO 16:W$ = W$ + F
W$(N): NEXT
1430 VTAB ZP + 15: HTAB 14: PRINT
SPC(16);: HTAB 14: PRINT W
$;
1440 RS$ = STR$(RS): HTAB 34 -
LEN(RS$): PRINT RS$;
1450 TS(ZP) = TS(ZP) + RS
1460 TS$ = STR$(TS(ZP)): HTAB 3
6: PRINT SPC(5 - LEN(TS$
));TS$
1470 RETURN
1480 REM WINNER DISPLAY
1490 VTAB 23: HTAB 1: CALL - 95
B: PRINT "PRESS ANY KEY TO C
ONTINUE";: GET V$
1500 TEXT : HOME
1510 VTAB 4: HTAB 12: PRINT "ORD
ER OF MERIT"
1520 HTAB 12: PRINT "-----
---": PRINT : PRINT SPC(27
)"PTS": PRINT
1530 IF ANZ = 1 GOTO 1620
1540 FOR I = 1 TO ANZ - 1
1550 FOR J = 1 TO ANZ - 1
1560 IF TS(J) > TS(J + 1) THEN 1
600

```

(continued on next page)

(continued from previous page)

```

1570 S = TS(J),S# = P*(J)
1580 TS(J) = TS(J + 1):P*(J) = P*(J + 1)
1590 TS(J + 1) = S:P*(J + 1) = S#

1600 NEXT
1610 NEXT
1620 FOR I = 1 TO ANZ
1630 HTAB 7: PRINT P*(I);: HTAB
31 - LEN ( STR$( TS(I))):
TS(I)
1640 NEXT
1650 RETURN

1660 REM RESET
1670 FOR N = 1 TO ANZ
1680 TS(N) = 0
1690 NEXT
1700 RETURN
1710 REM INSTRUCTIONS
1720 HOME
    
```

```

1730 VTAB 1: PRINT "RULES OF LET
TERS PLAY"
1740 PRINT "-----"
1750 PRINT "THE OBJECT IS TO MAK
E A WORD OF UP TO 16 LETTERS
USING AT LEAST 3 LETTERS CHO
SEN BY THE COMPUTER AT RANDO
M."
1760 PRINT : PRINT "THESE LETTER
S ARE PUT IN A FRAMEWORK IN
THE POSITIONS OF YOUR CHOICE
POINTS ARE SCORED FOR EACH
LETTER ACCORDING TO THE DIFF
ICULTY OF USING IT."
1770 PRINT : PRINT "YOU MAY CONT
INUE TO ACCEPT LETTERS
CHOSEN BY THE COMPUTER AFTE
R THE THIR.D DOUBLE POINTS AR
E SCORED FOR THE FOURTH LETT
ER, TREBLE FOR THE FIFTH ETC.
    
```

```

ONCE GENERATED A LETTER M
UST BE USED."
1780 PRINT : PRINT "WHEN YOU HAV
E ENOUGH LETTERS FROM THE
COMPUTER YOU MUST FINISH THE
WORD USING LETTERS OF YOUR
OWN.NO POINTS ARE SCOREDFOR
THESE LETTERS.IF YOU FAIL TO
MAKE A WORD YOU SCORE -10 F
OR THE ROUND"
1790 PRINT : PRINT "PRESS RETURN
TO CONTINUE.": GET AN$
1800 RETURN
1810 DATA 33,7,13,18,45,11,8,25
,32,3,4,16,12,30,30,8,3,24,3
1,35,13,6,9,2,9,1: REM FREQ
UENCY OF LETTERS
1820 DATA 1,6,3,3,1,4,6,2,1,15
,11,3,4,2,2,6,15,2,1,1,3,8,5
,18,5,20: REM POINTS FOR
LETTERS
    
```

## Duck Shoot

A tidy and compact game comes from Peter Brown of Preston, using joystick or paddles to aim a cross-hair sight on the high-resolution screen. The target is a duck.

The time allowed per shot is set at the start of play between an impossible one second and a very leisurely 30 seconds. Some 20 ducks are presented per game, each small enough a target to keep the player concentrating to the end. Any number of shots may be taken while the duck is on screen.

### Duck Shoot.

```

1 POKE 768,12: POKE 769,0: POKE
770,32: POKE 771,0: POKE 772
,55: POKE 773,0: POKE 774,90
: POKE 775,0: POKE 776,92:
2 POKE 777,0: POKE 778,94: POKE
779,0: POKE 780,96: POKE 781
,0: POKE 782,98: POKE 783,0:
POKE 784,100: POKE 785,0:
3 POKE 786,102: POKE 787,0: POKE
788,104: POKE 789,0: POKE 79
0,106: POKE 791,0: POKE 792,
108: POKE 793,0: POKE 794,11
0:
4 POKE 795,0: POKE 796,5: POKE 7
97,0: POKE 798,5: POKE 799,0
: POKE 800,41: POKE 801,45: POKE
802,45: POKE 803,229:
5 POKE 804,219: POKE 805,219: POKE
806,36: POKE 807,36: POKE 80
8,36: POKE 809,151: POKE 810
,146: POKE 811,146: POKE 812
,56:
6 POKE 813,63: POKE 814,63: POKE
815,119: POKE 816,73: POKE 8
17,73: POKE 818,54: POKE 819
,54: POKE 820,54: POKE 821,5
:
7 POKE 822,0: POKE 823,63: POKE
824,63: POKE 825,60: POKE 82
6,36: POKE 827,55: POKE 828,
54: POKE 829,53: POKE 830,45
:
8 POKE 831,45: POKE 832,45: POKE
833,37: POKE 834,37: POKE 83
5,60: POKE 836,36: POKE 837,
39: POKE 838,36: POKE 839,53
:
9 POKE 840,54: POKE 841,37: POKE
842,36: POKE 843,52: POKE 84
4,20: POKE 845,193: POKE 846
    
```

```

,54: POKE 847,61: POKE 848,6
2:
10 POKE 849,93: POKE 850,55: POKE
851,54: POKE 852,52: POKE 85
3,62: POKE 854,63: POKE 855,
63: POKE 856,7: POKE 857,0:
11 POKE 858,5: POKE 859,0: POKE
860,5: POKE 861,0: POKE 862,
5: POKE 863,0: POKE 864,5: POKE
865,0: POKE 866,5:
12 POKE 867,0: POKE 868,5: POKE
869,0: POKE 870,5: POKE 871,
0: POKE 872,5: POKE 873,0: POKE
874,5: POKE 875,0:
13 POKE 876,5: POKE 877,0: POKE
878,5: POKE 879,255: POKE 88
0,2:
100 TEXT : HOME : PRINT "=====
=====
====": INVERSE : PRINT "
DUCK SHOOT IN HI-RES
": NORMAL : PRINT "=="
=====
105 PRINT : PRINT "INSTRUCTIONS"
: PRINT "=====": PRINT
: PRINT "A SMALL DUCK WILL A
PPEAR AT A RANDOM POINT O
N THE SCREEN."
110 PRINT "TO SHOOT THE DUCK YOU
MUST LINE IT UP WITH THE
FLASHING CROSS HAIR BY USING
THE JOYSTICK AND FIRE BY
PRESSING BUTTONZERO."
115 PRINT : INVERSE : PRINT "GOD
D LUCK": NORMAL
120 PRINT : PRINT : PRINT "PRESS
ANY KEY TO CONTINUE!"
125 GET KY$
140 POKE 232,00: POKE 233,03
145 SC = 0
300 SCALE= 1: ROT= 0
1000 TEXT : HOME
1010 PRINT "HI-RES SHOOTING."
1020 PRINT "=====
1025 PRINT : PRINT : PRINT "YOU
GET 20 SHOTS "
1026 PRINT "==== = = = = "
1030 PRINT : PRINT : PRINT "SCOR
E = ";SC: PRINT "HIGH SCORE
= ";HS
1035 PRINT : PRINT : PRINT "WHAT
LEVEL OF DIFFICULTY 1-30
(1=HARDST)": INPUT R
T
1036 IF RT < 1 OR RT > 30 THEN 1
035
1040 PRINT : PRINT : PRINT "PRES
S PADDLE BUTTON TO CONTINUE
"
1050 IF PEEK ( - 16287) > 127 THEN
    
```

```

2015
1060 GOTO 1050
2015 HOME
2020 VTAB 24: PRINT "HIGH SCORE
= ";HS
2023 SC = 0
2030 VTAB 22: PRINT "SCORE = "SC
2045 GOSUB 9045
2050 X1 = INT ( RND (1) * 250 +
15):Y1 = INT ( RND (1) * 13
0 + 15)
2060 FOR LOOP = RT * 4 TO 1 STEP
- 1
2070 X2 = INT ( PDL (0) * 0.98 +
15):Y2 = INT ( PDL (1) * .5
1 + 15)
2080 HCOLOR= 3: DRAW 2 AT X1,Y1:
HCOLOR= 1: DRAW 1 AT X2,Y2
2090 IF PEEK ( - 16287) > 127 THEN
3000
2100 IF X1 > X2 - 3 AND X1 < X2 +
3 THEN 2105
2103 GOTO 2110
2105 IF Y1 > Y2 - 3 AND Y1 < Y2 +
3 THEN HCOLOR= 3: DRAW 2 AT
X1,Y1
2110 FOR DE = 1 TO 10: NEXT DE
2120 HCOLOR= 0: DRAW 1 AT X2,Y2
2130 NEXT LOOP
2140 NEXT HMS
2150 IF SC > HS THEN HS = SC
2160 GOTO 1000
3000 IF X1 > X2 - 3 AND X1 < X2 +
3 THEN 3005
3003 GOTO 2100
3005 IF Y1 > Y2 - 3 AND Y1 < Y2 +
3 THEN 4000
3010 GOTO 2100
4000 VTAB 23: HTAB 22: PRINT "***
A HIT **": REM 9 HIDDEN C
TRL <G>S
4005 VTAB 23: HTAB 22: PRINT "
"
4010 SC = SC + 1
4020 VTAB 22: PRINT "SCORE = ";S.
C
4025 IF SC > HS THEN HS = SC
4030 NEXT HMS
4070 GOTO 1000
9045 HGR : HCOLOR= 3: HPLLOT 0,0 TO
10,10: HPLLOT TO 269,10: HPLLOT
279,0 TO 269,10: HPLLOT TO 2
69,149: HPLLOT 279,159 TO 269
,149: HPLLOT TO 10,149: HPLLOT
0,159 TO 10,149: HPLLOT TO 1
0,10
9046 HPLLOT 0,0 TO 279,0 TO 279,1
59 TO 0,159 TO 0,0
9050 RETURN
10000 RUN
    
```

If you are a standard size and all your clothes fit you perfectly, you're the rag trade's ideal customer.

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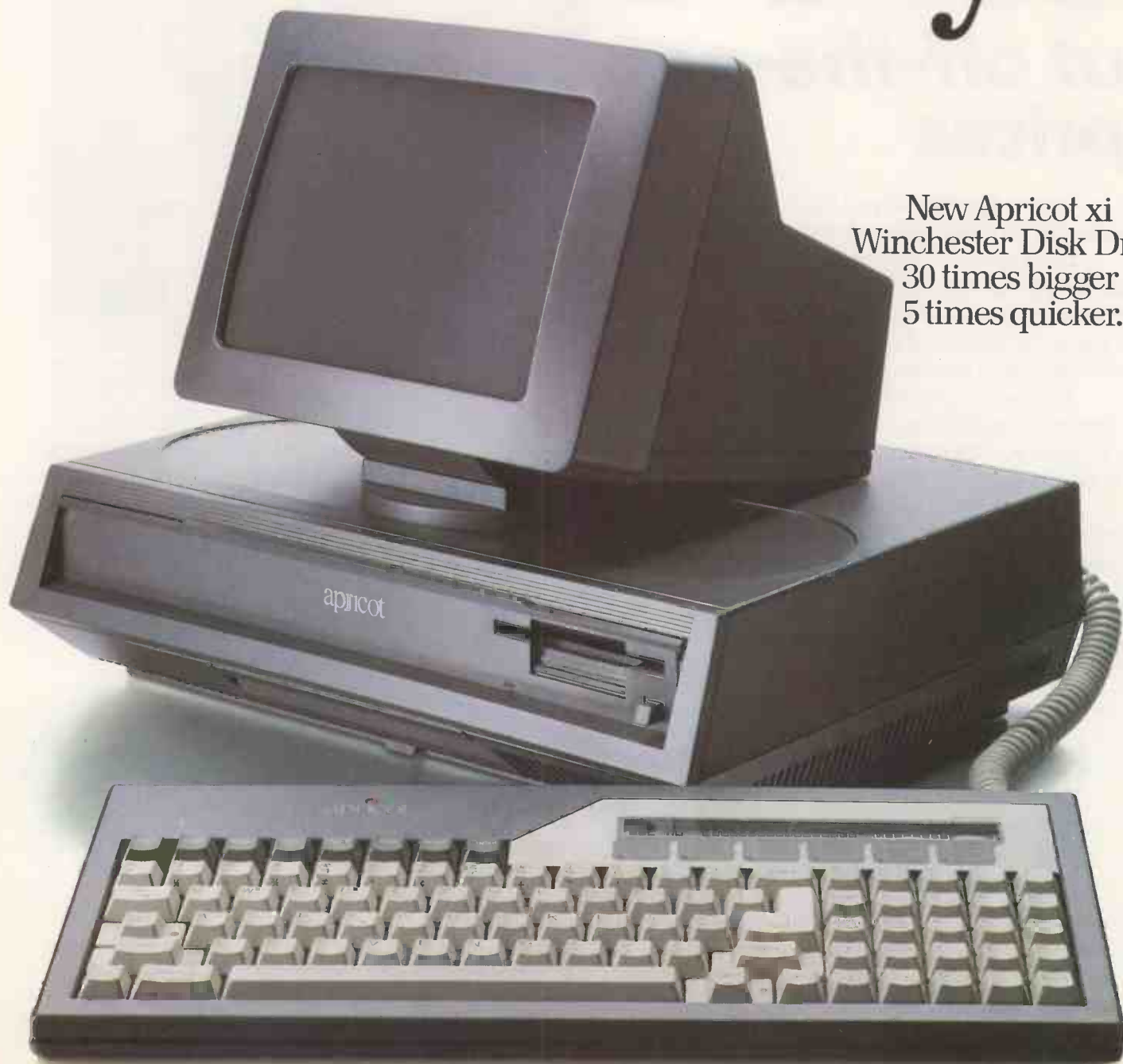
The Apricot excites...  
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Editor, Computer Answers, Nov. 1983.

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machine a leading role in the  
micro show.

Personal Computer World, Benchtest, Oct. 1983.

# What will they say



New Apricot xi  
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5 times quicker.

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Marketing, February 1984.

# y about this one?

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This brings with it two stunning advantages. In simple terms it means you get up to thirty times the storage capacity and up to five times the speed.

But it has the same neat footprint.

Unlike most other machines with a Winchester disk, you can clip the keyboard underneath the unit and carry it to and from the office without doing yourself or the machine any damage.

It's light as a loaded briefcase and just

as likely to survive the 8.15. (For safety's sake, the disk heads automatically retract and lock when you switch off.)

Whatever your business is, ACT has the software that'll help you run it. Nobody has a bigger published library of British business micro software.

The Apricot xi comes in two versions, the 5-Mbyte at £2,695 and the 10-Mbyte at £2,995. In other words, you can get twice the storage capacity (10 million characters) for only £300 more.

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# Asteroid Belt

ASTEROID BELT is a game written by Martin Holmes of Uxbridge, Middlesex, to run on a BBC Model B in Mode 1. In it a continuous stream of asteroids and fuel depots hurtle towards you and you have to manoeuvre your craft to dock with the supply depots.

To move the craft to the left you press the

Z key, and to move to the right you press the / key. The program accepts characters from the keyboard by use of the negative Inkey function. You destroy the oncoming asteroids by pressing the space bar.

Before play begins, a short delay occurs during which the message "Get Ready" appears. If during this interval, L is

pressed, you may set the level of difficulty of play from 1 to 5. Pressing any other key cancels the delay. On the lower levels there are fewer fuelling depots and asteroids to get in your way but scores are lower.

A high-score facility is provided which keeps track of the highest point scored since loading the program.

```

10 REM *****
20 REM *
30 REM *   ASTEROID BELT   *
40 REM * A PROGRAM WRITTEN BY *
50 REM *   M. HOLMES   *
60 REM *
70 REM *****
80 REM
90 REM # USE Z AND / FOR L. AND R.
#
100 REM #   AND SPACE TO FIRE
#
110 REM
120 ONERROR RUN
130 MODE2
140 PROCinit: *FX9,5
150 *FX10,2
160 FOR I=100 TO 200 STEP 10: SOUND 1,1,2: NEXT
170 COLOUR 15: PRINTTAB(0,10)"G E T
R E A D Y ! !": START=INKEY(200): IF STA
RT=76 THEN PROClevel
180 MODE1: PROCinit
190 REM
200 REM *****
210 REM *MAIN LOOP*
220 REM *****
230 REPEAT
240 FUEL%=FUEL%-1
250 IF FUEL%<0 THEN PROCfuelstatio
n
260 COLOUR6: PRINTTAB(T,0)CHR$(224)
270 IF TIME>6000 THEN PROCfincourse:
MODE7: PROCfinprint: MODE 1: PROCscoreboa
rd: END
280 PROCastpos
290 IF TIME<5500 AND RND(11-L%)<3 TH
EN PROCastprint
300 PRINTTAB(0,31)
310 IF FUEL%+100<255 THEN FS=FUEL%+1
00 ELSE FS=254
320 IF FUEL%>0 THEN SOUND 1,0,FS,0: S
OUND 0,-10,7,3: t=TIME: REPEAT UNTIL TIM
E>t+2
330 MOVE0,0
340 point=POINT(T*32+4,988)
350 IF point=1 THEN PROCendsound: MODE
1: PROCscoreboard: END
360 IF point=3 THEN PROCrefuelled
370 IF FUEL%>0 AND INKEY(-98) AND T>0
THEN PROCleft
380 IF FUEL%>0 AND INKEY(-105) AND T
<38 THEN PROCright
390 IF FIRE THEN GCOL 0,0: MOVE XP,1
023: DRAWXP,YP+56
400 FIRE=FALSE
410 IF FUEL%>0 AND INKEY(-99) THEN
PROCfire
420 IF RND(L%)=1 THEN PROCfuelstatio
n
430 IF INKEY(-1) AND INKEY(-2) THEN
PROCcheat
440 UNTIL FALSE
450 REM
460 REM *****
470 REM *DEFINE PROCEDURES*
480 REM *****
490 DEFPROCendsound
500 TIM=TIME/100: *FX15
510 PROCvibrate: CLS: VDU19,0,15,0,0,0
: FOR V=-15 TO 0: SOUND U,V,6,6: NEXT V: E
NDPROC
520 DEFPROCvibrate
530 VDU19,0,7,0,0,0: FOR delay=1 TO 1
50: NEXT: FOR vibrate=1 TO 15: VDU19,0,0,
0,0,0: SOUND 0,-15,5,2: FOR vib=4 TO 1 S
TEP -1: VDU23,13,vib,0,0,0: NEXT
540 PRINTTAB(0,0)CHR$(127)
550 PRINTTAB(0,0)CHR$(127)
560 PRINTTAB(39,31)
570 PRINTTAB(39,31)
580 FOR vib=1 TO 4
590 VDU23,13,vib,0,0,0;
600 NEXT
610 VDU19,0,7,0,0,0
620 NEXT
630 VDU19,0,0,0,0,0
640 FOR delay=1 TO 300: NEXT
650 ENDPROC
660 DEFPROCscoreboard
670 VDU19,0,3,0,0,0
680 IF FUEL%<0 THEN FUEL%=0
690 COLOUR 1
700 PRINT"" You had ";FUEL%;" unit
s of fuel left."
710 PRINT"" You lasted for ";TIM"
seconds, "" and destroyed ";ASTERS%";
" asteroids."
720 score%=(FUEL%+TIM*20)*ASTERS%*(L
%-2)/8
730 PRINT"" This makes your score
";score%;"."
740 IF score%>H% THEN H%=score%
750 PRINT"" High-score : "H%"
760 *FX15
770 INPUT"" Another game",game$
780 IF LEFT$(game$,1)="Y" OR game$=""
THEN RUN
790 ENDPROC
800 DEFPROCastprint
810 DET=RND(3)
820 COLOUR 1
830 PRINTTAB(R,31)CHR$(225);
840 IF DET=1 THEN PRINTTAB(R,31)CHR
$(225);
850 ENDPROC
860 DEFPROCastpos: R=RND(38): R1=RND(3
8): ENDPROC
870 DEFPROCfincourse
880 TIM=60
890 TIME=0: REPEAT UNTIL TIME>200
900 CLS
910 FOR N=1 TO 10: FOR C=1 TO 7
920 VDU19,0,C,0,0,0
930 TIME=0: REPEAT UNTIL TIME>10
940 SOUND 1,1,0,C*(N+20),1
950 NEXT C
960 NEXT N
970 *FX15
980 ENDPROC
990 DEFPROCfinprint
1000 FOR print=10 TO 11
1010 PRINTTAB(2,print)CHR$(131)CHR$(1
41)"C O N G R A T U L A T I O N S ! "
1020 NEXT
1030 PRINTTAB(5,15)"You guided your c
raft safely"
1040 PRINTTAB(7,16)"through the aster
oids."
1050 wait=INKEY(300)
1060 *FX12,0
1070 ENDPROC
1080 DEFPROCfuelstation
1090 COLOUR 3
1100 PRINTTAB(RND(38),31)"V";
1110 ENDPROC
1120 DEFPROCrefuelled
1130 *FX15
1140 SOUND 2,1,120,10
1150 FUEL%=FUEL%+30
1160 ENDPROC
1170 DEFPROCfuelstatio
n
1180 *FX15
1190 FSOUND=FSOUND+5
1200 SOUND 1,1,FSOUND,3
1210 ENDPROC
1220 DEFPROCinit
1230 VDU23,11,0,0,0,0;
1240 VDU23,224,255,126,60,24,24,0,0,0
1250 VDU23,225,124,254,255,255,255,25
4,124,124
1260 ENVELOPE1,1,3,2,-2,4,4,4,90,0,0,
-4,100,0: ENVELOPE2,1,-12,-12,-12,240,2
40,240,20,0,0,-20,126,126
1270 IF L%<6 OR L%>10 THEN L%=7
1280 IF Z%<>FEEDFACE THEN H%=0
1290 Z%=&FEEDFACE
1300 FUEL%=100
1310 FSOUND%=50: ASTERS%=0
1320 FIRE=FALSE
1330 *FX9,1
1340 *FX10,1
1350 T=20
1360 TIME=0
1370 ENDPROC
1380 DEFPROCfire
1390 FIRE=TRUE
1400 I=0
1410 XP=T*32+16
1420 YP=1000
1430 REPEAT
1440 YP=YP-32
1450 I=I+1
1460 point=POINT(XP,YP)
1470 UNTIL point>0 OR I=10
1480 MOVEXP,1000
1490 GCOL 0,3
1500 DRAWXP,YP+24
1510 IF point>0 THEN PROCchit
1520 ENDPROC
1530 DEFPROCchit
1540 IF point=1 THEN ASTERS%=ASTERS%+
1
1550 VDU19,0,7,0,0,0
1560 *FX15
1570 SOUND 2,1,80,10
1580 COLOUR 0
1590 PRINTTAB(XP DIV 32,(1024-YP) DIV
32);CHR$(225)
1600 VDU19,0,0,0,0,0
1610 ENDPROC
1620 DEFPROClevel
1630 CLS
1640 COLOUR 3
1650 REPEAT
1660 PRINT TAB(1,10)"Which Level, 1 t
o 5"" (5-hardest)""
1670 INPUT L%
1680 UNTIL L%>0 AND L%<6
1690 L%=L%+5

```

(continued on next page)

(continued from previous page)

```
1700 RUN
1710 DEFPROCcheat
1720 *KEY100LD|MPROCcheat|M
1730 VDU 22,7
1740 FOR print=10 TO 11
1750 PRINTTAB(8,print)CHR$(141)CHR$(1
35);CHR$(157);CHR$(132);"YOU CHEAT! "
CHR$(156)
1760 NEXT
```

```
1770 PRINT"" Bad Luck, I'm not foole
d by that one!""
1780 VDU131
1790 PRINT""I've got to be going now,
bye!""
1800 REPEAT
1810 ONERROR GOTO 1810
1820 UNTIL FALSE
1830 ENDPROC
```

```
1840 DEFPROCright
1850 T=T+1
1860 SOUND 3,-12,100,2
1870 ENDPROC
1880 DEFPROCleft
1890 T=T-1
1900 SOUND 3,-12,100,2
1910 ENDPROC
```

## Cowboy

Paul Gautrey of Wellingborough, Northamptonshire, has submitted a game written for use with joysticks. It is based on the popular game called Shootout.

The game is for two players, represented by two gun-slinging cowboys. The cowboys move about and hide behind a row of cacti while shooting at each other. You have to hit your opponent three times in order to win.

You are allowed six bullets to start with, and another six are awarded when both of you run out of ammunition. The fire button on each joystick releases the bullets, which can blow up a cactus on impact thereby reducing the amount of shelter available to your opponent.

The game is for 32K machines. If you have discs you should key in the program as it stands and then relocate it to Page &E00 with the relocation routine.

### Cowboy.

```
10 REM SHOOT OUT BY P.GAUTREY
20 REM*****
30 REM* Listing courtesy of *
40 REM*DATALeAF Ltd. Wellingborough*
50 REM*****
60 MODE7
70 PROCTITLE
80 MODE2
90 VDU5
100 VDU19,0,2,0,0,0
110 VDU19,2,0,0,0,0
120 PROCINIT
130 CX=0:RX=0:JX=0:KX=0
140 XX=300:YX=300:HX=900:VX=600
150 PROCDRAWCACTI
160 MX=6:ZX=6
170 VDU4:PRINTTAB(8,0);"6 6":VDU5
180 PROCMAN1ERASE
190 XX=XX-32*(ADVAL(1)-32700)DIV25000:
IFXX<0 XX=0 ELSE IFXX>400 XX=400
200 YX=YX+16*(ADVAL(2)-32700)DIV18000:
IFYY<64 YY=64 ELSE IFYY>950 YY=950
210 PROCMAN1DRAW
220 PROCMAN2ERASE
230 HX=HX-32*(ADVAL(4)-32700)DIV25000:
IFHX>1216 HX=1216 ELSE IFHX<816 HX=816
240 VX=VX-16*(ADVAL(3)-32700)DIV18000:
IFVX<64 VX=64 ELSE IFVX>950 VX=950
250 PROCMAN2DRAW
260 FX=ADVAL(0)AND3:IF(FX=1ORFX=3)ANDC
X=0ANDMX>0 CX=1:MX=MX-1:VDU4:PRINTTAB(8,
0);MX:VDU5:AX=XX+64:BX=YX-16:SOUND0,1,6,
1
270 IF(FX=2ORFX=3)ANDRX=0ANDZX>0 RX=1:
ZX=ZX-1:VDU4:PRINTTAB(11,0);ZX:VDU5:PX=H
X-32:QX=VX-16:SOUND0,1,6,1
280 TIME=0
290 REPEAT
300 IFCX=1 PROCBULLET1
310 IFRX=1 PROCBULLET2
320 UNTILTIME>BSX
330 IFMX+ZX+CX+RX=0THEN150
340 IFJX=3ORJY=3THEN900
350 GOTO180
360 DEFPROCbullet1
370 GCOLOR,0:MOVEAX,BX:VDU242
380 AX=AX+64:IFAX>1280 CX=0:ENDPROC
390 IFABS(HX-AX)<35ANDABS(VX-BX-16)<35
PROCD2:ENDPROC
400 IFPOINT(AX+20,BX-12)>0ORPOINT(CX+4
```

```
0,BX-20)>0 DX=BX:CX=0:PROCCACTI:ENDPROC
410 GCOLOR,7:MOVEAX,BX:VDU242
420 ENDPROC
430 DEFPROCbullet2
440 GCOLOR,0:MOVEPX,QX:VDU242
450 PX=PX-64:IFPX<-64 RX=0:ENDPROC
460 IFABS(XX-PX)<35ANDABS(YX-QX-16)<35
PROCD1:ENDPROC
470 IFPOINT(PX+20,QX-12)>0ORPOINT(PX+4
0,QX-20)>0 DX=QX:RX=0:PROCCACTI:ENDPROC
480 GCOLOR,7:MOVEPX,QX:VDU242
490 ENDPROC
500 DEFPROCD1
510 PROCTUNE
520 KX=KX+1
530 PROCMAN1ERASE
540 RX=0:CX=0:MOVEAX,BX:VDU242
550 GCOLOR,2:MOVEVX,YX:VDU243
560 FORTX=YX+16TO996STEP16
570 GCOLOR,0:MOVEVX,TX:VDU243
580 GCOLOR,2:MOVEVX,TX:VDU243
590 FORTD=0TO500:NEXT
600 NEXT
610 GCOLOR,0:MOVEVX,TX:VDU243
620 GCOLOR,2:MOVEVX+120,1024:VDU243
630 ENDPROC
640 DEFPROCD2
650 PROCTUNE
660 JX=JX+1
670 PROCMAN2ERASE
680 CX=0:RX=0:MOVEPX,QX:VDU242
690 GCOLOR,2:MOVEVX,YX:VDU243
700 FORTX=YX+16TO996STEP16
710 GCOLOR,0:MOVEVX,TX:VDU243
720 GCOLOR,2:MOVEVX,TX:VDU243
730 FORTD=0TO500:NEXT
740 NEXT
750 GCOLOR,0:MOVEVX,TX:VDU243
760 GCOLOR,2:MOVEVX+120+800,1024:VDU243
770 ENDPROC
780 DEFPROCCACTI
790 GCOLOR,0:MOVE600,INT(DX/20)*20:VDU4
2
800 ENDPROC
810 DEFPROCTUNE
820 RESTORE
830 FORT=0TO10
840 READNX,LX
850 SOUND1,-15,NX,LX
860 SOUND1,0,0,2
870 NEXT
880 ENDPROC
890 DATAS,2,5,2,5,1,5,7,21,2,13,2,13,
4,5,8,5,8,1,12,5,20
900 FORTD=0TO2000:NEXT
910 CLS
920 VDU5
930 XX=0:YX=500:IFKX=3 N$=R$ ELSE N$=L
$
940 N$=N$+" WINS!"
950 FORTX=1TOLEN(N$):SOUND0,1,6,1:PROC
MAN1DRAW
960 FORTD=0TO100:NEXT
970 PROCMAN1ERASE:GCOLOR,7:MOVEVX,YX:VD
UASC(MID$(N$,TX,1))
980 XX=XX+64
990 NEXT
1000 VDU4
1010 PRINTTAB(30,6)"Another game ?"
1020 AS=GET$:IFAS<<"Y"ANDA$<<"N"THEN102
0
1030 IFAS="Y" CLS:VDU5:GOTO130
1040 END
1050 DEFPROCMAN1DRAW
1060 GCOLOR,3:MOVEVX,YX:VDU230
1070 MOVEVX,YX-32:VDU231
1080 GCOLOR,2:MOVEVX,YX:VDU232
1090 MOVEVX,YX-32:VDU233
1100 GCOLOR,7:MOVEVX,YX:VDU234
1110 MOVEVX,YX-32:VDU235
1120 ENDPROC
1130 DEFPROCMAN1ERASE
1140 GCOLOR,0:MOVEVX,YX:VDU230
1150 MOVEVX,YX:VDU232
```

```
1160 MOVEVX,YX:VDU234
1170 MOVEVX,YX-32:VDU231
1180 MOVEVX,YX-32:VDU233
1190 MOVEVX,YX-32:VDU235
1200 ENDPROC
1210 DEFPROCMAN2DRAW
1220 GCOLOR,3:MOVEVX,YX:VDU236
1230 MOVEVX,YX-32:VDU239
1240 GCOLOR,2:MOVEVX,YX:VDU237
1250 MOVEVX,YX-32:VDU240
1260 GCOLOR,7:MOVEVX,YX:VDU238
1270 MOVEVX,YX-32:VDU241
1280 ENDPROC
1290 DEFPROCMAN2ERASE
1300 GCOLOR,0:MOVEVX,YX:VDU238
1310 MOVEVX,YX:VDU236
1320 MOVEVX,YX:VDU237
1330 MOVEVX,YX-32:VDU239
1340 MOVEVX,YX-32:VDU240
1350 MOVEVX,YX-32:VDU241
1360 ENDPROC
1370 DEFPROCINIT
1380 VDU23,230,878,8FC,0,0,0,848,8C8,88
8
1390 VDU23,231,888,0,838,878,848,848,84
8,0
1400 VDU23,232,0,0,0,0,830,830,870
1410 VDU23,233,873,878,840,0,0,0,86C
1420 VDU23,234,0,0,830,838,830,0,0,0
1430 VDU23,235,4,880,0,0,0,0,0
1440 VDU23,236,81E,83F,0,0,0,812,813,81
1
1450 VDU23,237,0,0,0,0,12,12,14
1460 VDU23,238,0,0,12,81C,12,0,0,0
1470 VDU23,239,820,0,81C,81E,812,812,81
2,0
1480 VDU23,240,8CE,81C,2,0,0,0,836
1490 VDU23,241,820,1,0,0,0,0,0
1500 VDU23,242,0,0,0,818,818,0,0,0
1510 VDU23,243,818,818,87E,87E,87E,818,
818,818
1520 ENVELOPE1,1,0,0,0,1,0,0,127,0,0,-4
,127,127
1530 ENDPROC
1540 DEFPROCDRAWCACTI
1550 GCOLOR,3
1560 FORTX=0TO192STEP20:MOVE600,TX+100:
VDU42:MOVE600,TX+600:VDU42:SOUND0,-15,6,
1
1570 FORTD=0TO500:NEXT
1580 NEXT
1590 ENDPROC
1600 DEFPROCTITLE
1610 PRINTTAB(10);CHR$(141);"C-O-W-B-O-
Y""TAB(10);CHR$(141);"C-O-W-B-O-Y""
1620 PRINT:PRINT"The idea of the game i
s to shoot your"
1630 PRINT"opponent's cowboy three time
s."
1640 PRINT"Each player is limited to xi
x bullets"
1650 PRINT"per screen."
1660 PRINT
1670 PRINT"Player names must be less th
an 15 chars."
1680 INPUT"Left hand player's name",L$
1690 IFLEN(L$)>14THEN1680
1700 PRINT
1710 INPUT"Right hand player's name",R$
1720 IFLEN(R$)>14THEN1710
1730 PRINT
1740 INPUT"Bullet Speed 0 to 5 (5=Fast)
",BSX
1750 IFBSX<0ORBSX>5THEN1740
1760 BSX=BSX+5
1770 ENDPROC
>
```

### Relocation routine.

```
*KEYO"FOR I$ = 0 TO TOP-PAGE STEP 4:
!(8EO+I$) = !(PAGE+I$): NEXT I$;MPAGE=8EO0
;MOLD;M"
```

# Collectors aid

MIKE COOMBS of Newport, Gwent has sent us in a program for keeping aircraft spotters' records. There are probably not many readers of this magazine who are aircraft spotters as well as computer buffs, but it does provide a good example of a useful form of database in which objects

and their attributes can be entered, subsequently listed and also searched for. With some modification of the text the program could be used for bird-watchers, philatelists, collectors or indeed anyone who has a collection of records to file and read. One bug remains in the program. If

you read through the records and find that you want press N in reply to the question

Scroll?

the program is broken and the data is lost. The whole program then has to be reloaded from tape. Is there an answer to this?

```
10 REM Aircraft-Spotters' Record
      by M.Coombes (1983)

30 LET m=800: DIM z$(m,1): DIM r$(m,9): DIM t$(m,5): DIM o$(m,10): DIM d$(m,8): DIM f$(m,10)
40 LET r=0
50 FOR f=0 TO 7: POKE USR "a"+f,0: NEXT f: POKE USR "a"+4,255: POKE USR "a"+5,255: LET t$=""

100 REM Menu
110 INK 7: BRIGHT 0: BORDER 1: PAPER 1: CLS
120 BRIGHT 1: DRAW 255,0: DRAW 0,175: DRAW -255,0: DRAW 0,-175
130 PRINT AT 1,3: INK 5: "AIRCRAFT-SPOTTERS' RECORD"; AT 3,10: INK 7: "By M.Coombes"
140 INK 6: PRINT AT 6,4: "PRESS A to print record"; AT 7,12: "on screen"
150 PRINT AT 9,4: "PRESS B to print record"; AT 10,12: "on printer"
160 PRINT AT 12,4: "PRESS C to alter record"
170 PRINT AT 14,4: "PRESS D to search for"; AT 15,12: "record"
180 PRINT AT 17,4: "PRESS E to save to tape"
190 PRINT AT 19,4: "PRESS X to exit"
200 PRINT AT 6,10: INK 2: PAPER 6: FLASH 1: "A"; AT 9,10: "B"; AT 12,10: "C"; AT 14,10: "D"; AT 17,10: "E"; AT 19,10: "X"
202 BEEP .1,20: BEEP .1,10
205 INK 7
210 LET i$=INKEY$: IF i$="" THEN GO TO 210
220 RESTORE 235: FOR f=1 TO 6: READ a$,b$: IF a$=i$ THEN BRIGHT 0: BORDER 7: PAPER 7: CLS: INK 0: GO TO b
230 NEXT f
232 GO TO 210
235 DATA "a",1000,"b",1000,"c",2000,"d",3000,"e",4000,"x",9000
1000 REM PRINT RECORD
1002 LET ret=100
1005 IF r=0 THEN PRINT AT 10,3: INK 2: "NO RECORDS IN MEMORY"
1010 IF i$="a" THEN LET s=2: GO TO 1030
1020 LET s=3
1030 INK 1: FOR f=1 TO r: PRINT #s;t$: INK 2: "Record number: ";f
1040 INK 1: PRINT #s;"Aircraft registration: ";r$(f)
1050 PRINT #s;"Aircraft type: ";t$(f)
1060 PRINT #s;"Operator: ";o$(f)
1070 PRINT #s;"Date seen: ";d$(f)
1080 PRINT #s;"Airport: ";f$(f)
1090 NEXT f
1100 IF i$="b" THEN GO TO 100
1500 PRINT "TAB 10; INK 2; PAPER 7; FLASH 1; "PRESS ANY KEY"
1510 GO TO 1510+(INKEY$<>"")
1520 GO TO ret
2000 REM ALTER RECORD
2005 IF r=0 THEN GO TO 2100
2010 PRINT AT 10,0: INK 1: "DO YOU WISH TO ADD A RECORD OR DELETE A RECORD? (PRESS "; INVERSE 1;
```

```
"A"; INVERSE 0;" OR "; INVERSE 1;"0"; INVERSE 0;)"
2020 IF INKEY$="a" THEN GO TO 2100
2027 LET p1=r
2030 IF INKEY$="d" THEN GO TO 2300
2040 GO TO 2020
2100 REM ADD RECORD
2110 LET r=r+1: CLS
2120 PRINT AT 7,0: INK 2;"PLEASE ENTER REGISTRATION OF AIRCRAFT IN THE FOLLOWING FORM:"
2130 PRINT "[country designator ]-[reg.]"
2140 PRINT " INK 1;"FOR EXAMPLE: G-BAJH"; AT 13,15: "PH-ARD"; AT 14,15: "EC-AJH etc..."
2150 POKE 23658,8: INPUT LINE n$: FOR f=1 TO LEN n$: IF n$(f)="-": THEN GO TO 2153
2151 NEXT f
2152 BEEP 1,-20: GO TO 2150
2153 IF LEN n$>8 THEN BEEP 1,-20: GO TO 2150
2154 POKE 23658,0: LET r$(m)=n$
2160 FOR f=1 TO LEN n$: IF n$(f)("<" THEN NEXT f
2161 IF LEN n$<f+1 THEN BEEP 1,-20: GO TO 2150
2162 LET z$(m)=n$(f+1)
2168 CLS: INPUT "Aircraft Type? (max 5 letters) "; LINE n$: IF LEN n$>5 OR n$="" THEN BEEP 1,-20: GO TO 2166
2170 LET t$(m)=n$
2180 INPUT "Operator (max 10 letters) "; LINE n$: IF LEN n$>10 OR n$="" THEN BEEP 1,-20: GO TO 2180
2190 LET o$(m)=n$
2200 INPUT "Date Seen? (max 8 letters) "; LINE n$: IF LEN n$>8 OR n$="" THEN BEEP 1,-20: GO TO 2200
2210 LET d$(m)=n$
2220 INPUT "Airport? (max 10 letters) "; LINE n$: IF LEN n$>10 OR n$="" THEN BEEP 1,-20: GO TO 2220
2230 LET f$(m)=n$
2235 GO SUB 7000
2240 PRINT AT 10,0: "ANY MORE RECORDS TO BE ADDED? (press Y or N)"
2250 IF INKEY$="y" THEN GO TO 2100
2260 IF INKEY$="n" THEN GO TO 1000
2270 GO TO 2250
2300 REM DELETE RECORD
2310 CLS: INPUT "ENTER NUMBER OF RECORD TO BE DELETED OR '0' IF NUMBER OF RECORD NOT KNOWN"; LINE n$
2315 IF n$="" THEN BEEP 1,-20: GO TO 2310
2320 FOR f=1 TO LEN n$: IF CODE n$(f)<48 OR CODE n$(f)>57 THEN BEEP 1,-20: GO TO 2310
2330 NEXT f
2335 IF n$="0" THEN LET ret=2310
2340 LET i$="a": GO TO 1010
2350 IF VAL n$>m THEN BEEP 1,-20: GO TO 2310
2337 IF z$(VAL n$,1)="" THEN GO TO 2360
2340 FOR f=VAL n$ TO r
```

(continued on next page)

(continued from previous page)

```

2350 LET z$(f)=z$(f+1): LET r$(f)
)=r$(f+1): LET t$(f)=t$(f+1): LE
T o$(f)=o$(f+1): LET d$(f)=d$(f+
1): NEXT f
2355 LET z$(r)="": LET r=r-1
2360 PRINT AT 10,0;"ANY MORE REC
ORDS TO BE DELETED? (press Y or
N)"
2370 IF INKEY$="y" THEN GO TO 23
10
2380 IF INKEY$="n" THEN GO TO 10
0
2390 GO TO 2370
3000 REM SEARCH FOR RECORD
3005 IF r=0 THEN PRINT AT 10,3;
INK 2;"* NO RECORDS IN MEMORY *"
BEEP 3,-20: GO TO 100
3010 POKE 23658,8: INPUT "ENTER
AIRCRAFT REGISTRATION TO BE SEA
RCHED FOR "
3015 POKE 23658,0: LET s$=s$+"
"
3020 FOR f=1 TO r: IF z$(f)=s$(1
) THEN GO TO 3100
3040 NEXT f
3050 GO TO 3900
3100 FOR g=f TO r: LET rec=g: FO
R f=1 TO 10: IF r$(g,f)="" THEN
LET pos=f: GO TO 3200
3110 NEXT f
3120 NEXT g
3130 GO TO 3900
3200 FOR e=1 TO 10-pos: IF s$(e)
<>r$(rec,e+pos) THEN GO TO 3120
3210 IF s$(e)="" THEN GO TO 323
0
3220 NEXT e
3300 REM RECORD FOUND

```

```

3305 BEEP .1,5: BEEP .1,10
3310 PRINT AT 4,0; INK 1;"Record
number: ";rec;AT 6,0;"Registrat
ion: ";r$(rec);AT 8,0;"Aircraft
type: ";t$(rec);AT 10,0;"Operate
r: ";o$(rec);AT 12,0;"Date seen:
";d$(rec);AT 14,0;"Airport: ";f
$(rec)
3320 PRINT AT 16,0; INK 2;"PRESS
ANY KEY..."
3330 IF INKEY$="" THEN GO TO 333
0
3340 GO TO 100
3900 REM RECORD NOT FOUND
3910 PRINT AT 9,0;"Sorry, record
not found.": BEEP .5,-20: GO TO
3320
4000 SAVE "RECORD" LINE 50
4010 GO TO 100
7000 REM SORT RECORDS
7005 IF r=1 THEN LET pl=1: GO TO
7060
7010 FOR f=1 TO r
7020 IF CODE z$(f)>CODE z$(m) TH
EN LET pl=f: GO TO 7030
7025 NEXT f
7027 LET pl=r
7030 FOR f=r TO pl+1 STEP -1
7040 LET f$(f)=f$(f-1): LET r$(f)
)=r$(f-1): LET t$(f)=t$(f-1): LE
T o$(f)=o$(f-1): LET d$(f)=d$(f-
1): LET z$(f)=z$(f-1)
7050 NEXT f
7060 LET f$(pl)=f$(m): LET r$(pl)
)=r$(m): LET t$(pl)=t$(m): LET o
$(pl)=o$(m): LET d$(pl)=d$(m): L
ET z$(pl)=z$(m)
7070 RETURN
9000 BEEP 1,20: NEW

```

### 3-D graphs

A Hill of Paisley, Scotland has submitted a routine to produce a variety of bar graph, in which the bars are drawn as if they were three-dimensional columns. The

program was written for the 48K Spectrum but I cannot see why it should not fit inside 16K or perhaps even 1K.

The program is intended to be a subroutine of another program, for as it stands the user has to enter the percentage

length of each bar. It comes to a rather abrupt halt in line 150 so this is where the main program should carry on. No colour is used, which is a pity because group comparisons could then be made, but nevertheless it is a neat and useful routine.

#### 3-D graphs.

```

1 REM GO GRAPH
2 REM @ADAM T HILL
3 PRINT TAB 13;"3D GRAPH"
5 SAVE "3D GRAPH"
10 LET C=0: LET X=0: LET Y=10
LET I=0
20 INPUT "NUMBER OF BARS (1 TO
14)";B
30 IF B<1 OR B>14 THEN GO TO 2
0
31 BEEP 1,6
40 INPUT "PERCENTAGE OF BAR(0-
100)";P
50 IF P<0 OR P>100 THEN GO TO
40
71 PLOT 0,0: DRAW 223,0
72 PLOT 0,156: DRAW 0,-165
80 FOR J=0 TO P: FOR K=X TO Y
90 PLOT K,J
100 NEXT K: NEXT J
110 PRINT AT 6,I:P
120 LET X=X+15: LET Y=Y+15
130 LET I=I+2: LET C=C+1
140 GO SUB 1000
150 IF C=B THEN STOP
160 GO TO 40
3000 IF B<0 OR B>14 THEN GO TO 4
0
1000 DRAW 5,5: DRAW 0,-P: DRAW -
5,-5
1010 DRAW -10,P: DRAW 5,5: DRAW
10,0
1020 RETURN

```

### Polygon drawer

Stephen Hollis of London WC1 remarks on the Spectrum's annoying habit of

stopping with an error report when a draw line runs off the edge of the screen. Lines 100 to 130 of his polygon-drawing program manage to overcome this problem neatly.

However, there is one small drawback since the figures distort where the lines run off and then return back on to the screen.

#### Polygon drawer.

```

0>REM @ S.HOLLIS 1983
5 RANDOMIZE
10 LET s=10: LET g=3*RND: LET
a=0
20 LET turn=PI/RND*20
30 BORDER 0: PAPER 0: INK 6: B
RIGHT 1: CLS
40 LET xx=127-s/2: LET yy=87-s
/2: PLOT xx,yy
50 LET x=s*SIN a: LET y=s*COS
a: GO SUB 100
60 LET x=s*COS a: LET y=-s*SIN
a: GO SUB 100
70 LET x=-s*SIN a: LET y=-s*CO
S a: GO SUB 100
80 LET x=-s*COS a: LET y=s*SIN
a: GO SUB 100
90 GO TO 50
100 IF x+PEEK 23677>255 THEN LE
T x=255-PEEK 23677
110 IF x+PEEK 23677<0 THEN LET
x=-PEEK 23677
120 IF y+PEEK 23678>175 THEN LE
T y=175-PEEK 23678
130 IF y+PEEK 23678<0 THEN LET
y=-PEEK 23678
140 DRAW x,y: LET a=a-turn: LET
s=s+g
150 IF INKEY$="S" OR INKEY$="s"
THEN PAUSE 50: PAUSE 0: RETURN
160 IF INKEY$<>" " THEN RUN
170 RETURN

```

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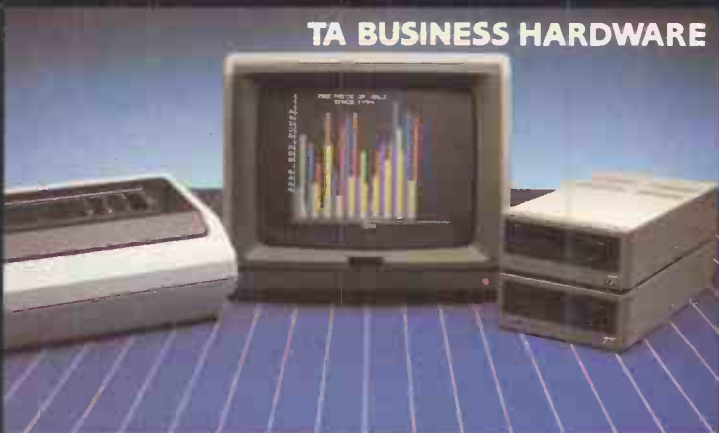
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# Tape directory

TWO INTERESTING programs have arrived from Peter Sayers of Cranleigh, Surrey. One of them is a routine which will LPrint a directory of a tape on the integral cassette recorder. I had always meant to write just such a program myself but never got round to it.

The program is quite short and could, if required, be included on every tape. It first asks you for the name of the tape and then runs through it, printing out the details such as the counter number Tapcnt, file name, length and type.

The second program does exactly the same job, but with an external cassette recorder. Unfortunately, I have no standard-size tapes on which to test it.

## Internal cassette.

```
10 INPUT"NAME";N$:LPRINTTAB(5)N$:WIND
20 T1=28
30 ONERRORGOTO200
40 OPEN"1",#1,"CASO*":CLOSE:WIND
   TAPCNT-T
50 ONERRORGOTO100
60 A$="":A=TAPCNT:L=1
70 LOAD?"CASO*":L=0:B=TAPCNT:C=B-A:
   GOSUBB0:LPRINTUSING"#### #";C;
   PEEK(&H337):GOTO30
80 FOR I= &H32C TO&H333: A=A+CHR#
   (PEEK(I))-POKE I,&H20: NEXT: LPRINT
   USING "#### #";A;A$:RETURN
100 IF(L=1) AND (TAPCNT(5000) THEN
   PRINT:GOSUB 200:LPRINT" IO ERROR":
   A$="":L=0:RESUME30 ELSE IF TAPCNT
   (5000) THEN RESUME 30 ELSE PRINT
   "NEXT TAPE":RUN
110 PRINT ERR,ERL:END
200 CLOSE:IF ERR =51 THEN WIND
   TAPCNT-T1:RESUME 50 ELSE 100
```

## External cassette.

```
10 INPUT"NAME";N$:LPRINTTAB(5)N$:WIND
20 ON ERRGR GOTO 100
30 T$="":A$=TIME$:L=1
40 LOAD?"CAS1*":L=0: B$=TIME$: TMS=A$+
   GOSUB 80: A=T: TMS=B$: GOSUB 80:
   B=T: IF A)B THEN THEN B=B+3600
50 C=B-A: GOSUB 70: LPRINT USING "####
   #";C;PEEK(&H2E3): R=R+C: GOTO 30
70 FOR I= &H2DB TO &H2DF: T=T+CHR#(
   PEEK(I)): POKEI,&H20: NEXT: LPRINT
   USING"#### #";R,T$: RETURN
80 T=VAL(MID$(T$,4,2))*60+VAL(RIGHT$
   (TMS,2)):RETURN
100 IF ERR= 53 THEN IF (L=1)
   AND (A$()) THEN PRINT: GOSUB 80:
   LPRINT" IO ERROR":A$="": L=0:
   RESUME 30
110 PRINT ERR,ERL:END
```

## Clock/calendar.

```
10 'CLOCK 30/08/83
20 '-----
30 'by Steve Dyson
50 'Initialise array of day names
70 DATASunday,Monday,Tuesday,Wednesday,
   Thursday,Friday,Saturday
80 FOR I=1TO7
90 READ$(I)
100 NEXT
120 'Initialise array of month names.
140 DATAJanuary,February,March,April,M
   ay,June,July,August,September,October,N
   oember,December
150 DIMM$(12)
160 FORI=1TO12
170 READ$(I)
180 NEXT
200 'Define time & date functions
220 DEFFNNS$=RIGHT$(TIME$,1)
230 DEFFNMS$=MID$(TIME$,4,2)
240 DEFFNH$=LEFT$(TIME$,2)
250 DEFFND$=MID$(DATE$,4,2)
260 DEFFNX$=LEFT$(DATE$,2)
270 DEFFNY$=RIGHT$(DATE$,2)
290 'Print initial time & date
310 CLS
320 LOCATEB,0,0:PRINTTIME$
330 LOCATEB,1,0:PRINT$(DAY)
340 LOCATEB,2,0:PRINTFNDS" "M$(VAL(FNX$
   )));
350 LOCATEB,3,0:PRINT"19"FNYS
380 'Update clock etc as necessary
400 OY$=FNYS
410 OX$=FNXS
420 OD$=FNDS
```

```
430 OH$=FNHS
440 OM$=FNMS
450 OS$=FNSS
460 IF OS$=FNSS$THEN460ELSELOCATEB,0,0:P
   RINTTIME$
470 IF OM$=FNMS$THEN 450 ELSE GOSUB 570
480 IF OH$=FNHS$THEN 440 ELSE SOUND 19
   ,4:SOUND 17,6
490 IFOD$=FNDS$THEN 430 ELSE LOCATEB,1,0
   :PRINT$(9):LOCATEB,1,0:PRINT$(DAY):L
   OCATEB,2,0:PRINTFNDS
500 IFOX$=FNXS$THEN420ELSE LOCATE1,2,0:
   PRINT$(9):LOCATE1,2,0:PRINT$(VAL(FN
   X$))
510 IF OY$=FNYS$THEN 410ELSE LOCATE10,3,
   0:PRINTFNYS$:GOTO 400
530 '*** subroutine to draw clock ***
550 'Undraw clock hands
570 LINE(XM1,YM1)-(XM2,YM2),PRESET
580 LINE-(XM3,YM3),PRESET
590 LINE(XH1,YH1)-(XH2,YH2),PRESET
600 LINE-(XH3,YH3),PRESET
620 'Draw perimeter of clock face
640 LINE(0,0)-(31,0),PSET
650 LINE-(31,31),PSET
660 LINE-(0,31),PSET
670 LINE-(0,0),PSET
690 'Draw hour markers
710 PSET(7,1):PSET(8,1)
720 PSET(15,1):PSET(16,1)
730 PSET(23,1):PSET(24,1)
740 PSET(30,7):PSET(30,8)
750 PSET(30,15):PSET(30,16)
760 PSET(30,23):PSET(30,24)
770 PSET(23,30):PSET(24,30)
```

```
780 PSET(15,30):PSET(16,30)
790 PSET(7,30):PSET(8,30)
800 PSET(1,23):PSET(1,24)
810 PSET(1,15):PSET(1,16)
820 PSET(1,7):PSET(1,8)
840 'Draw clock centre
860 PSET(15,15):PSET(15,16):PSET(16,15)
   :PSET(16,16)
880 'Calculate coords for & draw minute
   hand
900 A=VAL(FNMS)*.1047198
910 B=A-1.570796
920 XM1=16+SIN(B)
930 XM2=16+15*SIN(A)
940 XM3=16-SIN(B)
950 YM1=16-COS(B)
960 YM2=16-15*COS(A)
970 YM3=16+COS(B)
980 LINE(XM1,YM1)-(XM2,YM2),PSET
990 LINE-(XM3,YM3),PSET
1010 'Calculate coords for & draw hour
   hand
1030 A=VAL(FNH$)+VAL(FNMS)/60
1040 A=A*.5235988
1050 B=A-1.570796
1060 XH1=16+SIN(B)
1070 XH2=16+10*SIN(A)
1080 XH3=16-SIN(B)
1090 YH1=16-COS(B)
1100 YH2=16-10*COS(A)
1110 YH3=16+COS(B)
1120 LINE(XH1,YH1)-(XH2,YH2),PSET
1130 LINE-(XH3,YH3),PSET
1140 RETURN
60023.SAVE"ANALOCK.PC":END
```

## Clock/calendar

Steve Dyson in Zambia has turned in the following program. The program makes the HX-20 into a very expensive time-keeper. He said that he wrote it because the battery of his watch ran out. The analogue clock face changes every minute — it will not appear until the minute changes for the first time.

## Random numbers

The problem of seeding a random series of numbers can be solved using the built-in clock, as Peter Clark of Chelmsford, Essex

points out. The formula  
VAL(MID\$(TIME\$,7,2))  
will evaluate the seconds of the time at any particular moment, which may be sufficiently unpredictable to be used as a seed.

When a random series is required frequently over a period of time, it may be better to evaluate the hours, minutes and seconds of the clock and then multiply them. To ensure that the seed does not exceed 32767, which is the maximum value for Randomise, only the second digit of the hour figure should be used as follows:

```
10 H = VAL(MID$(TIME$,2,1))
20 M = VAL(MID$(TIME$,4,2))
```

```
30 S = VAL(MID$(TIME$,7,2))
40 T = (H*60 + M)*60 + S
50 RANDOMISE T
```

## Character designer

Several readers have pointed out the rather silly mistakes that I made in the character definition program on page 153 of the January issue. I complained that it branched into the monitor, but in fact it only did so because I had mistakenly typed Poke&H115,0 in line 300; the correct address is &H11F.

# Pet screen print

```

1 rem"@abcdefghijklmnopqrstuvwxyz[\]^_
2 rem" !"£$%&'()*+,-./0123456789:;<=>?
3 rem" ABCDEFGHIJKLMNOPQRSTUVWXYZ
4 rem"
5 rem above are screen codes 0 to 127

10 rem +-----+
12 rem" ! Screen Dump To Printer !
14 rem +-----+

100 a$="+";for a=1 to 40:a$=a$+"-":next
:a$=a$+" ";open4,4:print£4,,a$
110 a=32*(peek(59468)=14):m=32768
120 for y=m to m+999 step 40:p$=""
130 for x=y to y+39:p=peek(x)and127:b=p
:if p<32 then b=p+64-a-a*((p=0)+(p>26))
140 if p>63 then b=32;if p>64 and p<91
then b=p+32+a
150 p$=p$+chr$(b):next:print£4,,chr$(12
4);p$;chr$(124):next:print£4,,a$:close4
ready.
run.
```

```

1 REM"@ABCDEFGHIJKLMNopqrstuvwxyz[\]^_
2 REM" !"£$%&'()*+,-./0123456789:;<=>?
3 REM" abcdefghijklmnopqrstuvwxyz
4 REM"
5 REM ABOVE ARE SCREEN CODES 0 TO 127

10 REM +-----+
12 REM" ! sCREEN dUMP .tO pRINTER !
14 REM +-----+

100 A$="+";FOR A=1 TO 40:A$=A$+"-":NEXT
:A$=A$+" ";OPEN4,4:PRINT£4,,A$
110 A=32*(PEEK(59468)=14):M=32768
120 FOR Y=M TO M+999 STEP 40:P$=""
130 FOR X=Y TO Y+39:P=PEEK(X)AND127:B=P
:IF P<32 THEN B=P+64-A-A*((P=0)+(P>26))
140 IF P>63 THEN B=32:IF P>64 AND P<91
THEN B=P+32+A
150 P$=P$+CHR$(B):NEXT:PRINT£4,,CHR$(12
4);P$;CHR$(124):NEXT:PRINT£4,,A$:CLOSE4
READY.
RUN
```

AT ONE TIME routines to dump the contents of the Pet's screen on to the Commodore printer were all the rage and A Peake of Swansea has provided a short program to dump the screen on to an Epson printer. None of the Pet graphics are available of course, and some conversion from the Pet's screen codes into true ASCII for the printer is required.

The listing itself is given as a screen dump. In the first part of the listing the screen was in lower-case mode and in the second part it was in upper-case mode. The routine detects this, automatically altering the characters as they are printed.

The program could be used as a subroutine within a program for dumping the screen and if necessary the instructions used to generate the border could be removed by changing line 100 to

```
100 OPEN 4,4
```

and removing the two Chr\$(124), and the final Print # in line 150.

## Letter Writer revisited

In the December Commodore Open File, I included Mr Peake's Letter Writer and stated that it could also be used on the Commodore 64.

It's true, it can be used on the 64, but not without some modification as follows:

```

POKE 53,120 becomes POKE 56,120
PEEK(53) becomes PEEK(56)
POKE59468,14 becomes PRINTCHR$(14);
and line 3160 should read:
3160 GET A$:IF A$<>"space" THEN 3160
3165 POKE 198,0
```

Also, the program was written specifically for the Epson printer and will need quite a lot of reworking for the Commodore printers.

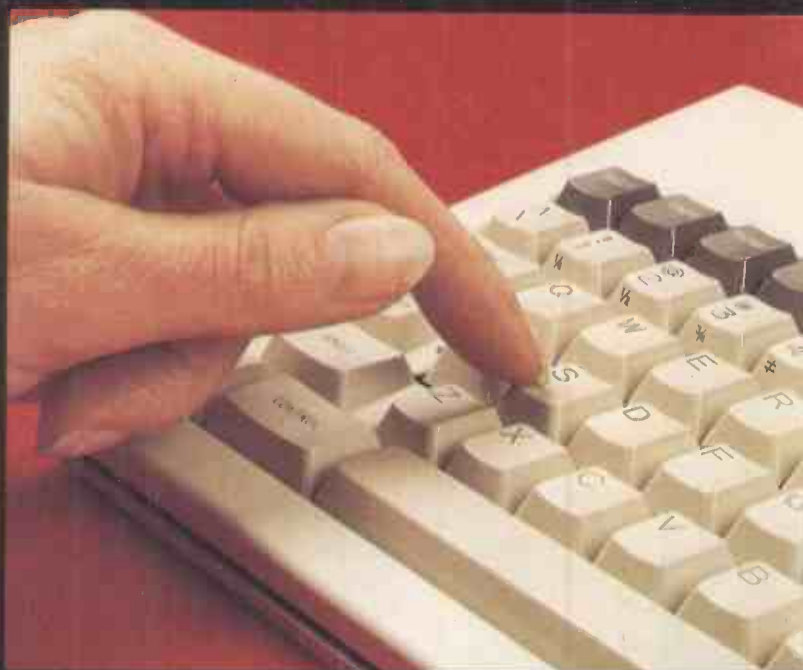
## Crashproof input

In the December 1983 issue, page 156, Doug Maloney offered one possible solution to the Pet's annoying habit of aborting a program when the Return key is pressed without any input. But his method does not work with Basic 4 machines, and I am grateful to M Pike of Poole in Dorset for reminding me of this.

He prefers to provide a default input value following the prompt, and then put the cursor back to just before this point with three Cursor Left characters. When the Pet goes to get the input data, the cursor will be sitting on top of the default response. This can be seen more clearly in line 100 where the default prompt Y is provided.

(continued on page 164)

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(continued from page 162)

The only objection to this technique is that if you overtype the Y with a space and then press Return, the program will still abort as though no input had been provided. A preferred method is given in lines 200 to 240 where the keyboard, device 0, is opened as an input file, and the Input # command is used.

In this case, line 200 opens the file and 210 prints the prompt, since prompts cannot be included within the Print # command. Line 220 receives the input. Only one Cursor Left character is required in this instance.

The program will now only continue if some input is provided, otherwise nothing happens. Once the input data has been entered, the cursor will not be reset to the start of the new line as it would with a normal Input command. Consequently line 230 must be included to do this and the file

Crashproof input.

```

100 INPUT "CONTINUE~(Y/N)~~Y[LEFT3]";V$

200 OPEN 1,0
210 PRINT "CONTINUE~(Y/N)?~~Y[LEFT]";
220 INPUT#1,A$
230 PRINT
240 CLOSE 1
    
```

closed in line 240 once all input is finished. This technique also means that the ? prompt is not issued, so if it is required it should be included in the prompt in line 210.

The Vic-20 and Commodore 64 do not

have the problem of aborting under these circumstances. Instead they continue the program, leaving the variable unchanged. This technique can be used with the Vic and 64 to suppress the ? prompt and prevent the program continuing with no input.

Shutter Speed.

1 REM SHUTTER TIMING - PET

```

10 DATA 120,169,1,44,79
20 DATA 232,208,251,238,55
30 DATA 3,208,8,238,56
40 DATA 3,208,3,238,57
50 DATA 3,44,79,232,240
60 DATA 238,88,96,0,0
70 B =826
    
```

```

100 FOR I=B TO B+29
110 READ Q: POKE I,Q
120 NEXT
    
```

```

130 PRINT "READY TO MEASURE"
140 POKE B-3,0:POKE B-2,0
:POKE B-1,0
150 SYS(B)
160 A=PEEK(B-3)+256*PEEK(B-2)
: +65536*PEEK(B-1)
170 PRINT A*16E-6;"SECONDS"
    
```

1 REM SHUTTER TIMING - VIC

```

10 DATA 120,169,1,44,16
20 DATA 145,208,251,238,60
30 DATA 3,208,8,238,61
40 DATA 3,208,3,238,62
50 DATA 3,44,16,145,240
60 DATA 238,88,96,0,0
70 B =831
    
```

```

100 FOR I=B TO B+29
110 READ Q: POKE I,Q
120 NEXT
    
```

```

130 PRINT "READY TO MEASURE"
140 POKE B-3,0:POKE B-2,0
:POKE B-1,0
150 SYS(B)
160 A=PEEK(B-3)+256*PEEK(B-2)
: +65536*PEEK(B-1)
170 PRINT A*16E-6;"SECONDS"
    
```

## Shutter Speed

Checking a camera's shutter speed is a useful project for a personal computer. R M Boardman of Hemel Hempstead has produced a simple program which will allow this to be done, given a small amount of extra hardware.

The technique is to connect a silicon photo-transistor, such as a FPT-100, to the user port with the collector to pin C and the emitter to pin A. The base is not connected.

With the light detector connected enter

the following simple program:

```
10 PRINT PEEK(59471):GOTO 10
```

and then place the detector behind the camera with its shutter open and a lamp in front of the camera. Running the program will display a list of numbers: 255 when the light detector is in darkness and 254 when the light from the lamp is shining on it. If necessary, adjust the position of the detector and lamp so that the number displayed is 254 when the shutter is open and 255 when it is closed.

Although Basic can be used to time very

long shutter speeds, machine code must be used for the faster speeds. Before running the actual timing program given in the listings, set up the detector, light source and camera. With the shutter closed, Run the program. It first loads the machine code and then prints

READY TO MEASURE

on the screen.

At this point release the shutter and read the timing from the screen. For best results you should repeat the measurement several times and calculate the average. □

# Counting the cost

CARCOST is an Oric program to calculate the cost of running a vehicle. It takes into account interest lost on the capital invested in the vehicle as well as all the normal running costs. The result is presented as cost per mile.

The program is very straightforward to

use, and presents a series of questions on the cost of different items. Decimal points may be used, as well as negative numbers.

After the first run, 0 may be entered to keep the entered amounts the same. One item at a time can be changed and the result noted. The program asks

run again?  
at the end.

There are no graphics, so the program is very easy to adapt to other machines. The only things that need to be changed are the control codes for the screen and the tune, which may be omitted.

```

1 REM CARCOST V1.0 (c)MARTIN WADE 1984
10 REM initialise screen
20 CLS:PAPER4:INK7:X=.00001
30 D1=X:T1=X:S1=X:I1=X:R1=X:M1=X:P1=X:G1=X:A1=X
40 REM caps and cursor off
50 PRINTCHR$(20),CHR$(17)
60 REM print title
70 PRINTSPC(6),"CAR RUNNING COSTS"
80 PRINT:PRINTSPC(5),CHR$(96);" MARTIN WADE 1984"
90 PRINT:PRINT
100 PRINT"IF NO DATA CHANGE REQUIRED - ENTER 0"
110 PRINT:PRINT
120 REM enter data
130 INPUT"AMOUNT PAID FOR CAR £";A
140 PRINT
150 INPUT"YEARLY DEPRECIATION OF CAR £";D
160 PRINT
170 INPUT"COST OF TYRES PER YEAR £";T
180 PRINT
190 INPUT"COST OF SERVICING EACH YEAR £";S
200 PRINT
210 INPUT"INSURANCE COSTS PER YEAR £";I
220 PRINT
230 INPUT"ROAD TAX PER YEAR £";R
240 PRINT
250 PRINT"MILES PER YEAR";:INPUTM
260 PRINT:INPUT"PRICE OF PETROL PER GALLON £";P
270 PRINT:INPUT"M.P.G. OF YOUR CAR";:G
280 REM check if data has changed
290 IFD<>0THEND1=D
300 IFT<>0THENT1=T
310 IFS<>0THENS1=S
320 IFI<>0THENI1=I
330 IFR<>0THENR1=R
340 IFM<>0THENM1=M
350 IFF<>0THENP1=P
360 IFG<>0THENG1=G
370 IFA<>0THENA1=A
380 REM find interest lost on capital
390 A2=A1*.12
400 REM find m.p.g.
410 MFG=P1/G1
420 REM find cost per mile (CPM)
430 CPM=(A2+D1+I1+R1+T1+S1)/M1+MFG
440 REM round off result
450 X=(CPM*100):X=INT(X)
460 Y=(CPM*1000)-(X*10):Y=INT(Y)
470 IFY>4 THEN X=X+1
480 CPM=X/100
500 REM play tune
510 GOSUB1000
600 REM print result
610 PRINT:FORN=1TO37:PRINT"*";:NEXTN
620 PRINT" ":PRINTSPC(8)"COST PER MILE = £";CFM
630 PRINT:FORN=1TO37:PRINT"*";:NEXTN
640 WAIT500:PRINT" ":PRINT"RUN AGAIN ?";:GETY$
650 REM re-run program
660 IFY$="y"THENCLS:GOTO90
670 REM caps and cursor on - end
680 PRINTCHR$(20),CHR$(17),CHR$(12):PAPER0:END
1000 REM tune
1010 RESTORE
1020 FORI=1TO9
1030 READX,Y
1040 MUSIC1,4,X,7:MUSIC2,4,(X+2),7
1050 PLAY3,0,0,0
1060 WAITY
1070 PLAY0,0,0,0
1080 NEXTI
1090 RETURN
1100 DATA3,20,4,20,5,20,4,20,5,20,6,20,5,20,6,20,7,80

```

## 3-D plotter

Daniel Freeman has converted his three-dimensional plotter program to run on the Sinclair Spectrum, BBC Micro and ACT Sirius. It was first published on page 154 of the September issue of *Practical*

*Computing in Research Machines Basic.*

The programs allow you to enter a formula.

```

1/(COS(X/2)*COS(Y/2)+1.1)
1/(COS(X)*SIN(Y)+1.1)
1.5/(COS(X)*SIN(Y/2)+1.1)
1.5/(COS(X)*SIN(Y/3)+1.1)
1/(COS(X)*COS(Y)+1.1)

```

$(\sin(X/3)*2) \uparrow 3 + (\sin(Y/3)*2) \uparrow 3$

Each gives a different result, and by trial and error you will also be able to invent your formulae.

The two BBC Basic listings give different results. In the GBasic listing for the ACT Sirius the formula is defined by the Def FN statement in line 50.

3-D plotting.  
Sirius version.

```

10 REM A GRAPHICS PROGRAM - BY DANIEL FREEMAN.
20 SCREEN 2
30 KEY OFF
40 CLS 2
50 DEF FNA=1/(COS(X/2)*COS(Y/2)+1.1)+2
60 FOR Y=0 TO 8 STEP .25
70 LET K=1
80 FOR X=0 TO 8 STEP .25

```

(continued on next page)

(continued from previous page)

```

90 IF K=1 THEN PSET (50*(X+Y),279-(Y-X+FNA)*10 ) ELSE LINE -(50*(X+Y),279-(Y-X+F
NA)*10)
100 LET K=0
110 NEXT X
120 LINE-(50*(Y+8),279-(Y-X+2)*10)
130 NEXT Y
140 FOR X=0 TO 8 STEP .25
150 PSET (50*X,259+10*X)
160 FOR Y=0 TO 8 STEP .25
170 LINE -(50*(Y+X),279-(Y-X+FNA)*10)
180 NEXT Y
190 NEXT X

```

BBC versions.

LIST

```

10 REM 3D GRAPH PLOTTING ROUTINE
20 REM BY DANIEL FREEMAN.
30 MODE 1 : REM MODE 4 ON BBC 'A'
40 INPUT F$
50 FOR Y=0 TO 8 STEP 0.25
60 LET K=69
70 FOR X=0 TO 8 STEP 0.25
80 GCOL 1,3
90 PLOT K,80*(X+Y),341+(Y-X+2+EVAL(F$))*30
100 LET K=5
110 NEXT X
120 GCOL 1,1
130 DRAW 80*(Y+8),341+(Y-X+2)*30
140 NEXT Y
150 FOR X=0 TO 8 STEP 0.25
160 PLOT 69,80*X,341-30*X+60
170 GCOL 1,1
180 FOR Y=0 TO 8 STEP 0.25
190 PLOT 5,80*(Y+X),341+(Y-X+2+EVAL(F$))*30
200 GCOL 1,3
210 NEXT Y
220 NEXT X

```

LIST

```

10 REM 3D GRAPH PLOTTING ROUTINE
20 REM BY DANIEL FREEMAN.
30 MODE 1 : REM MODE 4 ON BBC 'A'
40 INPUT F$
50 FOR Y=0 TO 8 STEP 0.5
60 LET K=69
70 FOR X=0 TO 8 STEP 0.5
80 GCOL 1,3
85 IF X=INT(X) THEN LET K=69 ELSE LET K=5
90 PLOT K,80*(X+Y),341+(Y-X+2+EVAL(F$))*30
100 LET K=5
110 NEXT X
120 GCOL 1,1
130 DRAW 80*(Y+8),341+(Y-X+2)*30
140 NEXT Y
150 FOR X=0 TO 8 STEP 0.5
160 PLOT 69,80*X,341-30*X+60
170 GCOL 1,1
180 FOR Y=0 TO 8 STEP 0.5
185 IF Y=INT(Y) THEN LET K=5 ELSE LET K=69
190 PLOT K,80*(Y+X),341+(Y-X+2+EVAL(F$))*30
200 GCOL 1,3
210 NEXT Y
220 NEXT X

```

Spectrum version.

```

10 REM A Graphics Program.
20 REM by Daniel Freeman.
30 INPUT f$
40 PRINT f$
50 FOR y=0 TO 8 STEP 0.5
60 LET k=1
70 FOR x=0 TO 8 STEP 0.5
80 IF k=1 THEN PLOT 15*(y+x), (
y-x+2+VAL f$)*6+50
90 IF k=0 THEN DRAW 15*(y+x)-P
EEK 23677,(y-x+2+VAL f$)*6-PEEK
23678+50

```

```

100 LET k=0
110 NEXT x
120 DRAW 15*(y+8)-PEEK 23677,(y
-x+2)*6-PEEK 23678+50
130 NEXT y
140 FOR x=0 TO 8 STEP 0.5
150 PLOT 15*x,-6*x+62
170 FOR y=0 TO 8 STEP 0.5
180 DRAW 15*(y+x)-PEEK 23677,(y
-x+2+VAL f$)*6-PEEK 23678+50
200 NEXT y
210 NEXT x

```

# Sinclair ZX Microdrives and ZX Interface 1

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The unique ZX Microdrive system sets the ZX Spectrum apart from all other computer systems.

At a fraction of the cost of floppy discs, it gives fast access to 85K of program and data on Microdrive cartridges. And it opens up exciting possibilities through an RS232 interface and local area network.

### **ZX Microdrives – the fast way to save or load 85K of program and data. £49.95**

ZX Microdrives are controlled by ZX Interface 1.

For their compact size, they're massively powerful. Each interchangeable Microdrive cartridge stores at least 85K of program and data!

You can create up to 50 files on the cartridge – identified by titles of your own choice.

And when you want to display the data again, Microdrives give you lightning-fast access:

- Just 3.5 seconds to access a typical file.
- Only 9 seconds to LOAD a typical 48K program.

ZX Microdrives use the Spectrum's own power supply.

Your first Microdrive is connected to Interface 1 by a Microdrive lead. Then, up to 7 more Microdrives can be added using Microdrive connectors. That gives you a minimum of 680K bytes of on-line capacity.

With memory like that, the possibilities are limitless – stock control, word-processing, even huge adventure games!

With each Microdrive, you'll receive a Microdrive connector and Microdrive demonstration

cartridge. Blank Microdrive cartridges cost £4.95 each. They are available in packs of 4 (with a free cartridge wallet) or singly.

### **ZX Interface 1 – the multi-purpose controller. £49.95**

ZX Interface 1 is a multi-purpose device. It controls up to 8 Microdrives. And it adds file-handling and communication facilities to your Spectrum.

So in one low-priced unit, you also get these two built-in features:

- **RS232 interface** This industry standard interface allows you to link your Spectrum with full-size printers, communicate with other computers employing RS232, and transmit data over telephone lines via modems.

- **The ZX Net** Now you and your friends can transfer programs and data on a local area network – or even play computer games together.

The ZX Net makes it easy, and fast!

It links between 2 and 64 Spectrums, transmitting at 10,000 characters per second. (So a full screen is transferred in around 3 seconds!) With the ZX Net, only one person need type in a program. And a Microdrive or printer can be shared by everyone in the network!

ZX Interface 1 offers you all these facilities, and retains the same peripheral port as the Spectrum itself.

With each ZX Interface 1, you'll receive a connecting lead for the first Microdrive; a ZX Net

lead with jack plugs; plus a comprehensive manual. An RS232 lead is available as an optional extra at £14.95.

Available from: larger branches of Boots • WHSmith Computer Stockists • Greens Computer Centres • Spectrum Computer Stores • and larger branches of John Menzies • Dixons • Laskys • Currys • John Lewis Partnership • Rumbelows • British Home Stores • House of Fraser and many other good computer stockists nationwide.

### **Find out more – in your local shop!**

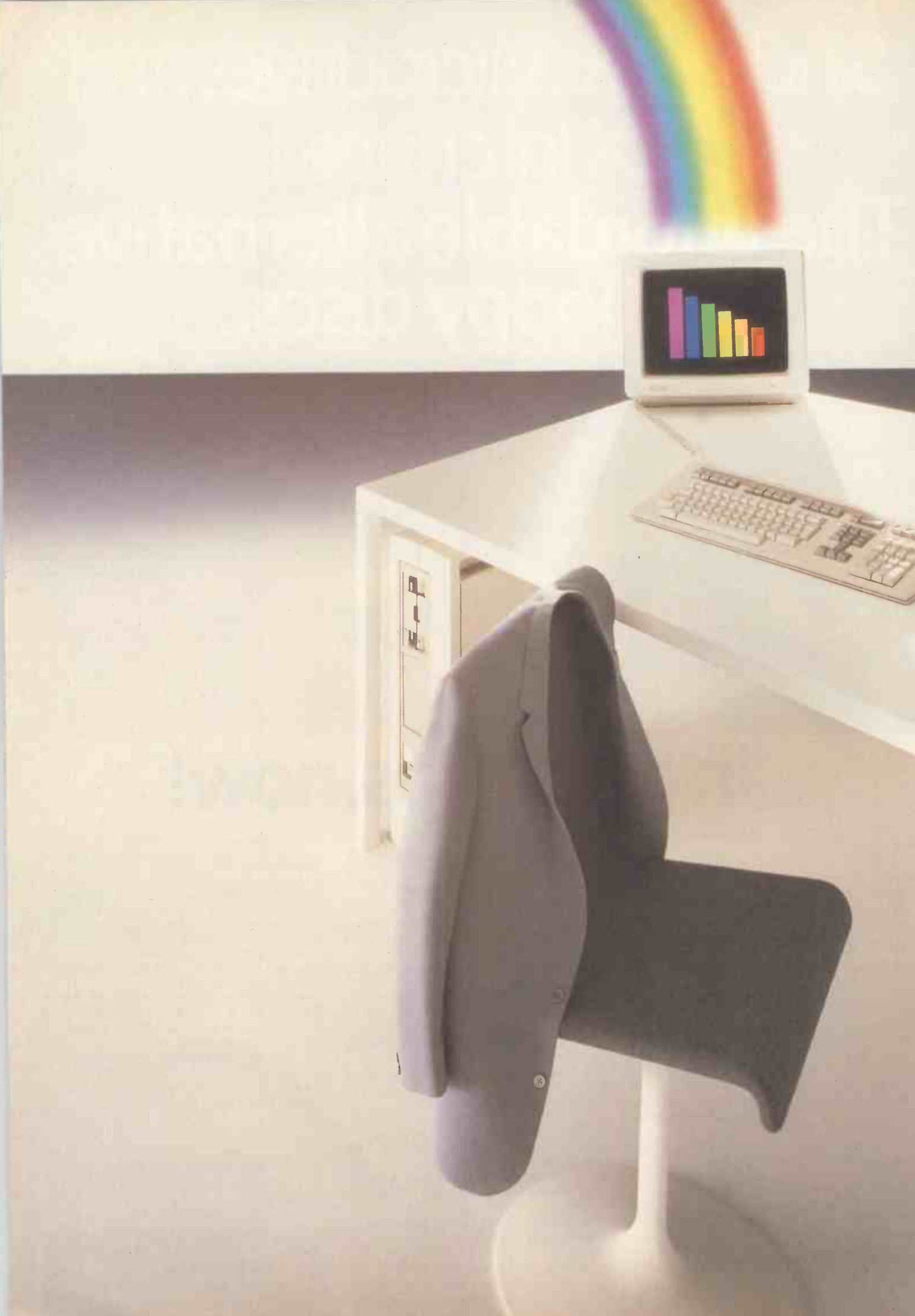
The best way to evaluate ZX Microdrives and Interface 1 is to see them for yourself.

There is a full range of ZX peripherals – including ZX Interface 2 for joystick and ROM Cartridge capability, alongside the only computer that supports them – the ZX Spectrum!

For more information, telephone Sinclair Research Ltd, on 0276 685311.

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SINCE the introduction of the Apple II I doubt whether there is a big market for *The Easy Guide to your Apple II* by Joseph Kascmer, *Apple II Basic Programs in Minutes* by Stanley R Trost and *Disks, Files, and Printers for the Apple II* by Brian D Blackwood and George H Blackwood. Moreover, these might have been fine five years ago, when there were no introductory texts, and there were no user magazines and groups to hold the beginner's hand. But they are too general and too basic today.

There are hundreds of books on programming in Basic. You can take your pick from *Programming the Apple in Basic* by Paul Tebbe, *Applesoft Language* by Brian and George Blackwood, *Hands-on Basic for the Apple II* by Herbert Peckham, *Better Basic for the Apple* by J N P Hume and R C Holt, *Fancy Programming in Applesoft* by Gabriel Cuellar, and *Basic for the Apple II* by Larry Joel Goldstein and Martin Goldstein.

Douglas Hergert's *The Apple II Basic Handbook* is marginally more useful than some of the others as it is organised as a reference book, but it is not much better than the Applesoft manual. *Exploring Applesoft* by Roger McShane is more fun and more useful than most of the Basic tutorials despite its high price. The examples are well chosen and attention is paid to programming style and technique. If I had to choose among the endless Basic primers, I would settle for the Blackwoods' offering, which seemed to be the most general in its approach. It includes good discussions of general programming concepts, which would be portable into another language.

Fortran is as standard in some

# Bushel of books

Christopher Roper looks at some of the literature available to help you understand your Apple computer.

computing environments as a white shirt is at IBM. There are huge libraries of subroutines written in Fortran in every university computer centre and most industrial installations. But Fortran is designed for a mainframe environment. Apple Fortran uses the Apple Pascal UCSD operating system. If you are going that far, why not use Pascal or Modula-2? But there's no accounting for taste, and someone may find a use for *Apple Fortran*, another title by that industrious pair Brian and George Blackwood.

One genre of books I found useful when I began to get interested in micros was that covering writing games. Out of the two books *Apple Graphics Games* by Paul Coletta, which includes a demo disc, and *Games Apples Play* by Mark James Capella and Michael Weinstock, I preferred the former. This is mainly because I loathe keying other people's Basic programs into my computer. However, both books would answer questions about how computer

games are constructed, and might stimulate ideas about how they could be improved.

There were several annoying bugs in the programs provided on the Coletta disc, but maybe part of the challenge is to sort them out. All the programs can be listed out, and are analysed. Both books would be good additions to a school computer library, in particular to provide source material for projects.

*Apple II Computer Graphics* by Ken Williams, Bob Kernaghan and Lisa Kernaghan is a good complement to the games books. It takes you through the capabilities of Apple graphics, down to high-resolution animations, and should liven up some of the games. Another book which does its job well is *Apple Graphics Activities Handbook* by Harold Bailey and J Edward Kerlin. Work your way through the projects and exercises and you will know as much as you will ever need to about Apple graphics. Compared with

(continued on next page)



## Bushel of books

(continued from previous page)

most of the other books on offer this is a real bargain.

The book I enjoyed most is *Apple II Assembly Language Tutor* by Richard Haskell, which includes a disc. Haskell's text is built around a screen simulation of the 6502 processor. You write assembly language programs and can then step through them, watching the registers changing. This is the perfect preparation for using one of the powerful Apple II assemblers, such as Merlin, which open the way to serious games programming on the Apple.

A similar case may be out for *Apple II Applications* by Marvin de Jong, which tells you how to use the Apple II "to make measurements of physical quantities, to control other devices, and to communicate with other computers". This really is an excellent introduction to interfacing and practical electronics, using the Apple II as your laboratory. I would recommend this book highly to anyone without an electronics background who wants to understand something of the hardware side of microcomputing.

Both Haskell and de Jong pitch their books at exactly the right level. They are not merely rehashing the Apple manuals but give you the tools you need to advance in understanding computing. They will also keep you busy for a good number of hours and emerge with a clearer understanding of your computer's capabilities.

There are also rows of books on applications programming for the Apple, including *Accountant's Basic Programming for the Apple II* by Alan J Parker, *Database Management for the Apple* by Nat Wadsworth, and *Executive VisiCalc for the Apple Computer* by Roger E Clark. I didn't like the first two much better than I liked the Basic primers. I do not believe accountants will sit down and write programs in Basic when they can use professionally programmed ledgers. The same applies to databases. It is impossible to write a useful database-management program in Basic. By useful, I mean a program which is significantly better than its paper-based equivalent.

VisiCalc primers are rather different. Spreadsheets are extremely useful and often it is not easy to get the best from them on the basis of the information provided by the manual alone. At the same time, there are lots of different books and Roger Clark does not break new ground.

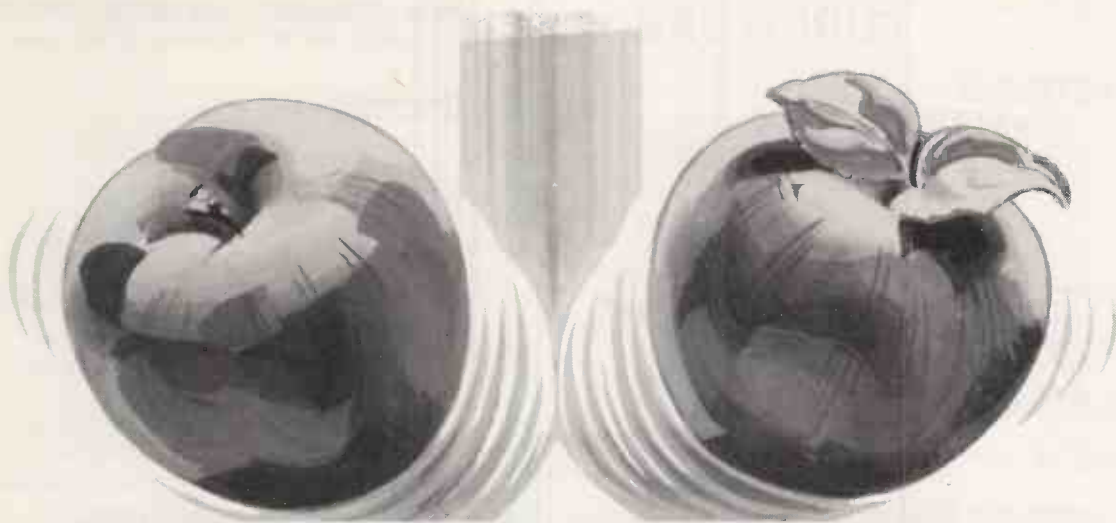
Before you sit down to write that great program which will make your fortune, you could do worse than consult *Apple Computer Software 1983* edited by Jeffrey Stanton, Robert Wells and Sandra Rochowansky. This is a well presented

compendium of things you can do with your Apple without writing a line of code. My main complaint concerns some curious omissions. No mention of Pascal, for example; Forth and Logo are the only alternatives to Basic. In general, its games reviews are of a higher standard than its business software reviews. Clearly the book was written before the appearance of the

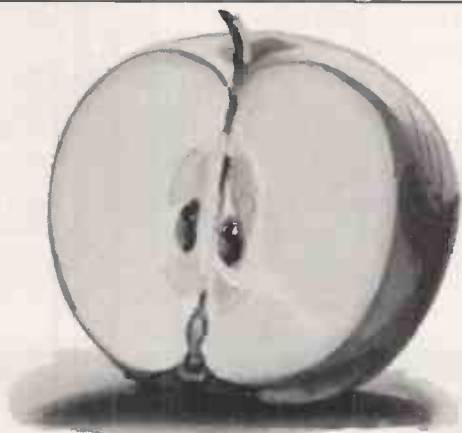
IIe, and a good deal has happened in the intervening period, particularly when it comes to hardware add-ons.

Except for those by Haskell and de Jong, the books cover well trodden ground without adding much to the sum of knowledge. One problem for publishers is that the microcomputer industry moves faster than they can. □

- Accountant's Basic Programming for the Apple II*, by Alan J Parker and John F Stewart. Published by Prentice Hall International, £12.70. ISBN 0 8359 0047 9
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- Applesoft Language*, by Brian D Blackwood and George H Blackwood, second edition. Published by Prentice Hall International, £11.85. ISBN 0 00 022073 6
- Basic for the Apple II — Programming and Applications*, by Larry Joel Goldstein and Martin Goldstein. Published by Prentice Hall International, \$14.95. ISBN 0 89303 189 5
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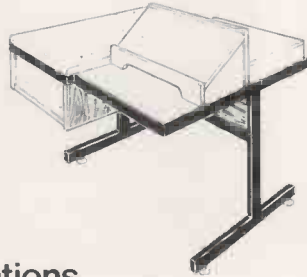
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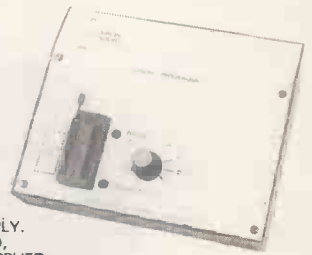
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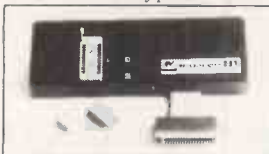
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>NEXT MONTH

>ROBOTS

Next month's special section covers one of the most interesting aspects of computing today, Robots. We start with turtles in the primary school, and learn the secrets of micromice from Britain's top mouser Alan Dibley. The Craftsman Robot Project shows how home computers can perform complex industrial tasks. We also provide a detailed rundown on the home robot Hero, and a guide to cheap robot arms for use with micros.

>REVIEWS

The Epson PX-8 is the most exciting portable yet to hit the market, so we will be reviewing this second-generation machine.

And there are three new home computers offering microfloppy-disc drives and serious computing at a low price — the Amstrad CPC 464, the Oric Atmos and the Tatung Einstein. We will be assessing their relative merits, and reviewing the Atmos in depth. Watch out for a preview of the new Apple IIc, too.

On the software side, there will be reviews of Apple's new Prodos, the integrated software package Jane, and a first look at Open Access on the IBM PC.

>AND MUCH MORE

David Levy tells how he played the world's best chess computer, a Cray XMP, for a \$5,000 stake.

Plus there will be programs and programming features on how to really use your BBC's function keys, improve your sorting techniques and much, much more.

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# Copying ahoy!

Barry Miles discusses the nature of software piracy and how companies are trying to avoid it.

THERE IS considerable interest in the subject of piracy these days. Not the skull and crossbones variety but the software sort. It is not very long since *Personal Computer World* agreed to pay £65,000 damages to Acorn who was very upset by Guy Kewney giving publicity to a technique for copying its programs. The story was covered in Jack Schofield's Editorial in the March issue of *Practical Computing*.

The subject gained extra poignancy when another piece of English software was the subject of a court case in Holland. In this case, the well-known word processor program Vizawrite, by Kelvin Lacy of Viza Software, was alleged to be illegally on sale in shops in Holland. The outcome of the case was that damages were awarded against the seller of the pirated English and American programs in Holland.

The miscreant was an unknown character who signs his work with a number. In this case he added the number to the heading of the program. Apparently on other programs he has the audacity to add it to the copyright notice, so that it might read: Copyright Llamasoft, Broken by 1103. His *modus operandi* is to break the security of the program and send it anonymously to a retailer. The retailer is obviously tempted to sell large quantities of the program, paying only for the media and the manual to be printed.

## Incitement

These two cases are poles apart of course. The *PCW* case was very unusual because the view taken was that Kewney's article was an incitement to break the copyright law. To the layperson this is pretty far-fetched. However, the doctrine of incitement can be carried to extremes. For example, recently there was a successful prosecution of a person running a flower stall. The offence was one of enticing people to commit a parking offence. This seems to be an amazing extension of responsibility for other people's actions.

There is a company advertising a product in America which is designed to copy any disc at all which runs on a popular microcomputer. The company concerned is unabashed by the criticism which has been heaped upon it by a software house. A representative told me, "We have been inundated with complaints by software houses of course, but we are shipping hundreds a week of the package, and we have had to get the architects in to discuss enlarging our building. The guy who sells the gun is not responsible for the killing which is done with it!"

It seems a pity that the Kewney case did not go to court, because the logical extension of the view being taken about responsibility here is that anyone is responsible for anything which is wrongfully done on the basis of their writings. This is patently absurd. If it were true, then the mail order house which sold

Lee Harvey Oswald his rifle should have been charged with being an accessory before the fact in the murder of President Kennedy, and any author of a book on unarmed combat could be held responsible for the killing of someone by a student of such a work.

It seems we should make a very severe distinction between copying and piracy. Every user is anxious not to lose the use of program on which they rely. In the case of the business user, it would be the height of folly to rely on a single copy of a payroll program or accounting packages. Similarly, if you are using a spreadsheet or database program daily, it would be idiotic for you not to have a backup program.

Wise users seek to make a backup of any program before using it, and store the original for safety. However, they are often confounded by the attempts of the software house to avoid piracy. An English company which manufactures a program for enabling all Vic tapes to be copied obtained counsel's opinion as to the legality of selling such a program, and was assured that no successful action could be brought.

Why then did *PCW* feel obliged to settle out of court? This would appear to be the result of the pressure of the enormous market for computer magazines, and the loss of potential sales which might have occurred if sales were delayed by waiting for the court hearing to take place. Legal history is full of cases of people setting out of court as a result of external considerations, even when they might have won.

This all seems very unsatisfactory. But the software houses are in a dilemma. Some of them will replace your disc for a small fee if you send it back to them, but this does not solve the problem of what happens to your work in the meantime. Others will sell you two discs when you buy the program. However, they are taking a chance since it is rumoured that in Holland you can buy a copy of a certain well-known database program, well below market price, but what you get is a photocopy of the manual and a single disc.

Other attempts to secure programs have unforeseen results. DOS-protected discs

which cause the disc drives to behave in an unusual way are preferred by some users on the grounds that they are better than having to plug a security device into one of the sockets of the machine. However, evidence is coming to light that certain disc drives do not take kindly to this treatment and can suffer from being sent out of alignment as a result. Thus all access to your data is prevented until the drive can be re-aligned by an expert engineer. This is not too bad in a small country but what if your nearest dealer is several hundred miles away? Yet another approach is possible; bring the price down to the point where copying is not worth bothering with.

## Free advertising

Honeyfold Software takes the view that making the software which accompanies its books freely copyable is a good move because every time the copies are run it gets a free advertisement. In any case the books are so cheap that it is not worth making photocopies of them. Therefore the people who have a chance to copy the programs will not bother to do so.

Perhaps lengthy, American-style manuals are an answer. Make the manuals too voluminous to copy, and the documentation becomes the security device. But this brings other unfortunate consequences, the trend is for programs to become more user-friendly, and to be provided with comprehensible on-screen prompts. For extreme cases of difficulty, Help screens are commonly available too. All of this tends to reduce reliance on the manuals, so this story promises to be a continuing one.

It is only recently that we have got around to paying the authors of books any sort of royalty at all for the use of their copyright by public libraries. Furthermore, it would be almost impossible to find any owner of a cassette recorder who has not used it illegally to record copyright material. Similarly, there cannot be a single photocopier which remains untainted by wrongful use. We have a long way to go in protecting the rights of authors and publishers. □



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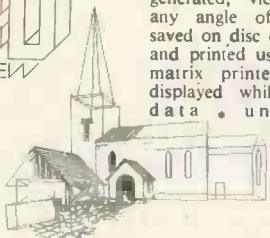
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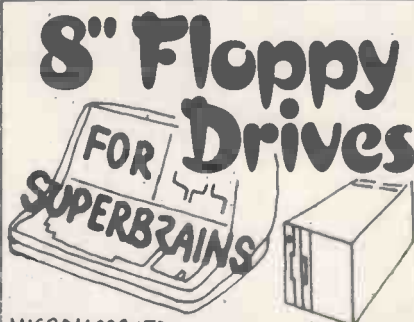
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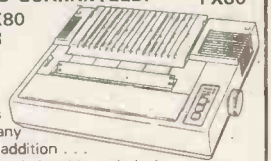
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