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85p November 1983
Volume 6 Issue 11

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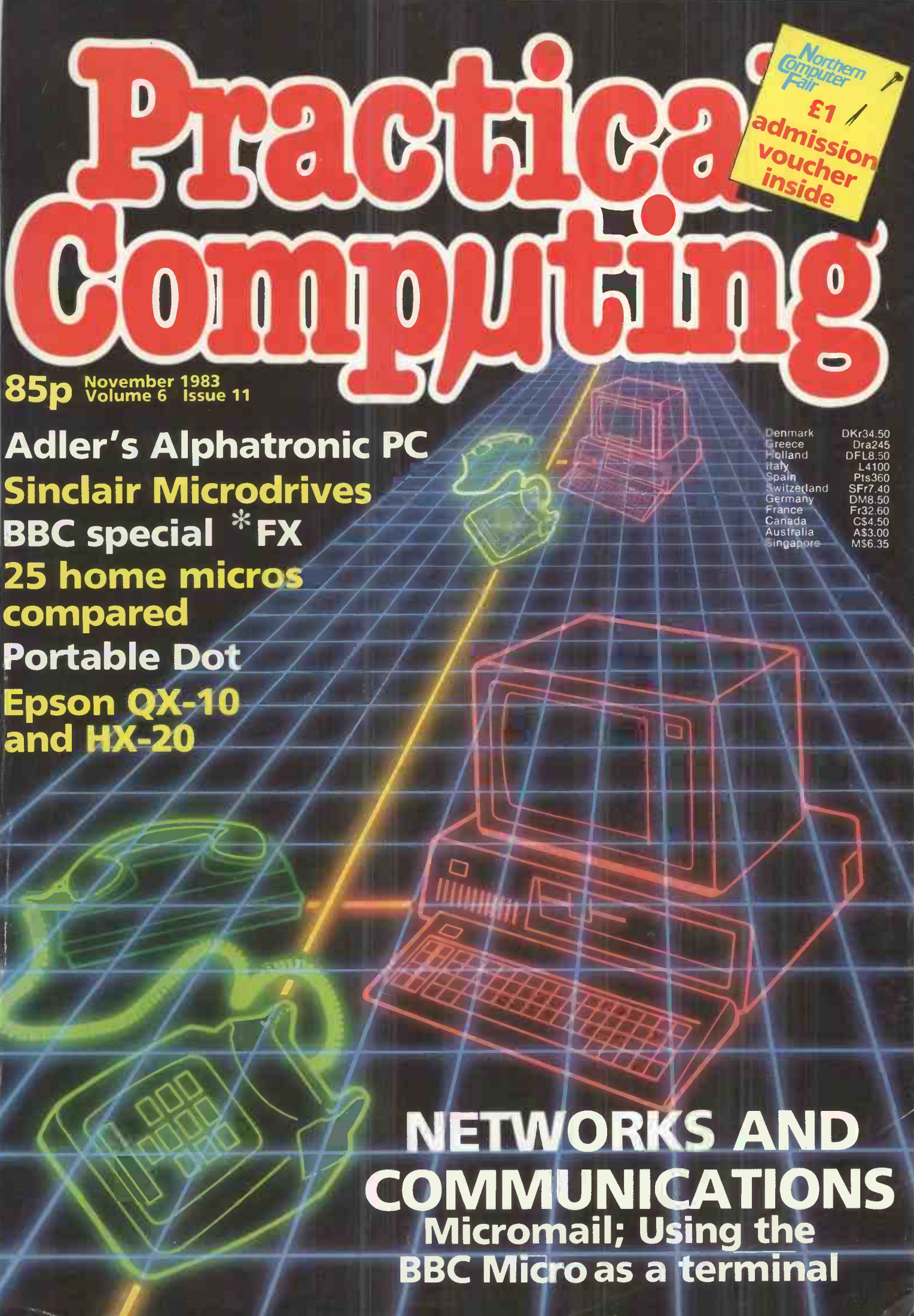

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Staying alive

IN THE MIDDLE of June we were predicting that a number of microcomputer companies would soon find themselves in difficulties. No names were named partly because of the danger of self-fulfilling prophecy. Saying "Bloggs is about to go bankrupt" is not likely to help Bloggs stay solvent. However, the problems of the industry are now becoming more widely appreciated, and it behoves us to keep readers up to date with developments which could affect them.

In the United States, Texas Instruments, Atari and Mattel have declared losses totalling around $500 million, while Osborne has been forced to close one of its factories and lay off staff. In the U.K., Grundy Business Systems and Information Technology and Computer Services seem to be the only companies to have suspended production, though both the Newbrain and Zita machines may still survive.

Three companies — Torch, Dragon Data and Camputers — have managed to raise further finance. With Torch this meant two of the original founders of the company being forced to leave. Camputers raised money privately. According to a report in *The Times* on September 3, it was "The City" which put together a £2.5 million package "to try to save Dragon Data" while Mettoy's shares fell from 17p to 2p before rallying to 8p.

By American standards the sums involved are trivial. It is as well to remember that Atari's world-wide advertising budget is larger than Acorn's turnover, while for Texas £2.5 million is almost petty cash. These multi-billion dollar corporations have the resources to get themselves out of trouble.

As is now obvious, there is a diminishing amount of profit potential in the sub-£200 home-micro bracket. Similarly competition in the small business market is getting tough because many potential buyers will not risk £2,500 to £5,000 on an experimental system. The key market now is for a £1,000 system — $1,000 in the U.S. — including discs and printer.

Both Atari and Commodore will be able to deliver. Both will shortly be offering CP/M add-ons too. Acorn's failure to deliver the Z-80 second processor, which is virtually a second computer, and Camputers' failure to deliver CP/M could therefore be damaging. If they are not on sale now they could well be too late.

The reason is that not only are Dragon, Sinclair, Acorn and Camputers aiming towards this £1,000 system market, so are Apple and IBM. Apple is currently testing the Macintosh home micro, and IBM is preparing the so-called Peanut. Other major manufacturers must also be eyeing this sector, especially the Japanese, who have yet to deliver the right products.

Let us therefore spell it out. There is a huge potential market for a micro which offers both colour and sound, with lots of games and educational programs, which also runs VisiCalc — or a comparable program — and other genuinely useful home/small business applications capabilities, but which costs around £1,000 for the system.

The stance of this magazine sometimes confuses people who cannot understand why we mix our coverage of business systems with both education and games and why we cater for both BBC and IBM PC users. It does not confuse the world's largest computer corporation, IBM, which gave its equally serious PC sound and colour-graphics capabilities and is careful to include games and educational programs in its official software line-up.

Like IBM, *Practical Computing* knows where the market is, and where it is going. While there may at this moment be a noticeable shortage of home/business systems with the right capabilities at the right price, this will change. IBM, Apple and — from a software point of view — Digital Research are aiming at it from the top of the market. Commodore, Atari and Texas Instruments are aiming at it from the bottom. Sinclair, Acorn, Dragon and Camputers are teetering on the edge with forthcoming new or expanded machines. But unless they launch these products quickly, they will lose the chance of getting them established. When the big boys muscle in there is going to be a blood-bath.

5 Years ago...

The home computer user probably falls into two categories. There is the person who wants to build a computer from scratch and who will get considerable pleasure from construction. On the other hand, someone who wants a computer for some application or amusement will have the rewards from using the system.

It could be said that to understand a computer you have to build one. Well, it's not true but it can be fun all the same.

Probably the cheapest kit on the U.K. market is from Science of Cambridge. For £39.95 you can build your own computer. It is called the MK 14 and it is a complete microcomputer with keyboard, display and memory. Put together the 31-piece kit and you have a device which you can program to be an alarm clock, a calculator or even to play games like Moon Landing or Mastermind.

Slightly more up-market are the Nascom 1, the Sym 1 and the Kim 1: you will pay more for them but they will do more. The Nascom 1 costs £197.50 and can be built into a powerful computer. It is one of the few British-manufactured systems around and is being built and used by hobbyists and industrialists alike.

Practical Computing Volume 1, Issue 4.

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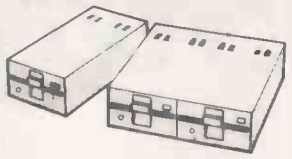

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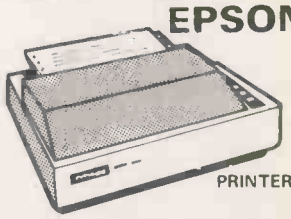

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- UHF Modulator 6MH2 350p
- UHF Modulator 8MH2 450p
- Stack Pack the unique stackable twin drawer racking system for Computer Cassettes. 5 Drawers (10 sections) including 10×C12 Computer Cassettes and Labels £6.00

CRYSTALS

32.768KH	100	16.0MHz	200
1MHz	275	18.0MHz	180
1.6MHz	392	18.432M	150
1.8MHz	395	19.968M	150
1.843M	200	20.0MHz	200
2.0MHz	225	24.0MHz	170
3.2768M	150	24.930M	325
3.57954	98	48.0M	175
3.8864M	300	100.0M	375
4.0MHz	150	100KHz	236
4.433619	100	1.28MHz	392
5.0MHz	160	2.4576M	200
6.0MHz	140	3.276MHz	160
6.144MHz	150	4.032MHz	290
6.5536M	200	4.194304	200
7.0MHz	150	4.80MHz	200
7.168MHz	160	5.185MHz	300
7.68MHz	200	5.24288	390
8.0MHz	150	7.7328M	250
9.0MHz	200	8.0833M	395
9.375M	350	8.86723	175
10.0MHz	175		
10.7MHz	150		
10.23MHz	200		
12.0MHz	175		
12.58M	185		
14.31818	170		

IDC CONNECTORS

Spead block type	PCB Plug with latch Strt Pins	PCB Plug with latch Angle Pins	Female Header Socket	Female Card Edge Connectors
10 way	90p	99p	85p	120p
16 way	130p	150p	120p	p
20 way	145p	166p	125p	195p
26 way	175p	200p	150p	240p
34 way	205p	236p	160p	320p
40 way	220p	250p	190p	340p
50 way	235p	270p	200p	395p

JUMPER LEADS Ribbon Cable Assembly DIL Plug (Headers)

Single Ended Lead 24" Long Length	14pin	16pin	24pin	40pin
24"	145p	165p	240p	325p
Double Ended Leads				
6"	185p	205p	300p	465p
12"	198p	215p	315p	490p
24"	210p	235p	345p	540p
36"	230p	250p	375p	595p

IDC female receptacle jumper leads

	36" 20way	26way	34way	4way
1 end	180p	200p	260p	300p
2 end	290p	370p	480p	525p

DIL SOCKETS

	Low Prof	Wire Wrap
8pin	8p	25p
14pin	10p	35p
16pin	10p	42p
18pin	16p	52p
20pin	16p	52p
22pin	25p	70p
24pin	25p	70p
28pin	28p	80p
40pin	30p	99p

RIBBON CABLE

Ways	Grey	Colour
	Price per Foot	
10	15p	28p
16	25p	40p
20	30p	50p
26	40p	65p
34	60p	85p
40	70p	90p
64	100p	135p

DIL PLUGS (Headers)

	Solder	(IDC)
14 pin	40p	99p
16 pin	49p	105p
24 pin	88p	170p
40 pin	250p	265p

AMPHENOL PLUGS

24way IEEE	475p
36way Centronics	
Parallel	485p

ZIF DIL SOCKETS

24way	565p
28way	750p
40way	799p

VIDEO MONITORS

- ZENITH 12" Hi-Res, Green Monitor, 40/80 column select switch. Attractively finished £75
- MICROVITEC 1431. 14" Colour Monitor. RGB Input. Cable included £225
- KAGA RGB 12" Standard Res. Colour £199
- KAGA RGB 12" Medium Res. Colour £240
- KAGA £5

EURO (DIN) CONNECTORS

	Female Strt	Female Angle	MALE Strt	MALE Angle
	Pins	Pins	Pins	Pins
DIN41617 31way	170p			175p
41612 AB 2-32way	275p		220p	285p
41612 AC 2-32way	295p	340p	240p	300p
41612 ABC 3-32way	360p	385p	260p	395p

EDGE CONNECTORS

	.156"	.1"
TWO ROWS		
2×18way	145p	180p
2×22way	200p	199p
2×23way		185p
2×25way		225p
2×28way		210p
2×30way		245p
2×36way		295p
2×40way		315p
2×43way		395p

D CONNECTORS: Miniature

	9way	15way	25way	37way
Male				
Solder	80p	110p	160p	250p
Angle	160p	210p	250p	355p
Pins	120p	130p	195p	295p
Female				
Solder	110p	160p	210p	350p
Angle	165p	215p	290p	440p
Pins	150p	180p	240p	420p
Covers	85p	80p	80p	100p

IOC 25way 'D' plug 385p Skt 450p

● Circle No. 103

Pirates and patents

HAVING READ Anne Staines' article entitled "Your Software and the Law" in the August issue, I should like to make some comments in relation to the protection of ideas and concepts incorporated within software products.

Section 1 of the Patents Act 1977 declares that a program for a computer is not an invention for the purposes of the Act. However, Section 1 includes a qualification defining that the provision relates only to a program for a computer as such. Patents are granted for inventions which comprise "a computer system including means for performing a particular set of functions" or "a game comprising a display device, a computer and a man-machine interface, the computer including means for controlling the display in accordance with a stored sequence of operations and the operation of the man-machine interface in which the stored sequence of operations ...." for example, as long as the invention meets the requirements of patentability. The requirements in question are novelty, inventiveness and capability of industrial application.

The patents which are being granted on such inventions are only directly infringed by the person who operates the computer system. However, the Patents Act 1977 includes a further act of infringement, called contributory infringement, which defines that "a person also infringes a patent for an invention if he supplies in the U.K. a person with any of the means relating to an essential element of the invention for putting the invention into effect".

It is easy to see that the supply of ROM-, disc- or cassette-based software which turns a micro into a computer system or a game, and which infringes a valid patent, could be interpreted as "means relating to an essential element of the invention." The patent system, therefore, will not provide blanket protection for all your software but it should be seriously considered as a method of protecting valuable software packages which, when incorporated in a computer system, produce a product which meets the requirements of the Patents Act 1977. Patents are expensive items of property to obtain and are national rather than international, but good comprehensive insurance is always more expensive than third-party insurance.

I should like to know how worried your readers are that there is not a cheap and automatic system of legal protection for ideas and concepts. This information would be of substantial interest to the British Computer Society which, through its Copyright Committee, can make submissions to the advisory group of governmental experts on this very subject.

R J Hart,
Chairman, BCS Copyright Committee,
Liverpool.

Market forces

I WAS most interested to read H J Challen's letter in the September Feedback column. "Playing Fair by Acorn". Mr Challen is clearly not concerned, or is unaware that products for the BBC Micro from Acorn, and indeed other manufacturers, are grossly overpriced.

It seems that makers will charge what the market will bear, and BBC Micro owners are prepared to pay 25 percent to 50 percent over the odds for peripherals and software in the mistaken belief that the link with the BBC name, like IBM, means that they are getting better quality.

For my own part, I have recently added a 100K disc unit to my BBC Micro for just £240: £160 for the drive, the rest for the disc-interface chips. I have also designed and built an 2764/27128 EPROM blower for the BBC. Total cost was about £15, compared to £100-plus for a commercial unit.

Perhaps with increased computer literacy people will not only be able to write structured programs but will also be able to judge the real value of products, and treat accordingly those that fall short.

Calum Steen,
Helensburgh,
Dunbartonshire.

Elusive interface

I WAS INTERESTED to note the little piece on page 15 of your September issue regarding Olivetti interfaces. The following quote especially surprised me: "Newer Olivetti typewriters come complete with computer interfaces".

My wife bought a "newer" Olivetti Praxix 45 this April. We were given to understand at the time that an interface was available — indeed Olivetti adverts since that time have specificaly mentioned the 45 as being good as computer printer/keyboards. Since May I have been trying to obtain these interfaces with little success. Every time local dealers approach Olivetti they are met with complete ignorance on the subject.

I wrote to Olivetti in June complaining about the matter. I eventually had a reply from G A Conway, Divisional Marketing Manager, to the effect that a serial interface was scheduled for availability in July/August. I therefore went back to a local dealer telling them the glad tidings. They rang Olivetti — several times because people always seemed to be at lunch — and were still faced with complete ignorance regarding the interface.

I wrote again to Mr Conway five weeks ago asking for help — I still await his reply. Could it be that Olivetti have got "Sinclair Syndrome", or did they pass it on to the computer industry in the first place? I have now spoken to several Olivetti dealers and all seem to find that company poor with regard to service.

Brian Lockey,
Bramhall,
Cheshire.

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.

Vitesse software

I HOPE that you will allow me to reply to the review of the Logica VTS Vitesse which appeared in your publication in October.

The Vitesse which was tested thoroughly by your writer was an early model, and was supplied to you for review with the first release of the software. While you were conducting your tests we were undertaking a similar exercise ourselves. As a result of our experience we have implemented a number of enhancements which have been supplied to all Vitesse users.

Issue 2 of the CP/M-86 Operating System is up to 40 percent faster in operation than Issue 1. It provides for user programming of the 12 function keys F1 to F12, and in fact all keys are user-redefinable under CP/M-86. The Issue 2 CP/M-86 system and utilities come supplied all on a single diskette, and the back-up program now permits copying of all tracks, so system disks may be copied. Screen switching is now transparent.

Tod is suplied by Digital Research, which is addressing the problem described by Chris Bidmead. CPM.H86 is supplied for dealers' use in "specialised" applications.

On the hardware side, the keys labelled Erase Word, etc. are for use by word-processing packages such as Wordsworth.

(continued on next page)

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The 592K drives are the formatted capacity. Unformatted, they are referred to as 1 megabyte drives. The machines have an RS-232C port as standard in addition to the Centronics port.

MS-DOS 2.0 operating system and the Wordsworth word-processor package are in Beta Site testing at present and will be fully available shortly. The MPSL BOS operating system and applications suite are also available.

We are convinced that our implementation of CP/M-86 is now very competitive. With the improvements in current software and extensions to the range to include MS-DOS 2, BOS and Wordsworth, we are confident that the positive market response to the Vitesse will continue to grow.

Marion Lewis,
Logica VTS,
Swindon,
Wiltshire.

Date routine

THE DATE ROUTINE program on page 166 of the September issue will not work if the date happens to fall on a Saturday. In that case Sunday will be displayed. However, if a line 265 is inserted in the program:

```
265 IF C1 = 0 THEN 400
```

Saturday will be chosen correctly.

Richard Honeyman,
Rutherford Appleton Laboratory,
Chilton,
Oxfordshire.

For-Next Step 0

I WAS RATHER perturbed by the article on page 103 of the September issue by John Hooper in which he advocates using For-Next loops with a Step of 0 to simulate Repeat-Until and, albeit in an unspecified manner, While-Endwhile. He really should make it clear that the revolutionary technique he proposes, while being of some use, is simply an optimisation technique. It ranks alongside declaring all major variables at the start of a program, with the most frequently used being defined first, to set up the variable table in the most efficient manner.

John Hooper seems to be portraying this method as an elegant alternative to the proper structured constructs. The great breakthrough in computing over the last few years has been the realisation that there exist just a few fundamental structures, and three main ways of arranging them: sequentially, or nested, or as sub-modules such a procedures or functions. Taken together they are sufficient to express any computing problem.

I suggest that there is a world of difference between the clarity of the truly structured code in listing 1 and the John Hooper style Basic program in listing 2. Indentation, use of upper and lower case, long variable names and emphasis of reserved words make the structured Program Development Language, PDL, version much clearer than the Step 0 construction.

Llsting 1.

```
COUNTER: = 0
repeat
  COUNTER: = COUNTER +
                      1
  print 'Counter =', COUNTER
until rnd > 0.5
print 'That is it!!'
```

Listing 2.

```
10 C = 0
20 FOR X = 1 TO 2 STEP 0
30 C = C + 1
40 PRINT "Counter = "; C
50 IF RND(1) > 0.5 THEN X = 3
60 NEXT X
70 PRINT "That Is it!!"
80 END
```

Certainly, use Step 0 loops if you really need to make a program run fast, but concentrate on writing neat, clear and hopefully bug-free programs using structured techniques for the rest of the time. Even if you are limited to Basic, you can still write well structured programs, it's just a bit more difficult.

Duncan White,
Little Chalfont,
Buckinghamshire.

THE METHODS of avoiding Goto discussed in John Hooper's article are indeed valuable. The Shell-Metzner sort, in the form in which it is usually published, requires four Gotos, three of them backwards. A version which I wrote a while ago uses no Goto at all and can be packed into three statements. It sorts a set of N numbers X(N) into ascending order.

H J Gawlik,
Muir of Ord,
Ross-shire.

HAVING READ John Hooper's article with great fascination, I thought I would rewrite all my Newbrain programs and make them run even faster However, when I tried out his suggestion, I found a curious thing happening. First of all, the Gotos ran faster than the For-Next loops: only 6 seconds for the Gotos, as against 7 seconds for the For-Next loops.

However, the big surprise came when I tried out the routine at the end of my longest program, 900 lines long. Here John Hooper quoted times varying from between 35 seconds on the Apple, down to 66 seconds on the Sharp. On the Newbrain the time comes out at only 7.5 seconds.

Thus the Newbrain ran the routine five times faster than the Apple, six times faster than the Pet, and seven times faster than the Sharp. Since most business programs are likely to contain a lot of Gotos this perhaps explains the extraordinary speed of the Newbrain. What a pity that it now appears to be floundering!

Andrew Selkirk,
London NW3.

Mock turtles

A SECTION of type appears to have dropped off the page of my Basic Turgra routine, on page 115 of the September issue. In the second part of line 1860 there should be

```
ELSE PROCTURNTO(
```

before SGN (– XDIF)*90.

Boris Allan,
Stockport.

Telling right from wrong

THE LETTER by R M Flinn in September's Feedback column was correct in its interpretation of the results of the statistical test in my article of June 1983. Strictly speaking, the test tells you the probability of obtaining samples with rankings as extreme or more extreme than those shown by the sample under test, when in reality there is no difference. And that is all.

However, in the context of an article aimed at the non-specialist and published in a

(continued on page 13)

Shell-Metzner sort by H J Gawlik.

```
1 M=INT(N/2):FORA=-1TO0STEP0:FORJ=1TON-M:
  FORH=JTO0STEP-M:L=H+M
2 K=0:IFX(H)>X(L)THENZ=X(H):X(H)=X(L):X(L)=Z:K=H
3 H=K:NEXT:NEXT:M=INT(M/2):A=(M)0):NEXT
```

sinclair special 5

Inside... New Interface 2 and ROM cartridges! New Software!

TAKING NEW SOFTWARE IN NEW DIRECTIONS

You'll see that this issue of Sinclair Special devotes considerable space to software. Why, when we've so much to say about hardware and peripherals? Simply because at Sinclair we believe in supporting first-class hardware with first-class software.

This month sees the start of a new commitment to education in our catalogue, both for adults and children.

In the field of micro theory, we've programs like Beyond BASIC and Make-a-Chip, which take you from the creation of simple ZX® assembler subsets to simulated circuit design projects.

There's Musicmaster, to teach you music terminology, note values and composition.

And if you're keen to beat your Spectrum at chess (which can be hard), you'll certainly want to try Chess Tutor 1, the first program in a complete chess masterclass.

Coming soon...

In the pipeline are many new releases, some of which break completely new ground. LOGO and micro-PROLOG for instance. They're fifth generation languages which will take you and your Spectrum closer than ever before to the creation and application of artificial intelligence.

A formal agreement between Sinclair and Macmillan Education has been announced, the first results of which will be published this autumn. These consist of five programs in a complete early reading course plus the first four of a series of programs based on Macmillan's top selling Science Horizons Scheme. All programs are designed for use in schools or the home.

And with Blackboard software, we're publishing six more home education programs for primary school children. Covering alphabet, spelling and punctuation, each of these programs is a true gem, unlike any other education software, and fascinating to run. Even for adults!

I believe that these new titles represent a major advance in educational software for the home.

New ROM software too!

You may well have heard news of ZX Interface 2® and ROM cartridge programs. You'll find full details of the Interface and its software on the facing page (and there's an order form on the back page too!). These offer an instant games playing facility at unbeatable prices, and expand the possibilities of using your Spectrum in yet another direction.

Alison Maguire

Alison Maguire
Applications Software Manager

SOFTWARE UPDATE

The latest cassette software for ZX® Computers

Chess Tutor 1

For 48K RAM Spectrum. **£9.95.**

Chess Tutor is a new way of learning all about chess – using your ZX Spectrum.®

It starts from the beginning by teaching you about the chess pieces and the way they move – including castling, en passant, promotion, check, checkmate, stalemate and perpetual check.

Then it teaches you the basic tactics – pins, forks, double attacks and skewers.

There are over 120 exercises and over 200 questions for you to answer – with demonstrations and hints from your ZX Spectrum when you want them.

You can choose which parts of the course you want – and even experienced players may be surprised at what they can learn from Chess Tutor.

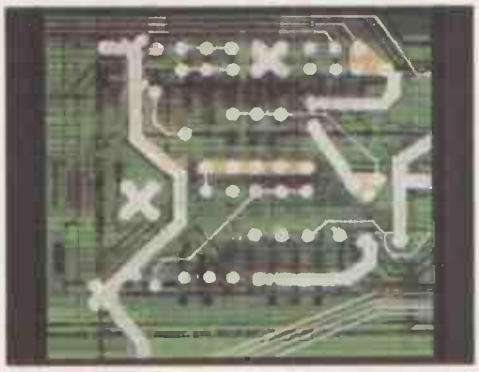
Musicmaster

For 48K RAM Spectrum. **£9.95.**

Musicmaster turns your ZX Spectrum into a musical instrument which will not only play tunes, but will also demonstrate key signatures, durations of notes, and scales.

You can write your own tunes – in any key – play them over and over again, save them on tape, modify them.

You can either write your music on a stave, or place a simple overlay on your Spectrum for a 17-note keyboard.



Make-a-Chip

For 48K RAM Spectrum. **£9.95.**

Make-a-Chip teaches you the basic elements of circuit design, shows you how they fit together, and then lets you design and test your own circuits.

When you have designed a circuit, you can give it inputs and outputs and your ZX Spectrum will check it for you. Then it will run it, or tell you what's wrong so that you can modify it.

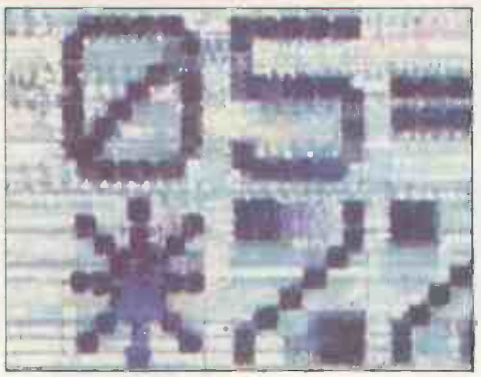
Make-a-Chip is a fascinating way of finding out how computer logic works.

Print Utilities

For 16K and 48K RAM Spectrum. **£9.95.**

Increase the printing and display facilities of your ZX Spectrum with the Print Utilities program.

Print Utilities enables you to enhance your programs by generating characters of eight different sizes which you can place anywhere on your screen.



Beyond BASIC

For 48K RAM Spectrum. **£9.95.**

Takes the agony out of assembler. Takes the mystery out of machine code.

Beyond BASIC gives you a deeper insight into the workings of your ZX Spectrum. It explains what happens inside your micro when you run a program, and it teaches you simple Z80 machine code programming.

A major feature of Beyond BASIC is that it enables you to write your own Z80 assembler programs – then you can actually see on your screen how they affect the ZX Spectrum memory and registers.

ZX INTERFACE 2®

The New ROM Cartridge/Joystick Interface

Loads programs instantly! Takes two joysticks! Just plug-in and play!

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum® system. It enables you to use new ZX® ROM cartridge software: plug-in programs that load instantly. It allows you to use two standard joysticks, without the need for separate, special interfaces.

To use new ZX ROM cartridge programs, just connect Interface 2 to the rear of your Spectrum or Interface 1 and plug in the cartridge of your choice. The program is then loaded, ready to run!

You can use any joystick that has a 9-way D plug. Use one or two of them for extra fun with ZX ROM cartridge or Sinclair cassette programs – or with dozens of other Spectrum-compatible programs!

SEE BACK PAGE FOR ZX INTERFACE 2 AND ROM CARTRIDGE ORDER FORM!

...AND BRAND NEW ROM CARTRIDGE SOFTWARE!

There's already plenty of choice of ZX ROM cartridge programs for your Spectrum. Some are old favourites, in an exciting new form. Others are new.

And now, thanks to ROM cartridge technology, you can run them *all* on a 16K RAM Spectrum, even if they were originally written only for 48K machines!

Every ROM cartridge program loads fast and faultlessly. No wires, no waiting, no worries about loading errors! All of them are affordably priced too, at £14.95.

Backgammon

Everything you need to play the famous and deceptively simple board game. Board, stones, rolling dice and doubling dice are shown in full colour and high resolution. Choose from four levels of skill to suit experts and beginners alike – full rules are included.

Space Raiders

Your skill is all that's stopping successive waves of aliens from destroying Earth. Use your gun base to attack. Shelter behind buildings... move out and blast the passing alien soaceship!

Full-colour high-resolution graphics with sound.

New! PSSST

Robbie the Robot sits in his garden. Help him fetch compost to cultivate his prize Thyrgodian Megga Chrysanthodil. Help him make the right choice of pesticide, to ward off devilish insects. Stop the insects breeding to overwhelming numbers before Robbie's plant has bloomed. PSSST is horticulture with a horrendous twist!

One and two player option, with a host of features including sound effects.

Chess

This sophisticated program does everything you'd expect at board game level, and much more besides.

The high-resolution chessboard and pieces are arranged in a row and column system, so it's easy to key in your moves.

At any stage of the game you can request the computer to suggest a move, reverse roles or change the level of skill.

Full-colour high-resolution graphics.

Planetoids

Dodge and swerve using your thrust button, turn on a planetoid... fire! But beware – the alien ship moves fast to destroy you with cluster bombs. And when it comes to the crunch, use your hyperspace button!

Full-colour high-resolution graphics with sound.

Hungry Horace

Horace is forever being chased around the park by guards.

He steals their lunch, eats pathway flowers and creates chaos in the park by ringing the alarm!

You'll have to be quick to keep Horace out of trouble!

Full-colour high-resolution graphics with sound.

New! Tranz Am

Set in a future time ruled by cars and trophies, in a land where petrol replaces gold, and status is possession of the 8 Great Cups of Ultimate.

Driving your Super Blown Red Racer, use your skill to outwit and crash the Deadly Black Turbos. Use your instruments to locate and collect the trophies – before you overheat or run out of fuel.

A program with outstanding multi-directional movement, graphic features, and a playing area equivalent to more than 600 times actual screen area.

Horace and the Spiders

Guide Horace on the hazardous journey to the cobwebbed house full of poisonous spiders.

Safely in the house, you must move along cobwebs, choose a spot... and jump on it! The spiders will be in a frenzy – scuttling to repair their precious web.

And when a spider is spinning a new section, you're safe to attack and destroy it!

Kill all the spiders, and a new web appears... with even more spiders to catch.

Full-colour high-resolution graphics.

New! Cookie

You're Charlie the Chef, who keeps his ingredients locked in the larder. But if the ingredients escape, they bring the inedible Nasties with them!

You must daze the escaping ingredients with flour bombs, and knock them into the mixing bowl. Stop them getting into the dustbin, at all costs! And beware of Nasties that get into the mixing bowl!

Cookie is fast-moving panic in the pantry, with a cast of real characters. A program to make you smile – and sweat!

New! Jet Pac

As Chief Test Pilot of the Acme Interstellar Transport Company, your task is to deliver and assemble spaceship kits. On your way round the galaxy, you're free to collect precious stones and gold.

The catch? Rocket fuel is precious and scarce. And the aliens don't take kindly to the theft of their valuables. You'll need your wits and your lasers!

With a host of features, including multi-directional movement, explosions, sound effects and one and two player option.

ZX MICRODRIVE

NOW ON RELEASE

The ZX Microdrive® System – as you'd expect from Sinclair – is unique to the world of computing. It's a compact, expandable add-on system which provides high-speed access to massive data storage. With just one Microdrive alone (and Interface 1), you'll have at least 85K bytes of storage, the ability to LOAD and SAVE in mere seconds, the beginnings of a local area network of up to 64 Spectrums, *and* a built-in RS232 interface! The cost? Less than £50 for each Microdrive.

How to get ZX Microdrive

Spectrum owners who bought direct from us, by mail order, have been sent full details. Order forms are being mailed in strict rotation, so if you haven't yet received your order form please bear with us. We're making good progress in meeting the huge demand.

If you didn't buy your Spectrum by mail order, don't worry. Send us the form from the bottom of this page. We'll add your name to the mailing list, and send you details by return.

Each Microdrive costs £49.95. Interface 1 costs £49.95, but just £29.95 if purchased with a ZX Microdrive. Extra ZX Microdrive cartridges: £4.95.

How to order

Simply fill in the relevant sections on the order form below. Note that there is no postage or packing to pay on some purchases. Orders may be sent FREEPOST (no stamp needed). Credit card holders may order by phone, calling 01-200 0200, 24 hours a day. 14-day money-back option, of course. Please allow 28 days for delivery.

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Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Telephone: (0276) 685311.

To: Sinclair Research Ltd, FREEPOST, Camberley, Surrey, GU15 3BR. **ORDER FORM**

Section A: Hardware

Qty	Item	Code	Item Price £	Total £
	ZX Interface 2	8501	19.95	
	ZX Spectrum – 48K	3000	129.95	
	ZX Spectrum – 16K	3002	99.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
			TOTAL £	

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G22/R	Backgammon	5304	14.95
G10/R	Chess	5301	14.95

CASSETTE PROGRAMS for ZX Spectrum

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E7/S	Musicmaster	4306	9.95
E8/S	Beyond BASIC	4307	9.95
E6/S	Make-a-Chip	4305	9.95
L5/S	Print Utilities	4404	9.95
			TOTAL £

*I enclose a cheque/postal order made payable to Sinclair Research Ltd for £

*Please charge to my Access/Barclaycard/Trustcard account no:

*Delete/complete as applicable.

Signature

Mr/Mrs/Miss

Address

PRC 911

(Please print)

ZX Microdrive information request

Please add my name to the Microdrive Mailing List, *and* send me a colour brochure with full specifications of ZX Microdrive/Interface 1 ☐ *(tick here)*. You can use the above form to send us your name and address.

● Circle No. 104

(continued from page 8)
journal devoted to the practical applications of computing, I feel that it is important to go further. Having been given the technically correct interpretation of the test, the average reader would probably reply "So what!" An over-academic approach to statistical analysis has done much to foster the scorn which so many of the lay public delight in pouring on the results of statistically based surveys.

After the analysis has been done, the question is: "Do the figures mean anything? Yes or no?" Without over-emphasising the fact, I have tried to show readers that a Yes or No answer is hardly ever possible. The best that one can do is to back one answer or the other, knowing that either may be the true one and that there is inevitably a particular probability of being wrong, whichever answer one selects. This probability may be estimated by a statistical test.

If you state that a sample is not significantly different from average, when the test shows that to obtain such a sample under such conditions would be an extremely rare occurrence, then you are almost certainly wrong. The results of the test can be used to tell you how likely it is that you are wrong.

I am sorry if I have exceeded the bounds of statistical propriety by jumping straight from figures to practical decisions without dwelling on the rigorous interpretation of results. But I am convinced that by so doing, readers are more likely to have obtained at least an intuitive understanding of the applications and meaning of statistical analyses.

Owen Bishop,
Doncaster,
South Yorkshire.

School stats

IT IS a pity that notes accompanying Chris Bulmer's School Statistics program in the September issue did not include a brief discussion on the values of the variable Z. My main criticism is that the Z values in the program listing, assuming a normal distribution, would produce a probability of less than one pupil per 100 achieving an A grade. In other words, the Z values are set wrongly.

I converted the listing provided to run on my school's BBC Micro and examined effects of using different values to limit grades. It occured to me that different class ability structures, such as mixed ability, setting, etc. might require different Z value limits. I teach classes of varying ability structure and therefore may well need to fine tune the Z values within the framework of probabilities.

I wonder how many well meaning teachers, keen to use computers in test analysis, might use the program listing without giving a thought to the Z values. A few comments in the article might have been worthwhile and would prevent possible abuse of the program as a teaching tool.

Derek Wheway,
Bude,
Cornwall.

Dragon screen dump

DESPITE much error checking a small bug has unfortunateely crept into my screen-dump program for the Dragon 32, published in the October issue, page 164. The routine at present fails to print line 0 of the screen, the top line out of 192. To correct this the figure 191 must be changed to 192 in lines 40,50,72 and 74.

S J Combes,
Bishops Stortford,
Hertfordshire.

New skills for millions....

I READ with interest the article "New skills for millions" in the September issue.

I firmly support your views regarding the need for training on microcomputers, and we have in fact now opened the first two Apple training centres in conjunction with Keyboard Training Limited.

The first centres are in London and Manchester. A third will follow immediately in Birmingham, then up to 20 others around the U.K. The centres are run by an independent training organisation and are offering both pre- and post-sale training courses.

In order to encourage awareness among potential and established customers in the value of training, we have arranged with Keyboard Training Ltd for a two-hour familiarisation course to be available free of charge. Purchasers of an Apple computer will be offered a further £100-worth of free training. We hope in so doing we will ensure that the purchaser makes the best use of his or her Apple as soon as possible.

Keith Hall,
Apple Computer (U.K.) Ltd,
Hemel Hempstead,
Hertfordshire.

.... or just for some

YOUR ARTICLES on computers and education were admirable but flawed. In particular the introductory piece "Tools for Learning" was good copy but poor psychology, with delusions of grandeur. This utopian eulogy, where the brave new world we will inherit owes all to computers, had an almost wilful ignorance of the current economic climate and educational psychology.

The author states that "pupils may shortly provide their own micros". Well in Hampstead £100 may not be much but with four million unemployed it's a hell of a lot to many parents. It has been stated — *Guardian* August 22nd — that half a million children could not afford three meals a day. Which planet does your author live on? Not here I think. Feeding children comes before giving them computers.

This leads on to the whole question of which sectors of society will benefit from micros in schools. The answer is those than can afford them and have the staffing ratios to use them will. A computer cannot for many years replace a teacher. The "accurate feedback" it can give is nothing to the attention of a qualified teacher.

Why aren't there more teachers? Because they cost more than micros, and I fear that is really more important than children's education. They are a stop-gap against the overcrowding in classrooms brought on by perfidious governments policies. Those schools with PTAs with money will make the most of the MEP, but then they aren't usually the sectors of society facing long-term unemployment. As all of us can't be computer programmers then guess who looses out — again.

In my darker moments I see the MEP as doing a cynical PR job for the government. A few Spectrums are not going to change much in the long run, but they look good in the pandering press. Your author's fascination for micros has blinded him to the harsh realities of the world.

If you are going to discuss micros in schools, be realistic. I'm not against computers — I'm a programmer myself and they have given me a good living. But there is more to the growth of a child's mind than giving it a few programs to play with. Children need education all round, and that needs teachers.

Andrew Jeavons,
London N5

Sexist ravings

LUCKY DANIELLE, who seems to have sent the same letter to all the computing magazines and got most of them to print it.

Poor Danielle, who's view of life seems to be that anything relating to women is judged good or bad, dependent only on whether it shows them in a good or bad light.

Perhaps Danielle could do with a statement of reality? People are people. Different people are not the same. In particular, people of one gender are different, in a multitude of ways, from people of the opposite gender. Finally, some people, and situations relating to people, are good, some are bad. It would be foolish not to take all this into account.

People are not equal, there is no justice, and life is not fair!

J P Lindesay,
Marlow,
Buckinghamshire

Dear departed

I WAS sad to read in my daily paper of the demise of the Newbrain, since over the last six months I have come to have a considerable regard for it.

There must be quite a large number of people like myself who intend to go on using the Newbrain, so I hope you will continue to publish any interesting tips and programs.

L E Weaver,
St Leonards-on-Sea,
East Sussex.

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HP is in touch

HEWLETT-PACKARD'S HP-150 offers an alternative to the mouse for user-friendliness: a touch screen. The catch is that the software has to be menu-driven and set up to cater for it. HP is supplying Personal Card File, Memomaker, VisiCalc, WordStar and Condor for this. Another 30 programs are currently undergoing modification for the system. Of course, the micro will run on ordinary software too.

The HP-150 uses the Intel 8088 CPU running MS-DOS, has 256K of RAM, two 3.5in. micro-floppy disc drives, and costs £2,900. A printer can be added to the VDU, and the whole outfit still occupies only 1.7 square feet of desk space.

Contact Hewlett-Packard, Nine Mile Ride, Easthampstead, Wokingham, Berkshire RG11 3LL. Telephone: Crowthorne (0344) 773100.

Toshiba

AFTER ITS exclusive review in *Practical Computing* last February the Toshiba T-100 personal computer promptly disappeared without trace. Now it has reappeared in the hands of Scan Computers, which will also be distributing the T-300 Professional micro we announced in March.

For the Z-80 based T-100 prices run from £1,495, and for the 8088-based T-300 from £2,495. Contact Scan Computers, Chanctonbury House, Church Street, Storrington, West Sussex RH20 4LZ. Telephone: (09066) 5432.

CP/M from £799

NOW YOU CAN buy a British Z-80 micro with twin 400K 5.25in. floppy-disc drives for £799. For an extra £100 the same system comes with 800K drives, with 1.6Mbyte drives at £999 and 2.4Mbyte ones at £1,199. All models have 64K of RAM expandable to 128K, a range of ports and CP/M.

You have to add a VDU displaying 80 characters by 24 lines and a keyboard. Contact Micronix Computers, Suite 2, 26 Charing Cross Road, London WC2. Telephone 01-240 0213/0217.

Canon X-07

FOOTBALL LEAGUE SPONSOR Canon is about to launch a micro small enough for a football manager to use on the touchline, or for a goalie to use to keep score. What's more they could communicate in mid-match. Called the X-07, it is about the size of a hard-backed novel. It has a QWERTY keyboard and an LCD display of 20 characters by four lines. Memory is limited to 4K of RAM and 8K of ROM, which includes Microsoft Basic.

The two novel features of the X-07 are softcards and infra-red communications. A softcard is about the size of a credit card and holds 4K, though 8K ROM/RAM cards are planned. The accessory infra-red link allows the X-07 to talk directly to a host computer, printer or other gadget up to five metres away. An RS-232C port allows for more conventional networking.

The price is yet to be finalised, but could be in the £200 to £300 range. Contact Canon (U.K.), Waddon House, Stafford Road, Croydon CR9 4DD. Telephone: 01-680 7700.

Elan

SIT DOWN and design the ideal home micro, and it would come out looking like the Elan. Start with the well-known Z-80 chip for software compatibility, but run at 4MHz for speed. Add a DIN-standard 68-key keyboard laid out like a new IBM Selectric.

Throw in a built-in joystick. Provide a 20K Basic written to ANSI standards, with all the structured commands plus automatic indenting for readability. Then add named functions and turtle graphics — so who needs Logo? Provide a built-in word processor, and a 12K operating system that addresses memory in 16K pages. The result is 58K free to Basic on a 64K machine, with a maximum RAM of 3.9Mbyte.

On specification the Elan Enterprise looks set to wipe out half the British micro industry, and take over a large slice of the American market. However, there is quite a gulf between specifying a machine and producing it reliably, in quantity and at a price.

Contact Elan Computers Ltd, 31-37 Hoxton Street, London N1 6NJ. Telephone: 01-739 4282.

Computer of the year

EVERY YEAR Europe's leading computer magazines — plus *Popular Computing* from America — get together to select the Computer of the Year. For 1983 there will be four categories, and our nominations will be:

- Home computer : Commodore 64
- Personal computer: IBM PC XT
- Portable computer : Epson HX-20
- Transportable: Dyanlogic Hyperion

Four other micros that would have come into the reckoning, if they had arrived early enough to make an impact on the European market in 1983: the Acorn Electron, Apple's Lisa, the Sharp AC-5000, and the ACT Apricot. The final results will be announced in a future issue.

(More news on next page)

BBC Micro news

WONG's of Hong Kong has been awarded a contract worth $45m to build BBC Micros for the U.S. market. Contact Wong's International at 01-959 3201.

● **Crofton Electronics** can supply an exact replica of the BBC Micro case made in sheet steel. It costs £39.50. Telephone: 01-891 1923.

● **Intastor** has launched a "transit case" for carrying a BBC Micro around. Telephone: (045383) 2334.

● **Data Type Services,** which normally offers maintenance on products like the Sirius 1 and Osborne micros, has just added the BBC Micro to the list. Telephone: (06333) 71177.

● **Cambridge Systems Technology** has designed an IEEE-488 standard interface with an 8K EPROM to run it. As well as connecting your BBC to a plotter, voltmeter, or whatever, it also provides a way of linking up with a Commodore micro — which could prove useful to many schools. Telephone: (0223) 323302.

● **Integrex** has launched a printer buffer to fit inside an Epson MX-80 being driven by a BBC Micro. It will hold 3.5K and costs £95 plus VAT. Telephone: (0283) 215432.

● **The National Extension College** is about to launch a typing tutor, All Fingers Go!, for the BBC Micro. It has brilliant graphics and costs £15 for the cassette version. Telephone: (0223) 316644.

Shake-outs

IN SEPTEMBER Osborne Computer filed for court protection from its creditors under Chapter 11 of the U.S. bankruptcy law. Debts are estimated at £30 million. Osborne had already laid off most of the staff with two hours notice.

Victor Technologies, the manufacturer of the Sirius, laid off 1,200 of its 2,500 workers, after losing $11.1 million in the second quarter. ACT says it has assembled a couple of hundred Sirius micros from kits at its factory in Scotland.

Texas Instruments is still having a bad time with its TI-99/4a home computer. Although it represents only five percent of Texas' turnover, it lost the corporation $183 million in the second quarter of 1983, leading to an overall loss of $119 million. Home-computer losses for the whole year could amount to $250 million. Although this former £900 machine looks cheap in the U.K. at £99.95, the U.S. price is currently $89 or £60 in real money. Even so, Texas has had to lay off 750 workers at its manufacturing plant.

Mattel, whose toy home computer the Aquarius has just been launched in the U.K., lost $156 million on sales of $227 million in the second quarter. U.S. sales have already declined by about 20 percent, leading to staff layoffs. The U.K. price is currently far too high, and Mattel could well find itself in a Texas Instruments situation, even if it gets the Aquarius II — a replacement with a proper keyboard — into production quickly.

Computer Devices, the manufacturer of the Dot portable reviewed in this issue, lost $5 million on sales of $14.4 million over the first six months of 1983. It has laid off 180 staff — almost half the total — because, in the words of executive vice president and chief financial officer Robert Moor, "We have a product that doesn't sell."

The long-awaited Dragon 64 has been launched at £225. It can be used as a 32K machine like the original Dragon, as a 48K machine with a 16K Basic, or as a 64K machine with the OS-9 disc-operating system. Many consider OS-9 superior to CP/M, though it lacks CP/M's range of software. Dragon's new disc drive has a formatted storage capacity of 180K and costs £275. Contact Dragon Data, Kenfig Industrial Estate, Margam, Port Talbot, West Glamorgan.

Seiko

THOSE WHO WANT a 16-bit personal computer now, with the option of upgrading to a multi-user system later, are catered for by the new Seiko 8600 business computer. It features an 8086 CPU, 128K of RAM and is a beautifully made modular piece of hardware. It costs £2,400. You then add a screen and a 100-key detached keyboard at £1,188 each. The system has four RS-232C ports to support up to four terminals. The operating system will usually be MP/M-86, but CP/M-86, MS-DOS, Oasis-16, MBOS and Uni-Dol are also available. Contact Intelligence (U.K.) at 01-543 3711.

Pertec, Aston & Kode

FIVE FORMER Wicat employees have started their own company, Aston Technology, but they are staying in the Motorola 68000-based micro business. They are importing the Pertec system from the U.S. and plan to use British disc drives and cases with the Pertec board to make up into a British machine, the Crystal 68000.

Contact Aston Technology, Aston Science Park, Love Lane, Birmingham B7 4BJ. Telephone: 021-359 1861.

The same Pertec products are imported by Kode and sold under the Pertec label. Contact Kode Ltd, Station Road, Calne, Wiltshire SN11 0JR. Telephone: (0249) 813771.

In brief

Corona Data Systems' two IBM PC-compatible micros have arrived in the U.K. Both have 256K of RAM and twin floppy-disc drives. The desk-top model costs £2,675 plus VAT, and the portable is just £50 cheaper. Both come with GW Basic, MS DOS and the Multimate word processor. The distributor is Midlectron, Midlectron House, Nottingham Road, Belper, Derby DE5 1JQ. Telephone (077382) 6811.

Dennis Computer Systems provides a kit you can build into a powerful 6809 computer. The basic board and components costs only £60, including VAT. Contact Denis Computer Systems, 241 Baker Street, London NW1 6XE. Telephone: 01-486 7671.

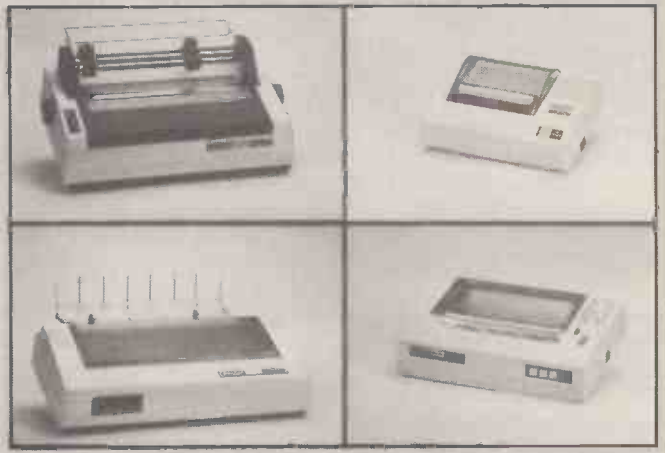
Solidisk Technology has launched a new low-cost 16-bit micro, the STL-PC. It comes with 256K of RAM, two floppy-disc drives and an IBM PC-style keyboard. Software in the package includes CP/M-86 or MS-DOS, WordStar and Supercalc 2, but the total cost is a mere £1,200. Contact Solidisk at 87 Bournemouth Park Road, Southend-on-Sea, Essex. Telephone: (0702) 618144.

Tashkl has announced an eight-bit micro that provides both a Z-80 and 6502, 64K of RAM, and two 163K 5.25in. floppies. The price of the OM-8064 is £1,080 plus VAT. Contact Tashkl Computer Systems Ltd, 24 Logan Road, Wembley, Middlesex. Telephone 01-904 4467.

Atari has demonstrated the $400 add-on that provides CP/M with any Atari micro with Atari or other disc drives. It also provides an 80-column screen, software switchable from the standard 40-column one. It will not reach U.K. shops until 1984. Contact Atari at Slough (0753) 33344.

Tandy has launched four new printers which are of four different types: daisywheel, ink-jet, thermal and dot matrix. Contact Tandy at (0922) 648181.

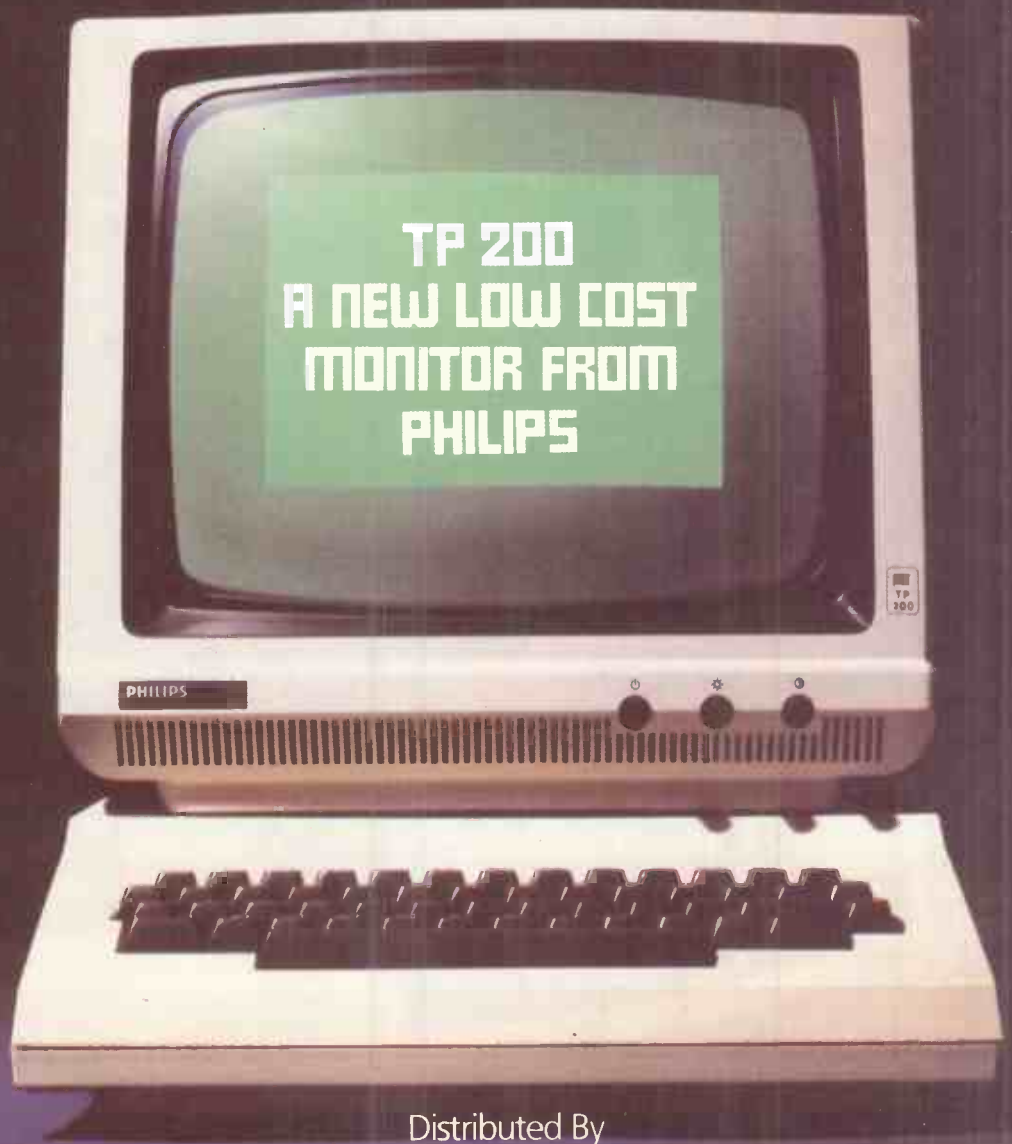
NEC has launched its lap computer, the PC-8201, which is almost identical to the Tandy 100. Both are made by Kyocera — see *Practical Computing*, August issue page 16. The NEC version has some improvements, offers more RAM than the Tandy 100 but costs less. Olivetti will also be taking this highly portable machine into its product range as the M-10. Contact NEC at 01-388 6100.



The four new printers in Tandy's range. Clockwise from top left: DWP-210 daisywheel printer; TP-10 thermal printer; CGP-220 colour graphics printer; DMP-42 dot-matrix printer.

Now you can afford a separate monitor

The low price of the new TP 200 means *you* can now afford a separate monitor for your personal computer. This mains-powered 12″ monochrome monitor has a composite video input compatible with most of today's home computers.
Crisp, clear definition is assured by the Philips green anti-glare screen with its 80 x 25 character resolution and 18 MHz bandwidth.



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Sirton Computer Systems' new Distributed Processing System; MIDAS-MPS, has been specially designed to be a flexible, multi-user system. Each user terminal added to the system has its own local processor, expanding the computing capacity of the system. The MIDAS-MPS is CP/M compatible,

has sophisticated password protection, it is easily installed and, as with all our systems, reliable.

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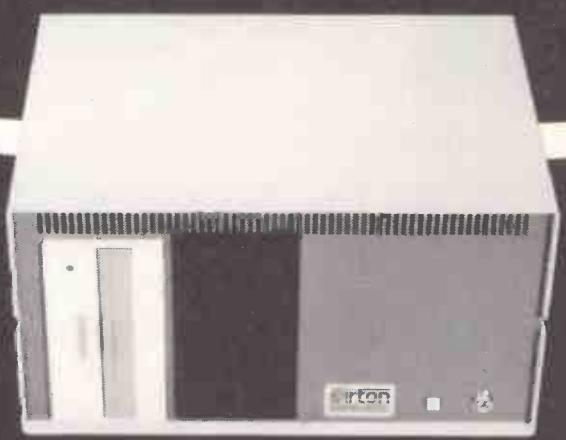

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SOFTWARE AND TECHNOLOGY

'We never looked back' is typical of the comments made by users of Apple's Lisa, the mouse-driven computer. Users are adapting quickly and naturally to mice, especially where the software makes full use of the mouse capabilities. Just think how many times you have to push different control buttons in, for example, a word processing package. How much easier it would be if the functions were indexed on the screen and all that was needed was to move the mouse on your desktop and push a button. In fact, extensive research into the use of mice has shown that users become very proficient and able to move the mouse swiftly and accurately, running through a sequence of commands much quicker than otherwise possible. In most cases, the mouse was preferred to the comparatively strenuous activity of leaning forward to touch screens, or the imprecise track-ball. Why not try a mouse?

Providing a consistent upgrade path has been one of the prime design objectives behind the MS-DOS operating system. This upgrade path allows both software developers and users to take their programs from one computer to another. MS-DOS initially provided the upgrade from the 8-bit world of CP/M-80. Today, MS-DOS runs on the vast majority of 16-bit systems and is firmly placing itself as the operating system for the future. On the other hand, in the world of multi-user microcomputers, the XENIX operating system is well established. The latest versions of XENIX, and the latest version of MS-DOS share a certain amount of compatibility which allows properly written programs to run on both systems. Operating systems such as XENIX have long been used in communication and mailing systems, offering the ability to work on many programs simultaneously. Now these features are being brought to future versions of MS-DOS by Microsoft, the company who also supplies XENIX. The upgrade path will then extend across single and multi-user micros, and across all the major microprocessor families.

With today's rapidly changing hardware market, micros almost become out of date if they are more than six months old. For software developers, this poses something of a problem. The packages developed on one machine will have a lifetime limited by the success of that particular hardware. What the software developer needs to look for, is the right development environment. Based on the MS-DOS operating system, development environments of the IBM PC and ACT's Sirius, for example, are both similar. It is though, presumptious to assume that these will be the mainstream machines in 12 months' time. What the developer needs, is a consistent development environment (one which allows him to run his software on many different machines immediately) and one which will be there on future generations of micros. Having already eased the transition from 8-bits to 16-bits, MS-DOS is now offering compatibility with the popular XENIX multi-user operating system. MS-DOS will shortly give access to the new, exciting world of graphics, multi-tasking and networking. For the software developer, a forward-thinking development environment of this kind spells success in an otherwise unstable market.

About that 'development environment' – from portables and IBM 'lookalikes' to any of the other major 16-bit micros on the market, one thing is clear, namely, that there is a firm commitment by computer manufacturers to offer this consistent development environment. Have you noticed how almost every newly announced 16-bit micro comes with the same operating system, MS-DOS? From the major manufacturers such as DEC, Wang, IBM, Data General and NCR to the 'portables' manufacturers, such as Hyperion, Compaq, Gavilan and ACT's new Apricot, MS-DOS is always offered, generally as that manufacturer's preferred operating system. Look also at those machines now on the market which do not even have the 8088/8086 processor favoured by MS-DOS. Olivetti and Commodore have firm plans for add-on processor boards to run MS-DOS, and Apple is rumoured to be thinking along the same lines for its revolutionary Lisa computer. So, wherever you go, it looks as though you'll always be able to take your favourite software packages with you.

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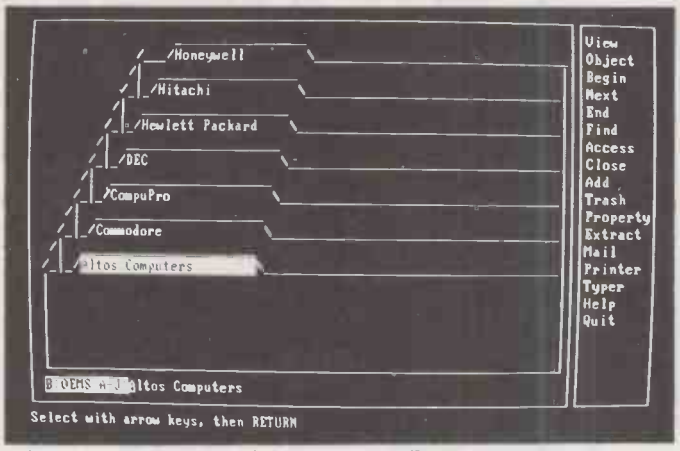
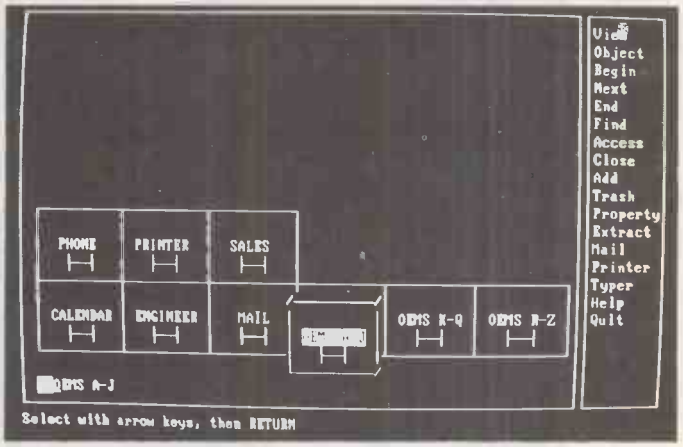
CP/M at home on ROM



A filing cabinet drawer of data contains files.



VIP allows programmers to set up windows and menus.

DIGITAL RESEARCH has announced Personal CP/M, an easy-to-use version of CP/M 2.2 which can be produced in ROM. This development will allow CP/M to be incorporated in systems which lack disc storage, such as portable and home computers.

Aimed squarely at novice users, Personal CP/M makes use of menus and easy-to-understand graphic symbols. The traditional cryptic CP/M error messages like "BDOS Error on B" are replaced by help screens and prompt lines in English, or so Digital Research claims.

To complement Personal CP/M, Digital Research is releasing VIP, the Visual Information Processor. It is a set of software routines, written in the C language, which will enable programmers to develop application programs which have a simple, consistent user interface. The programmer will be able to define easily movable windows, graphic symbols and menus.

The influence of Lisa, VisiOn and Smalltalk concepts is obvious. A major advantage the VIP approach holds out to software developers is the ability to adapt software to new machines more easily. Much of the task of screen display and keyboard input is handled by standard library routines.

At present no end-user prices have been announced. Digital Research is showing the products to equipment manufacturers and major software houses. Availability of Personal CP/M and VIP is promised for this year.

For more information contact Digital Research (U.K.) Ltd, Oxford House, Oxford Street, Newbury, Berkshire RG13 1JB. Telephone: (0635) 35304.

Supercalc gets graphics

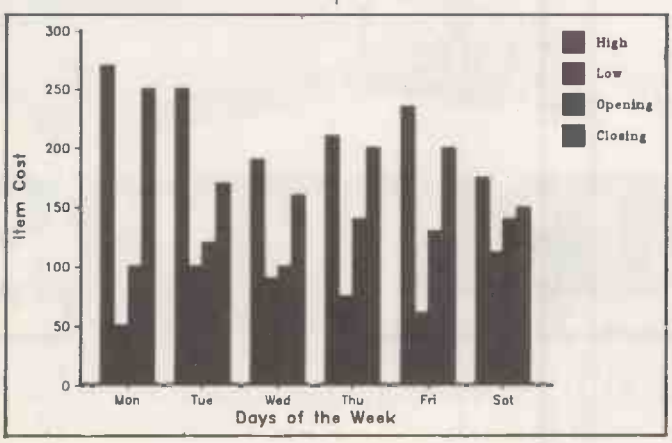
GRAPHICS and spreadsheet are integrated together in the latest release of Sorcim's Supercalc package. Supercalc 3 will generate any one of seven types of graph from data contained in the spreadsheet cells.

Data can be displayed in graph form with no prior designation, and you can switch instantly to any of the graph types.

Files created with either Supercalc or Supercalc 2 can be used without modification — as can most other DIF files including VisiCalc ones.

Supercalc 3 is promised "from the autumn" for the Sirius, Apricot, and IBM PC and XT machines at a cost of £295. An upgrade from Supercalc 2 costs £95; from Supercalc it costs £195.

Details from ACT (Pulsar) Ltd, Highfield Court, 24 Highfield Road, Edgbaston, Birmingham B15 3DP. Telephone: 021-455 7000.



Commodore

A RADIO COMMUNICATIONS interface to transform the Commodore 64 into a powerful aid for the radio amateur has been developed in Holland. The Commodore 64 can function as a terminal for Morse, Baudot, ASCII or Slow Scan TV transmission, or as a telephone modem.

The Com-In 64 interface is supplied as software in ROM with additional hardware and a user manual written in English. The price is £99.

Contact Computer World, Hilversum, Hilvertsweg 99, 1214 JB Hilversum, Holland. Telephone: (31) 3512633. Telex: 43776 Inco NL.

Oric WP

TRY YOUR HAND at word processing on the Oric with Oricstar. Although the Oric is by no means the ideal machine for the job — the keys tend to stick if you press them too hard — Oricstar claims an extravagent spec, including mailshot facilities. Kenema Associates is asking £12 for the program. Learn more from Kenema Associates Ltd on (0934) 510279.

Which? Tax Guide

THE CONSUMERS ASSOCIATION, publisher of *Which* magazine, has entered the world of software publishing with the release of Taxcalc for the BBC Model B machine.

The program asks you questions about your income and circumstances and calculates your tax liability. It comes with a booklet explaining how the income tax system works, and costs £17.25 including VAT.

Taxcalc should be in the shops, or is available directly from the Consumers Association, Castlemead, Gascoyne Way, Hertford SG14 1LH.

(More news on page 24)

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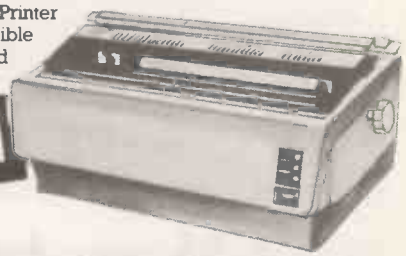

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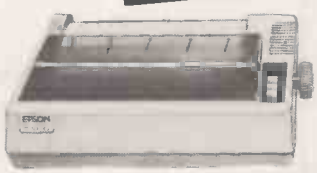

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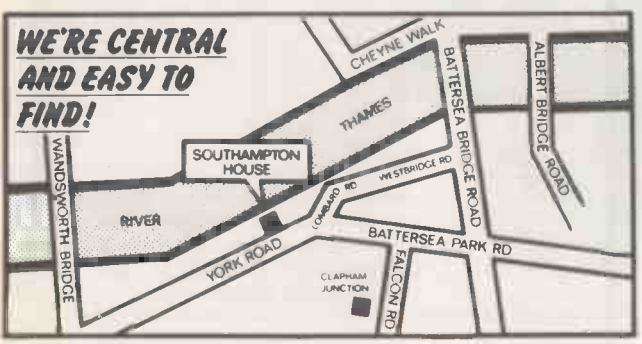

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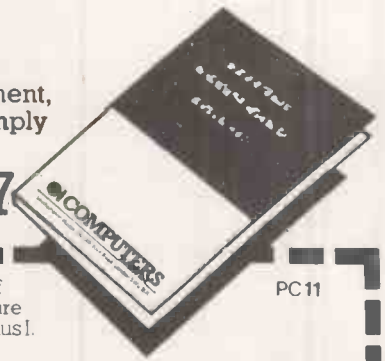

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Hard disk or floppies: Integrated Accounts is on just one floppy disk – compare that to competitive packages – and runs successfully with the Commodore twin disk units. Integrated Accounts with Stock Control and Sales Order Processing ideally requires a hard disk.

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Your Commodore dealer should have these packages ready for demonstration. If not, phone Anagram and we will fix a demonstration for you. Or send the coupon.

To: Actionline Sales
Anagram Systems, 60A Queen Street,
Horsham, West Sussex RH13 5AD

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```
10 REM. SHELL SORT ON STRING ARRAYS
20 REM.
30 DIM sort 300
40 exterr=$209
50 FOR pass=0 TO 1
60   P%=sort
70   [OPT pass*2
80   LD A,(IX):DEC A:JP NZ,error
90   LD A,(IX+1):CP $81:JP NZ,error
100  LD L,(IX+2):LD H,(IX+3):LD (start),HL
110  DEC HL:LD D,(HL):DEC HL:LD E,(HL):DEC HL:LD A,(HL):DEC A:JP NZ,error
120  LD HL,(start):ADD HL,DE:ADD HL,DE:ADD HL,DE:ADD HL,DE:LD (end),HL
130  SRL D:RR E:LD HL,$FFFF:EX DE,HL
140  .rotate SRL D:RR E:OR A:SBC HL,DE:ADD HL,DE:JR C,rotate
150  EX DE,HL:ADD HL,HL:ADD HL,HL:LD (spacer),HL:EX DE,HL
160  .loop LD IY,(start):PUSH IY:ADD IY,DE:LD (check),IY:POP IX:LD (item),IX
170  .newlen LD A,(IX):CP (IY):JR C,short:LD A,(IY):.short LD B,A
180  OR A:JR Z,null:LD E,(IX+2):LD D,(IX+3):LD L,(IY+2):LD H,(IY+3)
190  .next LD A,(DE):CP (HL):JR C,ok:JR NZ,swap:INC DE:INC HL:DJNZ next
200  .null LD A,(IY):CP (IX):JR NC,ok
210  .swap PUSH IX:POP HL:PUSH IY:POP DE:LD B,4:.move
220  LD A,(DE):LD C,A:LD A,(HL):LD (DE),A:LD (HL),C:INC HL:INC DE:DJNZ move
230  LD DE,(check):PUSH IX:POP HL:OR A:SBC HL,DE:ADD HL,DE:JR C,ok
240  PUSH HL:POP IY:LD DE,(spacer):SBC HL,DE:PUSH HL:POP IX:JR newlen
250  .ok LD HL,(item):LD BC,4:ADD HL,BC:LD (item),HL
260  PUSH HL:POP IX:LD DE,(spacer):ADD HL,DE:PUSH HL:POP IY
270  LD DE,(end):SBC HL,DE:JR C,newlen:LD DE,(spacer):SRL D:LD A,E:RRA
280  AND &FC:LD E,A:OR D:LD (spacer),DE:JP NZ,loop:RET
290  .start DEFW 0:.end DEFW 0:.spacer DEFW 0:.check DEFW 0:.item DEFW 0
300  .error LD A,100:CALL exterr:]
310  $P%="Bad sort parameters"+CHR$0
320 NEXT pass
330 :
340 REM. Test program:
350 :
360 PRINT "Filling 1000 6-character strings..."
370 DIM A$(999)
380 FOR I=0 TO 999:A$(I)="PORS"+CHR$(64+RND(26))+CHR$(64+RND(26)):NEXT
390 FOR I=0 TO 14:PRINT A$(I),::NEXT:PRINT "etc..."
400 PRINT "Sorting the strings..."
410 CALL sort,A$(0) : REM. Call assembly language sort routine.
420 FOR I=0 TO 14:PRINT A$(I),::NEXT:PRINT "etc..."
430 PRINT "Finished."
```

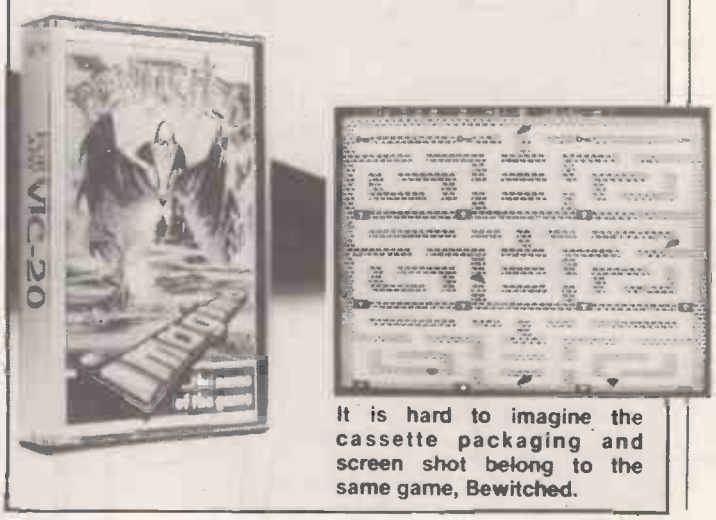
BBCBasic (Z-80) closely resembly Acorn's Basic for the 6502-based BBC Microcomputer, but runs on Z-80 based CP/M machines. Like the original it has an in-line assembler but it generates Z-80 mnemonics, of course, rather than the 6502 set. In this example the assembler is invoked at line 70. BBCBasic (Z-80) is available for the Torch at £110, and for other Z-80 based CP/M machines at £95. The Torch version supports sound and graphics. Contact M-Tec Computer Services, Ollands Road, Reepham, Norfolk. Telephone: Norwich (0603) 870620.

Stocking fillers

Gridrunner on Spectrum Jeff Minter's best-selling game Gridrunner is now available for Spectrum owners, who have had to wait in line behind Vic, Commodore 64, Atari and even Dragon owners. Gridrunner costs £6.95 and should be in the shops now, or contact Salamander on Brighton (0273) 686454.

Ant Attack Spectrum graphics are pushed to their limit in Soft Solid 3D Ant Attack, another new game for the 48K Spectrum. The price in the shops is £6.95. Contact Quicksilva on Southampton (0703) 20169.

Bewitched Imagine Software has bravely sent us screen shots from its maze game Bewitched. You wojld be hard put to recognise it from the graphics on the cassette packaging. Bewitched runs on the Vic-20 and costs £5.50. Contact Imagine on 051-236 6849.



It is hard to imagine the cassette packaging and screen shot belong to the same game, Bewitched.

Microguide

THE MAGAZINE *What to Buy for Business* has produced a special issue on microcomputers. The September issue is a really excellent guide to systems in the £1,000 to £15,000 price range. The 90-page guide is available for £19.75 for non-subscribers.

What to Buy for Business is a subscription-only magazine devoted to business purchasing; it is not available on the news stands and carries no advertising — hence the price. Annual subscription is £39.50. Contact *What to Buy for Business*, Freepost, London SW3 1BR.

Hello Epson

A NAVIGATION SYSTEM for use on yachts and power craft is now available from Microtek. Based on the battery-powered Epson HX-20 portable, the system is intended for both racing and routine cruising. The Epson's built-in printer is used to produce a running log of speed, position, true course and time.

Microtek is now working on linking the Epson directly to the compass, wind-speed and direction instruments. More details from Microtek, 15 Lower Brook Street, Ipswich, Suffolk IP4 1AQ. Telephone: (0473) 50152.

Online Information Show

DECEMBER 6 TO 8 at the Cunard Hotel in Hammersmith London, sees this year's International Online Information Exhibition and Conference. This annual event takes in all forms of electronic publishing and online computer databases, with an inevitable bias towards the more established mainframe on-line information systems.

Entrance to the exhibition costs £4 on the door. The fee for the full three days of the conference is £175. For full details and conference programme contact Learned Information Ltd, Besselsleigh Road, Abingdon, Oxford OX13 6LG. Telephone: (0865) 730275.

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Buying a home computer is something you have to get right first time. It's too late when you've got one to find it won't take plug-in software. Or can't be programmed without an expensive accessory.

The TI Home Computer is a real computer system

The TI Home Computer has got the memory power you might expect from more expensive computers, built in. At its heart is a powerful TMS 9900 16-BIT Microprocessor. Most other home computers have only an 8-BIT. And you can expand the memory from 16K of RAM up to 52K.

The total memory capacity is 114K Bytes.

A wide range of software for everyone

Another feature that makes the TI system so powerful, yet so easy to use is Solid State Software.™ These plug-in cartridges cover everything from space games like Parsec™ to teaching maths, managing home finances and composing music. And the range is getting wider all the time.

It even has what professionals look for in a home computer

CPU: TMS 9900 16-BIT, plus 256-byte Scratchpad RAM.
Memory: Total 114K bytes; 26K bytes ROM internal; up to 36K ROM cartridges external; 16K built-in RAM expandable to 52K bytes.
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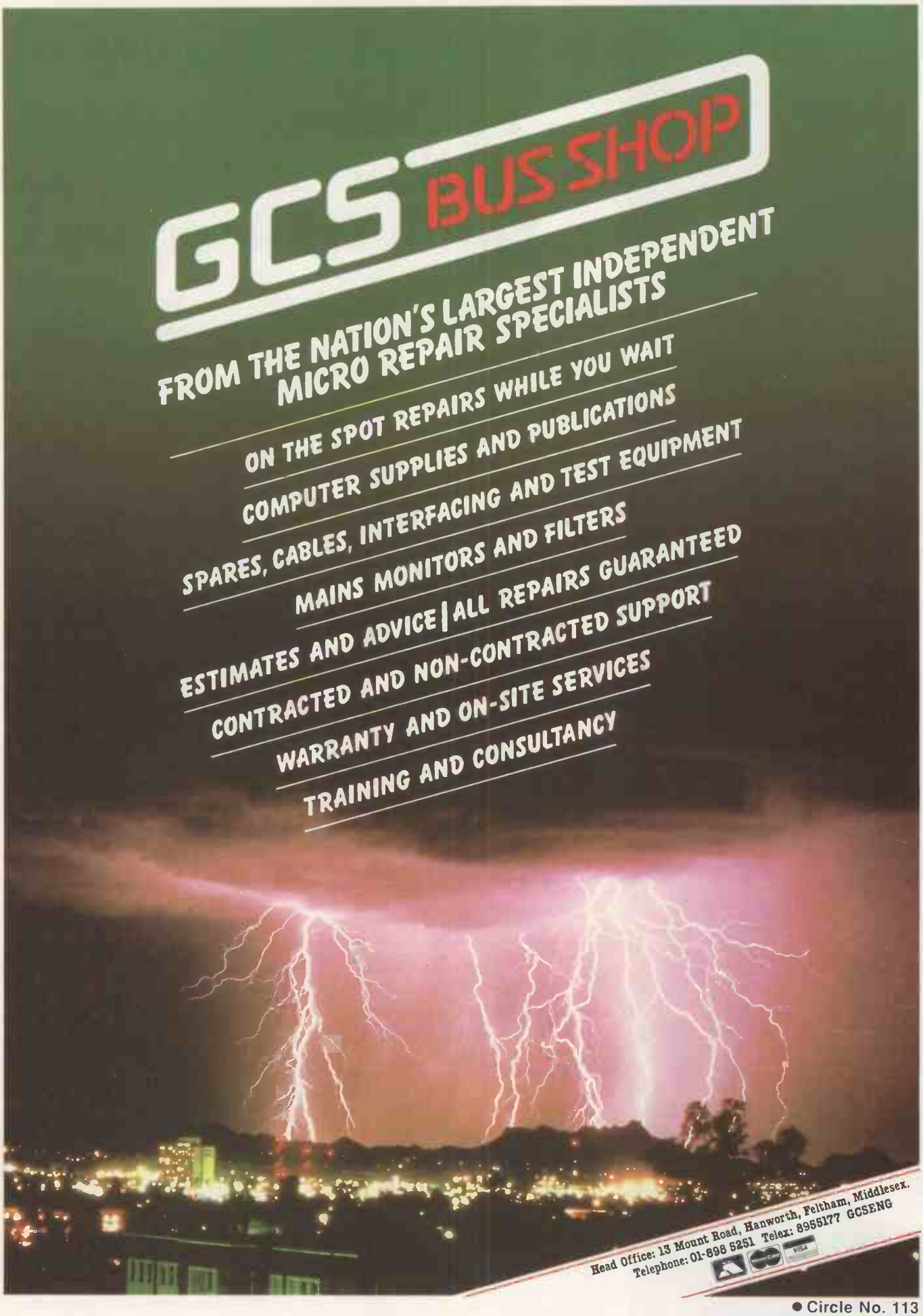

● Circle No. 113

New at Compec

We look ahead to Britain's foremost computer exhibition — at Olympia on November 15 to 18.

COMPEC is too big and too important an exhibition to sum up in one page. We cannot even — with apologies — provide a full and complete listing of all the exhibitors, let alone detail the products they will be showing. Also, many of the most interesting new introductions are kept securely under wraps until the show opens.

However, there are some products that will arouse interest, from mice to mainframes. We will be looking in particular for Microsoft's mouse and the world premier of its word processor, Word, so as to compare them with Apple's Lisa. Will ICL show a Lisa-like version of its own mousey Perq?

We certainly want to see the world's first multi-user portable networking micro, the Teleporter from Televideo. It should be appearing on the Encotel stand along with the Televideo Supermouse.

Small is beautiful, so Rodime's 10Mbyte hard disc should draw crowds, as it is a 3.5in. model. Also small, Convergent Technologies' portable micro The Slate could be an introduction to watch.

New desk-top micros should include the Data General Desktop Generation, the new Shelton Signet 3, the stylish new Krypton range from Transtec, the powerful Globe from ABS and the Crystal 68000 from Aston Technology. Equinox has a new 80186-based system to unveil, Almarc has a 68000 board for its new Spirit range.

Compec will be held at Olympia, London W14, from November 15 to 18. The opening times are 10am to 6pm but closing at 4.30pm on Friday. Admission costs £3 at the door or £1.50 in advance.

As one of the sponsors of the show *Practical Computing* will be on stand 2131.

Compec exhibitors

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Terminals, DDC, Dean Electronics, Decision Data, Dectrade, Department of Industry, Derwent Data Systems, Diablo Systems, Dicoll Electronics, Digico, Digi Data, Dec, Digital Microsystems, Digivision, Dilog International, Direct, Discom Trading, D M England, DN Computer Services, Doric Computer Systems, DRG Business Machines, DTI Europe, DVW Microelectronics, Dynatech Microsoftware, Dysan, Electronic Brokers, Emco Electronics, Emulex, Epson, Equinox, Ericsson, Estate Computer Systems, Eurocom Data, Euro Electronics, Euro Micro, Export Software International, Facit, Farnell, Feedback Data, Fenwood Designs, Ferranti, Filetab Support Services, Five Technology, Focom Systems, Fortune Systems, Fuji Film, Fujitsu, Fungus Computer Products, Gandalf, Gemini Microcomputers, Gems of Cambridge, General Datacomm, Gould Power Conversions, General Instruments, Get NV, Geveke, GMT Electronics, GNT Automatic, Gulfstream Bytech, Gould SEL, Graffcom Systems, Manatech, Great Northern Computer Services, Gresham Lion, Group NH, HAL Computers, Halycon Data, Hamilton, Hantarex, Hawke Electronics, Hestair Dataline, HPA, Hewlett-Packard, Hitachi, Honeywell, Hytec Microsystems, IAL, IBM, ICE, Immediate Business Systems, Infodata, Information Equipment Maintenance, Informex, Input Business Machines, Insight Terminals, Instrumentation Labs, IMP, Integrex, Interlekt, Intermec, ICL, International General Electric, ISG Data Sales, C Itoh, Jones & Brother, Keen Computers, Kendata Peripherals, Kennedy International, Keyboard Training, Key Computers, Kode, KPG, Lambart, Leenshire, Leeway Data Products, Legend Computers, Lifeboat Associates, Linear Graphics, Lion Systems, Livingston Hire, Logica VTS, Logitek, Longs, Lucas Logic (Nascom), Lynwood Scientific Developments, Mannesman Tally, Marconi, Master Systems, MBS Microtex, McNulty's Interchange, MDB Systems, Mediatech, MEL, Mellordata, Mercator Computer Systems, Micom Borer, Micro-APL, Microfin Systems, Microfocus, Microlease, Micromanagement, Micro Memory Systems, Micromite, Micromos, Micro Networks, Micro Peripherals, Micropro, Micropute, Microsoft, Microsystems Services, Microvitec, Midlectron, Millbank, Mini Computer Systems, Mitsubishi, Modus Systems, Motorola, MPI Europe, MPSL, MSI Data, Mullard, Multicomputer, Nabu Commercial Terminals, Nashua Computer Products, National Panasonic, NEC, Newbury Data, Nexel, Nine Tiles Computer Systems, Nissei Sangyo, Nolton Communications, Norman Magnetics, Northamber, Norsk Data, Nowask Datentrager, Numeric Arts, OCLI Europe, Office Efficiency Machines, Office & Electronics Machines, Offshore Computing, Olivetti, Omicron, Open Computer Services, Osborne, Paul Corbett, Paxton Computers, Peachtree, Peerless Foam Moulding, Penny & Giles, Pepperl & Fuchs, Perex, Perfect Software, Pericom Data System, Peripheral Hardware, Perkin Elmer, Pete & Pam, Philips Personal Computers, Plessy Microsystems, Positron, Poss, Power Testing, Pragma, Pets, Precision Software, Prentice Hall, Priam, Project Office Furniture, Pronto, Prosig Computer Consultants, Prospero Software, Protek, Pye, Quest International, Qume, Racal-Milgo, Rack Data, Rair, Ramtek, Rank Xerox, Rapid Recall, RCS Microsystems, Real Time Developments, Real Time Printers, Real Time Systems, Research Machines, Rhone-Poulenc, Riva Terminals, Roland, Root Computers, Roxburgh Electronics, RTS Technology, Russet Instruments, Samleco Computer Services, Sarel Electric, SB Electronic Systems, Scicon, Scientific Electronic Enterprises, Selven Systems, Shelton Instruments, Sherfield Investments, Sinclair Research, Sintrom Electronics, Sirton Computers, Soft Option, Software Connection, Software, Software Products Group, Sola Banner, Sony, Southdata, Stage One Computers, Star Computer Group, STC Business Systems, Summagraphics, Superior, Swis Tek, Symbiotic, Symicron, Systems Designers, Systems Productions, Systime, Tamsys, Tanberg, Tandon, Tann Synchronome, T Bar, TDI, Technel Data Products, Tektronix, Telefile Computer Services, Telxon, TSS, Thame Systems, Thorn EMI, Timeplex, Toltec Computers, Tradesoft/Interam, Transam, Transdata, Trend Communications, Triumph-Adler, Unit C, VAS, Vector International, Verbatim, Vermont Research, Versatec, Videcom, Video Marine Services, VSI Electronics, Wabash, W & G Instruments, Walters Microsystems, Weir Electronics, Wesper International, Westra Office Equipment, Weyfringe, Willis Computer Supplies, Wormald Data Systems, X Data, Xidec, Xitan Systems, Xtec, Xylogics, Zenith Data Systems, Zentec, Zeta Systems, Zilog, Zygal Dynamics.

Please note that this is a partial and abbreviated listing of companies exhibiting, available at the time of going to press.

G. W. COMPUTERS LTD LONDON'S WEST END NATIONWIDE OVERNITE SERVICE MORE PRODUCT RANGES BETTER SERVICE PROBABLY THE WIDEST SELECTION OF NETWORKS... MICROS...AND PRINTERS ON DISPLAY NATIONWIDE

*****THE NEW DBMS III (series III of the world's first 'task-robot-programs')*****

*****FEATURES*****

1400 character record sizes
mathematical scratchpad
record relational indexes
translateable to any language
User-defineable reporting
field protection/classification
either-or. same as. greater. smaller
sorts 'alpha or numeric' any window
12 online file architectures
32000 records per filename
20 main/200 sub fields per record
field and record related formulae
'Jump-to' any of 32000 records per file
random/binary/key/multiple field search
'if-then' questioning
file protection/password entry
range match. not match. integer match
sort speed 500 records per 20 seconds
12 online file architectures
240 fields using cross-referencing
cross-record calculations
'Jump-to' any record in 12 files
User-defineable files/field words/sizes
endless 'either-or' matching
formulate/recall on selection criteria
13 interrogation question types
short filing output/audit trails
Word-star & Mbasic compatible

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 select that in file 1 you are interested in just the name and telephone numbers, whereas in file 2, 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 on just one JUMP command go to any record in any of the 32000 records in any 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, setup your report mask, and then enter your records. Switch to 'automatic drive' and formulated any task you wish to program to fulfill, the task is stored as a macro. Take a copy of the program on another 'task disk' and from then on, the task disk will function without a single key-stroke. Think of a number of such 'task disks' such as "stock-re-order reports"; "stock-valuation reports"; "analysis"; "patient history analysis"; "research-analysis"; "budgetting-analysis"; "vehicle-location control"; "librarian analysis"; "plus more?"

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) I.E.: SIRIUS/VICTOR/IBM DBMS II IS £395.00 (or £250.00 by mail order ex. training) . . . DBMS III is £575.000 (or £295.00 by mail order ex. training).

MICRO-COMPUTERS

INTERTEC	-Superbrain 64K RAM/320K disks	1895.00
	-Superbrain 64K RAM/700K disks	2395.00
	-Compustar 64K RAM/320K disks	2195.00
	-Compustar 64K RAM/700K disks	2595.00
NORTHSTAR	-Advantage 64K RAM/700K disks	£2195.00
(exc DOS)	-Advantage 64K RAM/5.3M disks	£3095.00
TELEVIDEO	-802 64K RAM/700K disks	2395.00
	-802H 64K RAM/7.3M disks	3950.00
	-806 64K RAM/10M disks	5195.00
	-816 256K/750K disks	*£3350.00
ACT	-Sirius 1 256K/1.2M disks	*£2195.00
	-Sirius 2 256K/2.4M disks	*£2695.00
	-Sirius 3 256K/10MEG disks	*£3995.00
VICTOR	-9000 256K/1.2M disks	*£2195.00
IBM	-PC 64K RAM/640K disks	*£2795.00
	-PC1 330K/640K disks	*£3395.00
IBM	XT (TEN MEGABYTE)	£4480.00
IBM	XF (FIVE MEGABYTE)	£3500
Ten 4480		*3995.00
Five 64K 5 Meg disk		£3250
ALTOS	ACS800-2 64K RAM/1M disks	2195.00
	ACS800-10 256K/10.5Meg disks	5695.00
NEC	APC 128K RAM/2M disks	call.00
CORVUS	Concept 16 bit pc	call.00
SANYO	G80 64K RAM/320K disks	1195.00
ABC	26 64K RAM/2.2M disks	3250.00

All computer prices include mbasic as standard.
All prices marked * are 8/16 bit machines.

WE STOCK MOST OF THE BEST KNOWN SOFTWARE ALSO MOST OF THE BEST KNOWN BRANDS OF PRINTERS & PERIPHERALS FROM 300.00 TO 2700.00 (OKI/EPSON/DRE/NEC/QUME/ANADEX/RICOH)

SYSTEM DEAL (our speciality) SAVES YOU 1500.00+

Buy any computer, any printer and 150.00 value diskettes add £85.00 for cables and testing.
add 10% for return to base warranty for 1 year (optional)
add £110.00 for delivery & installation (optional)
Training optional extra £120.00
and get completely *****FREE*****

cpm handbook	50 basic exercises	2000 sheets paper
DBMS III.7	magic wand w/proc	magic calc
mbasic 80	diagnostics	msort/dsort
recover	autoload	instant basic
library boxs	disk/games	DT/AS/NS sorts

Total Value £1525.00

Based on 8 bit hardware, 16 bit software varies.

Here's a typical example of a complete system deal

1-Sirius 128k ram/1.2 megabyte disks	2395.00
2-Oki microline 80 printer	295.00
3-Cables & testing	85.00
4-Diskettes	150.00
5-price differential on magic/wand for word-star	100.00
software described above ***** FREE *****3025.00	

We specialise in 'STANDARD MICRO-PRINTER SYSTEMS' as well as 'NETWORK SYSTEMS BASED ON A SHARED HARD DISK'.

The range of computer products (mostly ex stock) includes the most popular brands of micro-computers, printers, modems, buffers, spoolers and software.

PRINTERS

OKI	-Microline 80	295.00
	-Microline 82A	395.00
	-Microline 83	695.00
	-Microline 84	895.00
EPSON	-MX80/FT-3	425.00
	-MX100/FT-3	575.00
ANADEX	-DP 9000	895.00
	-DP 9501	1045.00
	-DP 9501 (A)	1145.00
QUME	-9/45 R/O	1995.00
	-9/55 R/O	2195.00
	-9/35 R/O	1495.00
NEC	-3510 R/O	1495.00
	-7710 R/O	2195.00
	-5520 KSR	2250.00
DRE	-8820	1295.00
	-8830	1695.00
TEXAS	-810	995.00
	-825	995.00
DIABLO	-630	1995.00
RICOH	-RP1600	1095.00
OLYMPIA	-ESW 103 14 CPS	975.00

G.W. COMPUTERS LTD — Tel: 01-636 8210
POPULAR BRANDS OF EQUIPMENT WE SELL
MICROS: Sirius/Victor/I.B.M./DEC
Epson/North-star/Sanyo/Superbrain
Compustar/Altos/Apple-Lisa/Televideo
PRINTERS: Nec/Qume/Diablo/Oki/Epson
Olympia/Ricoh/Texas/Dre/Anadex
OTHERS: Corvus/Compustar
Hard disks networks and multiplexors
Spoolers/Modems/Buffers
most of the best known brands of software

PERIPHERALS & ACCESSORIES

CORVUS	-6 Meg hard disk	1950.00
	-11 Meg hard disk	2950.00
	-20 Meg hard disk	3950.00
	-Multiplexor 7 station	695.00
	-Mirror backup card	695.00
INTERTEC	-Compustar 10 Meg hard disk	2950.00
	-CDC 144 Meg hard disk	7950.00
N'STAR	-16 Bit u/grade	395.00
	-18 Meg hard disk	2995.00
RODIME	-6 Meg hard disk	1495.00
	-12 Meg hard disk	1950.00
GENIE	-5MG fixed/5MG removeable disk	3295.00
QUADRAM	-64K print spooler/copier	295.00
BIZCOMP	-RS232/Auto-modem 1200 baud	450.00
AST	-port expanders (4 tmnls to 1 prtr)	395.00
GIX	-port expander (switcher)	95.00

NOTE: Corvus drives with multiplexor may network sirius.. Superbrain.. Concept.. PET.. Victor.. IBM..

SOFTWARE

G.W.L.	-BUS V8.00 (Accounts)	275.00
	-DBMS II (Database)	*£395.00
	-DBMS II (by mail order only)	*£250.00
	-DBMS III (database)	*£575.00
	-DBMS III (by mail order only)	*£295.00
	-FORMS/TEXT/CALC/-DBMS IV	*£575.00
	-Sales Ledger	*£95.00
	-Purchase Ledger	*£95.00
	-Nominal Ledger	*£95.00
	-Stock-Control	*£95.00
	-Address-Mailer	*£95.00
	-QASort/QNSort (500 Recs/14secs)	*£95.00
MICROSOFT	-Mbasic 80	*195.00
	-Fortran 80	295.00
	-Cobol 80	395.00
	-Basic Compiler	*225.00
	-MU lisp/mu star	125.00
MICROPRO	-Word-star	*£295.00
	-Mail-merge	*£95.00
	-Spelstar	125.00
	-W-star/M-merge/Sp-Star	425.00
BYROM	-BStam (communications)	100.00
	-BStms (tele-comms)	100.00
DIGITAL	-CBasic	75.00
	-Concurrent CPM/86	*375.00
	-CBasic86	*175.00
	-Pascal MT	225.00
LIFEBOAT	-T/Maker	155.00
M'FOCUS	-CIS Cobol	420.00
	-Forms II	100.00
SORCIM	-Super Calc	195.00
PEACHTREE	-Magic Wand	190.00
	-Magic Calc	175.00
VARIOUS	-including tele-comms etc	call.00

Software formats on all micros in our hardware list.
All prices marked £ are available 8/16 bit formats.

SOFTWARE COMMENT!!!
INTEGRATED SOFTWARE IS PROPERLY REPRESENTED, when the degree of integration reflects the ability to refer to as many different files, as well as employ as many different functions, under as many different modes as possible in one program only. This principle not being observed, will confer upon your purchases the attribute of their being expensive as an aggregate even though individually they are cheap. "DBMS III.7" and "THE KEY" are comparably worthy of such a label.

TERMS & ETC

G. W. Computers Ltd (Grama (Winter) Ltd)
55 Bedford Court Mansions
Bedford Avenue London W.C.1. England.
Tel: 01-636 8210: 01-631 4818: tlx 892031 twc g
Boston office tlx 94-0890
24 hour answerphone-leave address for infopacks
We do not operate a reader's reply card service.
Terms: C.W.O. or C.O.D. Prices exclude V.A.T., but include all non-credit discounts available.
No dealers. The above lists are not exhaustive
Please call at our showroom only by prior appointment. Unless expressly agreed, all warranties are commercial 90 days return to base for parts and labour. Annual warranties and maintenance facilities available nationwide through closely related third parties.

TELEPHONES: 01-636 8210 : 01-631 4818 : TLX: 892031 TWCG (BOSTON 94-0890)

AN IMPORTANT ANNOUNCEMENT FOR POTENTIAL SYSTEM BUYERS

Any serious buyer knows that although the HARDWARE and SOFTWARE are both inter-dependant, the choice of software is CRITICAL to the consequence of having useless piece of hardware nor not.
With this in mind our standard system deal gives you the software free with a system purchase. However, if you want more!

NOW we have a piece of software that is a challenge to the highest state of the art on micro-computers today. It's the first of its kind world-wide. It is called THE KEY, and it will unlock the power of your micro to the limits of your imagination. It is very expensive however, because it is the first to embody many features of other programs, in one single program that has over-lapping functions. It costs 995.00 Stg., and is available with a system purchase.

it features, the entire list of functions already covered by our program called DBMS III.7a to be seen elsewhere in our advertisement. PLUS. + + + + + + + + +
Paint any form including upwards from 100 (depending upon size of ram in hardware) data fields on the screen. Screen width up to 250 columns. Page lengths 100 lines.

The form might be a letter where data fields on the screen. Screen width up to 250 columns. Page lengths 100 liens.

The form might be a letter where data fields are name-addresses. Search files and accept any fields on teh database into any fields on the letter. The form might be a spreadsheet, where searches call records (in columnated style) from the database and perform calculations, the difference here is that unlike other 'calc' programs giving you 254 lines per spreadsheet, THE KEY gives you 32000 lines if your database has that many records.

The standard attributes of any field, allow you to SEARCH OTHER FILES for fields to accept into any field on the current form, plus allowance to POST OTHER FILES any fields from the current form into any fields on that file. RELATE TO AS MANY OTHER FILES, as the number of data fields you have on the master form. Make data fields CALCULATE AGAINST FORMULAE, and other data fields. VALIDATE DATA INPUTS critically character by character; numerically, alphabetically and date-wise.

NO MANUAL NEEDED, all help menues accessible by hitting 'esc' at any point in the three major modes of activity (create, data entry, data query).

You can set up dozens of individual files that eventually are inter-connected through one master form; like an invoice, order, personnel-file, stock control, mail-shot. The master form may at every juncture of a data field, go outside the current form to supplementary forms for data retrieval, or post-filing.
Come along the computing road with us. We're out in front so you'll get the best there is at the price. On IBM and SIRIUS.

The first robot-concurrent-forms-database-text-processor-spreadsheet-no-manual-all-in-one-program.

G. W. COMPUTERS LTD — Tel: 01-631 4818

Contains the highest state of the art software available today

FORMS/TEXT/CALC/DBMS IV ALL IN ONE PROGRAM — "KEY" — at £995

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.
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, or any other kind of form that is required to fit your existing stationery.

INVOICE <0>£££££££££££				
To £<1>£££££££££££ £<2>£££££££££££££ £<3>£££££££££££££ £<4>£££££££££££ £<5>£££££££££		From: G.W. Ltd 55 Bedford Court Mans. Bedford Avenue London W.C.1. Tel: 01-636 8210		
Date <6>££.££	Tax point <7>££.££		Agent <8>£££	
Quantity	Description	Cost	Tax	Total
<9>£££	<10>£££££££££££££	<11>££	<12>££	<13>£££
<14>££	<15>£££££££££££££	<16>££	<17>££	<18>£££
and so on...				
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.
<??> <9 >request quantity, validate range.
<??> <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 a 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 >, <6 >, <7 >, <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.
Available at present only on SIRUS/IBM PC.

● Circle No. 114

YOU HAVEN'T SEEN ANYTHING LIKE THIS ON A COLOUR MONITOR BEFORE.

An RGB monitor from JVC offering a resolution of 370 x 470 pixels for less than £150?

We guarantee you won't see another bargain like that in this or any other micro mag – or in any other supplier's showroom.

For we've managed to acquire the sole distribution rights to these superb machines and we are able to offer them at an unbeatable price.

There are two models available: medium resolution (370 x 470 pixels) at £149.95; and high resolution (580 x 470 pixels) at £229.95. (Both excluding VAT.)

The units have a 14" screen and are suitable for the BBC Micro, Lynx, Oric, Apple, IBM and most other leading micros.

They are robustly constructed in a handsome cream casing. And come with a full year's guarantee.

Delivery is good: your monitor should arrive by courier service within ten days of our receiving your order.

You can order by filling in the coupon below and posting to: Opus Supplies Ltd., 158 Camberwell Road, London SE5 0EE. Or by telephoning 01-701 8668 quoting your credit card number. Or, of course, you can buy in person at our showroom between 9-5.30pm, Monday-Saturday.

MODEL REFERENCE	1302-1 Medium Resolution	1302-2 High Resolution
RESOLUTION	370 x 470 Pixels	580 x 470 Pixels
C.R.T.	14"	14"
SUPPLY	220/240v. 50/60Hz.	220/240v. 50/60Hz.
E.H.T.	Minimum 19.5kv Maximum 22.5kv	Minimum 19.5kv Maximum 22.5kv
VIDEO BAND WIDTH	6MHz.	10MHz.
DISPLAY	80 characters by 25 lines	80 characters by 25 lines
SLOT PITCH	0.63mm	0.41mm
INPUT: VIDEO	R.G.B. Analogue/ TTL Input	R.G.B. Analogue/ TTL Input
SYNC	Separate Sync on R.G.B. Positive or Negative	Separate Sync on R.G.B. Positive or Negative
EXTERNAL CONTROLS	On/off switch and brightness control	On/off switch and brightness control

To Opus Supplies Ltd., 158 Camberwell Road, London SE5 0EE.

Please send me _____ Medium Resolution Colour Monitor(s) at £149.95 each (ex. VAT).

_____ High Resolution Colour Monitor(s) at £229.95 each (ex. VAT).

_____ Connection lead(s) at £6.00 each.

I understand carriage per monitor will cost an extra £7.00.

(N.B. A Medium Resolution Monitor including VAT, lead, and carriage costs £187.39. A High Resolution Monitor including VAT, lead, and carriage costs £279.39.)

I enclose a cheque for £_____ Or please debit my credit card account with the amount of £_____ My Access/Barclaycard (please tick) no. is _____

Name _____

Address _____

_____

Telephone: _____

Opus. Opus Supplies Ltd.

● Circle No. 20

If your microcomputer job involves managing information, you'll need a Compsoft Data Management System. It's your guarantee that computerisation will be a success.

Compsoft are world leaders when it comes to easy to use database programs. There is nothing quite so genuinely user friendly, and nothing quite as powerful. And Compsoft were the winners of the 1983 RITA (Recognition of Information Technology Achievement) Awards 'Software Product of the Year'.

We can give your *Computer the power to breeze through the management of any record keeping situation, – effortlessly, efficiently, and more accurately than you ever dreamed possible. From sales ledger to stock control, purchaser ledger to personnel, clubs to customers, and in a thousand other ways, we can lend a helping hand.

You don't have to be a computer expert to use Compsoft's DMS or Delta. Both programs offer fast, accurate and elegant database power for both first time computer users and professional systems designers.

You owe it to yourself to know more. Either return the coupon to us, or simply telephone the office and we'll send you a complete guide to our versatile database programs – today.

* Delta is available for almost any microcomputer with the MSDOS, PCDOS, CP/M, or MP/M operating systems, including IBM, DEC Rainbow, SIRIUS, XEROX, ICL, EPSON and many others.

DMS is also available for Commodore computers.

Compsoft Limited
Hallams Court
Shamley Green
Nr Guildford, Surrey
England GU4 8QZ
Telephone: Guildford (0483) 898545
Telex: 859210 CMPSFT

Please send me further details

Company _____

Contact _____

Address _____

_____

PC Tel No. _____

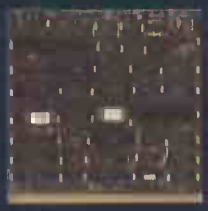
● Circle No. 116

80-BUS SOLUTIONS

GM813—CPU/64K RAM Board
- ★ 4MHz Z80 CPU
- ★ 64K Dynamic RAM
- ★ RS232 Serial Interface
- ★ Two 8-Bit I/O Ports
- ★ 1200 Baud Cassette Interface

GM833—512K RAM—DISK
- ★ 512K Dynamic Memory
- ★ Simple Software Interface
- ★ Switching Allows Multiple Boards
- ★ High-speed Silicon Disc

GM816 MULTI-I/O Board
- ★ 6 I/O Ports
- ★ 4 Counter/Timer Channels
- ★ Real Time Clock
- ★ Further Expansion Capability



GM812—IVC Board
- ★ 80x25 Display Format
- ★ On-board Z80A Microprocessor
- ★ Programmable Character Generator
- ★ 160x75 Pixel Graphics
- ★ Light Pen Input

EV814—IEEE488 Controller
- ★ Cost Effective Controller
- ★ Comprehensive Software Supplied

GM829—FDC/SASI Board
- ★ Single/Double Density Operation
- ★ Single/Double Sided Drive Support
- ★ Up to 4 mixed 5.25" and 8" Drives
- ★ Industry Standard SASI Hard Disk Interface

IO828—Colour Graphics Processor Board
- ★ 640x576 Bit Mapped Display
- ★ On-board 16-Bit Microprocessor
- ★ Comprehensive On-board Software

TWO SPARE SLOTS
The Galaxy 3 computer shown has two empty slots, in a 5 board 80 Bus format, for simple addition of Gemini Multiboards to develop your own requirements.

GM811—CPU Board
- ★ Z80A CPU
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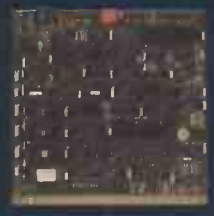

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Lower current, higher power

MOST OF the microprocessor systems advertised in this or any other magazine rely on two different semiconductor technologies for their internal circuits, namely NMOS and bipolar. NMOS is currently the standard fabrication process used for microprocessor and memory components — see July Chip-chat.

To build up a complete system it is usually necessary to add some "glue" in the form of buffers, latches and gates. These glue parts are generally chosen from the widely available 74 series bipolar TTL logic family. This cosy symbiotic relationship between NMOS and bipolar parts is unlikely to last for long, however, because both technologies are being given the elbow by an explosion of new devices which use only CMOS logic.

CMOS actually stands for complementary metal oxide semiconductor, and has the great advantage that power consumption is reduced dramatically compared with the other two technologies. Every logic switch uses two active devices in series, one N-channel and one P-channel, instead of an active device plus a resistive load as in the NMOS and bipolar family.

In an NMOS or bipolar switch circuit, when the switch is on there is a constant current flowing through the resistive load, which means of course that there will be a continuous dissipation of power. In the CMOS switch, on the other hand, only one of the two complementary active devices is ever allowed to conduct at a time, and so there is no standing current through the switch and no continuous power dissipation. Power is used when the switches change state because current has to flow to charge the gate capacitance of the next switch, but the overall result is a circuit which uses much less power especially at low clock rates.

CMOS circuitry has been available for quite some time — since the end of the 1960s, in fact — and it is largely thanks to this technology that we can have a digital watch which runs for two years or more from a battery not much bigger than a pea. So why, you may ask, hasn't it been used much for microprocessors and memory circuits?

Well, it has, but like all good ideas it has a drawback. CMOS logic circuits are inherently more complex than their NMOS equivalents, and have therefore been more expensive to make and physically larger, so you ended up with less circuitry for your money. The RCA 1802 CMOS microprocesor came out at roughly the same time as the NMOS 8080. It has been widely used in battery-powered applications, but take a look at its simple architecture and scrawny instruction set and you will see why no self-respecting personal-computer designer would touch it with a barge pole.

In recent years things have begun to change rapidly and considerable R&D effort has been expended to improve the CMOS image, with dramatic results. In the July issue I described how Intel, traditionally an all-NMOS outfit, has suddenly embraced CMOS and is about to introduce a 64Kbit dynamic RAM which uses much less power than earlier NMOS devices. Hitachi has developed an 8K static RAM using CMOS, and it can now be said

by Ray Coles

that the traditional gap between the density of NMOS and CMOS has been narrowed almost to vanishing point.

Although memory devices are leading the CMOS revival, microprocessors and glue parts are not far behind. Already CMOS versions of many of the most popular eight-bit NMOS microprocessors like the 8085, Z-80, 6802 and 6502 have been launched. Teamed with dense CMOS memories these devices are making possible a whole new generation of portable microcomputers.

Just announced by Harris is a much more exciting development, a CMOS 16-bitter, the 80C86. The 80C86 is pin and function compatible with the Intel 8086 and is already supported by a complete family of CMOS peripherals. They include a clock generator, bus controller, parallel interface, timer counter and an interrupt controller. At a 5MHz clock rate the 80C86 draws 50 milliamps compared with 340 milliamps for the 8086, but unlike the NMOS device the 80C86 is completely static and can be placed in standby mode with a stopped clock. In standby the 80C86 draws only 400 microamps.

You might think that Intel is rather put out by this development from Harris, but in fact Intel has given its blessing and intends to build the 80C86 itself in the near future thanks to a technology-exchange deal which gave Harris details of the 8086 architecture and Intel a leg-up in the field of CMOS technology. Before too long we can expect to see CMOS versions of the 8088 and even an 8MHz 80C86-2, which should overturn for ever the generally accepted axiom that CMOS is too slow.

Not that Harris and Intel are the only companies working on 16-bit CMOS microprocessors. Motorola is known to be working on advanced CMOS versions of the 68000, and the PDP-11/70-on-a-chip known as the Micro J-11 from Digital Equipment Corporation is also fabricated exclusively in this technology. Glue parts too are now becoming available in CMOS and are helping to bring the all-CMOS 16-bit microcomputer closer to fruition.

The first CMOS logic family, known as the 4000 series, has been available for about 15 years and has coexisted happily with the bipolar TTL families throughout that time. The 4000 series is used a lot for battery applications, but it has never been able to match the ever-improving TTL devices on one important parameter — speed. This fact has virtually excluded it from the lucrative computer market, until now. In the last 12 months there has been what amounts to a revolution in the market for glue parts, thanks to the introduction of a totally new CMOS logic family called high-speed CMOS or HCMOS. Whether individual semiconductor manufacturers have exchanged technologies, or whether HCMOS was simply an idea whose time has come, I do not know.

Remarkably, there are now 20 different manufacturers who have either already introduced, or are about to introduce, a family of high-speed CMOS logic. HCMOS, unlike the 4000 series, is available in a form which is pin-compatible with the bipolar TTL competition. It can therefore offer drop-in replacements for most of the TTL parts currently used as the glue in microprocessor systems, but with the advantage that much less power is needed.

All the ingredients are now available for a totally CMOS microcomputer with a performance at least equal to the traditional NMOS/bipolar systems on sale today. In the future it is likely that CMOS will actually overtake the other technologies and become the dominant formula. We can therefore look forward to truly portable computers with a power and memory capacity far beyond that of today's puny systems.

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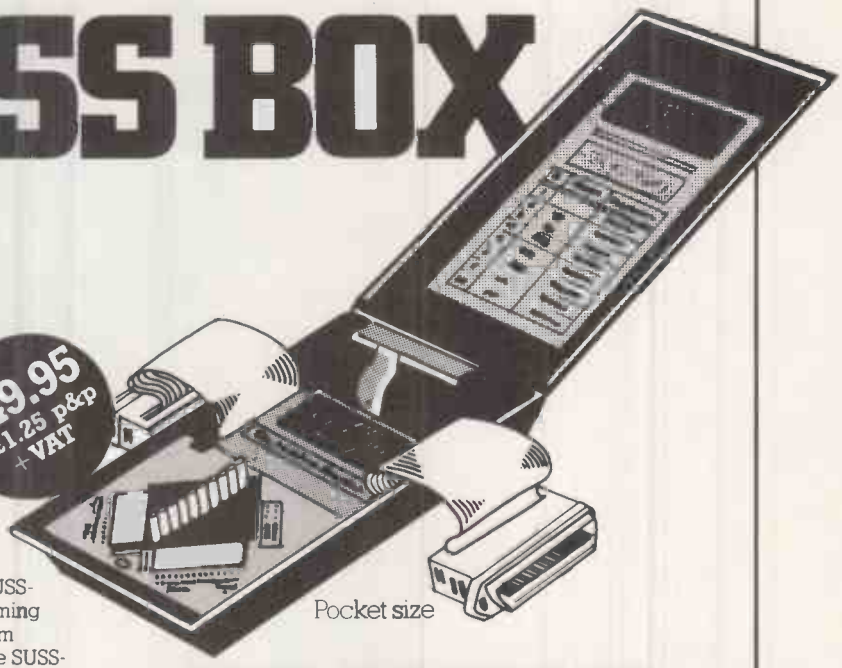

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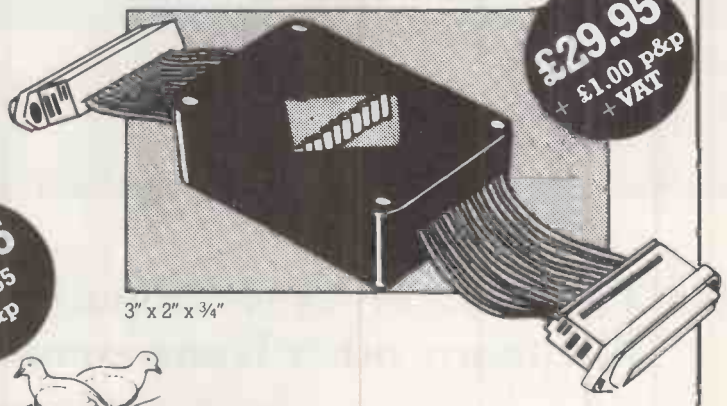

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Don't do it!

A J Harding, writing on behalf of the Computer Retailers Association, argues that existing U.K. law prohibits unauthorised copying of software, with the possibility of heavy damages being awarded against offenders.

DURING THE LAST two or three years there have been an increasing number of articles published in the press on the subject of pirates. Usually these articles have been unsupported by confirmed facts or statistics, and are often apparently written with the belief that everyone — and a microcomputer owner in particular — is basically dishonest and hence, obviously, there must be a lot of pirating going on.

Furthermore, a quantity of these articles have been prepared by authors who have apparently not researched their subject fully or at all, and have presented obviously incorrect judgements on the basis of this unresearched or ill considered data. Pirating of software, particularly in view of the recent furore over video pirates, is considered by editors to be news and one can therefore hardly blame them for printing such articles. It is for these reasons that the Computer Retailers Association decided to investigate the true position and release its findings in this article.

The word "copyright" is something of a misnomer. Its implication is correct in that the word means a right to copy, but in fact it is generally understood in everyday parlance to mean precisely the opposite, namely a restriction on a person's right to copy. The prime statute at the present time is the Copyright Act 1956. It has been amended several times but in the main stands today as it was written.

In the United Kingdom it is not necessary for a British subject to make any formal registration to bring his work within the protection of the Act. The copyright arises automatically when a qualified person generates the appropriate work. It is, of course, wise to state the copyright on the work. It is in this respect that there are a number of differences throughout the world. Some countries like the well known © symbol; others do not, but even for world-wide release the statement in microcomputer software "Copyright 1983 J Bloggs" is sufficient. You will see, therefore, that the requirements necessary in order to give a person copyright are quite general and simple to implement. It is not even necessary to publish the work in order to be able to claim the copyright, although publication will affect the life of it.

What does matter is that copyright will only subsist in original works which are defined under the Act. Thus, Section 2 states that copyright subsists " ... in every original literary, dramatic, or musical work ... of which the author was a qualified person at the time when the work was made ... ". Section 3 of the Act extends copyright to include artistic works and specifically mentions paintings, sculptures, engravings and photographs, together with works of archtiecture. A catch-all sub-section extends copyright to all works of artistic craftmanship. Part II of the Act extends the subsistence of copyright into sound recording, cinematography, broadcasts, television broadcasts and other items. The words "qualified person" refer to the author's nationality.

In the context of microcomputer programs the would-be plaintiff relies on the first two categories mentioned above; that is to say, literary and artistic works. Luckily for many of us, copyright protection is extended by the Act regardless of literary or artistic merit.

When judging any specific case, therefore, the first thing that has to be decided is whether or not any particular work comes within the Act. In order to decide this there are two prime requirements. First of all the work must be original and the author must have instilled into the work a sufficient degree of labour, skill or judgement so as to qualify. Secondly, it must be a category of work defined by the Act, such as "literary" or "artistic".

Restricted acts

The manner in which the Copyright Act is given teeth is by the law saying, first of all, that certain works will qualify for copyright and secondly that there are a number of specific restricted acts which third parties are prohibited from doing, with regard to those qualified works.

There are a number of restricted acts, but for the sake of our discussion we are primarily concerned with the restrictions imposed by the act upon:

a — Reproducing the work in any material form,
b — Publishing the work,
c — Making an adaptation of the work.

Although the law, and the Copyright Act in particular, does not define the word "publishing" as we do in common parlance, the second of the above three restrictions is sufficiently obvious to require little comment. The third is fairly straightforward as well; the Act is simply saying that one cannot adapt the work for another use as, for instance, including a subroutine written by one author and inserted into another author's program.

It is the first restriction that has caused the most problems in the discussions on computer software copyright, in particular whether or not the work is reproduced in a material form when it is loaded into computer memory. However, when we started this article we mentioned that we would be looking only at the practical aspects of copyright, and there seems to be little doubt that in the majority of cases there would be no difficulty in proving a restricted act. The first of the restrictions after all is extremely wide and it is very difficult to see how a would-be pirate would be able to do anything with code without reproducing it in some material form. Hence, although idealistic discussions on whether or not loading a program into memory is reproduction in a material form is very tempting, from a practical point of view such discussions are of little value.

Infringement

So far the Act has said that certain works will qualify for copyright and we have also described that it stipulates that certain acts are restricted. Infringement of the Copyright Act will occur when a person performs a restricted act without the permission or licence of the copyright owner. There are a number of other infringements which can be made upon the rights of the copyright holder, but we feel that it goes without saying, for instance, that a third party who "sells, lets for hire or by way of trade offers or exposes for sale or hire any article or by way of trade exhibits any article in publication" — Section 5(3) — will be in contravention of the Act.

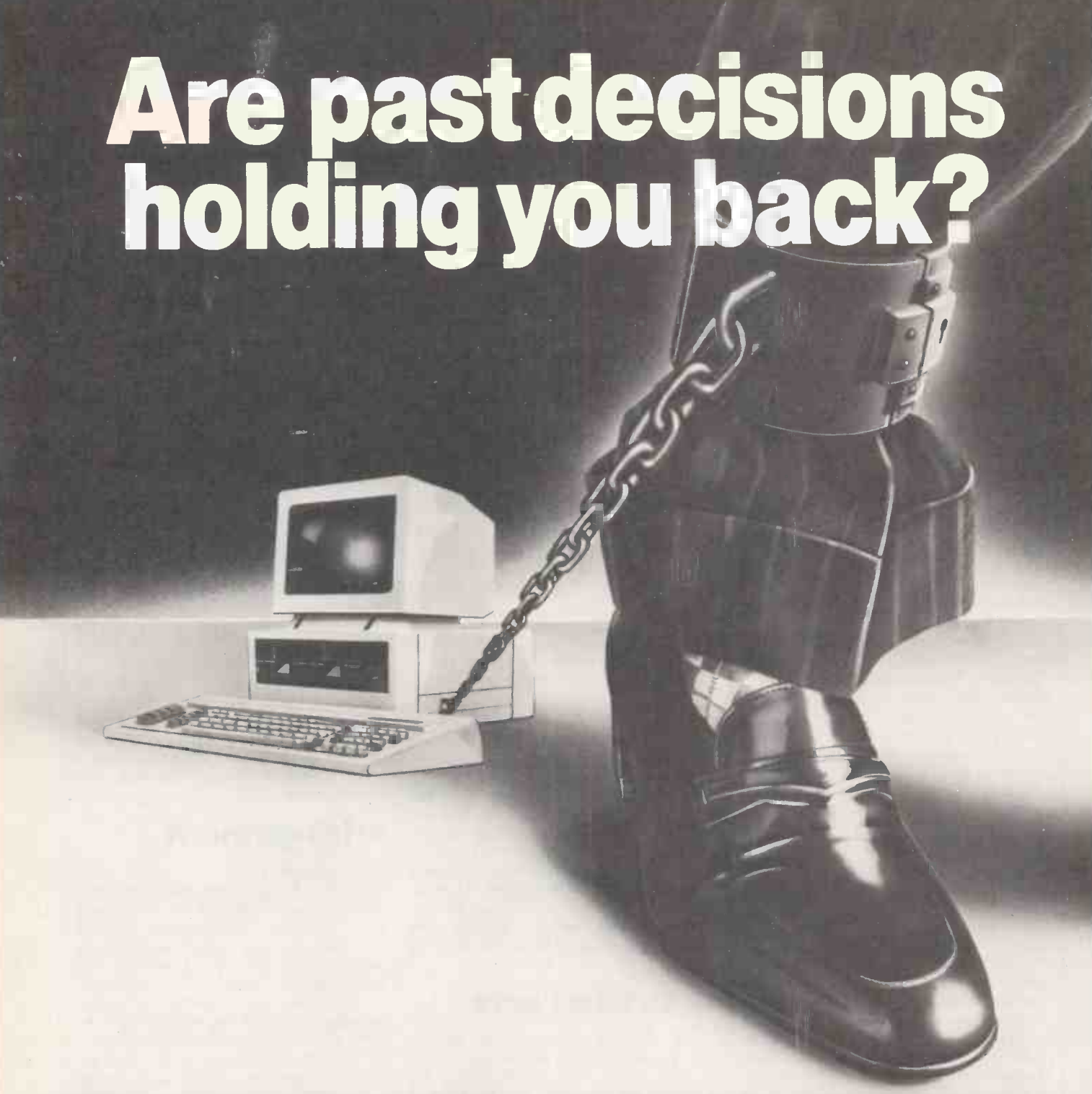
Let us put all of the above together. If it is accepted that microcomputer software is a work coming within the provisions of the Act, then various acts done in relation to that work are restricted, and if a person does them he is in infringement of the Act and penalties flow therefrom.

It is, therefore, of prime and paramount importance that it should first of all be decided whether microcomputer programs do in fact come within the ambit of the Act. That is to say, that they are either literary or artistic works.

Contrary to what appears from the press to be widespread belief, there is in fact very little doubt that microcomputer programs

(continued on page 43)

Are past decisions holding you back?



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Don't do it!

(continued from page 41)

are covered by the Copyright Act 1956 as it stands at the present time. The fact that the Act does not specifically use the words "microcomputer programs" has nothing whatever to do with whether or not such works are covered — except of course in the affirmative. That is to say, if when the Act was written microcomputers had been around and specifically mentioned then, of course, I would not be writing this article.

It is in no way uncommon for a statute not to mention various items which in fact it covers. Obviously this has to be so, as no Act could be drafted so as to cover all possible contingencies, not only at the time it was drafted but also which might arise in the future. Deciding whether or not any specific matter comes within the ambit of any specific Act is, if it is not actually mentioned in the Act, for a judge to decide. So although it is no doubt obvious, it bears repeating that the mere fact that microcomputer software is not mentioned in specific words in the Act, has nothing whatever to do with whether or not the Act covers microcomputer software.

The authority for the statement that software comes within the Act is strong. Contrary to what a lot of people seem to think, there have been at least three cases in which a High Court judge had decided that the Act does apply to microcomputer programs. The first such case was one in which I was personally involved as a plaintiff back in 1980, the second was in mid-1982 and the third in late 1982.

Presumably the reason that some magazine writers have had doubts is that all three of those cases — and there may well be more — have been ended at the interlocutory stage. In other words, for one reason or another the plaintiff has obtained his redress against the defendant, who infringed copyright, without having to take the case to a full trial. In two of them, for instance, what are called Anton Pillar orders were granted. It is beyond the scope of this article to go into what an Anton Pillar order comprises. It is sufficient for our discussion to know that, before one is granted, the judge that is hearing the case has to be satisfied that the Copyright Act covers the works which are the subject of the action. Hence at least three High Court judges have decided that software is covered by the Act.

In addition to the above, to my knowledge two learned counsel, one of whom is well known for his knowledge of copyright and the other who is a co-author of the prime textbook on copyright, have expressed their opinions that microcomputer programs do come within the Act. The only uncertainty arises from the fact that no plaintiff has yet seen any economic sense in pursuing the matter to a full trial.

What therefore is the difficulty? In fact the answer to this is in the negative, there is really none whatever. Any defendant who took a microcomputer program and copied it with the intention of making some money out of it would, as the cases mentioned above prove, be in a great deal of trouble. If the injured party wished, such an offender would be faced either with an injunction, a claim for damages or both, but in any event with a very large bill not only for his own costs but for those of the plaintiff as well.

If there is a difficulty, then it is in the area of whether or not what the defendant has done is a restricted act. Every informed opinion that I have ever seen supports the contention that the loading of a program into memory by a third party is a restricted act. Indeed, it would have to be — although this is a dangerous phrase to use in law — a matter of common sense that, as a microcomputer program comes within the Act, then the loading of it into memory must be a restricted act if only by reason of the fact that that is what the offender does with it before he copies it.

The results of infringement

So if you do it and you get caught, what happens? The quick answer to this is that it depends entirely on the plaintiff. In the cases which have occurred so far, the plaintiff has decided that an Anton Pillar Order and resulting settlement has been enough. Thus, in at least one of the above cases damages were agreed and paid and the matter left at that.

Perhaps the most important point to understand is that "innocent" infringers are just as likely to find themselves at the receiving end of a writ as are the more morally guilty ones. Put another way, theoretically a customer who copies his Invaders to give to his friend is just as likely to find himself sued as is the company who specifically sets out to rip off a major accounting system for profit. It is only the infringement that the court is concerned about.

I personally happen to be one of those people who feel that the microcomputer software industry is not being ruined by copying. Various tests and statistics that I have carried out in my own business tend me to this belief. However, without a doubt copying goes on. I have been to user group meetings and indeed have had customers sitting on the other side of my desk, who have admitted to owning a program which they did not buy. It continually amazes me, that an otherwise sensible law-abiding man can willingly take the risk of ending up in the bankruptcy courts simply to save himself a few pounds.

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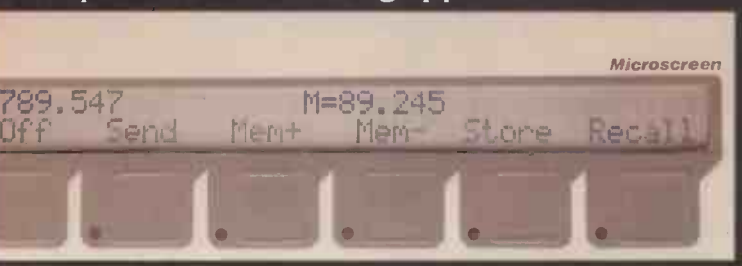

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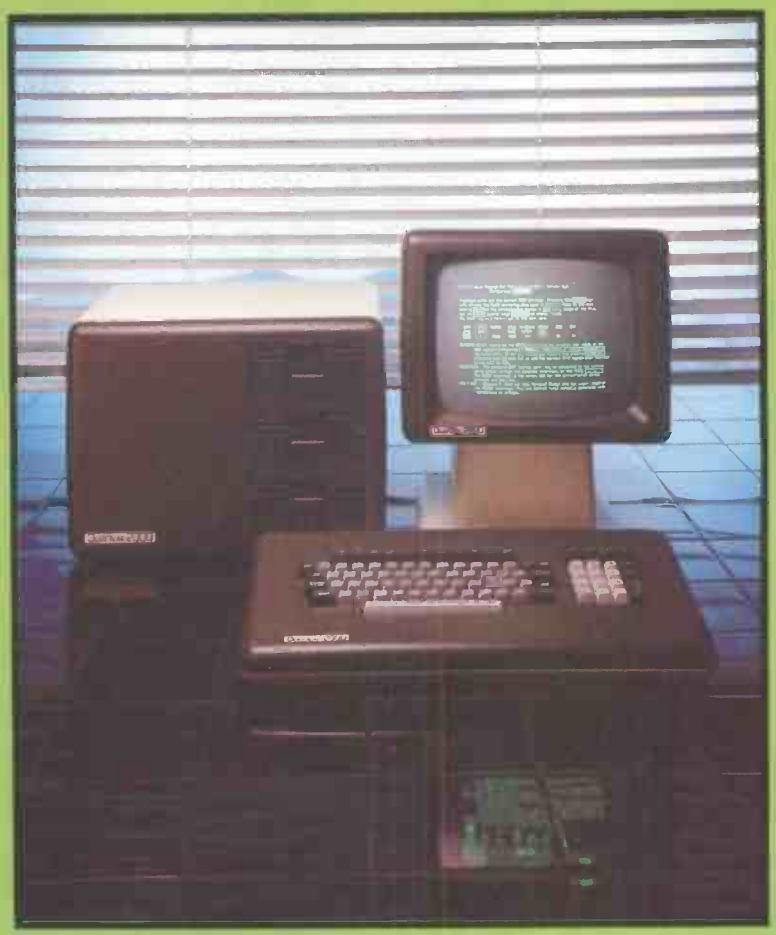

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Lucky Bluggers

Boris Allan spent a weekend with the Logo faithful at BLUG's first full conference.

TOWARDS THE END of the conference a delegate commented: "When they have conferences on Fortran, do they ask themselves what will come after Fortran?" The remark sums up the highly critical attitudes of Logo supporters towards themselves and their language. They see Logo as a means by which education and learning can be immensely improved, but they are pragmatists and try to see the consequences of their actions.

The first conference of the British Logo Users Group, held in September at Loughborough University, was a resounding success. With very little publicity, apart from one letter in the *Times Educational Supplement*, about 250 people attended the conference, and many joined up as Bluggers.

They ranged from primary-school teachers who had used Logo in their classes, and found it had worked, to workers in artificial intelligence who use Logo in teaching AI to undergraduates. One category which was rather poorly represented was that of computer scientists.

The star of the show was Professor Seymour Papert from MIT, author of *Mindstorms* and inventor of Logo and turtle graphics. The central message of his opening talk was that children learning with Logo are engaged in a subversive activity. They often find out what they are not supposed to know, though, as he noted, this is what education and learning should be about. Logo is more than just a language, it is a philosophy. Children are always capable of far more than we give them credit.

Used properly with children, the computer produces a continuing Hawthorn Effect. Papert wondered whether, when computers become normalised, children would become non-subversive. He hoped not — he thought not. At least, through using Logo children would then have a more accurate idea of the place of the computer in our culture than they would otherwise.

With Logo children develop very different styles of programming. The language does not try to force children — or adults — into any form of fixed style. Children might develop what is conveniently called a "structured style of programming if they find it natural, but they are not funnelled into unnatural styles by the computer language or the form of teaching. Papert expanded on this attitude towards children and learning, and struck many a chord among his audience.

One of the most valuable aspects of any conference is the opportunity it provides for making contact with the other participants. Many of the teachers at Loughborough found that much of what Papert had said matched their own experiences with children.

From a school which has been using Computer Concepts' Logo 1, a very simple turtle graphics, on the BBC Micro, one teacher reported an interesting difference between the sexes. Girls found the graphical aspects of Logo engrossing, she said, and they learned mathematics through that interest. Boys at first were more interested than girls, but when the boys found the girls were just as good they began to ask for conventional sums with conventional ticks and crosses.

These experiences matched research findings from the Department of Artificial Intelligence at Edinburgh University. Workers there found that Logo did not hinder boys, but actively helped girls. The AI department at Edinburgh has a long

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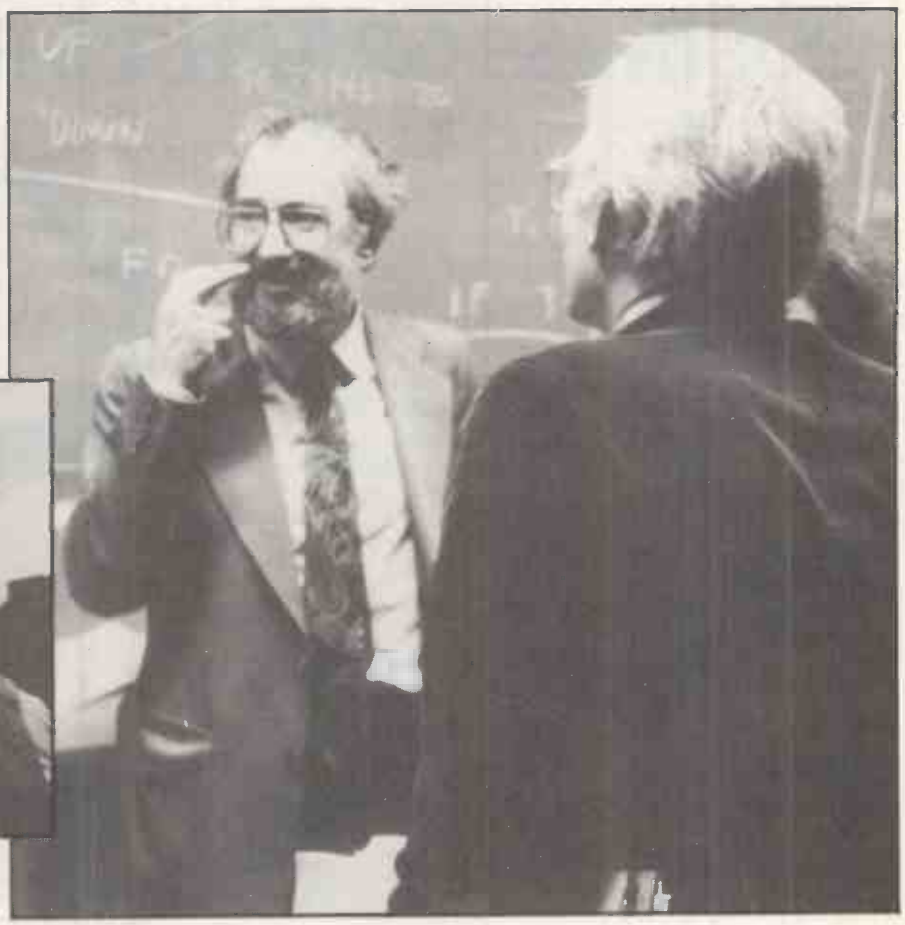


Seymour Papert (right, facing camera): learning with Logo is a subversive activity, but will it remain so?

Lucky Bluggers

(continued from previous page)

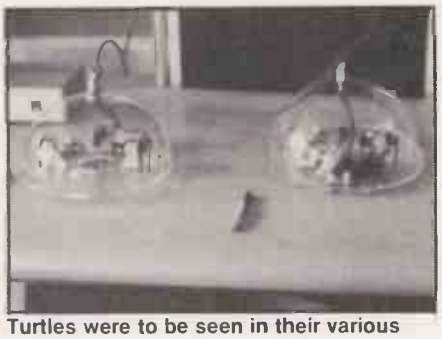
history of research and development in Logo and is responsible for the version of Logo on Research Machines micros. The Edinburgh version of Logo is rather different from most others, which tend to follow the MIT formulation.

The radical ethos which seems to underpin Logo does not mean that teachers who use and support Logo are unaware of the practicalities of teaching. Deborah Booth, who has been using Logo for a year in the Chiltern project, gave a very enlightening lecture on how Logo might be used.

Two key elements to come out of her talk were communication and assimilation: "communication" in this context had nothing to do with networks or modems, she meant communication between children. It was found that children progressed better in small groups of two or three than alone. Deborah Booth found that mixed-ability groupings did not work so she organised the groupings by ability. Interestingly, this grouping by ability was by computer ability and was often unrelated to other abilities.

For details of BLUG contact Pam Valley, 26 Tithby Road, Bingham, Nottingham NG13 8GN.

Workshops on list processing continued after the main conference sessions.



Turtles were to be seen in their various guises.

Computer manufacturers were well represented, with machines from Texas Instruments, Atari, Research Machines, Apple and IBM PC. Some Spectrums were to be found running micro-Prolog. I was most taken with the Atari Logo and least taken with the Research Machines version. Logos are due to appear for most machines — with the notable exception of the BBC.

Since this was a Logo conference there were turtles from Jessop Electronics, and the designer of the BBC Buggy. M P Doyle demonstrated a computerised teaching device which children operated by pressing pictures or "icons" on a touch-sensitive surface. It may not be Logo but it is highly interesting.

The conference reached a climax with an open session in which most energy went into castigating Acorn for the lack of a proper Logo for the BBC. It was suggested that the government should consider increasing the numbers of makes of approved microcomputers so that more schools could use Logo.

Primary schools normally have BBC Micros or Spectrums, and it looks as if the Spectrum version — nearly finished, so its writer told me — will be the only one available to them. Secondary schools are more likely than primary schools to have Research Machines, but Research Machines Logo is rather different and memory is rather tight.

Looking back at this conference, my memories are mainly of the enthusiasm shown by nearly everyone I met. I will also remember that Acorn was less than popular.

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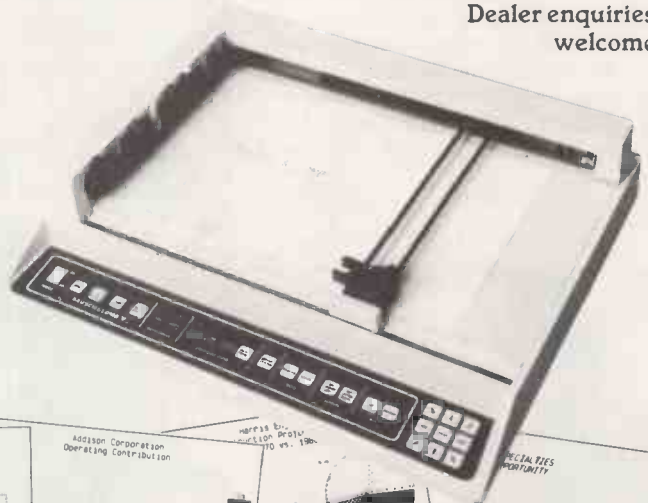

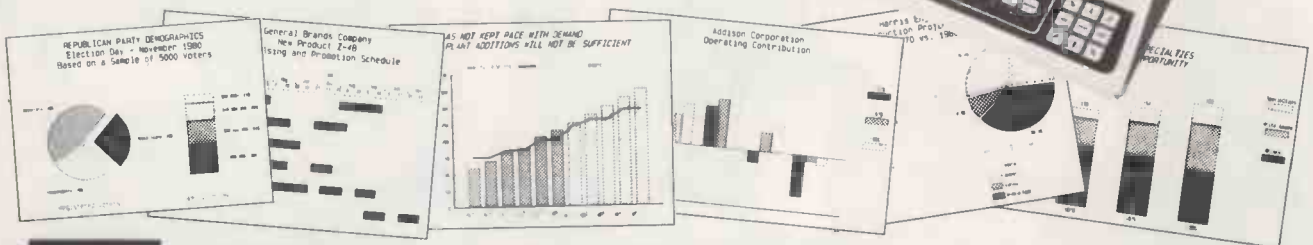

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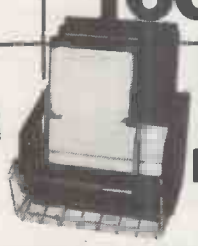

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The All-Purpose System

The MTX Series is a new departure in micro-computer technology. Whether your needs as a user are for personal programming, games playing, scientific or process control, educational or business use the MTX Series is already capable or very easily adaptable to almost every application. Glance through the standard features below - you'll see what we mean.

Hardware - 32K RAM on the MTX500, 64K on the MTX512.

The MTX500 has 32K of user RAM as standard (64K on the 512), expandable to 512K plus 16K of video RAM, controlled by a separate Video Processor. Sixteen colours, 40 column text, 256 x 192 high resolution graphics with all sixteen colours available, and 32 easily moveable user defined graphics characters (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are centronics printer port, two joystick ports, an uncommitted I/O port, 2400 Baud Cassette port, separate TV and Video Monitor ports, 4 channel sound with hifi output plus a dedicated cartridge port. Other standard features include the Z80A processor running at 4MHz, real time clock, full moving key keyboard with 79 keys including eight 2-function keys and separate numeric pad.

Software

The MTX's 24K ROM contains several languages and routines which enable the novice or the experienced programmer to make full use of the machine. Standard languages are MTX BASIC, MTX LOGO commands, NODDY. ROM routines include an ASSSEMBLER/DISASSEMBLER with screen display of the Z80 CPU registers, memory and program, which can be manipulated from the keyboard. Machine code programs can be stepped through one instruction at a time, and easily called from within BASIC programs. A further feature is the Virtual Screen facility which enables the programmer to split the screen into a maximum of eight sections to work independently whilst maintaining all full screen facilities. Pascal is available as an add-on ROM pack.

The Disc Based Computers from Memotech

Designed to use the full power of the MTX computers the FDX and HDX make perfect business systems at prices which make perfect business sense. Both feature the CP/M operating system, giving instant access to a wide range of proven application software. Available in October these feature:

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All Memotech products are designed and manufactured in Oxfordshire, England

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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.

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If your computer can produce invoices in a matter of minutes it seems crazy to then spend hours mailing them by hand. The Neopost System Five-2 from Roneo Alcatel is designed to fold, insert, seal and frank in a fraction of the time it takes manually. The 'system' can be controlled by a single operator saving many costly man-hours and its modular construction gives it the flexibility to match your needs exactly. If you're interested in saving time and money circle this number today for more details.

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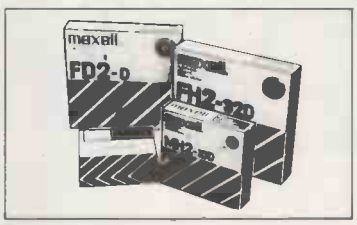

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Buying floppy disks for your computer? Maxell floppies come in 3in, 5¼in and 8in sizes, single and double density and you'll get absolute reliability every time. It makes sense to entrust your vital data to a reputable brand and Maxell's wide acceptance with major users such as software publishers and government departments endorses their claims for top reliability. The rapidly expanding dealer and distributor network means easy availability too. Contact me now for more information.

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Nashua Copycat reliable & versatile

A frequent problem with copiers is that you must choose between either reliability or a wide range of features. But the new 4400 and 4600 from Nashua offer versatility you can use with confidence. The key is a series of unique anti-jam mechanisms which keep the copiers running smoothly. Enlargements and three sizes of reduction are all part of the specification and microprocessor monitors keep the machine in top form. For more details on these sophisticated, highly dependable copiers, just circle this number.

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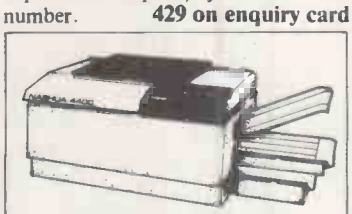

A cut above the rest . . .

Continuous stationery can create as many problems as it solves, with paper-cutting bottlenecks holding up output. But according to Bell & Howell their Fimafold 1000 provides a low-cost solution for small or medium computer installations. The accent is on ease of use and maximum versatility, with electronic control systems keeping the operator fully informed and in complete control. Interested? Circle the number and I'll be happy to send you full details.

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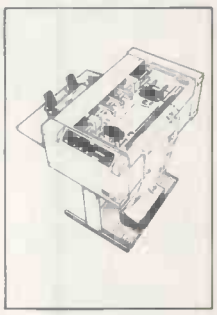

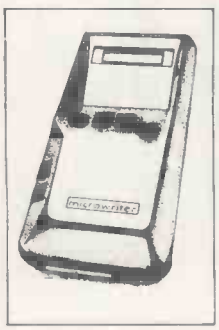

Microwriter cut their prices to £299

Due to developments in overseas markets, production runs on the Microwriter have enabled the company to bring forward a massive price reduction of nearly 40%. This portable one-hour-to-learn word processor can now cost users as little as £10 per month to buy. Personal purchases in this country are expected to boom. Contact me now for full details.

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Canon AP350 simple sophistication

The Canon AP350 typewriter offers sophisticated electronic capabilities in a low priced, easy to operate, machine. A liquid crystal display allows corrections to text before typing and the electronic memory can store text and formats for a later time. The AP350 has a friendly keyboard similar to an electric typewriter. Electronic function keys are on either side of main keyboard for easy access and operation. The Canon AP350 can be interfaced with the RS232C and helps you take the next step towards office automation. I have full details.

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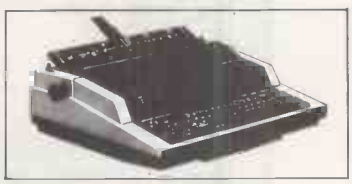

Canon AP400 smart and silent

The Canon AP400 electronic typewriter has a host of features that will delight you. Smart looking and with a 500 character correction memory, the AP400 will automatically centre text between margins, tabs and words or around any carrier position. This typewriter will also interface with the RS232C. Other features include right hand alignment, underlining, bold lettering, automatic carrier return and paperfeed and decimal tabulation with numerical punctuation. The AP400 is yet another step towards office automation. I can put you in touch with Canon.

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A fully automatic sheet feeder

A completely mechanical single bin sheet feeder has been developed called the Easifeed. No complex electronics or interfacing with your printer, simply clip on and it's ready for use. The reliable Easifeed, from Link International, takes paper sizes up to A3, prints edge to edge and is available for most WP and DP printers. Individual sheets and envelopes can be fed without removing the attachment. A reverse feed facility is also incorporated. Tractor feeds are also available. Contact me for full details on these low cost products.

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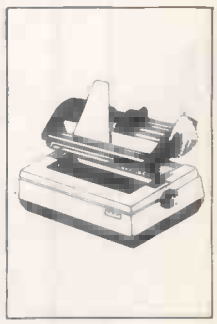

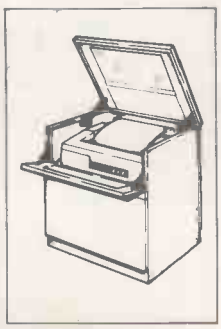

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A truly self-contained mobile acoustic cabinet is now available from Link International. The Link Printstation is quieter and stronger than a desk top cover and has been designed to be functionally effective. Paper piles neatly in the bottom of the cabinet and controls are reached via a drop-down door which eliminates the need to open the main lid each time. This Printstation costs no more than an acoustic cover and printer stand. To find out more, just circle this number.

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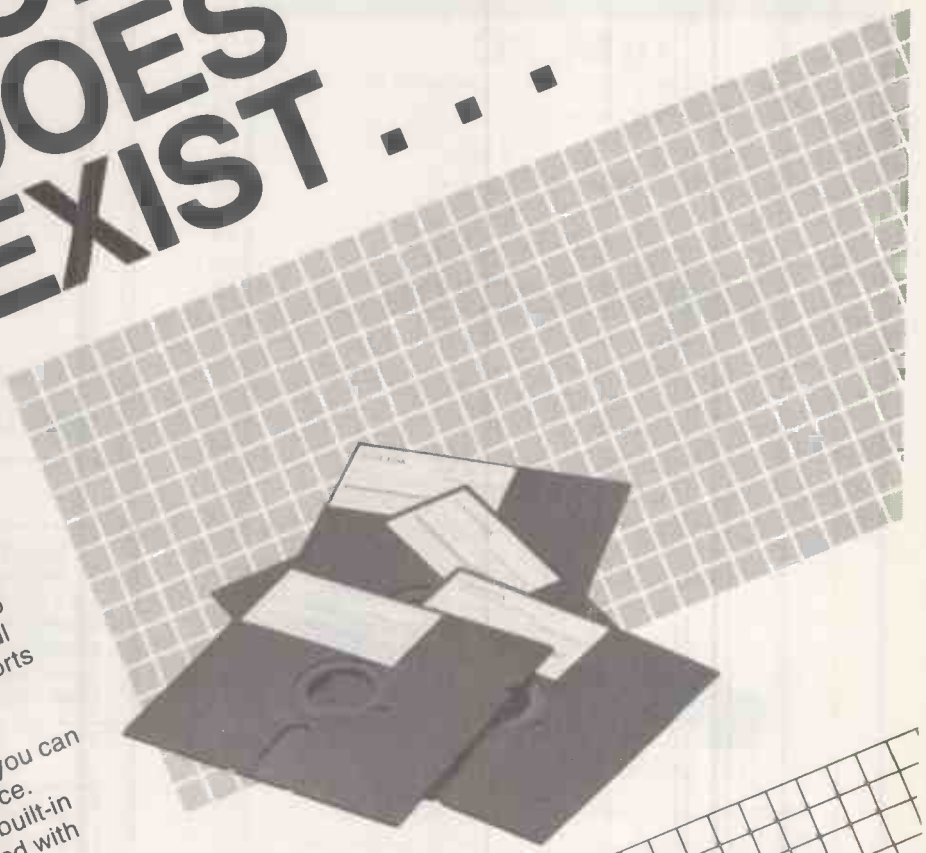

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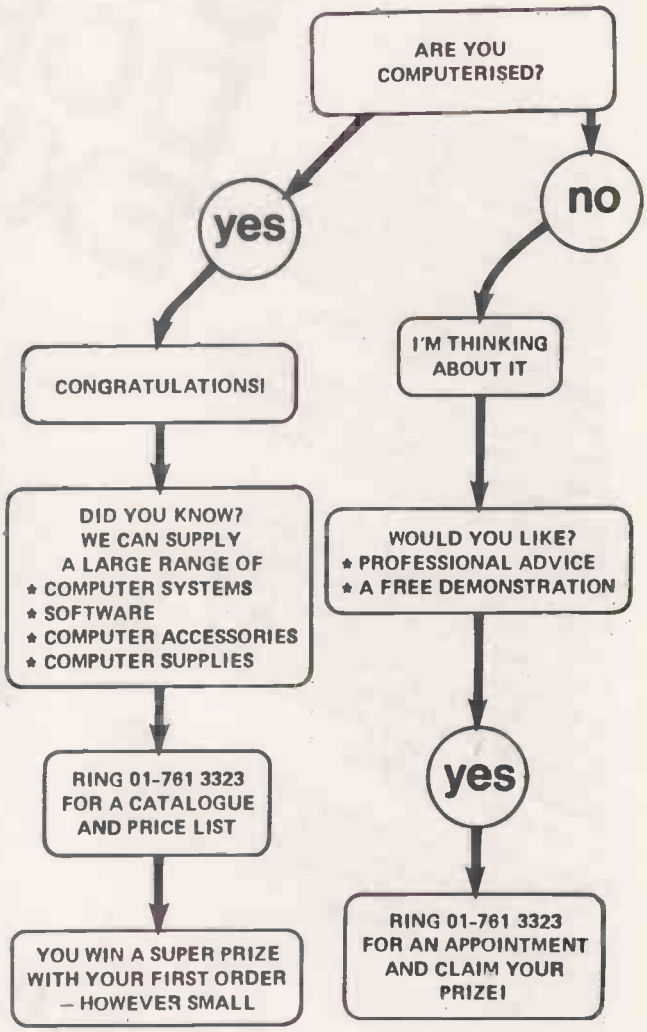

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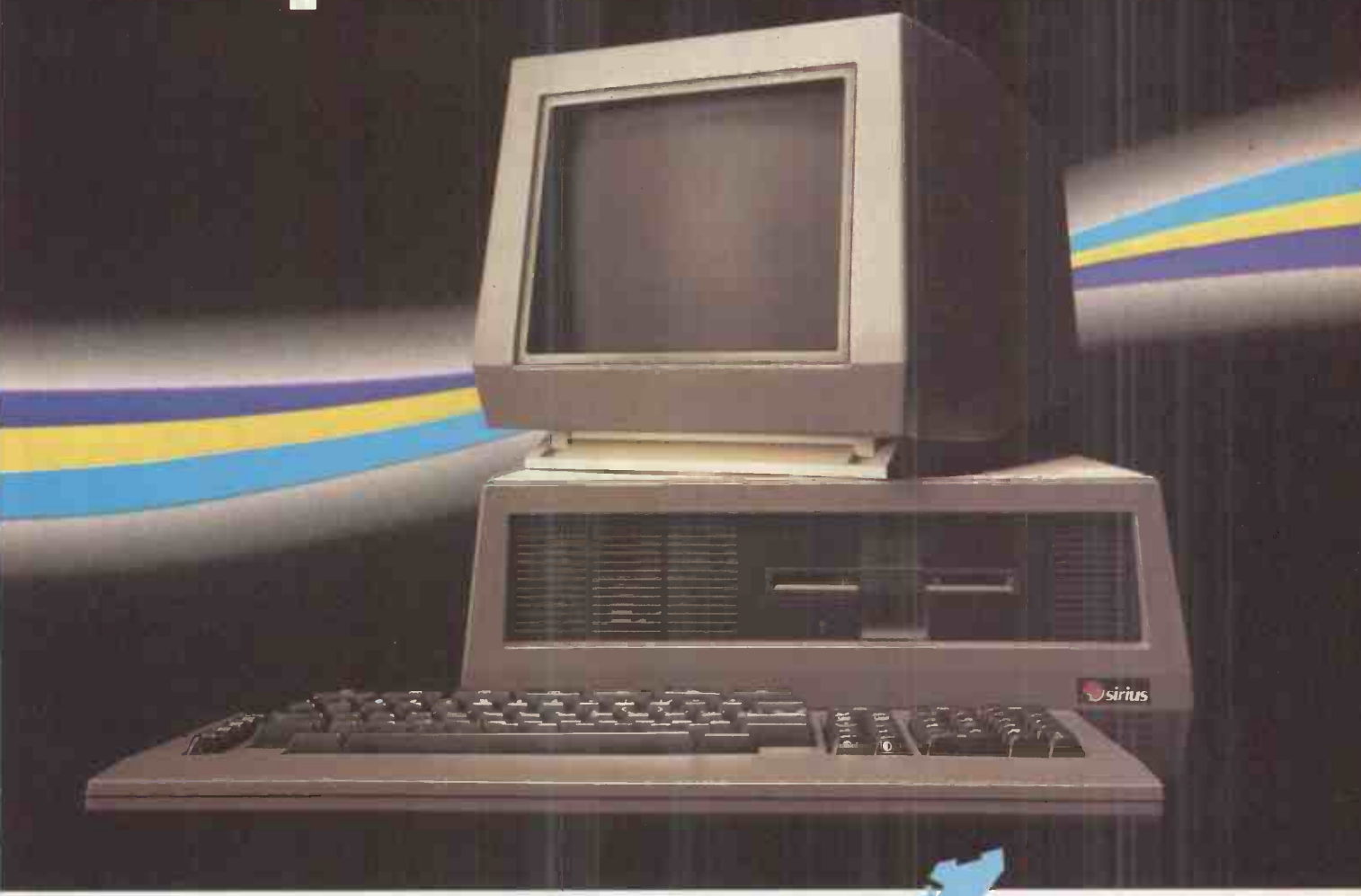

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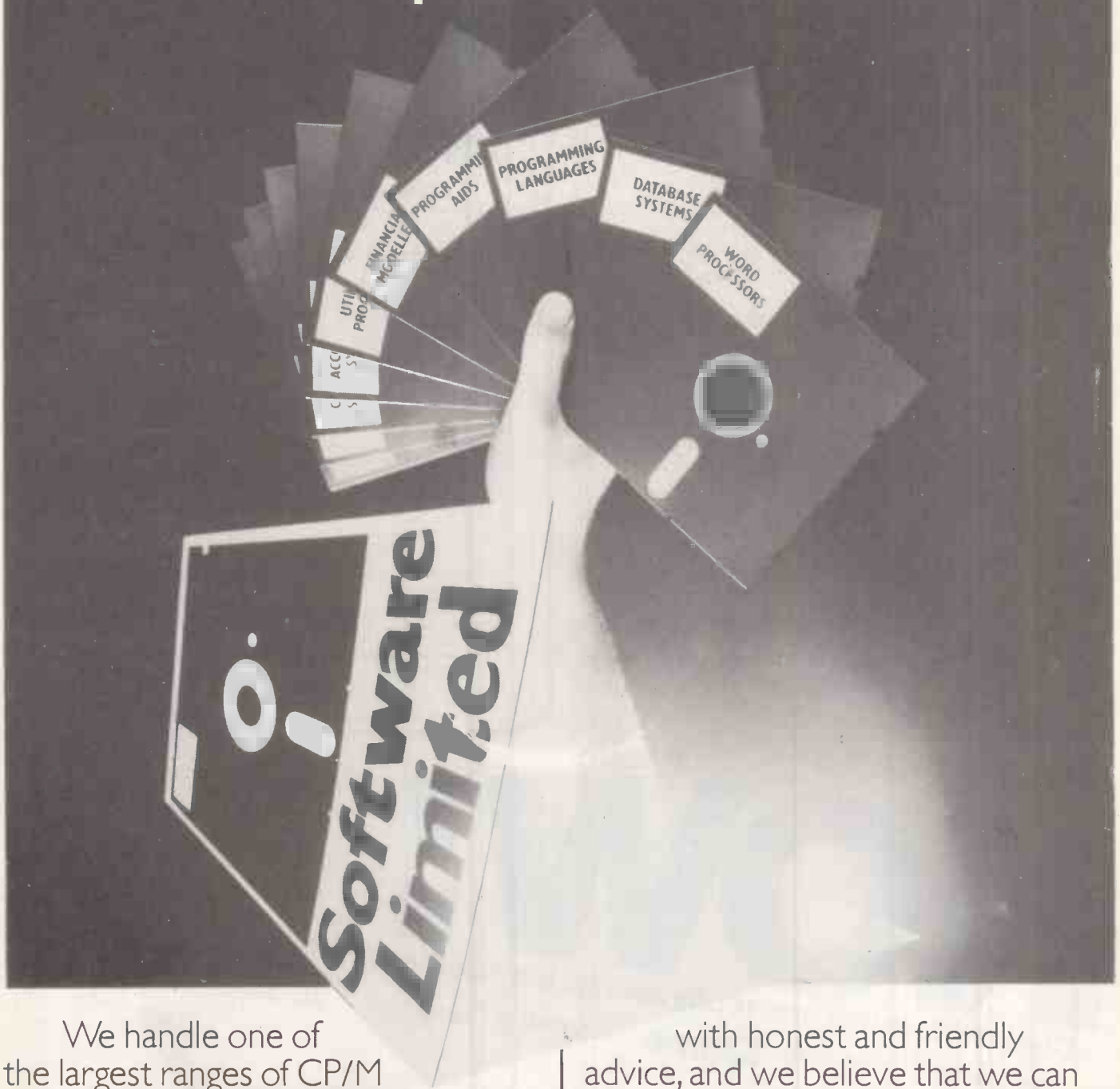

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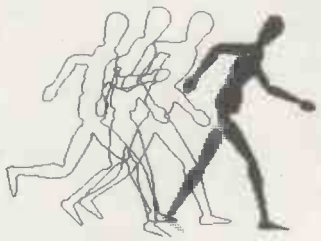

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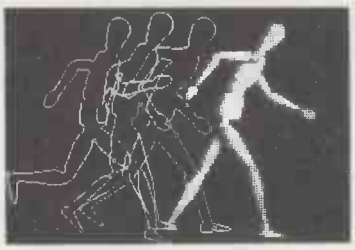

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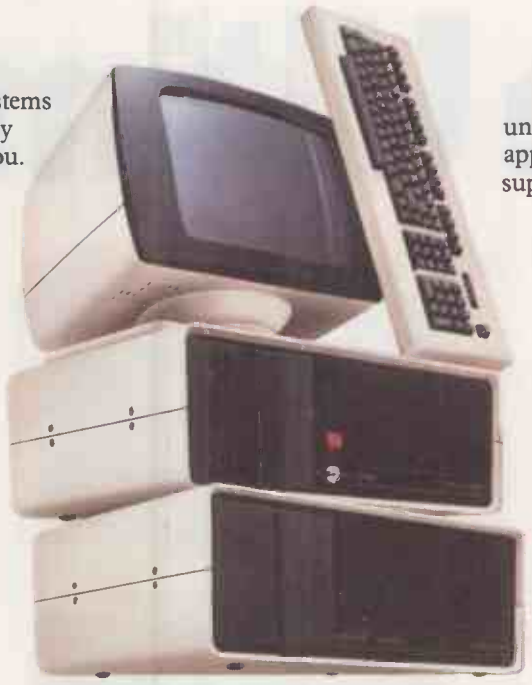

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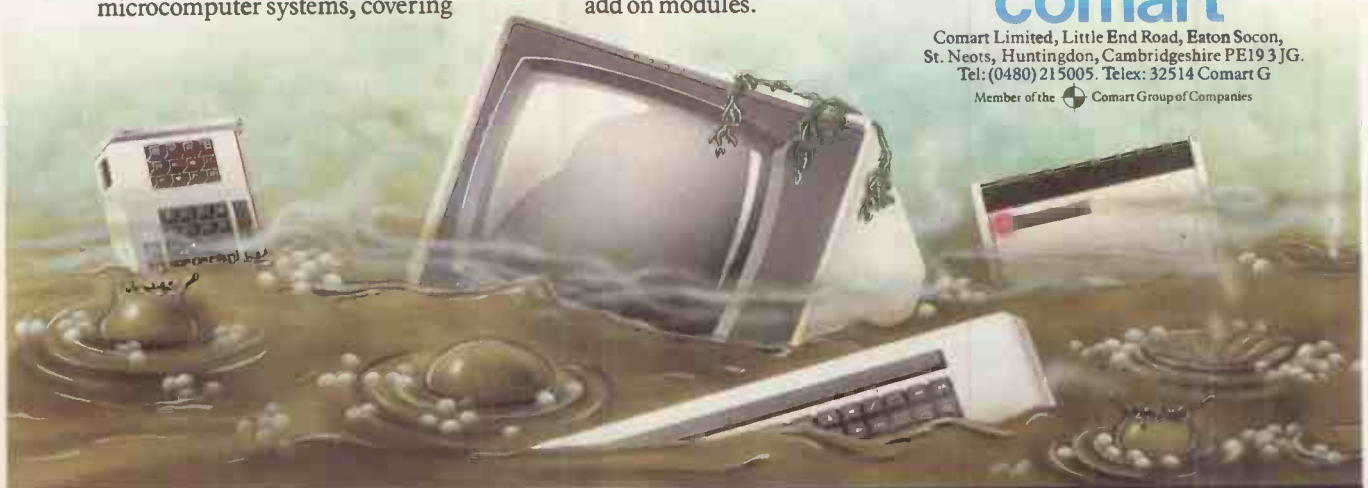

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The Ultimate

At last there is a truly professional micro available in the UK at a personal price. The Z100 surpasses anything else you may have considered – mainly because Zenith Data Systems has concentrated all its resources into producing the ultimate micro. Unlike some manufacturers who are primarily involved in mainframes and minis, Zenith's technology is based on the screen approach.

Designed to carry out routine business applications including word processing, the Z100 also offers exceptional business and engineering graphics in full colour as standard.

The Z100 is superbly engineered, its reliability has been proved in thousands of installations, making Zenith the number four best-seller in the United States.*

Combined unit.

Prices from £2,072, excluding VAT. Quantity discounts available. Price includes CP/M, ZDOS (= MS-DOS), ZBASIC and colour graphics on low profile unit as standard.

* Source: Dataquest Desktops Survey.

Hardly surprising when you consider that the Z100 gives you:

- Intel 8085 8-bit and 8088 16-bit processing
- 224K to 960K RAM memory, including video RAM
- Five S100 expansion slots
- high quality colour graphics
- CP/M(TM) and MS-DOS(TM) operating systems
- 10MB (formatted) 5¼" integral Winchester disk drive
- communications facilities via 1 parallel and 2 serial RS232 ports.

The Z100 is available both as a combined screen/disk/keyboard unit or in low profile with a moveable screen.

CP/M(TM) and MS-DOS(TM) enable the user to take full advantage of the wide range of current and planned software.

The Z100 is available through our dealer network and of course is backed by nationwide field service.

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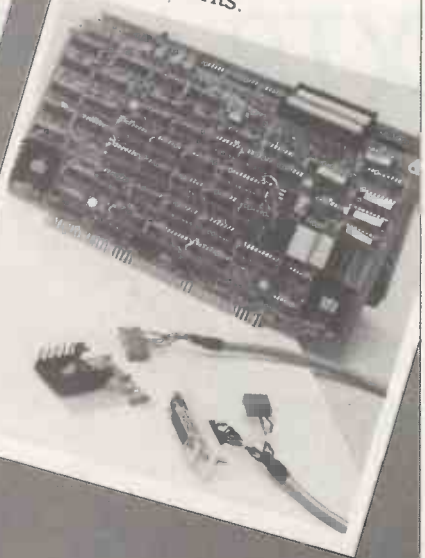

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● Circle No. 148

CHOOSING A HOME MICRO

WARNING

Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

THE PITFALLS

"DON'T LET THE ADD ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost.
These offers usually have a hidden sting inasmuch as the essential accessories such as connection leads, peripherals and software often carry very high cost premiums.
e.g. software for low cost hardware usually costs between £29 and £49 for a ROM cartridge!!

CHECK THE QUALITY OF THE PRODUCT.

Raw materials are now an area where corners can be cut, and shoddy workmanship during 'building' can effect the 'up-time' of your unit.
Areas to watch out for are unreliable edge connectors, corrosion and poor quality P.C.B.s. Low quality components and bad design will seriously effect the reliability of the end product, and can lead to false economy.

DON'T BUY A GAMES MACHINE

Unless you want just games and nothing else! With a games computer you are limited.
Some computers, however, have the advantage of both games facility plus the whole world of computing to explore, as your interest and skills develop. A real computer system will allow you to expand your knowledge of the Hi-Technology world, and help earn its keep with its added uses in the field of education, communication and home business use.

SOFTWARE

Make sure the system you choose has a growing library of support software, to enable you to realize the full potential of your machine.

KEY POINTS TO LOOK FOR

● High Resolution Colour

In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together. If the result is less than 35,000, then the graphics can hardly be considered high resolution.
Without high resolution graphics displays such as those used in games tend to be "Chunky" in appearance.

● High Quality Sound

Some computers claim to provide a sound channel when in reality all that can be found inside the computer is a small buzzer controlled by electronic pulses. At the very least a sound facility should provide more than one channel and a raise channel as well (for gun shot effects in games for example). The best systems also provide envelope control of the sound channels to produce very sophisticated effects: very important for generating music. Also look for the ability to connect to external amplifiers.

● Keyboard

For accurate entry of programs and data into a computer it is important that the keyboard has a good tactile feel in operation. Coupled with acoustic feedback the user is fully aware when the computer has accepted his/her actions. Also of importance in a keyboard is layout. A standard computer keyboard layout will familiarise the user with the vast majority of computers used in the world of business and professional applications; very important if the purpose of purchasing a computer is educational.

● RAM

One of the most important features of a computer is the amount of RAM, or memory, included. In general the more powerful and exciting a computer program is the more RAM it requires. But take care, all computers are advertised quoting the total RAM used in the system. Computers use up a great deal of their own RAM for storing essential data and particularly in supporting the graphics display and the CPU. If it is less than 32K think again. is it enough?

● Computer Language

It is too dificult to program a computer in its own binary language so high level languages are used, the most popular being BASIC. However. there are a number of BASICs, some being very different from the rest. A de facto standard in the computer industry is Microsoft BASIC. Learn this one and you will be able to program in the majority of computer BASICs; such an important point if a home computer is to be used to educate your children to face the technology of the future.

● Expansion

As your interest and knowledge of computing grows, you will need a computer system that will grow with you; able to accommodate Printers, Disk-drives, Joysticks, Communications Modem, and Colour Monitor, as well as produce HI-FI sound effects.

● Software

The computer you choose should have a growing selection of utility software to make the most of its capability.
Remember, computing is here to stay. You can't learn to compute on a toy, or a device which does not behave like a real computer.
In short, look out for a computer which offers all the points above, and you will be sure of getting the best value for money.

Choosing the right system carefully will save you from throwing your money away. Check full specification, plus peripherals and software prices, before you buy. Preferably choose a Real computer system that can expand to meet your needs.

To find out which company offers you the right choice, with:-

- Good value, high specification, quality micros.
- A quality, 4 colour, plain paper printer/ plotter.
- Communications Modem.
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TURNOVER...

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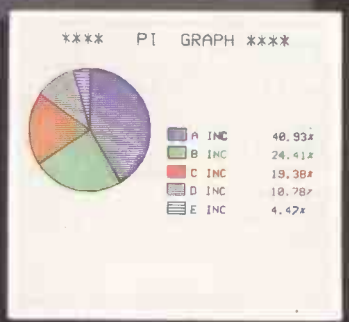

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Expert-Ease

ARTIFICIAL INTELLIGENCE work under Donald Michie at the University of Edinburgh has lead to a practical application of AI in the form of Expert-Ease, an expert-system generator for the IBM PC. It is, in fact, a micro version of a mini-computer program called ACLS, developed using an algorithm known as Quinlan's ID3.

The program has a spreadsheet-style format, with help screens, and is about as easy to use as VisiCalc or TK!Solver. You enter your expert knowledge in the form of examples, and Expert-Ease induces — or deduces — the rules that apply, and presents them as a decision tree. You can then add descriptive tags to the key words to generate a £50 enquiry-only system that can be used easily by non-experts.

The analogy with VisiCalc is interesting, because the format of VisiCalc suggests it must be used for large, labour-intensive financial planning. In fact it is used on an *ad hoc* basis to produce quick answers to short but complex problems. Similarly the design and price of Expert-Ease suggest it should appeal to hospitals, government departments and large corporation who will spend years of experts' time developing complex systems to diagnose gallstones or whatever.

An expert-system generator with a spreadsheet-style format.

Its first attraction is that it isolates examples of muddled thinking where the fruits of experience lead to conflicts in logic, and Expert-Ease signals "clash". Next, the decision tree reveals where further examples are needed to produce better distinctions between different options. Third, Expert-Ease's mechanical logic discards the irrelevant elements. Using it on a series of tests, for example, might reveal that half of them contributed nothing to the final decision. In these three ways Expert-Ease actually provides a way for the expert to clarify his/her thinking and thus solve problems more simply.

But there are a couple of problems with Expert-Ease: it only runs on the IBM PC under UCSD p-system, and it costs £1,500 for a single copy. The distributor, Export Software International, is currently negotiating with leading software publishers to bring to the mass market a version written in C to run under MS-DOS on the IBM PC and the Sirius. The price should then be brought below £500.

Contact Export Software International, 4 Canongate Venture, New Street, Royal Mile, Edinburgh EH8 8BH. Telephone: 031-556 3266.

Shopping in Carolina

*MARK III is claimed to be the world's largest commercial teleprocessing network. It is run by Geisco, General Electric Information Services Co., which has no connection with Lord Weinstock's GEC. Now if you have an IBM PC you can dial *Mark III's electronic shopping service, Execuclub, based in North Carolina, and try out its range of computer programs. If you like one you can have it downloaded and you will be invoiced later. Browsing need not entail a horrifying phone bill as Geisco's service is available as a local call in 750 cities world-wide. The service is based on 44 mainframes, the nearest one to London being in Amsterdam. While Geisco's announcement is for the IBM PC interface, pretty much any micro can be connected to the system.

Contact Geisco Ltd, 25-29 High Street, Kingston-upon-Thames, Surrey KT1 1LN. Telephone: 01-546-1077.

Prolok

VAULT CORPORATION of Westlake, California, claims to have solved the problem of software piracy. Vault provides a disc you can copy but not pirate, because the program will not run without the unique fingerprint on the protected disc. If you accidentally erase the program disc, then you can use your back-up copy to restore it. If the dog chews up your Proloked disc, hard luck.

Vault does not claim the fingerprint is impossible to crack, but points out that each disc has a unique identification, so cracking one disc does not crack the system. Prolok is compatible with CP/M, MS-DOS, Apple DOS, Atari DOS and selected CP/M-86 systems. The initial release is of the IBM PC version. We have it and we can't crack it. The cost per disc is less than $1.

Contact Vault Corporation, 2649 Townsgate Road, Suite 500, Westlake, Ca 91361. Telephone: (805) 496 6602.

(More news on next page)

PC flashes

● **Lifeboat Associates** now reckons to have a full range of software for the IBM PC. As Lifeboat supplies over 200 programs in more than 90 disc formats there is no room to mention them here, but if you write you will be sent a free catalogue. Contact Lifeboat Associates, PO Box 125, London WC2H 9LU.

● **Visicorp** of San Jose, California, has now upgraded its products to run on the XT, the hard-disc version of the IBM PC. Contact U.K. distributor Rapid Recall, Rapid House, Denmark Street, High Wycombe. Telephone: (0494) 35634.

● **Waterloo Logo** comes from the University of Waterloo, Canada and requires a PC or XT with 128K of RAM. It costs £145 plus VAT from Roundhill Computer Systems, Axholme, London Road, Marlborough, Wiltshire. Telephone: (0672) 54675.

● **Keyboard Templates** are handy when learning to use a package, or if you keep switching from job to job. Now you can have templates for the IBM PC for such popular programs as WordStar, VisiCalc, Supercalc, Easywriter, dBase II and 123 from Impex Micro Products, 4 Ridgeway Court, Grovebury Road, Leighton Buzzard, Bedfordshire. Telephone: (0525) 371597.

● **Map Software** has been released to provide integrated accounts on the PC as well as popular CP/M micros. As well as general uses, vertical markets catered for include solicitors' client accounting, time recording, and accountants' incomplete records. Contact Map Computer Systems, 105-107 Windsor Road, Oldham OL8 1RP. Telephone: 061-624 5662.

● **Mediatech** has launched Accounting Plus-16, a business-management system, on the IBM PC. It comprises a suite of programs which build up to an integrated system. It is also available for the Sirius, DEC Rainbow and NEC APC, among others. Contact Mediatech Software, Woodside Place, Alperton, Wembley, Middlesex HA0 1XA. Telephone 01-903-4372.

IBM distribution

IN A REMARKABLE departure from tradition, IBM is now starting to distribute other people's software for the IBM PC. Industry observers were astonished when, two years ago, IBM started to sell other people's products under the IBM label. The sight of IBM distributing them still wearing the colours of other firms should send many to an early grave.

The first products to be honoured by IBM distribution are Personal Cobol from Micro Focus, and Compsoft's sophisticated database program Delta.

IBM Product Sales Ltd's Programming and Publications manager is Alan Malsher, Telephone: (0256) 56144.

Frontrunner

NO, not another data management system, Frontrunner runs on the IBM PC under PC-DOS and is claimed to be easy to operate and offers comprehensive retrieval facilities. It can even write data in user-specified formats so you could transfer information to WordStar or another popular program. Finally, it is both British and reasonably priced at £190.

Contact Decision Technology, 7 St Johns Road, East Molesey, Surrey KT8 9JH. Telephone: 01-979 5533.

Two Tava PCs

TAVA CORPORATION of Tustin, California has simultaneously announced in the U.K. and the U.S. the launch of two IBM PC look-alikes. One is a desk-top model, the other a portable. Tava has also signed a deal with London systems house Paperlogic to sell the machines in Europe through the Compushack chain of stores. The first European one will be opened next January.

The Tava portable weighs 32lb. and is a 256K system with two 320K floppy-disc drives. It will cost £2,199. The Tava PC is a 64K model which will cost £999. Paperlogic plans to show a 64K dual eight/16-bit networking machine later.

Other products to be handled by Paperlogic will include Shugart disc drives for the BBC Micro, a Tava 10Mbyte hard disc, and the 64K Big Blue CP/M card — shouldn't that be Baby Blue? — which will allow the IBM PC to run useful eight-bit software.

Contact Compushack, 12 Nottingham Place, London W1M 3FA. Telephone: 01-935 0480.

General Accounting

A NEW SOFTWARE package under the IBM label is General Accounting. This menu-driven program handles sales and purchase ledgers and VAT information, and writes cheques for the small business. It accommodates up to 1,000 accounts on a PC with 64K of RAM, or up to 2,000 with a 128K version. The larger RAM is required for cheque printing.

General Accounting was developed in the U.S. by BPI Systems International for use in the U.K. It costs £351 plus VAT from IBM Retail Centre.

Pete & Pam

WELL KNOWN APPLE and IBM PC dealer Pete & Pam is importing a wider range of PC programs than before.

Two popular software families now available for the IBM PC are PFS and the Super series from Sorcim. PFS File and PFS Report from the Software Publishing Corporation cost £84 each. Supercalc costs £149 and Superwriter costs £249.

File-Fax is an American database fromTMQ and runs on a range of systems including Apple and Atari. Pete & Pam imports the Apple and IBM versions, which cost £39 each.

Another new database is Data Base Manager II from Alpha Software in Burlington, Massachusetts. It claims to integrate spreadsheet and word-processing capabilities with database management, and to be fully compatible with leading programs such as VisiCalc, 123, Multiplan and WordStar

A new super-fast compiled version of Chartman is Chartman Super, from Graphic Software in Boston. It is menu-driven, allows the production of charts, graphs and forms, and interchanges data with VisiCalc.

A PROM blaster from Apparat Inc of Denver, Colorado, is said to program virtually all common 24-pin EPROMS. It costs £159.

PC Pal, the latest teaching program from Comprehensive Software, Los Angeles, uses games, animation and sound. It covers the keyboard, software and hardware and costs £23.33.

Question is an educational game based on artificial intelligence. You think of an item and the computer guesses what it is. The price is £32.95.

All these programs are available from Pete & Pam Computers, New Hall Hey Road, Rawtenstall, Rossendale, Lancashire. Telephone: (0706) 227011.

● Acting as P&P Micro Distributors Ltd, Pete & Pam can supply the Rana 2000 320K disc drive for the IBM PC. The price is £295.

PFS File and PFS Report are now stocked by Pete and Pam.

More word processing

TWO TRIED and tested packages for the Commodore micros have been redesigned to run on the IBM PC.

Wordcraft, for example, has sold 15,000 in its CBM form. Now it has been rewritten in BCPL — a C-type language developed at the University of Cambridge — for the IBM PC and Sirius micros. It uses the function keys and is claimed to be superior to WordStar, both in power and ease of use. Standard features include spelling checking, mailing lists, arithmetic and background printing. Contact Wordcraft in Derby at (0332) 683892 or Dataview Ltd, in Colchester at (0206) 869414.

Wordpro has appeared in an enhanced version for the IBM PC, under the name of Wordplus-PC. As well as powerful word-processing facilities, Wordplus PC offers mailing-list facilities plus the ability to take information from spreadsheet programs. Another new feature is the ability to create graphics on the screen, and then print them using an IBM Graphics Printer. Contact Wego Computers Ltd, 22a High Street, Caterham, Surrey CR3 5UA. Telephone: (0883) 49235.

Full knowledge

Neville Ash has been toying with Knowledgeman, a combined database manager and spreadsheet for the less well informed as well as the expert programmer.

KNOWLEDGEMAN comes from the same stable as DBMS III, reckoned by some to be the most advanced database-management system currently on the market. But where DBMS is aimed at the experienced computer person, Knowledgeman is for the first-timer, though it includes advanced features which can be used by the more sophisticated programmer.

Knowledgeman needs 192K of RAM, so owners of 64K or 128K IBM PCs will need extra RAM chips. The program has been designed specifically for the new 16-bit computers so using 192K of RAM makes practical sense. It's a trend followed by other companies like Lotus with 123 and Software Arts with TK!Solver. If the memory is available, why not put it to practical use?

Most programs today are supplied on a single set of discs, and back-ups are an optional extra. Knowledgeman takes the opposite approach. The user is supplied with three 5.25in. program discs, and is encouraged to make working copies of the program and to keep the original discs in a safe place. It is a refreshingly practical attitude. One advantage is that it makes Knowledgeman dead easy to use from a hard disc, as on the IBM XT. However, the manual warns that you will not be provided with a new copy of the package if the distribution disc is accidentally erased.

The all-in-one concept can mean a spreadsheet, graphics and a database, as in Lotus 123 or a Calc facility, word processing and a form of database as in The Incredible Jack. In Knowledgeman the options are data management, ad hoc enquiries, spreadsheet analysis, statistical analysis, screen I/O forms management, and printed forms management. For the advanced user there is a comprehensive toolkit for building decision-support systems using a completely structure programming language.

Knowledgeman's three discs contain a total of 28 files. There are 17 different program files, covering everything from the driver program, through initialisation overlay and the main instruction commands within Knowledgeman, finishing up with the Convert overlay.

Nine of the files are utilities for terminal management, password security and macro key management. Two files contain special notes on Knowledgeman and sample files. In total there is nearly 450K of program on disc and the manual recommends you have 500K drives to avoid having to change discs to access different sections of the program. It worked quite adequately on my 160K drives, though.

```
 Volume in drive C is JACK
 Directory of  C:\kman

.            <DIR>
..           <DIR>
KPASS    IGU        896
IBMCOL   TRM        256
IBMBW    TRM        256
KMKEYS   TRM        128
MACKEYS  TRM        384
KMAN     EXE      56320
FDM001   OVL      10240
FDM002   OVL      14336
FDM003   OVL      15360
FDM004   OVL       8704
FDM005   OVL      15360
FDM006   OVL      10240
FDM007   OVL      14848
FDM008   OVL       7680
FDM009   OVL      15872
FDM010   OVL      16384
FDM011   OVL       9728
FDM012   OVL      12800
FDM013   OVL      13824
FDM014   OVL      16384
FDM015   OVL      16384
FDM016   OVL      12288
USRMAN   EXE      60928
TERMAN   EXE      22528
SCRAM    EXE      48128
KEYMAN   EXE       9216
KTERM    TRM        256
```

Figure 1. Directory for the suite of files which make up Knowledgeman.

Knowledgeman is available under PC-DOS, MS-DOS and CPM-86. Installation is straightforward with PC-DOS as long as version 2 is used: you just copy IBMBW.TRM to KTERM.TRM for a monochrome screen, or IBMCOL for colour. If your IBM.PC has PC-DOS 1.1, then the operating system sometimes thinks it has written information to disc when it has not. A program patch to overcome this is included in the installation details.

Four files must be installed on the default drive. They are the KMan driver program, FDM program files, and the KTerm and KMKeys utilities. The utility files USRMan, TerMan, KeyMan and Scram can be left off-line. KPass is also needed on the default for data security.

After loading PC-DOS you insert the disc with the appropriate files into the default drive and off you go with the date, and password to enter the system. To make the operation easier you can load the operating system on to the first Knowledgeman disc.

The four arrows on the IBM PC keyboard, plus Home, Ins, Del and End, can all be used in place of the default keys for certain control functions. Just remove the first letter F, from each of the words in table 1 and the commands appear as normal English words.

Knowledgeman organises data into tables. Each one is given a name, and the fields that are needed are also titled. The size of each field is indicated, and whether it will have numeric, string or logical data values. The field picture can be defined, so that Knowledgeman can use it to edit the field's data values. For data security read / write access codes can be specified for a table or any of the individual fields. The structural details of any table can be reviewed by using the flexible data-dictionary facility which is available in Knowledgeman.

Once a table has been defined you are ready to add data. If you type the word Create, Knowledgeman prompts you for this data. When the full table has been created, other commands within the program can be used to modify, delete, sort of retrieve it. Tables can be redefined at any time: it just needs an indication of which fields are going to be amended, added to or deleted. All the indexing details are handled by using the B+ tree technique. Knowledgeman can also build and use indexes for fast retrieval time on particular key fields.

One of the most practical features of Knowledgeman is the Ad Hoc enquiry feature. Unanticipated spur-of-the-moment pieces of information can be located just by typing in a single query. The actual query syntax is just like SQL/DS, one of IBM's top-of-the-line relational mainframe systems. Data can also be obtained from multiple fields, and a wide variety of conditions can be made in the queries. In this way the retrieval can be extremely selective.

Making up the forms that are going to be used for data input is easy. You specify the layout of prompts and elements in the form, and whether the user will complete the values or the results are to be displayed by Knowledgeman. Forms can have

(continued on next page)

(continued from previous page)

automatic editing and character-by-character integrity checks for any of the screen elements. Additions can be made to the form to allow for colour, reverse video and blinking, which can all be done automatically.

At this stage the forms which are to be produced by the printer are defined in detail. You have complete control over the layout, and Knowledgeman can also be used to print the forms. They can also be stored directly to disc instead of being printed out.

By just using a single command Knowledgeman provides full statistics on the values of any fields containing numbers in the table. This statistical analysis can cover minimum, maximum, sum, count, mean, standard deviation and variance. It is simple to place conditions on the statistical analysis if required, and in this way only the data that complies with specific criteria will be used for this analysis.

Apart from the features common to most spreadsheets, Knowledgeman provides a number of extras. There is extensive read / write security for the cell definitions, right down to the level of individual cells. The presentation style of any cell can be controlled by selecting foreground and background colours, blinking, reverse video, bell and invisibility.

Unlike the earlier types of spreadsheet, Knowledgeman's version can be integrated with the other capabilities. For example, the result of an Ad Hoc enquiry could be subjected to the spreadsheet analysis.

Up Arrow — FUP
Down Arrow — FDOWN
Left Arrow — FPRIOR
Right Arrow — FNEXT
Home — FRESTART
Ins — FINSERT
Del — FDELETE
End — FDONE

Table 1. Use of control keys for commands.

Knowledgeman's procedures and functions make up a toolkit which includes a wide range of extra options capable of being incorporated into the other Knowledgeman capabilities. This section supports a completely structured programming language which will be valuable to more advanced users.

Knowledgeman's limits are imposed by the hardware on which it is run, not the program itself. The design specifications provide for large, multi-coloured tables, which can be manipulated in a very flexible way.

Conclusions

● Knowledgeman has a wide range of functions, which can each be mastered before going on to learn more about the program.

● Most of the commands are in normal English, which makes it easy to understand the programs.

● The program has obviously been written for the IBM PC and makes full use of the special function and cursor-control keys. It will be interesting to see if later versions for other machines are as well implemented.

● Though the manual is quite large, there are three types of entry to cater for the first-timer, someone with basic understanding and the really experienced user. The language is down-to-earth in style.

● With all its features Knowledgeman should make an impact from the ease of use on the one hand and the specification on the other. However, 16-bit computer users must have 192K to make the most of Knowledgeman.

● Using a combination of automatic data encryption plus a range of user passwords, Knowledgeman can control access down to the level of an individual field, an extremely useful combination for sensitive material like personnel records.

● As one of the new generation of programs, Knowledgeman offers an extremely sophisticated range of facilities. They can be understood quite quickly as long as you follow the manual closely.

● Further Knowledgeman products are known to be under development. To go with Knowledgeman there will be Knowledgetext, Knowledgepaint and Knowledgegraph. The total should eventually form an extremely powerful integrated system.

● Knowledgeman is imported and distributed by Tamsys Ltd, Pilgrim House, 2-6 William Street, Windsor, Berkshire SL4 1BA. Telephone: (07535) 56747. Knowledgeman costs £350.

```
The Knowledge Manager     ver  1.02
(C)  COPYRIGHT 1983, Micro Data Base Systems, Inc.
Lafayette,  IN  47902


User Name: knowledgemaster
Password:


_DEFINE REVIEWS
FILE?
FIELD? MICRO STR 20
FIELD? MTYPE STR 20
FIELD? SUPPLIER STR 40
FIELD? PHONE STR 20
FIELD? MAGAZINE STR 20
FIELD? ISSUE STR 20
FIELD? PAGE NUM USING "ddd"
FIELD? AUTHOR STR 30
FIELD? PHONE STR 20
FIELD? COMMENTS STR 40
FIELD?
_LET E.LMOD=FALSE
_CREATE RECORDS FOR REVIEWS
```

Figure 2. Screen produced when defining file. "Field?" is followed by a name and the maximum length of the string containing it.

```
Record Number:      1
#MARK:     FALSE
MICRO:     ADVANCE
MTYPE:     HOME/BUSINESS
SUPPLIER:  ADVANCE
PHONE:     (01) 609-0061
MAGAZINE:  PRACTICAL COMPUTING
ISSUE:     OCTOBER 1983
PAGE:       72
AUTHOR:    IAN STOBIE
COMMENTS:  Preview of IBM cheap IBM compatible pc
_LET COMMENTS = "Preview of cheap IBM compatible pc"
```

Figure 4. The completed first record after saving to disc. Note how an error in the last line is corrected using Let.

```
Record Number      1

MICRO:
MTYPE:
SUPPLIER:
PHONE:
MAGAZINE:
ISSUE:
PAGE:
AUTHOR:
COMMENTS:
```

Figure 3. The line Create Records for Reviews automatically throws up a form into which the record can be entered.

```
_SORT REVIEWS BY ASCENDING MICRO
_SELECT MICRO, ISSUE, PAGE

        MICRO                    ISSUE          PAG

ADVANCE                 OCTOBER 1983            72
ELECTRON                OCTOBER 1983            68
LOGICA VITESSE          OCTOBER 1983            64
ZENITH Z-110            SEPTEMBER 1983          82
ZORBA                   SEPTEMBER 1983          92

Number of Observations:      5
                                               378  Sum
                                                76  Ave
                                               129  Var
                                                11  Sdv
ADVANCE                 OCTOBER 1983            72  Min
ZORBA                   SEPTEMBER 1983          92  Max
```

Figure 5. After five records had been entered, Sort produced an alphabetical list. Three of the 10 fields were selected and printed out, together with the statistical information, which can be suppressed if necessary.

New TRS-80™ Model 4

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64K 2-Disk Model 4 **£1499** Inc. VAT
Cat. No. 26-1069

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Full - and Helpful - Documentation. You get a comprehensive owner's manual, reference card, our famous tutorial manual for BASIC programming and a tutorial introduction explaining how to get the most out of your Model 4.

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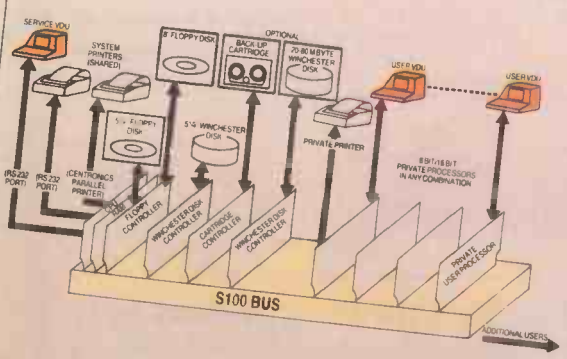

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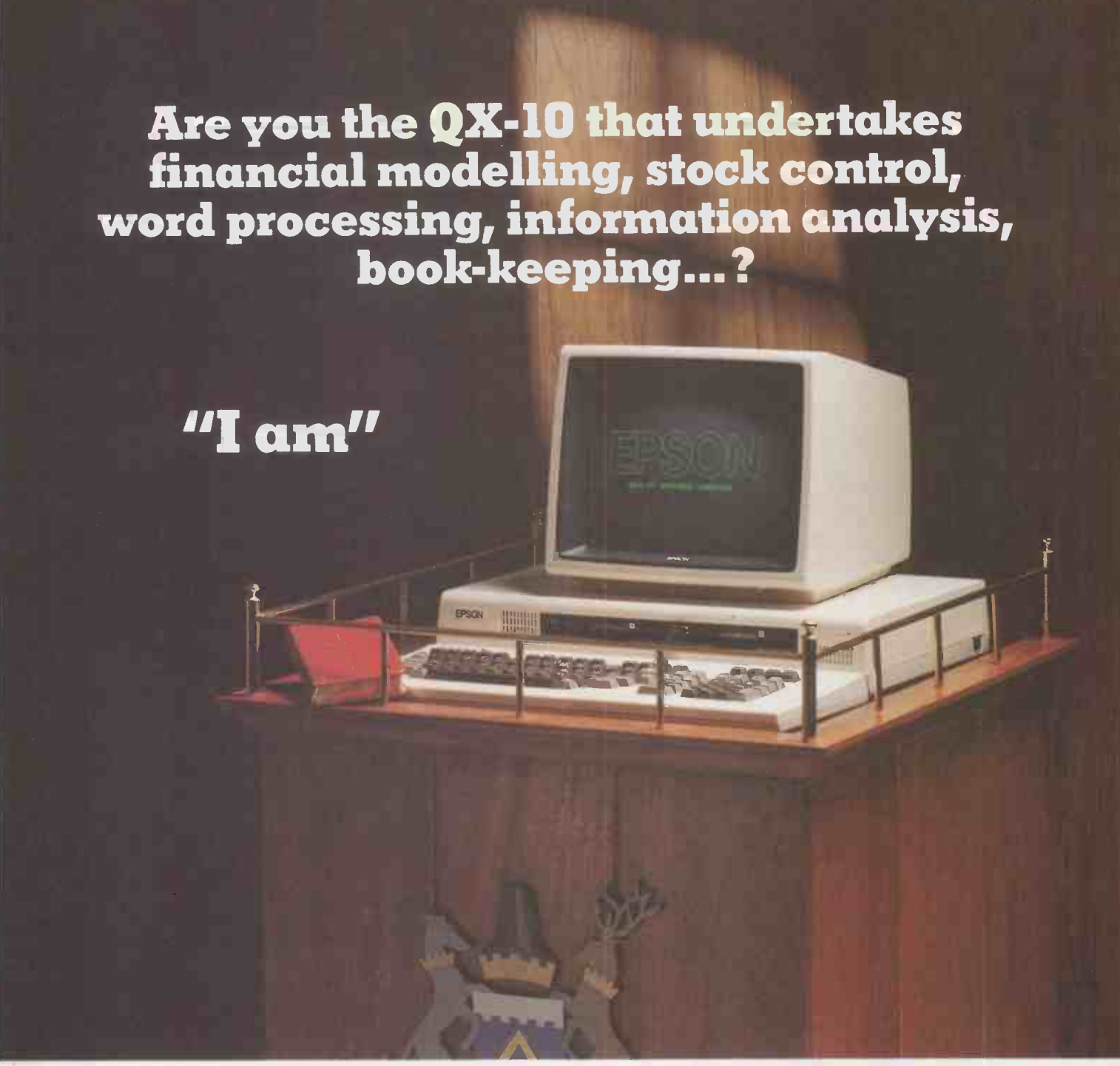

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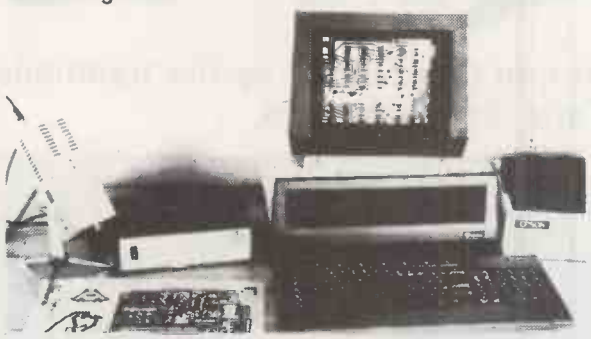

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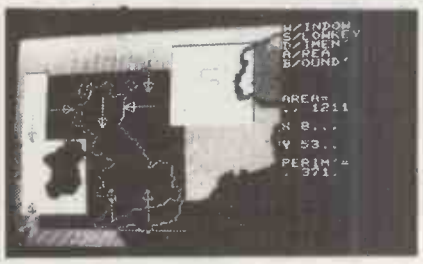

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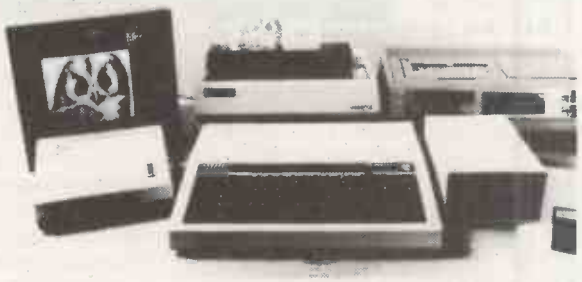

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EPSON QX-10

It's built round a Z-80 compatible CPU — but don't be put off by the traditional spec, advise Chris Bidmead and Marcus Mazure.

IN THE LIGHT of today's 16-bit fever it may come as a surprise that Epson has chosen an eight-bit processor as the power behind its first true business computer to be launched outside Japan. The three-part system comprises a combined processor and disc-drive unit, a monochrome monitor unit and a low-profile keyboard. The QX-10 ranks high among the most immediately attractive machines we have seen, and unlike some other pretty hardware the beauty turns out to be more than skin deep. Extensive use left us with the impression of a thoughtfully designed machine with excellent ergonomics.

The Z-80 style processor only directly addresses 64K of RAM, but by using bank switching, in its minimal configuration the QX-10 commands 192K of RAM, split into three banks. Most of the operating system, including an enlarged BIOS, is lodged in bank 1, leaving 56K of user transient program area on bank 0. At operating-system level bank 2 offers a virtual drive called F:, but this memory area is overwritten when Basic is loaded and part of it can be reconfigured as an additional user area to house machine-code routines.

A further 2K of battery-backed CMOS RAM offers permanent fast-retrieval storage which a well written applications package can use to store system parameters and details specific to the user. Users may add a fourth bank by populating empty sockets on the main system board, thereby providing a second 56K virtual drive called E:. It seems a pity that these two virtual drives cannot be combined into one. A single 112K drive would have been even more useful.

On power-up the LEDs on the four character-fount select keys, as well as the Caps Lock and Insert keys, light up in sequence, suggesting a keyboard text is taking place. If drive A: is empty the screen displays the message:

Insert disk

Once the disc is found by the system, booting automatically takes place into Multifonts CP/M, Epson's enhanced version of the ubiquitous eight-bit operating system. Modifications include the extra code needed to drive the multiple character founts, virtual disc drive and the special graphics features.

The keyboard is connected to the front of the CPU box using a sturdy coiled wire terminated at both ends by DIN connectors. Each plug has a neat folding tab, making it easier to remove from its socket. The keyboard is a robust, high-quality unit

with a pleasing and positive feel to it. Besides the main typewriter-style keys there are four other key-pad areas: cursor control, numeric pad, function keys and character-fount select.

The four character-fount keys can be depressed in 16 combinations. Each depression illuminates or extinguishes the LED in the key cap to produce a pattern of lights which identifies one of the 16 different character founts. As is now standard on bit-mapped 16-bit machines, the keyboard features a Scrn Dump key which triggers a bit-image copy of the screen memory on to the printer, printing any graphics and text displayed at the time.

The anti-glare, long-persistence green-phosphor screen is designed very compactly. Placed in its normal position on the CPU unit it adds only 27cm. to the height of the system. Unlike the IBM PC, which requires a separate power line, connection to the CPU unit is very simple. Video data and power are combined in a single cable terminated by DIN connectors. Contrary to all ergonomic recommendations, the brightness control is accessible only from the back and there seems to be no external way of controlling the contrast. It is unfortunate too that the screen does not tilt.

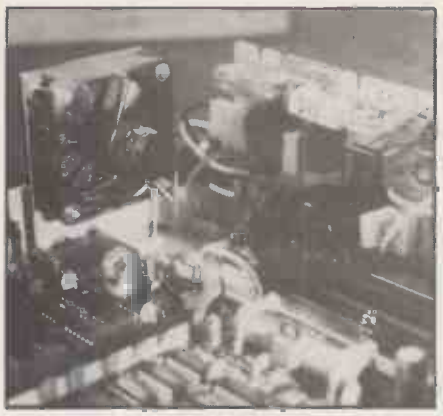
The CPU unit with its slim-line drives stand a mere 10cm. high and occupies 25 by 50 cm. of desk space. Its compact size is complemented by unusually quiet operation. Beneath each of the slim-line drive slots is a disc-head engage knob that must be pressed after the disc has been pushed into position. On normal drives with latched doors it is easy to damage the centre

One of MFBasic's 16 typefaces.

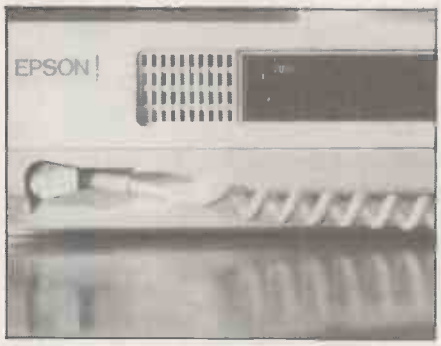
hole of the disc by sandwiching it before it has been centered. The arrangement used in these Epson-built drives offers some protection against this kind of rough use. It is still not entirely foolproof and we managed to dish the centre of one disc.

For a while we cursed the omission of a reset switch and found it infuriating to have to power-down the machine whenever an attempt at software diagnostics resulted in a hanging CPU. Only when we came to dismantle the hardware did we discover that Epson has provided a small reset button. It is mounted below the front panel, easily accessible without opening the machine. What makes it hard to spot is the way it is recessed to guard against being pressed accidentally. It is all well documented in the manual, so perhaps there is a moral here. At the risk of being called a sissy, always read the manual first.

In America the QX-10 is distributed with Valdocs, an operating system with integral database and word processing. Critics have not been to impressed with its speed, which is perhaps why Epson U.K. supplies the QX-10 with a version of CP/M. What the system software writers have managed to



A miniature 12V fan contributes to the system's quiet running.



Epson slim-line drives and the lead to the keyboard are on the front.

Specification

SYSTEM
CPU: UPD780C-1 4MHz, Z-80 compatible, manufactured by NEC
Memory: 192K expandable to 256K on main board; four banks of 64K per bank
Bus: Epson 60-way, five expansion slots, one used by Multifont PROM card
Standard interfaces: Centronics parallel; light-pen serial; communications serial, RS-232C 9,600 baud maximum
Features: Multifonts CP/M operating system; Multifonts Basic language; programmable detached keyboard; programmable characters; clock calendar with battery back-up; sound generator
Drives: Twin double-sided slim-line 5.25in. soft-sectored floppies, 320K per drive
Dimensions: 508mm. × 340mm. × 103mm.

MONITOR
Type: 12in. green-phosphor CRT
Display: 25-column × 80-line characters in 80-column mode; 20 × 40-line characters in Multifont mode; 16 possible character founts.
Graphics: 640 × 400 dot resolution
Dimensions: 312mm. × 340mm. × 270mm.

KEYBOARD
Type: detached with separate cursor, numeric and function key pads, 103 keys in all; auto-repeat on all keys
Features: 10 programmable function keys, four special function keys, four fount-style selection keys giving 16 founts

do with the Z-80 type chip, its attendant extended RAM, and the new NEC 7220 graphics-controller chip, is a lesson to many a hopeful so-called 16-bit machine. The graphics particularly are superb, and all transferable to hard copy if you have one of the new Epson printers like the FX-80.

Unlike other CP/Ms with unusual banking arrangements, Multifonts CP/M gave no problems of compatibility when tested with a wide range of CP/M software. As well as the resident enhancements Epson has added a few transient .Com utilities of its own. For example, Epson shields the sensitive user from the rigours of raw CP/M's I/O handling with a routine called Config, which allows the selection of printer type, serial communications port characteristics, and setting the time of day on the system clock.

It is refreshing not to have to bother logging on the date and time every time you power-up, as required on many a 16-bit machine. When we first set the machine up in this office we got ready to tell it the time of day, but instead it told us — which is the better way round.

We used Config to match the QX-10 to Epson's HX-20 portable. It proved very simple to get text across into the big machine for editing, and the interfaces of both computers have obviously been developed with this in mind. The documentation did not disclose the address of the serial connector ports, but the jump vectors and registers are fully listed in the manual and were all we needed to patch our standard communications software. Machine-code hackers who feel tempted to explore further will have to know the Z-80 pretty well because the code vectored to jumps banks before true I/O takes place.

Config's menu implies that printer selection is limited to the Epson range. Epson uses the standard Centronics interface, so although we did not try other parallel printers the chances are that any of them would work for normal text printing. A perverse gremlin dwelling somewhere between the graphics software and the Epson FX-80 printer had us utterly baffled for a while. At first we could find no way of printing out the founts produced so easily on the screen. The answer to that was simple: Config needed to be told that there was, specifically, an FX-80 at the end of the line.

But then most of the special functions documented for the FX-80, such as underline, expanded print, condensed print and so forth, simply refused to perform. This time it wasn't a matter of omitting to read the manual. The more we pored over the documentation for the FX-80 and the QX-10 the more confusing the problem became. Although well laid out, Epson's manuals are time-consuming because the job appears to have been turned over to copywriters and typographers — people who have not necessarily used the system.

Usually the criticism is the other way round: beware, they say, documentation produced by computer specialists. In this instance we wished for the sort of structured approach to communicating knowledge a good systems analyst would have used, rather than pages of nicely laid-out lists of functions and specifications. Only when we had given up on the manuals and resorted to trial and error did the true solution emerge. The QX-10 needs to be misled into thinking it is writing to a plain old MX-type printer, whereupon it abandons the fancy-fount section of the BIOS and pipes down straightforward escape sequences.

We later discovered a more scientific method of controlling the printer by way of the Bit On/Bit Off instruction in Basic, which allows you to override Multifonts mode. The instruction is explained accurately in the MFBasic manual, but in a way that manages to avoid mentioning multiple founts altogether. It is easy to overlook.

Two other utilities, MFont.Com and Norm.Com, complement the Multifont capabilities. Running MFont.Com clears the screen and returns the CP/M prompt in enlarged letters. From now on all characters entered from the keyboard or displayed on the screen will be double-sized, 40 to the line. Each character occupies the space of two, the second byte of the memory-mapped display now being used to hold information about the kind of fount required.

MFont has loaded an extension to the BIOS, making screen output sensitive to the setting of the four Multifount selection keys. Press all the keys down for a fount called Old Germany and your directory listing will come up in a spectacular gothic black-letter.

MFont serves as a handy introduction to the fount capabilities, but apart from this the usefulness of trick typography at CP/M command level is not entirely self-explanatory. If you switch on Multifonts and then enter an applications program that uses cursor addressing or expects an 80-column display — Peachtext, for example, which was provided with the review machine — all you get is a screen full of garbage. When you have finished experimenting with MFont you simply turn off the copperplate calligraphy with Norm. Good old Norm!

Multifonts comes into its own when employed by specially written applications programs. We had a glimpse of this in a program called IMCA Sales Ledger from Southern Computers. The fancy fount-work is used to create attractive and highly legible menus, and to print professional-looking invoices. Unfortunately the documentation for Sales Ledger appeared to be a rough first draft, with the software not much further advanced, to judge by the error messages we kept encountering.

Epson includes a utility called CharaDef the like of which we have only seen up to now on 16-bit micros. With it you create your own 14-by-18 dot-graphics characters,

(continued on next page)

EPSON QX-10

(continued from previous page)

building up each one dot by dot on an oversized representation using simple commands within CharaDef. As the image is built up it is simultaneously displayed as a group of four actual-size characters. Cursor-control keys are used to access any part of the simulated graphic matrix and turn the pixels on or off. The character set you create like this can then be stored on disc for later use.

CharaDef also allows you to modify some of the standard characters supplied on the Multifont CP/M release software. The top line of the character matrix does not actually appear in the hard copy but is used as proportional-spacing information to indicate how much of the character is to be printed. In the proportional mode the printer truncates any part of the character cell which does not lie directly under the top row of dots. With the exception of the MX-80, all the printers in the Epson range are capable of proportional printing.

Multifonts CP/M comes with a matching Multifonts Basic thrown in. Loading MFBasic off the floppy disc takes 11 seconds while to load standard Basic-80 on the same machine takes only about six seconds. There are two reasons for the time difference. MFBasic is enlarged, with extra features like the facility for on-screen editing using the cursor-positioning keys. Interestingly it chooses to tuck itself away in memory bank 2, leaving a great stretch of bank 0 to the user with 56K of program space instead of the usual 30K in a 64K single-bank Z-80 system.

Character limits

As the name of the Basic implies, it is a simple matter to display or print Multifont characters under program control. One catch is that the over-sized two-byte characters are not recognised by the interpreter, so the Basic commands that make up the muscle of your programming have to be kept in 80-column mode.

Multifonts comes into its own with a line like:

```
10 LPRINT "PRACTICAL COMPUTING"
```

when the string in quotes can be entered directly as any one of the 16 embellished alphabets.

There are a number of Basic commands specific to this machine. The graphics capabilities in particular are very impressive. In a similar way to to IBM's Basica the commands in MFBasic allow plotting of points, lines, circles and the filling in of any shaped area. The NEC 7220 controller chip driving the screen is also capable of zooming in on a graphic image by changing the amount of graphics RAM the controller looks at. The review machine was the monochrome version, but to support the well heeled user who has bolted on all the options MFBasic includes colour and light-pen commands.

The zoom capability, featured in high profile in the promotional literature, is not actually explained in any of the manuals users are likely to lay their hands on. Epson has probably shied away from end-user documentation of its complexities because it requires careful handling to make it behave sensibly. We managed to get the zoom working by looking at how it is done in the Epson demonstration program. Disappointingly this is not a simple matter of a Basic Zoom instruction with parameters but requires a series of Out instructions to various ports. Without documentation our approach was very much hit and miss. The zooming certainly worked but on a number of occasions we also managed to get the controller so muddled that it was impossible to reset the screen without rebooting the system.

Mastermind

Bill Gates, the power behind Microsoft and hence the brains behind Epson's software, is an enthusiast for the Unix way of dealing with peripherals as extensions of the file structure. So, as in MS-DOS, MFBasic treats printers, the keyboard and the screen as though they were files. One way of getting text into the QX-10 then is to use Basic's Open instruction:

```
10 OPEN "I", 1, "COM0:(C8N2F)
```

COM0: defines the port to be used, and the parameters that follow in brackets define the baud-rate code, the number of bits per character, the parity code, the number of stop bits, and finally a code to determine the handshaking to be used. Subsequent Reads from file 1 will now pull in the data waiting at the standard RS-232 interface.

This makes it easy to load text from the Epson HX-20 micro because the portable Basic uses identically structured instructions. However, the coding is quite different and even in the thought-out world of Epson Murphy's Law is upheld. The same characters represent different baud rates and stop-bit lengths in the two different machines.

There are two ways of reaching the innards of the QX-10. A removable cover on the left-hand side allows easy access to the five Epson 60-way expansion slots. One of them is taken up with the option supplied as standard in the U.K. — the Multifont character-generator card with its 8039 slave processor. This where you might want to add one of Epson's optional RS-232 communications interface boards, which have the advantage of being able to run at 19,200 baud instead of the 9,600 baud of the standard interface supplied. The cover also exposes the eight empty sockets where the RAM chips for bank 3 are added.

To open the machine up further is more tricky. First you have to uncover the bolt heads, which are neatly plugged with moulded plastic inserts to preserve the appearance of the machine. On levering up the lid of the case you discover that the disc drives are attached to it, which means having to disconnect the drive cables from the main circuit board.

Behind the compact switching power supply you find the reason for the system's unusually quiet running — a miniature 2in. cooling fan operating off the 12 volt supply. There is another nice small touch too: the mains fuse-holder, shielded behind a plastic cap, is able to accommodate two different sizes of fuse, presumably to assist Epson's bid for the international market.

The 2in. by 1in. 2 watt elliptical speaker mounted on the bottom casing of the machine has the luxury of a volume control which you can operate from the rear of the machine without removing the case. The nickel-cadmium battery is charged from the mains during power-up and looks substantial enough to keep the real-time clock and the 2K of battery-backed CMOS RAM alive through long periods of neglect.

The main circuit board covers most of the base of the machine. The bus slots and user-RAM chips are to the side, where the expansion access cover is located. On this board too are located the printer, light-pen and communications connectors. The graphics circuitry with the NEC 7220 is mounted on a separate card piggybacked on the main system board. Extensive metal shielding and earthing protects it against electrical interference from the disc drives.

Four bolts have to be removed before you can get at the central NEC Z-80 look-alike processor chip underneath and its matching Zilog-inspired SIOs and PIOs. All in all the interior of this thoughtfully designed machine is as handsome as the exterior.

Conclusions

● The Epson QX-10 combines the attractions of superb ergonomics and hardware features not usually found in a machine in this price bracket.

● If you are put off by the fact that it is "only" an eight-bit machine you have spent too much time reading the ads in the computer comics and not enough time reading the articles.

● No applications packages are supplied with the machine, but with an eight-bit micro running CP/M there is a vast choice of ready-made programs.

● The monochrome version can be upgraded to colour by adding an Epson colour board and a colour monitor. There is no industry-standard expansion bus, so further upgrades will depend on machine-specific add-ons becoming available from Epson or other manufacturers.

● It is not our business to make predictions, but it certainly looks as if the QX-10 is going to follow the Epson range of printers into the best-sellers list.

● The QX-10 is distributed by Epson (U.K.) Ltd, Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892. It costs £1,735 plus VAT.

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A thought which presents a businessman contemplating buying a computer with something of a dilemma: if he buys a computer to help him while he's growing, what happens once he's outgrown it?

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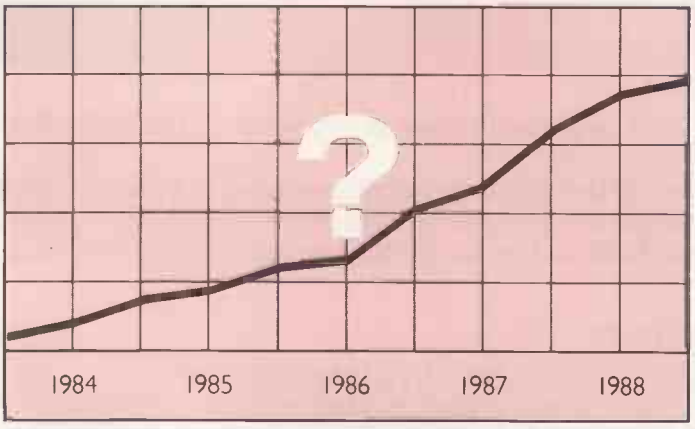
In the past, there was nothing for it but to write off the investment and make



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Conceived and constructed in Britain, it's called Octopus. (Even with LSI's experience and reputation behind it, it's comforting to know the nearest servicing centre isn't halfway round the world.)

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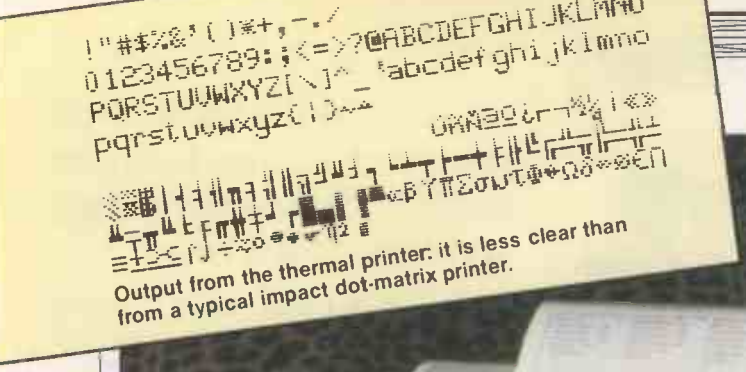


Output from the thermal printer: it is less clear than from a typical impact dot-matrix printer.

DOT

Ian Stobie is less than impressed by a heavy, mains-powered transportable from America.

COMPUTER DEVICES' Dot is one of America's better known portables, but we were not entirely happy with it. It is a fairly heavy mains-powered micro built round the 16-bit 8088 processor; it runs MS-DOS software and uses Sony 3.5in. micro-floppy disc drives. Although the built-in display screen is large enough for comfortable viewing, in our opinion it is not bright enough.

The system we had for review was the twin-drive version which will be standard in the U.K. It costs £2,995 for a system providing 560K of disc storage, 128K of RAM, two RS-232C ports and a built-in thermal printer. Also included in the price are several software packages, including MS-DOS, Microsoft Basic-86, the word-processing package Volkswriter, a diary program called Time Manager and the excellent Multiplan spreadsheet.

Specification

CPU: 16-bit Intel 8088
RAM: 128K with additional 32K of dedicated video RAM.
Expansion: two card slots; RAM expandable to 704K
Keyboard: Detached, standard QWERTY layout with numeric pad and 10 programmable function keys.
Display: 9in. diagonal monochrome CRT; displays 25 lines of 80 characters or 25 lines of 132 characters using IBM PC character set, or 320 by 254 dot graphics.
Discs: two Sony 3.5in. micro-floppy drives, each providing 280K of storage
Built-in printer: thermal dot-matrix type, printing on to 8.75in. rolls of thermal paper at 160cps; selectable 80 or 132 columns, graphics capability
Portability: weight in carrying case 29lb. for non-printer model, 34lb. with built-in printer; mains-powered
Software in price: MS-DOS, MS-Basic, Multiplan, Volkswriter, Time Manager
Manufacturer: Computer Devices, Burlington, Massachusetts, U.S.
U.K. price: £2,995, or £2,695 without printer
U.K. Distributor: Computer Devices Inc., Radix House, Central Trading Estate, Staines, Middlesex TW18 4XA. Telephone: (0784) 51444

The Dot's processor, screen, discs and printer are built into a single unit. The keyboard is separate. The screen is unusually wide, measuring 3.75in. by 8in. Normally it displays 25 lines of 80 columns, but 132 columns can be selected by software if required.

Two screws on the back of the Dot allow you to adjust the brightness and contrast, but we were not satisfied with the results. You can make the screen brighter, but then the flyback lines become visible and the contrast deteriorates. Computer Devices supplied us with a second machine to look at but it was no better than the first. Until this problem is corrected it is difficult to recommend the Dot.

Both machines we saw had the standard black-and-white screen. Amber and green models can also be obtained, but as they just use a different-coloured plastic filter layer on the front of the same P4 phosphor tube there is unlikely to be much difference in performance. All Dots have a composite Sync output socket, so you could attach a separate video monitor.

The Dot's keyboard, on the other hand, is quite good. It has a slightly spongy feel but is lightweight. Its layout is close to the IBM PC's, but without the annoying extra key between Z and the left Shift.

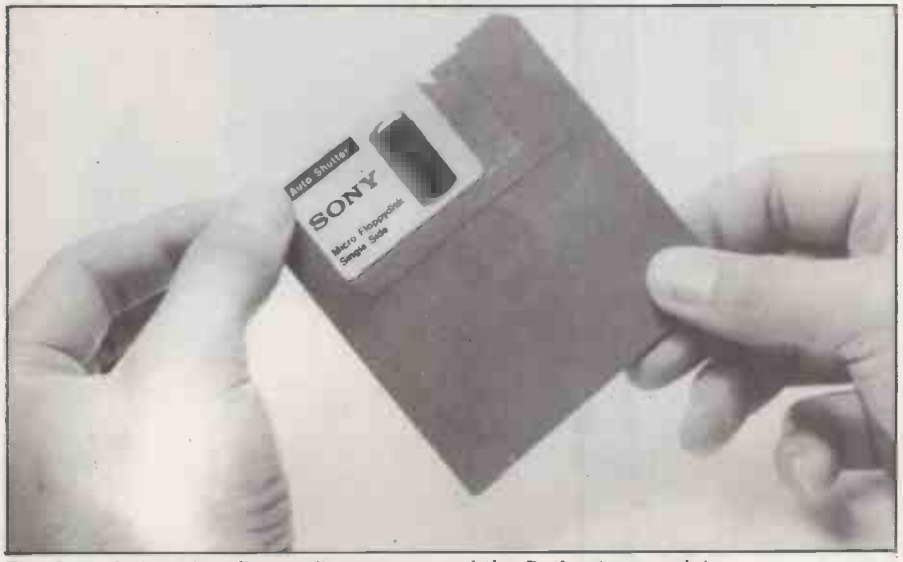
The Dot main unit and keyboard pack up quite easily into a rigid plastic case for carrying. It is rather heavy, even by the standards of other mains-powered transportables, and is really too heavy for anything but occasional short-range carrying. The literature quotes 29lb., but our machine in its case was 34lb. when we weighed it. The built-in printer probably accounts for the difference.

The Dot's printer prints 80 or 132 columns on rolls of thermal paper 8.75in. wide. The quality of the output is inferior to that from a typical impact dot-matrix like the Epson RX-80. It is good enough for preview printing but not for business correspondence. You can attach an external printer via one of the Dot's RS-232C serial ports. Without the printer the Dot costs £300 less. The money could probably be better spent on an external impact dot-matrix printer.

The 3.5in. Sony disc drives are good. The discs themselves are made from what seems to be the same flexible recording material used for conventional floppy discs, but it is contained inside a rigid plastic casing, making the micro-floppies less fragile if treated properly. The slot cut in the casing through which the read/write head reaches the recording surface is protected by a sliding metal shutter. However, if you forget to close the shutter after removing a disc from the drive, grit and greasy fingers can easily get in. With some other computers using the Sony drives — Hewlett-Packard's series 100 and 200 machines for example — the drive mechanism itself controls the shutter, so it is always closed when you take the disc out of the machine. The Dot lacks a worthwhile refinement here.

The documentation supplied with the Dot is good, and there is plenty of it. The system comes with the standard Microsoft manuals for MS-DOS, Basic and Multiplan, all repackaged in the Computer Devices house style, together with several additional introductory-level manuals including *Business and Fun with Basic* and *Your Dot File Cabinet*.

Multiplan is a good choice of spreadsheet package, very well known and highly regarded. Volkswriter is a new piece of software, not representing any startling breakthrough in word processing but capable of doing all the standard tasks I asked of it. The on-screen help information is good, making it suitable for newcomers to computing.



The Sony 3.5in. micro-floppy discs are one of the Dot's strong points.

Conclusions

- **The Dot is a potentially interesting 16-bit portable, but is disappointing for the price. It is let down by a poor built-in display: it cannot be unreservedly recommended without an improvement in this respect.**
- **At 29lb., or more with the printer fitted, the Dot is fairly heavy, even for a 16-bit transportable. The rival Hyperion, for instance, weighs only 20lb.**
- **The built-in thermal printer is adequate, but probably not worth the weight penalty except for specialised applications.**
- **The Dot's 3.5in. Sony discs are tougher than conventional 5.25in. floppies, although Computer Devices has lost some of this advantage by not providing automatic shutter control.**
- **The Dot is professionally presented, with good documentation. Two major software packages, Volkswriter and Multiplan, are included in the price and are worth having.**
- **Fairly small changes to the Dot's specification would make it an attractive machine.**

Getting serious with Sinclair

With the arrival of the Microdrives and ZX Interface the Sinclair Spectrum can claim to be a competitor in the market for small business computers. Mike Salem finds out how it shapes up as part of a serious microcomputer system.

AFTER MUCH DELAY, the Microdrives are now with us. They are small boxes, about 9cm. square by 5cm. high weighing under 250g. The Spectrum plugs into the ZX Interface 1 and sits on top of it. Two screws removed from the Spectrum are replaced by screws built into the Interface, making for reliable connections.

Accessories designed to plug into the back of the Spectrum can be plugged into the Interface, though there is no guarantee they will work. The Interface also has two 3.5mm. sockets, similar to the Ear and Mic sockets on computers and tape recorders, as well as a socket which will accept a printer cable and a connector for a Microdrive. Another Microdrive may be joined to the first by a plug-in connector and a screw-on baseplate. Several Microdrives may be connected in this way.

The Microdrives store information on tiny cartridges measuring 3cm. by 4.5cm. by 0.7cm. and containing an endless loop tape which cycles through in about seven seconds. Cartridges are guaranteed to hold 85K of data. In practice the capacity is around 89K. The tape drive only operates when the Spectrum needs to read from or write to a cartridge.

Any endless-loop tape operating at high speed is subjected to rapid bending at a sharp angle as it is pulled out of the centre of the spool. Previous devices of this type, such as the Exatron Stringy Floppy, have acquired a reputation for unreliability as they tended to shed their oxide magnetic surface. They were improved later, but were never as reliable as standard tape.

The Microdrives allow programs to be saved impressively fast. New cartridges must be formatted before use, which takes about 30 seconds. A long program can be saved on a freshly formatted cartridge in as little as three seconds, which is faster than many disc drives. When using a cartridge which already contains some information the time increases, as the Spectrum must find the right place. Loading a program from a Microdrive takes up to seven seconds longer than saving.

Data takes rather longer. We carried out some experiments with a file containing 51,200 bytes of information. Data files must be opened, and this took 10 seconds. Writing all the information on to a newly formatted cartridge took 40 seconds. Closing the file is very fast, while Erasing took 21 seconds.

The major problems with the Microdrives are lack of random-access files and the inability to modify or append to an existing file. While tape is inherently sequential, it is possible to devise suitable operating-system software to make it look like a random-access device. The Microdrive contains a ROM with software to control the drives and on it there is some code which looks very much like pseudo-random access. However, it is not implemented.

It is, of course, possible to write a program which will scan records until the right one is found, and then read it. This can be slow, often requiring several revolutions of the tape. To make a quick test we wrote a program that found the 400th of 400 records. It took 90 seconds. The time taken depends upon the order in which the Spectrum has recorded information on the cartridge, which in turn depends upon a number of factors such as the space already used.

The records could all have been recorded in inverse order: 400, 399, 398, ... down to 1. The Microdrive tape goes round in 7 seconds so finding the 400th record would take 7×400 seconds or 46 minutes.

The only way to alter a record is to read all the information on the file until the record is found, copying on to another file

Each cartridge holds at least 85K of data.

as you go. You then read the record to be altered, alter it, write the altered record on to the new file, then read and copy the rest of the file. Finally, delete the old file. Appending information on to the end of an existing file must be done in exactly the same way.

How reliable the Microdrive system is remains to be seen, but reliability is certain to be a factor with major implications for software producers. Much existing Spectrum software is copy-protected and if the latest super-game fails it may be no more than frustrating and annoying. However, if a payroll program for a company employing 50 people fails it is rather more serious. While back-up copies and replacement of cartridges that fail are possible, commercial applications can tolerate only very infrequent media failure in normal use. In this respect the cartridges themselves are rather worrying. They are about three times the price of a floppy disc, have less capacity and may well be less reliable and shorter-lived.

Communications

The Interface 1 which controls the Microdrives also provides RS-232 serial input/output for interfacing with suitable printers. It also allows the Spectrum to communicate bidirectionally with other computers, given suitable software.

A cable is available from Sinclair to connect the Spectrum to an RS-232 printer with a standard 25-way D connector. The RS-232 cable is not suitable for connecting the Spectrum to many other computers. The Spectrum is connected as a DCE device and expects to be plugged into a DTE device. A cable with crossed-over connections, sometimes called a "null modem", is needed to connect the Spectrum to another DCE device. We tested the RS-232 facilities by connecting the Spectrum to another computer, rather than to a printer, and had no problems — once we had worked out how to wire up the cable.

A problem when using a printer is that control codes embedded in program listings can make the printer do odd things. For example, one of the graphics characters can effectively make the printer go dead. The codes that control flashing characters, colour, etc. can also cause trouble. On the other hand, it is often necessary to send control characters to a printer or another computer.

The Interface 1 solves this problem by providing two types of output. Output to the t channel, for use with LList, strips off all graphics characters and all control characters except Carriage Return. Output to the b channel, for program output with LPrint, will send out ordinary, graphics, and control characters exactly as found. Graphics characters will not be printed as such, and graphics on the screen cannot be copied.

One problem is that Carriage Returns are followed by Line switches inside your printer if you want to LList programs and run programs which send output to the printer. Otherwise you have the choice of producing correct listings with program output printed over and over on one line, or double-spaced listings and correct output.

Up to 64 Spectrums can be plugged together to make a network, using the 3.5mm. sockets on the ZX Interface. Stations can send each other programs and data, and several Spectrums can share Microdrives and printers. Information transfer is extremely fast, but disconnecting a networked Spectrum while communication is going on can cause trouble.

Business use

True disc drives have been interfaced to the Spectrum at a relatively low price by independent companies. The keyboard is an obvious limitation, but better keyboards can also be attached to provide a system with good performance at low cost. However, such a system will only be viable commercially if a range of software is produced to take advantage of it.

A Spectrum with tape or Microdrives would be suitable for word processing, payroll, stock control up to about 1,000 stock lines, and other applications where a useful amount of information can be loaded into memory and processed independently of any other data. The system would not be suitable when more information than will fit in memory needs to be processed together.

Another vital aspect is support. When you spend thousands of pounds on a system, extended demonstrations, installation, and continuing support and advice are included in the price. Cheaper computers tend to be treated as an offshoot of games marketing: software is sold over the counter by salespeople who know little or nothing about computers or the user's application. The prices are very low, as overheads are minimal. This is in many ways good for users, who can experiment at low cost. In many cases software that is fully comparable with products at 10 to 20 times the cost on larger machines can be found. There is also a fair amount of rubbish.

But sometimes support is required. There can be shortcomings or errors in the software, or advice may be required on using the program in ways which were not originally envisaged. There may be problems in using software with other software or hardware — using a different printer than the one assumed, for example. While the supplier may offer a refund for a package that does not work, that is really not what is wanted. If the price of support was not included in the software, and support cannot be bought, the user may not be able to make full use of it.

So is the Spectrum suitable as the sole computer for a small business? If all aspects of the business are to be put on the computer, probably not. The Microdrives are not good enough, and disc drives are not supported by software. Good computer hardware and software is becoming available from more and more sources at ever-decreasing prices. A CP/M-based computer with disc drives is not expensive.

However, the Spectrum is useful as an aid to learning how to buy and use a computer and software. It is also useful for a number of practical tasks, and is cheap enough to be dedicated to them. Finally, it is a useful adjunct to a larger computer system. The Spectrum can be used as a printer buffer for a Centronics-standard or RS-232 printer. It can be used to generate text at home for downloading it into another computer. The Spectrum is excellent for educational purposes, particularly when networked. It can be used as an inexpensive controller with suitable interfaces.

Dr Mike Salem is a director of Hilderbay Ltd, which produces computer accessories and software.

Spectrum story

The Sinclair Spectrum was launched in April 1982. It is based on the Z-80 microprocessor and is available with 16K or 48K RAM. Initially mass storage was on ordinary cassette tape, but program and data storage was reasonably fast. A large program would load in one minute and enough data to fill all 48K of memory would load in another three minutes.

At the launch, fast Microdrive mass-storage units were promised for later in 1982, together with an interface that would allow a number of Microdrives and an RS-232 printer to be used with the Spectrum. They finally arrived in August 1983.

The Interface is firmly attached.

ALPHATRONIC

"CAPABLE OF ANYTHING. And enjoyable too. The Alphatronic PC . . . You can let it think for you. You can make it work for you . . . And it's a treasure in the house. It makes sure that the central heating functions economically, that the locks and burglar alarms work reliably." On and on the brochure goes, cheerfully mixing fantasy with outright falsehood. Cat been sick? No problem. The trusty Alphatronic PC is probably responsible.

All this conceals the fact that the Triumph-Adler Alphatronic PC is a very attractive machine. For £350 the Z-80 based micro offers 64K of RAM, a high-quality standard-layout keyboard, cassette interface and both colour TV and monitor display outputs. Used with a standard domestic colour TV and audio cassette recorder the Alphatronic PC is well set up for a normal home life of playing games and giving people practice in Basic programming.

The Alphatronic PC also has good expansion possibilities. It comes fitted as standard with an expansion bus and has both a serial RS-232C and a Centronics-type parallel interface, so you can easily add a printer and discs. This puts the Alphatronic PC into the same category as the Commodore 64 and the BBC Model B, as a dual work-and-play home machine. In its expanded disc-based configuration it is a CP/M machine, opening up a wide range of useful software to the home user. Not controlling the central heating system or locking doors, but word processing, record keeping and spreadsheet analysis.

Externally the Alphatronic PC is a two-tone grey plastic wedge about the size of a large book — 405mm. by 255mm. by 73mm. The full-size keyboard is of a high standard — indeed it is very similar to the keyboards found on Triumph-Adler's office microcomputers. Triumph-Adler is having the machine built in Japan to a West German design, and generally the construction is good.

The machine we looked over in Triumph-Adler's U.K. headquarters was the German version with the DIN standard keyboard layout. The U.K. model will have the same general configuration: a separate numeric keypad and six programmable function keys in addition to all the usual keys in QWERTY layout. Normal-acting Shift keys give both upper and lower case. The keyboard feels nice to use, and should prove a strong selling point against other machines in this super home computer class. It really is office quality.

Above the PC's keyboard a panel pulls off to reveal a socket for inserting ROM cartridges, so software for the standard machine can be distributed either on cassette or cartridge. Triumph-Adler says there are some German-written games cartridges already in existence, but we were only shown some fairly simple Basic programs loaded from disc.

The German keyboard: British machines will have the conventional QWERTY layout.

Software ROMs up to 16K can be plugged into a slot above the keyboard.

The Basic is written by Microsoft and is resident in 24K of ROM on the main board. It is a full business Basic which Triumph-Adler says closely resembles the Basic running on the company's P2, P3 and P4 Z-80 based office micros. The Basic supports mixed text and graphics on the screen, in up to eight colours.

Characters are formed from an eight by 12 matrix and look clear on the screen. The display is software selectable between 24 lines of 80 characters, 24 lines by 40, 16 lines by 80, or 16 lines by 40. The range of different display modes reflects the Alphatronic's dual role as a work-and-play machine.

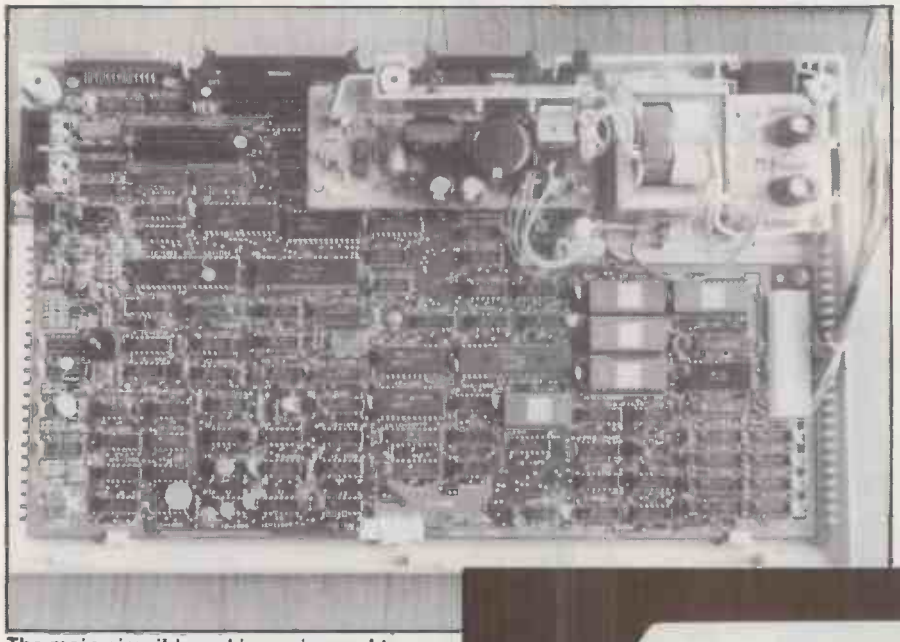
The matching Alphatronic 5.25in. 320K floppy-disc drive costs £330 and includes CP/M 2.2 in the price. A second drive costs £270. With the addition of a cheap monochrome monitor, costing say £50, and a £280 dot-matrix printer you have the elements of a practical single-drive system for around £1,000.

The PC could be attractive to commercial and industrial users. System houses and OEMs in particular might want to bundle it up with other equipment and software to make up a specialised product. Triumph-Adler plans to have the Micromite local-area network available for the PC, which may encourage this development.

Triumph-Adler, a German company, sells typewriters, computers and other office equipment under the Adler, Triumph, Royal and Imperial brand

PC

Ian Stobie takes an early look at this German newcomer to the work-and-play market which can be expanded to run CP/M software.



The main circuit board is engineered to high standards

names. The Alphatronic PC is a departure from the company's strictly business orientation though maybe a home computer is not all that different from a portable typewriter. The alphatronic PC will be sold through Triumph-Adler's existing 2,000 or so dealers in the U.K., and probably also through general multiple retail chains, although no details have yet been made public on this point.

We were unable to examine the documentation the Alphatronic will be supplied with in the U.K., or evaluate the software offered for the cassette-based system. The alphatronic PC is scheduled for general availability in the U.K. in January 1984.

Conclusions

- **The Alphatronic PC seems to be a well constructed, good-looking home machine, intended for both work and play but probably more suited to work.**
- **There is not much to recommend the Alphatronic PC to the pure games player, but if you are thinking of eventual expansion to a disc system for practical use at home the Alphatronic PC is worth serious consideration.**
- **The keyboard is particularly good for a home machine.**
- **There may be less software available for the cassette-based entry-level system than for established rival machines like the Commodore 64 and BBC Model B. On the other hand the disc-based Alphatronic PC system should have abundant CP/M software available.**

Specification

CPU: Z-80A eight bit
Memory: 64K ROM; 32K RAM of which 24K is Basic interpreter; slot for 16K ROM software cartridges
Keyboard: full-travel keys in standard QWERTY layout and spacing, with numeric pad and six programmable function keys; 85 keys in total
Display: output sockets for separate TV or RGB monitor
Display modes: 24 lines of 80 characters, 16 by 80, 24 by 40 or 16 by 40; 80 by 72 dot graphics on TV, 160 by 72 with monitor; eight colours; mixed text and graphics; characters are constructed on eight by 12 matrix
Interfaces: Centronics parallel printer interface and RS-232C serial interface: Alphatronic expansion bus
Options: up to two 5.25in. floppy-disc drives providing 320K each; CP/M operating system for discs
Manufacturer: made in Japan for Triumph-Adler of West Germany
U.K. distributor: Triumph-Adler (U.K.) Ltd, 27 Goswell Road, London EC1M 7AJ. Telephone: 01-250 1717

IT TAKES FLEXIBILITY AND PRICE TO PRODUCE CLEAR WINNERS.

This is the new Decision Mate V from NCR.

Designed and manufactured in Europe, it's a high performance micro-computer specifically developed for the business professional.

It offers all the processing power, versatility and reliability of much larger and more expensive systems.

At the same time it is easily installed, simple to use and can be upgraded as and when required.

The Decision Mate V is the first of a family of NCR micro-computer products providing maximum functions at the lowest possible cost.

The basic Decision Mate V features 64 K of memory, upgradable to 512K, high resolution monochrome or colour video display, dual 5¼" floppy discs, upgradable to 10Mb and a dedicated graphics processor.

The detachable keyboard is light, low-profile, multi-language and has 20 programmable function keys.

The Decision Mate V processor can be upgraded from an 8 bit to an 8 and 16 bit dual processor.

This enables the user to not only select from the large range of established 8 bit software but also ensures compatibility with the expanding range of 16 bit software.

To further enhance the Decision Mate V we're introducing Decision Net, a local area network, which will link up to sixty three micro-computers sharing expensive peripheral devices.

All of which adds up to a very flexible unit and, when we tell you that the basic Decision Mate V costs well under £2,000 it's not hard to see why we call it a clear winner. Every time.

Contact the Independent Marketing Division of NCR at 206 Marylebone Road, London NW1 Tel: 01-388 8440

THE DECISION MATE V
a clear winner from
NCR

● Circle No. 158

DISPLAY MANAGER

Mike Lewis looks at Digital Research's utility for handling screen output.

DIGITAL RESEARCH deserves a pat on the back for Display Manager. This simple programming tool will solve many of the problems faced by professional programmers — or at least, those who care about the appearance of their programs and the convenience of their operators.

As its name suggests, Display Manager is all about the displays that appear on the computer's screen. Its aim is to remove from the programmer much of the work involved in screen formatting, cursor control and on-screen editing. It also allows you to write programs that are completely portable across different screen types.

In short, Display Manager does for the screen what a database does for files. It separates the mechanics of screen displays from the actual application. Once you have got used to using it, it will certainly speed up your programming.

Drawback

But there is a snag, and it's a big one. Display Manager is only compatible with certain of Digital Research's compiled languages. These are CB-80 compiled Basic, Pascal MT+ and PL/1. If you are committed to Microsoft Basic, ProPascal or Fortran, you will either have to switch languages or forget about Display Manager. The reason the package is so closely tied to these languages is that much of Display Manager's work is done by a set of run-time support routines that you link to your application program.

The display editor is a free-standing program that you use to design the screen and to specify input and output fields. To get to know the editor, I tried it on one of the supplied demonstration displays — see figure 1. It represents the sort of form that a firm might use for entering a customer's telephone order.

It only took a few minutes for me to get the hang of the display editor, possibly because I am familiar with WordStar. The control keys are almost identical and using the editor is simply a matter of juggling things around on the screen until you are happy with the way it looks. You also use the editor to define the fields in the display. There are three types of fields. A literal is a field that does not change, like the field labels or the instruction to the operator at

(continued on next page)

```
                    CUSTOMER TELEPHONE ORDER

Customer:                          Address:

    City:                            State:        Zip code:

   Phone:                 Method of payment:
                                   (A=a/c; B=bank; C=Cr. card)

==============================================================
QTY     DESCRIPTION     PART NO.        PRICE EACH      TOTAL
===     ===========     =======         ==========      =====

---     -----------     -------         ----------      -----

---     -----------     -------         ----------      -----

---     -----------     -------         ----------      -----

---     -----------     -------         ----------      -----
                                        TOTAL SALE:
==============================================================

PRESS: ESC to exit; ^Z for a list of part numbers
```

Figure 1. A screen layout created with the Display Manager editor.

DISPLAY MANAGER

(continued from previous page)

the foot of the screen. An output field is one that your application program uses for displaying variable data; examples include the description and price fields.

The third type is an input field, which is used to accept data from the operator. The customer's name, address, etc., are examples. If you specify validation criteria for these input fields the run-time part of the package will refuse to accept invalid keystrokes such as a letter in a quantity field. When you are satisfied with your screen you save it to a file. You may later recall it, alter it, or delete it. The editor also allows you to merge screens and to incorporate part of one screen in another. The whole process is menu driven and very easy to use.

Once you have created a display, you may use it in as many programs as you like. The whole idea of Display Manager is to keep the appearance and attributes of the display independent of the way in which the data is used. You could completely redesign the order form in our example without having to amend a single line of the programs that use it. Figure 2 shows an extract from one such program. Its purpose is to display the order form and to accept details entered by the operator. When a part number is entered the program looks up the description and the unit price and displays these items in the appropriate fields. The program also calculates the price extension and the total. A Help screen is available which displays a list of all valid part numbers.

The application program communicates with Display Manager by means of a set of function calls. They have names like Dispd to display a screen, Posf to select a field for input or output, and Getf to accept and validate data from the operator. There are 15 of them in all. One function that I especially like is Retdm. It tells the program what visual attributes are supported by the hardware in use. The sample program makes use of them by setting a prompt to highlight the current field. This prompt is normally a reverse-video block, but if the user's screen does not support reverse video the program uses a solid line instead.

These hardware characteristics are defined by a set-up program within Display Manager. It has two distinct functions. Firstly, it installs the package so that the editor can work with the programmer's screen. Secondly, it provides control codes for the end-user's screen, which are stored in a file which must be available when the application program is run. So to port the program to a different screen type you only need to alter this file.

But the feature of Display Manger that I like best is one of its simplest: the ability to print to paper an exact image of a screen. If you have ever written a user manual, you will know how valuable it is to be able to include replicas of screens. This seemingly simple task is surprisingly difficult if the screen is formatted by a program that uses direct cursor addressing. Display Manager's screen editor does it for you at the touch of a control key. I must award another pat on the back to Digital Research for the Display Manager documentation. The manual is clear, concise, well organised, and indexed. And it's not often that I get a chance to say that in a software review.

```
REM -- constants used in the program
     ON$ = "0"                                   REM make a field visible
     OFF$ = "1"                                  REM make a field invisible
     LST.SZ% = 50                                REM size of parts list
     TABS$ = "              "                    REM tabs for output

REM -- include the Display Manager runtime library definitions
     %INCLUDE DMEXTR.BAS

REM -- get screen handling control code from installation file
     IF END # 1 THEN ERR1                        REM if no term file, then abort
     OPEN "CURRENT.TRM" AS 1
     READ # 1;TERM$
     CLOSE 1

REM -- assign Display numbers, these can be changed as needed
     PHONE.ORDER% = 1                            REM main display
     HELP% = 2                                   REM part no. reference

REM  start program here. Main loop from LOOP:

     RET.ERR% = INITDM(TERM$)                          REM init the library
     CALL DM.ERR(RET.ERR%,INITDM$)
     AVAIL.ATTR$ = RETDM                               REM CRT attrs avail.
     IF MID$(AVAIL.ATTR$,3,1) <> "0" \ inverse video supported
        THEN PRM.ON$ = "031" : \
             PRM.OFF$ = "330" : \ use for prompts
        ELSE PRM.ON$ = "0" : \
             PRM.OFF$ = "3"                          REM just initials

REM -- open display file, show it, and position to the first field
     RET.ERR% = OPNDIS("ORDERS.DIS")                   REM open the file
     CALL DM.ERR(RET.ERR%,OPNDIS$)
LOOP:RET.ERR% = DISPD(PHONE.ORDER%)                    REM show the display
     CALL DM.ERR(RET.ERR%,DISPD$)
     RET.ERR% = NXTF(-10)                              REM 1st field
     CALL DM.ERR(RET.ERR%,NXTF$)
     PROMPT$ = "__________________"                    REM initials

REM -- all prompts are inverse video if possible, underlines otherwise

REM -- get each field in turn

REM -- start with the header part
     CUSTOMER = GET.ENTRY                              REM use relative move-
     ADDRESS = GET.ENTRY                               REM ment and GETF
     CITY = GET.ENTRY
     STATE = GET.ENTRY                                 REM alphabetic only
     ZIP = GET.ENTRY                                   REM numerical valid-
     PHONE = GET.ENTRY                                 REM ation by DM

REM -- get each field in main part of order
PAYM:PAYMENT(0) = GET.ENTRY                            REM A, B, or C only

REM             etc. etc.
```

Figure 2. An extract from a Basic program with Display Manager function calls.

Conclusions

● Display Manager is a valuable programming tool that will take a lot of the hassle out of screen displays and operator inputs.

● If you are already programming in one of Digital Research's compiled languages you should certainly consider using it, but whether it is worth switching to one of these languages just to get the benefits of Display Manager is something that you will have to decide for yourself.

● Display Manager is available from most dealers at around £260, or contact Digital Research, Oxford House, Oxford Street, Newbury, Berkshire RG13 1JB. Telephone: (0635) 35304.

Would You Ask A Pig Farmer To Landscape Your Garden?

Of course not, you would select a professional with experience. The same applies when looking for the right software. When it comes to the Epson HX-20 there is really only one name to consider.

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* Full document handling as if the microcassette were a disc.
* Text operations include move, insert, overwrite, delete, search, replace.
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One of a selection of business software packages specially designed for the Epson HX-20.

For information contact:
FFOSS Ltd., 112 Bath Road, Slough, Berkshire. Telephone: Slough (0753) 820277.

● Circle No. 235

Movable type

Four packages which exploit the Epson HX-20 as a portable text editor, tested by Chris Bidmead.

THE EPSON HX-20 exemplifies the new generation of true portables that are battery driven and can be carried under the arm as easily as a clipboard. A number of small software houses, taking advantage of its full-size keyboard, have climbed on board with so-called "word processing" offerings. The quotes are there because though the term is used extensively most software for smaller micros is capable of only relatively simple text manipulation. Outside the world of marketing they would probably be referred to as text editors, and that is what I will call them here.

This is not to dismiss Intext, Correspondent 20, Apwriter and ITE+. I have been trying them out as tools rather than toys in a range of tasks, from jotting down notes in the garden to rewriting TV scripts on location and even writing articles abroad under the hot Turkish sun. They were used mostly for text entry, the data being later downlined to a large hard-disc machine for editing and formatting.

Each of the packages was also tested by editing the text *in situ* and then sending it directly to the printer. The cost of a text-editing system at this level is about £500 for the Epson and minicassette machine, £450 for the printer and £50-odd for the software.

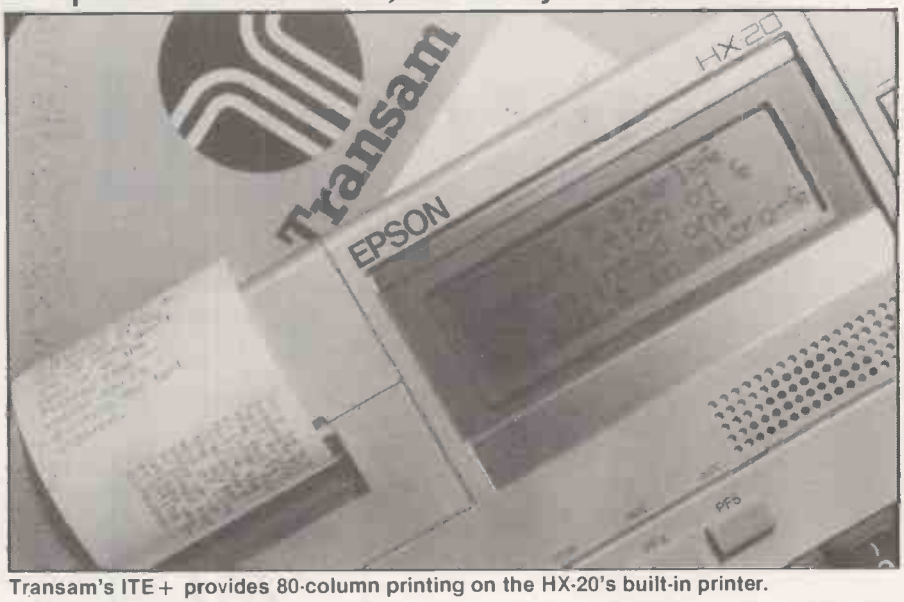
The authors of all four packages have had to cope with the problem that the Epson HX-20 runs an interpreted Basic, and that is not the best language for the fast handling of text. One of the packages, Apwriter, confronts this problem by ignoring it: Apwriter is written entirely in Basic. Correspondent 20 and Intext split the difference: the shell is written in Basic, with the internal workings in machine code. ITE+ is all machine code, but like Correspondent 20 the code makes calls to Epson's resident text-editing routines.

You can understand the temptation. The procedures for screen editing are already there in the ROM and calling them costs no precious space in this 16K machine. But there is a catch, as the built-in routines to insert and delete characters are designed to work with Basic's short physical lines.

ITE+

ITE+ from Transam is a plug-in ROM chip primarily designed to turn the HX-20 into a portable intelligent terminal. It has a built-in editing capability which certainly brings it into the scope of this review, and in some respects its text handling offers advantages over the other packages. Unlike Correspondent 20 and Intext, ITE+ provides on-screen word wrap, breaking the line at a convenient space when the 80-character width of the virtual screen is exceeded.

As you type text into ITE+ the physical window on the virtual screen pans automatically. At the end of the 80-character line the screen-display code breaks the text at the previous space and carries the last word over to begin the following line.



Transam's ITE+ provides 80-column printing on the HX-20's built-in printer.

ITE+ is reasonably fast, as it is written in machine code, but a moderately efficient typist can easily outpace it once the screen has begun to fill up and processor time has to be borrowed to take care of the scrolling. Characters can be lost as a result, a problem which is not unique to ITE+.

Having to slow down is annoying, as the keyboard is a beautifully laid-out invitation to the touch-typist. An irritating feature that ITE+ shares with Correspondent 20 and Apwriter is the chirrupping bell tone which invites you to hit the Return key as the cursor comes within five characters of the right-hand edge of the physical screen. As word wrap takes place automatically, I could not see the need for it.

There is a note in the documentation that explicit Carriage Returns ought to be entered if you intend sending the text to another computer that expects Carriage Returns to delimit lines. Yet the solution surely would be to silence the insistent bell tone and make the word-wrap mechanism actually insert the necessary Newline character. As it is, if you rely on the auto word wrap while creating text for downloading to your favourite word processor you may be in for trouble. What look like new lines on the HX-20 screen are in fact only strings of spaces inserted to push the next character on to the following physical line. This behaviour is traditional on some terminals, but I do not know any word-processing software that can make sense of it.

Editing under ITE+ uses the resident screen-moving apparatus, but text insertion is rather different from the Epson standard. Hitting the upper-case Ins/Del key pushes forward the remaining text to open up a single space under the cursor, and this action has to be repeated for each character you want to add into the text as there is no Insert mode. When the screen was particularly full the insert key would sometimes make room for another character by deleting the character at the current cursor position. The bug seemed to pop up when auto word wrap had allowed long logical lines to build up, and may be something to do with the shortcomings of the resident Basic screen-editing routines that ITE+ is calling.

A simple menu reached by hitting the Menu key allows you to save the contents of memory to cassette. Several files can be stored on a single cassette but there are no safeguards against overwriting existing data. You have to make sure the tape is correctly positioned. Files names are restricted to the form ITE-?, where ? represents a single letter of the alphabet.

ITE+ offers the choice of printing out the text on the built-in printer either in the normal way, breaking words along the right-hand edge of the paper, or with full 80-column print. This handy miracle is accomplished by software that turns the text through 90 degrees. The ITE+ package includes a specific routine for sending text down the RS-232 interface. Setting up the options to match baud rate, parity and so forth are commendably simple, but it is a pity that there is no way of altering the width of the text once the document has been created inside ITE+.

Correspondent 20

Correspondent 20 is the text-handling package that Epson itself markets and endorses under the Epsonsoft umbrella. Like ITE+ it makes heavy use of the built-in screen handling, but unlike ITE+ it takes cassette saving very seriously and sets up internal checking to store files in the right place on the tape and find them again.

The version under test came in a ROM cartridge that clips into the same slot as the microcassette. Code is loaded into RAM exactly as if it were stored on tape, but the process takes only 25 seconds.

Correspondent 20 initially comes up with a menu — see figure 1. The E: command

```
**Menu**          D:Delete
I:Initial         P:Print
L:Load            E:Edit
S:Save            X:Exit
```

Figure 1. Correspondent 20 main menu.

takes you into the Correspondent 20 page, a single 60-by-60 virtual screen where all your text entry and editing takes place. When the page is full — it holds about 500 words — you have to save it on to tape.

As with ITE+, the screen scrolls to accommodate the movement of the cursor. The Epson beeps to let you know when you are nearing the end of the line. Correspondent 20 will not word wrap the line if you continue to type; instead it breaks the word in the middle as necessary and continues on the next line.

Once again the documentation advises you to take the advice of the beeping tone and insert a Carriage Return. If a text block between two Carriage Returns is allowed to spill over on to several lines subsequent inserts and deletions in one line will push and pull all the other lines in the block. This will create unwanted breaks in the middle of words, which you will have to tidy up manually. Each text block is separate, and you can insert and delete characters inside one block, safe in the knowledge that the changes will not affect the line endings of any of the other blocks. By using explicit Carriage Returns to keep the blocks shorter than the lines on the virtual screen you can guarantee you will only need to tidy up that one short block if insertion causes it to spill.

The trouble with observing this rule of one Carriage Return per line is that if you are a confident typist you may have already skipped on to the next line by the time you register the beep. You will have to go back, delete the fragmented word, enter the Carriage Return and continue. This is not exactly state-of-the-art word processing, though it is certainly easier than splodging Tippex all over a typewriter.

These text blocks are a legacy of the Basic screen editor. They force you to do some dextrous juggling if you want to make extensive changes to text on the page. However, it turns out that there are hidden and undocumented depths to Correspondent 20 that make it feasible to edit in a way that is not available under the other systems. You can turn a folded single logical line into a pair of logical lines simply by entering a Carriage Return anywhere in the first half of the line — the lines will not look any different after you have made this change.

Correspondent 20 also allows you to join a pair of logical lines into a single line. You have to overwrite the invisible Newline that lurks in the column-60 position with some other character. It is convenient to choose the first character of the following line, which you then delete to join the two lines.

The initialisation option of the menu does not, as you might expect, set up printer and RS-232 parameters. You have to establish all this outside Correspondent 20 or by patching the code of the loader program. Instead it turns out to be a routine for preformatting the tape, something that has to be done before files can be written to the cassette.

The first file on a Correspondent 20 cassette is always the directory: it keeps track of the remaining space, which is always divided into seven files. Several files can have the same name, in which case they are distinguished only by a page number, which is a useful way of partitioning a document longer than a single file.

The file handling works rather like disc-space organisation on a larger machine. However, getting or putting data in and out of the directory and then winding on to the relevant tape position all takes more time than a straight save or read. As the tape fills up, the distance that has to be traversed becomes greater, with correspondingly longer times to save or load.

Storing the directory in the middle of the tape would help cut down access times. As it stands the biggest problem with Correspondent 20 is that the RAM memory is liable to fill up just as you get into your writing stride. A long tape-saving palaver then intervenes, giving you time to forget everything you wanted to write.

The Print option in the menu always allows you to send your file down the RS-232 line or produce hard copy on the built-in printer. It is designed to print a file that has already been saved to cassette, but there is an option to print the current file in RAM by entering * as the file name. Rather foolishly the software first goes to check if there is a file called * in the directory, so the process is never speedy.

Apwriter

Apwriter is an ambitious suite of programs designed to match the executive-on-the-move image of the HX-20. As well as straightforward text-editing capabilities, additional Basic programs are provided on the same cassette to let you create and retrieve a file of names and addresses and merge them with text files for mailing.

Lines are written into Apwriter using the Type option from the main menu. Type automatically puts line numbers at the left-hand end of each line, which you must refer to when you come to use Edit mode. The only way you can alter text directly entered

(continued on next page)

Prices and suppliers

Apwriter AP Systems, 90-100 Brighton Road, Kingston, Surrey KT6 5PP. £25.
ITE+ and Intext Transam, 59-61 Theobalds Road, London WC1X 8SF. £50.
Correspondent 20 Epson (U.K.) Ltd, Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. £85.

HX-20 virtual screen

The Epson HX-20 has a 20-character by four-line LED display, but as far as software is concerned this is only the physical screen. The operating system allows the software writer to establish a virtual screen of up to 255 by 255 characters, subject to the available memory. The physical screen is then regarded as a movable window on to the virtual screen.

Standard screen-moving controls

Control-A — left-hand edge of screen
Control-S — scroll screen leftwards
Control-D — scroll screen rightwards
Control-F — right-hand edge of screen

Additionally there is the Home key to return the cursor to the top left-hand corner of the screen and the Scrn key to move the physical window up and down the screen. The Ins/Del key is used in shifted and unshifted mode for editing:

Unshifted. Destructive backspace removes the character to the left of the cursor and moves the cursor back one character.

Shifted. Enters insert mode which pushes forward the text to the right of the cursor as new text is entered. Use of the cursor keys causes exit from this mode.

Movable type

(continued from previous page)
in Type mode is by destructive backspacing. This will not remove characters beyond the beginning of the current line, although you are allowed to delete the line numbers, which seems to be a mistake. The buffer will handle up to 50 lines of text; a prompt comes automatically at line 45 to remind you that you have five more lines to go.

Apwriter's is the most obtrusive of all the chirrups offered by the text-handling routines reviewed here. As you approach the end of the line there is a rapidly ascending arpeggio followed by a single sustained warble as automatic word wrap occurs. Though always welcome, the auto word wrap is hardly an aid to fast typing because of Apwriter's sluggish acceptance of text.

To rewrite lines other than the current one you have to go back to the main menu and select the Edit option. You are then asked which line you want to edit — and you had better know the number because there is no opportunity to access the line by context. The line corresponding to the number you enter is displayed, and you then have the opportunity to move the cursor up into it and perform standard Basic-style editing.

Like Intext, Apwriter uses the HX-20's built-in cassette to print out a hard-copy record of each file as it is saved. A similar record is printed out again whenever a file is retrieved, which seems a little unnecessary. It is left to the user to locate the correct position on the tape for each file transaction.

A menu option takes you into a routine for printing, directable either to the built-in printer, the LED screen or to an external printer. You are given the chance to change the line width, but it turns out that this only works for widths shorter than the text currently stored. There seems to be no way of making lines longer.

Apwriter offers no specific communications option for sending text to a remote computer, but the external printer option worked well enough for this purpose. It is a pity that unless your communications protocol happens to fit with the Aprwriter's default you have to reset it each time you power-up the program. It is not even possible to patch the Basic code, as you can in Correspondent 20, because it is protected against listing.

In a curious denial of the whole philosophy of this powerful portable, Apwriter, like Correspondent 20, does not store text in the machine's internal memory after power down. But what really makes Apwriter unfit for any serious work is the painfully slow speed of entry.

Intext

The author of Intext uses a radically different approach. Basic's control of the screen and the keyboard are kicked out altogether and machine code takes charge of both. One immediate advantage is that the dangerous Clr key is reallocated to harmless use to get you to the bottom of the text, which is logical when you consider that the shifted function is Home. In Correspondent 20 and Apwriter this key literally deletes everything on the screen. It is only a rather annoying bug in Apwriter, because when you return to input mode by way of the main menu the text is still there. But under Correspondent 20 the virtual screen is in effect the text buffer, and you've lost all your text if you touch the unshifted Home/Clr key by mistake.

Intext loads from the cassette in about two minutes, pausing on the way to ask if your printer can backspace and how much of the available memory you want to dedicate as the text buffer. Once Intext is in control you remove the cassette and put it in a safe place. Normal data-security procedure would dictate that you make back-up copies of valuable software, but Intext comes in the form of three programs — a machine-code program topped and tailed with a pair of Basic routines — making it difficult to copy.

Intext's approach to text display is different too. It switches off the horizontal scrolling of Epson's virtual screen mechanism, to produce a tightly wrapped screen that breaks the text in mid-word if necessary. Many users will find this off-putting at first sight, but there are two advantages that you come to appreciate. Text is continuous on the screen, and without scrolling very fast text entry is possible. Intext was the only system that kept up with my not particularly speedy touch-typing without spilling a precious word.

Mapping the width of the virtual screen to the physical screen like this also greatly simplifies the business of insertion. There is no need for the concept of text blocks and, once you get used to the appearance, no need to worry about words broken in mid-sentence. Word wrapping and formatting are taken care of when the time comes to print or transmit the text.

Apart from a one-note fanfare on entry, Intext also eschews beeping in all its forms. It only requires you to enter Carriage Returns where you actually want them — at the end of paragraphs or where the text has to be broken into short lines for any other reason. The program marks the place with the built-in Carriage Return character provided by Epson, and carries on along the same line. On transmission or printing this character is converted to a Carriage Return or a Carriage Return / Linefeed pair, as you choose. Aligning text between the physical margins of the paper is taken care of by true word wrapping at this stage.

This makes the maximum use of the small display but, like the word breaking at the edge of screen, it takes some getting used to. I found it infinitely preferable to the way Correspondent 20 and ITE+ handle physical line shaping, and a good deal easier to edit afterwards, either on the Epson or after downloading to a mainframe.

Intext does not keep a directory, so there is no need for initialisation of the tape or winding backwards and forwards when loading and saving. Instead it uses the built-in printer to produce a written record of each file as it is saved, with the file name, tape-counter position, date and time. Loading of files is speeded up by allowing you to wind by hand to the correct position on the tape.

Intext needs to save to cassette less frequently too. Larger files are possible because most of the program is in machine code. On the unexpanded HX-20 its text files run to about 920 words, or about twice what a Correspondent 20 file will hold. The editing and text-creation part of the Intext does not need to know what you intend to do with the text once you have written it: decisions about line lengths and margins can safely be deferred until the printer is attached or the RS-232 line connected.

It is at this point that the real strength of Intext emerges. The print routine is entered from the menu, and lets you choose between sending text to the internal printer, a printer attached to the RS-232 port, or downloading direct to another computer. This last option also allows you to send data to a remote station by way of a modem.

Talbot Offset has designed Intext specially to include typeset codes in the text stream when the document is to be sent directly to publishing or printing establishments. A similar arrangement allows you to insert codes for indenting, bold text, underlining and so forth. They come set up for the Epson range of printers, but it is not difficult for someone with an average knowledge of Basic to modify the loader program to match any printer.

Conclusions

● ITE+ does a good job of turning the Epson HX-20 into an intelligent terminal. Its communications facilities are simple to use, and with its built-in machine-coded tape accessing it makes an excellent general-purpose tool for text entry and storage, although its editing facilities are rather limited.

● Apwriter attempts to achieve a lot for its price, but will only satisfy you if you are a very slow typist. Correspondent 20 is more generally useful, but I found the small buffer size limiting and did not think the complexities of its cassette handling were worth the benefits.

● Of all the programs, Intext is the best adjusted to the capacities of the HX-20, although the mid-word wrapping and embedded Carriage Return characters are hard to get used to.

watch out for data warrior

Data Warrior are proud to announce the launch of their new product range which includes the highly acclaimed Hewlett-Packard 7470A Plotter. The only one with "Sweet-Lips" technology.

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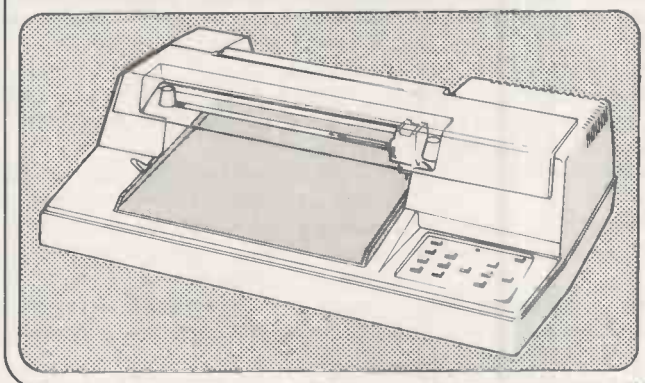
7470A PLOTTER



Despite the myriad imitations, the 7470A Plotter is the **only** one with "Sweet-Lips" technology. It's interesting to see other plotters producing what appears to be a similar output to the 7470A, but if accuracy in dimensions is important to you, then you'll find that few if any can match the Hewlett-Packard expertise. The HP 7470A can plot 1000 points in a 1-inch line! With that degree of resolution coupled with the capability to run almost all popular micros, **and** the back-up and experience of one of the world's largest manufacturers, you can't afford to sell lesser machines.

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Negative history

by Phillip Gething

Open University, morning transmissions.

Good morning, students. Please remember to respond to asterisk prompts and to end all comments and questions with another asterisk. Course title is as follows:

Jennie Lee Memorial courses, post-experience course 97/1823.

Protection against computer frauds.

Now key the number of your next unit.

4

Confirmed. Title of unit is as follows:

Error in a Court Sentence.

In this unit we study the use of computers in recommending and enforcing court sentences and the mistakes that can occur in the software. Please study the following brief account of events affecting Mr James Ling before attempting your unit assignments, which include an essay on the lessons that can be learned from these incidents.

In 1993 Mr James Trevelyan Ling, a retired shopkeeper, was aged 73. He appeared before Reading Magistrates' Court on January 15 of that year, charged with a motoring offence committed on January 3.

He and his wife had travelled by car to Manchester on January 2 from their home near Reading to see friends. The visit, being outside the local Southern area, had required permission in advance. This had been duly obtained by lodging an application and itinerary with the Berkshire office of the Travel Commission.

The approved route had consisted mainly of a direct motorway journey in each direction, with no mention of Nottingham. Yet Mr Ling and his wife were picked up in a random police check on motorists in that city the next day.

In the Magistrates' court on January 15, Ling admitted the offence. He claimed, as extenuating circumstances, that his wife had felt a sudden urge on the morning of January 3 to visit one of their sons living in Nottingham. This information was rejected as totally irrelevant by the magistrates, who pointed out that in a real emergency a special permit could have been obtained in Manchester. They reminded the defendant of the reasons why travel restrictions are imposed. Please suggest what reasons they gave.

World shortage of petrol

Strictly, the potential world shortage of petrol. Two more reasons, please.

Need to prevent the free movement of criminals. Need to prevent the free movement of terrorists

First part of answer accepted. Second part is a repetition, because terrorist is an attribute of entity criminal in the legal database. Try again.

Desire to catch criminals

That is a valid reason for police checks but not for travel restrictions.

I disagree. The two are related

Tutor will be contacted over network to resolve disagreement — please wait for next response.

Tutor now connected. I support the student. Any measure that hampers the movement of criminals tends to contribute to their arrest. I will check with the court proceedings in a moment to see what the magistrates really said, but congratulations on a good answer.

What have I missed?

The increased risk of accidents in heavy traffic. This was one of the reasons given for establishing the Travel Commission. Tutor still connected. What sentence would you now impose?

Was it a first offence?

Yes. Tutor now needed by another student. Bye.

Bye. Did defendant have any source of income other than state pension?

Good question, missed by many students. Yes, Mr Ling received about £400 a month under a private pension plan. What sentence would you now recommend?

Fine of approximately £500

The chairman of the magistrates asked for a recommendation from the Central Justice Department Computer and received the following message on his VDU:

Fine recommended – £600. No prison sentence, no disqualification, no endorsement.

Do you agree with this sentence as reasonable?

Magnitude of fine seems reasonable. But what is the dash or minus sign?

Congratulations on spotting the significance of this character, which was overlooked by the chairman of the magistrates. Have you discussed the course material with a previous student?

No, but this is a course on computer fraud and a unit about an error in a court sentence, so I looked carefully

Explanation accepted. The minus sign arose from a deliberate error in the software of the relevant program at the Central Justice Department, which we will come to next. Further information about the hearing in the magistrates' court can be obtained from the National Computer Archive legal database.

We now continue the account with a brief summary of events after the imposition of the negative fine. What enforcement action would you expect the justice computer to take?

I would expect it to send a cheque for £600 made out to James Trevelyan Ling

Correct. Would you expect this to be the end of the matter?

Yes, on the facts stated, and provided Mr Ling banked the cheque and kept quiet

Correct answer on the information supplied to you so far. We now consider the negative sign, which was inserted into any court sentence imposed in the name of James Trevelyan Ling, that is to say whenever his personal file was called by the sentencing program. Do you understand file calls?

Yes, they were fully covered in an earlier course

There was a sleeper statement tucked away in the call for the personal file by the execution subroutine. Sleepers were covered in units 2 and 3. It is assumed that the sleeper was inserted by a friend of Mr Ling's working in the Justice Department, but the person responsible has never been identified. What checks would you expect to be applied to software in the Justice Department?

Thorough checks, and rechecks at intervals against the specifiction

Correct answer. The specification for the execution subroutine had been altered. It was a comparatively short and general piece of code, and nobody expected the name of a specific individual to be inserted into it. An unauthorised alteration was made, perhaps by a computer freak on the staff who wanted to see whether the system could be beaten. The automatic code generator, working from the specifiction, made sure that a negative sign would be inserted if ever the James Trevelyan Ling file was called.

The account so far has been simplified in one important respect, for easier assimilation by students. The complication is that the magistrates did impose a disqualification, contrary to the advice offered by the computer. What would you expect the effect of this decision to be?

*The disqualification would have to be

ILLUSTRATION BY TEOMAN IRMAK

counted backwards from the date of sentence because of the minus sign*

Correct. The computer duly worked backwards and came to the conclusion that the driver was disqualified at the time of the Nottingham incident. What now?

Driving while disqualified carries severe automatic penalties. I am not sure of the exact details

The penalties are a fine of £1,000 and three months in prison. They were imposed by the computer without a further court case. The cheque for £1,000 arrived the day after the cheque for £600. Please continue.

If the computer believed wrongly, that Mr Ling had been in prison for three months, he could not have been the driver of the car on January 3

Yes. The computer noted Mr Ling's apparently perfect alibi and classified the conviction as wrongful, arising from a mis-identification. Please continue.

Mr Ling would now be awarded compensation

Correct. Because the computer still accessed his personal file through the execution subroutine, he was awarded negative compensation. He received a bill for £3,000. What would you now do in his place?

Mr Ling had already accepted £600 and £1,000, knowing that he was not really entitled to these sums. He was not in a position to query the bill, otherwise the whole story would come out and he and his accomplice might have been charged with fraud

Good answer, avoiding mistaken belief of many students that Mr Ling would own up. What would you do instead?

I would request the Justice Department to pay my compenstion to a named charity, by electronic transfer. Such donations can be made anonymously and it is an offence, under one of the Data Privacy (Financial) Acts, to try to trace the source

Novel answer, not in database. Our suggested answer is that Mr Ling must have managed to meet the net debit of £1,400 on his account from his savings. Tutor will now be contacted for comments on your answer. Please be prepared for slight delay.

Tutor now connected. Your suggestion is a very interesting one and we shall have to investigate its feasibility. I will also compose a new entry for our set of model answers. Sorry, I'm needed by another student. Bye.

Tutor no longer connected. Please give full name so that we can append it to model answer.

I do not want my name quoted

String not recognised. Please key again.

John Smith

Not consistent with password; name recorded as Duncan Trevelyan Ling. Key Yes or No.

Yes. Grandson of James Trevelyan Ling. My girlfriend works in the Justice Department

Name accepted.

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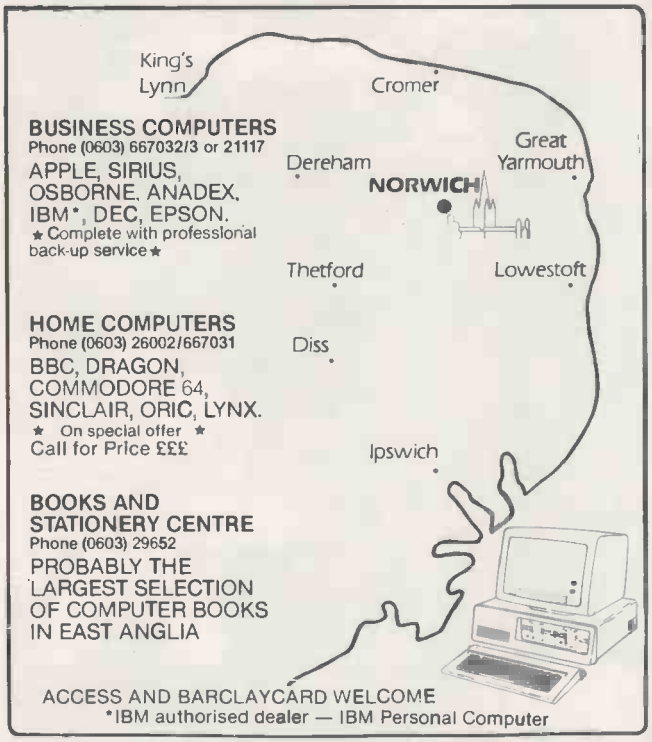

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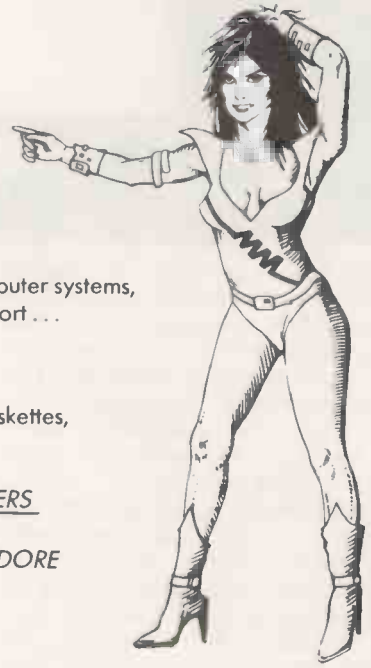

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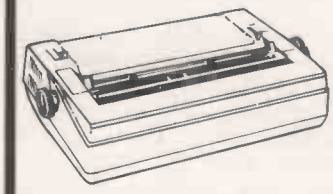

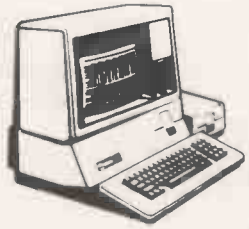

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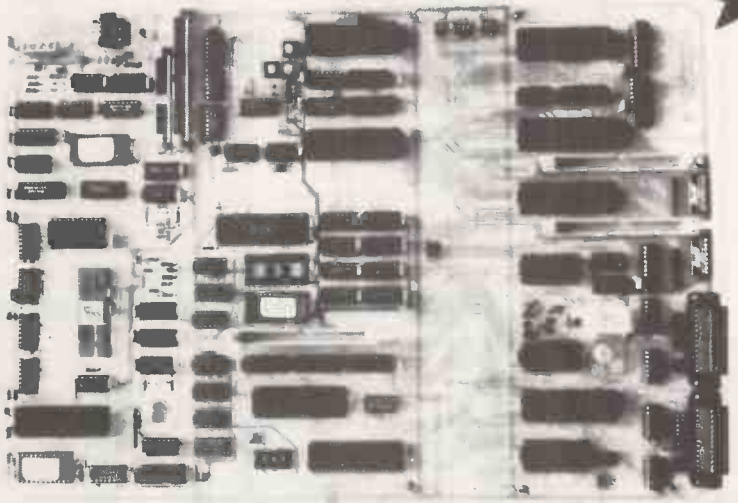

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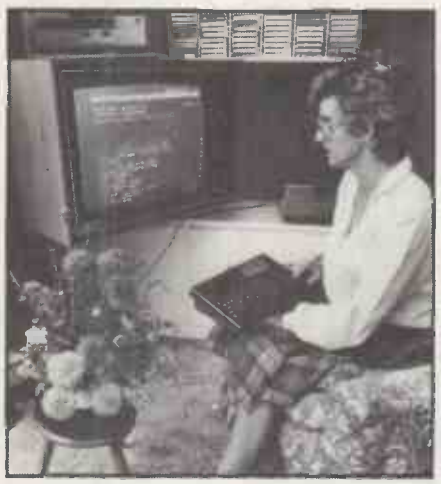
WHETHER YOU USE your micro for business or leisure, its strength lies in its independence. Unlike a dumb terminal, it has its own processing power, its own operating system and independent software. Microcomputers have become so popular in business, education and at home because you no longer need to wait your turn to get access to a mini or mainframe. You have all the power you need on a desk top.

Many people only see their micro as a stand-alone device to run application software, to learn programming, to do word processing or to play games on. But in fact a micro is capable of much more if you give it the power to communicate. It can be connected to another computer, either within an office or over a telephone line to exchange information and programs. It can be connected to a local network to send messages to other micros and terminals and also to share resources such as printers and discs. You can connect your micro to the telex service to send telexes all over the world and you can also use public databases and electronic mail services, such as Prestel, Telecom Gold and Rewtel.

All these options are starting to make communications using a micro popular. What will really make communications take off over the next few years is the ready availability of good software, the advent of built in standard communications interfaces and the reduction in the cost of modems. Communications used to be an expensive and complicated business for micro owners. It often involved buying add-on interfaces and communications printed-circuit boards. It also involved using fairly sophisticated programming to get different machines to communicate. On top of that you had to pay for a modem at each end of the link or, in the case of local area networks, expensive protocol convertors.

A modem is a device which changes a digital data signal from a computer into an analogue voice signal which can be accepted by a telephone line, and back again. The name is a contraction of modulator/demodulator. Until recently you would expect to pay hundreds if not thousands of pounds for a modem, but it is now possible to buy a simple acoustically coupled modem for as little as £50 to £100.



Club 403's viewdata shopping service opened this autumn in the Midlands.

The majority of micros come with one or more of three standard interfaces. For the cheaper micros you can buy an add-on interface. The standard interfaces are RS-232, IEEE-488 and Centronics. All three can be used for sending data, but the last two have limited use when it comes to communications because they are parallel interfaces, unlike the serial RS-232.

A computer translates numbers and letters into binary digits, combined into groups of eight to represent characters or bytes of information. The common binary code in micros for transmitting data is called ASCII, the American Standard Code for Information Interchange. ASCII uses seven of the eight bits to describe the character, leaving one spare bit which can be used to check the data.

In parallel transmission the computer sends a whole byte in one go using a set of cables, with one cable for each bit. Although this is a very fast way of sending information, it has its limitations. The cable must be fairly short otherwise the bits will arrive at slightly different times and you end up with an incoherent mess. you cannot use a parallel interface to send data down a telephone line. A telephone only accepts serial data sent one bit at a time.

Having an RS-232 interface is the first step towards successful communications, though even when you have passed this compatibility hurdle several others still loom ahead. Although in theory ASCII is a standard code the control characters which tell your computer to do a carriage return, to print, etc. vary from machine to machine. These idiosyncrasies can be overcome by buying a standard software package or by some simple programming.

Before you start sending messages you must make sure that the speed you are going to send the data suits the computer that is to receive it. You must also make sure you are sending the information in a format that the other computer can understand. The other computer must also know when each byte of the information you are sending starts and stops.

There are two methods of keeping data in step. Synchronous transmission is usually used for high-speed data. A synchronised message is sent before the data to get the sending and receiving modems into step and then a clocking signal is sent with the data. Asynchronous transmission gives each byte of information its own clock in the form of a start bit and one or two stop bits.

To make sure that transmission runs smoothly you can also throw in an extra parity bit, which is set to make the number of 1s in every byte an odd or even number. If odd parity has been established, a computer which receives a byte with an even number of 1s knows something is wrong and can ask for that byte to be transmitted again.

The type of modem you choose depends largely on the sort of job you want to do. Acoustic couplers use rubber cups to attach a computer directly to a telephone handset. They are cheap and portable, but generally not as reliable as a hard-wired modem. Interference can arise from outside noise and from components in the telephone itself.

If you are using your micro from home, the chances are you will opt for a fairly slow acoustic coupler, which is perfectly adequate for sending messages to friends' micros and for connecting to electronic-mail services. In general it is simple to

(continued on next page)

(continued from previous page)
send a message from your computer over a telephone line to someone else's micro, even one of a different make. Problems may arise when you want to exchange programs or data files. You must remember to save any programs or files in ASCII, as that is the code you will use to send the data; if you don't the information will become garbled.

Some computer user clubs have set up electronic bulletin boards on a central computer which you can ring up and leave messages, find out information and possibly download program listings. Forum 80 and Rewtel are accessed from all over the country. A similar idea has been developed further by other companies to produce national electronic-mail and information services.

Probably the most interesting service for home micro users is Micronet, a large database and mail service that can be accessed through the public Prestel viewdata service. For £50 to £60 Micronet provides a cheap Prestel modem for many of the popular makes of micro. You pay a small rental charge, which added to the Prestel fee works out at around £1 a week, and of course telephone charges on top of that. You can use Micronet to access thousands of pages or programs and information, some of which are free and some at an extra cost. There are also pages for business and educational users. Home users can also download programs and information from the BBC's Ceefax teletext service.

For office workers there are Telecom Gold and other sophisticated electronic-mail services. Telecom Gold costs around £15 a month plus the cost of a modem and telephone calls. It is hardware independent and as long as you have a device that can talk to a modem it can connect to the service. There are several speeds you can pick for sending and receiving information, from 300 baud up to a 96,000 baud using a direct line.

Telecom Gold uses the fast packet-switched network and you can send messages as far as the U.S., Australia or the Far East. The service also links into the telex network and telemessage service, so you can send messages to people who are not Telecom Gold subscribers. For Sirius, Apricot, and IBM PC users, ACT has introduced its own Micromail service using Telecom Gold. The ACT package costs £275 and includes a year's subscription, a modem card to fit into the micro and all the software.

Electronic mail is faster than using the postal service, telex or facsimile and it is cheap. ACT reckons you can send an electronic-mail message of 400 words at off-peak time for less than the cost of a second-class letter. Even at peak rate long distance, the cost is only 17p and you do not have to pay for paper and envelopes.

If you work in an office the chances are that most of your messages are internal. Here again micros are ideal for sending and storing them. A confusing array of office automation products has appeared, ranging from the very simplest cable links to private viewdata systems and local area networks. Because most offices have a jumble of incompatible equipment, such as telex machines, micros, word processors, printers, mini or mainframe com-

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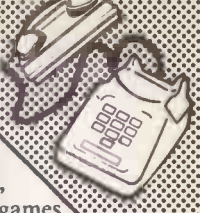
Arcnet	Baseband coaxial cable using token passing	Datapoint (U.K.) Ltd, 400 North Circular Road, London NW10 0JG. Telephone: 01-459 1222.
Chain	Ethernet-style network based on Zilog's Z-Net. Uses CP/Net on Research Machines. Coaxial cable.	Research Machines Ltd, Mill Street, Oxford OX2 0BW. Telephone: (0865) 49791-3.
Clearway	Uses a ring cable, with different options depending on customer needs.	Real Time Developments Ltd, Lynchford House, Lynchford Lane, Farnborough, Hampshire GU14 6JA. Telephone (0252) 546213.
Cluster/One	Networking system for Apple II and III micros	Zynar Ltd, 122/3 High Street, Uxbridge, Middlesex UB8 1JT. Telephone: (0895) 59831.
C-Net	LAN for Cromenco micros; like Ethernet but slower	Comart Ltd, Little End Road, Eaton Socon, St Neots, Cambridgeshire PE19 3JG. Telephone: (0480) 215005.
Constellation	Star network developed by Corvus; can be used with a wide range of micros	Keen Computers, Minerva House, Spaniel Row, Nottingham NG1 6EP. Telephone (0602) 41277.
Darkstar LAN	Low-cost LAN developed at Bath University	SML, 15 Alexander Way, Ashchurch Industrial Estate, Tewkesbury, Gloucestershire GL20 8NB.
Dataring	Cambridge ring, empty-slot type using twin twisted-pair cable	Toltec Computers, 24 Thompson Lane, Cambridge CB5 8AQ. Telephone: (0223) 312347.
Decnet	Ethernet-type networking	Digital Equipment Corporation, Digital Park, PO Box 110, Imperial Way, Reading RG2 0TR. Telephone: (0734) 868711.
DSN-1000	Distributed systems network using various techniques	Hewlett-Packard, Nine Mile Ride, Wokingham, Berkshire RG11 3LL. Telephone: (0344) 773100.
Econet	Low-cost network for BBC Micro	Acorn Computers, Fulton Road, Cambridge CB1 4JN. Telephone: (0223) 245200.
Ethernet	A CSMA-CD bus network using coax cables at 10Mbit per second. Industry standard with support from DEC, Intel *et al*	Rank Zerox, 338 Euston Road, London NW1 3BH. Telephone: 01-380 8000.
Exo/Net	Baseband bus system for Avalanche computers	Exo Corporation, 951 Mariner's Island Boulevard, San Mateo, Ca 94409. Telephone: (415) 349 7000.
GE-Net	Broadband cable network with voice and video facilities	Intersil Datel U.K. Snamprogetti House, Basing View, Basingstoke, Hampshire RG21 2YS. Telephone: (0256) 57361.
Hinet	CP/M-compatible net using multi-drop screened-pair cabling	Digital Microsystems Ltd, Tavistock Industrial Estate, Ruscombe, Twyford, Berkshire RG10 9NJ. Telephone: (0734) 343885.
Hydra	LAN designed specifically for Commodore micros	Dataview Ltd, Portreeves House, East Bay, Colchester CO1 2XB. Telephone: (0206) 869414/865835.
Interlan Net/Plus	American Ethernet-style LAN with high level of compatibility	Data Translation Ltd, 430 Bath Road, Slough, Berkshire SL1 6BB. Telephone: (06286) 3412
Linc	Low-cost LAN using standard telephone wire and token passing	Vector Graphic, Vector House, William Street, Windsor. Berkshire SL4 1BA. Telephone: Windsor 69375.



puters and electric typewriters, the task of connecting them is initially an awesome one.

Local area networks are still in their early days, but it is surprising what you can connect to a network. You can receive all your telex messages through your micro. Using software packages such as BSTAM, BSTMS, Sempahore, Link or Supercom, you can communicate at quite an advanced level with previously incompatible micros, minis and mainframes to exchange files and data. If your company has a digital private exchange you do not even need to have modems to convert the digital computer signal to analogue within an office. The price and efficiency of simple protocol convertors to connect to networks are improving all the time, and soon it will be rare to see a stand-alone micro in an office.

This communications revolution in micros has altered the way many businesses work. People have become portable, and it is no longer essential for all the company's workers to be tied to a central office. Some companies are experimenting with people working at home for most of the week, sending their work over the telephone line to the head office. Sales staff can send their ordering information direct to the main computer from home or a hotel. The company saves money in overheads such as heating, lighting and office space, and can get away with fewer secretarial and clerical staff.

In education, communications can also make an impact in the way computers are used. Because money is scarce in most schools and colleges communications are welcome as cost cutters. A networking system allows several computers to share expensive storage and printing resources. It is also ideal for arranging time sharing on larger computers and accessing information from a central database.

The coming of cable TV should play an important part in the development of microcomputer communications. The cable fed into your home or office will have plenty of capacity for carrying messages, and companies in the data services industries are well aware of its potential for offering electronic mail services, electronic banking, electronic mail-order, computer games and databases. Both British Telecom and Mercury Communications, the company with a licence to compete with it, are interested in cable TV and hope to provide a range of non-programme services to home users.

Micro communications can totally change the way you use your computer or even the way you work. It is also fun, and it is easy to get carried away with enthusiasm. But although the field is fascinating it is also frustrating. When you start trying to link your computer to other equipment there are always teething problems.

Before you go into a shop and buy a modem, get some advice from your micro's manufacturer or dealer or a local user group to make sure the equipment and software you get is compatible with your machine and will fit your requirements. The industry is still young and cursed with much inexperience and its fair share of quick-sale artists.

Localnet	Broadband bus network using coaxial cable; runs like Ethernet	Systek. U.K. Distributor: Network Technology Ltd, Unit 8, Sutton's Park Avenue, Sutton's Industrial Park, Reading, Berkshire. Telephone: (0734) 664667.
Melnet	Duplex ring using two optical-fibre cable	Mitsubishi Electric, 2-3 Marunouchi, 2-chome, Chiyoda-ku, Tokyo 100, Japan. Telephone: Tokyo (218) 2171
Micronite	Adapted by Triumph Adler for Alphatronic micros; single-user CP/M software.	Triumph Adler (U.K.) Ltd, 27 Goswell Road, London EC1M 7AJ. Telephone: 01-250 1717
Mmmost	Network for Televideo micros	Encotel Systems Ltd, 7 Imperial Way, Croydon, Airport Industrial Estate, Croydon, Surrey. Telephone: 01-686 9687/8.
Modus	LAN for Tensor micros, for factory automation and industrial use	Modus Systems Ltd, Park Drive, Baldock, Hertfordshire SG7 6EW. Telephone: (0462) 894848.
Net/One	Ethernet system with various options including broadband, IEEE-802 and fibre-optic links	Ungermann-Bass. Distributor: Thame Systems Ltd, Thame Park Industrial Estate, Thame, Oxfordshire OX9 3RS. Telephone (084421) 5471.
Omninet	High-speed bus network which can be used with a wide range of micros.	Keen Computers, Minerva House, Spaniel Row, Nottingham NG1 6EP. Telephone (0602) 412777.
Pacxnet	Switched network using coaxial cables with gateways into X.25 and IBM 3270 networks and PBX systems	Gandalf Digital Communications Ltd, 19 Kingsland Grange, Woolston, Warrington, Cheshire WA1 4RW. Telephone (0925) 818484.
Planet	Cambridge-style ring network using coaxial cable	Racal-Milgo, Richmond Court, 309 Fleet Road, Fleet, Hampshire. Telephone: (025672) 3911.
Polynet	Cambridge ring using twisted-pair cable	Logica VTS, 86 Newman Street, London W1A 4SE. Telephone: 01-637 5171.
Quorumnet	Daisychain network of work stations using coaxial cable. QLan is the CP/M-based version	Quorum Computers, Polygon House, Commerical Road, Southampton SO1 0GG. Telephone: (0703) 30721.
Silk	Ring network using register insertion not token passing; coaxial cable	Hasler, Hasler Works, Commerce Way, Croydon, Surrey CR0 4XA. Telephone 01-680 6050.
Symbnet	Fast tree-and-branch LAN for Apple and other micros; fibre optic cable	Symbiotic Computer Systems, Duroma House, 32 Elmwood Road, Croydon, Surrey CR9 2TX. Telephone: 01-683 1137
Tecnet	Based on Ethernet	Hytec Microsystems, Sandy Lane West, Oxford OX4 5JX. Telephone: (0865) 714545.
The Bridge	Based on Ethernet	Bridge Communications, U.K. Distributor: Sphinx Ltd, 43-53 Moorbridge Road, Maidenhead, Berkshire. Telephone: (0628) 75343.
Transring 3000	Cambridge ring with good compatibility with different products; twisted-pair cable or optical fibre	SEEL Ltd, 3 Young Square, Brucefield Industrial Estate, Livingstone, West Lothian, Scotland. Telephone: (0506) 411503.
Wangnet	Broadband LAN	Wang, Wang House, 661 London Road, 661 London Road, Isleworth TW7 4EH. Telephone: 01-560 4151.
Xinet	LAN using Micronodes	Xionics Ltd, Dunbarton House, 68 Oxford Street, London W1N 9LA. Telephone: 01-636 0105.
Z-Net	Ethernet-based network using coaxial cable	Zilog House, Moorbridge Road, Maidenhead, Berkshire SL6 8PL. Telephone: (0628) 39200.

Local area networks

Courtney Castello explains the principle of LANs and assesses the designs competing to become the industry standard.

MAINFRAME-ORIENTED USERS have seen a continuous devolution of computing functions from the computer building. First terminals, then matrix printers and data-collection floppy discs, and most recently minicomputers have brought increasing portions of the computational workload on to the user's site. The current wave of 16- and 32-bit micros is carrying devolution further.

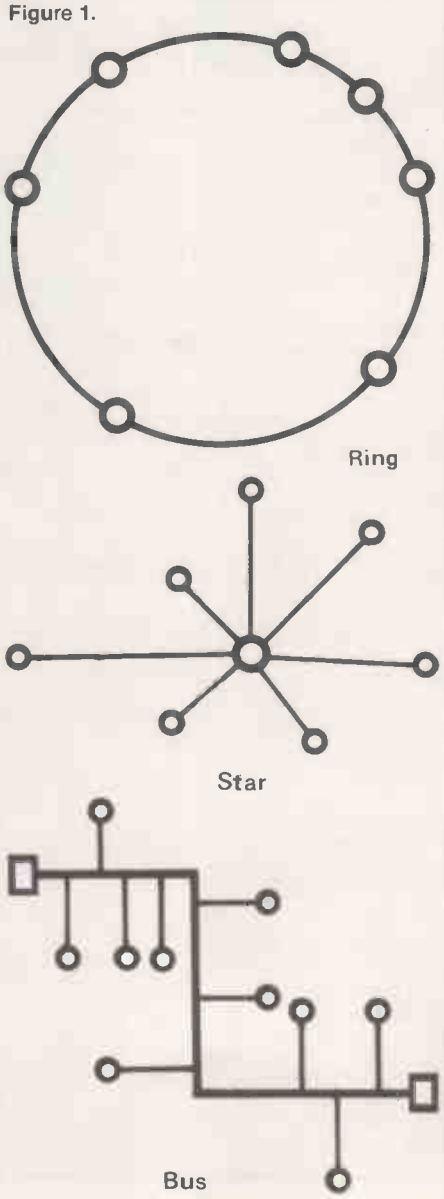
Many still argue for the role of the large central computer as a repository for organisation-wide data to be accessed and changed minute by minute from terminals and computers throughout the country and maybe the world. This is often referred to as database with transaction processing; the classic example is airline or theatre bookings. Clearly, if all the access points in one remote building or on one remote site could be linked and connected to the central computer by one communications line, there would be a considerable saving in cost and effort.

The complementary issue of this sharing of data is the sharing of hardware resources. Many users of micros are finding that certain applications will not run smoothly within the limitations of filing space and speed imposed by floppy-disc drives. The speed and print quality of matrix printers are sometimes cause for complaint too. But fast voluminous hard discs, high-speed line printers and letter-quality daisywheel printers are often too expensive to be dedicated to one micro: it would be good to be able to share them between several.

There has been a great proliferation of technologies aimed at the commercial and business audience in recent years. They include viewdata, exemplified by British Telecom's Prestel, teletext in the form of BBC's Ceefax and ITV's Oracle, electronic mail and video. The technologies have augmented the more traditional phone, telex, facsimile and computer data. If any office worker is to use more than a couple of these facilities regularly, then his or her desk will be covered in communications devices — unless the facilities could all be provided on one work station. A LAN would be the obvious means of providing this integration.

Regional, national and international computer networks are some years old now and can provide valuable lessons for those attempting the design and implementation of LANs. Furthermore, very large-scale integration, VLSI, has brought down the cost of computer hardware to such an extent that it can now be considered as a means of linking micros into the LAN.

Figure 1.



Given the diversity of the roots of the LAN concept it is not surprising that there is some disagreement about what exactly constitutes a LAN. There is consensus on three points, though:

- The network covers a small geographical area; for example, one building or one site. It will usually serve just one organisation.
- The network allows the two-way flow of information between devices: the connections are bidirectional and many-to-many.
- The flow of information is fast — faster than data usually travels along ordinary telephone lines, for example.

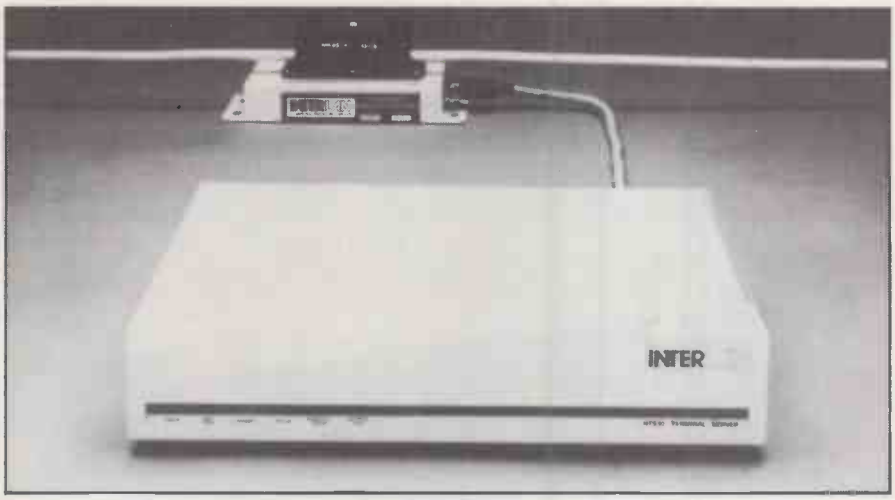
A LAN links together nodes, each of which consists of a device, a physical connection between it and the network, and a logical interface which makes use of the physical one. The logical interface has to be intelligent and usually uses VLSI chips. Within a LAN each node is known to the others by a unique address. LANs may be classified using four attributes: topology, medium, transmission mode and access protocol.

The topology is the pattern of connections between the nodes. There are three LAN topologies: bus, ring and star, illustrated in figure 1.

The medium is the stuff used to carry the signal from node to node. The simplest is a twisted pair of copper wires, as used for telephone wiring. Coaxial cable — the "cable" in cable TV — can also be used. It is a single wire shielded from electrical interference and physical damage by layers of other material. Optical-fibre glass filaments carrying laser light is a more sophisticated possibility, and the much vaunted very high capacity medium for telephone lines.

Two transmission modes are available. With the medium, the transmission mode determines the bandwidth, which is a measure of how much data can be

Courtney Castello is a technical programmer currently working with Racal Redac. he was previously with Metal Box plc, and this article was published in the company's magazine *Interface*.



The American Interlan, an Ethernet-style system.

transmitted through the medium in a given time. Baseband transmission uses the medium directly as a two-state or binary channel analogous to Morse code. Broadband transmission employs radio broadcasting techniques, the medium being used to carry radio-frequency signals. Broadband transmission increases the bandwidth of coaxial cable 30-fold compared with baseband, and the throughput of data is about 10 times as fast.

The access protocol is the means by which a node gains the right to put data into the network. Central control is perhaps the most easily implemented protocol. In it, all data entering the network must be sanctioned by a single network control or master. This protocol owes most to the two trends associated with the traditional computer industry: shared resources and distributed computing.

Token access protocols can be used by bus and ring topology LANs. A special signal called the token is passed from node to node in turn. Only when a node is in possession of the token may it put data into the network. This has been likened to the use of the conch shell in William Golding's novel *Lord of the Flies*.

The cumbersomely named CSMA-CD protocol has its roots in radio transmission techniques. A node with data to transmit listens to the network until it becomes quiet. Still listening, it then transmits its data: if it hears what it has sent then all is well. If not, its transmission has collided with that of another node, in which case it "backs-off" for a pseudo-random time period before trying again. The full name for CSMA-CD is carrier sense multiple access — collision detection. It is used with bus-technology networks, which need not be broadband.

Empty-slot protocols are used with ring LANs. A fixed number of fixed-size data receptacles known as "packets" continuously circulate around the ring like a set of goods wagons around a circular railway track. When an empty packet passes a node which has data to send, the node fills the packet and sets the appropriate destination node address.

Most of the combinations of the four LAN attributes are either improbable or downright impossible. The bulk of commercial and academic interest has been focused on a handful of designs. The only LAN media in wide use are twisted pairs and coaxial cable. Although fibre-optic cable offers very high data throughput it uses a very young technology. For the devices to be easily connected to the medium, T-junctions for similar links are necessary and such functions were said recently by a leading worker in the field to be unlikely to appear before 1990.

The earliest networks to appear were star networks, which are direct descendants of traditional methods of attaching devices to computers. A fairly large proportion of single-vendor networked or "clustered" systems use the star topology or use central-control access protocol with the bus topology, which shares many star-topology characteristics. Operational characteristics of star topology include:

- Relatively simple access protocol.
- Dependence on the central controller for both resilience — if the controller fails, so does the network — and speed; the controller may become a bottleneck.
- Lots of wiring. Each node must individually be physically connected to the controller. Establishing the LAN and adding new devices can be expensive in cable.

If you want to distribute computing from an existing mainframe or minicomputer, or simply want to share a hard-disc drive between a handful of micros made by the same company, the question of a standard for LANs may seem irrelevant. But the thriving market for IBM-compatible equipment has demonstrated the advantages of having a choice of supplier. How much more limited we would be without the RS-232C or V-24 terminal and Centronics printer interfaces which most manufacturers use.

The value of a standard is abundantly clear to IT integrators, the advocates of the "electronic office". The chief objective in using LANs will increasingly become the interconnection of products and services from as many suppliers as possible. Users of mainframes and micros all know that even substituting outdated equipment with a new model for the same manufacturer can be a fraught process.

Almost from the start there has been talk of a standard LAN. Two contending designs have received particular publicity and in turn have been popular with LAN implementors. The Ethernet design was drawn up by Xerox, a specialist in office equipment, which was joined in a consortium by DEC, a company building minicomputers, and Intel, a major maker of chips. It is a baseband, bus-topology network using CSMA-CD access control and coaxial cable.

The design was precisely specified by the consortium. It then began to licence other companies for the manufacture of Ethernet-compatible devices, at the nominal one-off sum of $1000, in a bid to make Ethernet the *de facto* standard. Hundreds of companies have taken up the offer, though many have not begun producing Ethernet devices. It is now possible to link any DEC minicomputer, several of the micros which run under CP/M and certain types of 16-bit micro. Interfaces to micros using most of the 16-bit processors are being developed.

Catchy name

There are other LANs which are described as Ethernet-like or Ethernet-type, including one for the Apple, but this often means merely that they use the CSMA-CD protocol. Perhaps CSMA-CD is just too offputting a name to use.

The Cambridge Ring was designed at the Cambridge University Computer Labs and is the archetypal empty-slot ring network. Commercial implementations have used both coaxial cable and twisted pairs. These networks can link together any DEC mini, Computer Automation minis, any computer with the IEEE-488 or GPIB interface — of which there are many, including the Commodore Pet — Data General mints and CP/M S-100 bus micros. Cambridge Ring interfaces are on the way for Prime minis and certain types of 16-bit micro. At least three British firms have implemented this highly regarded LAN.

Both Ethernet and the Cambridge Ring use media which transmit data in baseband mode at 10 million bits per second. Ethernet can carry bursts of data between any single pair of nodes at 1.25 million characters a second. The Cambridge Ring can carry a continuous stream of data at up to 250,000 characters a second between several pairs of nodes simultaneously.

The third major commercial contender for standard LAN has now even been announced yet. IBM is working with Texas Instruments on a LAN of its own. When it is announced it is expected to set something of a standard, as most of

(continued on next page)

Local area networks

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IBM's product announcements seem to. From the interest shown by IBM research workers and representatives, the IBM LAN has been deduced to be a baseband ring using the token-passing protocol.

The influential U.S. Institute of Electrical and Electronic Engineers, IEEE, source of several successful standards definitions, has set up a LAN standards committee. The IEEE 802 Committee has been meeting for some months. It has been lobbied by the Xerox/DEC/Intel Ethernet consortium and by IBM, and has been considering three baseband LAN designs:

- Ethernet;
- token-passing bus; and
- token-passing ring, promoted by IBM.

Draft standards were published early in 1983; the Cambridge Ring design is not shortlisted.

LAN standard

The European Computer Manufacturers Association approved a LAN standard in 1982 which is now compatible with Ethernet. Almost immediately 20 computer-equipment companies jointly announced their support for the ECMA standard, including the majority of major European manufacturers and the three members of the Ethernet consortium; several U.S. companies have since followed suit. This level of co-operation between competitors is unprecedented in the computer industry.

There are many bus and ring LANs on sale, most of which support only one manufacturer's computers. They range from LANs designed specifically to include mainframes, through supermini and mini-based, 16-bit micro-based and Apple-based, to the BBC Micro's Econet. The bus and ring topologies share the advantage of needing the minimum length of medium and the consequent lower cost of cabling both when first installing the network and when adding a node. Highly decentralised control is usually used with these topologies, making the networks more resilient than star-topology LANs.

Relatively few broadband LANs have been produced and perhaps least of all is understood of the patterns of use which will emerge for them. However, they do provide the scope for the fullest vision of the use of information technology. Only broadband LANs seem able to carry video at the speed necessary for continuous display which is essential for the notion of uniorm wall sockets for information into which any IT device can be plugged. Even for non-video transmission, the broadband bandwidth can be split into narrower bands and used to support several baseband LANs simultaneously. This technique will be vital for the integrated IT electronic office.

SEEL's Transring employs a Cambridge protocol with twisted-pair or optical-fibre media.

By spring 1984 there will probably be two or three LAN standards. They will be established through the number of network and device manufacturers implementing them, and through the support of certain particularly influential vendors. Endorsement by standards bodies such as the IEEE 802 Committee will not be enough in itself to make a design an effective standard.

The electronic office builders with their need to integrate a whole range of IT equipment must surely wait for the standards to arrive. When they do, the power and facilities of the new-wave 16-bit micros will ease the task of integration. The ability to switch attention instantaneously between different programs running simultaneously and to display the output produced in independently controlled areas of the VDU screen may at first seem esoteric. But when formulating a letter in reply to one already on file, including calculated figures and derived graphs, such capabilities will be invaluable.

What of the potential LAN users who wish to decentralise from mainframes or to share expensive resources between micros? Each will probably achieve the immediate objective using equipment from a preferred manufacturer. The emergence of a new wave of micros has a lesson for these users too, though. At some stage they will almost certainly want to enhance their networks with these machines and other developments, so it is important that the effort spent in installing and developing their LANs does not depend on the unique characteristics of their current machines.

Many computers are built around a very high speed internal data bus which is accessible to the outside world via plug-in printed-circuit boards. The S-100 or IEEE-696 and IEEE-796 Multibus buses are commonly used. High-speed LAN interfaces can be produced relatively simply for such machines by putting the necessary chips, circuits and LAN connectors on to a PCB. The computer may then be instantly interfaced to the LAN by plugging the PCB into the backplane, the physical manifestation of the bus. Bus-based machines clearly offer an advantage to buyers of new machines who are considering the use of LANs.

Now that software represents such a large proportion of the cost for a complete computer system it has become essential to protect any software investment as much as possible. This will be no less true of the software built on to the basic LAN interface provided by the network or device suppliers — programs to facilitate the transfer of a file between nodes, for example.

The International Standards Organisation, ISO, is in the course of defining a standard for open systems interconnection, OSI, to be used in establishing regional, national and international networks. The OSI model is a seven-layer structure ranging from physical links right through to basic applications software such as database interfaces. Certain LAN producers already supply LAN hardware and software components which are said to comply with most of the OSI layer definitions.

Since LAN software standards are clearly necessary, and many LANs will have gateways providing access to wide-area networks and to other LANs, potential LAN users should watch the development of the ISO OSI standard. For the moment the only safe investment in enhanceable local area network equipment is, perhaps, a kilometre length of coaxial cable.

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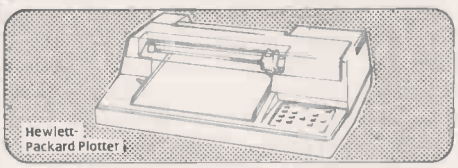

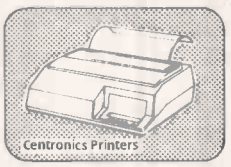

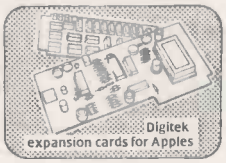

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Getting the message across

Transferring files can mean trouble if the receiving micro won't accept what it is offered. Chris Bidmead looks at three packages designed to change its mind.

FOR THE COMPUTER REVIEWER, getting familiar software on to unfamiliar machines and vice versa is a frequent preoccupation. As processors, disc drives and operating systems proliferate, the business of communicating between computers becomes increasingly complicated.

The ordinary user is unlikely to encounter the problem on quite the same scale, but it will crop up. If you haven't already reached the stage of having one machine at the office and another at home it's a treat that may be in store for you soon.

Commercial software itself should not present much difficulty. Nearly all the standard packages like WordStar and Supercalc are already available on disc formats for the two different machines, and in any case you will have read the terms of your licence and will want to abide by them. But say you spend a week developing an amazing application in dBase II or accumulate a large Supercalc data file of pertinent figures. The world is such that one day all this useful knowledge will be on machine A when you essentially should have it on machine B.

One advantage of a simple operating system like CP/M-80 is the ease of swapping files around between different hardware that shares the same systems software. Pip, which stands for peripheral interchange program, is a standard CP/M utility that not only moves files between drives but is also capable of exchanging text files with a remote machine. The Copy function of MS-DOS has many of Pip's capabilities.

Unfortunately it is not possible to guarantee that the files you want to move are what the operating system regards as text files. Each character in the file is coded into an eight-bit byte, but text-file characters traditionally only occupy seven of these eight bits. Standard CP/M utilities like the RDR: logical device that Pip uses will zero the high bit of each character transmitted on the assumption that only text is being sent. This means that some data files that use eight bits of the byte — and, of course, all object code — get seriously mutilated en route.

All CP/M-80 systems come with a utility called Dump, which converts a file into its ASCII hex representation. Because the resulting string of numbers is essentially a text file, it can run the gauntlet of CP/M's logical devices without fear of injury. All you need now is a utility that can rebuild the original file at the other end.

The CP/M user group has long enjoyed a utility called Undump which does precisely that. The Undump/Dump combination forms a lifeline between two machines using a simple RS-232 port that only need be unidirectional. Evoke Undump at the receiving end and leave it hanging, then go to the transmitting machine and type

DUMP filename

not forgetting to toggle Control-P before hitting Return, thereby switching on printer output before sending the command.

The LST: port, of course, will already be connected to the RDR: port of the receiving machine. If the connection is wired correctly and the baud rates and protocol of the two ports are properly matched, you should see the hex digits scrolling up the screens of the two consoles. When it's all done, Undump provides a file-size guide in the box called Save. Use this figure as the parameter to CP/M's Save command when you execute

SAVE filesize filename

Undump uses CP/M's transient program area, TPA, as its collection buffer and overflow causes errors. So it will not do for transmitting files larger than the 40K or so left in your TPA. Undump is also rather slow and becomes tedious to use when sending a number of files. For more extensive communication you will need to turn to a commercial system.

The traditional CP/M-80 package, now available under MS-DOS and CP/M-86, is BSTAM from Byrom Software of Utah. The initials stand for Byrom Software Telecommunications Access Method, a reminder that the package was developed to transmit files by way of modems down telephone wires.

BSTAM transmits file names as well as the code, and can be used in batch mode to send a whole discful of files without supervision. The catch is that BSTAM requires patching to match the hardware

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[B]  Set operating mode (BATCH, CAPTURE, REMOTE, LOCAL)

[C]  Communications commands (RECEIVE, SEND, CONV, DIAL, ANSWER, etc.)

[D]  Operating system commands (DEL, DIR, REN, RESET, RUN, TYPE)

[E]  HELP menu

[F]  Begin direct console command operation

[J]  Exit

Depress command key ...
```

Figure 1. Ascom main menu.

characteristics of your particular machine.

If your hardware uses an 8251-type Usart and you know its address on the system, only very elementary coding is required. For those new to assembler, simple routines of this sort make a good introduction. Full details come with the documentation. If your hardware uses the new SIO chip from Zilog, or your I/O has to take account of interrupts, the code required is rather more elaborate. In this case newcomers to coding at machine level should probably make sure BSTAM arrives already patched for their system.

BSTAM sends data in coded numbered blocks, and at the end of each block the receiving computer does an elaborate mathematical check on the integrity of the data, sending a checksum and the value of the last block number back to the transmitting computer for verification. If either value fails to check out, the transmitting computer resends the last block.

What this means in practice is that you can unplug the connection between the two computers in mid-transmission. On reconnection, the software will be able to keep its place in the file, which will be received intact when the transmission is allowed to resume.

Ascom

Unlike the Dump/Undump entente, BSTAM can only do its stuff if the line is simultaneously open in both directions. A more sophisticated applications package that takes fuller advantage of this is Ascom from Dynamic Processor Associates of New York. With copies of Ascom loaded into a pair of computers connected by a single bidirectional line you can actually drive the whole communication process from a single terminal.

Ascom even allows you to do some limited operating-system calls remotely so that, for example, you can call up the file directory of one computer from the terminal of the other. Like BSTAM, Ascom was originally designed to drive computers connected via modems and a telecommunications network.

Ascom has some particularly sophisticated embellishments that help in this sort of configuration. With a little hand patching to take care of the machine-dependent features, ASCOM can:

- alter the baud rate of the local Usart
- connect and disconnect appropriate auto-dialling modems,
- translate characters in the transmission stream as necessary,
- automatically respond to remote calls over the line,
- communicate directly between machines at system level for functions like file deletion, file renaming and change of logged-on drive, and
- accept instructions from a ready-written batch file, rather than directly from the console.

For the first-time user there is a help system that responds with potted wisdom on any or all of the available functions. At this level it is also possible to run Ascom as a completely menu-driven package. The menu in figure 1 branches off to sub-menus that cater for all the Ascom facilities.

Choosing option F enables those familiar with the system to enter commands directly. However you activate the functions there are three main things Ascom can do:

- communicate interactively with a second Ascom-driven computer;
- capture this communication in the form of text files; and
- exchange files — program as well as text — between machines by direct transfer from disc to disc. Additionally, by setting one computer into Remote mode and the other into Conversational mode the operator need only work from one of the consoles. All the instructions necessary to drive the remote computer may be entered from the other machine.

Imagine you are sitting at the terminal of one of a pair of computers running Ascom and want to receive a non-text file from the other. Assuming that baud rates and the rest of the low-level protocol is correctly matched, you first have to go over to the other computer and put it into Remote mode with the instruction Rem. Then you return to the local computer and put it into conversational mode by typing Conv against the command-line prompt. This connects you directly to the remote computer, and you can inspect its directory with the command Dir to make sure the file you want is there.

Then, because Ascom has a repertory of file-transfer conventions to fit all occasions, you have to make sure both computers are adopting the same method. Say you have already set up the local computer to operate in BlockV mode — a sophisticated block-transfer technique similar to BSTAM. You now write

```
PROT BLOCKV
```

against the Ascom prompt, and as you are in Conversational mode a Carriage Return will send this instruction to the remote computer.

Now you are ready to get the file. The transfer takes place in two stages: first you send an instruction to the remote machine to start sending the file. It will look something like:

```
> send yourfile.tx?;
```

The question mark is because the BlockV protocol is primarily designed to send groups of files and does not understand unambiguous file names. It's silly, but it is so.

The terminating semicolon tells the remote computer not to act on the command until it receives a second Carriage Return, and serves to hold up the action until the local computer has been sent into Receive state. This is done with the instruction

```
receive a:
```

if indeed you want the file on drive A. The blocks now begin their travels, and the moment is signalled on the local terminal with asterisks, one for each block.

For more complicated jobs you can create a command file — strings of instructions stored as a text file — enabling repetitious jobs to be set in motion with a single command. Elaborate communications procedures like those involved in the end-of-day collection of data from remote branch offices can be automated in this way.

BSTAM and Ascom are not exactly cheap. Each package costs in the region of £150 a shot, and the terms of the licence require you to buy a master disc for each micro you run it on. That makes the official entry price somewhere around £300, although the reality of the situation is that software distributors sell an alarming number of single copies.

Move-It

One new communications package worth considering on price alone is Move-It from Woolf Software Systems of California. It's not as well endowed as Ascom — there is no batch-file facility, for example — but for less than £100 you get a sophisticated file-exchange facility on two separate disc formats of your choice, plus the right to make up to five copies of the program for use on any one site.

Cut-price Move-It sacrifics very little that will be missed by the average user. Like Ascom it allows you to direct the whole operation from a single console, and there is even an improvement: under CP/M you can even change user areas from inside the program, remotely as well as at the local terminal. Altough Move-it lacks the hierarchy of menus that can be called up as optional help inside Ascom, it does produce a page of options to remind you of the commands. And some of the commonly used commands work considerably more simply than Ascom.

Organising a single file transfer is a case in point. Instead of the rather involved process required for Ascom there is no need to set up the computers in Conversational and Remote mode. Once Move-It is powered up you simply type RDIR to inspect the local directory, and then

```
GET MYFILE.TXT
```

The word "Working" flashes on the screen in front of you to denote the passage of the file blocks, and the standard Move-It asterisk prompt returns when the deed is done.

Move-It comes with a configuration program manual to set up the package. You need to know some fairly intimate details of the I/O connections, but all the facts you need to know for a very large variety of machines are listed in the manual.

The proprietory software I have mentioned can be obtained from Software Limited, 251 Goswell Road, London EC1; telephone 01-833 1173. There is an impressive array of equipment on the premises, which can be used to generate licensed copies for a very broad variety of formats.

Now UNIVOS and Tuscan overcome the barrier of incompatible disc formats.

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Transam Microsystems Limited
59/61 Theobalds Road
London WC1X 8SF
Telephone 01-404 4554

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*Univos library currently has 32 formats. If your format is not in this library it can be added by keying in information on a question/answer routine. Once keyed in Univos will remember this format which can then be called up from the library.

Connecting a pair of RS-232 devices can be difficult, but Chris Bidmead finds help with . . .

SUSSBOX

SOONER OR LATER anyone involved in micros is going to come up against the problem of connecting together a pair of so-called "standard RS-232" serial devices and discovering that despite correctly setting the baud rates and parity at each end nothing, but nothing, is happening. If something does happen but it isn't what you want — like garbage appearing on the screen or printer — the odds are that you have a parity or baud-rate incompatibility. The solution in this case is usually a relatively simple matter of rechecking the documentation and DIL switches.

It is when the net result is zilch that you could be in more serious trouble. I now keep close at hand a small gadget called a Sussbox for just such an occasion. It is about the size of a pack of cigarettes, but a whole lot better for your health.

Most micros, even the 16-bit kind, handle data in eight-bit bytes. When data is sent serially down a transmission line these eight-bit bundles are untied and the bits are transmitted one at a time. Serial communication between computers, or between computers and printers, is usually a two-way business. Data is sent out along one wire and read in along another in the form of voltages that rise and fall, corresponding to the bit patterns they represent. These voltages are measured with respect to a third wire, known as signal ground, SG.

Because the connected devices are looking at the same lines from different ends, the receive line of one is the send line of the other. This gives rise to two kinds of data devices: data communications equipment, also known as modems or data sets, and data terminal equipment. They are often just called DCE and DTE. You can usually guarantee that printers will be DTE, so microcomputer ports normally connected direct to printers will almost certainy be DCE. But many of the newer micros like the IBM PC can be equipped with ports intended specifically for communications, which are usually DCE.

RS-232 lines are named from the point of view of the terminal, so — curiously, you may think — the micro usually sends out its data on the receive line, usually known as Rx, and receives data on the transmit line Tx. It is not too hard to remember if you think of the micro as servicing the terminal rather than the other way round. One solid fact to hold on to is that the lines always have the same names: Pin 2 is always Tx and pin 3 always Rx.

Receiving devices often operate more slowly than sending devices, as in the case of a printer coping with the fast stream of characters sent by a computer. To be sure no data is lost, the printer needs a way of telling the sending device to hold off while it catches up. This process of relaying back information to stop and start the transmission is called data-flow control or handshaking.

There are two main approaches to handshaking. Hard handshaking requires a separate wire reserved for the purpose in addition to the Rx and Tx lines. The receiving device changes the voltage on this wire to let the sending device know when it is time to pause. The sending device, of course, has to monitor the wire to detect the message. Soft handshaking needs only the Rx and Tx lines. Whichever one is not being used by the sending device is commandeered by the recipient to send back special characters that are read as Flow On and Flow Off codes.

The Sussbox is a device for investigating how the hardware is handling the signals. Suppose you have set up a simple three-wire connection: Tx, Rx and SG. The simplest thing that can go wrong on the hardware front is that you are trying to connect two systems that are each transmitting down the Tx line and receiving down the Rx line.

Your first resort will be to cross over the Tx and Rx lines. Normally this will require some soldering and, if it doesn't work, some resoldering. Instead you simply plug in Sussbox between the cable and one of the devices and use the little pins to set up the through connections you want. Instead of resoldering, crossing Tx and Rx is simply a matter of repositioning two pins.

The input and output ports of Sussbox each have a 10-segment LED display. Each segment monitors one of the commonly used RS-232 lines to show whether a voltage is appearing there. You can actually see the transmission line going active when data is sent. If you see data coming down line 2, the Tx line, you know the device sending it is behaving as DTE, and vice versa.

Sussbox goes on being useful if, having established the Tx-Rx connections correctly, you are still blocked by communications protocol on the other lines. A simple example is when a device flatly refuses even to begin transmitting until the remote device signals its presence by raising the voltage on one of the lines. It is usually line 8, called Carrier Detect, although it could be lines 5 and 6, either individually or all together.

If the remote device is raising a signal, but on the wrong line, Sussbox's LED array will show you where it is appearing. You will be able to divert the voltage to the right line by simple repinning, as in the Tx-Rx example.

Some equipment may not have a spare voltage available on any of the lines from the remote device. Luckily, when an RS-232 interface requires a ready-to-go signal it usually sends one out as well. Sussbox lets you fold back a high signal that the local device is sending out to fool it into thinking it is getting what it needs from the remote device. Figure 1 shows how Sussbox's additional jumper areas can be used to fold back a voltage on line 20 so that the local device seems to be receiving the go-ahead on line 6.

Gadgets like the Sussbox have been part of an engineer's toolbox for a long time now, but usually at prices that start in three figures. Sussbox is available from Duplex Communications Ltd for just under £50. From the same supplier you can also get a version without the LEDs for £30, and a further £3.75 will buy you the Suss Book — a crib of Sussbox configurations to match those of virtually every computer on the market.

Duplex Communications' office for the Midlands and the North is at 2 Leire Lane, Danton Bassett, Lutterworth, Leicestershire LE17 5JB; telephone (0455) 209131. For the South contact Duplex at 52 High Street, Stock, Essex CM4 9BW; telephone (0277) 841011.

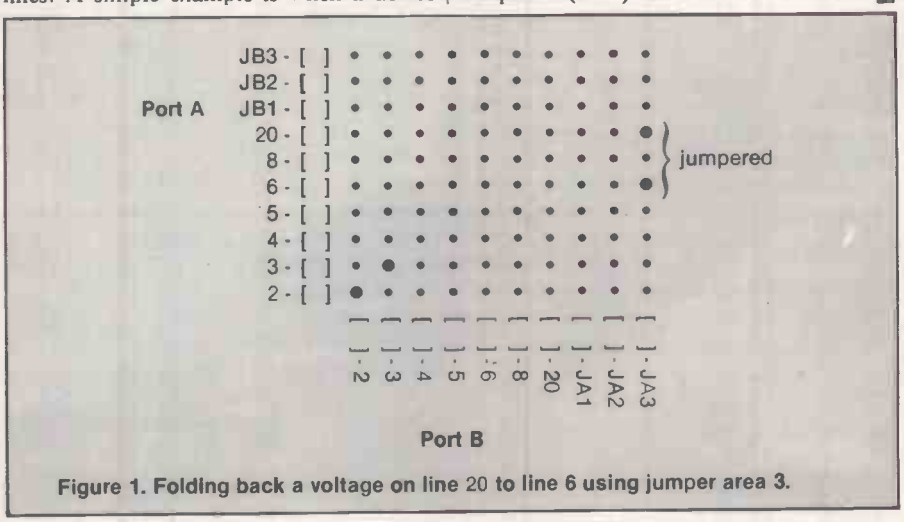

Figure 1. Folding back a voltage on line 20 to line 6 using jumper area 3.

● Circle No. 309

The BBC Micro as a mainframe terminal

John Leach and Neil Hogg offer a choice between a commercial EPROM and their own programs to interface your micro.

ON YOUR DESK sits a microcomputer. It has the usual keyboard, video terminal, a disc drive and a printer. With it you can do lots of calculations, data handling, data storage and report writing. But what about all the data stored on the office mainframe down the corridor or, if you are working at home, at the end of a telephone line? Wouldn't it be splendid if you could use your micro as a terminal to all the big computer's program power and data?

Or perhaps you are working away in a laboratory, acquiring masses of interesting information from the apparatus and feeding it into your computer where it is rendered down and displayed on the screen. Tables are printed out and it is all saved on floppy discs. To get all this valuable information into the mainframe you have to find another terminal and type it in. What a terrible waste of your valuable time. Couldn't it be copied straight away to the mainframe without further ado?

The answer to questions like this is Yes, with qualifications. First, you must have a microcomputer that is capable of communicating with a large machine. In practice this means that it must have a serial input/output port with RS-232 compatible features, as this is by far the most widely used communications protocol. Forget about Teletext look-alikes; no current mainframe supports communications of that sort.

Secondly, the micro must be capable of responding to the signals that the mainframe sends to the terminals normally connected to it. Finally, for the system to be of much practical use there must be a way of transferring data to and from the mainframe without having to key everything in by hand. Incidentally, we will use the term "mainframe" to cover any largish computer linked to a number of terminals. This is not the place to haggle over the distinction between a mainframe and a minicomputer.

The BBC Microcomputer is a good candidate for use as a terminal to another computer and there are already a number of successful implementations. Acorn's first concept of the BBC Micro was to make it a hyper-intelligent terminal; does anyone remember the Proton? It is now possible to buy ROMs that plug into the micro's spare sockets which, on a single keyboard entry, convert it into a versatile terminal with powerful communications facilities.

In the world of minis and mainframes terminals are said to have varying degrees of intelligence: that is, they can respond to instructions from the mainframe to clear the screen, move the cursor around, create highlighted text, draw graphics and so on. It is normally done via Escape sequences. The Escape code, decimal 27, is sent followed by a series of ASCII characters that the terminal knows how to decode. On the BBC Micro the VDU27 command "does nothing", to quote the *User Guide*, leaving the way open for users to pick up ASCII 27 and make it set off a series of events to their requirements.

Terminals used commercially are many and various. Except for simple Teletype-like line scrolling they are by no means mutually compatible. One very popular terminal family is the VT series manufactured by Digital Equipment Corporation for use with its Vax and PDP series minicomputers. The simpler versions can do a variety of text manipulations and display a set of lines and corners in graphics mode. The more expensive types can respond to graphics commands by drawing lines and moving the graphics cursor. So popular are they, with over a quarter of a million VT-100s sold at some £1,200 each, that other manufacturers include the VT-52 or VT-100 protocols in their own machines.

On a micro like the BBC, graphics commands from Basic can cause output to appear directly on a memory-mapped screen. Mainframes, however, have to send serial data to terminals which convert these instructions into an appropriate graphics display. A micro which is acting as a terminal must be capable of understanding what these commands mean. The mainframe's graphics commands will be specific to a particular terminal type, decided by the manufacturer.

One of the most widely used families of terminals for graphics is the Tektronix. Its protocol has been widely adopted as a standard for communicating graphics information, and masses of Tektronix-compatible software exists, mainly written in Fortran. A micro which can make use of this protocol for graphics display is indeed a valuable peripheral. The BBC's operating system contains all the necessary functions to make it possible to turn it into a Tektronix-type terminal, at minimal cost. The genuine article costs about £2,000.

When a micro like the BBC sends data to a printer, either through the serial RS-423 port or through the Centronics-compatible parallel port, it expects the printer to send back a message telling it to stop sending data when the printer input buffer is full. This is effected via a special wire between the micro and the printer which informs it of the printer's status.

Such a handshaking process is easy to implement when the two devices are next to each other on a desk, but if communication is to be over a distance — via a telephone for example — a proliferation of wires is not acceptable.

Bit 4	Bit 3	Bit 2	Result
0	0	0	7 bit + even parity + 2 stop bits
0	0	1	7 bit + odd parity + 2 stop bits
0	1	0	7 bit + even parity + 1 stop bit
0	1	1	7 bit + odd parity + 1 stop bit
1	0	0	8 bit + no parity + 2 stop bits
1	0	1	8 bit + no parity + 1 stop bit
1	1	0	8 bit + even parity + 1 stop bit
1	1	1	8 bit + odd parity + 1 stop bit

Table 1. Control of data bits, parity and stop bits using *FX151 call.

Three-wire connection has to do: one in, one out and one ground. If a two-wire telephone line is used the input and output are converted to different frequencies via a modem. Handshaking is still needed but has to be implemented in software, normally by using the so-called XOn/XOff protocol.

If a software handshake is to be implemented the BBC Micro must be fooled into ignoring the RTS and CTS handshaking signals it would normally expect. The easiest way to do this is to wire up the serial I/O plug with the RTS and CTS pins connected together. Remember not to use the plug for a serial printer on another occasion.

When a large multi-tasking computer is busy and unable to accept data from a terminal for a few seconds it sends an XOff to the terminal, telling it to suspend data transmission. XOff has a value of decimal 21, which can be duplicated with Ctrl-S; XOn is the same as Ctrl-Q or decimal 19. Sending XOff from the computer end must inhibit further input from the terminal, and the keyboard user must be informed of this, by disabling the keyboard, for example. An XOn sent later enables further input from the terminal.

XOn and XOff work the other way round, as well. Typically a user will want to view the contents of a file or the output from a program sent out by the mainframe. If the listing is too fast to read, it can be stopped by pressing Ctrl-S and restarted with Ctrl-Q. This is similar to holding down Ctrl and Shift together on the stand-alone micro to hold a listing temporarily.

Communicating with mainframes is not quite as simple as is sometimes suggested in the popular computing magazines. Some programs will work in part, but fail in other respects. For example, what does the terminal do when the Tab character, ASCII 9, is sent? On the BBC Micro nothing much happens except that the cursor moves forward one space, but on a proper terminal the cursor will move to the next eighth position: Tab at 1, 2, 3, etc. moves to 8; Tab at 8 moves to 16, and so on. And how does the terminal respond to Delete, ASCII 127? When Return is pressed does it send Carriage Return ASCII 13 only or Carriage Return and Linefeed ASCII 10?

Transferring memory contents or disc files between the micro and the mainframe opens up a whole new can of worms. During disc access the BBC Micro is extremely busy handling interrupts and can overlook what is happening at the serial input and output ports. The BBC Micro *User Guide* implies that it should be a simple matter to read a byte from the disc file, send it via the serial port to the mainframe, test the input port for a character or XOn/XOff, test the keyboard for input, and then get the next

(continued on next page)

Text-handling terminal.

```
 10 REM Program TERMINAL for BBC Microcomputer
 20
 30 REM By J.M. Leach, August, 1983
 40
 50 REM Supports Simplex/Duplex transmission
 60
 70 REM Exit from Program with f0
 80
 90 REM Printer can be toggled in and out with f1
100
110 REM 80 column display, with 8 space true tabbing
120
130 REM Supports XON/XOFF Protocol
140 REM Ceases sending when XOFF received from Mainframe: Continues after XON
150 REM Sends XOFF when RS432 Input, Output or Printer buffer > 127 bytes
160 REM Clears with XON when both reduced to less than 128 bytes
170 REM Bleeps when Keyboard Input buffer contains more than 127 characters
180
190 REM Tested up to 4800 Baud on VAX computer
200
210 MODE7
220 PROCASSEMBLE
230 CLS
240 PROCBIG(3,6,2,"BBC Terminal Emulator")
250 PROCBIG(4,0,5, "Set Baud Rate")
260 PROCBIG(2,0,8, "1.  300 Baud")
270 PROCBIG(2,0,11,"2. 1200 Baud")
280 PROCBIG(2,0,14,"3. 4800 Baud")
290 PROCBIG(6,0,17,"<RETURN> To Exit")
300 PROCBIG(3,0,20,"Enter 1, 2 or 3")
310 X=GET: IF X =13 GOTO 470 ELSE X$=CHR$(X)
320 IF X$="1" ?BAUD=3: GOTO 360
330 IF X$="2" ?BAUD=4: GOTO 360
340 IF X$="3" ?BAUD=6: GOTO 360
350 VDU7: GOTO 230
360 CLS
370 *FX 15,0
380 PROCBIG(3,5,2,"Printer in use ?"):PROCYN:IF NOT Y% ?DO_PRT=0:GOTO 420
390 ?DO_PRT=1: ?P_TOGL=0: REM Set up Printer, but toggled off
400 PROCBIG(2,5,5,"Is the printer set up ?"):PROCYN:IF Y% GOTO 420
410 PROCBIG(6,5,8,"Exiting while printer is setup"): PRINT TAB(0,12)":END
420 PROCBIG(6,5,8,"Enter S(implex) or D(uplex) >")
430 X$=GET$:IF X$="S" ?ECHO=0 ELSE IF X$="D" ?ECHO=1 ELSE VDU7:GOTO 430
440 *FX 15,0
450 CALL TERMINAL
460
470 MODE7:PROCBIG(6,5,10,"End of Terminal Emulation"):PRINT TAB(0,15)":END
480
490 DEF PROCBIG(HUE%,COL%,ROW%,TEXT$)
500 LOCAL I%
510 FOR I%=0 TO 1
520 PRINT TAB(COL%,ROW%+I%);CHR$141;CHR$(HUE%+128);TEXT$;
530 NEXT
540 VDU30
550 ENDPROC
560 DEF PROCYN
570 X=GET
580 IF X=ASC("Y") OR X=ASC("y") OR X=13 Y%=TRUE:ENDPROC
590 IF X=ASC("N") OR X=ASC("n") Y%=FALSE:ENDPROC
600 VDU7: GOTO 570
610
620 DEF PROCASSEMBLE
630 REM Terminal Emulator
640 DIM CODE 500
650
660 XON   =17  :REM XON Numerical value
670 XOFF  =19  :REM XOFF Numerical value
680 XFLIN =&70 :REM Flag for XON/XOFF Received
690 XFLOUT=&71 :REM Flag for XON/XOFF Sent
700 TEMP  =&72 :REM Used for Tabbing calculation
710 BAUD  =&73 :REM Store Baud Rate equivalent
720 ECHO  =&74 :REM Simplex/Duplex flag
730 DO_PRT=&75 :REM If = 1, allow printing
740 P_TOGL=&76 :REM If = 1, Print, else no print
750 K_FULL=&80 :REM Flag for Keyboard full
760 I_FULL=&81 :REM Flag for Input buffer full
770 O_FULL=&82 :REM Flag for Output buffer full
780 P_FULL=&83 :REM Flag for Printer buffer full
790
800 OSBYTE = &FFF4
810 OSASCI = &FFE3
820 OSNEWL = &FFE7
830 OSWRCH = &FFEE
840
850 FOR I%=0 TO 3 STEP 3
860 P%=CODE
870 [
880 OPT 0
890.TERMINAL                        \ Emulation routine
900 JSR term_init                   \ Set up for terminal emulation
910
920.Keyboard                        \ Anything in the Keyboard buffer ?
930 JSR Test_full                   \ See if any buffers are filling up
940 LDA #&91
950 LDX #0 : LDY #0 : JSR OSBYTE    \ Read Keyboard buffer
960 BCS In_Port                     \ Nothing, so try Input port
970 TYA: CMP #128 : BEQ Exit        \ Was Key f0 pressed for Exit ?
980.test1
990 CMP #129: BNE test2             \ Was it Key f1 for Printer toggle ?
```

(listing continued on next page)

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byte from the disc file. Alas, this is not so. Anyone contemplating doing the job for themselves is in for several weeks hard work with a machine-code program.

The popular RS-232 protocol has a number of options, among them the number of start bits, data bits, stop bits and whether there should be odd, even or no parity. It is of course, essential that the terminal and the computer both use the same bit pattern for sending and receiving data. The speed of transmission or baud rate must also be agreed between the two machines. Most large computers have an automatic baud-rate detection facility which is implemented by the first character it receives. Finally, a terminal can operate in simplex mode, when characters typed in at the keyboard are displayed at once, and then sent to the mainframe, or full Duplex, where the character is only displayed when echoed back by the mainframe.

Anyone wishing to establish communications will need to have at their disposal the handbooks for both the mainframe and the micro so there is no point in spelling out all the possible variations here. For the record, the defaults on the BBC are: a baud rate of 1,200, transmit and receive; one stop bit; no parity; and hardware handshaking, using the RTS and CTS pins on the serial port. The BBC uses the 6850 ACIA for serial transmission, which can be reconfigured by writing to the ACIA control register with *FX151,8,Y. The register bits in Y which control stop, parity and data bits are shown in table 1.

None of the regular advertisers in the micro magazines seem to have woken up to the fact that there is a very big market for a terminal emulator on the BBC Microcomputer, but the universities have not been idle. Every computing department we know about seems to be developing, or has developed, an emulation EPROM. An excellent example is the Workstation developed at the University of Sussex. Like any ROM on the BBC, what happens at switch-on depends on the position of the socket in which it is placed. If it is on the right-hand side, you enter Workstation, and Basic is accessed by typing *B; if it is on the left of the Basic chip you can get into Workstation by typing *W.

The first menu displayed offers the following options:

1. Set up Terminal
2. Tektronix 4010 Graphics emulation
3. DEC VT-52 emulation
4. File Archive/Restore

The first task is to set up the terminal with the appropriate baud rate from a menu, offering 75 to 9,600 baud; normally you would select 300, 1,200, 2,400 or 4,800 baud. You then return to the main menu. At any time a * command such as *Cat goes directly to the BBC operating system to do what is required, and returns to Workstation asking for a key press to continue.

The menu's Tektronix graphics emulation is exactly that, with the micro responding to all the commands known to the 4010 Tektronics terminal. Workstation with a Microvitek colour monitor gives perfectly acceptable graphics in Mode 0, although very small letters are difficult to read. On a decent monochrome monitor the results should be excellent. Only the most expensive raster terminals, with far more than the 256 to 640 resolution of the BBC screen can approach the vector scanning of the Tektronics for quality. That said, most graphics applications will be more than adequately legible, unless you were thinking of designing a new space shuttle.

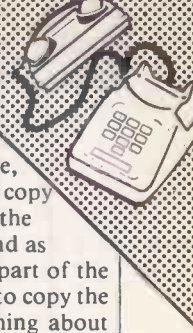
VT-52 emulation is very good, and by combined use of shift and function keys all the DEC editing functions can be used. As soon as the VT-52 mode is called the screen clears to the 80-column Mode 0 format and you are directly connected to the mainframe. Workstation was designed for use with DEC machines, particularly the Vax, so you only need a single Carriage Return to get connected and the Vax responds with a request for a password. Once logged in, you can return to the Workstation main menu by pressing Break. However, a Vax session can be carried out quite happily without returning to the menu at all.

The major triumph of Workstation is its ability to send disc files to and from the Vax. Menu option 4 asks if you want to Archive or Restore data. If you select this option, you are asked whether you want to transmit or receive. You are then asked for the BBC disc file name. If you enter the name of a non-existent file you are simply returned to the main menu, without any message.

Once a real, live file has been named, you are asked if you want to strip line feeds. The Vax automatically does a

(listing continued from previous page)

```
1000 LDA DO_PRT:BEQ  test2            \ Was the Printer specified, anyway ?
1010 LDA P_TOGL: EOR #1: STA P_TOGL \ It was, so switch printer on/off
1020 BEQ pr_off
1030 LDA #2: JSR OSWRCH: JMP In_Port\ Turn on Printer, but do not transmit
1040.pr_off                           \ to Mainframe
1050 LDA #3: JSR OSWRCH: JMP In_Port\ Turn off Printer
1060.test2                            \ Place other tests here, for function
1070                                  \ Keys etc.
1080 LDX K_FULL: BEQ k1               \ Test Keyboard buffer
1090 LDA #7:JSR OSWRCH:JMP Out_Port \ Bleep and ignore !
1100.k1 LDX ECHO: BNE end_t           \ Character to Screen if Simplex
1110 CMP#9: BNE simplex               \ Is it a TAB Character ?
1120 JSR tabber:LDA #9:JMP Out_Port \ Do the tabbing and restore #9 for output
1130.simplex
1140 JSR OSASCI
1150.end_t
1160 JMP Out_Port
1170
1180.Exit
1190 LDA #2 : LDX #0 : JSR OSBYTE   \ Select Keyboard again
1200 LDA #&E5
1210 LDX #0 : LDY #0 : JSR OSBYTE   \ Restore <ESCAPE>
1220 JSR OSNEWL                       \ Do C/R L/F before exit
1230 RTS                              \ Exit to BASIC
1240
1250.Out_Port
1260 TAY
1270 LDA #&8A: LDX #2 : JSR OSBYTE  \ Put character in RS423 Output buffer
1280
1290.In_Port
1300 LDA #&91
1310 LDX #1 : LDY #0 : JSR OSBYTE   \ Get character from RS423 buffer
1320 BCS Keyboard
1330 CPY #XOFF: BNE xtest2            \ Test for XOFF
1340 LDA #1: STA XFLIN: JMP Keyboard\ XOFF sent; set flag, and get Keyboard
1350.xtest2
1360 LDA XFLIN: BEQ screen
1370 CPY #XON: BNE end_scan           \ XOFF still implemented
1380 LDA #0  : STA XFLIN              \ XON received; clear flag
1390.screen
1400 LDA ECHO: BEQ end_scan           \ Character already written if Simplex
1410 TYA: CMP#9: BNE write_screen     \ Test for TAB
1420 JSR tabber: JMP Keyboard         \ Do the TAB
1430.write_screen
1440 JSR OSWRCH                       \ Note OSWRCH, not OSASCI as CR/LF is sent
1450                                  \ out by Mainframe at end of each  line
1460.end_scan
1470 JMP Keyboard                     \ Close the scanning loop
1480
1490.term_init                        \ Set up characteristics for Terminal
1500 CLD
1510 LDA #22: JSR OSWRCH              \ Set MODE 3
1520 LDA #3 : JSR OSWRCH
1530 LDA #19: JSR OSWRCH              \ VDU19,0,4,0,0,0 (Blue backgound)
1540 LDA #0 : JSR OSWRCH
1550 LDA #4 : JSR OSWRCH
1560 LDA #0 : JSR OSWRCH
1570 LDA #0 : JSR OSWRCH
1580 LDA #0 : JSR OSWRCH
1590 LDA #5 : LDX #1 : JSR OSBYTE   \ Pallel Printer selected
1600 LDA #6 : LDX #0 : JSR OSBYTE   \ Send L/F (= *FX 6,0)
1610 LDA #7 : LDX BAUD: JSR OSBYTE  \ Baud input
1620 LDA #8 : LDX BAUD: JSR OSBYTE  \ Baud output
1630 LDA #21: LDX #0 : JSR OSBYTE   \ Clear Keyboard buffer
```



Linefeed on receipt of ASCII 13, the Return character. So if your file contains CR/LF or LF/CR at the end of each line, the file on the Vax, when listed back, will be double-spaced. The normal choice will be to strip Linefeeds.

As soon as the file has been found on the disc by Workstation you are returned to the control of the mainframe. The syntax for file creation on the Vax is:

$CREATE FILENAME.EXT

Where Filename can have up to nine characters and Ext, which might be .Dat, can have three. Having entered this, instead of pressing Return in the normal way you press Shift-f0. The disc file on the BBC floppy is copied over immediately, the listing being displayed on the screen.

The file must be in ASCII format, not a Basic program with tokens or a Wordwise or View file containing control characters. If a Basic program is to be copied across, an ASCII version must first be created with the usual:

```
*SPOOL "F-NAME"
 LIST
*SPOOL
```

and F-Name is the version to be transmitted.

Once the transmission is completed, you enter Ctrl-Z from the keyboard, which is the way the Vax closes a Created file in any case, and that is the end of it. Of course, it is possible to confirm the process by using:

$TYPE FILENAME.EXT

on the Vax to see that all is well. The transfer can be aborted by entering Ctrl-C from the keyboard, which closes the Vax file and the BBC file. You receive data from the Vax on to the BBC disc by a similar process.

Among the other good things included in Workstation there is a screen-dump routine to an Epson printer, invoked by pressing one of the function keys. If the Vax has produced a graph or diagram, via a Fortran program, for example, you can get an immediate hard copy on a desk-top printer. Because the printer is in bit-image mode, and as there is no option for copying part of the screen, it takes several minutes to copy the screen. The final interesting thing about Workstation is the price: £40, or £35 to educational establishements. It is available from The Computing Centre, University of Sussex, Falmer, Brighton, Sussex BN1 9QH. Telephone: (0273) 606755.

If you intend to use the BBC as a serious terminal emulator, we can only advise that you buy Workstation or a similar EPROM. However, for those wishing to experiment with emulation programs, we offer two listings.

The first program acts as a straightforward text-handling terminal. It responds to the XOn/XOff protocol, incorporates correct tabbing, toggles the printer on and off, and has the option of simplex or duplex transmission. It can readily be extended by testing the input stream for control characters as Escape sequences followed by control codes which the program must convert to BBC graphics commands.

The program constantly scans the keyboard for input, sends a character out if there is one, and then looks to see if anything has come in via the RS-423 input port. At the same time it checks to see if any buffers are filling, and deals with XOn/XOff.

The second program emulates a Data General terminal in full, using a look-up table to convert the commands to BBC operating-system commands. This programming technique allows the emulation of almost any other 80-column terminal in a few minutes.

Full support is given for the use of the BBC as a full-colour graphics station driven by a mini or mainframe host. Ctrl-@ at the keyboard or ASCII null from the host toggles the BBC mode. In this mode all ASCII characters except null, which is unused by the BBC, are passed to the BBC without modification. It is entirely feasible to run the emulator, develop software on the mainframe to drive the BBC, run it, break into it using Ctrl-@, modify it, rerun it, and so on. Because of the in-built handshaking, commands that take a long time to execute on the BBC, such as drawing between two points, will not result in characters from the host being lost.

All handshaking is done via software, using Ctrl-Q and Ctrl-S from the keyboard or sent from the program. A parallel printer is toggled on and off with Ctrl-B. When the printer is enabled, the handshaking routine switches its attention from the RS-423 input buffer to the printer-output buffer. The printer may be enabled and disabled at will without loss of characters, and at any baud rate.

Handshaking is overridden at the

(continued on next page)

```
1640 LDA #21: LDX #1 : JSR OSBYTE   \ Clear RS423 Input buffer
1650 LDA #21: LDX #2 : JSR OSBYTE   \ Clear RS423 Output buffer
1660 LDA #&E5
1670 LDX #1 : LDY #0 : JSR OSBYTE   \ <ESCAPE> as ASCII 27
1680 LDA #2 : LDX #2 : JSR OSBYTE   \ Enable RS423 Receiver
1690 LDA #0:STA XFLIN: STA XFLOUT   \ Clear XOFF input and output
1700 LDX#3                          \ Clear buffer flags
1710.clear_flags
1720 STA K_FULL,X: DEX: BPL clear_flags
1730 RTS
1740
1750.tabber                         \ 8 Space Tabbing routine
1760 PHP:CLD
1770 LDA #134: JSR OSBYTE           \ Line position in X
1780 TXA                            \ Save prior to subtraction
1790.test_pos
1800 TAX: SEC: SBC #8: BPL test_pos \ Subtract 8 until negative
1810 STX TEMP: LDA #8: SEC: SBC TEMP\ Calculate spaces to put
1820 TAX                            \ Index for spacing loop
1830.sp_loop
1840 TXA: PHA: LDA #32              \ Save X, and put " " in A
1850 JSR OSWRCH                     \ Write the space on screen
1860 PLA: TAX: DEX: BNE sp_loop     \ Recover X and test for looping
1870 PLP: RTS
1880
1890 .Test_full                     \ Test buffers and set flags
1900 LDY #1
1910LDX #255: LDA #128: JSR OSBYTE  \ Keyboard
1920TXA: BPL f1: STY K_FULL: BMI f2: .f1 LDA #0: STA K_FULL
1930 .f2
1940LDX #254: LDA #128: JSR OSBYTE  \ Input buffer
1950TXA: BPL f3: STY I_FULL: BMI f4: .f3 LDA #0: STA I_FULL
1960.f4
1970LDX #253: LDA #128: JSR OSBYTE  \ Output buffer
1980TXA: BMI f5: STY O_FULL: BMI f6: .f5 LDA #0: STA O_FULL
1990.f6
2000LDX #252: LDA #128: JSR OSBYTE  \ Printer buffer
2010TXA: BMI f7: STY P_FULL: BPL f8: .f7 LDA #0: STA P_FULL
2020.f8
2030
2040 \ Send an XOFF if any of the Input, Output or Printer buffers are full
2050 \ unless the XFLOUT flag has already been set
2060
2070 \ Send an XON if all these buffers are clear to receive more, unless
2080 \ the XFLOUT flag is already clear
2090
2100 \ Note that the Keyboard, Input and Output buffers are very unlikely to
2110 \ fill unless the printer is being used, or the Mainframe is very heavily
2120 \ engaged with other work
2130
2140CLC: LDA #0: LDX #2               \ Test P_FULL, O_FULL and I_FULL in turn
2150.b1
2160ADC I_FULL,X: DEX: BPL b1       \ by adding contents to A
2170BCC all_clear                   \ All flags are clear
2180LDA XFLOUT: BEQ b2: RTS         \ No action required if flag is set
2190.b2
2200LDA #1: STA XFLOUT: LDY #XOFF   \ Set flag, and
2210LDA #&8A: LDX #2 : JSR OSBYTE   \ Send XOFF to Mainframe
2220 RTS
2230.all_clear
2240LDA XFLOUT: BNE b3: RTS         \ No action required if flag is clear
2250.b3
2260LDA #0: STA XFLOUT: LDY #XON    \ Clear flag, and
2270LDA #&8A: LDX #2 : JSR OSBYTE   \ Send XON to Mainframe
2280]
2290NEXT I%
2300 ENDPROC
```

(continued from previous page)

keyboard. Ctrl-S entered at the keyboard takes precedence over internal handshaking: a keyboard Ctrl-S while output is going to both the screen and printer will halt output to both devices. No characters are lost. The baud rate can be altered as desired while the emulator is running. Ctrl-F followed by numeric values 1 to 8 sets the Tx/Rx rate as described in the *User Guide*.

Four values in the source code allow the function keys to be altered in a flexible way, using normal, Shift, Control and Control-Shift. In the emulation of the 6053 the four cursor-control keys are used as function key 11. These keys can also be changed to meet any requirement.

During emulation the value of the control character is multiplied by 3 and then forms the LSB of a two-byte address stored at the table pointer LSB and MSB. The MSB of the table is always &0D. The emulator then indirects through the table pointer to the correct three-byte entry in the look-up table — one-byte JMP instruction and two-byte address. This in turn directs the emulator to the relevant section of code. To alter the emulator for other terminal applications simply swap around the entries in the look-up table.

The Data General 6053 has 11 function keys. Pressing any key results in an ASCII 30 header code followed by an ASCII value ranging from 33 to 123. The function-key handling is simplified by setting their base value to higher than ASCII 128. Detection is then a simple matter, and the desired value of the function key can be obtained by subtracting a constant from the base value.

To emulate function key 11 you have to use the cursor-control keys. They generate fixed ASCII codes so they are dealt with separately. If another emulation does not require these keys, simply remove that section of code.

If this program is used with a disc drive, the look-up table will have to be placed elsewhere and the MSB will need to be changed accordingly. A suitable home would be &0C00, the user-defined character storage area.

680	Establish MSB address of look-up table
770	Output to screen selected
810	Mode 3 selected
850	Display emulator name and rev number
920	9,600 baud Rx
960	9,600 baud Tx
1000	Esc generates ASCII 27
1040	Cursor keys to generate ASCII codes
1080	Clear all function keys
1120	Function key f0 generates ASCII 220
1160	Shifted f0 generates ASCII 204
1200	Ctrl-f0 generates ASCII 156
1240	Ctrl-Shift-f0 generate ASCII 140
1290	RS-423 port input stream selected
1330	Screen and printer output streams selected
1350	Set bias favouring transmission from host
1430	Get character from input stream
1450	If 0 then character was received
1520	In BBC mode check for ASCII 0 only
1530	Restart emulator

Data General terminal emulator.

```
 10 REM
 20 REM
 30 DIM Z% 900
 40 OSBYTE=&FFF4
 50 OSWRCH=&FFEE
 60 OSASCI=&FFE3
 70 OSNEWL=&FEE7
 80 LOOK_PORT=&0D60
 90 XPOS=&0D61
100 MPD=&0D62
110 MPR=&0D63
120 TABLE_POINTER_LSB=&0D64
130 TABLE_POINTER_MSB=&0D65
140 BBC_MODE_FLAG=&0D66
150 BAUD_FLAG=&0D67
160 LPT_FLAG=&0D68
170 CTRL_S_FLAG=&0D69
180 BUSY=&0D6A
190 CURSOR_COUNT=&0D6B
200 P%=&0D6C
210 $P%="Data General 6053
    Emulator - Revision 1.0"+CHR$(13)
220 FOR N=0 TO 2 STEP 2
230 P%=&0D00
240 [OPT N
250 \DATA GENERAL 6053 LOOK UP TABLE
260 .CNTRL_TABLE
270 JMP BBC_MODE_ON
280 JMP CHAR_DONE
290 JMP CHAR_DONE
300 JMP CHAR_DONE
310 JMP CHAR_DONE
320 JMP SEND_CURSOR_POSITION
330 JMP CHAR_DONE
340 JMP BELL
350 JMP HOME
360 JMP CHAR_DONE
370 JMP NWLINE
380 JMP ERASE_TO_EOL
390 JMP F_FEED
400 JMP CR
410 JMP CHAR_DONE
420 JMP CHAR_DONE
430 JMP RECEIVE_CURSOR_POSITION
440 JMP CHAR_DONE
450 JMP CHAR_DONE
460 JMP CHAR_DONE
470 JMP INV_ON
480 JMP INV_OFF
490 JMP CHAR_DONE
500 JMP C_UP
510 JMP C_FORWARD
520 JMP C_BACK
530 JMP C_DOWN
540 JMP CHAR_DONE
550 JMP CHAR_DONE
560 JMP CHAR_DONE
570 JMP CHAR_DONE
580 JMP CHAR_DONE
590 ]
600 P%=Z%
610 [OPT N
620 .START
630 \
640 \SET UP INITIAL CONDITIONS
650 \
660 CLD
670 LDA #&0D
680 STA TABLE_POINTER_MSB
690 LDA #0
700 STA XPOS
710 STA BBC_MODE_FLAG
720 STA BAUD_FLAG
730 STA LPT_FLAG
740 LDA #3
750 LDX #4
760 LDY #0
770 JSR OSBYTE
780 LDA #22
790 JSR OSWRCH
800 LDA #3
810 JSR OSWRCH
820 LDY #0
830 .DISPLAY_CHARACTER
840 LDA &0D6C,Y
850 JSR OSASCI
860 INY
870 CPY #42
880 BNE DISPLAY_CHARACTER
890 LDA #7
900 LDX #7
910 LDY #0
920 JSR OSBYTE
930 LDA #8
940 LDX #7
950 LDY #0
960 JSR OSBYTE
970 LDA #229
980 LDX #1
990 LDY #0
1000 JSR OSBYTE
1010 LDA #4
1020 LDX #1
1030 LDY #0
1040 JSR OSBYTE
1050 LDA #18
1060 LDX #0
1070 LDY #0
1080 JSR OSBYTE
1090 LDA #225
1100 LDX #220
1110 LDY #0
1120 JSR OSBYTE
1130 LDA #226
1140 LDX #204
1150 LDY #0
1160 JSR OSBYTE
1170 LDA #227
1180 LDX #156
1190 LDY #0
1200 JSR OSBYTE
1210 LDA #228
1220 LDX #140
1230 LDY #0
1240 JSR OSBYTE
1250 .RECEIVE
1260 LDA #2
1270 LDX #1
1280 LDY #0
1290 JSR OSBYTE
1300 LDA #3
1310 LDX #0
1320 LDY #0
1330 JSR OSBYTE
1340 LDA #5
1350 STA LOOK_PORT
1360 \
1370 \SEE IF THE HOST HAS
     ANYTHING FOR US
1380 \
1390 .EXAM_PORT
1400 LDA #129
1410 LDX #0
1420 LDY #0
1430 JSR OSBYTE
1440 CPY #0
1450 BEQ CHAR_SENT
1460 JMP CHAR_DONE
1470 .CHAR_SENT
1480 LDA #0
1490 CMP BBC_MODE_FLAG
1500 BEQ DRIVE_CURSOR
1510 CPX #0
1520 BNE OUT
1530 JMP START
1540 .DRIVE_CURSOR
1550 LDA #0
1560 CMP CURSOR_COUNT
1570 BEQ NORMAL_CHAR
1580 TXA
1590 JSR OSWRCH
1600 DEC CURSOR_COUNT
1610 JMP CHAR_DONE
1620 .NORMAL_CHAR
1630 CPX #32
1640 BCC CTRL_CODE
1650 .OUT
1660 TXA
1670 JSR OSWRCH
1680 JMP CHAR_DONE
1690 .CTRL_CODE
1700 \MULTIPLY CNTRL CODE BY 3 FOR
     OFFSET FROM LOOK UP TABLE TOP
1710 LDA #0
1720 STA TABLE_POINTER_LSB
1730 STX MPD
1740 LDA #3
1750 STA MPR
1760 LDA #0
1770 LDX #8
1780 \DO THE MULTIPLICATION
1790 .LOOP1
1800 LSR MPR
1810 BCC NO_ADD
1820 CLC
1830 ADC MPD
1840 .NO_ADD
1850 ROR A
1860 ROR TABLE_POINTER_LSB
1870 DEX
1880 BNE LOOP1
1890 JMP (TABLE_POINTER_LSB)
1900 .CHAR_DONE
1910 DEC LOOK_PORT
1920 BEQ EXAM_KBD
1930 JMP EXAM_PORT
1940 \
1950 \IS THE USER TRYING TO GE
     A WORD IN?
1960 \
1970 .EXAM_KBD
1980 LDA #3
1990 LDX #7
2000 LDY #0
2010 JSR OSBYTE
2020 LDA #2
2030 LDX #2
2040 LDY #0
2050 JSR OSBYTE
2060 \HANDSHAKING
2070 LDA #1
2080 CMP CTRL_S_FLAG
2090 BNE CHECK_PRINTER
2100 JMP HANDSHAKE_DONE
2110 .CHECK_PRINTER
2120 CMP LPT_FLAG
2130 BEQ LPT_HANDSHAKE
2140 .SCREEN_HANDSHAKE
2150 LDA #128
2160 LDX #254
2170 LDY #255
2180 JSR OSBYTE
2190 LDA #1
2200 CMP BUSY
2210 BEQ SCREEN_CTRL_Q
2220 .SCREEN_CTRL_S
2230 CPX #40
2240 BCC HANDSHAKE_DONE
2250 LDA #1
2260 STA BUSY
2270 LDA #19
2280 JSR OSWRCH
2290 JMP HANDSHAKE_DONE
2300 .SCREEN_CTRL_Q
2310 CPX #0
2320 BNE HANDSHAKE_DONE
2330 LDA #0
2340 STA BUSY
```

1560 Number of cursor co-ordinates outstanding
1590 Send X or Y co-ordinate to the screen
1640 Filter out those Ctrl codes
1890 Seek out that table
1910 Decrement bias favouring host transmission
2010 RS-423 port output stream selected
2050 Keyboard input stream selected
2130 Select appropriate handshaking
2180 Look in the 423 serial input buffer
2240 Is a Ctrl-S necessary?
2280 Call a temporary halt
2320 Is a Ctrl-Q called for?
2360 Resume the flow
2420 Look in the printer output buffer
2480 Is a Ctrl-S necessary?
2520 Call a temporary halt
2560 Is a Ctrl-Q called for?
2600 Resume the flow
2650 Get character from input stream
2670 If 0 then someone is awake
2710 If baud flag set the next key press will set rate
2790 ASCII 0 means toggle BBC mode
2830 BBC mode off
2840 Send Esc to halt host
2880 Flush all buffers
2890 Restart emulator
2910 BBC mode on
2950 ASCII 6 means baud rate to follow; set flag
3010 ASCII 2 means toggle parallel printer
3060 Switch it on
3100 Screen and printer output streams selected
3120 Send: Enable Printer
3160 Switch it off
3180 Negate any Ctrl-S issued by handshaking
3220 Screen and printer output streams selected
3240 Send: Disable Printer
3270 Check for Ctrl-Q
3330 Check for Ctrl-S
3390 Output character to selected stream
3480 Filter out Copy key
3680 Function-key value into A
3700 Subtract 107 from key value to get the real value
3730 Function-key header code
3740 Send header
3760 Send modified function-key value
3900 RS-423 output stream selected
3920 Read text-cursor position
3940 Tell host-cursor position coming next
3960 Send X co-ordinate
3980 Send Y co-ordinate
4180 Read text-cursor position
4220 Subtract cursor position from line length
4270 Save number of spaces needed
4300 Wipe the line
4340 Restore original cursor positions
4530 Move cursor to X,Y that follows
4600 Define text colour
4620 Foreground black
4660 Background white
4710 Define text colour
4730 Foreground white
4770 Background black
5020 Reduce ASCII value to between 1 and 8
5070 Less than 1
5110 Greater than 8
5150 Set Rx baud rate
5190 Set Tx baud rate

```
350 LDA #17
360 JSR OSWRCH
370 JMP HANDSHAKE_DONE
380 .LPT_HANDSHAKE
390 LDA #128
400 LDX #252
410 LDY #255
420 JSR OSBYTE
430 LDA #1
440 CMP BUSY
450 BEQ LPT_CTRL_Q
460 .LPT_CTRL_S
470 CPX #50
480 BCS HANDSHAKE_DONE
490 LDA #1
500 STA BUSY
510 LDA #19
520 JSR OSWRCH
530 JMP HANDSHAKE_DONE
540 .LPT_CTRL_Q
550 CPX #63
560 BNE HANDSHAKE_DONE
570 LDA #0
580 STA BUSY
590 LDA #17
600 JSR OSWRCH
610 .HANDSHAKE_DONE
620 LDA #129
630 LDX #0
640 LDY #0
650 JSR OSBYTE
660 CPY #0
670 BEQ KEY_PRESS
680 JMP RECEIVE
690 .KEY_PRESS
700 LDA #1
710 CMP BAUD_FLAG
720 BNE WHICH_KEY
730 JMP SET_BAUD_RATE
740 .WHICH_KEY
750 CPX #128
760 BCC QWERTY_KEY
770 JMP FUNCTION
780 .QWERTY_KEY
790 CPX #0
800 BNE BAUD
810 CMP BBC_MODE_FLAG
820 BNE SET_MODE
830 LDA #27
840 JSR OSWRCH
850 LDA #15
860 LDX #0
870 LDY #0
880 JSR OSBYTE
890 JMP START
900 .SET_MODE
910 LDA #1
920 STA BBC_MODE_FLAG
930 JMP RECEIVE
940 .BAUD
2950 CPX #6
2960 BNE LPT
2970 LDA #1
2980 STA BAUD_FLAG
2990 JMP RECEIVE
3000 .LPT
3010 CPX #2
3020 BNE CTRL_Q
3030 LDA #1
3040 CMP LPT_FLAG
3050 BEQ LPT_OFF
3060 STA LPT_FLAG
3070 LDA #3
3080 LDX #0
3090 LDY #0
3100 JSR OSBYTE
3110 LDA #2
3120 JSR OSWRCH
3130 JMP RECEIVE
3140 .LPT_OFF
3150 LDA #0
3160 STA LPT_FLAG
3170 LDA #17
3180 JSR OSWRCH
3190 LDA #3
3200 LDX #0
3210 LDY #0
3220 JSR OSBYTE
3230 LDA #3
3240 JSR OSWRCH
3250 JMP RECEIVE
3260 .CTRL_Q
3270 CPX #17
3280 BNE CTRL_S
3290 LDA #0
3300 STA CTRL_S_FLAG
3310 JMP SEND
3320 .CTRL_S
3330 CPX #19
3340 BNE SEND
3350 LDA #1
3360 STA CTRL_S_FLAG
3370 .SEND
3380 TXA
3390 JSR OSWRCH
3400 JMP RECEIVE
3410 .FUNCTION
3420 \DEAL WITH THE FUNCTION KEYS
3430 CPX #140
3440 BCS PROPER_FUNCTION_KEY
3450 \PRETEND THE CURSOR KEYS ARE
     FUNCTION KEY 11
3460 CPX 135
3470 BNE CURSOR_KEY
3480 JMP RECEIVE
3490 .CURSOR_KEY
3500 CPX #136
3510 BNE RIGHT
3520 LDA #123
3530 JMP STORE_IT
3540 .RIGHT
3550 CPX #137
3560 BNE DOWN
3570 LDA #107
3580 JMP STORE_IT
3590 .DOWN
3600 CPX #138
3610 BNE UP
3620 LDA #43
3630 JMP STORE_IT
3640 .UP
3650 LDA #59
3660 JMP STORE_IT
3670 .PROPER_FUNCTION_KEY
3680 TXA
3690 SEC
3700 SBC #107
3710 .STORE_IT
3720 PHA
3730 LDA #30
3740 JSR OSWRCH
3750 PLA
3760 JSR OSWRCH
3770 JMP RECEIVE
3780 \
3790 \TRANSLATE CNTRL CODES
     INTO BBC SPEAK
3800 \
3810 .BBC_MODE_ON
3820 LDA #1
3830 STA BBC_MODE_FLAG
3840 JMP RECEIVE
3850 \
3860 .SEND_CURSOR_POSITION
3870 LDA #3
3880 LDX #7
3890 LDY #0
3900 JSR OSBYTE
3910 LDA #134
3920 JSR OSBYTE
3930 LDA #31
3940 JSR OSWRCH
3950 TXA
3960 JSR OSWRCH
3970 TYA
3980 JSR OSWRCH
3990 JMP RECEIVE
4000 \
4010 .BELL
4020 LDA #7
4030 JSR OSWRCH
4040 JMP RECEIVE
4050 \
4060 .HOME
4070 LDA #30
4080 JSR OSWRCH
4090 JMP RECEIVE
4100 \
4110 .NWLINE
4120 LDA #10
4130 JSR OSASCI
4140 JMP RECEIVE
4150 \
4160 .ERASE_TO_EOL
4170 LDA #134
4180 JSR OSBYTE
4190 STX XPOS
4200 LDA #80
4210 SEC
4220 SBC XPOS
4230 CMP #0
4240 BNE WIPE_IT
4250 JMP RECEIVE
4260 .WIPE_IT
4270 TAX
4280 LDA #32
4290 .LOOP2
4300 JSR OSWRCH
4310 DEX
4320 BNE LOOP2
4330 LDA #31
4340 JSR OSWRCH
4350 LDA XPOS
4360 JSR OSWRCH
4370 TYA
4380 JSR OSWRCH
4390 JMP RECEIVE
4400 \
4410 .F_FEED
4420 LDA #12
4430 JSR OSWRCH
4440 JMP RECEIVE
4450 \
4460 .CR
4470 LDA #13
4480 JSR OSWRCH
4490 JMP RECEIVE
4500 \
4510 .RECEIVE_CURSOR_POSITION
4520 LDA #31
4530 JSR OSWRCH
4540 LDA #2
4550 STA CURSOR_COUNT
4560 JMP RECEIVE
4570 \
4580 .INV_ON
4590 LDA #17
4600 JSR OSWRCH
4610 LDA #0
4620 JSR OSWRCH
4630 LDA #17
4640 JSR OSWRCH
4650 LDA #129
4660 JSR OSWRCH
4670 JMP RECEIVE
4680 \
4690 .INV_OFF
4700 LDA #17
4710 JSR OSWRCH
4720 LDA #1
4730 JSR OSWRCH
4740 LDA #17
4750 JSR OSWRCH
4760 LDA #128
4770 JSR OSWRCH
4780 JMP RECEIVE
4790 \
4800 .C_UP
4810 LDA #11
4820 JSR OSWRCH
4830 JMP RECEIVE
4840 \
4850 .C_FORWARD
4860 LDA #9
4870 JSR OSWRCH
4880 JMP RECEIVE
4890 \
4900 .C_BACK
4910 LDA #8
4920 JSR OSWRCH
4930 JMP RECEIVE
4940 \
4950 .C_DOWN
4960 LDA #10
4970 JSR OSWRCH
4980 JMP RECEIVE
4990 \
5000 .SET_BAUD_RATE
5010 TXA
5020 SBC #48
5030 STA BAUD_FLAG
5040 LDA #0
5050 CMP BAUD_FLAG
5060 BCC UPPER_LIMIT
5070 JMP DONE_BAUD
5080 .UPPER_LIMIT
5090 LDA #9
5100 CMP BAUD_FLAG
5110 BCC DONE_BAUD
5120 LDA #7
5130 LDX BAUD_FLAG
5140 LDY #0
5150 JSR OSBYTE
5160 LDA #8
5170 LDX BAUD_FLAG
5180 LDY #0
5190 JSR OSBYTE
5200 .DONE_BAUD
5210 LDA #0
5220 STA BAUD_FLAG
5230 JMP RECEIVE
5240 ]
5250 NEXT N
5260 CALL Z%
```

Fast post

Ian Stobie has been using ACT's Micromail package to explore the facilities of Telecom Gold.

ELECTRONIC MAIL is fundamentally very simple, though the whole field is strewn with horrendous jargon which puts people off. The attraction of Micromail is that ACT has done the equipment selection and paperwork for you to make the addition of a mail facility to a microcomputer into a simple one-off purchase.

For £275 you will get an add-on modem card, software on disc and a mailbox on the Telecom Gold system — everything that is necessary to start sending and receiving messages. Micromail is available for the ACT Sirius and the new ACT Apricot. It is also promised for the IBM PC. We reviewed the Sirius version, using an acoustic-coupling modem instead of the on-board modem card. The set-up costs £95 for the Micromail software and mailbox number, and you would have to allow about £250 for the acoustic coupler.

The ordinary voice telephone system is the largest instant telecommunications system there is. With the right equipment attached it is quite suitable for transmitting data, so it makes sense to use it for sending messages from computer to computer. The modem is the device which makes this possible. It fits between the computer and the phone system and converts data to pulses that go down the phone line. A second modem at the other end translates the pulses back into machine-readable form.

There are two main types of modem: acoustic-coupling modems, and direct-connect modems like the ACT Micromail modem card. The acoustic-coupling modem box has two rubber cups on top into which a telephone handset fits. There are two cables: one plugs into the mains and the other into the RS-232C communications port of the Sirius. The Micromail modem card, on the other hand, fits inside the Sirius, with a single cable going to a telephone jack plug.

Acoustic couplers easily win the approval of the telephone authority because they have no direct electrical connection to the phone system. The coupler emits audible beeps into the telephone mouthpiece to send data, and converts beeps from the telephone earpiece back into electrical signals when receiving data. Gently tapping the telephone handset while the Sirius was receiving information via the acoustic coupler produced random characters on the screen. Direct-connect modems are less subject to interference.

We could not use the ACT on-board modem because it is not yet approved by British Telecom. It is not just ACT which faces this problem. In general BT is very slow to approve this kind of equipment. The salesmen may tell you that approval for their particular product is coming through next month, but next month could well come and go with nothing having happened. BT-approved equipment tends to be expensive or old fashioned.

Not surprisingly, BT takes a lot of stick from all concerned. Much of it is justified, but there are genuine risks in connecting devices with limited intelligence directly to

Inset: The acoustic-coupling modem box into which a telephone handset fits.

Micromail for the ACT Sirius and ACT Apricot includes everything necessary to start sending and receiving messages.

the phone system. It is not just a question of people accidentally shooting mains voltages down the phone line and electrocuting their neighbours. Once you have a direct-connect modem built into your computer it makes sense to add extra features. Most direct-connect modems have auto-dial and auto-answer facilities, allowing the user to leave the actual transmission of the messages to the system.

But these extra features can create problems. For example, an auto-dial system which rings up a number and finds it engaged is apt to try again — and again and again. BT does not want its phone system completely clogged up by tireless auto-dial systems, especially since call charging only starts from when the call is connected. Exchange equipment is tied up by your computer ringing through to an engaged number, but you will not be paying for it. So British Telecom has to figure out exactly how a system will behave under all sorts of conditions before giving it approval. It is not a trivial task. In a software-controlled system like Micromail it probably means examining the source code.

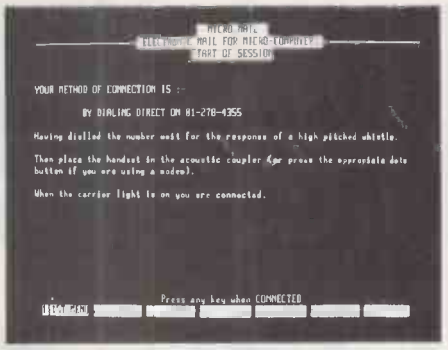
Once modem and micro are connected up you can turn the Sirius on and insert the Micromail disc. A menu comes up which says:

1 Start of Session
2 Operating Mode
3 Change Parameters
4 Text Editing
5 End of Session

Selecting option 1 produces a screen displaying a phone number and giving you instructions for connecting up to the electronic mail system. Electronic mail goes further than simply communicating between one computer and another through the telephone system. It would be cumbersome, after all, to have to tell the owner of the receiving computer that you want to send their machine a message. So you send your messages via a central computer system which stores them until whoever you have sent them to connects up via the phone system and collects them.

BT's public electronic-mail system is Telecom Gold, and it is this that you are using with ACT Micromail. BT has several Prime minicomputers with large disc drives attached to them, scattered round the country. They are connected to the phone system, waiting for your computer to call them up, and it is one of these numbers that the Micromail software puts up on the Sirius screen.

If you are using an acoustic coupler you dial the appropriate Telecom Gold phone number by hand, wait for the equipment to answer and emit a whistle, and then place the telephone handset into the rubber cups of the acoustic coupler. With the on-board modem this would all be done for you. In either case the Micromail software then takes over, transmitting the appropriate signing-on dialogue with Telecom Gold. This conversation is echoed on the screen, so you can see your mailbox number — JET727 in our case — and password.



Option 1 tells you how to connect up.

The Prime mini stores all properly encoded and addressed messages from registered users on disc. Each user is allocated a mailbox, which is in fact a disc file. When another user sends you a message your disc file is updated. Then when you come to read the contents of your own mailbox, the Prime sends any messages in it down the phone line to the computer you have attached to your telephone.

Anyone with the appropriate equipment and software can register with Telecom Gold and become a user. You can talk to anyone who has a mailbox on the system, not just other ACT Micromail users. Telecom Gold is also part of a world-wide system, which is called Dialcom in the United States and run by ITT.

The Micromail prompt comes up when you are signed on; it looks like the MS-DOS prompt, which is confusing. You then have to enter a command. If you do not know it you can look it up in the documentation or in the comprehensive on-screen Help information which is available at almost every point in the system. We had the Dialcom documentation handed out by BT, consisting of a 98-page manual and a small, clear quick-reference guide. ACT plans to do its own.

A typical activity at this stage would be to look in your mailbox. Typing Mail followed by Return produces the prompt "Send, Read or Scan" on the screen. Read will get you the entire mailbox, Scan just the headings. Typing in Read, in our case the first message to appear is:

TO: I. STOBIE (JET727)
FROM: J.ALLASON (JET007) POSTED: Thu 1-Sep-83 12:28
SUBJECT: APPLICATION GENERATORS
---more---

This is just the header. You can type in Next to skip to the next message, or Return to see the rest of the message.

Having read the whole of the message the system displays prompts with Action Required. You can delete a message, leave it in your mailbox or copy it on to the Sirius disc. It is best to delete or copy the message rather than leave it in your mailbox, as you are charged for storing messages there.

All the time your micro is connected to Telecom Gold you are charged, both for the telephone call itself and for CPU time. Connect time to the CPU costs 10.5p a minute in normal business hours or 3.5p at all other times. Mailbox storage costs 20 pence per 2,000-character unit per month. One of the drawbacks of Telecom Gold is that junk mail costs money.

It obviously makes sense to delete unwanted messages and to keep connect time to a minimum. One way of doing this is to prepare messages with a word-processing package before phoning up Telecom Gold. Since the Dialcom editor is old fashioned, and much less convenient than say WordStar, this makes sense anyway. One problem with this procedure is that WordStar dot commands are very similar to some Dialcom commands. Forseeing this, the Micromail software strips out any dubious-seeming characters in your file before sending it. This can have unfortunate consequences: for example, journalists often want to send double-spaced copy because that is what periodicals like to work with — contributors please note — but the system diligently strips out extra Carriage Returns.

With familiarity the system connect time can be reduced almost to the minimum necessary to sign on plus actual message-transmission time. Transmitted at 300 bits per second through an acoustic coupler, a 400-word message would take just over a minute to send or receive. ACT's own estimate of running costs is 17p all told for a 400-word message at peak time.

Telecom Gold offers a number of other facilities. You can send up to 500 carbon copies of a message to other users on the system for no extra charge to the sender — though recipients might have to pay a little more on storage. You can have date-activated messages which pop into people's mailboxes weeks after you have been sacked from your job for abusing the electronic-mail system. A more socially acceptable way of addressing users at large is the noticeboard facility which leaves other people's mailboxes untouched. You can also originate outgoing Telexes though not receive them. All these facilities are available with Micromail.

Micromail is a cheap and convenient way of getting on to Telecom Gold, and I look forward to playing around with it some more. Like other time-sharing services the users form a kind of community and it has a culture of its own, which will become more interesting as numbers grow.

I still have a feeling that electronic mail is an idea whose time has not quite come. Approval for cheap direct-connect modems seems to be the hold-up but once they appear in volume electronic mail should take off. That day cannot be far away: BT itself stands to gain as it has an attractive electronic-mail service in Telecom Gold.

Details about ACT Micromail are available from ACT House, Telephone Avenue, Bristol BS1 4YX; telephone: (0272) 211733. For details on Telecom Gold generally telephone 01-403 6777, or write to Telecom Gold Ltd, 42 Weston Street, London SE1 3QD.

DIAL-TEXT 50

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DIAL-TEXT 50 is a simple to use electronic typewriter (ET) to electronic typewriter communications device. It is plug compatible with the OCTET 121 and HERMIT 21 interfaces designed by Duplex and can also be used with any RS232 device such as a microcomputer or printer.

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Installation is easy and no special wiring is required – communication is achieved by simple cable connection or through any acoustic coupler. For instance, the user can simply place the DIAL-TEXT 50 unit and acoustic coupler between an OCTET 121 or HERMIT 21 typewriter and a standard telephone handset for transmission of ERROR FREE letters and documents (or telex messages) to a remote DIAL-TEXT 50 unit and acoustic coupler; nationally or internationally.

Typical application

The DIAL-TEXT 50 unit is ideal for remote offices which would like to use the main office telex facilities; Text can be prepared at the remote office and transmitted to the main office to cut telex paper tape for forward transmission. Incoming telexes for the remote office would receive messages in the reverse manner.

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2. ERROR free messages through use of automatic ERROR DETECTION and CORRECTION facility.
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4. MENU DRIVEN through a 16 character display.
5. OPERATORS CONTROL PANEL for message viewing and deletion.
6. INCOMING/OUTGOING messages automatically differentiated by special character.
7. ABILITY TO PRINT (retrieve) messages from the DIAL-TEXT 50 unit at any time.
8. ABILITY TO STORE messages onto a standard tape cassette unit. (Ask for the OCTET or HERMIT TI unit)
9. CONVENIENT/CONFIDENTIAL MESSAGE HANDLING. ie use own secretary as operator.
10. PORTABLE lightweight stand-alone unit with own 240v power supply which can be shared within the office.
11. DIAL-TEXT 50 allows local text processing without the need to transmit messages.
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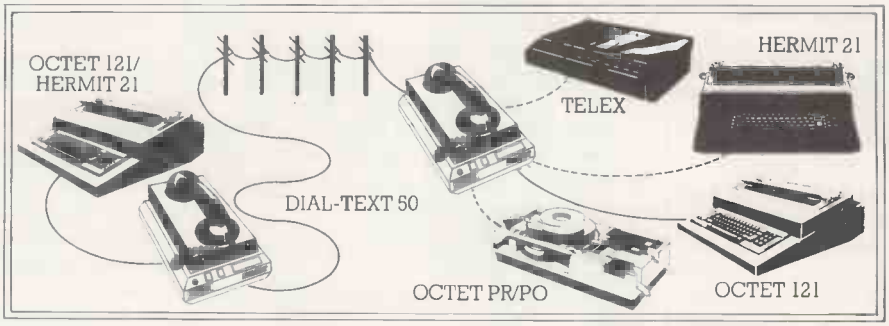
13. MESSAGE SCRAMBLER facility. (optional).



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The Interface People

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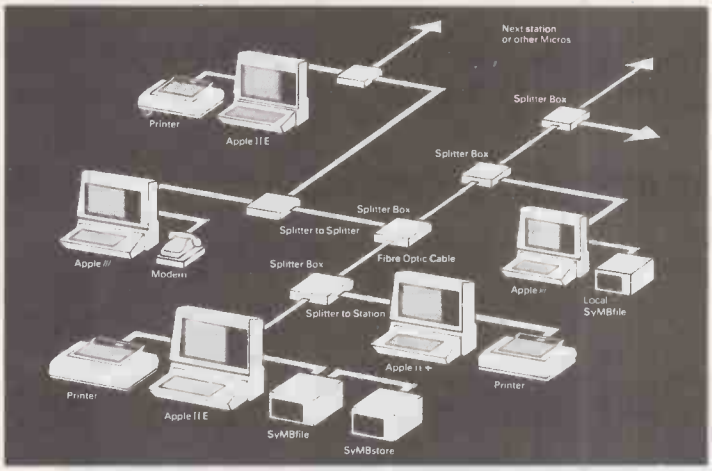

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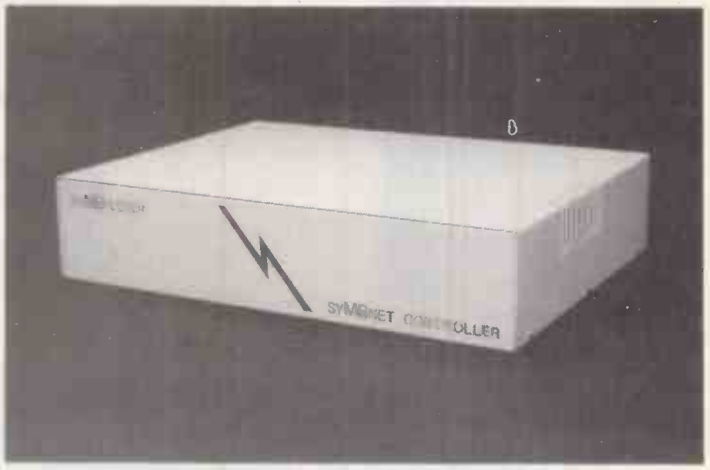
SYMBNET is a "tree and branch" network system using fibre optic cable to allow several microcomputers to share a common SYMBFILE . SYMBNET is the fastest long range local area network for microcomputers, and can cover a range of 7-9 Kilometres. Fibre optics means that SYMBNET is more cost effective; it uses a high intensity semi-conductor laser to transmit data and cables can be laid along the shortest route, whereas other networking systems use flat ribbon or coaxial cable which are sensitive to electrical noise from fluorescent lights, photocopiers, etc. SYMBNET is compatible with DOS, Pascal, SOS, and CP/M running on any microcomputer supported by the SYMBFILE in concurrent operation.



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NETWORK CONTROLLER

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Calling by name

John Hooper explains how named subroutines can structure your programs and clarify your listings.

STRUCTURED PROGRAMMING has several features that mark it out, regardless of the language used. Foremost among them is the lack of jumps from one place in the program to another, as effected by Basic's Goto. A second is the use of subroutines — often called, rather grandly, procedures. It is typical of structured languages that they discourage jumps by having no command like Goto, while they encourage subroutines by enabling them to be called by name.

Basic is castigated for its unstructured nature, which seems necessarily to result in unstructured programs. But it is not inevitable, for not only can Gotos be avoided almost entirely, but with a little cunning subroutines can be called by name.

Jumps requiring a Goto may be forward, to a line further on in the listing, or back to an earlier statement. The backwards Goto can to all intents and purposes be eliminated by using the For-Next-Step 0 technique I explained in *Practical Computing*, September 1983. The forwards jump is usually a conditional jump round a block of code that is not to be executed unless a particular condition is true. It can be done away with by making the lines to be jumped into a subroutine. In this way the program segment in listing 1, which includes a forward Goto, can be replaced by that in listing 2, which does not.

Subroutines

Subroutines are usually employed whenever a block of lines is used more than once. Putting the block out to one side and calling it when needed saves a lot of in-line code. In listing 2, however, a subroutine is being used for quite different reasons — to allow a single line, in effect, to include the entire block and thus avoid the need to jump round it when the If condition means it is not required.

Calling a subroutine by name normally has two immediate benefits. The most important is that the name is a label, and the interpreter has previously assigned to the label a value indicating where in memory the subroutine is stored, so that the jump to it is almost instantaneous. The second benefit is so simple that it is often

(continued on next page)

```
100 IF CONDITION IS TRUE THEN 200
120
140
160  } BLOCK OF CODE HERE
180
200 [REST OF PROGRAM]
```

Listing 1.

```
100 IF CONDITION IS NOT TRUE GOSUB
    1020
200 [REST OF PROGRAM]

1020
1040
1060  } BLOCK OF CODE HERE
1080
1085 RETURN
```

Listing 2.

```
100         REM SWITCHING
110         IF SUB$ = "HEADING" THEN 1100
120         IF SUB$ = "ANSWER" THEN 1200
130         IF LEFT$ (SUB$,5) = "DELAY" THEN 1300
140         IF SUB$ = "MORE?" THEN 1400
150         IF SUB$ = "CONTINUE" THEN 1500
160         IF SUB$ = "INITIALISE" THEN 1600
 |
 |
1200        REM ANSWER
1210        FOR G1 = 1 TO 2 STEP Ø
1220        GET AN$
1230        IF AN$ = "Y" THEN PRINT "YES":G1=3
1240        IF AN$ = "N" THEN PRINT "NO":G1=3
1250        NEXT G1
1260        SUB$ = "DELAYØ1":GOSUB 100
1270        RETURN

1300        REM DELAY**
1310        DEL$ = RIGHT$ (SUB$,2):DEL=VAL(DEL$)
1320        FOR D=1 TO 1000*DEL:NEXT D
1330        RETURN

1400        REM MORE?
1410        PRINT "DO YOU WANT TO DO SOME MORE (Y/N)? ";
1410        SUB$="ANSWER":GOSUB 100
1420        RETURN
 |
 |
 |
5000        REM START MAIN PROGRAM
5010        SUB$ = "INITIALISE":GOSUB 100
5020        SUB$ = "HEADING":GOSUB 100
5030        PRINT "DO YOU WANT TO READ
            THE INTRODUCTION (Y/N)? ";
5040        SUB$ = "ANSWER":GOSUB 100
5050        SUB$ = "INTRODUCTION":IF AN$="Y" GOSUB 100
5060         REST OF  PROGRAM
```

Listing 3.

Calling by name

(continued from previous page)

overlooked. It is that the program listing is inherently clear; the very act of calling a subroutine by name indicates to the reader what the program is doing at that point.

The Basic on Apple, Pet and Sharp micros does not allow the direct calling of a named subroutine, but there is still a worthwhile substitute. First, the subroutine's name is assigned to a variable. Second, the variable is fed by a conventional Gosub to a "switching" routine starting at a known line number. Finally, the subroutine's name is assigned to a variable. Second, the variable is fed by a conventional Gosub to a "switching" routine starting at a known line number. Finally the switching routine jumps to the identified subroutine using a conventional Goto.

The first step is accomplished by a line like

```
SUB$ = "SUBROUTINE NAME"
```

and the second is merely a Gosub to the line number where the switching routine starts. This routine is just a collection of If-Gotos in the form of

```
IF SUB$ = "[name]" THEN [line number]
```

and compares the contents of Sub$ against each of the If conditions, jumping to the indicated line number when a match is found. A not-so-obvious advantage is that any subroutine can be relocated anywhere in the listing, and the only consequent change will be to its first line number as used in the switching routine.

An example of the whole sequence is shown in listing 3. Even without detailed knowledge of what the various named routines do, the general nature of the main program, line 5000 onwards, is clear. After initialisation the screen heading is displayed, and you are asked whether you want to read the introduction. If the subroutine at line 1200 onwards provides the answer No, then the introduction is not shown. The introduction subroutine is not called, so its code is effectively jumped round, but without any Goto. Whether the answer is Yes or No, the main program then continues, having apparently disposed of the whole introduction in one line of code.

A subroutine can, of course, call another subroutine, and so on up to the level of nesting allowed by your micro. An example is given in the subroutine More? in listing 3. Suppose that in the main program you are inputting data, and are asked whether any more is to be input. The main program calls More? with the line

```
SUB$ = "MORE?":GOSUB 100
```

and More? itself calls Answer, which in turn calls Delay**. The return from Delay** is of course via Answer and More? to the main program. It is almost instantaneous because Returns direct the interpreter straight to memory locations rather than to numbered lines of coding.

As shown by the subroutine Delay** a subroutine can be given a name that includes variable information to be passed into the routine. The part of the name bit compared by the switching routine is fixed, while the rest holds the variable data. In Delay **, for example, the left five characters — D E L A Y — are fixed, and are found by a simple Left$(Sub$,5) operation in line 130. The last two characters — 01 in the case of Answer — are used to set the length of the delay.

Naturally, much more complicated information passing can take place. For instance, it is possible to envisage an input routine into which is passed a pattern defining the field length, the type of characters allowed, and the range of acceptable input values.

Structure is available even when working in unstructured Basic. Using the For-Next-Step 0 technique programs can avoid backwards Gotos and execute loops a lot faster. Employing subroutines, even for blocks of code only needed once, enables all forward Gotos to be eliminated. The subroutine-naming technique ensures that the program is clearly readable and comprehensible, even months afterwards when the inevitable bug crops up.

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Special *FX

Neville Maude reveals some of the more unusual system calls which are available on the BBC Micro's operating system.

THE ORIGINAL 0.1 operating system for the BBC Micro was imperfect. After long delay good supplies of the new 1.2 operating system are becoming available and all new micros will have it installed. To check which you have type *FX0. It does seem that OS1.2 will be the standard for some time and is worth obtaining, either by buying it separately, with a rebate for EPROM-based 0.1s or with one of the several devices for which it is essential.

Unfortunately the new ROM comes without a list of new facilities — at any rate mine did — which means digging around to find any information apart from bits here and there in the *User Guide*. The main advantages of OS 1.2 are:

- Elimination of the zero block in the cassette filing system.
- Ability to use paged or sideways ROMs.
- Correction of the Plot routine; formerly queer things could happen at bottom right of the screen.
- Correction of former problem with Put and Get with cassettes.

An interesting facility is the use of the Shift key in combination with a function key to produce ASCII codes 128 to 137. Hence Shift plus f1 gives red characters for the rest of that line. Similarly f2 gives green, f3 yellow, f4 blue and f6 cyan. With f5 it gives magenta not cyan as published elsewhere. Shift plus f7 restores white; f8 gives a steady flash on and off while f9 restores the steady state. If you press Control and a function key simultaneously, then teletext graphics symbols appear in the same colours.

Cold start

A difference you notice at once is that a cold start is obtained with Ctrl plus B instead of B twice. There are two new series of Plot commands, 72 to 79 and 88 to 95, which were described fully by John Dallman in the October issue of *Practical Computing*.

In the same general area is the new Osword call &0D. It returns the preceding two positions of the graphics cursor as 16-bit integers, converted back to user coordinates by reversing the scaling and subtracting the current origin position, VDU29.

Operating system 1.2 allows many *FX calls, some new, some old but not noticed because they were usable with OS 0.1, and some apparently undocumented in the official literature. The list given here should be useful as a supplement to the *User Guide*, which has various notes with the subscript "this facility is only available from issue 1.0".

All these calls should be checked, especially undocumented ones. There can be useful as a supplement to the *User Guide*. For example, not everyone finds *FX3 works as in the book. New calls are being discovered all the time and their functions clarified. Thanks are due to those many indefatigable computer owners who slog out the effects of calls into the small hours of the morning and then share their discoveries with others. Perhaps you have unveiled some previously obscure function. If so *Practical Computing's* Open File will be glad to hear from you.

Operating system 1.2 *FX calls

*FX13,X. Two parameters in X disable events: X = 7 disables the RS-423 Reveive-Error event; X = 8 disables Service/Network Error event. See also pages 425 and 465 of the *User Guide* for *FX14 where parameters enable events.

*FX17. Makes ADC converter start conversation on selected channel

*FX18. Clears the user-defined key buffer. It is faster than using *Key on each.

*FX19. Makes machine wait until start of next frame for animation.

*FX20. Allows all characters to be redefined by exploding soft character RAM allocation. See *User Guide*, page 427.

*FX21. Allows any internal buffer to be emptied. For example, use *FX21,0 to flush keyboard buffer before Get or before "Another go?" at the end of a game. See also *FX15 on page 428 of the *User Guide*.

*FX123 Allows user print routine to indicate to the MOS that task is finished. Compare with *FX5,4.

*FX138. Uses syntax as *FX21, allowing a character to be inserted into the keyboard buffer. X contains buffer number and Y character for insertion.

*FX141. Equivalent to *ROM.

*FX146-151. Reads, executes and writes to output and memory-mapped devices. Allows use of user port across Tube.

*FX152. Examines buffer number in X with call returns of carry bit set if empty, carry bit clear if character in buffer.

*FX153. Inserts character into input buffer handling interrupt character, generating an escape condition if necessary. It is valid for X = 0 or 1; Y contains insertion character.

*FX156. Alters 6850 control register to (Old value and Y) EOr X.

*FX158. Reads speech-processor chip.

*FX159. Writes to speech-processor chip.

*FX196. Starts period before auto-repeat; set by *FX11.

*FX197. Same for frequency of auto-repeat; set by *FX12.

*FX200. Escape key is turned on by *FX200,0 and off by *FX 200,1.

*FX201. Whole keyboard, except Break, is switched off by *FX201,1 and restored by *FX201,0.

*FX218. *FX210, 1 cancels sound and *FX,0 restores.

FX219. Redefines Tab.

*FX220. Reads or sets the ASCII value of Escape; default value is 27. *FX 220,0 disables and function to Ctrl-@.

*FX233. Be very careful: It acts as &E7, described on page 441 of the *User Guide*, but affects the system 6522.

*FX235. Checks for presence of speech processor; X = &FF if present, &00 if not.

*FX236. Output destination, as set by *FX3.

*FX237. Cursor state, set by *FX4.

*FX241. Read/Write *FX1 value. See page 438 of the *User Guide*.

*FX245. Read/Write *FX5 value. See page 438 of the *User Guide*.

*FX246. Read/Write *FX6 value. See page 438 of the *User Guide*.

*FX247/9. Affects the three locations examined by Break. For example:
*FX247,76, the JMP instruction;
*FX248,0, bottom of address;
*FX249,13, top of address.

*FX252. Reads sideways ROM, 0 to 15. Sockets are 15, 14, 13, and 12 — the others must be added.

*FX253. Indicates last type of reset: 0 is soft break, 1 is power-on break, 2 is Ctrl break.

*FX254. Read/Write RAM: 128 gives 32K, 64 gives 16K; useful for checking if a program will run on a Model A.

*FX255. Read/Write start-up options; permits links to be read, but wired values have priority. It is useful for discs and autoboot select. Values 6,7,8 set screen mode on hard reset.

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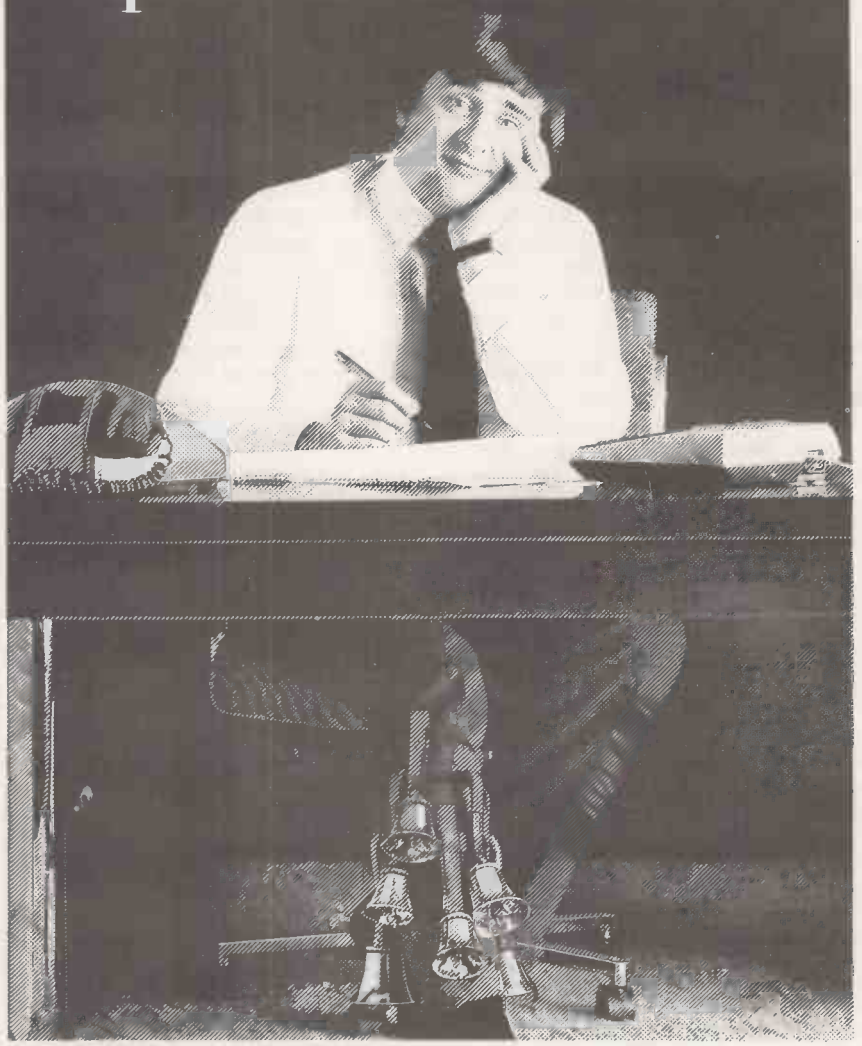

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One-liners

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WE CERTAINLY GOT more than we expected back in June when this competition was set. Until the closing date several close contenders had been shortlisted. Almost the final post brought the winning entry.

In all the entries, for those keying them to see what they do, spaces other than those in quotes are to be omitted and all Print commands should be keyed as ?. The Apple keyboard buffer will only take so much, which is just as well in this particular circumstance. Imagine typing a 4K one-liner and making a keying error.

From Andrew Hill of Maidenhead came a graphics program called Pompoms which colourfully pastes the high-resolution screen with a never-ending supply of decorations. Other graphics entries include a sine-wave plotter from J Stanley of London SW3 which functions and terminates elegantly, a style of code not always associated with one-liners.

An apple-drawing colour-flashing spectacular came from Wesley Reimer of Ontario, accompanied by the most psychedelic colour-box shunter you could hope to stretch out of an Apple II. A most curiously complex pattern generator which builds its inverting sketch out of parallel lines was devised by D M Miller.

Two entries contrived to be unexpectedly useful. One, from P M Doherty, converts rectangular to polar co-ordinates; the other, from Mark Heather, provides a strobe function, flashing the screen on and off at a frequency controllable through the games paddle. Wesley Reimer attempted the only sound-generating program with his third entry. Nothing seems to happen when it is run, but pressing a few keys produces a rather remarkable result.

And so to the winning entry from J H Lewis of Purley, Surrey. We print it together with our test results. Mr Lewis should go far — with a sense of humour like his he should at least be able to run fast. He calls his program "Anything Olivetti can do, Apple can too".

Pompoms by Andrew Hill.

```
10 HGR2 : FOR I = 1 TO 10:X =  RND
   (1) * 239 + 20:Y =  RND (1) *
   151 + 20: FOR J = 0 TO 6.2 STEP
   0.05: HCOLOR=  RND (1) * 6 +
   1: HPLOT 20 *  SIN (J) + X,2
   0 *  COS (J) + Y TO X,Y: NEXT
   : HCOLOR= 3: HPLOT X,Y TO X,
   0: NEXT : GET A$: RUN
```

Wave plotter by J Stanley.

```
10 HOME : HGR : HCOLOR= 3:Y = 14
 9: VTAB 21: HTAB 17: FLASH :
  PRINT "PLOTTING";: HPLOT 0,
 0 TO 0,Y: FOR N = 1 TO 278: HPLOT

 N,75 + 74 *  SIN (N / 24 * 9
 0): NEXT : HPLOT N,0 TO N,Y:
  NORMAL : HTAB 16: PRINT "SI
 NE WAVES": PRINT : HTAB 12: PRINT

 "ANY KEY TO CLEAR ";: GET Z$
 : TEXT : HOME
```

Spectacular by Wesley Reimer.

```
GR : FOR C = 1 TO 15: COLOR= C
   : VLIN 3,6 AT 19: HLIN 16,17
    AT 7: FOR I = 7 TO 22: READ
   A,B: HLIN A,B AT I: NEXT : HLIN
   20,21 AT 22: RESTORE : NEXT
   : DATA 21,22,15,23,15,23,14,
   22,14,22,14,21,14,21,14,21,1
   4,21,14,22,14,22,14,23,15,23
   ,15,23,16,22,17,18: RUN
```

Colour shunter by Wesley Reimer.

```
1 GR : FOR Z = 1 TO 50:A =  INT
   (15 *  RND (1) + 1):B =  INT
   (15 *  RND (1) + 1):C =  INT
   (15 *  RND (1) + 1):D =  INT
   (15 *  RND (1) + 1): FOR I =
   19 TO 0 STEP  - 1: COLOR= A:
    HLIN 0,19 AT I: COLOR= B: VLIN
   20,39 AT I: COLOR= C: VLIN 0
   ,19 AT I + 20: COLOR= D: HLIN
   20,39 AT I + 20: NEXT : NEXT
```

Sound by Wesley Reimer.

```
1 FOR A = 1 TO 19: READ P: POKE
   A + 770,P: NEXT : PRINT : PRINT
   "^";: FOR A = 1 TO 256: GET
   A$: POKE 0, ASC (A$): POKE 1
   ,10: CALL 771: PRINT A$;: NEXT
   : DATA 173,48,192,136,208,4,
   198,1,240,8,202,208,246,166,
   0,76,3,3,96
```

Parallels by D M Miller.

```
0 X = 270:Y = 185:T =  - 2:A = 10
   :B = A:C = 100:D = 30:E = 2:
   F = 2:G = 4:H =  - 4: HGR2 :
    FOR I = 0 TO 250:E = E + E *
   T * ((A >  = X) + (A <  = 5)
   ):F = F + F * T * ((B >  = Y
   ) + (B <  = 5)):G = G + G *
   T * ((C >  = X) + (C <  = 5)
   ):H = H + H * T * ((D >  = Y
   ) + (D <  = 5)):A = A + E:B =
  B + F:C = C + G:D = D + H: HCOLOR=
 3: HPLOT A,B TO C,D: NEXT : RUN
```

Co-ordinates by P M Doherty.

```
100 DEF  FN TG(U) = 180 * ( ATN
    (Y / (X + (X = 0))) / PI + 1
     + (X > 0) * ( - 2 * (Y >  =
    0) + 1)) - 135 * Y * (X = 0)
    :PI = 3.14159265: INPUT "ENT
    ER X,Y:";X,Y:R =  SQR (X * X
     + Y * Y):TH =  FN TG(U): PRINT
    "R=";R,"ANG="; INT (TH + .5)
```

Strobe by Mark Heather.

```
10 HGR : HCOLOR= 3: HPLOT 0,0: CALL
   62454: HGR2 : FOR L = 0 TO 9
   99: FOR S = 16299 TO 16300: POKE
    - S,0: FOR P = 0 TO  PDL (0
   ): NEXT P,S,L: END
```

The winner: Anything Olivetti can do Apple can too, by J H Lewis.

```
1  HOME : PRINT "DEFINE BRIEFLY Y
     OUR PROBLEM FOR COMPUTER SOL
     UTION": PRINT : INPUT A$: PRINT
     : PRINT "WITH APPROPRIATE HA
     RD & SOFTWARE THE 'APPLE' SH
     OULD MEET YOUR NEEDS": PRINT
     : PRINT "AGAIN?": INPUT A$: IF
      LEFT$ (A$,1) = "Y" THEN 1

]RUN
DEFINE BRIEFLY YOUR PROBLEM FOR COMPUTE
R SOLUTION

?INTEGRATED LEDGERS

WITH APPROPRIATE HARD & SOFTWARE THE 'A
PPLE' SHOULD MEET YOUR NEEDS

AGAIN?
?YES
DEFINE BRIEFLY YOUR PROBLEM FOR COMPUTE
R SOLUTION

?COMPUTER AIDED DESIGN

WITH APPROPRIATE HARD & SOFTWARE THE 'A
PPLE' SHOULD MEET YOUR NEEDS

AGAIN?
?YES
DEFINE BRIEFLY YOUR PROBLEM FOR COMPUTE
R SOLUTION

?ORBITAL SHUTTLE CONTROL

WITH APPROPRIATE HARD & SOFTWARE THE 'A
PPLE' SHOULD MEET YOUR NEEDS

AGAIN?
?NO
```

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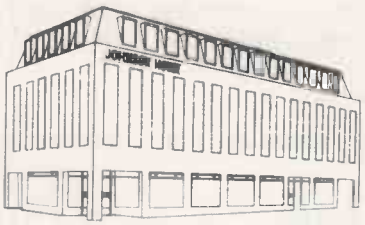

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Home truths

Jack Schofield gives the background to our critical selection of 25 home computers, which begins on the following page.

CHOOSING a home micro is difficult — probably more difficult than choosing a business model. Each brand has its own Basic, its own sound and graphics commands and its own way of handling discs. Virtually all the software is incompatible, even between different models from the same manufacturer.

But whether you want a micro for business, for pleasure or for a mixture of both, the two main aspects to be considered are the same: cost and function. Cost constraints can obviously limit the choice. For example, if you want a computer costing less than £50, that reduces the number of options to one — the ZX-81. If money is no object, then the home micro stretches as far as the IBM PC.

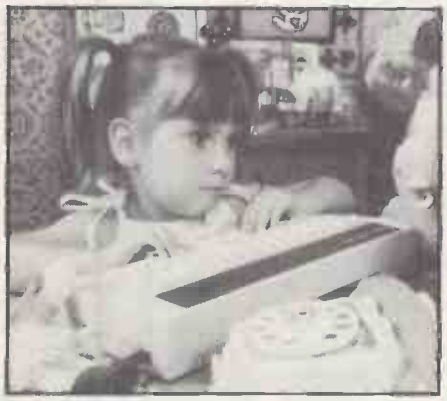
Function is a more complex criterion, and requires you to decide exactly what you want a home computer for. The main uses of home computers are education and programming, playing games, and household uses which may include filing, word processing and simple accounts, or even to run a business. Generally the chosen machine will be used for most or all of these functions, so the real problem is balancing the different requirements.

Even if you know what you want, a major problem remains: decoding the advertisements and promotional leaflets. Outrageous claims are all too common. One advertisement recently described a push-button calculator-style keyboard as "professional". Comparisons are sometimes wrong, and may even be deliberately misleading.

For example, when it comes to random access memory, RAM, it is easy to go astray. What beginners need is space free to Basic programs, but people are surprised to discover that the 48K Lynx has about as much RAM immediately free to Basic as the 16K Atari — about 13.5K.

Then there is the problem of what is available. Acorn advertisements have been talking blithely about "second processor" options — by which is meant second single-board computers — for the BBC Micro for some years. Delays have afflicted other items such as Sinclair's Microdrives, Lynx and Newbrain CP/M options, and Dragon disc drives. The only sensible line to take is that if you can't buy it, it doesn't exist. This means visits to local retailers.

Nor can rave reviews in computer magazines be relied on. It is all too easy to make a cock-up of lists and tests, though when the same idiocies appear month after month even charity wears thin.



Acorn's Electron — best for programming?

The real truth is that nearly every micro currently on the market is rubbish, as will be obvious to everyone in five years time. Some are better than others in some respects, and worse in others, but none is without flaws. So take a hard, sceptical look at published specifications.

RAM Ignore the chip count. The important figure is the amount of RAM free to Basic after any allowance has been made for work space and video RAM, which is where the screen image is held. On the 32K Electron this alone can consume from 8K to 20K.

Keyboards Don't believe what anyone says; try them for yourself. It matters less if you cannot type, but it is important if you want to do more than just play games.

Resolution In general, the more text characters a micro puts on the screen, the better. However, its usefulness also depends on the TV or monitor's ability to display them. Many people must have bought a Newbrain because it could put 80 characters on a line, then found their TV could not reproduce them legibly. With high-resolution graphics, a maximum of roughly 350 by 200 is about the limit of the average domestic television receiver, so higher is not better unless you buy a proper monitor.

Also check what colours are available when using the highest-resolution graphics, and how much memory this requires. The BBC Micro sounds great because the maximum resolution is 640 × 256 pixels. However, this mode restricts you to two colours, eats up 20K of RAM — and a TV cannot display it properly anyway.

Colour and sound are very important for good games, but again it is wise to check the specification against reality. Some manufacturers claim 16 colours as in "eight steady and eight flashing" or "eight foreground and eight background". They really mean eight colours. The more colours and sound channels the better, but see if they are usable. Colour and sound on the Commodore 64, for example, are poorly supported by the system software.

Peripherals Check what is actually available in the shops, and check the prices. The idiotic absence of joystick ports on the Electron, for example, will cost you. Ideally you should find out the cost of a full system including extra memory — if expansion is possible — joysticks, tape cassette, disc drives, printer, modem, etc. The computer is often the cheapest part of the outfit.

Software Nowadays most micros are used for running pre-written software, not for Basic programming, so the amount of software is important. Here the older machines score heavily. There are thousands of programs for the Apple and Atari micros, several hundred for the Sinclair Spectrum, under 100 for the Dragon and Colour Genie, and under 50 for the Lynx and Oric. A lot of the software for the cheaper micros is rubbish.

What's it for?

There is no single best home micro because different people want to do different things with their machines. Someone who wants to learn Basic should probably choose the Acorn Electron or BBC Micro, because the BBC Basic is the best; here the Commodore 64 is the one to avoid. If you want to play games, buy an Atari, because that has joystick ports, a cartridge slot and by far the best arcade-type games. The one to avoid is the Dragon.

The person who wants to run a small business from home needs a real keyboard and a range of word processors, spreadsheets, filing or database programs, and real software for things like stock control. This is where the Commodore 64 scores heavily because it uses an old Pet-style Basic, so established Pet programs can be transferred to it. Most of the other machines are poor in this respect, except the Apple II and IBM PC, which are far more expensive. The Atari 800 and BBC Model B are just about usable, but avoid the toy machines like the Mattel Aquarius and Sord M-5.

None of this means you should put off buying a micro now. There will always be better models on the horizon, but it is far more important to buy something — anything — and get stuck in.

ADVANCE £400

A truly amazing specification makes the Advance a machine to keep a close watch on. It is claimed to be compatible with the IBM PC, and 128K of RAM comes with the standard £400. machine. The processor is the 8086, a more powerful 16-bit chip than used on the IBM. The Model A comes with cassette interface and colour TV and monitor outputs. The Basic in ROM is written by Microsoft and supports sound and colour graphics. The keyboard is good for a home machine and is detached from the main unit on the end of a cable. For £876 you can buy the expansion unit which converts the Model A to the Model B, a full-spec business system. It has two 320K floppy-disc drives and four card slots. It runs MS-DOS, and WordStar, Mailmerge and Calcstar are included in the price.

For. Massive RAM. Powerful processor. Expandable to full disc-based IBM PC compatible system.

Against. New machine, new company — so no track record.

ALPHATRONIC PC £350

Triumph-Adler makes big micros for the office and is now trying its hand at a small micro for the home. The Alphatronic PC shows its origins in its very high quality keyboard and its provision for easy expansion. Built around the Z-80 processor, it comes with 64K of RAM, a cassette interface and both colour-TV and monitor output sockets. Serial and parallel ports and an expansion bus are provided as standard. The £330, 320K add-on floppy-disc drive comes with CP/M, so the Alphatronic PC is capable of running all sorts of sensible office software packages. Even the standard cassette-based machine comes with a very thorough Basic in 24K of ROM. The Alphatronic is a dual work-and-play machine, but with the emphasis on work.

For. High-quality keyboard. Disc and printer options. CP/M software runs on the expanded system.

Against. Not much games software. Not yet here.

APPLE IIE £850

The Apple started the computer boom in 1977. Now it has more good software than any other micro, both for business and pleasure. Anything that can be done with an eight-bit micro can be done with an Apple — at a price. But sound is limited, unless you buy a synthesier. The colour graphics are good but hard to use. There's VisiCalc, but for a lot of the business software you need CP/M — another extra card. While its expansion slots make the Apple supremely versatile, filling those slots costs a bundle. In spite of the 1982 upgrade it is beginning to show its age. Some rival machines — BBC Model B, Atari 800XL, Commodore 64 — lack the back-up and versatility, but are as powerful, easier to use, and less than half the price.

For. Versatile. Familiar. Masses of software.

Against. Expensive hardware and software needed to get the best out of it.

AQUARIUS £80

The Aquarius is produced by toy and computer games manufacturer Mattel, so it is no surprise it looks and feels like a toy. The basic machine is only £80, but then it only has 8K of ROM — including a limited Microsoft Basic — and 4K of RAM. In other respects the specification is pretty ordinary: Z-80A, 320 by 192 colour graphics, push-button keyboard with no space bar and a few stupidly placed keys. The Return key is worthy of the Lynx, and putting the Shift key next to the A is cretinous even beyond that. A £30 mini-expander adds 16K of much needed RAM, provides two game controllers and expands the sound facilities. The result is a machine that costs £10 more than the 16K Sinclair Spectrum but lacks its wealth of independent peripherals and cheap software.

Against. Overpriced. Limited RAM as standard. Limited graphics. Poor keyboard layout. Hardly any software.

ATARI £120-£300

For a long time after their launch in 1979 the 6502-based Atari 400 and 800, with their clever custom sound and graphics chips, were by far the best micros on the market. But while they were No 1 in the U.S. you could not get them in the U.K. and when they arrived they were vastly overpriced. Now that the hardware is competitive, the software is still too expensive for most people. Atari is locked in mortal combat with Commodore and has upgraded the 400 and 800 models on the 16-64K 600XL and 64K 800XL, with a CP/M add-on on the way. The Ataris have better graphics, a better Basic and more and better games software. As with Commodore, ROM cartridges, joysticks, special cassette recorders, discs, printers and other peripherals are widely available.

For. Easy to use. Good keyboards. Huge range of software and peripherals available. Great for games.

Against. Unusual and slow Basic. Needs dedicated cassette. Software is expensive.

BBC MICRO £400-520

The BBC Microcomputer got off to a shaky start with an incomplete operating system and waiting lists of up to nine months. As long-promised goodies became available and software flowed on to the market it started to look better and better. Now it is almost beyond criticism. It has a superb Basic, it's fast, and there seems no limit to what human ingenuity can extract from it. If there is a catch it is the price: the £400 base price requires you to add a £96 chip just to run discs — which the Commodore 64 and Atari micros do anyway. The BBC has mainly attracted copies of other people's games, leaving it inferior to the Atari as a fun machine. Nor has it attracted much good business software: the Commodore 64 is already well ahead here.

For. Fast, excellent Basic. Cheap software. Lots of expansion potential.

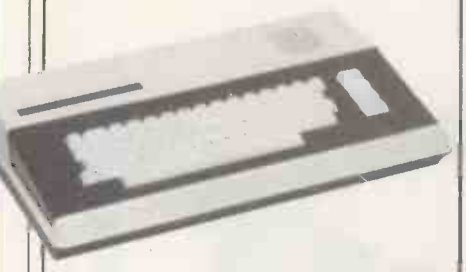
Against. Overpriced.

COLECO ADAM around £600

Video-games maker Coleco caused a huge stir at the June Consumer Electronics Show in Chicago by showing the Adam. There was nothing too spectacular about the specification: Z-80A, 80K of RAM, Applesoft-type Basic, two games controllers, proper IBM PC-style keyboard, built-in word processor — like the Elan — and Microdrive-style floppy tape. However, Coleco said it would throw in a daisywheel printer and the total price would be $600 — only £400 — while a CP/M add-on upgrade would be $400. Coleco actually demonstrated a working model in September, though the price had gone up to $700. Coleco claimed orders for 400,000 machines. If Coleco can deliver, the machine will be distributed in the U.K. by CBS.

For. Sounds wonderful.

Against. Doesn't exist.



COLOUR GENIE £168

The colour genie is not what it was. It is better. It now has 32K of RAM and costs £168, though you can pick up the old 16K version for less than £100. While not about to set the micro world alight it is an adequate machine, with a smallish software base that does include arcade games on cartridge. A modem is available and disc drives are promised soon. It has its own music synthesiser capable of a wide range of musical and non-musical sounds, and high-resolution colour graphics — with somewhat restrained colours. A real keyboard and as many ports as you could wish for give added appeal to more serious users. Possibly its best feature is the extended Basic, something which you have to pay extra for on the VIC-20 or Commodore 64.

For. Keyboard. Memory size. Good Basic. Sound.

Against. Small user base. Dingy colours. Old-fashioned.

COMMODORE 64 £230

The 64 is marketed as being equally at home in the office or playroom, and that is about right. It has a number of shortcomings, but on the whole it is very good value at £229. However, the Basic is a crude hangover from the past which is incompatible with all others, including Commodore ones. Although the hardware has some good features, like sprites and a synthesiser, they are difficult to use because they are not supported by the Basic. It is possible to buy a better Basic from Commodore, but it costs a lot of money. The operating system is awful and the manuals are atrocious. But despite all this the 64 is worth buying because it is a real computer, with real peripherals and real software. It is ideal for home word processing.

For. Price. Good spec. Available peripherals.

Against. Basic. Manuals.

DRAGON 32 £175

The Dragon 32 has a notoriously awful video display. However it does have a number of attractive features, not least of which is the keyboard. Maybe the best feature is the Dragon Basic, which closely resembles the Basic on the IBM PC. Sound is also reasonable on this micro, and the way that both sound and graphics are supported in Basic is very nice. Dragon's choice of the 6809 processor ought to be a plus: it is the best eight-bit chip around, and is easy to program, yet it does not seem to have inspired any programmers. Cassette loading is not easy on the Dragon, but there are to be discs that use Flex, a reputedly wonderful operating system. The Dragon manual is a masterpiece of muddled thinking. Expect the price to be reduced before long.

For. IBM PC-like Basic. 6809 processor. Real keyboard.

Against. Appalling video display. Lousy line edit. Awkward cassette operating system. Indifferent software.

(continued on page 145)

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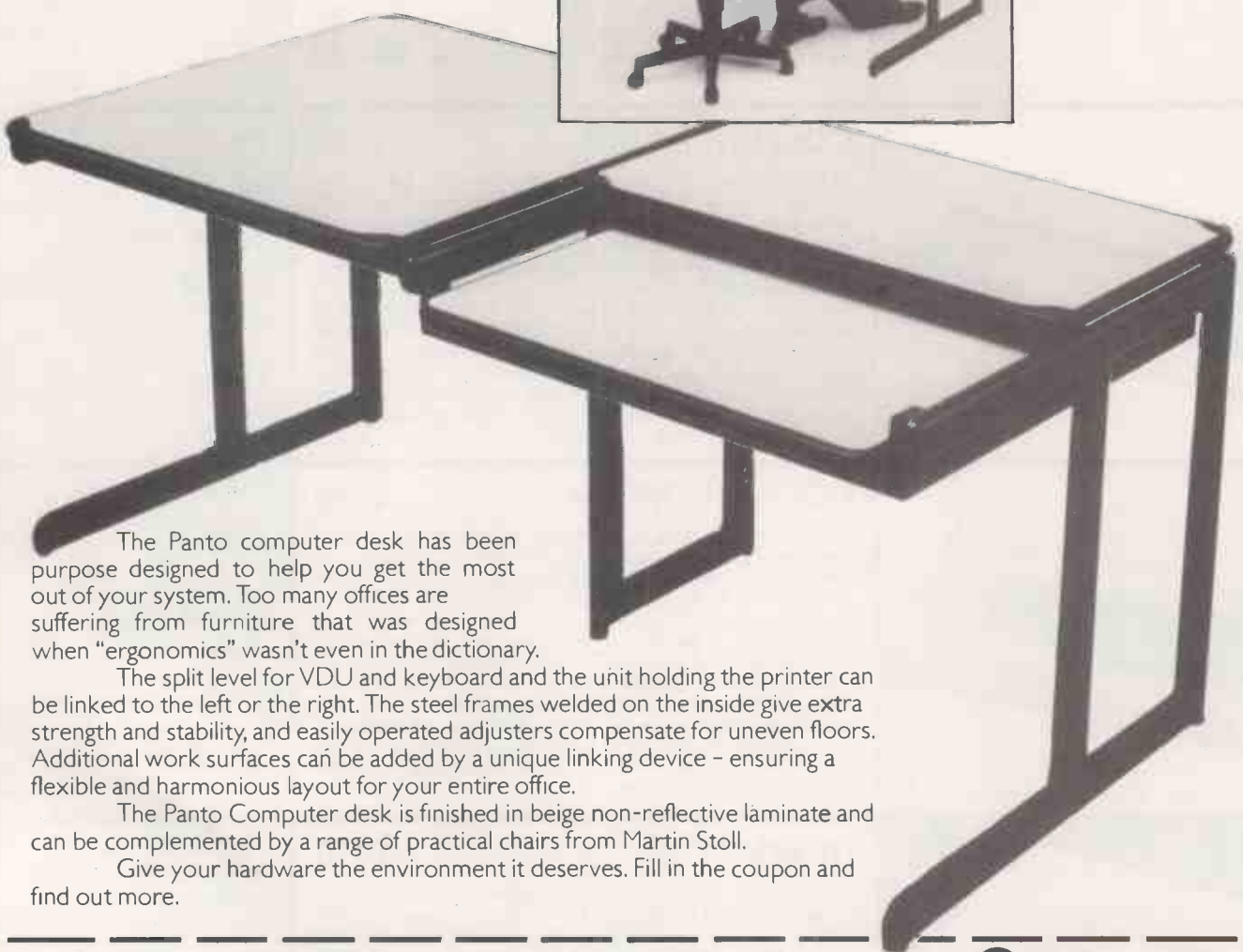

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ELAN £200

Take the specifications of all the current low-cost home micros, and beat them. Then build in a word processor and a joystick. That's the Elan. It has a proper keyboard you can type on, with a standard layout of keys. It has 64K of RAM expandable up to 3.9Mbyte. The familiar Z-80 runs at 4MHz. The Basic is based on the recent ANSI standard and the four sound channels even offer stereo. It has 256 colours and genuinely high-resolution 672 by 512 graphics. The output ports and expansion potential are outstanding. Unusually for a British micro, the Elan even as a proper cartridge port. Discs and other peripherals are promised. Unfortunately it does not actually exist, except as several separate boards in a card cage. Elan hopes to have machines for sale in April.

For. Sounds wonderful — and it's British.

Against. Not here yet.

ELECTRON £200

The Electron is Acorn's attempt to cash in on the BBC's popularity. It can be made more cheaply because most of the insides have been reduced to a single, huge 68-pin custom chip. Unfortunately it does not offer sideways scrolling and lacks the BBC's mode 7, the only graphics mode economical of memory. With a minimum of 8K needed for the screen, the 32K Electron does not come high in the memory stakes, and it has only one sound channel. Otherwise the Electron is like the BBC Micro, with the same excellent Basic and a proper keyboard. But the Electron has no proper cartridge slot, and no place to plug in standard, cheap joysticks, so it is no threat to the cheaper Spectrum and the more powerful Commodore 64 and Atari 800 XL.

For. Good keyboard. Excellent upwards-compatible BBC Basic.

Against. Overpriced. Limited free RAM. No joystick ports. Little software. Not quite BBC-compatible enough.

IBM PC £2,795

Is the IBM PC really a home computer? Of course that was one of the guiding principles of the design. It can produce superb graphics via the extra colour graphics card, and it has sound, even though it is only a single tone and not very versatile. In the U.S. where the PC was launched in late 1981, IBM offered a 64K cassette-based version at an Apple-type price. Now there are quite a few games and education programs for it too. In the U.K. the PC is far too expensive to be a home micro for people who do not run a business from home. But if the choice of home / business micro is between the IBM and something as expensive but totally lacking in amusement value, buy the IBM.

For. Well designed and made. Good range of software for business and pleasure.

Against. Vastly overpriced. Limited sound facilities. Software is expensive.

JUPITER ACE £90

Originally intended to rival the Spectrum as a mass-market home computer, the Jupiter Ace has had to adapt to a more modest role. Its distinctive feature is also its major drawback: you program it in Forth. While Forth has many virtues, it is difficult to read and uses the odd reverse-Polish mathematical notation. It is the wrong language for beginners and there is virtually no independent games software. The Ace has a Spectrum-style plastic keyboard, a Z-80 processor and 19K of RAM, 16K of which is tacked on to the back as something of an afterthought. TV output is in black and white. The Ace is not the ideal home machine. The latest marketing approach is as a serious control computer for industrial and educational applications.

For. A good implementation of Forth. Good for control purposes.

Against. Forth is hard for beginners. Not much independent software.

LYNX £225

The Lynx is a superficially attractive micro — which is to say, the more time you spend with it the more horrible it becomes. The first horror is the positioning of the Return key. The second disappointment comes when you discover that of the advertised 48K of RAM, not much over 13K is available to store Basic programs. The third source of despair is that the Basic is — to choose a kind word — idiosyncratic. Then you find writing to the screen is incredibly slow, that listings don't even scroll, and that you can't get any output to the printer. Perhaps there really will, one day, be a viable CP/M option for the 128K machine. But as it stands, the Lynx 48 is about the same price as a Commodore 64 or Atari 800 for an inferior piece of hardware with very little software.

For. High-resolution colour graphics.

Against. Odd Basic. Odd display. Limited free memory. Limited software.

(continued on page 147)

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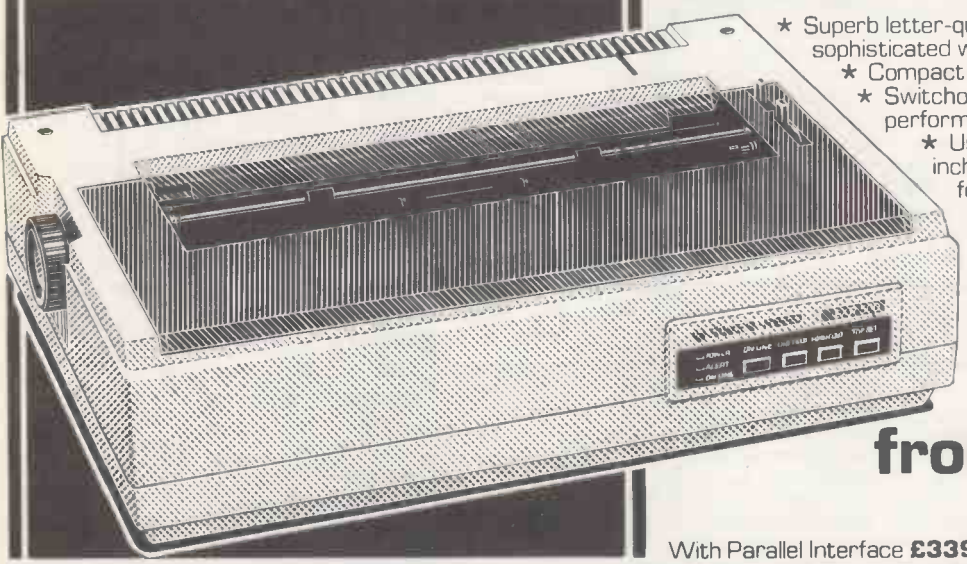

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MEMOTECH MTX £275-£315

Memotech is a name that is best known for a range of hardware add-ons for the ZX-81. Now it can also be found on a series of microcomputers. The basic MTX-500 is a Z-80 based micro with 32K of RAM, high-resolution graphics, 16 colours, a separate 16K video RAM and a number of ports, all for around £275. The ROM-based Basic contains a number of Logo-type commands and there is also a kiddy language aptly called Noddy. An assembler/dissassembler is also included in the ROM. However, the MTX series is not yet with us, nor are the promised Pascal ROM, 80-column video, floppy discs, hard discs, CP/M, silicon discs, colour WordStar, A/D converters and networking.

For. Just what the doctor ordered.

Against. Not yet available.

ORIC £100-£140

The Oric is destined to go down in history as one of microcomputing's also-rans, which is a pity because it is a smashing little micro. More than anything else the Oric is good at making sound. It shrieks, wails, zaps and pings as space invaders bite the high-resolution colour dust. It is not bad at making music either, with its built-in synthesiser. The keyboard design scores five out of 10 for trying, as it is laid out like a typewriter keyboard, but it does not feel like one. Oric Basic is let down by the high-resolution colour graphics which are difficult to use. What is inexcusable is the dreadful manual. The tape operating system is more than adequate, and the Oric printer/plotter is excellent. Fitted with discs, the Oric should attract users such as students.

For. Good specification. Ear-destroying sound.

Against. Poor manual. Video display problems.

SHARP MZ-711 £240-£420

So far the Japnaese have not discovered how to design a popular home micro, but the Sharp MZ-711 is the best attempt to date. It offers a good keyboard, a reasonable array of ports, eight colours and 64K of RAM — of which 36K is free to Basic. A four-colour pen printer/plotter and a dedicated cassette can both be fitted inside the spacious original case. However it comes with Basic on tape not ROM and has only block or character graphics, not bit-mapped graphics. These limitations were presumably supposed to maintain some compatibility with previous Sharp machines and thus provide access to a certain amount of software. But Sharp will have to bring its products up to date sooner or later, so why not sooner?

For. Beautifully made. Neatly accepts cassette and pen plotter.

Against. Basic on tape. Old-fashioned block graphics. Limited software.

SORD M-5 £150

The M-5 is made by one of Japan's fastest-growing companies, Sord, and is also sold in the U.K. as the CGL M-5. It is a well constructed games machine along similar lines to the Sinclair Spectrum. It has the same Z-80 processor inside and similar rubbery keys, and the additional facility of being able to accept software cartridges. Software is the Sord's principal weakness, however, with very few independently produced games available. The Sord's own Basic is a pathetically limited integer-only version. You have to pay more for a normal standard Basic. The Sord's limited standard 5K of RAM is expensive to expand too.

For. Well made. Cartridge slot.

Against. Very little software. Poor Basic. Not cheap to expand.

SPECTRUM £99-£129

The Spectrum is the dominant home machine by far. There are huge quantities of cheap software, and a whole industry to produce hardware additions. The Spectrum keyboard may be a nasty, clammy plastic thing, but there are several bolt-on keyboards available. Away from game playing and programming the Spectrum starts to lose out to machines like the Commodore 64 and the BBC Model B. Word processing on the Spectrum means a lot of extra add-ons and Sinclair's Microdrives cannot match the performance of a conventional floppy disc. Though criticised for diverging from the Microsoft standard, Sinclair Basic has a huge number of users, with innumerable books on it and programs written in it.

For. Vast software base. Good value. Lots of add-ons.

Against. Cheap keyboard. Not so good for the more serious uses in a computer's life.

(continued on next page)

TANDY COLOR £240

American-made and available only through Tandy stores here, the Colour Computer has not done as well as the very similar home-grown Dragon 32. The problem for a U.K. buyer is software: American software abounds, but it is somehow not the same for games, and a more severe drawback for some serious applications as tax laws differ. The Color Computer's Basic has good sound commands and good, if rather confused, graphics. Dragon programs keyed into the Color Computer will usually run but the Basic is tokenised differently so cassette or cartridge software will not. With the same 6809 processor as the Dragon it shares that machine's strengths and weaknesses. The Dragon is better supported here, and is cheaper.

For. Good keyboard Cartridge slot. Good Basic.

Against: All-Amercian machine. Software is all-American too. Overpriced.

TANDY MC-10 £100

Tandy's latest effort is aimed squarely at the Spectrum market. The keyboard is not a proper affair along Vic or Dragon lines, but it does compare well with the Spectrum as it has hard rather than soft plastic keys. On the other hand, the base-level MC-10 comes with only 4K of RAM as against the similarly priced Spectrum's 16K. The MC-10's Basic is actually worse than the Color Computer Basic, with very limited editing and debugging facilities and cryptic error messages. The MC-10 has colour graphics but the 64-by-32 resolution is pathetic by the standards of the competition. A mass of high-quality games software seems unlikely to appear, making the task of catching up with established rivals even more difficult.

For. Fairly cheap. Good manual.

Against. Poor Basic. Disappointing graphics.

TEXAS TI-99/4A £100

There is no better example than the Texas machine to illustrate how home micros have fallen in price. It started at almost £1,000, including an NTSC colour monitor, and in a couple of years crashed to under £100. It is solidly constructed and has a super keyboard and far superior colour graphics. But the Basic is no fun unless you buy the Extended Basic cartridge, which gives access to machine language and the sprite graphics, and the TI has a confusing expansion system which seems incredibly expensive. It costs £270 to add 32K of RAM because you also need to buy the Peripheral Expansion system. Worse, there is very little software. Some of the Texas brand games are truly awful and independent software is hard to find.

For. Well made. Good keyboard. Good graphics for low price.

Against. Slow, boring Basic. Expensive to expand. TI games generally poor. Dearth of independent software and support.

VIC-20 £140

The Vic-20 really proved Commodore's renewed commitment to home machines after early Pets began to drift up-market into offices. The Vic-20 has a good-quality keyboard and good sound facilities, and most important of all a very good software base. On more serious applications the Vic scores because of its proper keyboard, though the 32-character screen display is limiting. The Basic is old-fashioned. Standard memory on the Vic is 5K but most people fork out £40 for another 16K. Commodore computers need a special Commodore cassette unit, which is now supplied free with the Vic-20. For dual work-and-play use the 64 is probably the better buy, but as a cheap game machine the Vic-20 is still in the top rank.

For. Lots of game software. Good keyboard. Good sound.

Against. Poor Basic.

ZX-81 £40

Sinclair Research's ZX-81 is a classic. For hundreds of thousands, it was an introduction to microcomputing but can today be bought for the price of a London night out. Two years ago it was a marvel; nowadays it looks old fashioned. There are only four chips, and the 1K of RAM is big enough to store the names and addresses of all your friends only if you are really unpopular. A 16K RAM pack is available. The Basic is primitive, but that hardly matters as most software is written in machine code. The ZX-81 is the micro where the machine-code programmers have really risen to the challenge. There is no colour or sound, but just about every add-on imaginable can be bought from the enterprising cottage industry which has evolved around the ZX-81.

For. Cheap. Simple. Good manuals. Disposable.

Against. Crude by present standards. No colour or sound.

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Spectrum revisited

Zapping his way through the latest crop of cassettes, Jack Schofield decides that fancy graphics programming may not lead to a good game.

SPECTRUM GAMES have come a long way since I last reviewed a selection in the March issue. They may not be the Atari/Apple/BBC class, but they have effectively left the Dragon/Texas Instruments/Vic-20 category far behind — at least from the graphics point of view. Many current Spectrum games would have seemed impossible just a year ago.

However, the craze for three- and so-called four-dimensional programs is leading writers astray. All too often, as the graphics get more complicated the games get worse. A useful comparison can be made between the extremely simple-looking but very playable Jumping Jack from Imagine, and the enormously complicated graphics of Terror-Daktil 4D from Melbourne House. Jumping Jack is the better game.

The other limitations of current Spectrum games have more to do with the limitations of the machine, especially the poor sound and lack of standardised joysticks. However, most of the better games now offer users the chance to select their own operational keys or popular joysticks. Some, like Bug-Byte's tapes and Splat!, allow sound to be output via the tape recorder in the absence of a sound-to-TV channel or adaptor.

In a year Spectrum games have gone from, on average, simple but surprisingly good to complex but pretty bad. When complex graphics have become commonplace, however, we can expect them to be incorporated in more playable games. Manic Miner proves it can be done.

Harrier Attack

ORIGINALLY RELEASED for the Oric, Harrier Attack is a Falklands war game. Your plane takes off from a brightly coloured aircraft carrier and you fly over a ship and a well defined island to the target. You must then fly back before running out of fuel, or else you will have to bale out.

Notwithstanding the pretty pictures, the game is actually a simplified version of Scramble. Up and down plane movement is smooth, which makes it possible to dodge enemy planes and their rockets while you bomb their artillery. The game is less challenging than Penetrator, but easier to play.

Luna Crabs

CASSETTE LABELS often bear very little relation to the games themselves. Luna Crabs is unusual in that it has screen photographs on the cover. Yes, the game's three-dimensional graphics really are that good!

The yellow lunar landscape stretches out in front of your cannon towards the purple mountains. When you turn, the

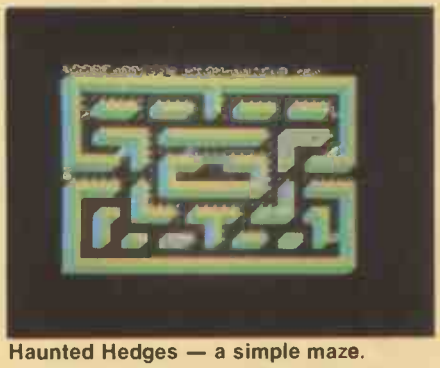
Manic Miner — in which Little Willy braves the Mutant Telephones.

Zzoom scores for good graphics, but Choplifter and Defender play better.

mountains scroll from left to right, or vice versa, through a full 360 degrees. It's beautifully done. Attacking crabs get bigger and bigger as they emerge from behind the mountains and come closer, firing at you as they approach. As three-dimensional graphics go, these are better than most.

Luna Crabs plays like something else but I can't quite remember what — Baja Buggies, perhaps. It is certainly a much better game than M J Estcourt's other popular effort, 3D Tanx from DK'tronics, which is just a shooting gallery.

Luna Crabs from Micromega.



Haunted Hedges — a simple maze.

Terror-Daktil 4D — outstanding graphics.

Harrier Attack, a Falklands game.

Terror-Daktil 4D

MELBOURNE HOUSE has a high reputation, earned for games like The Hobbit and Penetrator. The colour graphics in Terror-Daktil are truly outstanding, with a real three-dimensional landscape and bombs that reduce in size as they hurtle into the distance. The pterodactyls themselves are very finely drawn.

Sadly, while it provides a great graphics demo, Terror-Daktil 4D is a boring game. It is nothing more than a souped-up version of our old friend Space Invaders, and in playability much worse.

Haunted Hedges

LIKE TERROR-DAKTIL, Haunted Hedges is an "improved" version of an old standard — Pacman, in this case. The screen provides an aerial view of the maze, which is made of hedges, and the pizza-man has become a stick figure.

However, the maze has been simplified, the ghosts are little more than blobs, movement is slightly jerky, and for playability Haunted Hedges ranks way below the arcade version or even imitations such as Acornsoft's Snapper.

Hard Cheese

THIS IS another Pacman derivative, but without a fixed maze. You have to eat your way through the background while being chased by a mass of motorised mousetraps. You can fire at them but it is hardly worth the effort.

It is somewhat difficult to play Hard Cheese because there are no visible instructions. The game is fast, which makes it hard to learn, and you are dead almost before you get going. Perhaps there are more screens after the first one, and perhaps this is really a good game, but I wouldn't attempt it again without a joystick.

Maziacs

WHILE THE MAZIACS cassette cover is remarkably like the Hard Cheese one, the game is completely different. Maziacs has Adventure and arcade elements, but is primarily a maze game where a large stick figure representing the player has to find the treasure and return it to a spot in the maze.

The screen shows only 1/50th of the area of the maze, which makes it hard to find your way about. Pressing V gives a long-range view of about 1/12th of the maze, which is just enough to plan the way ahead.

The maze walls have sections containing food, swords and prisoners. You need the food to survive. You need the swords, because it costs a sword each time you fight and kill one of the bug-like Maziacs. You need the prisoners for information.

You always win fights as long as you are standing up and have a sword, so don't stop to think or the stick figure sits down for a rest. And don't fight Maziacs unless you know there is another sword within reach.

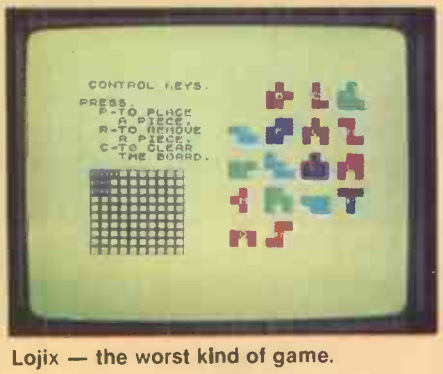
The game is quite complicated to play but has many nice design points. For example, you can set movement keys to suit yourself. At any point you can press I to read the instructions while play is suspended.

The game animation is good, though

(continued on page 153)

Game	RAM	Publisher	Price	Rating
Hard Cheese	16K	DK'tronics	£4.95	10/20
Harrier Attack	16K	Durrell	£5.50	9/20
Haunted Hedges	16K	Micromega	£6.95	8/20
Lojix	48K	Virgin	£5.95	0/20
Luna Crabs	16K	Micromega	£6.95	12/20
Manic Miner	48K	Bug-Byte	£6.00	18/20
Maziacs	48K	DK'tronics	£6.95	14/20
Racing Manager	48K	Virgin	£5.95	
Splat!	48K	Incentive	£5.50	12/20
Terror-Daktil	48K	Melbourne House	£5.95	11/20
Zzoom	48K	Imagine	£5.50	13/20

Racing Manager from Addictive Games.



Lojix — the worst kind of game.

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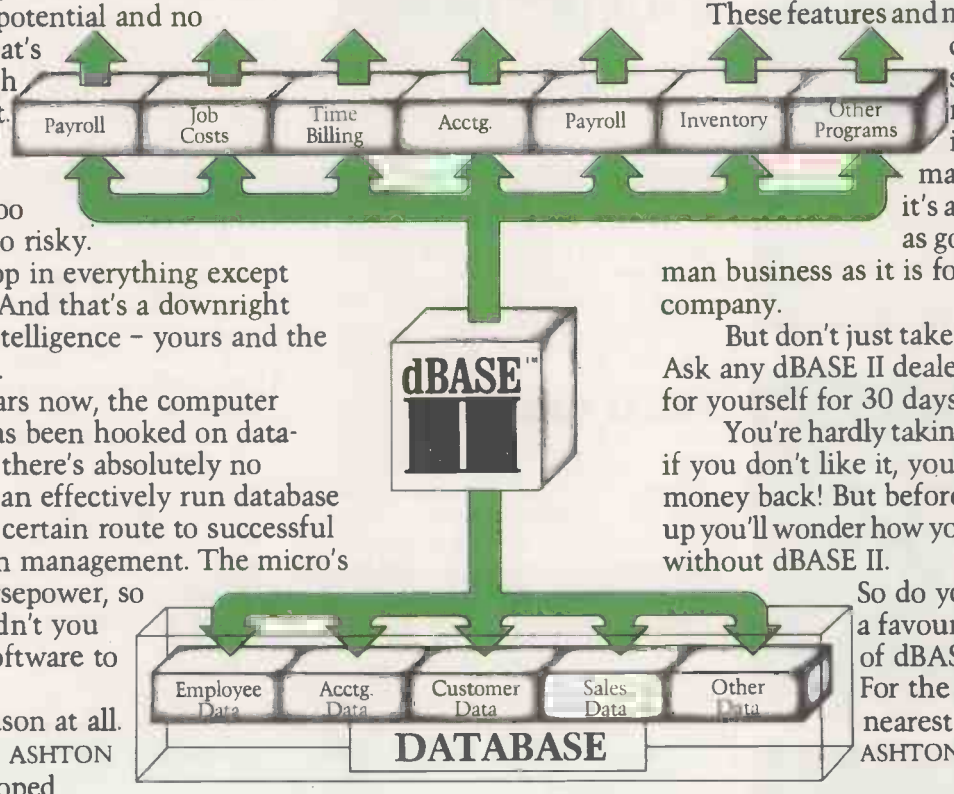

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(continued from page 151)

the fight sequences are somewhat overdone and grow tedious after a while. However, the game is quite absorbing and definitely challenging. If the idea of solving mazes catches your imagination you will enjoy this enhanced example of the genre.

Splat!

INCENTIVE SOFTWARE'S elegantly named new offering is a wall game rather than a maze game. You use keys or joystick to move a little x — no subtle graphics here — around a maze of walls. The aim is to explore, survive, and eat grass. If you do well you get to cross rivers and eat plums.

The catch — there has to be a catch — is that the x can only live inside a window surrounded by walls. The window scrolls over the maze in a random fashion. Nip between two maze walls to eat some grass and you can be cut off and crushed against the walls.

Though simple, this game is hard to play without either lots of practice or a joystick. As it took two people to write it, and it needs 48K, it may contain other wonders before "Escape at exit on level 7 (No chance!)". I didn't get past the first screen.

Living up to its name Incentive offers a prize of £500 for the highest score. There are code words hidden in the game to make sure you are not fibbing.

Lojix

ANOTHER GAME with an incentive offer is Lojix from Virgin Games. Virgin puts 50p in the kitty for every game sold and the first person to solve the puzzle wins the lot. However, Lojix is just the worst kind of computer game: not only does the computer fail to help you find a solution, it positively hinders you.

The idea is that you have 18 odd shapes to fit on to a 10-by-10 square. A popular early version of this board game is Pentominoes, where each different shape has a size of five units. Making them bigger does not make the game more interesting.

Playing the pieces on the board involves pressing numerous keys for position and rotation, which is just silly. If you really want to solve the puzzle, make a board and pieces out of bits of card. You will be able to experiment with variations a hundred times more quickly. Lojix itself is not a game to be recommended — but writing a computer program to solve the problem could be stimulating.

Racing Manager

ANOTHER VIRGIN GAME called Racing Manager is similar to the popular Football Manager from Addictive Games. The program lets you be a trainer entering horses in a day's racing and betting on the results. It all seems very thoroughly done and you do not have to watch all the races, just the final furlongs.

I happen to find real horse racing of no interest at all, and computer horse racing arouses positive antipathy. However, those who like racing will probably find this game entertaining. It is certainly challenging. It takes a long time to play and considerable effort to master. The extensive use of a printer is recommended, because without a "form book" you stand no chance.

Manic Miner

THE ORIGINAL Miner game is Bill Hogue's brilliant Miner 2049er for the Atari. It was inspired by Donkey Kong, and has in its turn inspired a legion of imitations. However, the Bug-Byte version has enough original graphics to stand on its own two feet.

In Manic Miner the feet belong not to Bounty Bob but to Little Willy, who has to navigate 20 screens of wonderfully original graphics. The horrors of the mine include seals with balls on their noses, aggressively mobile toilets with their lids flapping and the attack of the Mutant Telephones. Games addicts will spot joke references to many popular titles including Ah Diddums.

As well as superb graphics the game has good sound, with tunes from the *Peer Gynt* suite, etc., though these can be turned off. It is one of the few good Spectrum arcade games that is easy to play using the keyboard.

The Q and W keys take Willy left and right, and the Space key makes him jump. Keys from A to G provide a pause. Jumps need to be very finely judged to succeed in the object of the game, which is to avoid the mutant hazards and collect all the tokens on each screen.

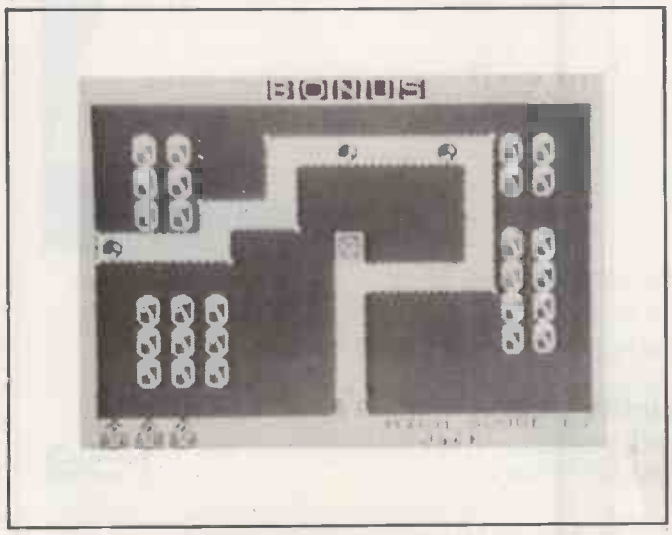
After three deaths you have failed. Willy then appears on a plinth, and a foot — inspired by *Monty Python*, perhaps — comes from the top of the screen and flattens him. It may take months to reach the Telephone level shown in the phograph here, but there is a demo mode so you can enjoy the graphics anyway.

Zzoom

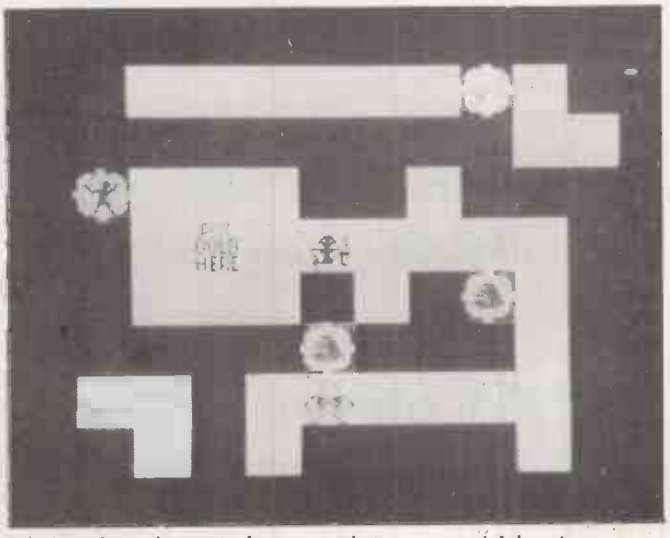
FINALLY, here is another three- or four-dimensional action game which is like a cross between Defender and Choplifter. The idea is that you fly a sort of skimmer and shoot down enemy planes who are bombing little men. The little men are pinched straight out of Choplifter.

The interest of the game is that it takes place in a well drawn three-dimensional landscape — or rather, at least three landscapes. Successive screens feature a road, a desert with palm trees and the sea. The planes fly past, then peel off towards you, again three dimensionally, as you try to shoot them down. Having downed all the planes, on the next screen you tackle tanks, and so on.

As with Terror-Daktil the graphics are far better than the game. As games Atari's Star Raider and Defender, Acornsoft's Snapper, and Broderbund's Choplifter are much more playable, and much more fun.



Hard Cheese — you need a joystick for the Pacman-style game.



Maziacs has elements from arcade games and Adventure.

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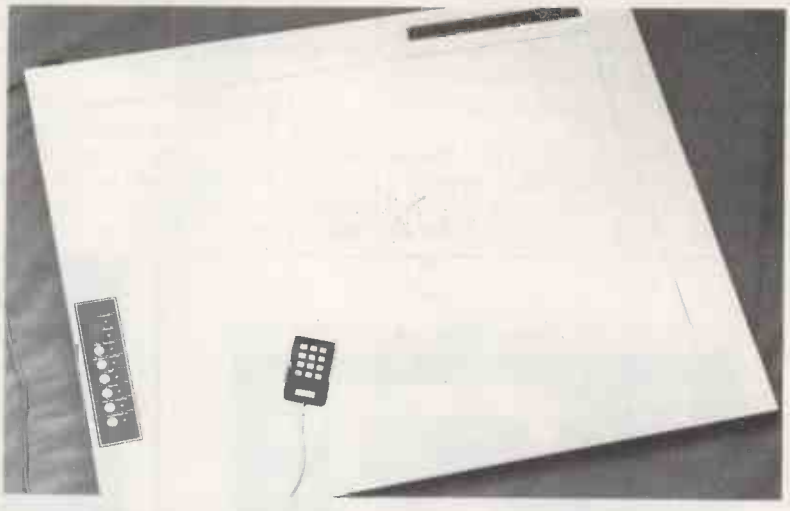

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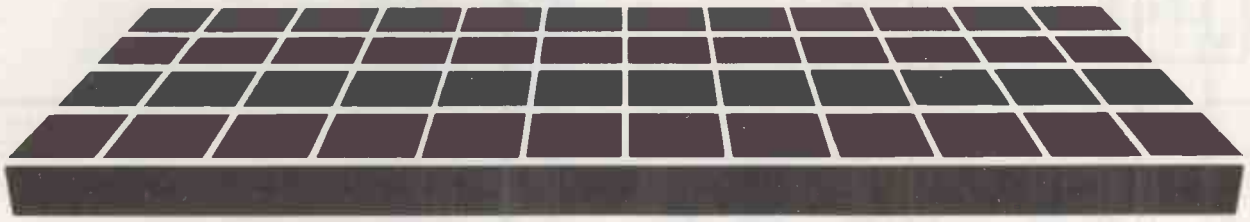

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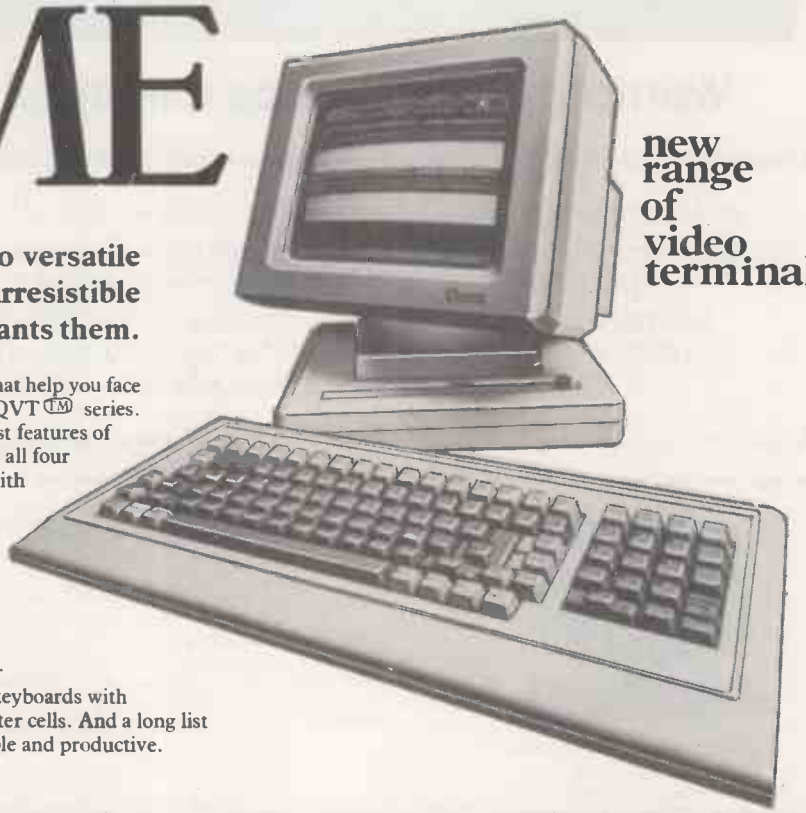

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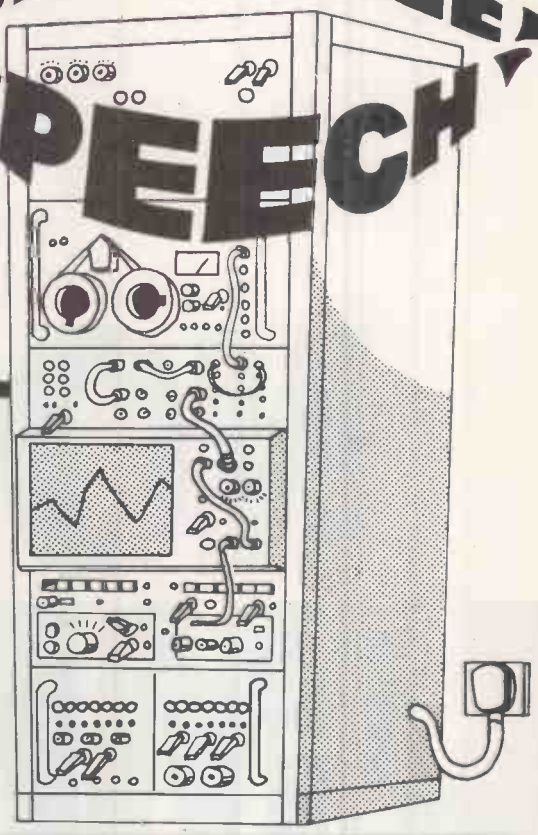

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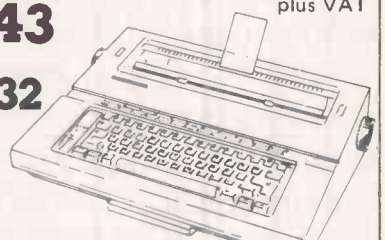

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Keyboard Facilities	10 programmable keys
Character Set	256 in ROM
Method of Display	TV, RGB, Comp/Sync colour or monochrome monitor
Display Facilities	Full screen handling, 4 screen paged
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Colours Available	16
Graphics Facilities	Scroll, reverse image
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Interfaces Included	Cassette port, light pen, joystick, Centronics
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>OPEN FILE

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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.

>COMMODORE

162 BACK-UP COPIER
Laurie Faulkner comes up with a quick way of making copies of an updated master disc.

162 BLOCK LOAD/SAVE
Pets lack the BLoad and BSave commands found in many other Basics; use this routine to save and load blocks of code.

>SINCLAIR

169 CASSETTE TALKER
Mark Dimon's program provides limited speech synthesis from a 48K Spectrum — without extra hardware.

169 WORD PROCESSOR
Even the 16K Spectrum lets you manipulate 500 words of text

170 BIGPRINT
Decorate your screen display with Oliver Völkers' large-character utility.

>TANDY

171 DEFINED FUNCTIONS
A set of 10 one-line routines to use in your programs.

171 DATA COMPRESSION
If your data includes a lot to dates, this program will help eke out precious memory.

172 GRAPHICS SELECTOR
Enhance screen displays with a routine which provides a choice of backgrounds.

>ATARI

177 FEARLESS U.K. PIRATES
R J Harvey's simple utility copies your discs file by file.

178 CALENDAR
The Julian Calendar started in 1753 — look up any date from then on using this perpetual calendar.

>BBC

186 WORLD WAR I
More death and destruction — do we really need it on the screen?

187 HAPPY
A personalised poster birthday greeting up to 6 feet long that you can set up on any printer.

190 VDU 23 DEFINER
This design aid will accept character definitions on a three-by-three matrix.

190 FIND ON BASIC II
An equivalence list to implement the Find routine.

>APPLE

191 WORDSQUARE
Create a 15-word puzzle on the screen — and solve it too, if you can.

195 HANGING AROUND
Dump high-resolution graphics to an Epson printer without wasting time.

>END OF FILE

196 BASIC-80 AIR ATTACK
Shoot down the incoming planes before they destroy your ship in this arcade game for tired Superbrain users.

196 JUPITER'S MOONS
To land safely you have to bomb the landing site clear in D F Haslam's Forth-coded game for the Ace.

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by Mike Todd

Back-up copier

OWNERS of disc drives will be well aware that back-ups of discs should always be made. The simplest way is to make complete copies of each disc, but it is more efficient to copy over only those files of which you do not already have copies.

Laurie Faulkner of Leicester found that as the library of programs grows it becomes increasingly inconvenient to ensure that the back-up discs are updated to include the most recent program. The straight-forward method is to make frequent comparisons between the master and back-up discs, and copy over all those programs not already backed up. But this is slow and tedious and really needs to be automated. Why do the work yourself when the computer can do it for you?

Mr Faulkner's idea was to read the directories of the two discs, compare them and copy over those which did not exist on the back-up disc. But reading the directory in Basic is a slow process — and reading two is even slower. As a result, his program only reads the directory of the master disc. It relies on the disc drive itself to check the back-up disc for a file of the same name. It does so by using the fact that an attempt to write a file with the same name as a file already on the disc will generate an error which can be detected by the program.

The program starts by checking that the correct pair of discs has been put in the drives and then builds a list of the master-disc files. It copies each one over to the back-up disc, checking to see if error 63, the File Exists error, is generated. If it is it goes on to the next file.

A list of the names of each file copied appears on the screen, and once under way the program can be left unattended to complete the task. The program listing has been processed to show the cursor controls in square brackets. In line 170

[DOWN2]

means two Cursor Down characters. Spaces to be typed within the quotation marks have been replaced by the character to make counting spaces a little easier.

Back-up copier.

```
130 PRINT"[CLEAR]~~~~[RVS]
    ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~"
140 PRINT"~~~~[RVS]~AUTOMATIC~BACKUP~
    DISK~UPDATER~"
150 PRINT"~~~~[RVS]~BY~~LAURIE~FAULKN
    ER~~FEB~1983~"
160 PRINT"~~~~[RVS]~~~~~~~~~~~~~~~~~~
    ~~~~~~~~~~~~~~~~"
170 PRINT"[DOWN2]ENSURE~THAT~[RVS]
    MASTER~DISK[RVOFF]~IS~IN~DRIVE~0"
180 PRINT"[DOWN]~~~~~~~~AND~[RVS]
    BACKUP~DISK[RVOFF]~IS~IN~DRIVE~1"
190 GOSUB 570
200 DIM D$(250):OPEN 15,8,15
    :PRINT#15,"I":GOSUB 510
210 K=1:B=30
220 S$="$1":DF=3
230 OPEN DF,8,0,S$
240 GOSUB 510
250 GET#DF,A$ :GET#DF,A$ :I$=""
260 IF ST<>0 GOTO 420
270 FOR A=1 TO B :GET#DF,A$
280 IF A$="" THEN A$=CHR$(0)
290 I$=I$+A$ :NEXT :I$=I$+"~~"
300 IF DF<>3 GOTO 330
310 J$=I$:S$="$0":DF=2
320 GOTO 230
330 IF B<>30 GOTO 370
340 PRINT"[DOWN]~~~~~~~~~~MASTER~DISK
    ~IS:[DOWN]":PRINT"~~~~~"MID$(I$,5,
    27)
350 PRINT"[DOWN]~~~~~~~~~~BACKUP~DISK
    ~IS:[DOWN]":PRINT"~~~~~"MID$(J$,5,
    27)
360 GOSUB 570:GOTO 400
365 REM READ MASTER DIRECTORY
370 FOR I=6 TO 27:IF MID$(I$,I,
    1)<>CHR$(34)THEN NEXT:GOTO 400
380 FOR J=I+1 TO 27:IF MID$(I$,J,
    1)<>CHR$(34)THEN D$=D$+MID$(I$,J,
    1):NEXT
390 D$(K)=D$:K=K+1
400 D$="":I$="":B=32:GOTO 260
410 REM COPY TO BACKUP
420 PRINT"[CLEAR]FILES~COPIED~TO~BACK
    UP~DISK~:[DOWN]"
430 FOR I=1 TO K-1
440 PRINT#15,"C1:"+D$(I)+"=0:"+D$(I)
450 GOSUB 510
460 IF ER=63 GOTO 480
470 PRINT"[RVS]"D$(I)
480 NEXT
490 CLOSE 2:CLOSE 3:CLOSE 15:END
500 REM CHECK ERROR CHANNEL
510 ER=0:INPUT#15,EN,EM$,ET$,ES$
520 IF EN=0 GOTO 550
530 IF EN=63 THEN ER=63:GOTO 550
540 PRINT"[RVS]"EN;EM$,ET$;ES$:STOP
550 RETURN
560 REM OK TO CONTINUE?
570 PRINT"[DOWN2]~~~~**~PRESS~[RVS]
    RETURN[RVOFF]~WHEN~READY~**"
580 GET A$:IF A$<>CHR$(13)GOTO 580
590 PRINT"[UP]~~~~----------
    ----------"
600 RETURN
```

Block Load/Save

It is often extremely useful to be able to save and load sections of the Pet's memory from within a program. It is a pity the Pet cannot use the Load and Save commands, something like the BLoad and BSave on the Apple.

The main problem is that the Pet's Save command uses the pointers to the start and end of the Basic program to identify the block to be saved. The Load command, when incorporated within a program, will automatically run the program, while in direct mode it will change the Basic pointers, causing all sorts of problems.

One solution is to write the bytes in the block to be saved one at a time using Basic, but this is extremely slow and tedious. R deBath of Manningtree in Essex has provided two short machine-code routines which will allow specified sections of memory to be saved and then reloaded at will, without any worry about the problems associated with the normal Load and Save routines.

The Basic loader program places the routines into the cassette buffer. If you have Basic 4, use the Data statements in lines 2000 to 2140; Basic 2 users should use lines 3000 to 3140 instead.

It is all very straightforward in Basic 2

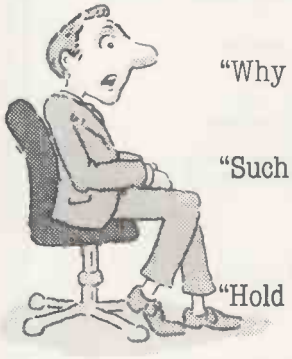
(continued on page 164)

Load/Save assembler routines.

```
0001  0000            ;***********************************
0002  0000            ;*                                 *
0003  0000            ;* BLOCK LOAD/SAVE (BASIC 4)       *
0004  0000            ;*      - BASIC 2 ADDRESSES GIVEN  *
0005  0000            ;*                                 *
0006  0000            ;***********************************
0007  0000            ;
0008  0000            ORIGIN = $0380
0009  0000            ;
0010  0000            ;***** ROM ROUTINES
0011  0000            ;*****   BASIC 4        ;BASIC 2
0012  0000            ;
0013  0000            CHKCOM = $BEF5          ;$CDFB
0014  0000            FRMEVL = $BD98          ;$CC9F
0015  0000            FCERR  = $C373          ;$D123
0016  0000            STRPTS = $C7B5          ;$D57D
0017  0000            GETADR = $C92D          ;$D6D2
0018  0000            LD15   = $F356          ;$F322
0019  0000            SV5    = $F6E3          ;$F6A4
0020  0000            TWAIT  = $F92B          ;$F8E6
0021  0000            ;
0022  0000            ;***** ZERO PAGE WORKSPACE
0023  0000            ;
0024  0000            WORK   = $00
0025  0000            INTADD = $11
0026  0000            RETADD = $1F
0027  0000            STATUS = $96
0028  0000            VERCK  = $9D
0029  0000            EAL    = $C9
0030  0000            FNLEN  = $D1
0031  0000            DEV    = $D4
0032  0000            FNADR  = $DA
0033  0000            TMP2   = $FB
0034  0000            ;
0035  0000                   * = ORIGIN
0036  0380            ;
```

(listing continued on page 164)

"HELLO. I'M ORION.
LET'S GET TOGETHER AT COMPEC, OLYMPIA LONDON, 15/18 NOVEMBER."



"Why should we?"

"Because I have a lot more to offer than you know."

"Such as?"

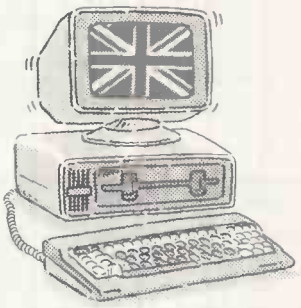
"An expansible memory up to 896K, vertical screens, enormous storage...."

"Hold on. Are you on speaking terms with other computers?"

"I will talk to anyone – other Orions, IBM and ICL mainframes; and I can link to information systems such as Viewdata (your electronic newspaper) and Telecom Gold so that between us we can send your mail electronically and telex 'while you work.'"

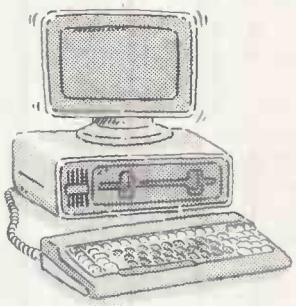
"The press keep writing about how quick you are."

"They say I am the fastest micro in town and what's more I'm keeping ahead of the herd by being able to offer you a low cost multi-user system with some exciting new software."



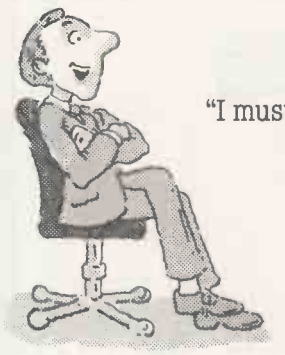
"Tell me about it."

"It's Minerva's multi-currency, multi-lingual, multi-user account package and Paxton's multi-user Business Desk. And in addition to Peachtree's available wide range of business software we have Micro Modeller, dBASE II, and word processing programs including Wordstar and OEM Gramma. We are adding more every day, including vertical application software."



"What other ideas have you?"

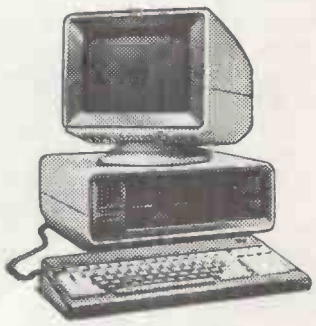
"For sure, with the Orion I.D.E.A.S. Relational Data Base we can create solutions to complex business problems at a fraction of the time achieved by other software tools."



"I must say you sound almost human. How can we get together?"

"Simple, come to COMPEC on 15-18 November. You will find me on Stand 803/910."

If you're interested and can't make it, put your business card in the post, or write to the address below.



OEM
ORION

ORION, Office and Electronic Machines PLC, 140/154 Borough High Street, London SE1 1LH. Tel: 01-407 3191.

● Circle No. 194

Basic loader.

```
11 REM ****************************
12 REM *                          *
13 REM * BLOCK SAVE/LOAD (BASIC4) *
14 REM *                          *
15 REM * LOAD:                    *
16 REM *   SYS896,DN,"NAME"       *
17 REM *                          *
18 REM * SAVE:                    *
19 REM *   SYS900,DN,"NAME",SA,EA *
20 REM *                          *
21 REM ****************************
1000 S=896
1010 READ A: IF A>255 THEN 1030
1020 POKE S,A: C=C+A: S=S+1: GOTO1010
1030 IF A<>C THEN PRINT"CHECKSUM ERROR"

2000 DATA 169,1,208,2,169,0,133,0
2010 DATA 160,0,132,157,132,150,32,228
2020 DATA 3,133,212,32,245,190,32,152
2030 DATA 189,32,181,199,133,209,165,31
2040 DATA 133,218,165,32,133,219,165,0
2050 DATA 240,13,32,86,243,32,43,249
2060 DATA 165,150,41,16,208,43,96,165
2070 DATA 212,240,38,201,3,240,34,32
2080 DATA 228,3,133,1,165,18,133,2
2090 DATA 32,228,3,133,201,165,18,133
2100 DATA 202,165,1,133,251,165,2,133
2110 DATA 252,32,227,246,169,76,133,0
2120 DATA 96,76,115,195,32,245,190,32
2130 DATA 152,189,32,45,201,165,17,96
2140 DATA 13359
2800 REM ****************************
2801 REM *                          *
2802 REM *   CODING FOR BASIC 2     *
2803 REM *                          *
2804 REM ****************************
3000 DATA 169,1,208,2,169,0,133,0
3010 DATA 160,0,132,157,132,150,32,228
3020 DATA 3,133,212,32,248,205,32,159
3030 DATA 204,32,125,213,133,209,165,31
3040 DATA 133,218,165,32,133,219,165,0
3050 DATA 240,13,32,34,243,32,230,248
3060 DATA 165,150,41,16,208,43,96,165
3070 DATA 212,240,38,201,3,240,34,32
3080 DATA 228,3,133,1,165,18,133,2
3090 DATA 32,228,3,133,201,165,18,133
3100 DATA 202,165,1,133,251,165,2,133
3110 DATA 252,32,164,246,169,76,133,0
3120 DATA 96,76,35,209,32,248,205,32
3130 DATA 159,204,32,210,214,165,17,96
3140 DATA 13580
```

(continued from page 162)

and 80-column Basic 4. Those using 40-column Basic 4 machines are likely to have problems as the last few bytes of the program will be overwritten by some of the operating-system variables. Of course, the program could be relocated. The ROM calls at the beginning of the listing are for Basic 4. Basic 2 addresses are also given where they are different.

The program has been written to be compatible with Mike Lake's routines provided in the January 1983 Open File. For those who wish to use it in this way or who simply wish to relocate it an assembly listing is provided.

To use the routines, all that is needed is an extended Sys command as follows;

SYS 900, DEVICE, "FILENAME", START ADDRESS, END ADDRESS

which will save the block of memory starting at the first address. The end address should be one more than the last byte to be saved.

Loading the block back again is even easier:

SYS 896, DEVICE, "FILENAME"

For example, to save the screen to the disc drive:

SYS 900, 8, "0:SCREEN", 32768,33768

Loading it back again is extremely quick and is done by:

SYS 896, 8, "0:SCREEN"

The routines will work with cassette or disc. Since cassettes are incapable of saving any memory beyond location 32767, the screen cannot be saved to cassette without first transferring it into memory.

(listing continued from page 162)

```
0037  0380             ;************************************
0038  0380             ; LOAD =
0039  0380             ;    SYS 896,DEVICE,"FILENAME"
0040  0380             ;
0041  0380             ; SAVE =
0042  0380             ;    SYS 900,DEVICE,"FILENAME",SA,EA
0043  0380             ;************************************
0044  0380 A9 01       LOAD   LDA #01          ;LOAD ENTRY
0045  0382 D0 02              BNE CONT         ;FORCED BRANCH
0046  0384             ;
0047  0384 A9 00       SAVE   LDA #00          ;SAVE ENTRY
0049  0386 85 00       CONT   STA WORK         ;FLAG LOAD/SAVE
0050  0388 A0 00              LDY #00
0051  038A 84 9D              STY VERCK        ;CLEAR FLAGS
0052  038C 64 96              STY STATUS
0053  038E             ;
0054  038E 20 E4 03           JSR VALIN        ;GET DEVICE#
0055  0391 85 D4              STA DEV
0056  0393             ;
0057  0393 20 F5 BE           JSR CHKCOM       ;CHECK FOR ","
0058  0396 20 98 BD           JSR FRMEVL       ;READ FILENAME
0059  0399 20 B5 C7           JSR STRPTS       ;SET POINTERS
0060  039C 85 D1              STA FNLEN        ;FILENAME LENGTH
0061  039E A5 1F              LDA RETADD       ;& START ADDRESS
0062  03A0 85 DA              STA FNADR
0063  03A2 A5 20              LDA RETADD+1
0064  03A4 85 DB              STA FNADR+1
0065  03A6             ;
0066  03A6 A5 00              LDA WORK         ;LOAD OR SAVE
0067  03A8 F0 0D              BEQ SAV1
0068  03AA             ;
0069  03AA             ;***** PERFORM LOAD
0070  03AA             ;
0071  03AA 20 56 F3           JSR LD15         ;ROM LOAD
0072  03AD 20 2B F9           JSR TWAIT
0073  03B0 A5 96              LDA STATUS       ;GET STATUS
0074  03B2 29 10              AND #$10         ;WAS IT OKPRINT
0075  03B4 D0 2B              BNE ILLEQ        ;IF NOT
0076  03B6 60                 RTS              ;RTS IF OK
0077  03B7             ;
0078  03B7             ;***** PERFORM SAVE
0079  03B7             ;
0080  03B7 A5 D4       SAV1   LDA DEV          ;CHECK DEVICE#
0081  03B9 F0 26              BEQ ILLEQ        ;IF NOT OK
0082  03BB C9 03              CMP #03
0083  03BD F0 22              BEQ ILLEQ        ;IF NOT OK
0084  03BF             ;
0085  03BF 20 E4 03           JSR VALIN        ;GET START ADDR
0086  03C2 85 01              STA WORK+1       ;WORK+1=START
0087  03C4 A5 12              LDA INTADD+1
0088  03C6 85 02              STA WORK+2
0089  03C8             ;
0090  03C8 20 E4 03           JSR VALIN        ;GET END ADDRE
0091  03CB 85 C9              STA EAL          ;EAL=END
0092  03CD A5 12              LDA INTADD+1
0093  03CF 85 CA              STA EAL+1
0094  03D1             ;
0095  03D1 A5 01              LDA WORK+1       ;TMP2=START
0096  03D3 85 FB              STA TMP2
0097  03D5 A5 02              LDA WORK+2
0098  03D7 85 FC              STA TMP2+1
0099  03D9             ;
0100  03D9 20 E3 F6           JSR SV5          ;ROM SAVE
0101  03DC A9 4C              LDA #$4C
0102  03DE 85 00              STA WORK
0103  03E0 60                 RTS
0105  03E1             ;
0106  03E1             ;***** HANDLE ANY ERROR
0107  03E1             ;
0108  03E1 4C 73 C3    ILLEQ  JMP FCERR        ;HANDLE ERROR
0109  03E4             ;
0110  03E4             ;***** READ INTEGER FROM BASIC
0111  03E4             ;
0112  03E4 20 F5 BE    VALIN  JSR CHKCOM       ;CHECK FOR ","
0113  03E7 20 98 BD           JSR FRMEVL       ;READ NUMBER
0114  03EA 20 2D C9           JSR GETADR       ;MAKE INTEGER
0115  03ED A5 11              LDA INTADD       ;.A=INTEGER
0116  03EF 60                 RTS
0117  03F0             ;
0118  03F0                    .END

ERRORS = 0000

SYMBOL TABLE

SYMBOL  VALUE
 CHKCOM   BEF5    CONT     0386    DEV      00D4    EAL      00C9
 FCERR    C373    FNADR    00DA    FNLEN    00D1    FRMEVL   BD98
 GETADR   C92D    ILLEQ    03E1    INTADD   0011    LD15     F356
 LOAD     0380    ORIGIN   0380    RETADD   001F    SAV1     03B7
 SAVE     0384    STATUS   0096    STRPTS   C7B5    SV5      F6E3
 TMP2     00FB    TWAIT    F92B    VALIN    03E4    VERCK    009D
 WORK     0000

END OF ASSEMBLY
```

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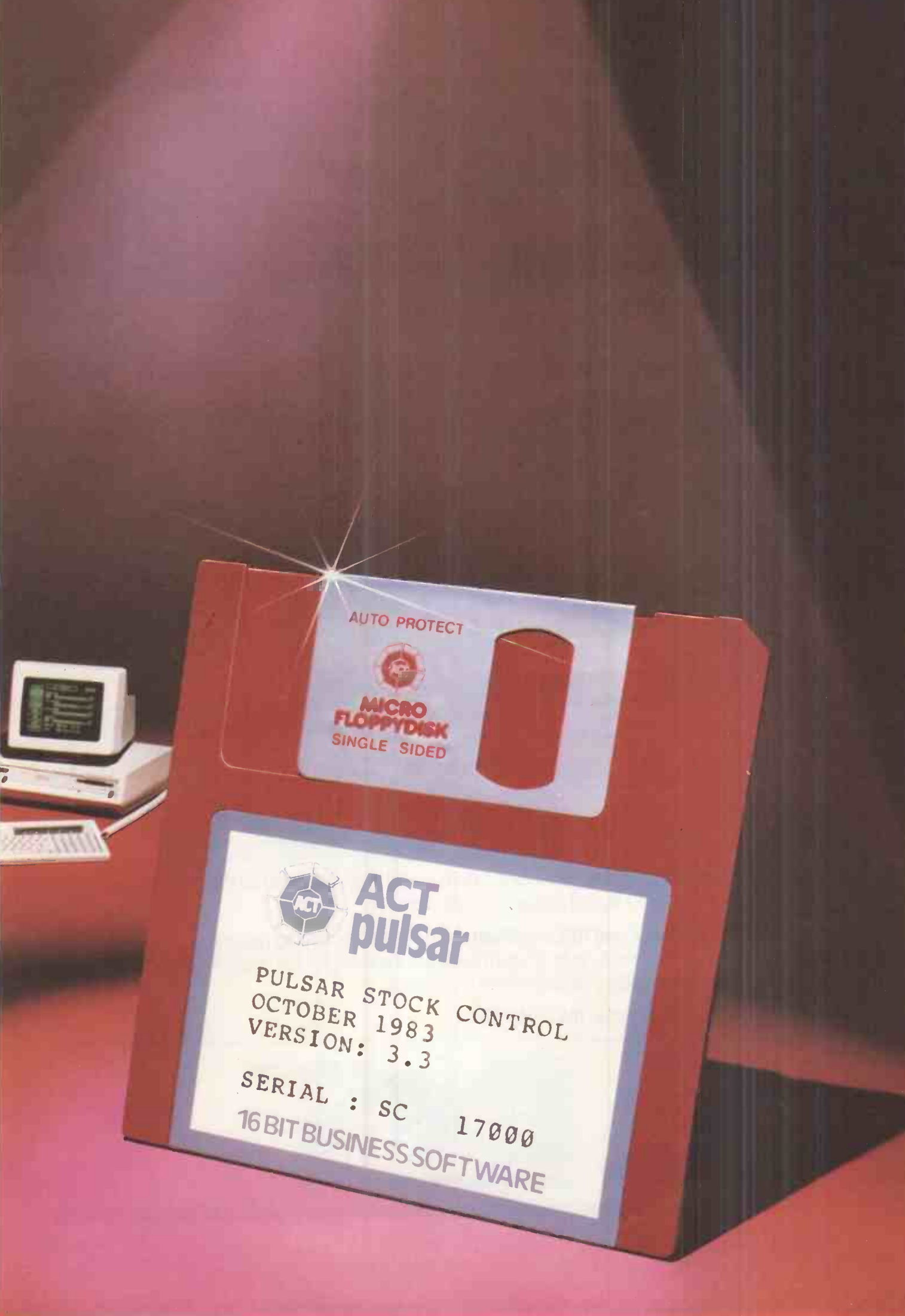
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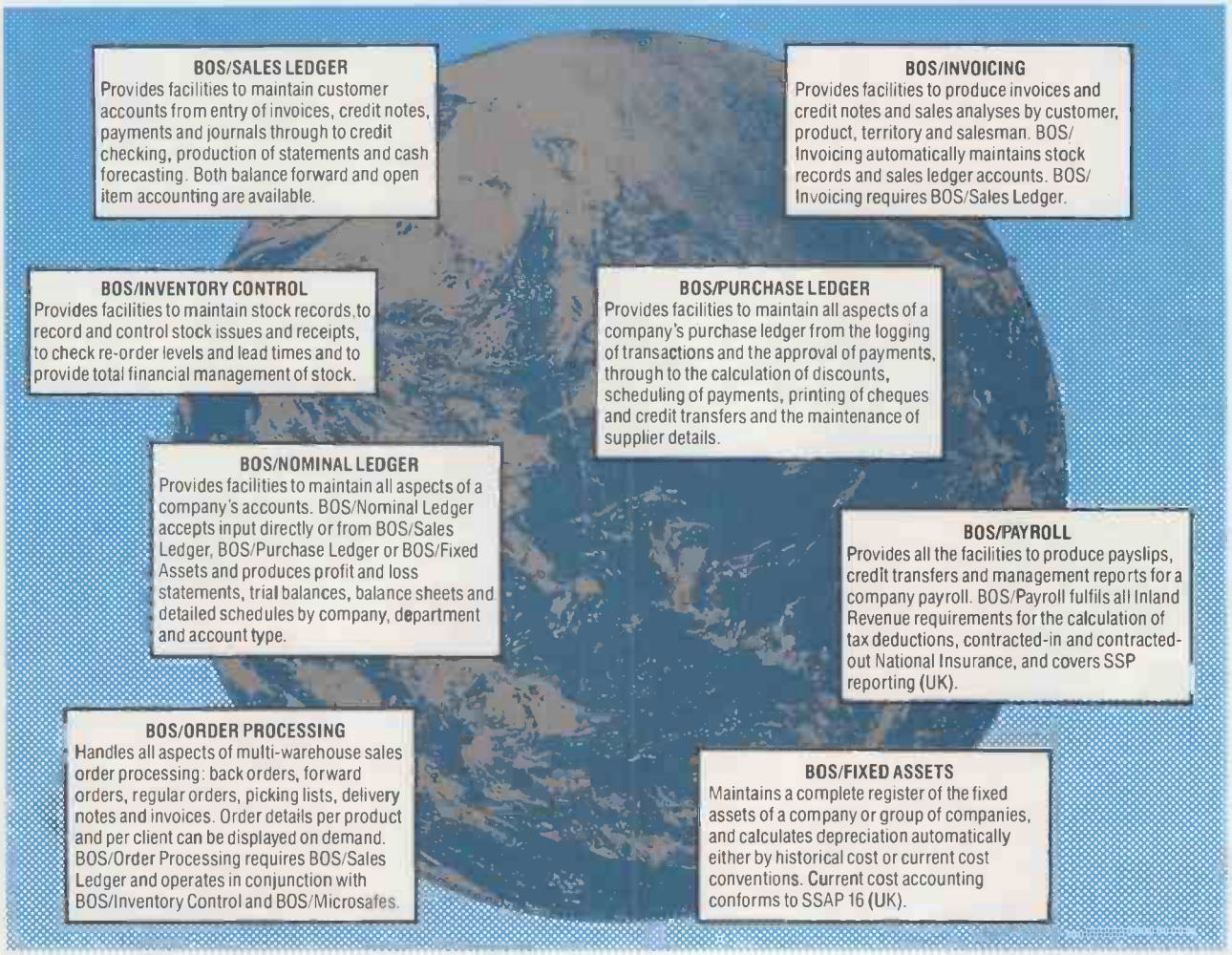

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Cassette talker

LIMITED SPEECH using only the cassette port of the Spectrum is possible, as this program by Mark Dimon of Gosport shows. It is written for a 48K Spectrum, and should work with all cassette recorders that allow the monitoring of a signal from an outside source.

Once the program has been loaded, disconnect the Mic lead from the cassette recorder, insert blank tape, and press the Play and Record keys. Then feed the signal from the cassette recorder's internal microphone to the Spectrum's cassette port.

The program works by periodically looking at the cassette port — bit 6 of input port 254 — and storing this value in memory along with the rest of the byte. In this way a square wave is built up in the memory with the same frequency variation as the original signal.

There are three machine-code routines. The first fills a block of memory with the data from the cassette port. The byte is, however, first rotated right twice to line up the relevant bit position of the cassette input port with the different bit position for the internal speaker. When the byte is output the bit recorded at the input port now drives the speaker.

The output routine simply sends the block of memory to the output port 254, reproducing the waveform stored in memory. The last routine is a delay which is called by both the other routines. The length of delay can be varied by changing the value of the parameter in the Data statement in line 31.

Talker.

```
  1 REM talker2.4
  2 REM for output to cassete
  3 REM port -change the data
  4 REM in line 17 to 203,31
  5 REM and make line 14:-
  6 REM LET one=233
  7
  8 REM the data in line 31
  9 REM is the lengh of delay
 10
 13 CLEAR 27000
 14 LET one=191
 15 REM input routine
 16 DATA 33,120,105,205,44,91,2
19,254
 17 DATA 0,0
 20 DATA 203,31,203,31,119,35,6
2,250,148,194,7,91,201
 21 REM output routine
 22 DATA 33,120,105,205,44,91,1
26,211,254,35,62,250,148,194,30,
91,201
 29 REM delay subroutine
 30 DATA 6
 31 DATA 4
 32 DATA 5,194,46,91,201
 33 FOR x=23300 TO 23346
 34  READ a: POKE x,a
 35 NEXT x
 50 REM menus
 51 CLS
 55 PRINT "e-enter word"
 56 PRINT "p-play back word"
 57 PRINT "v-veiwwave form"
 58 PRINT "s-stop program"
 59 INPUT "your option ";a$
 60 IF a$(1 TO 1)="e" THEN GO S
UB 120
 62 IF a$(1 TO 1)="p" THEN GO S
UB 300
 63 IF a$(1 TO 1)="v" THEN GO S
UB 140
 64 IF a$(1 TO 1)="s" THEN STOP

 66 GO TO 50
116 REM read in word
121 CLS
122 PAUSE 50
128 BEEP .1,-10
129 PRINT INVERSE 1;" talk now"
130 LET x=USR 23300
131 BEEP .1,10
132 PRINT INVERSE 1;"ok stop no
w"
135 RETURN
140 REM view word
141 CLS
142 PRINT "to view press space"
143 LET z=240
144 LET high=-1
145 LET low=-1
148 FOR x=27000 TO 64000
150 LET z=z+1
160 IF z>240 THEN LET z=0:
     GO SUB 400: CLS
     : IF a$="r" THEN RETURN
170 IF PEEK x<>one THEN PLOT z,
40: LET low=1: IF high THEN DRAW
0,50: LET high=0
180 IF PEEK x=one THEN PLOT z,9
0: LET high=1: IF low THEN DRAW
0,-50: LET low=0
185 NEXT x
200 RETURN
300 REM play word
310 LET x=USR 23323
320 RETURN
400 REM input for view
405 PRINT AT 2,5;"Address is ";
x
406 PRINT AT 4,5;"j-jump to new
address"
408 PRINT AT 5,5;"r-return"
409 PRINT AT 6,5;"space-to cont
inue"
410 LET a$=INKEY$
420 IF a$="j" THEN INPUT "new a
ddress ";x: RETURN
430 IF a$=" " OR a$="r" THEN RE
TURN
440 GO TO 410
```

Word processor

THE VERY LONG strings available in Sinclair basic form the basis of this word-processing program by C P Marriner of Grimsby. The 16K Spectrum has about 9K of memory for user programs but this program uses about 4K, leaving space for five pages each of 704 characters held in the arrays a$( ) and t$( ). Array a$( ) is used to store the current page, while t$( ) is used to store the pages of text when they are not being processed on the screen. By Poking into the attribute screen it is possible to achieve a flashing cursor which can travel over the text.

On running the program you are presented with a menu. Selecting option 6 allows you to set aside four pages on the 16K and up to 35 pages on the 48K. Option 8 takes you to the current page, which can be used like a typewriter.

Once a page is completed it can be copied on to one of the pages set aside using option 3. Pages can be saved on tape or printed on the printer. Using the Remove Spaces option allows a number of pages to be printed with no spaces in between.

In option 1 you are asked for the name of the file you wish to load. Press Play then wait until it loads.

Option 2 asks for the name of the file you wish to save. Press Record and Play when the tape is ready. Press any key to save the file. After saving, rewind the tape, press Play and the file will be verified. If there is an error Goto 1000 will get the text back.

To print out use option 4. You will be asked for the page you wish to print on the printer. If you do not remove spaces the file printed will be the same size as the screen. If spaces are removed then space on the end of the page is not printed.

For option 4 to clear a page, enter the page you require and the page will be cleared. To clear all use option 6 and enter the number of pages you wish to set aside. In option 7, to use all the keyboard, enter one of the graphics or Caps Lock. Option 8 returns to current page.

On the current screen, Caps-Shift, 5, 6, 7, 8 move the cursor round the screen. Edit opens up text; Delete closes up text; true video moves text down one line; inverse

(continued on next page)

Word processor.

```
    1 LET s=1: CLS : DIM l(1): PR
INT "Word-Pro C.P.Marriner  ©198
2    " OVER 1; BRIGHT 1;AT 0,0;"
                                
";: BEEP 1,0: BEEP 2,5: BEEP 1,10
: POKE 23562,1: PAPER 6: BORDER
5: INK 0
 100 DIM a$(704): LET p=5: GO TO
 3000
 900 LET k$=" ": GO TO 1010
1000 LET k$=INKEY$: IF CODE k$=k
 THEN LET s=s+1
1004 IF k<>CODE k$ THEN LET s=1
1005 LET k=CODE k$
1006 IF p>704 OR p<0 THEN LET p=
(p>704)*704+(p<0): GO TO 1000
1010 IF k$="" THEN GO TO 1000
1020 IF k>=3 AND k<13 THEN BEEP
.01,50: GO SUB 2000: GO TO 1000
1030 IF k=13 THEN GO TO 3000
1035 LET x=INT (p/32): LET y=p-1
-INT (p/32)*32: IF y=-1 THEN LET
 y=31: LET x=x-1
1040 BEEP .04,40: POKE 22527+p,5
5: LET a$(p)=k$: PRINT AT x,y;k$
: LET p=p+1: POKE 22527+p,187: G
O TO 1000
2000 LET p=p+((k=9)-(k=8))*s: PO
KE 22527,8*7: LET p=p+((k=10)*32
-(k=11)*32)*s: PRINT AT 0,0;a$:
POKE 22527+p,187
2020 IF k=7 THEN LET a$(p+1 TO 7
04)=" "+a$(p+1 TO 704): PRINT AT
 0,0;a$: POKE 22527+p,187: RETUR
N
2030 IF k=12 THEN LET a$(p TO 70
4)=a$(p+1 TO 704): PRINT AT 0,0;
a$: POKE 22527+p,187: RETURN
2040 IF k=4 THEN POKE 22527+p,8*
7: LET a$(p TO 704)="
                    "+a$(p TO 7
04-33): LET p=p+32: PRINT AT 0,0
;a$: POKE 22527+p,187
2050 IF k=5 THEN POKE 22527+p,8*
7: LET a$(p-32 TO 704)=a$(p TO 7
04): LET p=p-32: PRINT AT 0,0;a$
: POKE 22527+p,187
2090 RETURN
3000 BEEP .5,1: BEEP .5,10: CLS
: PRINT "File size ";l(1);" page
s": PRINT "1. Load file"'"2. Sav
e file"'"3. Change page"'"4. Pri
nt out"'"5. Clear a page"'"6. Cl
ear ALL "'"7. Use rest of keyboa
rd"'"8. Return to text"
3010 LET k=CODE INKEY$-48: IF k<
1 OR k>8 THEN GO TO 3010
3020 GO SUB 3000+(k*100): GO TO
3000
3100 CLS : PRINT "LOADING FILE":
 INPUT "Input name of file "; LI
NE n$: PRINT AT 10,5;"Trying to
load";n$;"'now": LOAD n$ DATA l
(): BEEP 2,0: CLS : PRINT AT 0,0
;"THE FILE IS ";l(1);" PAGES LON
G": LOAD n$ DATA t$(): BEEP 2,40
: RETURN
3200 CLS : PRINT "SAVING FILE":
INPUT "Name of file "; LINE n$
3205 PRINT AT 10,5;"Saving";n$;
"'": SAVE n$ DATA l(): BEEP 1,20
: SAVE n$ DATA t$(): BEEP 1,40
3210 CLS : PRINT "VERIFY FILE":
PRINT AT 5,5;"Press a key to sta
rt": PAUSE 0: PRINT AT 10,5;"Ver
ifying";n$;"'"'"Use GOTO 1000 t
o repeat": VERIFY n$ DATA l(): B
EEP 1,0: VERIFY n$ DATA t$(): BE
EP 2,40: RETURN
3300 CLS : PRINT "CHANGE CURRENT
 PAGE": INPUT ("Current page bec
omes(0-";l(1);")0-none");n: IF n
<>0 AND n<=l(1) THEN LET t$(n)=a
$
3310 INPUT ("New current page(1-
";l(1);") ");n: IF n<=l(1) THEN
LET a$=t$(n,1 TO 704)
3315 IF n>l(1) THEN PRINT "Page
number too big": BEEP 1,-10: PAU
SE 0
3316 RETURN
3400 CLS : PRINT "PRINT OUT": IN
PUT "Page number(1-";l(1);")";
n: INPUT "Remove spaces (Y/N) ";
n$: IF n>l(1) THEN GO TO 3400
3410 LET p$=t$(n): IF n$="y" OR
n$="Y" THEN FOR a=704 TO 1 STEP
-1: IF p$(a)<>" " THEN LET p$=t$
(n,1 TO a): GO TO 3420
3415 IF n$="y" OR n$="Y" THEN NE
XT a
3420 LPRINT p$: RETURN
3500 CLS : PRINT "CLEAR A PAGE":
 INPUT "Page to be cleared(1-";(
l(1));") ";n: IF n<=l(1) THEN LE
T t$(n)=""
3510 RETURN
3600 CLS : PRINT "CLEAR ALL": IN
PUT "Number of pages ";l(1): PRI
NT "Press a key to clear": PAUSE
 0: DIM t$(l(1),704): RETURN
3700 CLS : PRINT "USE ALL KEYBOA
RD": INPUT "Input what you requi
re "; LINE m$: IF LEN m$>=0 THEN
 LET a$(p)=m$(1): LET p=p+1
3710 RETURN
3900 GO TO 900
5000 SAVE "Word-ProI" LINE 1: BE
EP 3,40: REM 16K+: GO TO 5000
```

Bigprint.

```
  10 REM  BIG PRINT
  12 REM  for ZX Spectrum
  14 REM  ©1983 Oliver Voelckers
  20 CLS
  30 INPUT "Text (max 8 characte
rs):",t$
  40 PRINT AT 21,0;t$'AT 0,0;
  50 LET p$=""
  60 FOR i=7 TO 1 STEP -2
  70 FOR j=1 TO 63 STEP 2
  80 LET p$=p$+CHR$ (128+POINT (
j,i)+2*POINT (j-1,i)+4*POINT (j,
i-1)+8*POINT (j-1,i-1))
  90 PRINT p$(LEN p$);
 100 NEXT j
 110 NEXT i
 120 STOP : GO TO 20
```

(continued from previous page)

video moves text up one line; Enter returns to menu. Each text page is 704 letters long. You must remember not to use Basic keywords.

Bigprint

HAVE YOU EVER wanted to add big letters to your programs like those in commercial games? Oliver Völckers of West Berlin has an easy way to do so on any Sinclair Spectrum. Characters of 16 times normal size are generated and can be sent to the printer, or displayed on the screen in any colour using normal Print statements.

When you have typed in and run the program, it will ask you to input a text, which may be up to eight characters long. You may use upper- or lower-case characters, as well as numbers, signs or graphics characters. The program then starts to print the big letters.

The pattern is stored in P$, so whenever you Print or LPrint P$ the big writing will be produced. You can use

LET X$ = P$

or

LET A$ = X$ + P$

to store more than one word at a time.

To use Bigprint with your existing Basic programs store the big text you want as strings which are not covered by your program. Then save Bigprint and merge your program into Bigprint, which should still be in memory. Then erase the remaining lines of Bigprint one by one.

Use ordinary Print statements where you want to have the big text, for example:

PRINT AT 3,0; X$.

Be careful not to use Clear or Run as this clears the variables area and the big letters with it. Finally save your program using the autostart facility:

SAVE "filename" LINE 1

and the big letters will be available within your program.

After the text has been input it is printed at the lowest line of the screen in normal size. Line 80 examines four pixels of the small text at a time and finds the block-graphics character, CHR$ 128 to 143, which contains the same pattern. Line 90 prints the last character of P$ the graphic character which has just been found. The process is repeated 128 times, as one line of big writing consists of four lines of 32 block-graphic characters each. Variables i and j are used for the two loops; t$ contains the input text and p$ the big letters.

Defined functions

HAVE YOU SEEN that wonderful source book of ideas, Lewis Rosenfelder's *Basic Faster and Better and other Mysteries?* It is the fourth of a very interesting series of books on the Tandy and includes listings for using the various routines of Basic, especially those somewhat neglected ones like Varptr, for a more efficient and speedier program. No serious programmer should be without it.

But be warned. Although the style is very readable and you do not have to be a very advanced programmer to understand it, it needs some really hard study to get the most out of it. Mr Rosenfelder encourages his readers to build up a library of defined functions, DefFn, and gives a wide variety for all sorts of uses, such as converting byte addresses above 32767 for Peeking and Poking, and for converting time and date into convenient and economical sizes. He develops these quite simple ideas into extremely useful programs for fast sorts, graphics with the speed of machine language, for scrolling and splitting screens and other wizardry.

I have a little group of defined functions of my own.

Function 1 gives Mod Y/Z, that is, the remainder after dividing Y by Z. Function 2 strips the sign, which is invisible in positive numbers, from numeric variables and changes it to a string. If function 3 equals −1 then bit B is set, and if function 4 equals −1 then bits not set in H are not set in A.

Function 5 gives the sum of all integers up to and including Y. Function 6 sets bit A in variable B. Function 7 can be used in graphs, etc. to reduce an X in a range whose upper limit is Y to a smaller range whose upper limit is F. Function 8 ensures that any address, whether or not it is greater than 32767, is within the acceptable range of Peek and Poke.

Function 9 enables TRS-DOS to LPrint Tabs in excess of 64. To use it, define the function and then LPrint FNJ$(X), where X is a Tab exceeding 64. Function 10 gives the starting address of the position in memory where A$ is stored. It is very useful for fast graphics.

Defined functions.

```
1. DEFFNA(Y<Z)=Y=(INT(Y/Z)*Z)
2. DEFFFNB$(Y)=RIGHT$(STR$(Y),
   LEN(STR$(Y)-1)
3  DEFFNC(B)=((C AND 2^B)=2^B)
4  DEFFNH(A)=((H OR A)=H)
5  DEFFND(Y)=Y*(Y+1)/2
6  DEFFNE(A)=(B OR 2^A)
7  DEFFN(X,Y)=INT(X/Y*F)
8  DEFFNH(K)=((K>32767)*(65536-K))
   -((K<32768)*K)
9  DEFFNJ$(X)=STRING$(X-PEEK(16539),32)
10 DEFFNK(B$)=PEEK(VARPTR(A$)+1)
   +256*PEEK(VARPTR(A$)+2)
```

Date compression.

```
10 INPUT"DAY OF WEEK";D
20 INPUT"DATE";DA
30 INPUT"MONTH";M
40 INPUT"YEAR";Y
50 Y=(Y-1980)*16:MY=MY+Y
60 DA=(DA-1)*8:C=D+DA
70 IF C=13 THEN C=16
80 ' Here insert your filing routine as;
     90 OPEN"O";1,"DATER"
     91 PRINT£1,CHR$(C);",";CHR$(MY)
     92 CLOSE:END
100DATASunday,Monday,Tuesday,Wednesday,
Thursday,Friday,Saturday
110 FOR X= 1 to 7:READG$(X):NEXT
120 DATAJan,Feb,Mar,Apr,May,Jne,Jly,Aug,
Sep,Oct,Nov,Dec
130 FOR X= 1 to 12:READM$(X):NEXT
140 ' Now recall the coding as
      132 OPEN"I",1,"TEST"
      133 INPUT£1,CHR$(C),CHR$(MY)
      134 CLOSE:END
150 IF C=16 THEN C=13
160 FOR X= 0 TO 7:IF X>2 THEN 190
170 IF (C AND 2^X) THEN DA=DA+2^X
180 GOTO 200
190 IF (C AND 2^X) THEN DT=DT+2^X
200 NEXT X
210 FOR X= 0 TO 7:IF X>3 THEN 240
220 IF (MY AND 2^X) THEN M=M+2^X
230 GOTO 250
240 IF (MY AND 2^X) THEN Y=Y+2^X
250 NEXT: CLS:
260 PRINT"This is represented by ";
    C;" for the day of the week &
    the day of the month and ";MY;
    for the month & year"
280 END
```

Date compression

Memory space on disc or tape is always worth saving. One of the most frequent items of data put into a data file is the date, and even the most economical format DD/MM/YY will take up eight bytes of memory. Tape users have space to think about, but also the time needed to save and load. So a method of saving a date with just two bytes — and that includes the day of the week — is surely worth looking at.

The first byte holds the information about the day of the week and the day of the month. Seven days of the week multiplied by the maximum 31 days in a month means that you can link a day of the week to a day of the month by using one of 217 numbers. A regular code results, in which 9 will always represent Sunday, the second day of month, and 39 will represent Saturday the fifth.

All you need is a routine that will instruct the computer how to encode for filing and decode for translating. Use the three least significant bits of the byte to identify the day of the week and the remaining five to identify the date of the month. The table shows how.

In the table we can see how bits 0,1 and 2 are used to identity the day of the week. Binary, like decimal or hex numbers, are usually interpreted as having the lowest or least significant value on the right. However, the bits in a byte are usually written the other way round with the lowest or least significant bit, bit 0, on the left.

You can now use bits 3 to 7 to indicate the day of the month. If you take the day of

(continued on next page)

(continued from previous page)
the week as Tuesday, the three least significant bits will be 1 1 0. So the byte defining Tuesday as the first day of the month will be

1 1 0 0 0 0 0 0

which is 3 decimal, Tuesday the 2nd will be

1 1 0 1 0 0 0 0

which is 11 decimal, Tuesday the 3rd will be

1 1 0 0 1 0 0

which is 19 decimal, and so on.

In decimal mathematics, if X is the ordinate number of the day of the week and Y is the day of the month then

X+((Y−1)*8)

will identify both X and Y if you use a reverse formula to extract them. To decode this number, divide it by 8, add 1 to the quotient, giving the day of the month; the remainder is the day of the week.

The month and year is encoded in a similar way. Use the first four bits to encode the number of the year and the second four to encode the year. Each set of four bits provides 16 alternatives, which is quite sufficient for the months. For the years you add a number to a base year: using 1980, set the second four bits as

0 0 1 1

or 3 decimal and get the program to add 1980 after decoding it.

Any of the eight positions in a byte can be either occupied or vacant or, to make it a little more numerical, they can either represent 1 or 0. If the bit is 1 it is said to be "set".

Although a bit can only be in one of two states, its position in the row determines its value. If P is its relevant position in the byte its value is 2↑P. The lowest position is 0, and 2 to the power of zero is always 1. So any odd-value byte will always have the zero bit set or equal to 1. In position 1, the bit if set equals 2↑1; in position 2 if set equals 2↑2, and so on.

The program works as follows. You first input the number of the day of the week — starting with Sunday as 1, Monday as 2 and so on — followed by the date. Then enter the number of the month, and finally the year. In line 50 the year is subtracted from 1980, the base year in this case, and multiplied by 16.

In line 60, the day of the week occupies the first three positions and the date of the month the last five and so the date of the month, less one to give a zero, is multiplied by 8. The CHR$(13) in line 70 is used by the DOS as a limiter of records. So whenever 13 is read from a disc, the computer thinks that it has come to the end of a record and starts to read the next byte as the beginning of the next record; "13" is never regarded as a piece of data. From the table you can see that 16 is never used as there are only seven days in the week. You can file 16 with no difficulty and then change it to 13 when we come to decode it. Of course, these values are not filed as numerical values or integers, which need two bytes to record; they are filed as CHR$(16) or whatever the value is, which is only one byte.

Fly pilot

Every now and then people get the urge to write one-line programs. The shortest one I know which does anything useful is the screen word processor:

```
1 PRINT INKEY$;:GOTO 1
```

But Dr J Lowe of Plumtree, Nottingham has sent in a game, no less, in one line.

You pilot a fly through a stream of fly spray which appears to be aimed by someone just off the bottom of the screen. You use the X and Z keys to guide the fly, and the object is to keep the fly alive as long as possible — really, Doctor, not a very hygienic program!

Dr Lowe suggests that you will not be able to type the whole program in as one line, though I had not trouble. When you have entered all you can, the trick is to go into Edit mode, type X and type in the last few characters.

Graphics selector

I have a little routine which produces a display screen with a variable background based on the graphics characters 129 to 191. The number of the generating graphic appears in the centre. By pressing any key you can go through the entire range until you find the most suitable one for your needs. Then define A in line 20 as that graphic character number and use the routine as a Gosub to produce the pattern with your own text in the centre.

How to win friends

I have a plea to all those who send in programs to this column. First, please remember that we only have two or three pages and so really long programs simply cannot be accommodated. It is difficult to be precise, but we could fit in no more than 200 lines for a very good program. So please try and pack your programs as efficiently as possible.

Do not be like one contributor recently who sent in a 200-odd liner with a single statement on each line. But do not pack them too efficiently by removing all spaces. Remember that others will want not only to copy them, but also to understand them. One more point: if you send in a program more than 20 lines or so PLEASE send a tape or disc recording of it. Nobody has time here to copy long programs into memory just to see how good they are.

Fly pilot.

```
1 IFPEEK(P+15425)=94THEN"DEAD FLY
AT";T:FORN=1TO400:NEXT:CLS:RUN:ELSET=T+
1:POKE16441,0:S$=CHR$(92)+CHR$(179)+CHR
$(47):PRINT@P,S$:PRINT@RND(5)+965+P-RND
(5),CHR$(94):A$=INKEY$:IFA$="Z"ANDP>11T
HENP=P-1:GOTO1:ELSEIFA$="X"ANDP<53THENP
=P+1:ELSEGOTO1
```

Date compression table.

Bit Number	0	1	2	3	4	5	6	7	
Sunday	1	0	0	0	0	0	0	0	1 decimal
Monday	0	1	0	0	0	0	0	0	2 decimal
Tuesday	1	1	0	0	0	0	0	0	3 decimal
Wednesday	0	0	1	0	0	0	0	0	4 decimal
Thursday	1	0	1	0	0	0	0	0	5 decimal
Friday	1	1	0	0	0	0	0	0	6 decimal
Saturday	1	1	1	0	0	0	0	0	7 decimal

Graphics selector.

```
1' This prints on screen a
  diamond-shaped pattern in the graphic
  character indicated in the centre.
2'Press any key to draw the next screen.
10 CLEAR 1000:CLS
20 FOR A= 1 TO 64
30 FOR X= 32 TO 1 STEP -5
40 A1$= STRING$(X,128+A)
50 PRINT A1$;:PRINT TAB(64-X)A1$;
60 NEXT: PRINT STRING$(1,128+A);:PRINT
   TAB(63)STRING$(1,128+A)
70 FOR X = 2 TO 32 STEP 5
80 A1$=STRING$(X,128+A)
90 PRINTA1$;: PRINT TAB(64-X)A1$;
100 NEXT X
110 PRINT%477,A+128;
120 IF INKEY$="" THEN 120
130 CLS:NEXT A
(:::::::::::::: 96 LINE::::::::::::::)
```

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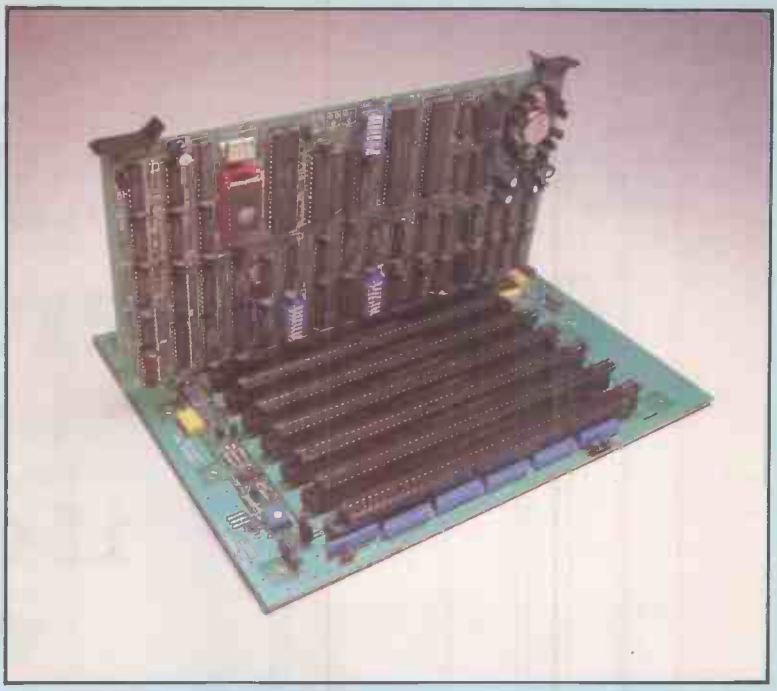

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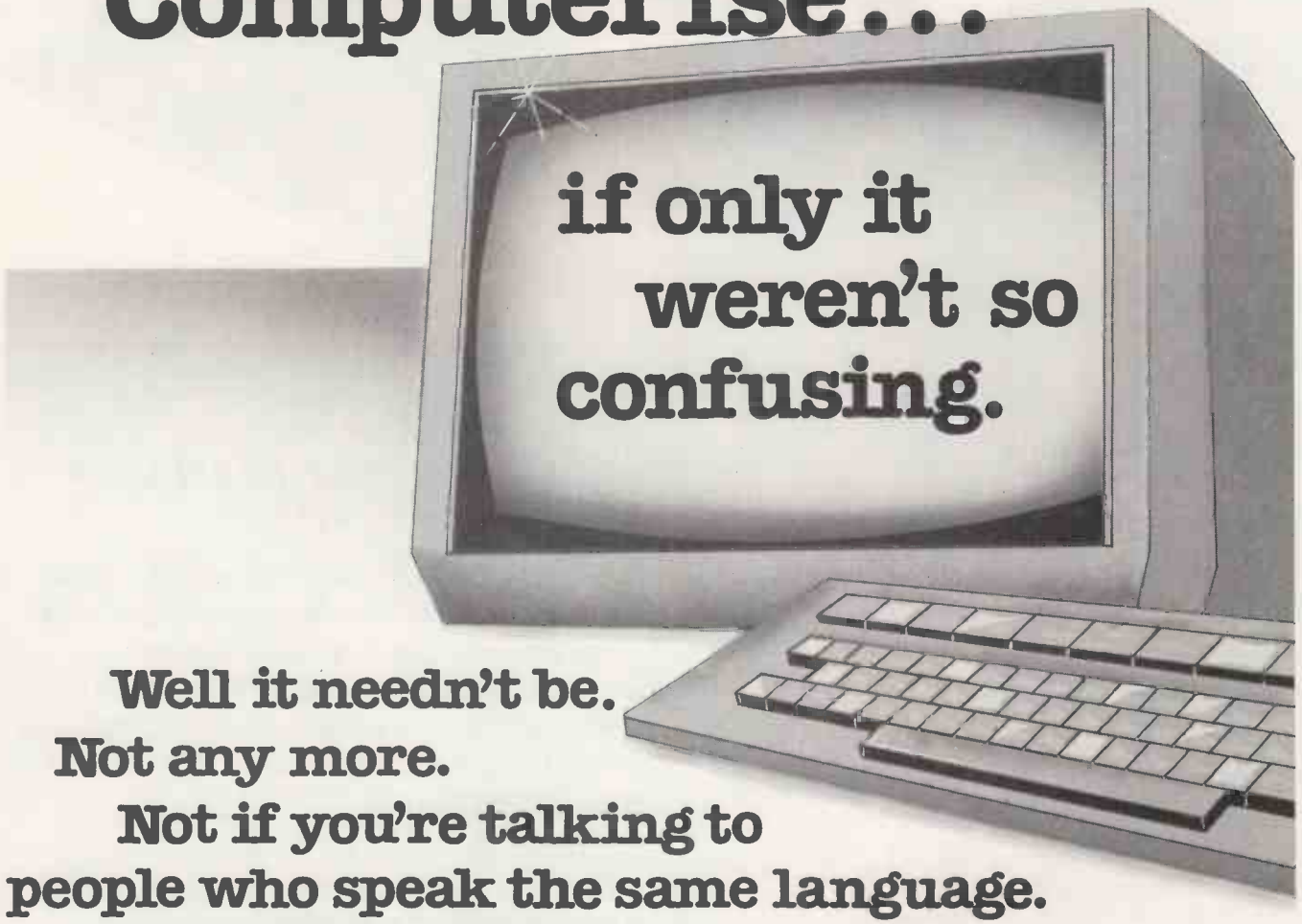

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Fearless U.K. pirate

THE HIGH PRICES of software for the Atari sometimes tempt copiers, and there are a number of copying utilities on the market. The Chip and the Happy Drive — both American products — seem to allow any disc to be copied. The Micromainframe, at $550, not only allows copying but is also one of three extensions which enable the Atari to run CP/M software, plus TRS-80 Model II and Oasis software. There is also a device on the market for dumping ROM cartridges to disc.

In response Atari, whose own CP/M maker is not expected until next year, is rumoured to have hired a private eye called Mad Dog, who has successfully assisted the prosecution of hundreds of pirates. "The nickname attaches because of his effectiveness and vindictiveness when it comes to pirates. His results reflect the enjoyment he finds in his work," reports a U.S. user group. Honest, it's true.

R J Harvey of Worthing has obviously not heard of Mad Dog, as he has submitted a short, simple disc copier. It uses Pokes into location 770 to transfer data sector by sector from one disc to another. This is not the same as using Atari DOS, which copies discs file by file. If the programmer has not used the file structure or has placed important data on an unflagged sector it will not be transferred by DOS, and when the program is loaded it will not run.

Mr Harvey warns that this is an early and simple form of copy protection. His program will not copy discs protected by bad sectoring. When such a program loads it attempts to read the bad sector, and if it can't the program runs. If it can read the sector it knows it has been copied and exits. Nor will it cope with custom formatting as used by Sirius, Broderbund and others. This form of protection involves selectively not formatting certain sectors, so when the program attempts to read such sectors it only runs if they don't exist, hence the scrunching noise these discs make when they are booted!

The catch is that the 810 disc drive is intelligent, and when it formats discs it is not under the control of the computer. Therefore there is no way to prevent the disc drive from formatting a particular sector.

Location 770 does offer some control over disc operations. Poke it with 82 to Read, 87 to write with verify, 80 to Put without verify, and 81 to read spin. A full account of this and surrounding locations is given in *Compute!*'s invaluable book *Mapping the Atari* by Ian Chadwick.

R J Harvey's program provides an instructive insight into disc operations, hence its publication here. The English are frightened of neither Mad Dog nor the midday sun.

Fearless U.K. pirate.

```
5 POKE 752,1:? "}":SNUM=0:SEC=0
10 DATA 104,32,83,228,96
20 FOR I=1536 TO 1540
30 READ J:POKE I,J:NEXT I
40 HIMEM=PEEK(741)+256*PEEK(742):LO
MEM=PEEK(144)+256*PEEK(145)+30
50 OPEN #1,4,0,"K:"
60 REM READ FROM DISK
70 POKE 710,192:? :? " INSERT SOURC
E DISKETTE, TYPE RETURN":GET #1,X
75 ? :? "      ****READING DISK****
":ROW=PEEK(84)+2
80 FOR M=LOMEM TO HIMEM-130 STEP 12
8
90 SNUM=SNUM+1:POKE 770,82:IF SNUM=
721 THEN POP :GOTO 200
100 POKE 779,INT(SNUM/256):POKE 778
,INT((SNUM/256-INT(SNUM/256))*256)
110 POKE 769,1
120 POKE 773,INT(M/256):POKE 772,IN
T((M/256-INT(M/256))*256)
130 X=USR(1536)
140 POSITION 3,ROW:? "Sector ";SNUM
150 IF PEEK(771)<>1 THEN 1000
151 ENUM=0
160 NEXT M
200 REM PUT TO DISK
210 POKE 710,32:? :? " INSERT DESTI
NATION DISK, TYPE RETURN":GET #1,X
215 ? :? "      ****WRITING DISK****
":ROW=PEEK(84)+2
220 FOR M=LOMEM TO HIMEM-130 STEP 1
28
230 SEC=SEC+1:POKE 770,87:IF SEC=72
1 THEN 500
240 POKE 779,INT(SEC/256):POKE 778,
INT((SEC/256-INT(SEC/256))*256)
250 POKE 769,1
260 POKE 773,INT(M/256):POKE 772,IN
T((M/256-INT(M/256))*256)
270 X=USR(1536)
280 POSITION 3,ROW:? "Sector ";SEC
290 IF PEEK(771)<>1 THEN 2000
291 ENUM=0
300 NEXT M
310 ? "}":GOTO 60
500 POKE 710,148:? :? "OPERATION CO
MPLETE, NO ERRORS DETECTED"
510 END
1000 ENUM=ENUM+1:IF ENUM=4 THEN POK
E 710,146:? :? "**READ ERROR**":END

1010 GOTO 100
2000 ENUM=ENUM+1:IF ENUM=4 THEN POK
E 710,146:? :? "**WRITE ERROR**":EN
D
2020 GOTO 240
```

(continued from previous page)

Calendar

Sometimes, at home or in the office, you need to look up a date in a past or future year, and to help you do so Philip Wade's program provides a universal calendar. It is very easy to use: just input a year and the computer displays that year in three four-monthly screens. It works for years from 1753, when the present Julian Calendar was introduced.

The program is easy to follow because of the use of meaningful variable names. It also uses good Atari techniques including long strings instead of string arrays and the use of function keys via Poke 53279. It is, of course, even more readable to issue an FKeys = 53279 and then use Poke(FKeys) instead.

Line 420 starts with a Chr$(95), and you could enter

LN$ = Chr$(95)

instead of the text shown. The rest of the line shows how quickly and easily a long string can be filled with a particular character. For an explanation of how it works, see Ian Sinclair's new book *Get More From The Atari*, published by Granada.

Use inverse video to type the quotes containing Start, Select and Invalid Year, and the e and r in Calendar. Two Pokes in line 490 which may not be familiar are to locations 656 and 657. They hold the cursor positions in the four-line text window by row and column respectively. Row values can be 0 to 3 and column values 0 to 39.

Calendar.

```
10 REM CALENDAR :PHILIP WADE (C) 198
3
20 GOTO 390
30 REM DAYFINDER
40 READ MONTH$:D=1:K=INT(0.6+(1/MONT
H)):L=YEAR-K:Q=MONTH+(12*K):P=L/100
50 Z1=INT(P/4):Z2=INT(P):Z3=INT((5*L
)/4):Z4=INT(13*(Q+1)/5)
60 Z=Z4+Z3-Z2+Z1:Z=Z-(7*INT(Z/7))+1:
MLEN=VAL(ML$(MONTH*2,MONTH*2+1))
70 IF MONTH=2 AND (YEAR=4*INT(YEAR/4
) AND YEAR<>100*INT(YEAR/100) OR YEA
R=400*INT(YEAR/400)) THEN MLEN=29
80 RETURN
90 REM 1st.ROW
100 ? "}":POSITION 8,0:? YEAR:POKE 5
59,34
110 POSITION 1,10:? LN$:POSITION 1,2
0:? LN$
120 FOR TOP=2 TO 22 STEP 20
130 GOSUB DAYFIND:Y=Z+2:X=TOP
140 POSITION TOP+2,1:? MONTH$
150 FOR I=1 TO 7:POSITION TOP-2,I+2:
? D$(I,I):NEXT I
160 FOR A=1 TO MLEN:POSITION X,Y:? A
170 Y=Y+1:IF Y=10 THEN X=X+3:Y=3
180 NEXT A
190 MONTH=MONTH+1:NEXT TOP
200 REM 2nd.ROW
210 FOR BOT=2 TO 22 STEP 20
220 GOSUB DAYFIND:Y=Z+12:X=BOT
230 POSITION BOT+2,11:? MONTH$
240 FOR I=1 TO 7:POSITION BOT-2,I+12
:? D$(I,I):NEXT I
250 FOR A=1 TO MLEN:POSITION X,Y:? A
260 Y=Y+1:IF Y=20 THEN X=X+3:Y=13
270 NEXT A
280 MONTH=MONTH+1:NEXT BOT
290 GOSUB 310:GOTO 100
300 REM CONSOLE KEYS
310 IF MONTH=13 THEN POSITION 2,22:?
 "For another year press  Start ":GO
TO 360
320 IF MONTH=9 THEN POSITION 2,22:?
"For the last 4 months press  select
 ":GOTO 340
330 POSITION 2,22:? "For the next 4
months press  Select "
340 IF PEEK(53279)<>5 THEN 340
350 RETURN
360 IF PEEK(53279)<>6 THEN 360
370 RUN
380 REM INITIALIZING
390 DIM ML$(25),MONTH$(14),D$(7),LN$
(38)
400 D$="SMTWTFS":DAYFIND=40:MONTH=1
410 ML$=" 312831303130313130313031"
420 LN$="_":LN$(38)=LN$:LN$(2)=LN$
430 DATA JANUARY,FEBRUARY,MARCH,APRI
L,MAY,JUNE
440 DATA JULY,AUGUST,SEPTEMBER,OCTOB
ER,NOVEMBER,DECEMBER
450 REM TITLE PAGE
460 GRAPHICS 2:POKE 710,0
470 POSITION 11,7:? #6;"CaLeNdAr"
480 POSITION 1,8:? #6;"_____________
_____":REM 18 CHR$(95)
490 POKE 752,0:TRAP 530:? "}":POKE 6
56,0:POKE 657,2:? "Enter the year ";
:INPUT YEAR:IF YEAR<1753 THEN 530
500 GRAPHICS 0:I=PEEK(560)+PEEK(561)
*256+6:POKE I-3,70:POKE I,6:POKE 82,
0:POKE 710,17:POKE 712,17
510 POKE 752,1:TRAP 40000:GOTO 100
520 REM INVALID YEAR
530 POKE 752,1:FOR I=1 TO 5:POKE 656
,0:POKE 657,2:? "> INVALID YEAR <
 ":FOR N=1 TO 30:NEXT N
540 POKE 656,0:POKE 657,2:? " >INVAL
ID YEAR< ":FOR N=1 TO 30:NEXT N:NEXT
 I:GOTO 490

OPTIONAL LINE 480:
480 POSITION 1,8:? #6;LN$(1,18)
```

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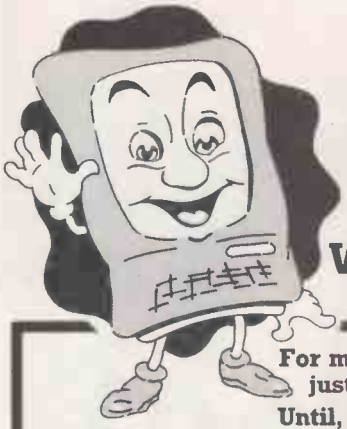

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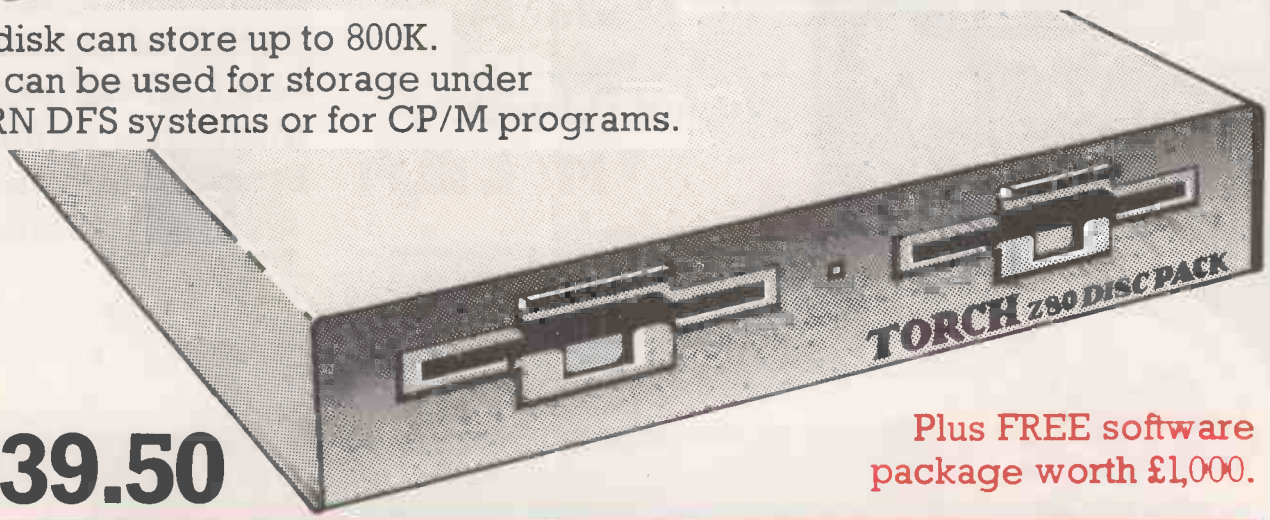

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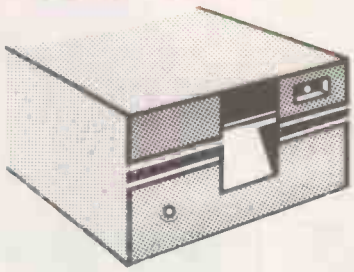

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World War I

BASED ON THE commercially available versions of this micro game — and on arcade versions for all I know — Colin Pinder's game requires the player to bomb a landing site clear of skyscrapers while inexorably losing height and fuel. Initial settings for difficulty vary the fuel load, the height of the buildings and the rate at which they grow between missions. The game is guaranteed to end at some point since the available fuel decreases marginally from one take-off to the next.

The scenario of so many games like WWI is not only unnecessarily bloody but could be replaced with one less fatal without much change to the game display or operation. Why a plane? Why buildings? The game structure fits perfectly with, for example, removing cars from piles in a scrapyard using a grab on a descending jib, with damage to the electromagnet ending the go.

Yet Mr Pinder insists on slaughter to the point of painting the sidewalk with gore. Given a speech chip I'm sure a further violent assault on the sensibilities would have been attempted. I compliment Mr Pinder on his design and coding and his ability to manipulate the display screen, but question his choice of subject.

World War I.

```
   10 ON ERROR RUN
   20 DIMHS%(10),HS$(10):MODE7:DIMC%(15
):PROCbegin
   30 HOB%=HB%+3:SOP%=SPL%+3:MODE5:VDU2
3;8202;0;0;0;:NSC%=0:SC%=0:PROCchars:PR
OCstart
   40 F%=30
   50 FORLK%=0TO15:C%(LK%)=0:NEXT
   60 PROCinit:PROCdisplay
   70 IFNSC%=1 HOB%=HOB%+PD%:IFHOB%>12
HOB%=12
   80 IFNSC%=1 PROCtakeoff:PRINTTAB(0,5
);A$:V=INT(V):FORV=V TO2STEP-1:PRINTTAB
(18,V+1);B$;B$;TAB(18,V);SH$;TAB(0,5);R
IGHT$(A$,V+2);:SOUND2,-9,5,1:FORG=1TO20
0:NEXT:NEXT:GOTO60
   90 IFF%<=0ANDBG%=0 SOUND2,1,200,60:B
G%=1
  100 IFF%<=0 PRINTTAB(SX%,SY%+1)SH$:PR
INTTAB(SX%,SY%)B$;B$:SY%=SY%+1
  110 PROCship:IF(SY%=26ANDF%<=0)ORexp%
 PROCexp:MODE7:PROCtable
  120 IFG%=0THENMODE7:END
  130 IFG%=1 GOTO30
  140 IFINKEY(-101)ANDB%=0 B%=1:PROCbom
b
  150 IFB%=1 PROCBOMB:ELSEFORMNB=1TO30:
NEXT
  160 IFINKEY(-68)ANDSY%>2ANDF%>0 PRINT
TAB(SX%,SY%-1)SH$;TAB(SX%,SY%);B$;B$:SY
%=SY%-1:F%=F%-1:PRINTTAB(10,0);F%;" "
  170 IF SOP% <10 FORWAIT=0TO(10-SOP%)*
10:NEXT
  180 GOTO70
  190 DEFPROCstart:COLOUR3:A$="    TAKE
OFF!        ":PRINTTAB(0,5):A$:C$="MISSI
ON TO BOMB CITY":PRINT'C$;
  200 D$="LAND AND STEAL THE ":PRINTD$:
E$="SECRET PLANS        ":PRINTE$:F$="TH
EN RETURN TO BASE":PRINT'F$:G$="FOR A H
ARDER        ":PRINTG$:H$="ASSIGNMENT!!
        ":PRINTH$:I$="'B' DROPS BOMBS
":PRINT'I$:J$="'F' MOVES UP        ":PRIN
TJ$
  210 PROCtakeoff
  220 FORH=19TO0STEP-1:PRINTTAB(0,5);RI
GHT$(A$,H);" ";TAB(0,7);RIGHT$(C$,H);"
";TAB(0,8);RIGHT$(D$,H);" ";TAB(0,9);RI
GHT$(E$,H);" ";TAB(0,11);RIGHT$(F$,H);"
 ";TAB(0,12);RIGHT$(G$,H);" ";TAB(0,13)
;RIGHT$(H$,H);" ";TAB(0,15);RIGHT$(I$,H
);
  230 PRINTTAB(0,16);RIGHT$(J$,H);:SOUN
D1,-9,5,1:FORG=1TO5:NEXT:V=V-.6:IFINT(V
)=0 GOTO240 ELSEPRINTTAB(18,V);SH$;TAB(
18,V+1);B$;B$;
  240 NEXT
  250 SOUND2,-9,5,1:PRINTTAB(18,1);B$;B
$:ENDPROC
  260 DEFPROCtakeoff:VDU19,0,6,0,0,0,19
,3,0,0,0,0,19,2,5,0,0,0:COLOUR2:FORX=30
TO26STEP-1:PRINTTAB(0,X);STRING$(20,CHR
$231);:NEXT:VDU19,2,3,0,0,0:COLOUR3:PRI
NTTAB(0,5);A$:V=25:PRINTTAB(0,25);SH$:
  270 IFNSC%<>1 THEN TIME=0:REPEAT:UNTI
L TIME>400
  280 FORH=1TO18:SOUND1,-9,5,1:IFH>2 V=
V-.08*H
  290 TIME=0:REPEATUNTILTIME>(25-H):PRI
NTTAB(H-1,V+.08*H);B$;B$;TAB(H,V);SH$;:
NEXT
  300 ENDPROC
  310 DEFPROCchars
  320 VDU23,225,1,1,195,230,255,255,255
,32:VDU23,226,254,140,24,48,255,255,252
,16
  330 VDU23,227,24,255,60,255,231,231,1
26,24:VDU23,228,24,24,24,60,60,126,126,
126:VDU23,229,126,90,90,126,126,90,90,1
26
  340 VDU23,230,0,0,0,0,36,118,126,126:
VDU23,231,255,255,255,255,255,255,255,2
55
  350 B$=CHR$32:SH$=CHR$225+CHR$226:END
PROC
  360 DEFPROCinit
  370 BG%=0:B%=0:BX%=0:BY%=0:NSC%=0:SX%
=1:SY%=2:G%=2:exp%=0
  380 ENVELOPE1,131,-1,-2,0,100,60,100,
3,3,0,-127,100,126:ENVELOPE2,132,0,0,0,
0,0,0,10,-1,0,-50,126,100
  390 ENDPROC
  400 DEFPROCdisplay
  410 VDU20,19,0,6,0,0,0
  420 VDU19,3,6,0,0,0,0:COLOUR3:FORQ%=2
5TO(25-HOB%)STEP-1:PRINTTAB(3,Q%);STRIN
G$(15,CHR$(229)):NEXT:SOUND2,-9,5,1
  430 Y%=25-HOB%:X%=0:PRINTTAB(X%,Y%);
  440 FORN%=1TOHOB%DIV2:FORM%=0TO14
  450 IFRND(5)<2ANDC%(M%)=0THENC%(M%)=1
:PRINTTAB(M%+3,Y%);CHR$(228):GOTO470
  460 IFC%(M%)=0THENPRINTTAB(M%+3,Y%);C
HR$(229)
  470 NEXT
  480 IFN%=HOB%-HOB%DIV2 SOUND1,-9,5,1
  490 Y%=Y%-1:NEXT
  500 FORM%=0TO14:IFC%(M%)=0THENPRINTTA
B(M%+3,Y%);CHR$(228)
  510 NEXT
  520 VDU19,3,0,0,0,0:PRINTTAB(18,2);B$
;B$;TAB(SX%,SY%);SH$;TAB(18,4);B$;B$;TA
B(0,0);"FUEL LEFT=";F%;" ";TAB(0,1)"SCO
RE=";SC%:SOUND2,-9,5,1
  530 ENDPROC
  540 DEFPROCsnip
  550 IFSX%=18 ANDSY%=25THENPROCgood
  560 SOUND1,-9,5,1
  570 PRINTTAB(SX%,SY%);B$
  580 IFSX%=18THENPRINTTAB(SX%,SY%);B$;
B$:SX%=-1:SY%=SY%+1
  590 IF?FNS(SX%+2,SY%,7)=119THENexp%=-
1:ENDPROC
  600 SX%=SX%+1:COLOUR3:PRINTTAB(SX%,SY
%);SH$
  610 ENDPROC
  620 DEFPROCbomb
  630 SOUND3,1,200,80:BX%=SX%:BY%=SY%+1
:IFBY%>=25 B%=0:*FX15,0
  640 ENDPROC
  650 DEFPROCBOMB
  660 COLOUR3:PRINTTAB(BX%,BY%);CHR$(22
7)
  670 IFBY%+1>=25THENPRINTTAB(BX%,BY%);
B$;TAB(BX%,BY%+1);B$:B%=0:*FX15,0
  680 IFBY%+1>=25 ENDPROC
  690 PRINTTAB(BX%,BY%);B$:IF?FNS(BX%,B
Y%+1,7)=119PRINTTAB(BX%,BY%+1);B$:PROCh
it:ENDPROC
  700 BY%=BY%+1:PRINTTAB(BX%,BY%)CHR$22
7
  710 ENDPROC
  720 DEFPROChit
  730 *FX15,0
  740 IFBY%+2>=27THENB%=0:ENDPROC
  750 PRINTTAB(BX%,BY%+2);B$:COLOUR3:PR
INTTAB(BX%,BY%+2);CHR$(230):SOUND0,-15,
125,10:B%=0:SC%=SC%+HOB%:PRINTTAB(6,1);
SC%;
  760 ENDPROC
  770 DEFPROCexp
  780 PRINTTAB(SX%,SY%);B$;B$:PRINTTAB(
BX%,BY%);B$:SX%=64*SX%:SY%=(31-SY%-1)*3
2+16:VDU5:SOUND0,-15,3,100:SOUND1,1,200
,100:FORXX=SY%TO200STEP-8:GCOL0,0:MOVES
X%,XX+8:PRINTCHR$231;CHR$231:GCOL0,3:MO
VESX%,XX:PRINTSH$:NEXT:SY%=XX
  790 *FX15,0
  800 MOVESX%,SY%:GCOL0,0:PRINTCHR$231;
CHR$231:SX%=SX%+48:VDU19,1,1,0,0,0:GCOL
0,1:SOUND0,2,4,100:FORGG=1TO200:PLOT69,
SX%+(RND(100)-50),SY%+(RND(100)-50):NEX
T:FORGG=1TO1000:NEXT:VDU4
  810 *FX15,0
  820 RESTORE:IFF%<=1THENPRINTTAB(4,10)
;" Hard luck!!":PRINT"You ran out of fu
el!":GOTO840
  830 PRINTTAB(4,10);"Hard luck you":PR
INTTAB(5,11);"Crashed!"
  840 REPEAT:READD,E:SOUND2,-15,D,E:SOU
ND2,0,2,2:UNTIL E=0
  850 ENDPROC
  860 DATA33,20,33,20,33,5,33,20,49,10,
41,5,41,10,33,10,33,20,25,5,33,40,0,0
  870 DEFPROCgood
  880 CLS:RESTORE910:VDU20:PRINT''"WELL
 DONE YOU LANDED";:PRINT"    SAFELY!":P
RINT''''"  NOW TAKE OFF FOR":PRINT"
A HARDER MISSION!":REPEAT READD,E:SOUND
2,-15,D,E:REPEATUNTILADVAL(-7)=15:VDU19
,0,RND(7)-1,0,0,0:UNTILE=0:CLS:NSC%=1
  890 F%=F%+5*HOB%:FORB%=0TO15:C%(B%)=0
:NEXT:ENDPROC
  900 DEF FNS(A%,B%,C%)=HIMEM+((A%*2)+B
%*40)*8+C%
  910 DATA137,5,129,5,121,10,137,10,149
,10,169,20,185,5,177,5,169,10,137,10,14
5,10,149,20
  920 DATA1,0
  930 DEFPROCbegin
  940 CLS:RESTORE1070
  950 FORCC%=1TO8:PRINTCHR$129;CHR$157;
:IFCC%>1 PRINTCHR$(146+CC%-2)
  960 NEXT
  970 FORCC%=1TO5:PRINTTAB(6,CC%);:FORL
CL%=1TO27:READA$:IFA$="H" PRINTCHR$255;
:ELSEPRINTCHR$32;:
  980 NEXT:NEXT
  990 PRINT''TAB(12);"By Colin Pinder":
PRINTTAB(17);"8/5/83"
 1000 PRINT''"How Difficult Would You Li
ke The Mission"
 1010 INPUT"Initial Hieght Of Buildings
 (1/5) ",HB%:IFHB%<1ORHB%>5 GOTO940
 1020 INPUT"Initial Speed Of Plane (1/5
) ",SPL%:IFSPL%<1ORSPL%>5 GOTO940
 1030 INPUT"Progressive Difficulty (1/5
) ",PD%:IFPD%<1ORPD%>5 GOTO940
 1040 PRINT''"PRESS <<ESCAPE>> TO RETUR
N TO THIS      TITLE SHEET."
 1050 PRINT'"      PRESS ANY KEY TO BEGI
N"
 1060 A=GET:ENDPROC
 1070 DATAO,O,H,H,O,H,H,O,H,H,O,O,O,H,H
,O,H,H,O,H,H,O,O,O,H,H,H
 1080 DATAO,O,O,H,O,H,H,O,H,O,O,O,O,O,H
,O,H,H,O,H,O,O,O,O,O,H,O
 1090 DATAO,O,O,H,O,H,H,O,H,O,O,O,O,O,H
,O,H,H,O,H,O,O,O,O,O,H,O
 1100 DATAO,O,O,H,O,H,H,O,H,O,O,O,O,O,H
,O,H,H,O,H,O,O,O,O,O,H,O
 1110 DATAO,O,O,H,H,H,H,H,H,O,O,O,O,O,H
,H,H,H,H,H,O,O,O,O,H,H,H
 1120 DEFPROCtable
 1130 JO%=0:PRINTTAB(7,3);"***SCORE TAB
LES***"TAB(9,7)CHR$130"Enter Your Name:
";:INPUTI$:T$=LEFT$(I$,6)
 1140 FORLI%=1TO1STEP-1:IFSC%>HS%(LI%)
 JO%=LI%:LI%=1
 1150 NEXT:IFJO%>0 FORLI%=2TOJO%:HS%(LI
%-1)=HS%(LI%):HS$(LI%-1)=HS$(LI%):NEXT:
HS%(JO%)=SC%:HS$(JO%)=T$
 1160 PRINTTAB(6,7)CHR$131"Place
Score      Name"SPC40':FORI%=1TO1STEP-
1:IFI%=10 PRINTCHR$136;:ELSEPRINT" ";
 1170 JO%=139-I%:IFI%<4JO%=128
 1180 PRINTCHR$(JO%)11-I%"   "HS%(I%)"
   "HS$(I%):NEXT
 1190 PRINTTAB(4,22)"Another Game (Y/N)
 ?";:I$=GET$:IFI$="Y" G%=1:ENDPROC:ELSE
G%=0:ENDPROC
 1200 DATA"   O OO O     O OO O     O"
```

Happy.

```
   10 REM HAPPY  des fisher Harlow(0279
) 22450  1983
   20 REM Prints a birthday card
   30 REM Variables to be set are:
   40 REM      n$ - recipients name (NO
SPACES)
   50 REM     pw% - paper width as numbe
r of characters
   60 REM intro% - number of blank line
s at start
   70 REM
   80 REM Also set MODE as required
   90
  100  n$="VanessaCooke"
  110  pw%=80
  120  intro%=4
  130
  140  MODE 0
  150
  160  pw%=pw%-1:pw%=pw%*.95:scale=pw%/
80
  170  lm%=pw%*.05:L%=0
  180
  190  VDU 2:REM Printer on (ONLY INCLU
DE THIS LINE IF PRINTER CONNECTED)
  200
  210  FOR I=1 TO intro%:PRINT:NEXT
  220
  230  PROCdatp
```

```
  240  PROCnose
  250  PROCdatp
  260  PROCtail
  270
  280  VDU 3:REM Printer off
  290  END
  300
  310
  320 REM  ** PROCEDURES **
  330 REM  datp (line,letter,print),
  340 REM  nose (line,insert,print),
  350 REM  tail (insert,print),
  360 REM  line (shuffle), letter (inse
rt,restore),
  370 REM  print, insert, shuffle,
  380 REM  restore.
  390
  400
  410  DEF PROCdatp:REM (line,letter,pr
int)
  420   REPEAT
  430     PROCline
  440     PROCletter
  450     IF tab=999 THEN 470
  460       PROCprint
  470   UNTIL tab=999
  480  ENDPROC
  490
  500
  510  DEF PROCnose:REM (line,insert,pr
int)
  520   s=INT(pw%/2+.5):step=INT(-2*sca
le)
  530   REPEAT
  540     s=s+step
  550     PROCline
  560     tab=0:PROCinsert
  570     tab=pw%-s:PROCinsert
  580     PROCprint
  590   UNTIL s<=1
  600  ENDPROC
  610
  620
  630  DEF PROCtail:REM (insert,print)
  640   s=0:step=INT(-4*scale):tab=INT(
pw%/2)
  650   REPEAT
  660     tab=tab+step:s=s+ABS(2*step)
  670     PROCinsert:PROCprint
  680   UNTIL s>=pw%-4
  690  ENDPROC
  700
  710
  720  DEF PROCline:REM (shuffle)
  730   PROCshuffle
  740   l$=""
  750   REPEAT
  760     l$=l$+n$
  770   UNTIL LEN(l$)>pw%
  780   REPEAT
  790     l$=LEFT$(l$,LEN(l$)-1)
  800   UNTIL LEN(l$)=pw%
  810  ENDPROC
  820
  830
  840  DEF PROCletter:REM (insert,resto
re)
  850   REPEAT
  860     READ  tab
  870     IF tab>99 THEN 930
  880       tab=INT((tab-5)*scale)
  890       READ s
  900       IF s=0 THEN s=pw%-tab:GOTO
920
  910         s=INT(s*scale+.5):IF s=0
THEN s=1
  920       PROCinsert
  930   UNTIL tab>99
  940   IF tab=200 THEN RESTORE 1990
  950   IF tab=201 THEN PROCrestore
  960  ENDPROC
  970
  980
  990  DEF PROCprint
 1000   IF RIGHT$(l$,1)=" " THEN l$=LEF
T$(l$,LEN(l$)-1):GOTO 1000
 1010   PRINT TAB(lm%);l$;CHR$(13);TAB(
lm%);l$
 1020  ENDPROC
 1030
 1040
 1050  DEF PROCinsert
 1060   sp$=STRING$(s," ")
 1070   lft$=LEFT$(l$,tab)
 1080   A=LEN(l$)
 1090   rght$=RIGHT$(l$,A-tab-s)
 1100   l$=lft$+sp$+rght$
 1110  ENDPROC
 1120
 1130
 1140  DEF PROCshuffle
 1150   A=LEN(n$)
 1160   n$=RIGHT$(n$,1)+LEFT$(n$,A-1)
 1170  ENDPROC
 1180
 1190
 1200  DEF PROCrestore
 1210   L%=L%+1
 1220   ON L% GOTO 1230,1240,1260,1260,
1270,1250,1280,1290,1300,1310,1320,1330
,1240,1270,1340,1250,1350
 1230     RESTORE 2020:ENDPROC:REM H
 1240     RESTORE 2240:ENDPROC:REM a
 1250     RESTORE 1940:ENDPROC:REM bspa
ce
 1260     RESTORE 2350:ENDPROC:REM p
 1270     RESTORE 2450:ENDPROC:REM y
 1280     RESTORE 2550:ENDPROC:REM B
 1290     RESTORE 2720:ENDPROC:REM i
 1300     RESTORE 2760:ENDPROC:REM r
 1310     RESTORE 2860:ENDPROC:REM t
 1320     RESTORE 2960:ENDPROC:REM h
 1330     RESTORE 3060:ENDPROC:REM d
 1340     RESTORE 3160:ENDPROC:REM l
 1350     RESTORE 3190:ENDPROC:REM END
 1360  ENDPROC
 1370
 1380
 1390
 1400 REM ** DATA **
 1410
 1420 REM  plane
 1430  DATA 5,37, 47,0,  100
 1440  DATA 5,28, 37,4, 48,0,  100
 1450  DATA 5,25, 60,0,  100
 1460  DATA 5,47, 57,0,  100
 1470  DATA 5,33, 51,0,  100
 1480  DATA 5,33, 51,0,  100
 1490  DATA 5,25, 32,6, 45,3, 51,0,  10
0
 1500  DATA 5,24, 33,5, 46,3, 51,0,  10
0
 1510  DATA 5,23, 34,4, 47,3, 51,0,  10
0
 1520  DATA 5,23, 34,4, 51,9, 63,0,  10
0
 1530  DATA 5,24, 33,5, 45,3, 51,9, 63,
0,  100
 1540  DATA 5,25, 32,1, 34,4, 46,3, 51,
8, 63,0, 100
 1550  DATA 5,29, 31,2, 36,2, 47,3, 51,
8,63,0,  100
 1560  DATA 5,30, 51,6, 63,0,  100
 1570  DATA 5,31, 51,3, 63,0,  100
 1580  DATA 5,32, 58,1, 63,0,  100
 1590  DATA 5,33, 55,4, 63,0,  100
 1600  DATA 5,33, 51,8, 63,0,  100
 1610  DATA 5,33, 51,8, 63,0,  100
 1620  DATA 5,33, 52,7, 63,0,  100
 1630  DATA 5,33, 52,7, 63,0,  100
 1640  DATA 5,33, 53,6, 63,0,  100
 1650  DATA 5,33, 54,5, 62,0,  100
 1660  DATA 5,33, 50,9, 62,0,  100
 1670  DATA 5,33, 49,10, 62,0,  100
 1680  DATA 5,33, 48,2, 56,4, 62,0,  10
0
 1690  DATA 5,33, 47,4, 57,3, 62,0,  10
0
 1700  DATA 5,33, 47,4, 56,4, 62,0,  10
0
 1710  DATA 5,33, 48,2, 51,9, 62,0,  10
0
 1720  DATA 5,33, 49,2, 53,7,  62,0,  1
00
 1730  DATA 5,33, 50,3, 55,5, 62,0,  10
0
 1740  DATA 5,33, 62,0,  100
 1750  DATA 5,33, 51,3, 57,4, 62,0,  10
0
 1760  DATA 5,33, 51,4, 58,3, 62,0,  10
0
 1770  DATA 5,34, 51,5, 59,0,  100
 1780  DATA 5,35, 51,6, 60,0, 100
 1790  DATA 5,36, 51,0,  100
 1800  DATA 5,37, 51,0,  100
 1810  DATA 5,38, 51,0,  100
 1820  DATA 5,38, 53,0,  100
 1830  DATA 5,38, 55,0,  100
 1840  DATA 5,38, 57,0,  100
 1850  DATA 5,38, 59,0,  100
 1860  DATA 5,39, 60,0,  100
 1870  DATA 5,39, 60,0,  100
 1880  DATA 5,41, 58,0,  100
 1890  DATA 5,0,  100
 1900  DATA 5,0,  100
 1910  DATA 5,0,  100
 1920  DATA 999
 1930
 1940 REM  big space
 1950  DATA 100, 100, 100
 1960  DATA 201
 1970
 1980 REM  space
 1990  DATA 201
 2000
 2010 REM  H
 2020  DATA 30,1, 70,1, 100
 2030  DATA 30,2, 69,2, 100
 2040  DATA 30,4, 67,4, 100
 2050  DATA 30,41, 100
 2060  DATA 30,41, 100
 2070  DATA 30,4, 51,5, 67,4, 100
 2080  DATA 30,2, 51,5, 69,2, 100
 2090  DATA 30,1, 51,5, 70,1, 100
 2100  DATA 51,5, 100
 2110  DATA 51,5, 100
 2120  DATA 51,5, 100
 2030  DATA 30,2, 69,2, 100
 2040  DATA 30,4, 67,4, 100
 2050  DATA 30,41, 100
 2060  DATA 30,41, 100
 2070  DATA 30,4, 51,5, 67,4, 100
 2080  DATA 30,2, 51,5, 69,2, 100
 2090  DATA 30,1, 51,5, 70,1, 100
 2100  DATA 51,5, 100
 2110  DATA 51,5, 100
 2120  DATA 51,5, 100
 2130  DATA 30,1, 51,5, 70,1, 100
 2140  DATA 30,2, 51,5, 69,2, 100
 2150  DATA 30,4, 51,5, 67,4, 100
 2160  DATA 30,41,  100
 2170  DATA 30,41,  100
 2180  DATA 30,4, 67,4, 100
 2190  DATA 30,2, 69,2, 100
 2200  DATA 30,1, 70,1, 100
 2210  DATA 200
 2220
 2230 REM  a
 2240  DATA 33,9, 47,3, 100
 2250  DATA 31,3, 41,3, 49,3, 100
 2260  DATA 30,2, 43,2, 51,2, 100
 2270  DATA 30,2, 43,2, 51,2, 100
 2280  DATA 30,2, 43,2, 51,2, 100
 2290  DATA 31,3, 41,3, 49,3, 100
 2300  DATA 33,17, 100
 2310  DATA 30,3, 100
 2320  DATA 200
 2330
 2340 REM  p
 2350  DATA 18,32, 100
 2360  DATA 31,3, 49,3, 100
 2370  DATA 30,2, 51,2, 100
 2380  DATA 30,2, 51,2, 100
 2390  DATA 30,2, 51,2, 100
 2400  DATA 31,3, 49,3, 100
 2410  DATA 33,17, 100
 2420  DATA 200
 2430
 2440 REM  y
 2450  DATA 21,3, 33,20, 100
 2460  DATA 19,3, 31,3, 100
 2470  DATA 18,2, 30,2, 100
 2480  DATA 18,2, 30,2, 100
 2490  DATA 18,2, 30,2, 100
 2500  DATA 19,3, 31,3, 100
 2510  DATA 21,32, 100
 2520  DATA 200
 2530
 2540 REM  B
 2550  DATA 30,1, 70,1, 100
 2560  DATA 30,2, 69,2, 100
 2570  DATA 30,4, 67,4, 100
 2580  DATA 30,41, 100
 2590  DATA 30,41, 100
 2600  DATA 30,5, 51,5, 66,5, 100
 2610  DATA 30,5, 51,5, 66,5, 100
 2620  DATA 30,5, 51,5, 66,5, 100
 2630  DATA 31,5, 50,7, 65,5, 100
 2640  DATA 32,5, 49,9, 64,5, 100
 2650  DATA 33,5, 48,5, 54,5, 63,5, 100
 2660  DATA 34,5, 47,5, 55,12, 100
 2670  DATA 35,16, 58,6, 100
 2680  DATA 38,10, 100
 2690  DATA 200
 2700
 2710 REM i
 2720  DATA 30,17, 50,3, 100
 2730  DATA 200
 2740
 2750 REM  r
 2760  DATA 30,23, 100
 2770  DATA 49,3, 100
 2780  DATA 51,2, 100
 2790  DATA 51,2, 100
 2800  DATA 51,2, 100
 2810  DATA 49,3, 100
 2820  DATA 47,3, 100
 2830  DATA 200
 2840
 2850 REM  t
 2860  DATA 33,38, 100
 2870  DATA 31,3, 51,2, 100
 2880  DATA 30,2, 51,2, 100
 2890  DATA 30,2, 100
 2900  DATA 30,2, 100
 2910  DATA 31,3, 100
 2920  DATA 33,3, 100
 2930  DATA 200
 2940
 2950 REM  h
 2960  DATA 30,41, 100
 2970  DATA 49,3, 100
 2980  DATA 51,2, 100
 2990  DATA 51,2, 100
 3000  DATA 51,2, 100
 3010  DATA 49,3, 100
 3020  DATA 30,20, 100
 3030  DATA 200
 3040
 3050 REM  d
 3060  DATA 33,17, 100
 3070  DATA 31,3, 49,3, 100
 3080  DATA 30,2, 51,2, 100
 3090  DATA 30,2, 51,2, 100
 3100  DATA 30,2, 51,2, 100
 3110  DATA 31,3, 49,3, 100
 3120  DATA 30,41, 100
 3130  DATA 200
 3140
 3150 REM  l
 3160  DATA 30,3, 36,35, 100
 3170  DATA 200
 3180
 3190  DATA 999
```

Happy

A program producing a personalised poster birthday greeting six feet long on any width printer at six lines per inch, or proportionately long at different density, comes from Des Fisher of Harlow, Essex. Setting up for a particular name is explained in the introductory Rems.

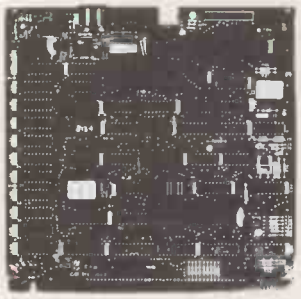
The final result is very well defined when viewed from a distance. Close to, the name of the recipient appears as a message within the message.

CLI interpreter

Keith Wolstenholme has sent a CLI interpreter which is not only a very clever way of by-passing the Basic interpreter, but

(continued on page 190)

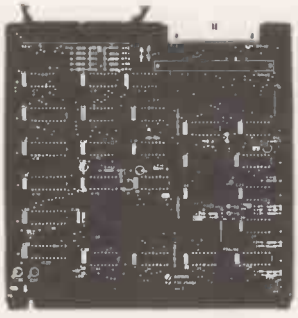
MicroValue 80-BUS MULTIBOARDS



GM813—CPU/64K RAM Board

* 4MHz Z80A C.P.U.
* 64K Dynamic RAM
* RS232 Interface
* Two 8-Bit I/O Ports
* Cassette Interface
* Extended & Page Addressing Modes
* CP/M Compatible Monitor

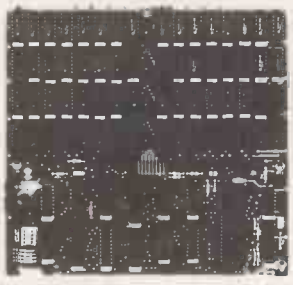
£225



GM829—Disk Controller Board

* Up To 4 Mixed 5.25 & 8" Drives
* SASI Hard Disk Interface
* Single & Double Density Operation
* Single & Double Sided Drive Support
* Supports 48 and 96 TPI Drives

£145

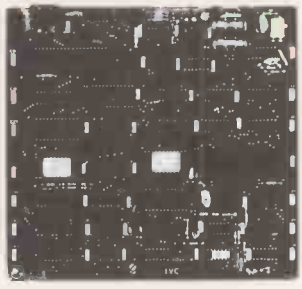


GM833—RAM-DISK Board

* Virtual Disk Operation
* 512K Dynamic RAM
* Port Mapped For Easy Interface Software
* Over 10 Times Faster Than a Floppy Disk

£450

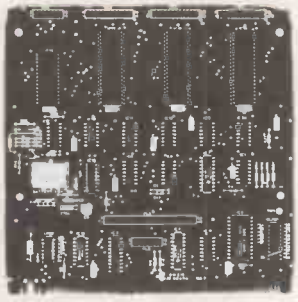
Please note: This board cannot be used as a conventional RAM board



GM812—Video Controller Board

* 80 Characters×25 Line Display Format
* On-board Z80A Microprocessor
* Buffered Keyboard Input
* Programmable Character Generator
* 160×75 Pixel Graphics
* Light Pen Input

£125



GM816—Multi I/O Board

* 6 I/O Ports
* 4 Counter/Timer Channels
* On-Board Real Time Clock
* Battery Backup
* Further Expansion Capability

£125

PLUTO—Colour Graphics Board

* On-Board 16 Bit Microprocessor
* 640×576 Bit Mapped Display
* 192K Of Dual Ported RAM
* Comprehensive On-Board Software

£399

CLIMAX—Colour Graphics Board

* 256×256 Pixel Display
* 16 Colours
* Ultra-fast Vector & Character Generation
* Light Pen Input
* UHF or RGB Outputs

UHF Version **£199**

UHF & RGB Version **£220**

GM811—CPU Board

* 4MHz Z80A CPU
* 4 'Bytewide' Memory Sockets
* 2×8-Bit Input/Output Ports
* 8 Bit Input Port
* RS232 Serial Interface
* Cassette Recorder Interface

£125

GM803—EPROM/ROM Board

* Up to 40K of Firmware
* 2708 or 2716 EPROMS
* Page Mode Operations

£65

GM802—64K RAM Board

* 64K Dynamic RAM
* 4MHz Operation
* RAM Disable Function
* Page Mode Operation

£125

MP826—Static RAM Board

* 32K Static RAM
* Battery Backup
* Page Mode Operation

£185

EV814—IEEE488 (GPIB) Controller

* Cost Effective Controller
* Comprehensive Software Supplied
* Full Implementation
* Easy To Use

£140

GM827—87 Key Keyboard

* User Definable Function Keys
* Numeric Keypad
* Cursor Control Keys

£85

GM839—Prototyping Board

* Fibreglass P.C.B.
* 80-BUS Signal Identification
* High Density IC Capability

£12.50

All the boards and components in the 80-BUS range are fully compatible and offer a very flexible and cost effective solution to your computer needs. For further information about the 80-BUS range contact your nearest MICROVALUE dealer.

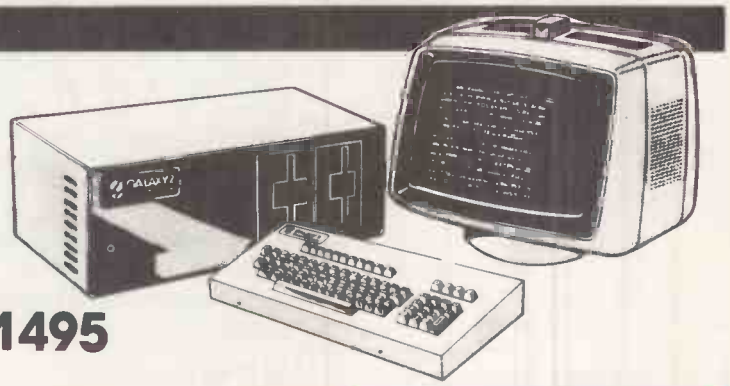
MicroValue - MicroValue

COMPUTERS

Gemini Galaxy 2

"I would place the Galaxy at the top of my list"
(Computing Today, April 1983)

- ★Twin Z80A Processors
- ★CP/M 2.2 Operating System
- ★64K Dynamic RAM
- ★800K Disk Capacity
- ★80x25 Video Display
- ★Serial and parallel printer interfaces
- ★Cassette and light pen interfaces
- ★User definable function keys
- ★Numeric key pad
- ★12" Monitor included

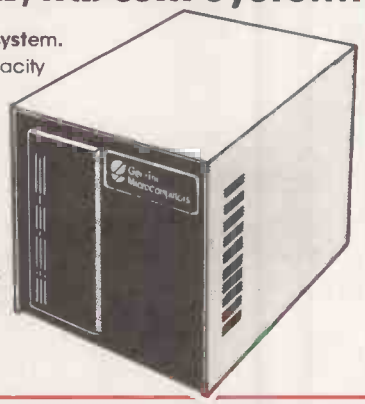


£1495

At last—a Winchester Drive for your Gemini/nascom System!

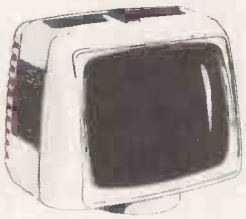
GM835 Winchester Drive Sub-system.

- ★5.4 Megabyte Formatted Capacity
- ★Rodime Drive
- ★Industry Standard SASI interface
- ★Integral Controller and power supply



£1450

Phoenix P12 Monitor

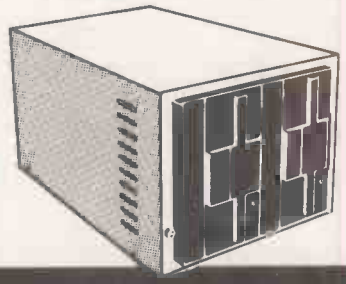


A high quality data display monitor, ideal for all Nascom and Gemini systems.
20MHz resolution.
Available in amber or green phosphor.

£110

Disk System for Gemini & nascom

GM825 Disk Drive Unit – The GM825 floppy disk housing is supplied with either one or two 5.25" single sided, double density, 96TPI high capacity Micropolis 1015F5 disk drives. These provide 400K bytes of formatted storage per drive. (Gemini QDSS format). The CP/M2.2 package available supports on-screen editing with either the normal Nascom or Gemini IVC screens, parallel or serial printers.
An optional alternative to CP/M is available for Nascom owners wishing to support existing software.
Called POLYDOS 4, it includes an editor and assembler and extends the Nascom BASIC to include disk commands.



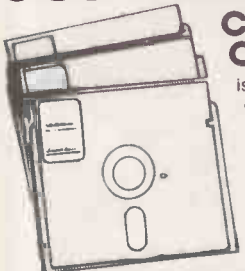
Single Drive System
GM825-1S
£350

Dual Drive System
GM825-2S
£575

CP/M2.2 Package
(GM 532 for Gemini)
£90

POLYDOS 4
for Nascom
£90

SOFTWARE



CP/M Software Compas

is totally different from other compiler based Pascal systems, as it allows you to create, edit, run, and debug Pascal programs in a highly interactive manner.

£120

'The Last One'

is used in conjunction with Microsoft's MBASIC*. No knowledge of BASIC programming is required since all input is performed using question and answer routines written in plain English.

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(continued from page 187)

is also very useful. For example, if you wish to change the name of a file on disc, the CLI interpreter program allows variable file names to be changed.

Using the Basic interpreter would require a hard-coded file name, whereas the CLI can be used to generate a variable file name. For example,

```
10 INPUT "Enter what command",
   command$
20 INPUT "To which files etc. ", file1$,
   file2$
30 LET function$ = command$ + file1$ +
   CHR$32 + file2$
40 PROCcli (function$)
50 END
```

It is possible to perform any operating-system command with a variable in this manner. On page 463 of the *User Guide* there is a reference to this command but, it does not go into nearly as much detail in explaining variable factors embedded in the command.

VDU 23 definer

Each new character-definition program I receive has a good reason for existing, a set of circumstances where it is the best tool for the job. In this instance Dr David Hunt of Billericay has produced a designer program which will accept character definitions graphically on to a three-by-three character matrix. It takes the resulting picture and shunts it one pixel at a time in a specified direction, using an EORed character set to give the smoothest possible impression of movement on the screen.

The required VDU 23 commands for the initial characters and the EORed set are shown for future program use. As a utility on my program library it is unique, and performs a function which I would otherwise not attempt.

Find on Basic II

No sooner did the Find routine of Douglas Stewart appear in July than Basic II made its appearance, complete with different routine addresses. I am indebted to Andrew Donald of Ilford for the equivalence list in the table.

Anyone with Basic II will need to amend Find on the lines shown. You can find out whether you have Basic II by keying Openup. If the response is "Mistake" you have Basic I; if it is "Syntax error" then you have Basic II.

CLI interpreter.

```
   100 DEF PROCcli(c$)
   110 DIM room 60
   120 $room=c$
   130 X%=room MOD 256
   140 Y%=room DIV 256
   150 CALL &FFF7
   160 ENDPROC
>
```

Find on Basic II.

Basic I	Basic II	Line	Function
&8A99	&8AF6	106	Basic re-entry
&B433	&B402	124	Error routine
&9834	&987B	187	Test for escape
&98F5	&9923	252	Print special line number
&97B6	&97E7	267	Decode line
&98F1	&991F	271	Print line number
&B53A	&B50E	276	Print Basic token in A
&B571	&B558	286	Print character in A

VDU 23 definer.

```
   10  REM Copyright-D.M.Hunt-May 1983
   20  MODE1:VDU19,1,6,0,0,0:K%=&C00
   30  COLOUR1:PRINTTAB(5,2);"USER-DEFI
NED MOVING CHARACTERS"
   40  PRINTTAB(22,5);"Up to 9 characte
rs";TAB(22,6)"may be defined"
   50  DIMA%(7,7),B%(7),F%(7)
   60  VDU23,255,255,255,255,255,255,25
5,255,255
   70  DATA 1,2,4,8,16,32,64,128
   80  FOR T%=0TO7:READ F%(T%):NEXT
   90  VDU24,150;200;1279;770;:N%=-1:R$
="N"
  100  X%=18:Y%=4:A%=159:B%=768:FOR J%=
224TO232
  110  IF N%<0 GOTO130 ELSE CLG:A%=159:
GCOL0,2:COLOUR2:PROCgrid(A%,B%):PRINTTA
B(X%,Y%);N%+1:A%=732:S%=23:GCOL0,1:COLO
UR1:PROCrecall(J%):PROCgrid(A%,B%)
  120  PROCcharacters:VDU23,J%,A%(0,0),
A%(0,1),A%(0,2),A%(0,3),A%(0,4),A%(0,5)
,A%(0,6),A%(0,7):COLOUR2:PRINTTAB(X%,Y%
);CHR$ J%:N%=N%+1
  130  IF N%<0 PRINTTAB(X%,Y%);CHR$255
  140  X%=X%+1
  150  IF X%=21 X%=18:Y%=Y%+1
  160  IF R$<>"N" R=GET
  170  NEXT
  180  IF N%<0 N%=0:GOTO100
  190  PROCeor
  200  IF R$="A" GCOL0,2:COLOUR2:N%=0:G
OTO100
  210  IF R$="M" PROCeor:GOTO200
  220  END
  230  DEF PROCcharacters
  240  A%=159:COLOUR3:PRINTTAB(0,26);"E
nter or alter character in position ";N
%+1;"  Y/N?";SPC(60)
  250  REPEAT:R$=GET$:UNTIL R$="Y"ORR$=
"N"
  260  IF R$="N" ENDPROC
  270  FOR T%=0TO7:A%(0,T%)=0:NEXT:PRIN
TTAB(0,26);"Use E to block in, SPACE to
 leave blank,D to delete"
  280  GCOL0,2:COLOUR2:FOR T%=0TO7
  290  XG%=0:FOR S%=0TO7:B%(S%)=0:NEXT:
REPEAT
  300  VDU 31,XG%+5,T%+8
  310  R$=GET$:IF R$="E" OR R$="D" OR R
$=" "GOTO320 ELSE GOTO310
  320  IF R$="E" AND XG%<8 VDU255:A%(0,
T%)=A%(0,T%)+128/F%(XG%):B%(XG%)=128/F%
(XG%)
  330  IF R$=" " GOTO360
  340  IF R$="D" AND XG%=0 GOTO310
  350  IF R$="D" AND XG%>0 VDU8,32,8:XG
%=XG%-1:A%(0,T%)=A%(0,T%)-B%(XG%):B%(XG
%)=0:PROCgrid(A%,B%):GOTO370
  360  XG%=XG%+1
  370  UNTIL XG%=9:K%?(((J%-224)*8)+T%)
=A%(0,T%)
  380  VDU9:PRINT;A%(0,T%)
  390  NEXT
  400  ENDPROC
  410  DEF PROCgrid(P%,Q%)
  420  PP%=255:QQ%=0:R%=0:S%=32
  430  FOR I%=1TO2:REPEAT:MOVEP%,Q%:DRA
WP%+PP%,Q%-QQ%
  440  P%=P%+R%:Q%=Q%-S%:UNTIL P%>A%+(8
*32)OR Q%<B%-(8*32)
  450  P%=A%:Q%=B%:PP%=0:QQ%=256:R%=32:
S%=0:NEXT:ENDPROC
  460  DEF PROCeor
  470  PROCmove:IF R$="A" ENDPROC
  480  FOR J%=224TO232:FOR Y%=0TO7:X%=0
:D%=K%?(((J%-224)*8)+Y%):E%=128:REPEAT:
F%=D% DIV E%:D%=D%-(F%*E%):A%(Y%,X%)=E%
*F%
  490  E%=E%/2:X%=X%+1:UNTIL E%<1:NEXT
  500  D%=K%?(((J%-227)*8)+7):G%=K%?((J
%-221)*8):FOR Y%=0TO7
  510  B%(Y%)=0:X%=0:E%=128:REPEAT:S%=0
  520  IF Y%=0 F%=D% DIV E%:D%=D%-(F%*E
%)
  530  IF Y%=7 H%=G% DIV E%:G%=G%-(H%*E
%)
  540  IF (J%=224ANDR$="L"ANDX%=0)OR(J%
=227ANDR$="L"ANDX%=0)OR(J%=230ANDR$="L"
ANDX%=0)OR(J%=226ANDR$="R"ANDX%=7)OR(J%
=229ANDR$="R"ANDX%=7)OR(J%=232ANDR$="R"
ANDX%=7)OR(J%<227ANDR$="U"ANDY%=0)OR(J%
>229ANDR$="D"ANDY%=7) S%=A%(Y%,X%):GOTO
640
  550  IF X%<7 GOTO570:ELSE IF R$="R" L
%=K%?(((J%-223)*8)+Y%):IF (A%(Y%,X%)=0A
NDL%>128)OR(A%(Y%,X%)>0ANDL%<128) S%=1
  560  IF R$="R" GOTO640
  570  IF X%>0 GOTO590:ELSE IF R$="L" L
%=K%?(((J%-225)*8)+Y%):G%=128:REPEAT:F%
=L% DIV G%:L%=L%-(F%*G%):G%=G%/2:UNTIL
G%<1:IF (A%(Y%,X%)=0ANDF%>0)OR(A%(Y%,X%
)>0ANDF%=0) S%=128
  580  IF R$="L" GOTO640
  590  IF Y%>0 GOTO610:ELSE IF (R$="U"
AND A%(Y%,X%)=0ANDF%>0)OR(R$="U" AND A%
(Y%,X%)>0ANDF%=0) S%=E%
  600  IF R$="U" GOTO640
  610  IF Y%<7 GOTO630:ELSE IF (R$="D"
AND A%(Y%,X%)=0ANDH%>0)OR(R$="D" AND A%
(Y%,X%)>0ANDH%=0) S%=E%
  620  IF R$="D" GOTO640
  630  IF (A%(Y%+YMOVE%,X%+XMOVE%)=0 AN
D A%(Y%,X%)>0)OR(A%(Y%+YMOVE%,X%+XMOVE%
)>0 AND A%(Y%,X%)=0) S%=E%
  640  B%(Y%)=B%(Y%)+S%:E%=E%/2:X%=X%+1
:UNTIL E%<1:NEXT:VDU23,J%+9,B%(0),B%(1)
,B%(2),B%(3),B%(4),B%(5),B%(6),B%(7):NE
XT
  650  PROCdemo
  660  COLOUR3:PRINTTAB(0,26);"Enter nu
mber of character for EOR value,M for a
 different movement or A to altercharac
ters"
  670  REPEAT:R$=GET$:UNTIL(VAL R$>0 AN
D VAL R$<10) OR R$="A" OR R$="M"
  680  IF R$="A" OR R$="M" ENDPROC
  690  CLG:N%=(VALR$)+232
  700  GCOL0,2:COLOUR2:S%=5:PROCrecall(
N%-9):A%=159:PROCgrid(A%,B%):GCOL0,1:CO
LOUR1:S%=23:PROCrecall(N%):A%=732:PROCg
rid(A%,B%):PRINTTAB(22,20);"EOR charact
er"
  710  GOTO660
  720  DEF PROCmove
  730  COLOUR3:PRINTTAB(0,26);"Movement
 Up, Down, Right, Left or Alter?";SPC(6
0)
  740  R$=GET$:IF R$="U" OR R$="D" OR R
$="R" OR R$="L" OR R$="A" GOTO750 ELSE
GOTO740
  750  IF R$="U" YMOVE%=-1:XMOVE%=0
  760  IF R$="D" YMOVE%=1:XMOVE%=0
  770  IF R$="R" YMOVE%=0:XMOVE%=1
  780  IF R$="L" YMOVE%=0:XMOVE%=-1
  790  IF R$="A" ENDPROC
  800  PRINTTAB(13,22);"Please wait";SP
C(80);TAB(17,24);"for";SPC(42);TAB(0,26
);"      Demonstration of movement";SPC
(10):ENDPROC
  810  DEF PROCdemo
  820  CLG:GCOL3,3:VDU5:M%=576:N%=520
  830  MOVE M%,N%:VDU224,225,226,10,8,8
,8,227,228,229,10,8,8,8,230,231,232
  840  FOR T%=1TO56
  850  MOVE M%+(T%*(XMOVE%*4)),N%+(T%*(
-YMOVE%*4)):VDU233,234,235,10,8,8,8,236
,237,238,10,8,8,8,239,240,241
  860  NEXT
  870  VDU 4:PRINTTAB(22,8);"To avoid t
he";TAB(22,9);"character leaving";TAB(2
2,10);"a line, the";TAB(22,11);"trailin
g row of ";TAB(22,12);"pixels must be";
TAB(22,13);"left blank":ENDPROC
  880  DEF PROCrecall(M%)
  890  FOR T%=0TO7:A%(0,T%)=0:NEXT:FOR
T%=0TO7:XG%=0:D%=K%?(((M%-224)*8)+T%):E
%=128:REPEAT:F%=D% DIV E%:IF F%=0 PRINT
TAB(S%+XG%,T%+8);CHR$32 ELSE PRINTTAB(S
%+XG%,T%+8);CHR$255
  900  D%=D%-(F%*E%):IF F%<>0 A%(0,T%)=
A%(0,T%)+E%
  910  E%=E%/2:XG%=XG%+1:UNTIL E%<1
  920  PRINTTAB(S%+9,T%+8);A%(0,T%);"
":NEXT:ENDPROC
```

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(continued from page 191)

```
      206,1,3,240,9,202,208,245,17
      4,0,3,76,2,3,96,0,0
2270  RETURN
2280  REM  ---------------
2290  REM  -- PLAY TUNE --
2300  REM  ---------------
2310  READ NT,DR
2320  IF NT = 0 OR DR = 0 THEN  RETURN
2330  POKE 768,NT
2340  POKE 769,DR
2350  CALL 770
2360  GOTO 2310
2370  DATA 188,127,144,127,144,64
      ,126,64,112,127,144,127,94,1
      27,94,127,112,127,112,127,10
      4,127,94,64,104,64,112,64,10
      4,64,94,127,126,64,144,64,12
      6,64,112,64,126,127
2380  DATA 188,127,144,127,144,64
      ,126,64,112,127,144,127,94,1
      27,94,127,112,127,112,127,10
      4,64,94,64,112,64,104,64,126
      ,127,126,64,144,64,144,127,0
      ,0
```

Hanging around

It is tedious to sit about for 2½ minutes whenever a graphics dump is requested, suggests TJ Morris of New Malden, Surrey. Too short a time to get on with something else, but too long to leave the hands poised over the keyboard.

Some os us use a 64K buffer, but failing that it may be possible to stash the graphics pages temporarily to disc and use this utility to push out a solid hour's worth of work. Charts are saved as

BSAVE name, A$2000,L$2000

or

BSAVE name, A$4000,L$2000

from HGR1 or HGR2; some programs like VisiPlot have in-built Save features which do just this.

The Picprint utility is set up to drive graphics to an Epson MX-100, and is coded to enable any other printer graphics controls to be plugged in. But I tried it on the F/T III and got nothing out. The code feels that prefixing a lot of On/Off bytes with CHR$(17) is acceptable, while my over sophisticatd Epson would prefer line by line to have prefixes of CHR$(27); CHR$(75); CHR$(n); CHR$(m); followed by bits — rather than bytes — of ons and offs to the tune of m*256+n.

Given that I have tested the rest of the program and read the central graphics-code section there is not much more I can do; printer control interfacing is the one area where tailoring is always both required and structurally different in this kind of application. There is no option but to know how to control your own hardware and plug in the appropriate code each time you need it.

One of two drives are catered for, and the catalogue of the first and optionally the second will be printed before setting up the list of files to print. From that point the program runs to completion, leaving the user to do whatever he wants so long as he does not need an Apple to do it — the main reason for prefering a buffer card on the printer; for £140 or so all those few-minute gaps disappear for ever.

```
90  REM  COPYRIGHT (C) T.J. MORRI
    S
100  GOSUB 2000
110  HOME :G1 = 1:D$ =  CHR$ (4)
120  DIM T$(50): DIM T3(50): DIM
    T4$(50)
130  GOTO 530
140 N = 1: GOSUB 1160
150  ONERR  GOTO 1000
160  IF S$ = "" THEN  GOTO 180
170  PRINT : PRINT "ENTER NAME OF
     PICTURE (DO NOT TYPE "S$")"
    : PRINT "( TO  END ,E)": PRINT
    : PRINT
180  PRINT "ENTER NAME OF PICTURE
     (TO END,E)"
190  GOSUB 390
200  GOTO 680
210  IF N < 2 THEN  GOTO 330
220 N1 = N1 + 1
230 B$ = T$(N1)
240  HGR2
250  PRINT D$;"BLOAD";B$",A$4000,
    D1"
260  PRINT D$"PR£1"
270  ON T3(N1) GOSUB 900,950
280  PRINT  CHR$ (17)
290  ON T3(N1) GOSUB 930,980
300  PRINT D$"PR£0"
310  IF N1 < N - 1 GOTO 220
320  TEXT
330  PRINT "DO YOU WANT ANOTHER R
    UN ? (Y/N)"
340  INPUT Z$
350  IF Z$ = "Y" THEN  CLEAR : HOME
    : GOTO 110
360  HOME
370  POKE 216,0
380  END

390  REM  ENTRY ROUTINE
400  PRINT  SPC( 3)"NAME" SPC( 12
    )"LARGE OR SMALL (L/S)
410  PRINT  SPC( 3);"----" SPC( 1
    2)"--------------------"
420  IF N < 10 THEN  PRINT N; SPC(
    3): INPUT E$: GOTO 440
430  PRINT N; SPC( 2): INPUT E$
440  IF E$ = "E" GOTO 520
450 T$(N) = E$ + S$
460 CV =  PEEK (37)
470  VTAB CV: HTAB 32: INPUT X$
480  IF X$ = "B" THEN T3(N) = 1:T
    4$(N) = "SMALL": GOTO 500
490 T3(N) = 2:T4$(N) = "LARGE"
500 N = N + 1
510  IF N <  = 50 GOTO 420
520  RETURN

530  REM  CATALOG ROUTINE
540  HOME : PRINT "DO YOU WANT A
    CATALOG PRINTED OUT? (Y/N)":
     INPUT Z$
550  IF Z$ = "Y" THEN  PRINT : PRINT
    "DRIVE 1 OR DRIVES 1 AND 2 ?
     (1/2)": PRINT  SPC( 20)"--
    ": INPUT Z2: GOTO 580:
560  ONERR  GOTO 1270
570  PRINT : PRINT  CHR$ (4)"CATA
    LOG,D1": GOTO 660
580  ONERR  GOTO 610
590  IF Z2 <  > 2 GOTO 610
600  PRINT : PRINT D$"PR£1": PRINT
     D$"CATALOG,D2"
610  PRINT D$"PR£1"
620  POKE 216,0
630  ONERR  GOTO 1270
640  PRINT D$"CATALOG,D1": PRINT
     D$"PR£0"
650  POKE 216,0
660  PRINT "DO YOU WANT ANOTHER C
    ATALOG? (Y/N)": INPUT Z$: IF
     Z$ = "Y" GOTO 530
670  GOTO 140: REM  RETURN
680  REM  CORRECTION ROUTINE
690  HOME
700 CT = CT + 1: IF  LEN (T$(CT))
     > 30 THEN T$(CT) =  LEFT$ (
    T$(CT),30)
710  IF CT < 10 THEN  PRINT CT SPC(
    2);T$(CT) SPC( 31 -  LEN (T$
    (CT)))T4$(CT): GOTO 730
720  PRINT CT SPC( 1)T$(CT) SPC(
    31 -  LEN (T$(CT)))T4$(CT)
730  IF CT < G1 + 11 AND CT < N -
    1 GOTO 700
740  PRINT : PRINT : PRINT "ARE T
    HE ABOVE CORRECT? (Y/N)"
750  INPUT Z$
760  IF Z$ = "Y" GOTO 880
770  PRINT : PRINT "WHICH NUMBER
     DO YOU WANT TO CORRECT? (TO
     EXIT,0)"
780  INPUT A%
790  IF A% = 0 GOTO 880
800  IF A% < G1 OR A% > CT GOTO 7
    40
810  PRINT "WHAT IS THE CORRECT N
    AME?"
820  INPUT E$
830 T$(A%) = E$ + S$
840  PRINT "LARGE OR SMALL ?(L/S)
    ": INPUT X$
850  IF X$ = "S" THEN T3(A%) = 1:
    T4$(A%) = "SMALL":CT = G1 -
    1: GOTO 690
860 T3(A%) = 2:T4$(A%) = "LARGE"
870 CT = G1 - 1: GOTO 690
880  IF G1 + 12 < N - 1 THEN G1 =
    G1 + 12: GOTO 690
890  GOTO 210: REM  RETURN
900  REM  SMALL PRINT ROUTINE
910  PRINT : POKE 1913,2
920  GOTO 940
930  FOR N2 = 1 TO 47: PRINT : NEXT
    N2: IF N1 / 3 -  INT (N1 / 3
    ) < .25 THEN  PRINT
940  RETURN
950  REM  LARGE PRINT ROUTINE
960  PRINT : POKE 1913,66
970  GOTO 990
980  FOR N2 = 1 TO 31: PRINT : NEXT
    N2: IF N1 / 3 -  INT (N1 / 3
    ) < .25 THEN  PRINT
990  RETURN
1000  POKE 216,0
1010  IF I1 = 1 GOTO 1110
1020  ONERR  GOTO 1080
1030  PRINT D$;"BLOAD";B$",A$4000
     ,D2"
1040  POKE 216,0
1050  ONERR  GOTO 1000
1060  GOTO 260
1070  GOTO 310
1080  POKE 216,0
1090 E1 =  PEEK (222)
1100  IF E1 = 8 OR E1 = 4 THEN I1
     = 1
1110  PRINT : PRINT D$"PR£1": PRINT
    "FILE "B$" NOT FOUND": FOR X
     = 1 TO 65: PRINT : NEXT : PRINT
    D$"PR£0"
1120  ONERR  GOTO 1000
1130  GOTO 310
1140  REM  INSTRS
1150  RETURN
1160  REM  SUFFIX SUBROUTINE
1170  GOSUB 1260: PRINT "DO ALL Y
    OUR PICTURES HAVE A COMMON
     SUFFIX ?(E.G. .PIX) (Y/N
    )"
1180  INPUT Z3$
1190  IF Z3$ <  > "Y" THEN S$ = "
    ": GOTO 1250
1200  GOSUB 1260: PRINT "ENTER SU
    FFIX": INPUT S$
1210  GOSUB 1260: PRINT "SUFFIX I
    S ;"S$"' IS THIS CORRECT?(Y/
    N)"
1220  INPUT Z3$
1230  IF Z3$ = "Y" GOTO 1250
1240  GOTO 1170
1250  RETURN
1260  VTAB 19: CALL  - 958: VTAB
    20: PRINT "": RETURN
1270  PRINT D$"PR£0": PRINT "I/O
    ERROR": PRINT : GOTO 650
2000  REM  INSTRUCTIONS
2010  HOME : PRINT "PICPRINT PROG
    RAM"
2020  PRINT "----------------"
2030  POKE 34,3
2040  VTAB 12: PRINT "DO YOU WANT
     THE INSTRUCTIONS ? (Y/N)": INPUT
     "";A$
2050  IF A$ <  > "Y" GOTO 2990
2060  HOME : PRINT "THIS PROGRAM
    PRINTS OUT UP TO 50 HIGH": PRINT
    "RESOLUTION GRAPHICS PICTURE
    S PREVIOUSLY STORED ON DISK.
    "
2070  PRINT : PRINT "IT USES DISK
     DRIVE 1 OR DISK DRIVES 1": PRINT
    "AND 2.IF THE OPTION OF PRIN
    TING OUT": PRINT "CATALOGS I
    S NOT CHOSEN THEN DISK DRIVE
     1ONLY IS CATALOGUED ON THE
    SCREEN."
2080  PRINT : PRINT "IF ALL THE P
    ICTURES TO BE PRINTED HAVE A
    COMMON SUFFIX IT NEEDS TO BE
     ENTERED ": PRINT "ONLY ONCE
    ."
2090  PRINT : PRINT "AFTER THE IN
    ITIAL ENTRY ROUTINE IS
    COMPLETED THERE IS THE OPTIO
    N TO CORRECTANY ERRORS."
2100  PRINT : PRINT "PRESS RETURN
     TO START"
2110  GET A1$
2990  POKE 34,0: RETURN
```

Basic-80 Air Attack

```
5 GOSUB 1290
6 OPEN"R",#1,"AIR.HSC"
7 FIELD#1,5 AS HS$,20 AS NS$
10 PRINT CHR$(12):FOR I=1 TO 23:PRINT " ":NEXT I:PRINT CHR$(1)
20 FOR I=0 TO 79:POKE 65328!+I,45:NEXT I
30 FOR I=1 TO 15:POKE 65294!+I,127:NEXT I:MC=0:C=0
40 FOR I=1 TO 5:POKE 65218!+I,127:NEXT I:M=25:CC=0
50 POKE 65218!,92:POKE 65224!,92:POKE 65226!,111:POKE 65227!,111
60 POKE 65140!,76:POKE 65141!,109:RANDOMIZE L
70 GOTO 1000
80 B=65218!:B=B-82:POKE B,92
90 FOR I=1 TO 11:B=B-82:IF PEEK(B)<>32 THEN POKE B+82,32:GOTO  1190
100 POKE B,92:POKE B+82,32:NEXT I
110 FOR I=1 TO 4:POKE B,42:POKE B,32:NEXT I:RETURN
120 B=65218!:B=B-81:POKE B,92
130 FOR I=1 TO 13:B=B-81:IF PEEK(B)<>32 THEN POKE B+81,32:GOTO 1190
140 POKE B,92:POKE B+81,32:NEXT I:GOTO 110
150 B=65218!:B=B-80:POKE B,124
160 FOR I=1 TO 14:B=B-80:IF PEEK(B)<>32 THEN POKE B+80,32:GOTO 1190
170 POKE B,124:POKE B+80,32:NEXT I:GOTO 110
180 B=65218!:B=B-1:POKE B,45
190 FOR I=1 TO 24:B=B-1:IF PEEK(B)<>32 THEN POKE B+1,32:GOTO 1190
200 POKE B,45:POKE B+1,32:NEXT I:GOTO 110
210 IF M<1 THEN RETURN
220 B=65224!:B=B-82:POKE B,92
230 FOR I=1 TO 18:B=B-82:IF PEEK(B)<>32 THEN POKE B+82,32:GOTO 1190
240 POKE B,92:POKE B+82,32:NEXT I:GOTO 110
250 IF M<1 THEN RETURN
260 B=65224!:B=B-81:POKE B,92
270 FOR I=1 TO 18:B=B-81:IF PEEK(B)<>32 THEN POKE B+81,32:GOTO 1190
280 POKE B,92:POKE B+81,32:NEXT I:GOTO 110
290 POKE IP1,32:POKE IP1+1,32:POKE IP1+2,32:POKE IP1+3,32:POKE IP1-80,32
300 IP1=IP1+2:PC1=PC1+2:IF PC1>75 THEN PL1=0:RETURN
310 POKE IP1,127:POKE IP1+1,127:POKE IP1+2,127:POKE IP1+3,62:POKE IP1-80,110
320 K=RND(1):IF K<.2 THEN GOSUB 410:GOTO 340
330 IF K<.4 THEN GOSUB 410
340 RETURN
350 POKE IP2,32:POKE IP2+1,32:POKE IP2+2,32:POKE IP2+3,32:POKE IP2-80,32
360 IP2=IP2+2:PC2=PC2+2:IF PC2>75 THEN PL2=0:RETURN
370 POKE IP2,127:POKE IP2+1,127:POKE IP2+2,127:POKE IP2+3,62:POKE IP2-80,110
380 K=RND(1):IF K<.2 THEN GOSUB 470:GOTO 400
390 IF K<.4 THEN GOSUB 470
400 RETURN
410 B=IP1+82:POKE B,92
420 B=B+81:IF PEEK(B)<>32 THEN POKE B-81,32:GOTO 490
430 POKE B-81,32:POKE B,92:GOTO 420
470 B=IP2+82:POKE B,92:GOTO 420
490 IF PEEK(B)=45 THEN RETURN
500 IF B>65296! AND B<65306! THEN 520
510 GOTO 110
520 FOR I=1 TO 18:PRINT:NEXT I:PRINT TAB(48)" \ \ \ | | / /"
530 PRINT TAB(48)"  \ \ ****/ / ":PRINT TAB(48)"---*********---"
535 FOR I=1 TO 800:NEXT I:PRINT CHR$(12):PRINT:PRINT:PRINT:PRINT
540 PRINT SPC(30)"AIR ATTACK - - - GAME OVER!"
550 PRINT:PRINT SPC(30)"YOU MANAGED TO SHOOT DOWN"
560 PRINT SPC(30)" ";CC" PLANES USING"
570 PRINT SPC(30)" ";C" A.A. SHOTS AND"
580 PRINT SPC(30)" ";MC" MISSILES."
581 GET#1,1:HS=CVI(HS$):IF HS<CC THEN PRINT:PRINT TAB(30)"YOU BEAT HIGHEST SCO
RE":GOTO 1530
582 PRINT:PRINT TAB(30)"HIGHEST SCORE IS "HS" BY "NS$
590 PRINT:PRINT:PRINT SPC(30)"TO END GAME PRESS 'E'"
600 PRINT:PRINT SPC(30)"ANY OTHER KEY FOR NEW GAME."
605 B$=INPUT$(1)
610 A$=INPUT$(1):IF A$="E" THEN CLOSE #1:END
620 L=ASC(A$):PL1=0:PL2=0:GOTO 10
1000 Y=INP(105):X=INP(107)
1010 IF X=128 THEN 1090
1020 IF Y=192 OR Y=196 THEN 1090
1025 Z=INP(80)
1030 IF Z=120 AND PEEK(65218!)=92 THEN GOSUB 80:GOTO 1100
1040 IF Z=99 AND PEEK(65218!)=92 THEN GOSUB 120:GOTO 1100
1050 IF Z=118 AND PEEK(65218!)=92 THEN GOSUB 150:GOTO 1100
1060 IF Z=122 AND PEEK(65218!)=92 THEN GOSUB 180:GOTO 1100
1070 IF Z=44 AND PEEK(65224!)=92 THEN GOSUB 210:GOTO 1110
1080 IF Z=46 AND PEEK(65224!)=92 THEN GOSUB 250:GOTO 1110
1090 GOTO 1120
1100 C=C+1:GOTO 1120
1110 M=M-1:MC=MC+1
1120 IF PL1=1 THEN 1140
1130 K=INT(RND(1)*20):IP1=6364B!+(K*80):PC1=0:PL1=1
1135 IF IP1=65008! OR IP1=65088! THEN IP1=65168!
1140 GOSUB 290
1150 IF PL2=1 THEN 1170
1160 K=INT(RND(1)*20):IP2=6364B!+(K*80):PC2=0:PL2=1
1165 IF IP2=65008! OR IP2=65088! THEN IP2=65168!
1170 GOSUB 350
1175 IF IP1=65214! OR IP2=65214! THEN 520
1180 GOTO 1000
1190 FOR I=0 TO 3:IF B=IP1+I THEN PL1=0:GOTO 1220
1200 IF B=IP2+I THEN PL2=0:GOTO 1250
1210 NEXT I:RETURN
1220 FOR I=1 TO 4:POKE IP1,42:POKE IP1+1,42:POKE IP1+2,42:POKE IP1+3,42
1230 POKE IP1-80,42:FOR A=1 TO 3:NEXT A:POKE IP1,32:POKE IP1+1,32
1240 POKE IP1+2,32:POKE IP1+3,32:POKE IP1-80,32:NEXT I:GOTO 1280
1250 FOR I=1 TO 4:POKE IP2,42:POKE IP2+1,42:POKE IP2+2,42:POKE IP2+3,42
1260 POKE IP2-80,42:FOR A=1 TO 3:NEXT A:POKE IP2,32:POKE IP2+1,32
1270 POKE IP2+2,32:POKE IP2+3,32:POKE IP2-80,32:NEXT I:GOTO 1280
1280 CC=CC+1:RETURN
1290 PRINT CHR$(12):PRINT:PRINT:PRINT STRING$(79,42):PRINT"*"TAB(79)"*"
1300 PRINT"*"SPC(34)"AIR ATTACK"TAB(79)"*":PRINT"*"TAB(79)"*"
1310 PRINT"*"SPC(27)"GAME BY R.CHICK. OCT,82."TAB(79)"*":PRINT"*"TAB(79)"*"
```

(listing continued opposite)

THE OBJECT of Air Attack by R Chick of St Helens, Merseyside is to shoot down as many attacking planes as possible before they destroy your ship. The program is written in Microsoft Basic-80 to run on a Superbrain micro.

The variables used in connection with the Poke command ends in an exclamation mark which is put in the listing by the microprocessor when the program is run. It should be omitted when typing in the program. All the £ signs in the listing should be entered as $ signs.

The Superbrain has 2K of RAM allocated to the display screen. It is not memory mapped as such, and out of these 2K only 2,000 bytes are displayed on the screen at any time. The screen has the effect of scrolling through the 2K, so Poking into the screen address does not produce a consistent result.

Line 10 overcomes this effect by setting up the screen to a particular portion of the 2K. Once set up in this way, the addresses of each character square remain the same providing that Print statements do not go past screen line 23 and are followed by CHR$(1). You can the Poke directly into screen memory as it is now effectively memory mapped.

Lines 1000 to 1025 perform the equivalent to the Get, Inkey, etc. of other microcomputers to enable the main program loop to be executed continually while still observing for a key pressed. The Microsoft Basic used on the Superbrain does not incorporate a single keyboard-scan command and so the keyboard ports are read directly. Ports 105 and 107 together identify if a key is being pressed and port 80 contains a value related to the key.

The program also includes a random file for recording the highest scorer. It can be removed if not required by deleting lines 6 and 7 and altering lines 581 and 1540 to:

581 IF HS<CC THEN rest of line same as listing

1540 HS = CC: NS$ = R$

Jupiter's moons

AN ARCADE GAME in Forth for the Jupiter Ace comes from D F Haslam of Bramhall, Cheshire. In it, a bomber must clear the runway of skyscrapers to enable it to land. The game runs on the unexpanded Jupiter Ace without most of the comments, and was successfully implemented on the unexpanded version. Memory is tight, so it is important to get the longer word definitions correct first time.

Rather than construct a look-up table for the skyline data, I saved some memory by using some of the ROM from location 20 onwards taking the absolute value modulo 9. It gave the most pleasing result, though you may wish to experiment.

A harder game may also be obtained by putting the land higher up the screen. Thus:

16 CONSTANT LAND
REDEFINE LAND

On the unexpanded Ace, editing a word may require prior Forgetting of the last two dictionary words in order to avoid an Out of Memory error; after editing they can be re-entered.

After entering all the words as shown just enter Run. For another game press the © key. Skilled players may wish to try speeding up the game by storing a lower value in Speed. Thus:

250 SPEED!

will make it twice as fast.

```
1320 PRINT STRING$(79,42):PRINT:PRINT:PRINT"PRESS ANY KEY TO CONTINUE."
1330 A$=INPUT$(1):L=ASC(A$)
1340 PRINT CHR$(12)
1350 PRINT SPC(35)"AIR ATTACK":PRINT:PRINT
1360 PRINT SPC(34)"INSTRUCTIONS":PRINT
1370 PRINT TAB(15)"YOU ARE IN COMMAND OF A SHIP WHICH IS UNDER ATTACK"
1380 PRINT TAB(15)"FROM ENEMY AIRCRAFT."
1390 PRINT TAB(15)"YOUR SHIP IS IMMOBILISED BUT IS STILL ABLE TO USE ITS"
1400 PRINT TAB(15)"GUNS AND MISSILES."
1410 PRINT TAB(15)"THE A.A. GUNS ARE AT THE FRONT OF THE SHIP AND HAVE"
1420 PRINT TAB(15)"4 POSITIONS, THESE ARE CONTROLLED BY KEYS Z,X,C,V."
1430 PRINT TAB(15)"Z IS HORIZONTAL AND V IS VERTICAL, X & C INBETWEEN."
1440 PRINT TAB(15)"THE MISSILES ARE LAUNCHED FROM THE REAR OF SHIP"
1450 PRINT TAB(15)"BY KEYS ',' & '.' (',' IS THE LOWER ELEVATION)."
1460 PRINT TAB(15)"MISSILES HAVE A LONGER RANGE THAN A.A. GUNS BUT"
1470 PRINT TAB(15)"ARE LIMITED (ONLY 25 MISSILES)."
1480 PRINT TAB(15)"THE OBJECTIVE IS TO SHOOT DOWN AS MANY AIRCRAFT"
1490 PRINT TAB(15)"AS POSSIBLE."
1500 PRINT TAB(15)"PRESS ANY KEY TO PLAY."
1510 A$=INPUT$(1):L=L+ASC(A$)
1520 RETURN
1530 PRINT:PRINT TAB(30)"TYPE IN YOUR NAME ";:INPUT;R$
1540 LSET HS$=MKI$(CC):LSET NS$=R$:PUT#1,1
1550 GOTO 590
```

Jupiter's moons.

```
FORTH ( suitable for Jupiter Ace)

DECIMAL ( enter program without comments)

22 CONSTANT LAND ( the bottom row)

0 VARIABLE BOMB ( screen address offset)

0 VARIABLE FLAG ( whether bomb falling)

500 VARIABLE SPEED

0 VARIABLE SCORE

CREATE PLANE 32 C, 145 C, 147 C, 61 C, 95 C,
            ( shape table)

: S@ ( screen fetch)
   9216 + C@
;

: ?G ( ground level yet?)
   32 + DUP S@ 160 =
;

: ?# ( part of a tower?)
   S@ 163 =
;

: XY ( co-ordinates from offset)
   32 /MOD SWAP AT
;

: GRND ( display ground level)
   CLS LAND 0 AT 32
   0
   DO
     160 EMIT
   LOOP
;

: TOP ( machine ROM used for skyline)
   20 + C@ ABS 8
   MOD 1+ LAND SWAP -
;

: TWR ( skyscraper column)
   >R LAND I TOP
   DO
     I J AT 163 EMIT
   LOOP
   R> DROP
;

: BLANK ( to follow bomb)
   DUP XY SPACE
;
: ?CLR ( no bomb on screen?)
   ?BOMB 0=
;

: SET ( the bomb in motion)
   BOMB ! 1 FLAG !
;

: WAIT
   SPEED @ 0
   DO
   LOOP
;

: TEST ( one game cycle)
   TOWN END 0
   DO
     I 4 + ?#
     IF
       ." FAILED"
       LEAVE
     ELSE
       ?BOMB
       IF
         DOWN
       THEN
       I FLY
       IF
         ?CLR
         IF
           I SET
         THEN
       THEN
     THEN
     WAIT
   LOOP
;

: © ( press © for another go)
   (D.F.HASLAM 26.1.83)
   BEGIN
     INKEY 127 =
   UNTIL
;

: RUN ( a concession to Basic users)
   BEGIN
     TEST © 0
   UNTIL
;
: CLR
   0 FLAG !
;

: BUMP
   SCORE @ 1+ SCORE !
;

: .B ( diplay the bomb)
   DUP XY 46 EMIT BOMB !
;

: FALL ( one level down)
   DUP ?#
   IF
     BUMP
   THEN
   .B
;

: ZERO
   0 SCORE !
;

: SHOW ( the score)
   DROP SCORE @ 0 0
   AT . ." pts"
   CLR
;

: TOWN (the skyline appears)
   ZERO CLR GRND 32 0
   DO
     I TWR
   LOOP
;

: END ( of the runway, if you win)
   LAND 32 # 4 -
;

: ?BOMB ( is one dropping?)
   FLAG @
;

: DOWN ( but not too far!)
   BOMB @ BLANK ?G
   IF
     SHOW
   ELSE
     FALL
   THEN
;

: FLY ( display the bomber)
   XY PLANE 5 TYPE INKEY
;
```

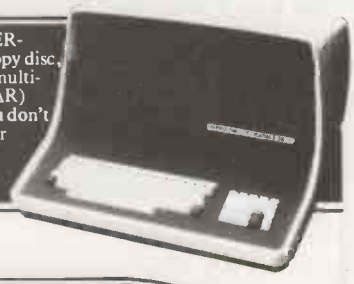
Steps & Adders

Start here with SUPERBRAIN

3 You need to store greater quantities of data with faster access times so Winchester Disc Storage facility now required. If you started with a W6, move forward 4 places. Otherwise . . .

2 Each SUPERBRAIN comes with CP/M operating system, BASIC programming language, twin Z-80 microprocessors and an RS-232 communications port.

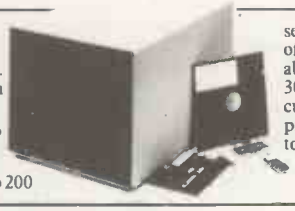
1 Choose your SUPERBRAIN. Twin floppy disc, hard disc (W6) or multi-user (COMPUSTAR) models available. If you don't need a W6 or multi-user straight away, don't worry – you can always upgrade later on.



4 Either upgrade your SUPERBRAIN by replacing one floppy drive giving a Winchester plus floppy configuration . . .

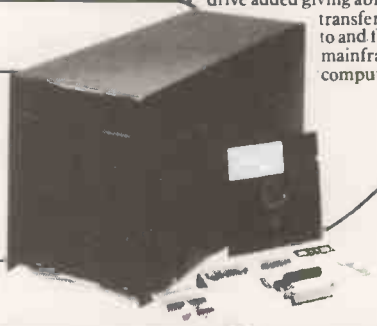
5 OR . . .

6 Add on a 5¼" Winchester in a separate box. Whichever way you do it, Icarus Winchesters give 5, 10 or 30 MB of disc storage – enough to accommodate up to 200 separate items of information about each of 300 individual customers/sales prospects or up to 60,000 stock control records.



7 Your company moves to another part of the country to take advantage of regional development grant. SUPERBRAIN servicing well supported by Icarus nationwide dealer network.

8 Data interchange facility required so external 8" floppy disc drive added giving ability to transfer data to and from a mainframe computer.



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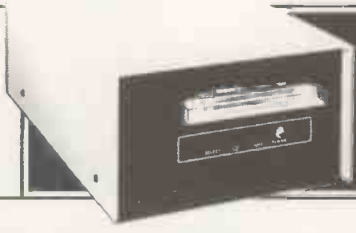

13 Leave nothing to chance. Add a 13 MB CARTRIDGE TAPE BACK-UP UNIT to give file-by-file back up for your SUPERBRAIN hard disc.

14 SUPERBRAIN: the game with no end. Our development continues as your business prospers . . .

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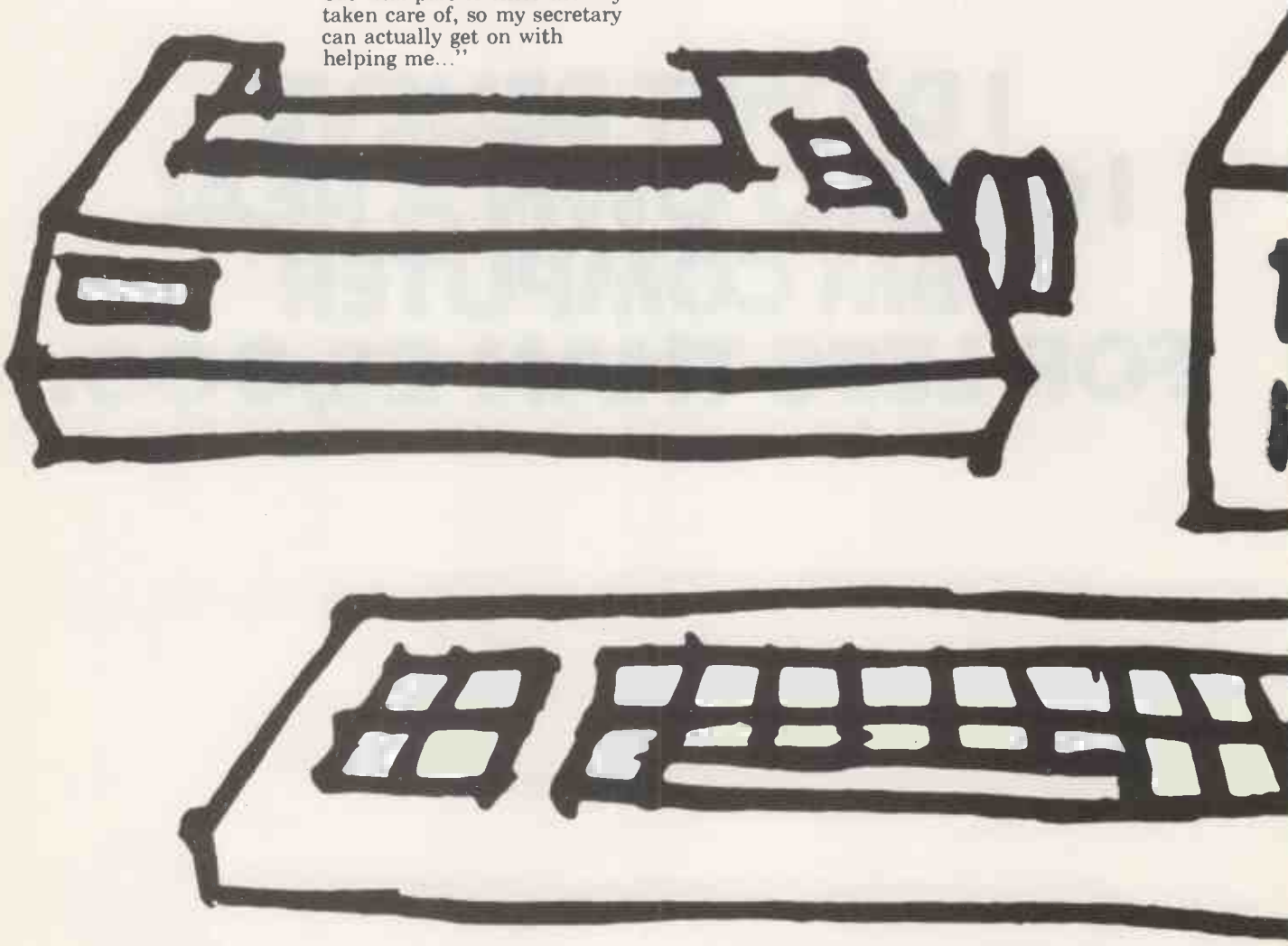

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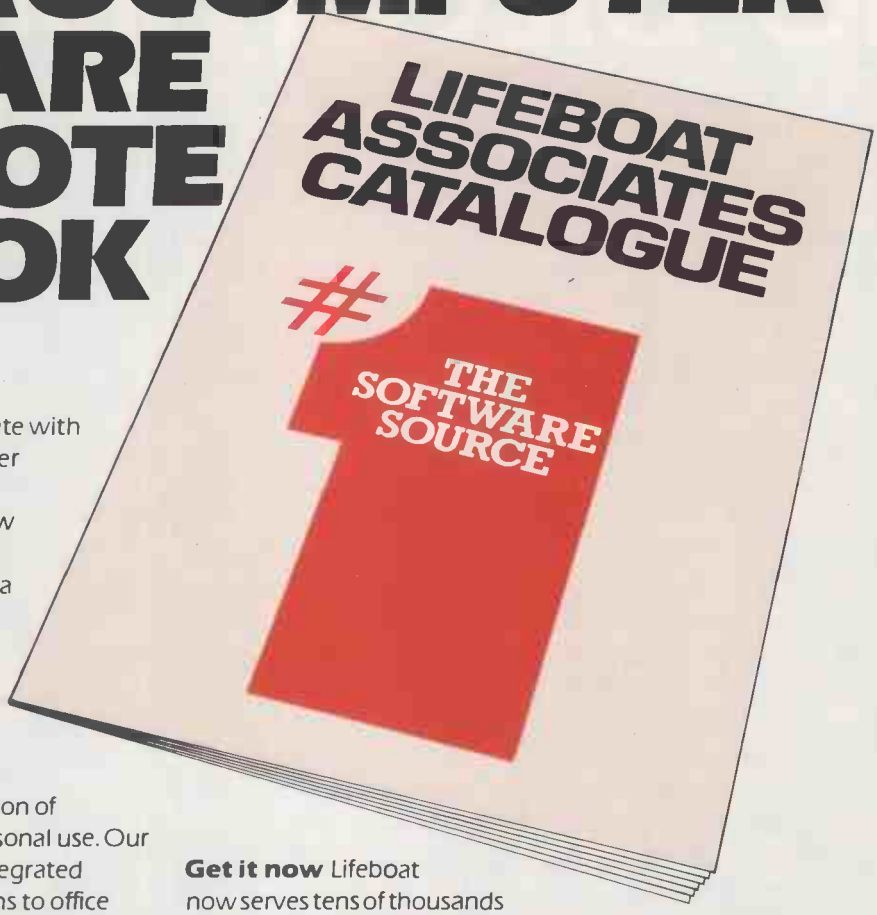

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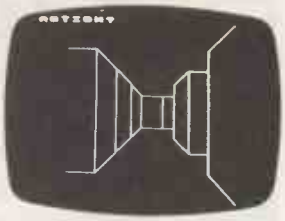

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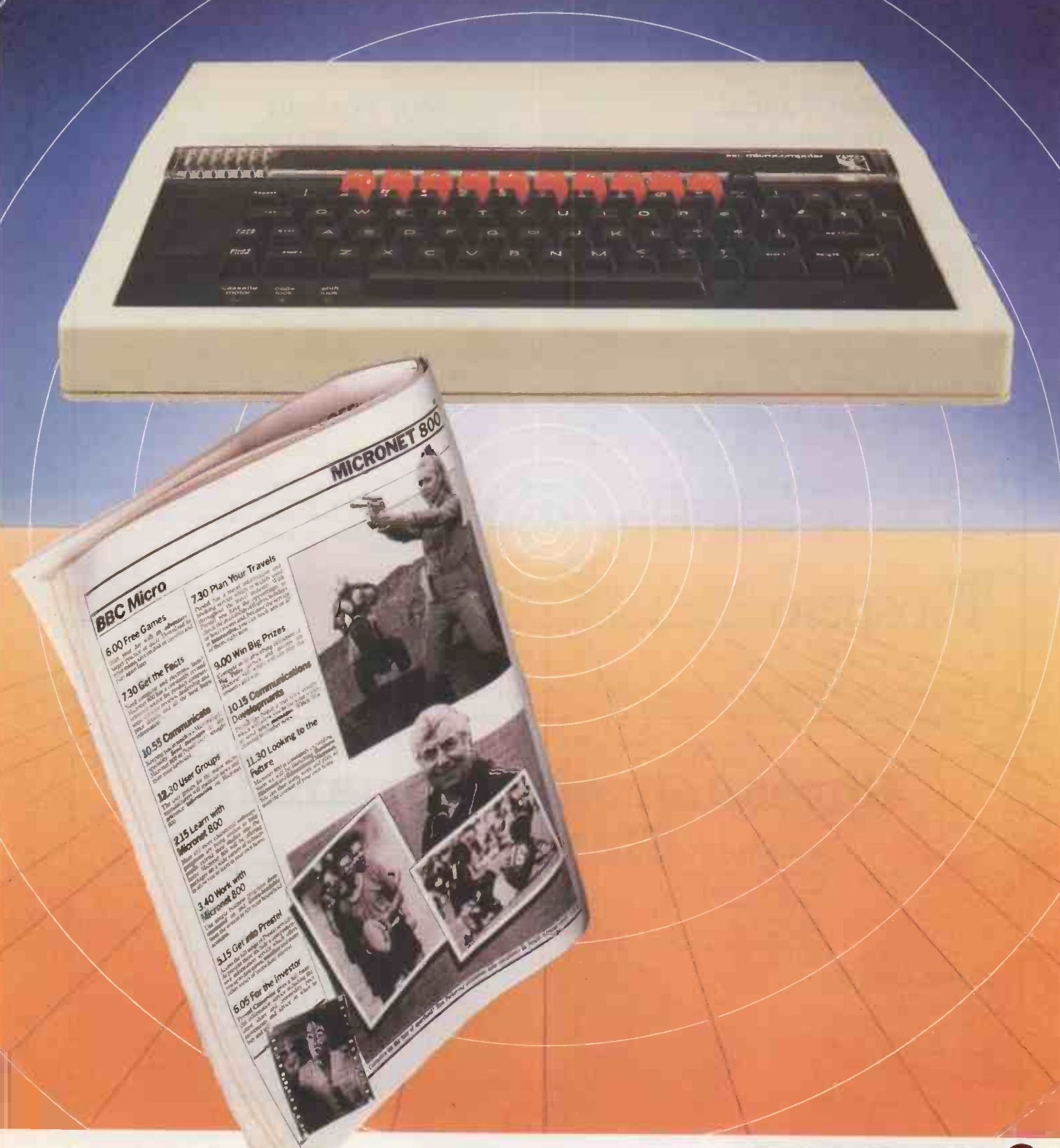

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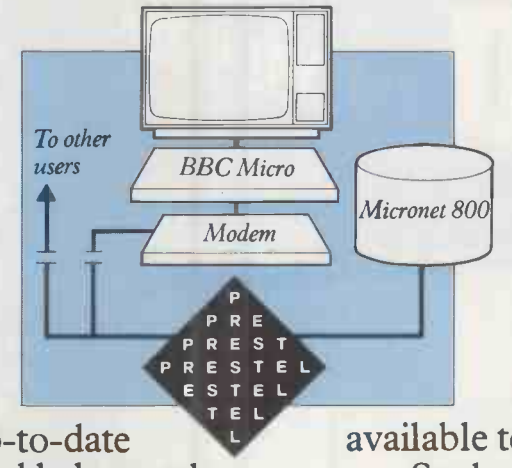

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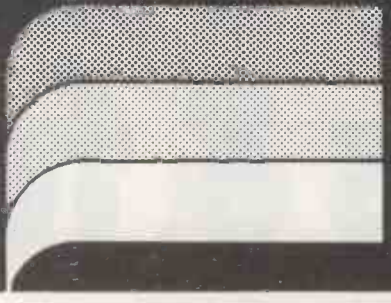

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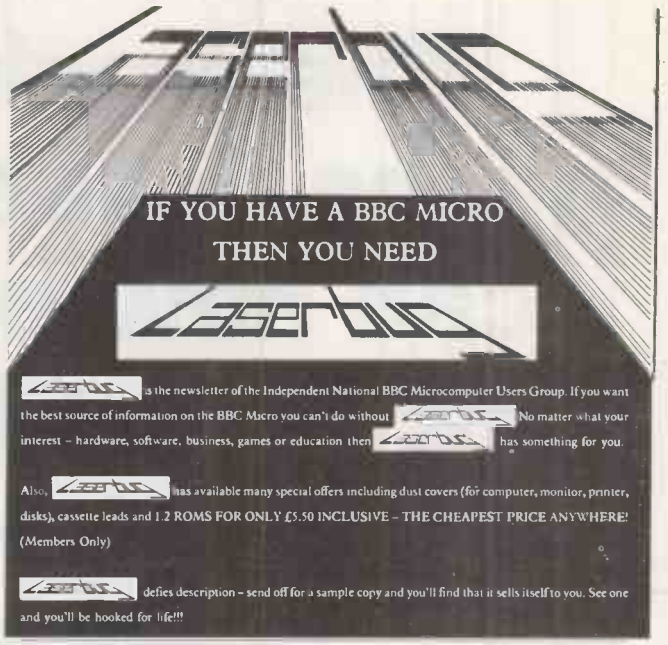

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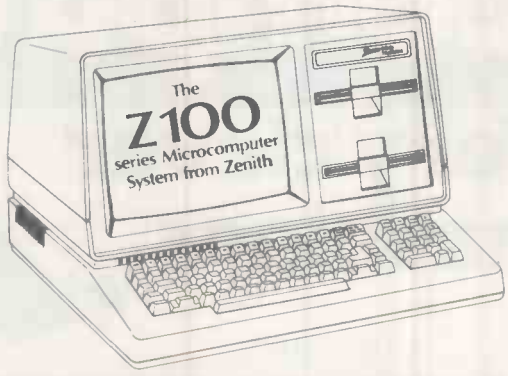

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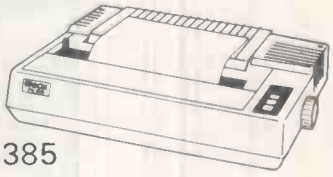

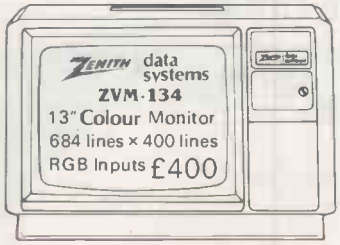

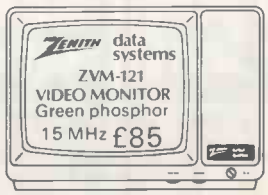

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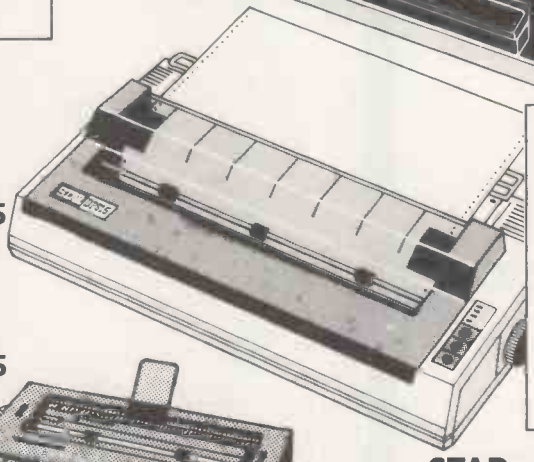

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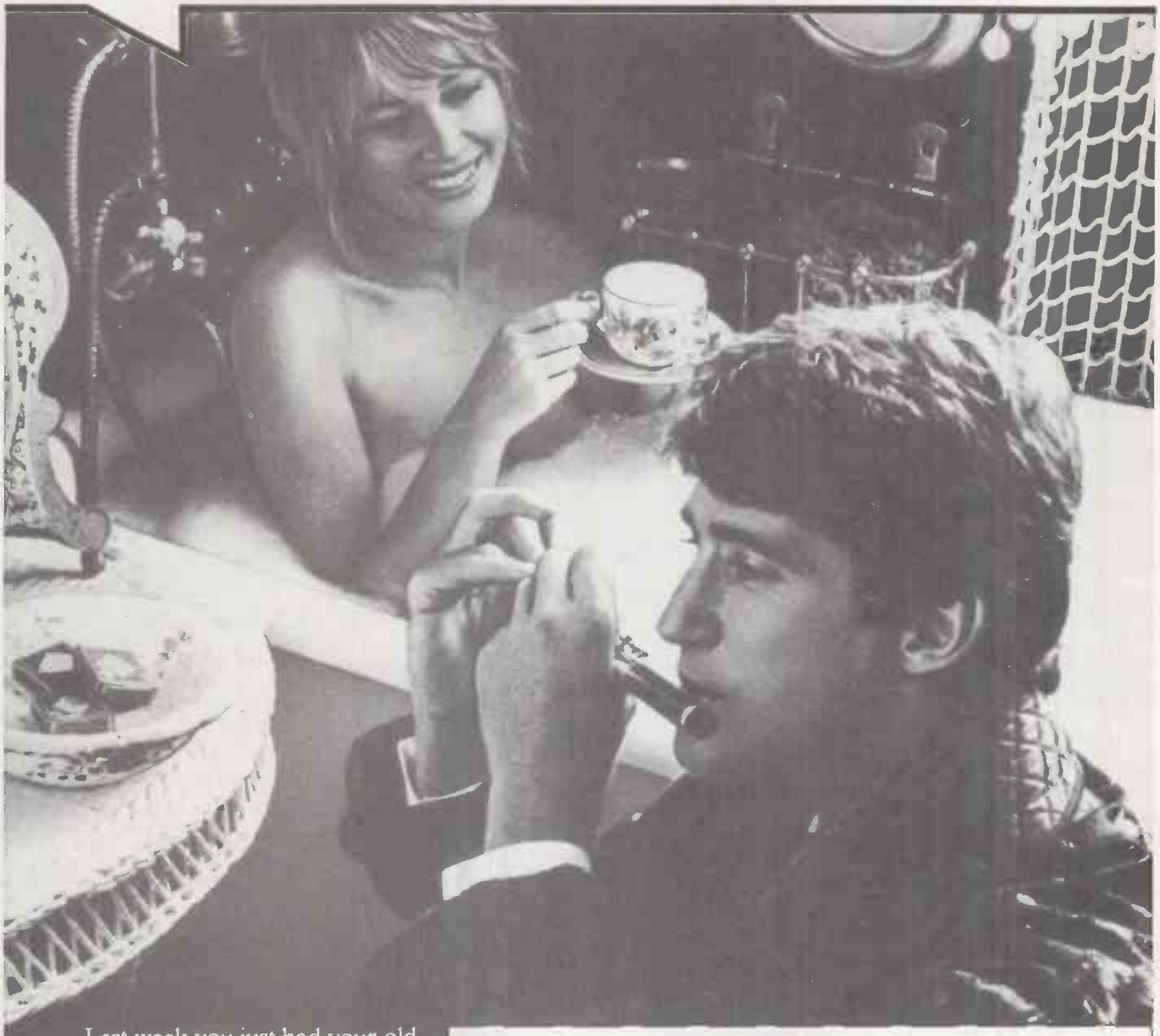

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THE Northern Computer Fair

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Small business systems

Belle Vue Manchester
November 24-26, 1983

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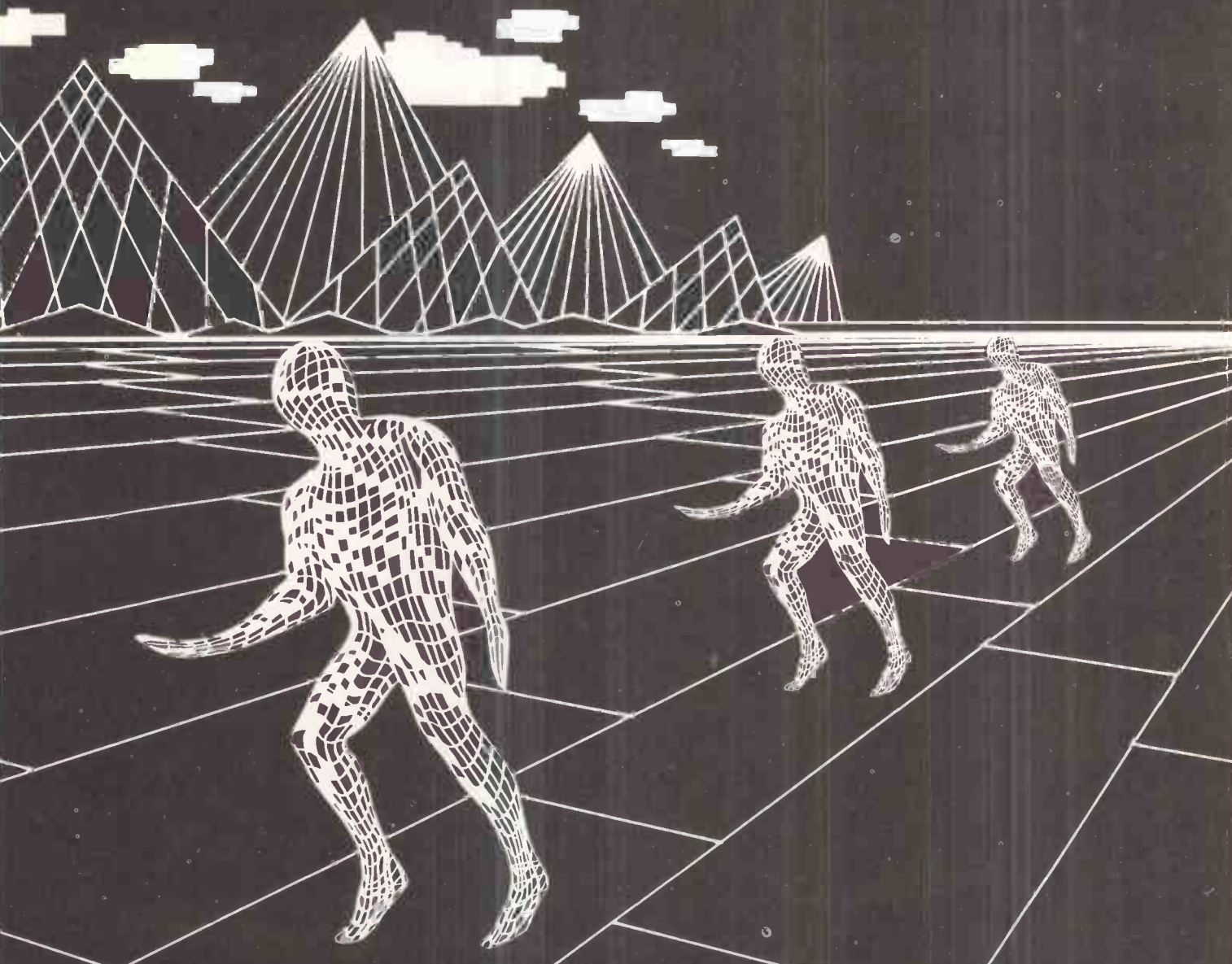

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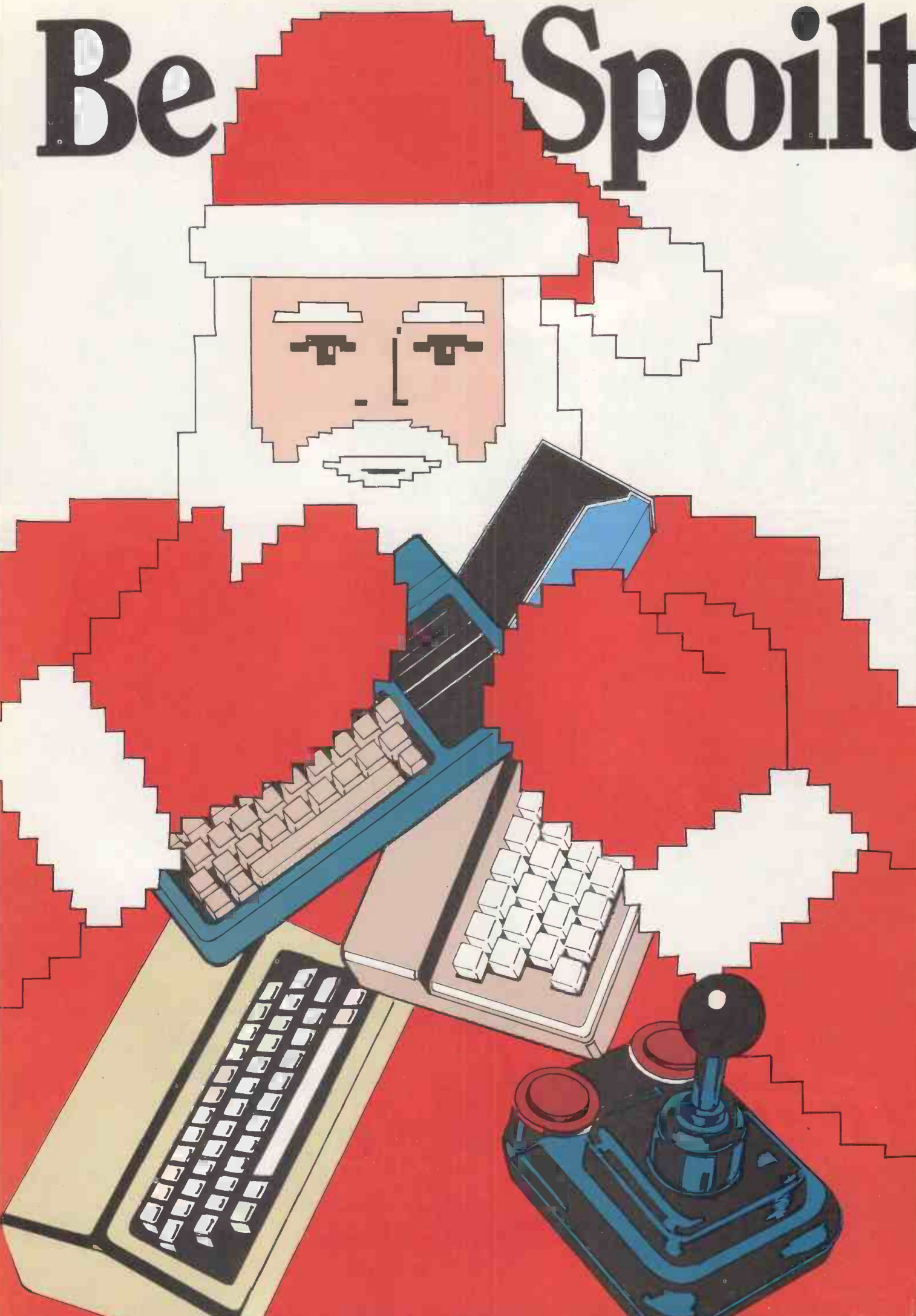

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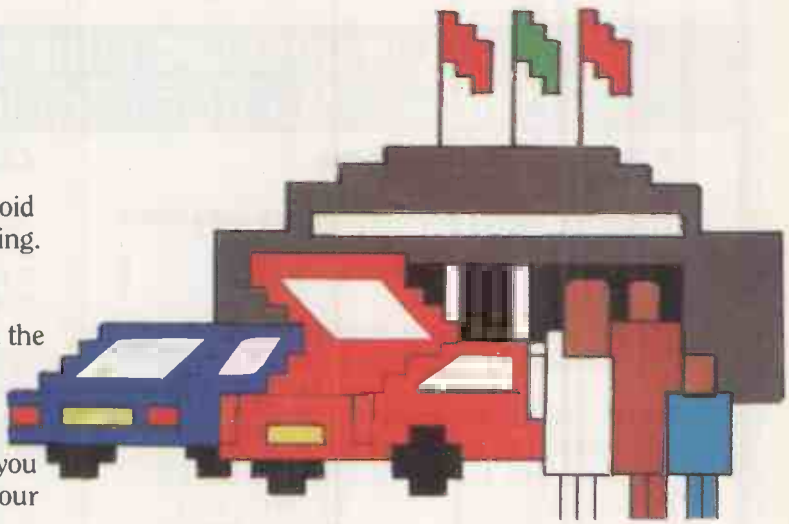

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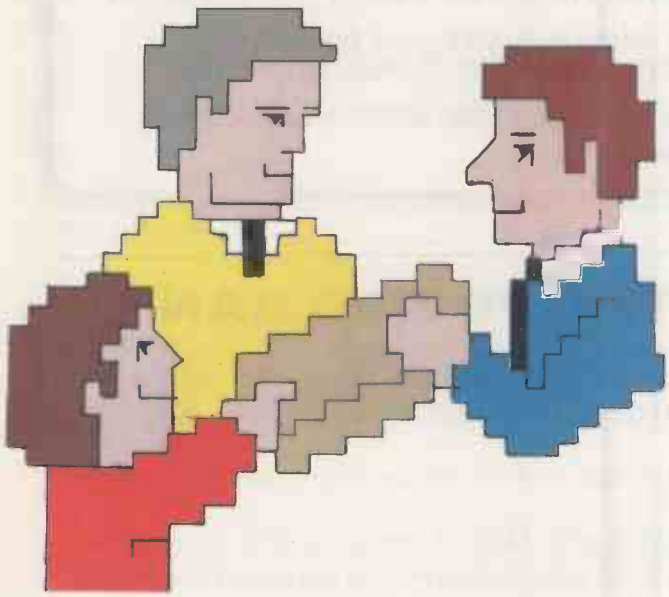

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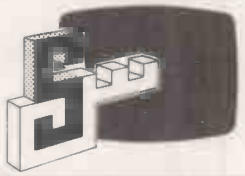

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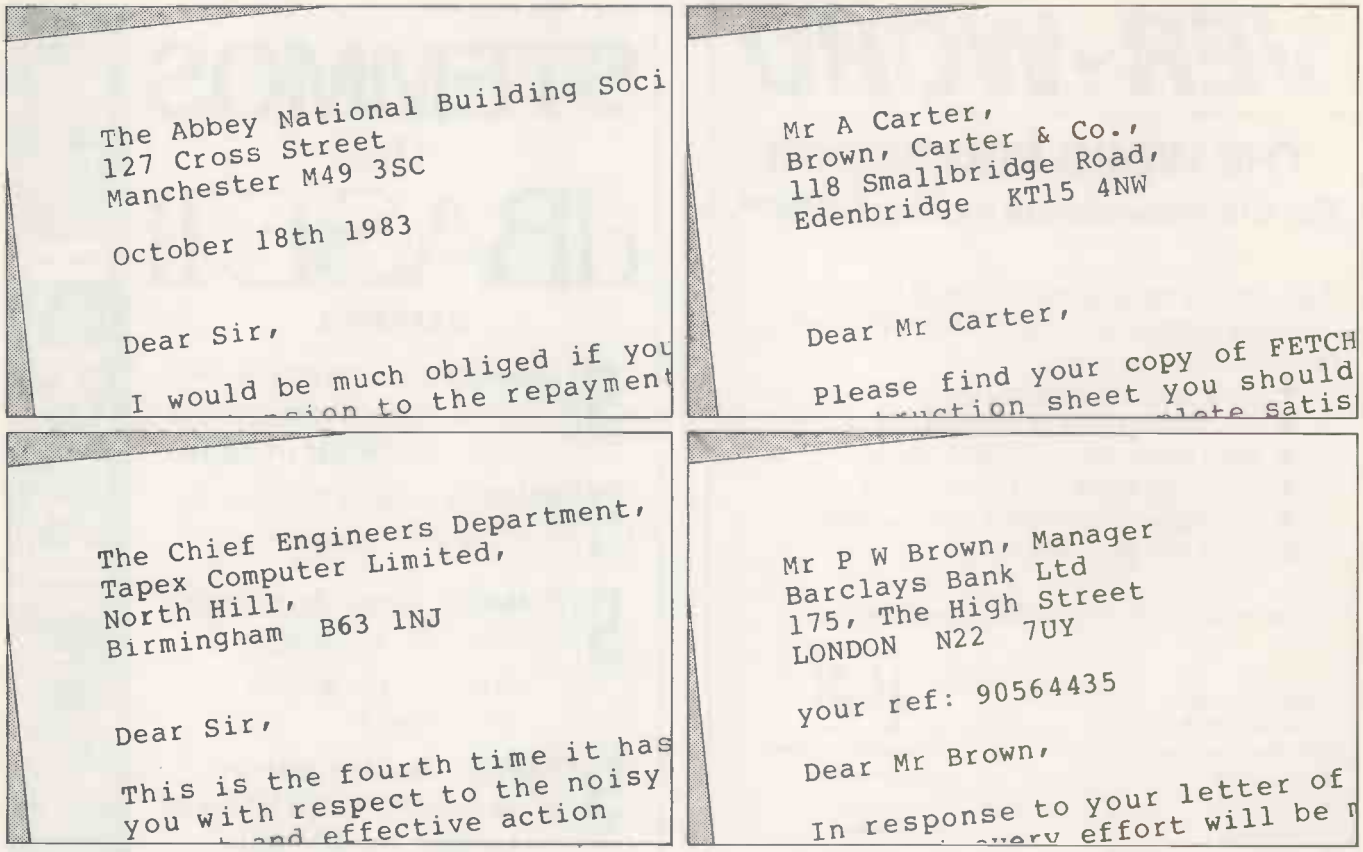

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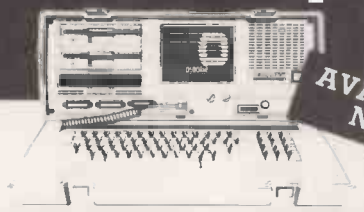

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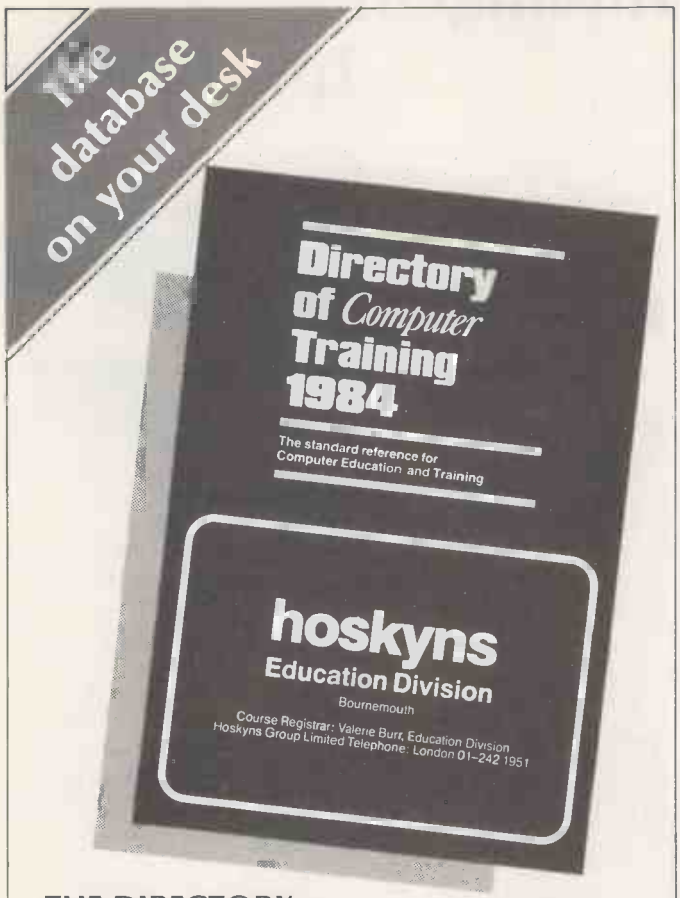

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>REVIEWS

Hardware on the test bench ranges from the small but extremely powerful Hewlett-Packard Series 16 with Sony micro-floppies, to the new Atari 800XL, which is more than a games machine. On the software side, Chris Bidmead will be comparing Concurrent CP/M-86 — set to take the 16-bit business market by storm — with the new MS-DOS v.2. Mike Lewis will be looking at some important add-on programs for dBase II.

>AND MUCH MORE!

Other features in the December issue range from an in-depth look at word processing on the Commodore 64 to an investigation of computer fraud. And there will be all the news of new micros, our regular columns and departments, plus pages of free software in Open File.

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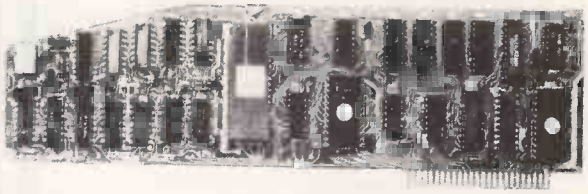

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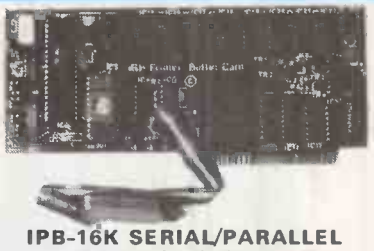

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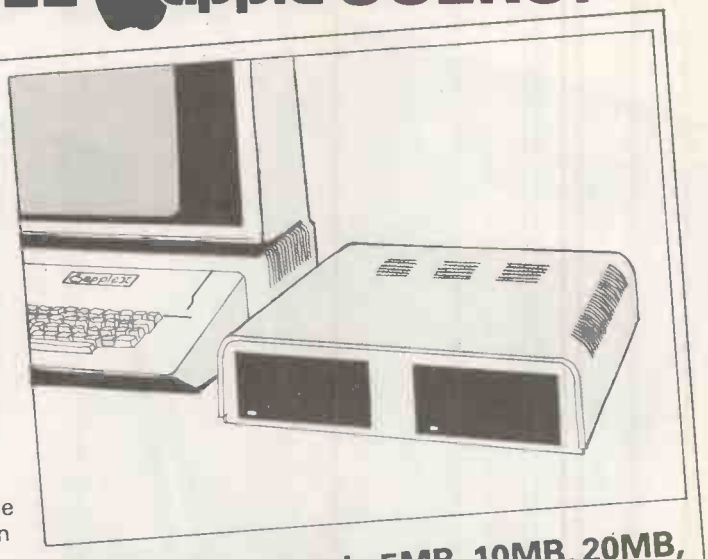

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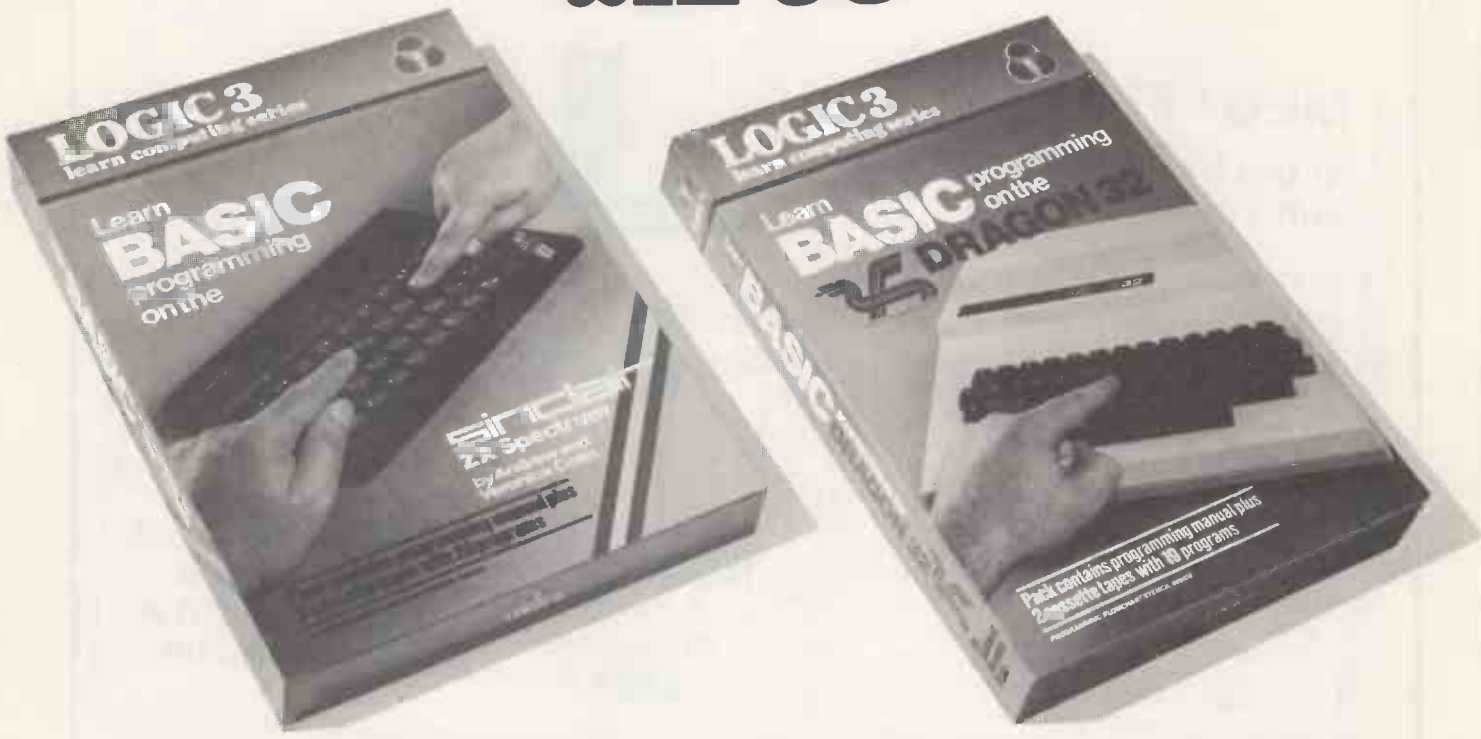

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2: The second is the recently announced new Software '84 exhibition and conference. A show devoted entirely to the subject of business and professional software at Earls Court, London, June 5 – 7 1984.

Both shows are organised by Reed Exhibitions, the country's largest business exhibition organisers, and sponsored by Computer Weekly and Software in association with Systems International, Practical Computing, Micro Business and Computer Talk.

For more information contact the Exhibition Manager, Compec '83 or Software '84, Reed Exhibitions, Surrey House, 1 Throwley Way, Sutton, Surrey SM1 4QQ. Telephone: 01-643-8040

A child could work it

by Peter Laurie

THERE IS a motto or saying ascribed to Gresham and laughingly elevated by economists to a law of nature that reads: "Bad money drives out good". Presumably it is because sensible people put the good money under their beds and use the rotten new stuff for the ordinary business of life.

At least there is a sensible reason. The explanation for Laurie's Law, that bad computers drive out good, is harder to find. Yet it is undoubtedly true. To verify it we have only to look around in the most cursory way. In all directions people are abandoning eight-bit machines that — after nearly five years of toil and agony — work reasonably well. Instead they are rushing to buy 16-bit machines that emphatically do not — or do not yet, anway.

One of the very first things that was said about the first 16-bit machine, the Sirius, was that MBasic ran a quarter the speed on it that it did on an eight-bit machine. Why was that? Because the good software persons had taken the eight-bit code and put it through a further mangling to get a sort of 16-bit code. The miserable little machine spent most of its time untangling the semantic problems of it all and very little time computing.

We all know by now that the coming thing is the IBM PC and its simulacra. Yet this is not a very smart machine at all. We had one here and it has cost me the pay of a system programmer for a month just to get it going. It came without a serial port — you have to beg one from somewhere. Then the operating system has no drivers so you must write them in machine code. Neither the system nor the hardware is properly documented. The persons employed to help in these matters by Microsoft, the author of the operating system, and IBM, the proud proprietor of the box, are mostly out to lunch, and when in are hardly more helpful than when they were out.

I was having a haircut yesterday and flipping through a pile of British and American hairdressing magazines. They are not uninteresting, particularly the American ones. Most of their advertising addresses itself to ladies who have been unfairly treated by nature. They are too slim in the bust, too full elsewhere. The same problems arise in every age and every land and the remedy, such as there can be, is generally thought to be moderation at the table and the bar. The Americans know better than this: "Nobody likes to wait for what they want. Attract more men this very night," they yell. "Our slimming pills /bust-enhancing cream works within seconds. Rub it on now for immediate happiness."

If you are selling something that cannot work to an audience of half-wits this, presumably, is what you have to do. It cannot be called attractive, and it is unfortunate that computers are solf the same way. The difficulty is that the good punters were told for years that computers were extremely complicated, dangerous and difficult things that could only be run by superior beings with the mental strength of lion tamers. Then they were told that, on the contrary, they were as simple and cuddly as teddy bears and that within a week you could run a nuclear power station with the meanest of them.

Not surprisingly, the poor people are confused. They are in the position of a chap who has ridden horses down country lanes all his life. Suddenly he comes across a nice man by a motorway selling Ferraris. The nice man explains how, in some miraculous way which our equestrian cannot quite understand, 300 horses have been distilled under the bonnet. This machine can carry him at unimaginable speed in incredible luxury. Great! He'll take it! He leaps in, saying "Please, please, don't baffle me with jargon. I don't want to be an expert, I just want something that works," and sets off.

The salesman, if he has any conscience, might mention that there are a few things our man ought to know, like driving on the left, tyre pressures, the dipstick, fourth gear not pulling as well as first, not braking too hard in the wet, camber, blind right-hand bends, rich mixture, radial tyres, speed limits, parking meters, the quality of coffee in motorway services, and a whole lot of stuff which we drivers have absorbed over the years without thinking about it. If the ex-horseman is lucky he gets out of earshot before there is a loud bang; if not, not.

I am afraid that a great many people who buy microcomputers are in this position. It has come to such a pass that when a customer turns up at our place saying "Please, please, don't baffle me with jargon . . ." we suggest that he takes his trade elsewhere. We cannot stand the crying down the telephone later on.

The culprits are the Americans. Americans honestly believe that their constitution guarantees them the right to have things easy. Not surprisingly, the people who sell computers to them have adapted. If your clientele will look on you as some sort of moron if you suggest that a computer is at least as complicated as a motor car and may take as much getting used to, in the end you give in and say: "OK have it your own way: a child could work it without training. Now give me the money and go away."

This produces some very unhappy people on all sides of the fence. One immediate result, which I have mentioned in these pages before, is that everyone lies through their teeth about how many whatevers they are selling. These lies are enshrined in surveys and government reports and thereafter no one can tell the truth. Since everyone knows that the computer business is booming, next year's sales figures must be better than this. And so the pork pies get whoppinger and whoppinger.

If the only thing at stake were the conceit of executives this would not be too bad. But it means that the most convincing justification for a free market, that consumers vote for what they want with their wallets, does not work. Huge glitches upset the difficult learning process we are all embroiled in. For example, in my view Apple's Lisa is a huge mistake. It says, in effect: "Don't worry about computing — it's all just the same as paper." Although it obviously entrances a lot of people who would dearly like everything to be simple, it is not actually true.

Apple's Lisa illustrates the folly of asking the horseman how he would like his car designed. "The reins, in chromed leather, come out of these slots in the dashboard, Sir." "Brakes — no I never rode a horse with brakes. Don't need those." If you are making something totally new, you have to make it work in a new way and the customers have to buckle down and learn how to use it. Dim dealers ring me up and ask whether our software is "user-friendly". Like a motor car, it is if you understand it. If you don't, it is user-lethal. At times I wish the consequences of computing ignorance were as satisfyingly terminal.

Peter Laurie was editor of *Practical Computing* for three years up to October 1982. he has spent the last year in the software mines selling Superfile, his company's database manager.

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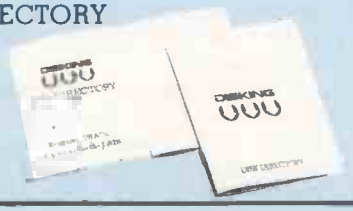

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3505	S/Sided 96 tpi 10 Hard Sect	27.90	26.90	25.90
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48 tpi suitable for 35 and 40 track operation
96 tpi suitable for 77 or 80 track operation

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3091	S/Sided D/Dens. 32 Hard Sect	26.90	25.90	24.90
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MD550-16	D/S 48 tpi 16 Hard Sect	29.90	28.90	27.90
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MD577-10	S/S 96 tpi 10 Hard Sect	28.90	27.90	26.90
MD577-16	S/S 96 tpi 16 Hard Sect	28.90	27.90	26.90
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FD34-8000	S/S D/Dens. Soft Sect	31.90	30.90	29.90
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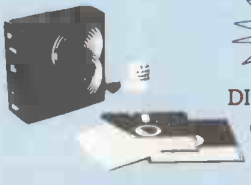

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105/2D	D/S 48 tpi 16 Hard Sect	37.90	36.90	35.90
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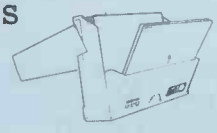

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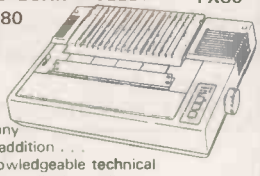

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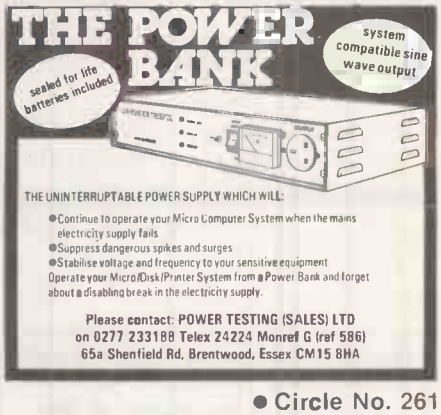

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