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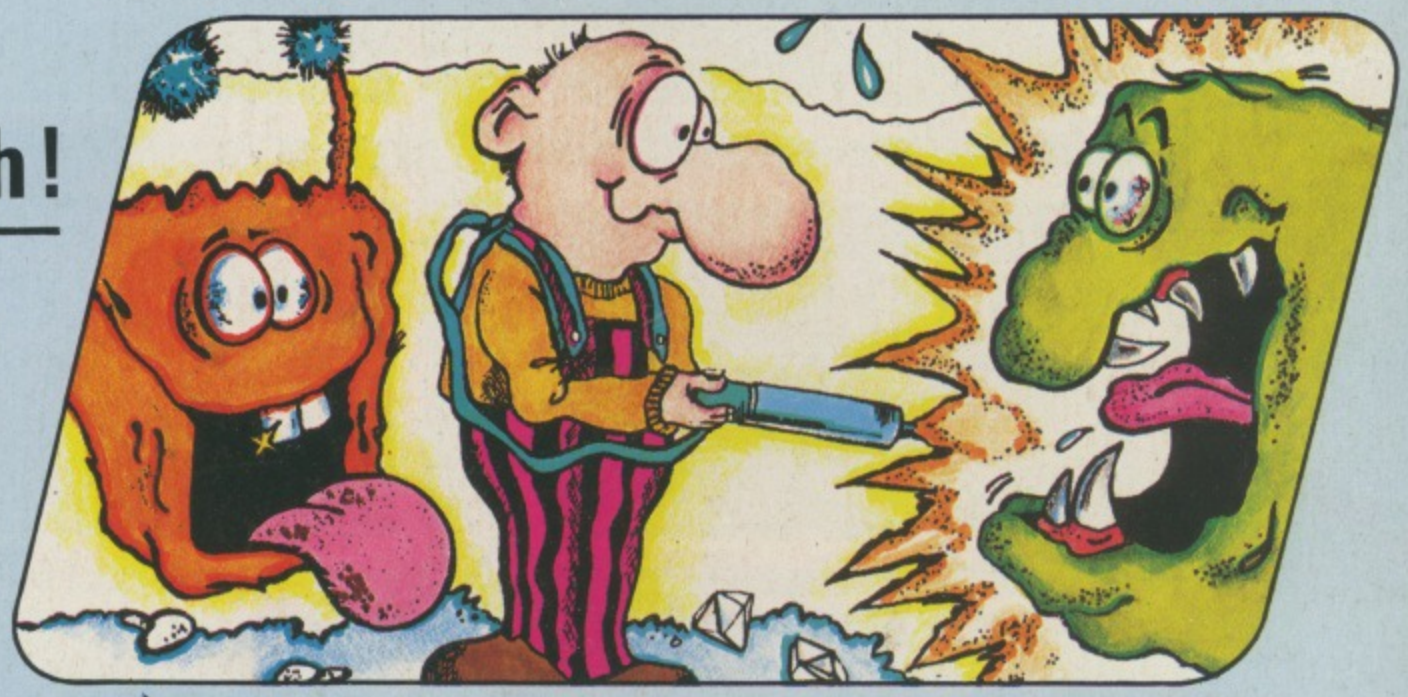

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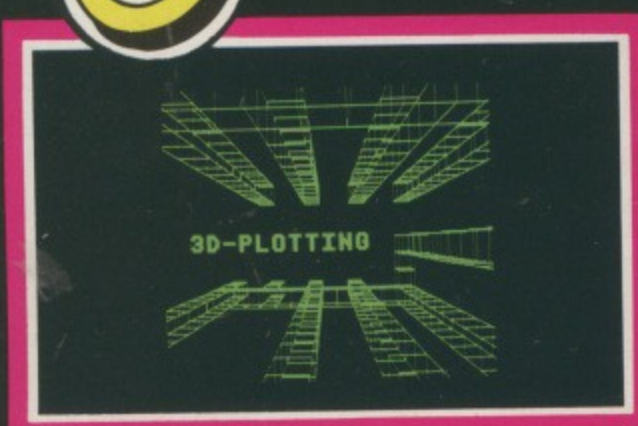

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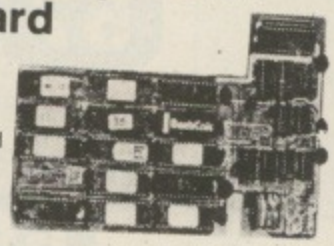

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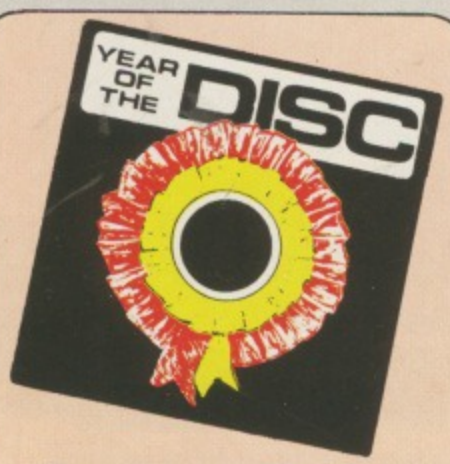

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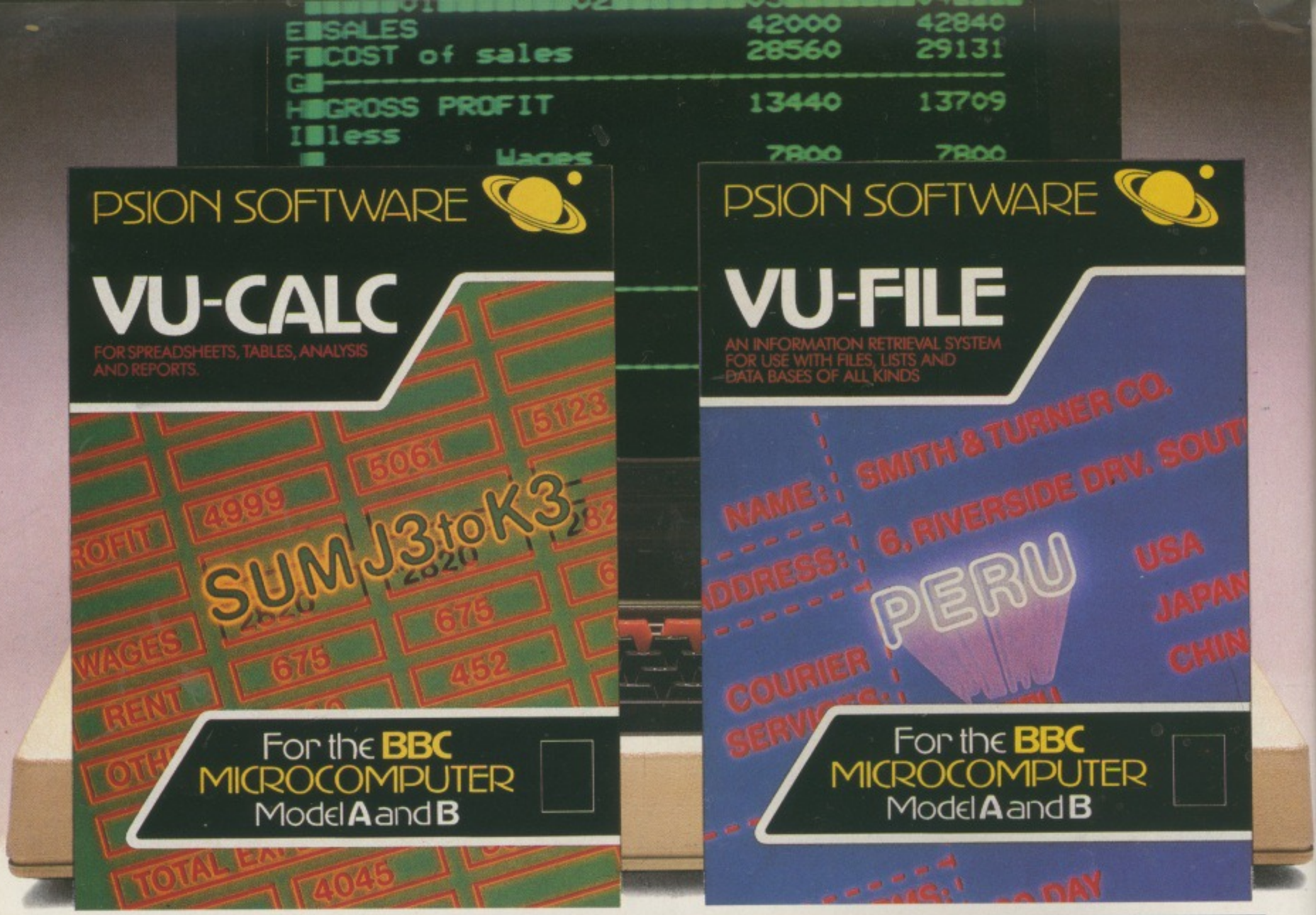

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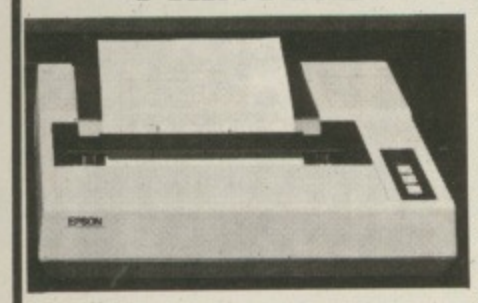

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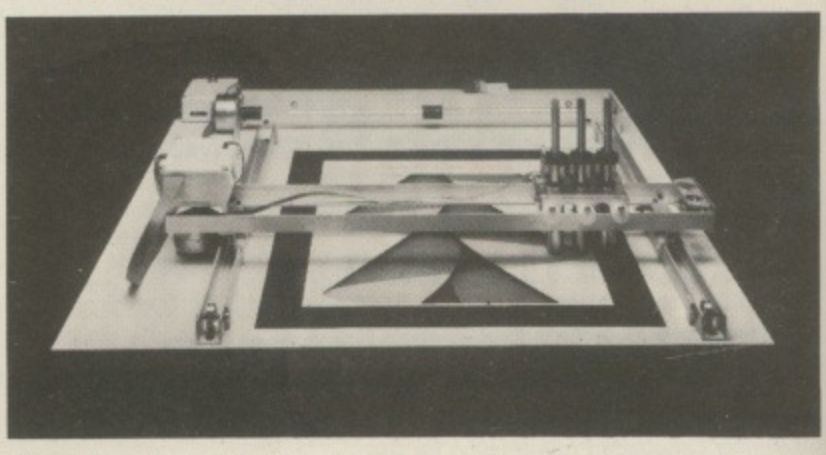

This robustly built 3-colour graphics plotter provides both versatility & precision. The carriage can be moved with an accuracy of 0.025cm. over an area the size of A4 paper. The plotter bed can accept paper & far thicker materials, at sizes of up to A3. The basic plotter carries three pens each of which is software selectable. Optional accessories that can be fitted include: Scriber, miniature drill, router, and optical sensor for scanning. This versatile plotter can provide an endless source of creative ideas.

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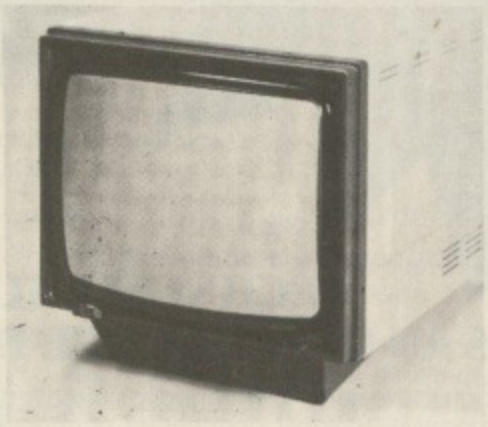

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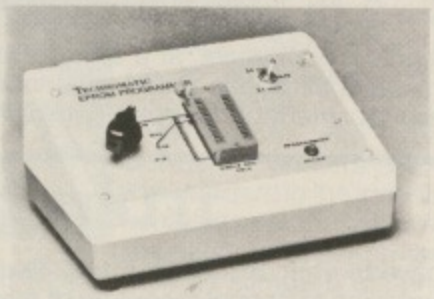

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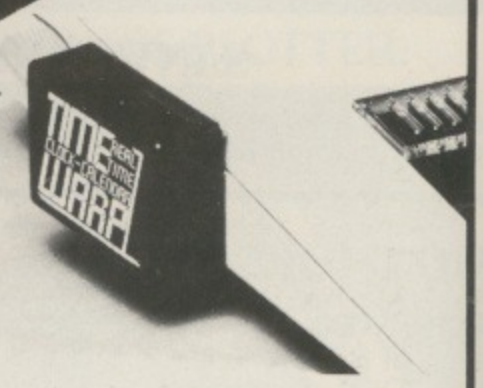

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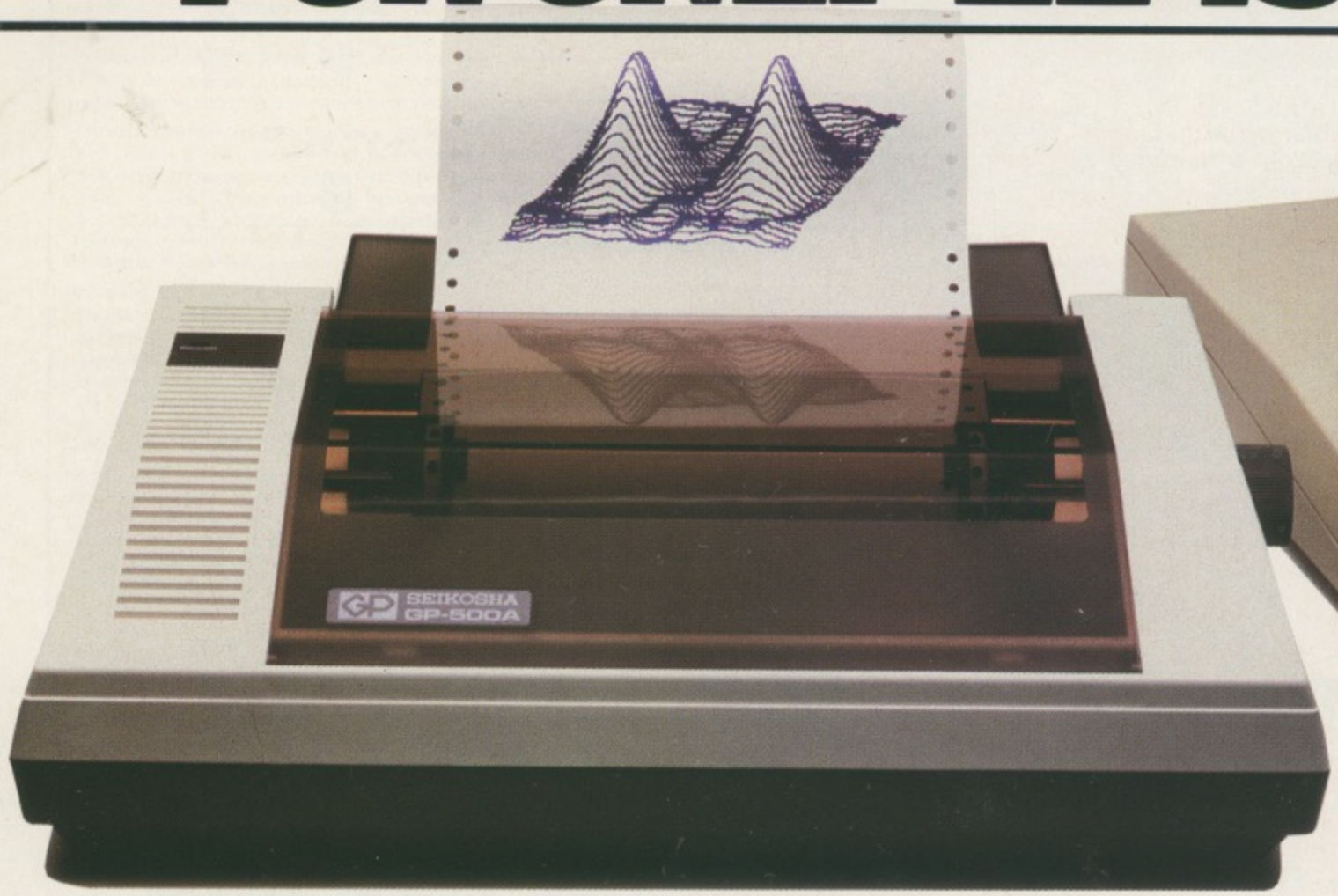

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Without a printer you're stuck.

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It's got full graphics capability, with a single command enabling you to repeat a column of graphic data as many times as you like.

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All for only £249.00.

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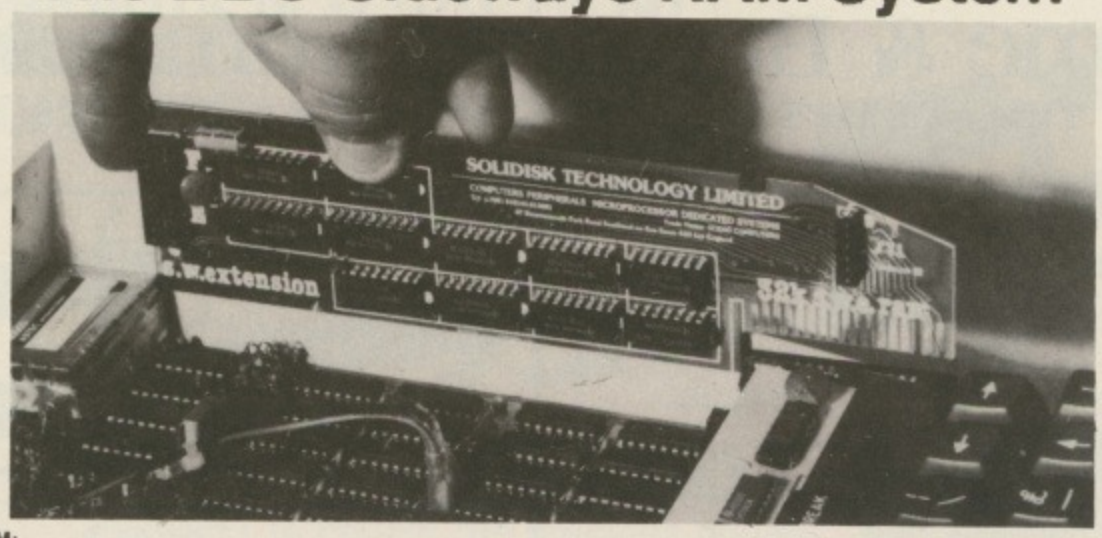
Micro Computer Software

The BBC-Sideways RAM System



The BBC Sideways RAM:
The most exciting add-on for the BBC micro, which many have been waiting for Acorn to produce!

What is the Sideways RAM?
The sideways RAM is a 16K (upgradable to 128K) memory board which fits into the rightmost ROM socket on your BBC micro. The sideways RAM is an essential piece of hardware for any BBC computer. Strategically integrated into the BBC system, the system CAN:

Answer definitively to shortage of Sideways ROM sockets:
The Sideways RAM is capable of running sideways system software such as languages, wordprocessor, electronic spreadsheet, etc.

Increase free memory for languages, add more entries to disk:
The sideways RAM can also be used to increase available memory by moving disk workspace into sideways RAM. PAGE is then set to the lowest possible value i.e. &0E00 thus rendering tape based software fully compatible with Acorn's disks. Furthermore, the disk directory is given extra space so that the maximum number of entries is increased from 31 to 154. Clearly, there is no way that other disk filing systems can offer such performance.

Increase text space for wordprocessor:
The Sideways RAM can also be used to increase effectively WORDWISE's text capacity from 24K to 32K or to a full 64K with the Silicon Disk. With the Sideways RAM system, you can create a whole chapter of a book in a single file! Machine code programmers using the Sideways RAM facilities are exceptionally favoured: the system can create assembly modules of up to 64K in size, up to 24K of space for labels and variables. A typical 8K machine code can be assembled in 2 minutes by BASIC, even directly to Sideways RAM.

Add a silicon disk to your computer:
If you have 128K of sideways RAM, part of it (112K) can be turned into a silicon disk. If you have a single drive, the system will address your floppy disk as drive 0 and the silicon disk as drive 1 (or 4 if you have 2 or more) but with a difference! The silicon drive has the capacity to load a 24K program faster than you can remove your finger from the 'RETURN' key with no clicking noise, no on/off LED, no wear. It can make you a backup floppy in 15 seconds from the original, proofread your wordprocessor texts nearly as fast as your own speed or re-create a relocatable, documented source code from an 8K ROM in minutes. The sheer speed of sideways RAM is absolutely ideal for programs like BEEBUG'S MASTERFILE (database applications), SPELLING CHECKER, VIEW (word-processing), Computer Concepts GRAPHIC EXTENSION (LOGO, Sprites etc.), BASIC, PASCAL, BCPL etc. Many other applications including games like ADVENTURE or CHESS will benefit from the ability of the Sideways RAM to make colourful 3D-graphic look like a movie picture or retireve any record in milliseconds. With the Solidisk fitted, the BBC outperforms most 16 bit machines.

Free software with every sideways RAM system:
The Sideways RAM comes already with lots of free software (on a 40 track single sided diskette). Sideways system software is free to all STL users, now and for future additions. All programs are given in basic source code and you are encouraged to personalise. Benevolent contributors will be rewarded with free hardware gifts. For example: 'STL0E00' and 'STL154' to set PAGE=&0E00 and allow 154 possible filenames, 'STLDISC' to create and maintain the SILICON DISK with extra commands like *FORMAT, *VERIFY and *DCOPY, 'WORD32' and 'WORD64' to increase text size for WORDWISE to 32K or 64K characters, STLASM to produce very large (up to 100K) assembly programs and a few other demonstration programs. Soon to be released: STLBASIC to run basic programs right in the Silicon Disk.

Increase the computer power by increasing sideways RAM:
The power of the BBC relies on its intelligent use of software where several sideways ROMs execute different tasks such as filing, calculating, drawing, processing, playing music, talking, compiling, debugging etc. The bigger the sideways RAM, the bigger the task the computer can handle.

Beautifully designed, easily installed, no soldering required:
The sideways RAM was first introduced and the first issue sold out at the ACORN USER SHOW (Sept. 83, London). The new issue has been exhibited at the PCW SHOW (Oct/Nov. 83, London), was on general distribution release at the BBC USER SHOW (Dec. 83, Westminster, London), reviewed by all major BBC micro magazines and user clubs and since then every week, hundreds of BBC users discover the convenience of the Sideways RAM system.
You can install it in 2 minutes and do not need to solder.
You can buy the 128K Solidisk now or a 16 or 32K Sideways RAM and upgrade it later if you needs grow.
Further upgrading is very simple: from 16K to 32K is by straight exchange (cost: £15 + p&p), from 32K to 128K is by plugging in the SOLIDISK extension (see figure 3) onto the 32K sideways RAM. It costs just £85 plus p&p.
You can also take advantage of the cheap hardware add-ons such as EPROM PROGRAMMER (£15) and EPROM ERASER (19.95) designed specially to compliment the sideways system.

Soon Available: Solidisk's Floppy Disc Systems:
STL also produce DISK PACKS which comprise all the necessary IC's, DFS ROM, manual, connecting cables, demonstration diskette in different storage capacities ranging from the basic 100K disc system to 1.8MB dual drive system. Both single density and double density are supported, fully compatible with ACORN disk system and the sideways RAM system. The choice of single or dual density is yours and there is virtually no difference in price.
SINGLE DENSITY DISK SYSTEM: based on the Intel 8271, the single density disk interface consists of a set of IC's to be added directly to the BBC board and is comparable to Acorn's disk interface upgrade. You choose 1 or 2 drives (up to 4 drives are supported), they are all half height units and usually come from TANDON, SHUTGUART, TEAC or CANNON with capacity ranging from 100K to 400K per drive (switchable). The single density disc system uses normal FM/IBM compatible recording technique, soft sectored 5¼"diskettes commonly available. Discs formatted with this system has 10 sectors of 256 bytes per track (2.5K bytes), a 40 track drive will offer 100K of storage using this system, a 80 track drive will offer 200K bytes and a double sided 80 track drive 400K, only 2 of the later can be used on the BBC. The real advantage of the single density disc system is neatness: the disc chip set goes neatly on the BBC board.
DUAL DENSITY DISK SYSTEM: based on the NEC 765A, the dual density disk system offers both single density and double density using MFM recording technique. The disc interface comprises a set of IC's and a small module plugging into socket 78. The advantage of the dual density disc system is the nearly twofold increased storage capacity with the same disc drive.
For price information, please refer to ordering coupon below.

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BBC 16K Sideways RAM (SWR16)	£39.65
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Dual Density Option: Please tick ☐

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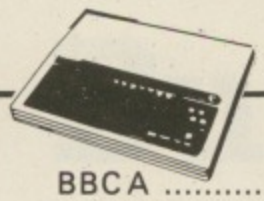

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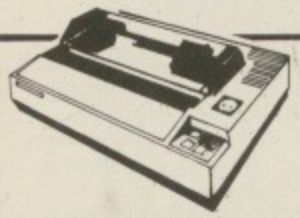

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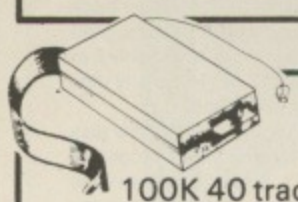

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Small business can now stop going by the book.

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(All tax deductible by the way.)

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Because now, there's a new series of floppy disc software specially for the smaller business.

It has been developed by Acornsoft, the software division of Acorn Computers who are the manufacturers of the BBC Micro.

For only £24.95, each disc can store volumes of vital bookwork which can be updated and amended in a fraction of the conventional time.

And there is a disc to cover most aspects of paperwork and book-keeping.

The Invoicing package.

This program stores details of products, VAT numbers and, of course, the names and addresses of your customers. As orders come in, you simply record them. Then, when it's time to invoice, you just press a few keys and each invoice or credit note is printed automatically in seconds.

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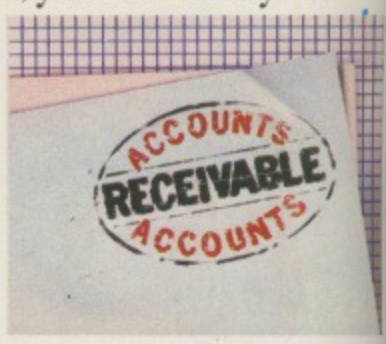
The Accounts Receivable package.

Now, it couldn't be easier to keep your customer accounts under control.

In an instant, you can analyse debtors, produce statements, keep a check on any credit limit and calculate VAT output automatically.



Using this package in conjunction with the invoicing package, you can also keep tabs on payments received against payments outstanding.

The Accounts Payable package.

This package will keep you fully up-to-date on how much you owe and who to. In addition, it calculates

input VAT and, used with the Accounts Receivable package, produces instant VAT returns.

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At £24.95 each, these packages could be priceless.

Each package comes with clear instructions on how to get the program running so that you can devote much more of your time to more profitable activities.

If you're a credit card holder, you can order any or all of the packages by ringing: 01-200 0200 anytime. Or 0933 79300 during office hours.

(By ringing the same number, you can get the address of your nearest stockist, or full details of the BBC Microcomputer system if you don't already have one.)

Alternatively, you can order the packages by sending the order form below to: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL. Please allow 28 days for delivery.

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Accounts Payable			SNB 13
Stock Control			SNB 11
Purchasing			SNB 14
Mailing			SNB 09
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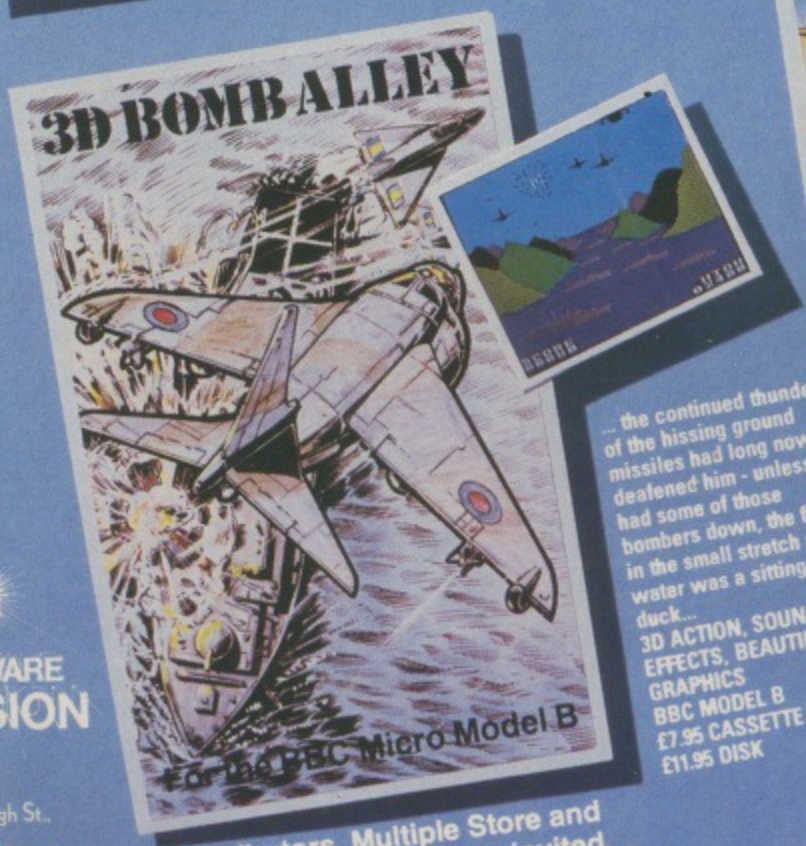

... the continued thunder of the hissing ground missiles had long now deafened him - unless he had some of those bombers down, the fleet, in the small stretch of water was a sitting duck...
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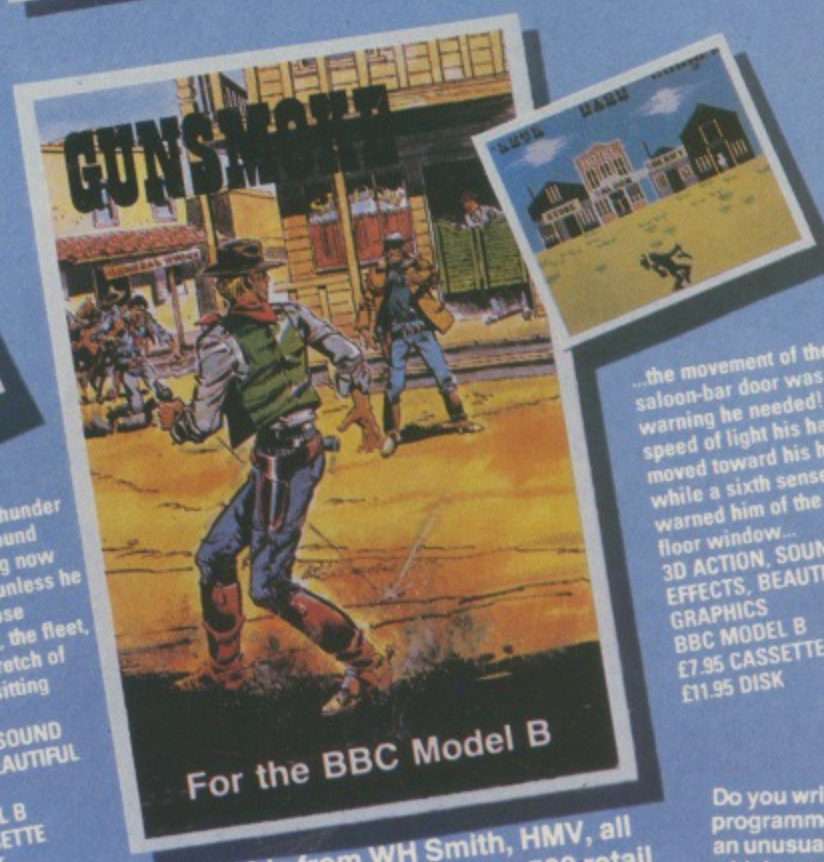

...the movement of the saloon-bar door was all the warning he needed! At the speed of light his hand moved toward his holster, while a sixth sense warned him of the upper floor window...
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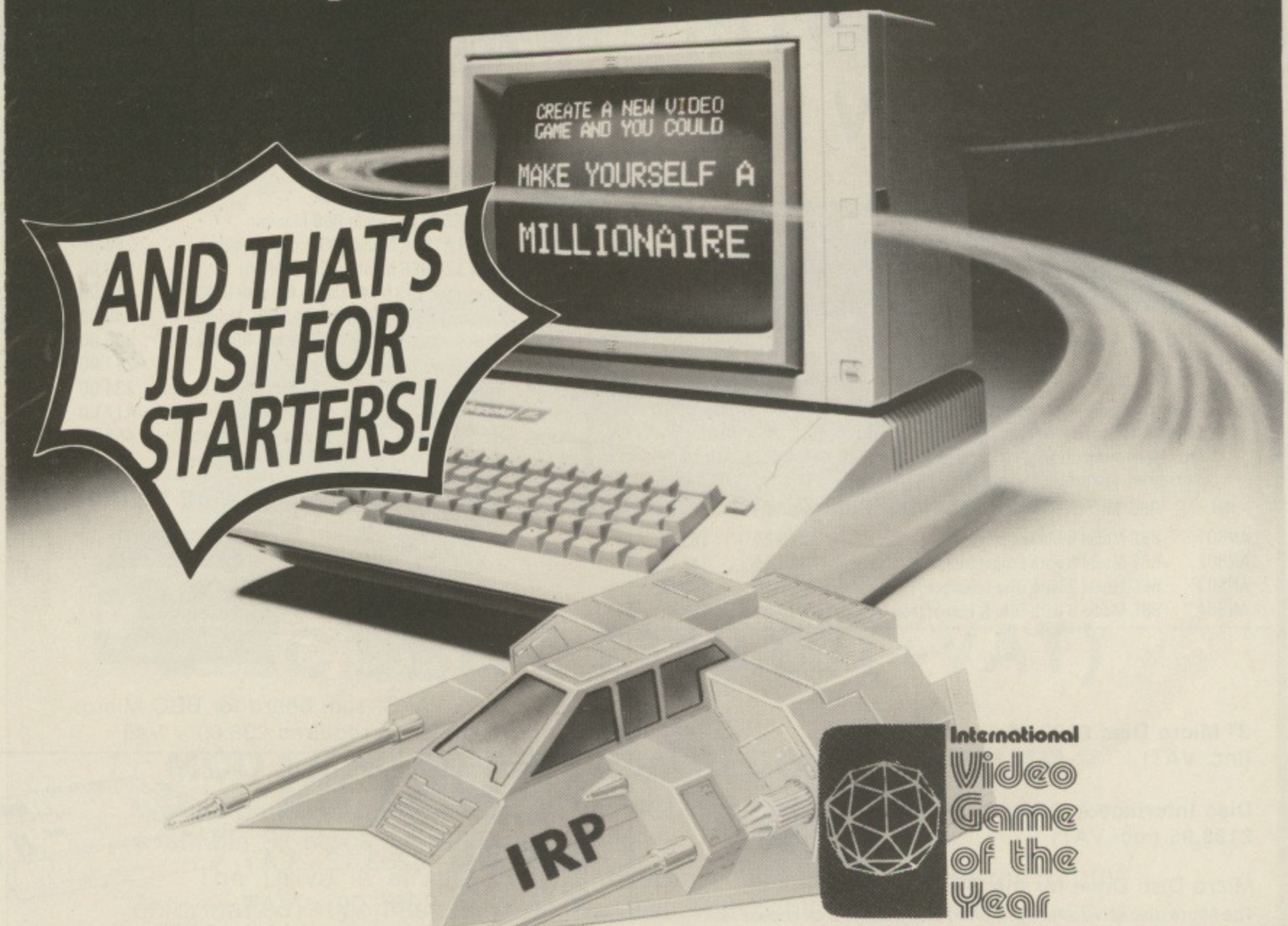

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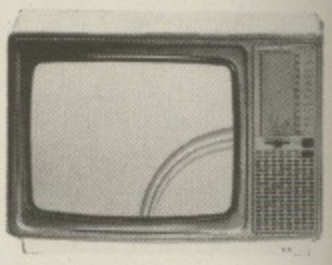

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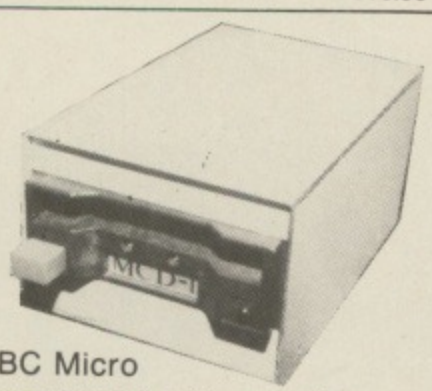

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Disc Interface & Drive
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Micro Disc Drive for the BBC Micro

The Micro disc drive offers a method of low cost quick access to programs. The drive is essentially a small version of a 5¼" disc drive and offers similar features to the larger drive.
The data is stored on a 3" disc, this is enclosed in a protective hard plastic cassette which features a write protect switch.
The micro drive requires the standard Acorn disc interface, but a new disc filing system rom. Acorn DFS may be exchanged for the micro DFS for £12.00. The new micro disc filing system allows 60 files per disc surface and it can read and write to Acorn DFS discs. Thus if a 5¼ inch and a micro floppy were connected on the same cable files could be transfered between them.
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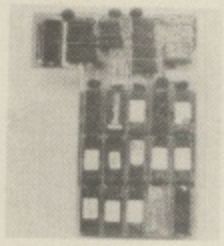
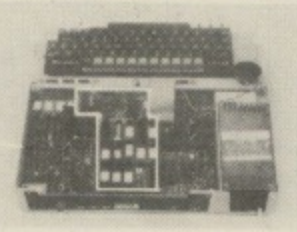
SIDEWISE



SIDEWISE FITTED



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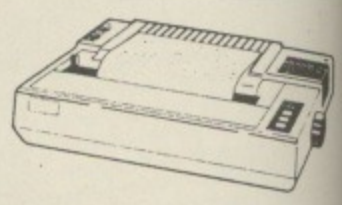

RX-80 £263.12 + VAT
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Printer price includes cable for BBC and screen dump rom is available for £7.50

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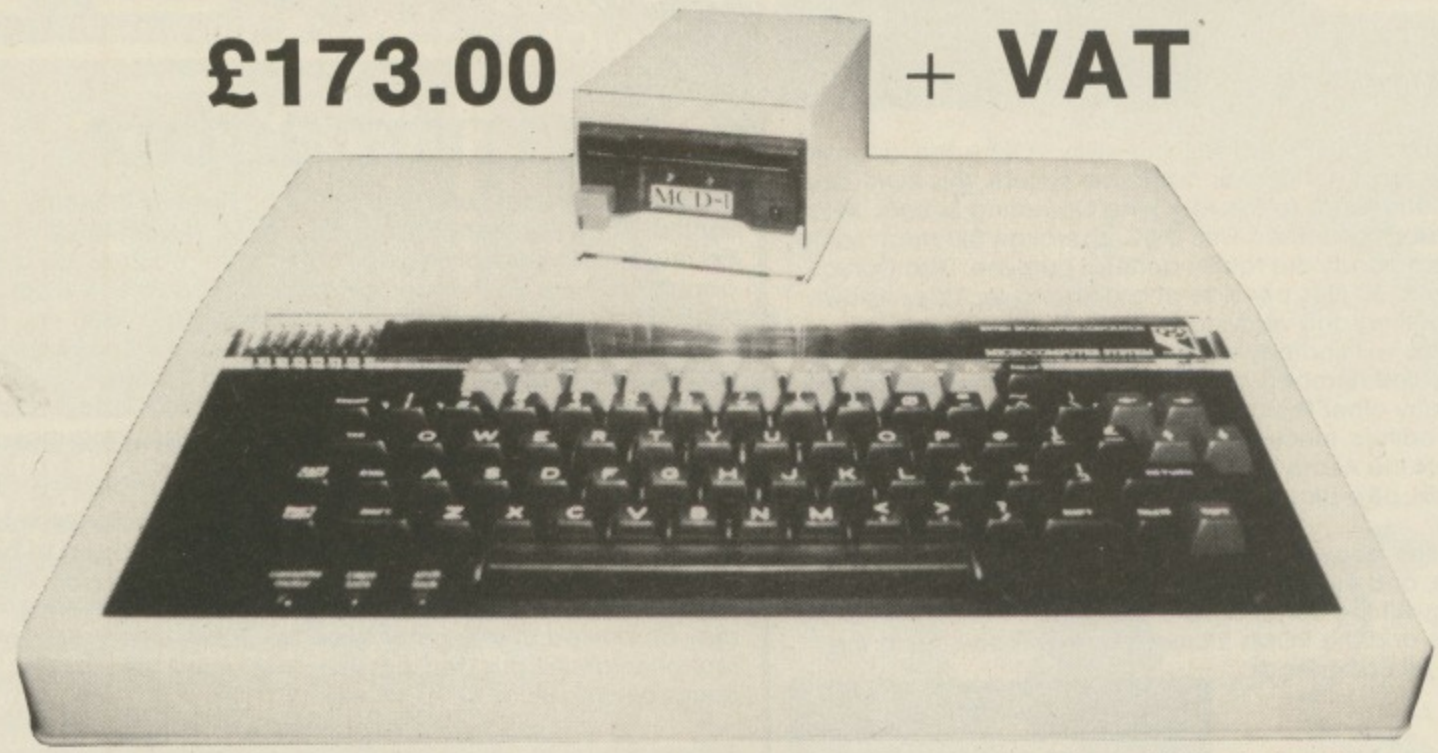

DISC DRIVE £113.00 (+VAT)

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We are pleased to announce that the MCD 1 Micro drive is now a reality, and available Ex-stock from Electronequip.

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The cost of the drive is £129.95 including VAT and the interface can either be bought as a package for £198.95 (for both drive and Interface). Alternatively we will exchange your Acorn DFS for a Micro-DOS EPROM for £13.80 or sell you the Micro-DOS EPROM for £25.00. Diskettes are £4.30 +VAT each.

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BBC

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ROMS SOFTWARE FOR THE BBC MICRO

```
DISC DOCTOR 1.09
  DiS <<sta>> <<end>> <<ofs>>
  DISCTAPE <afsp> <<afsp>>...
  DOWNLOAD <fsp> <<adr>>
  DSEARCH <str> <trk> <<trk><sct><drv>>
  DZAP <<trk>> <<trk><sct><drv>>
  EDIT <<key no >>
  FIND <str>
  FORM <drv> <no. trks> <<att>> <<S>>
  JOIN <fsp> <afsp> <<afsp>>...
  MENU <<drv>>
  MOVE <<dest page>> <<src page>>
  MSEARCH <str> <<adr>>
  MZAP <<adr>>
  PARTLOAD <fsp> <ofs> <ext> <adr>
  RECOVER <trk> <sct> <sct> <adr> <drv>
  RESTORE <trk> <sct> <sct> <adr> <drv>
  SHIFT <src> <dest> <ext>
  SWAP <<drv>>
  TAPEDISC <<fsp>>
  VERIFY <<drv>> <<no. trks>> <<att>>
```

DISC DOCTOR

Following on from WORDWISE this utility ROM is the ideal way to get the most out of your computer system. This ROM adds 20 new commands to the Machine Operating System. Most of these are concerned with DISC operation although some of the commands are totally general purpose. Disc Doctor allows up to 60 files per side of a disc and includes its own disc formatting and verifying commands. Three search commands will find any string in memory or on disc, or will list all the line numbers in a BASIC program that contain the string. Many other features include disassemblers, disc/memory editors, function key listing etc. Works with all versions of the Acorn DFS, and other Acorn compatible DFS's. £28 plus £1 p&p plus VAT.

Because the above programs are in ROM they are always available, and usually take no user memory when operating. All the commands can be used from within BASIC programs and the ROMs includes a help menu listing the syntax of all commands.

```
WORDWISE
(C) Computer Concepts 1982

1) Save entire text
2) Load new text
3) Save marked text
4) Load text to cursor
5) Search and Replace
6) Print text
7) Preview text
8) Spool text

ESC Edit Mode

Please enter choice_
```

WORDWISE

This ROM based word processor is simple to fit and simple to operate. Its greatest strength lies in its ease of use, yet it is a fully fledged text processing system, with all the features you would expect to find in many more expensive programs.

Once entered the user has total control over the text. Any section may be marked, this may be a word, sentence or any larger piece of text. The marked section may then be instantly deleted, moved or copied to any other point in the document. The more complex operations are menu driven so that the user is always prompted when necessary. When printing a document the user may specify the line length, line spacing, page length etc. WORDWISE even handles automatic page numbering, centering of text, justification and many more powerful features.

This word processor has become the best selling program for the BBC machine. In the year since its launch it has outsold all other available ROM, cassette or disc based word processors and continues to outsell them. £39 plus £1 p&p plus VAT.

new release

Printmaster

Joining our already extensive range comes PRINTMASTER a sophisticated printer handling utility ROM. PRINTMASTER will be released in several versions catering for each of the most popular printers on the market. This first PRINTMASTER ROM supports a range of EPSON printers: MX80, RX80, FX80 etc. All commands in the ROM must be preceded by an asterisk and can be used like all normal operating system commands from within BASIC programs etc. It is also possible to use them from WORDWISE and other language ROMs.

PRINTMASTER supports three types of screen dumps. The most flexible (★GDUMP) allows any graphics on the screen to be dumped onto the printer. This will operate in any mode, the colours being displayed as shades. Any part of the screen may be printed at any position on the paper in any one of four orientations. It is also possible to magnify the screen dump by any factor x2, x3, x4 etc.

A special feature allows true Mode 7 screen dumps with TELETEXT text and graphics, colours (as shades), double height etc.

★TDUMP allows any text mode to be dumped and ★FDUMP will automatically print the contents of a file on disc to the printer WHILE the BBC machine is doing other things, running other programs etc.

★WINDOW allows the user to interactively define a graphics window, this controls the part of the screen printed in ★GDUMP. A very much easier method of defining graphics windows than the normal VDU statement.

The above list is only a fraction of the commands in the PRINTMASTER ROM. Others include ★CENTRE, ★UNDERLINE, ★ITALIC, ★MARGIN etc. etc. which provide total control over the printer in the easiest possible manner. Order as PRINTMASTER (Epson), £28 plus £1 p&p plus VAT.

available now

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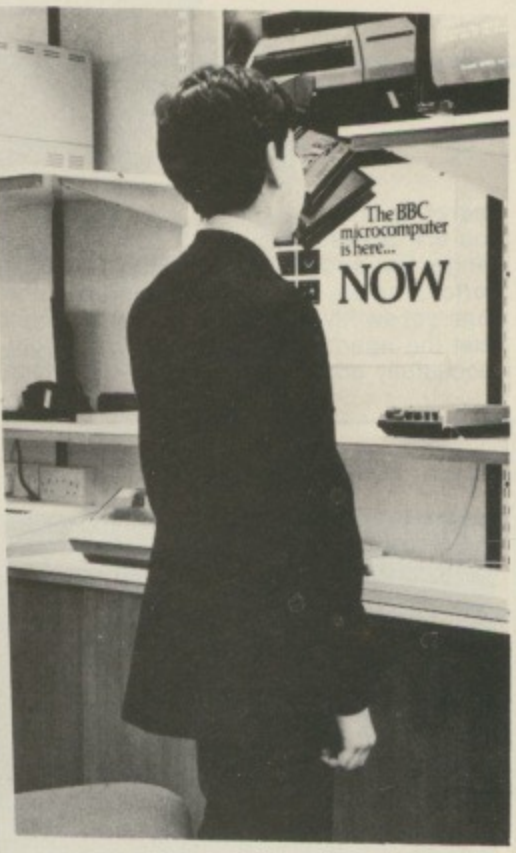

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No 1 on Micronet

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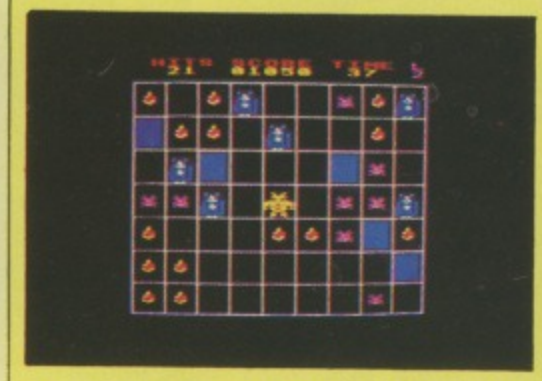
Q-MAN'S BROTHER is featured in the high score table of Q-MAN and now has his very own game. Have you time to paint all of the maze? Not if the PAINT POTS have anything to do with it or especially the deadly PAINT ROLLER which will erase all of your hard work! Increasing difficulty, excellent sound, AMAZING 3D graphics and high score.

No 5 on Micronet

BANANA MAN



A totally new concept from MRM. You are the BANANA MAN and you must eat 40 BANANA SANDWICHES each minute to stay alive. There are BLUE BLOCKS which may prevent you from reaching the food and deadly PURPLE TARANTULAS that are fatal if stepped upon. ETHEL the CAT also appears but can be scared away for mystery points. But watch out, she conceals a spider. Features include BONUS BANANAS, BLOCK 'SHUFFLE', INCREASING DIFFICULTY, HIGH-SCORE TABLE and GREAT GRAPHICS.

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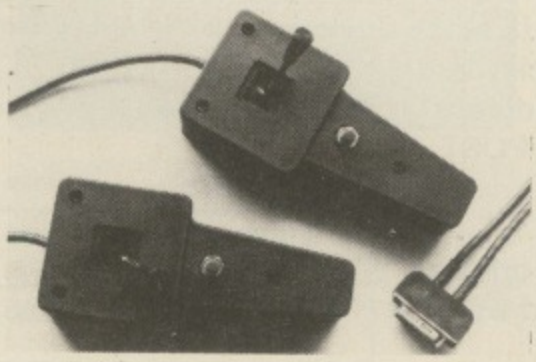

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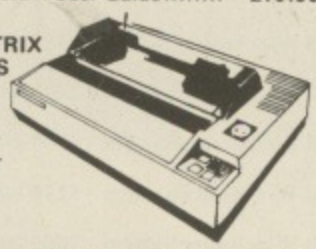
FREE CABLE AND PAPER WITH ALL PRINTERS



80 column, friction and adjustable tractor feed, bi-directional logic seeking HI-RES graphics and block graphics sub and super scripts, condensed and emphasised print, and underlining vertical and horizontal tabs, self test, italic print, etc.
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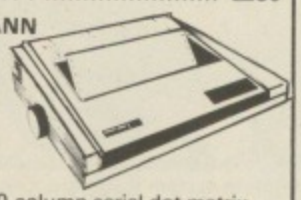

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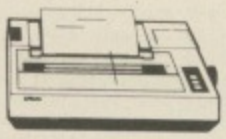

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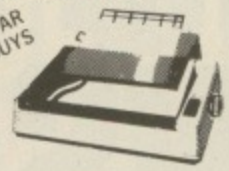

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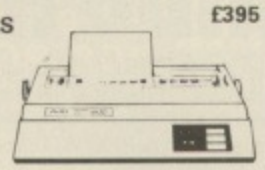

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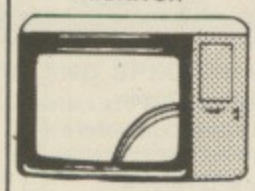

This TV Monitor is not a modified television as many TV Monitors are, but a 14" TV/Monitor which has been designed to perform both functions. It has RGB and Composits video and sound. An RGB cable for a BBC is supplied as standard.

With Remote Control £269

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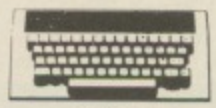

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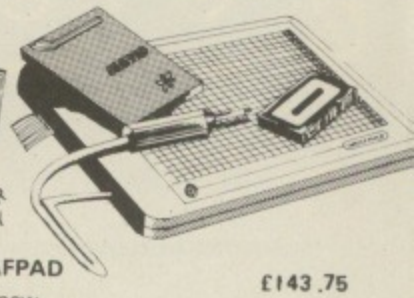

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Amazing value. Complete unit — simply plug in —

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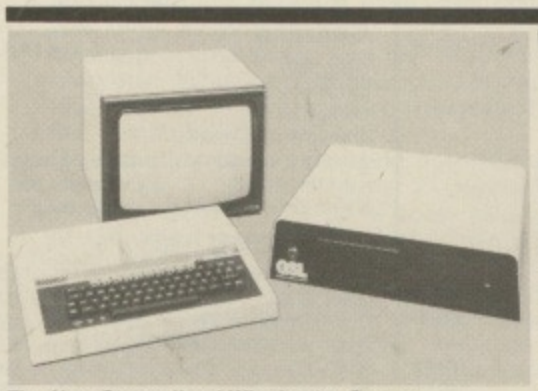
GSL COMPUTING NEWS

A GSL COMPUTING PUBLICATION

MARCH 1984

ISSUE 5

WINCHESTER SETTING THE STANDARDS IN EDUCATION



The New Streamlined Winchester System

E-NET a flexible network system for the BBC microcomputer is now being installed within Education. "Doctor Challiners Grammar School" in Amersham are now operating a twelve station networking system using a 10 Megabyte Winchester Hard Disc unit.

E-NET allows up to 200 computers to share a common, large central disc store, and overcomes many of the inconvenient features of earlier network systems.

E-NET uses a hard disc unit as the central disc store, allowing upwards of 8 Megabytes of storage. It has effective, simple structures to limit the disc space available to any user, and to permit access by any user to library programs. Many users of the few simple networks installed so far have complained of the difficulty of monitoring pupil's use of disc space, but E-NET overcomes all these problems by doing the monitoring for you. You simply allocate a space limit to each user on the Hard Disc using the simple command program. For most schools and colleges this size disc will allow each user to have a reasonable file store, but it can be extended if required by adding further hard disc units. Important files can be easily copied to minifloppies if required.

E-NET has many useful extra commands. For example a simple command which only operates from the master (teacher's) machine, and which forces each client machine (in a certain specified room or area) to load and run a particular program is included. This is very fast, and flexible, and allows for efficient use of C.A.L. packages. Care has been taken to ensure that the command structure is simple enough not to intimidate the non-specialist, while remaining flexible and robust.

E-NET allows one or more printers to be connected to the network and although this is connected to one of the network computers this computer can still be used even while the printer is in use.

E-NET is fast, simple to use and versatile. The first system being installed for use in September, and demonstrations can be arranged.

	Price £
5 MB Winchester System	1650.00
10 MB Winchester System	1950.00
20 MB Winchester System	2400.00
65 MB Winchester System	4700.00
105 MB Winchester System	5130.00
140 MB Winchester System	7000.00
280 MB Winchester System	9500.00

The complete system is compact and easy to use.

NORTHERN SOLE DISTRIBUTOR APPOINTED

Due to increasing demand for GSL Winchester System, GSL Computing Limited has appointed a distributor to cover the North U.K. Market.

The appointed Sole Distributor for the North U.K. Market is:- Pace Software Supplies Ltd., 92, New Cross Street, West Bolling, Bradford BD5 8BS. Telephone (0274) 729306.

Read the next ISSUE of this magazine for further developments and information of the "GSL WINCHESTER SYSTEM" and newly appointed dealers.

Showroom facility at GSL enlarged

Peripherals always available

GSL has an extensive showroom displaying all their advertised products and more. Customers are encouraged to use the equipment on show and helpful advice and personal demonstrations are readily available.

GSL know from talking to their customers that nothing is more frustrating than responding to an advertisement and finding the advertised goods are out of stock or not readily available. GSL hold large stocks of all computer peripherals advertised.

The GSL range is constantly growing and currently includes:

- BBC MICROCOMPUTER
- SHUGART DISC DRIVE RANGE
- NEC PRINTERS
- EPSOM PRINTERS
- PRINTER BUFFER
- MICROVITEC COLOUR MONITORS
- SANYO COLOUR MONITORS
- GREEN SCREEN MONITORS
- TORCH Z80
- VARIOUS SOFTWARE INCL. WORDWISE
- PRINTER PAPER

GSL Analogue Signal Display & Analysis System

This systems enables a BBC Microcomputer (Model B) to function as a two channel, large screen, storage cscilloscope, for frequencies up to high audio values.

The basic system comprises an analogue to digital interface unit which is connected to the computer via the 1MHz bus. The accompanying software package enables input signals to be displayed in the time domain and also, if required, analysed via fourier transformation to give frequency domain representation.

The main features of the system are:

1. Two channel, large screen, display of signal amplitude vs time, with grid scaling information, channel identification and pk/pk measurement.
2. Repetitive or externally triggered sampling of input signals.
3. Display time (total sampling period) variable from 0.002 sec. to 25 secs.
4. Number of sample values = 100 per channel.
5. Minimum sampling time = 20 sec. (inclusive of both channels).
6. Software controlled triggering delay available.
7. Option to list individual sample values.
8. Either the following or preceeding 'screen' of data is stored for each sampling period (the latter, only in triggered mode), and this may be displayed when required.
9. Fourier analysis of the data for either channel may be performed, and the frequency domain representation plotted (50 values).
10. Up to 5 frequency domain plots may be stored internally and recalled for comparison with the current plot.
11. Full screens of information may be 'dumped' to a printer (NEC PC-8023B-C Dot Matrix Printer), for both the amplitude vs time and amplitude vs frequency displays.

The programme is loaded from tape using the command CHAIN "scope".

Price £350.00 Excluding carriage + VAT.

GSL Announce the Hitachi 3" Disc Drive

Due to the ever increasing demand for reliable 3" disc drives, GSL are now marketing the proven Hitachi 3" drive. Ideal for Education the Hitachi drive is reliable and robust. Cased in rigid steel the drive is coloured to match the BBC Micro.

The compact disc which is now standard in Japan are strong and easily stored, like a music cassette. By simply turning the disc over they give 100K per side. The 3" discs encased in rigid plastic are also protected by a mechanical tab which prevents overwriting of data.

Like all GSL disc drives the Hitachi 3" drive runs off the BBC power supply thus saving considerable money over drives using their own power unit.

GSL have also ensured that all their disc drives are compatible. The Hitachi 3" can be run in tandem with the Shugart 5¼" drives.

*Price including case, leads and utility disc £180.00 exclude carriage and packing and V.A.T.

EDUCATION APPROVED DISC DRIVES MATCHING ACORN BBC MICRO

All disc drives supplied in metal case finished to match the Acorn BBC microcomputer.

Shugart SA200 Capacity 100K — Price £149.95 including Leads.

Less than two-thirds the height of standard models, Shugart's single-sided SA200 5-25 inch minifloppy disc drive offers 125 or 250 Kbytes of capacity in a low cost highly reliable package. Low cost, compact size and high reliability make the SA200 an ideal choice for entry level desk top applications in personal computers, word processors, memory typewriters, portable computers or terminal add ons. Package includes all interconnecting leads.

Shugart SA455 Capacity 200K — Price £238.00 including Leads.

Shugart SA465 Capacity 400K — Price £281.50 including Leads.
Prices excluding carriage and VAT.

Shugarts SA455/465 half height mini floppy disc drive offer a compact alternative to standard height drives for desk top systems requiring maximum performance in a greatly reduced space. Since users can quickly double existing storage capacity by fitting two drives in the space formerly occupied by one standard minifloppy the SA455/465 drives provided and excellent means to increase storage capacity without increasing space.

We are an official Acorn Dealer and Service Centre

Dealer Enquiries Welcome

Return to GSL COMPUTING LTD, 2 North Way, Andover, Hampshire SP10 5AZ

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- Your full range of Micro Computers and computer peripherals ☐
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UCSD PASCAL

UCSD BASIC

68000

6502

LET'S STOP PLAYING GAMES

The BBC micro is a great computer if you want to play games and learn about computing.

However, if the time has come for you to stop playing games and get on with the real business of producing professional programmes for the microcomputer market, you need the UCSD p-system from Microtraffic Systems.

Program Development environments.

The UCSD p-system is the fastest growing software development system for microcomputers. Microcomputer manufacturers, software houses and more than 50,000 end users have already made the p-system their choice. And more are doing so every day. This is because:

- p-system users can write program modules in Pascal Fortran, Basic and Assembler and integrate them into a single application program.
- p-system application programs can run on the widest range of microprocessors viz:- Z80, 8080/8085, 8088, 6502, 6809, 9900, 68000, PDP-11 and LSI-11.
- the p-system is the friendliest and most powerful professional program development environment available for microcomputers today. With program chaining and dynamic overlays the largest applications programs will run on the smallest machines. With single keystroke commands and a continuous display of available options, the operating system, editor, filer and other utilities are simple, yet sophisticated programs to use.

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THE MICRO USER
MARCH 1984
NEWS

Acorn smashes US sales target

THE BBC Micro is taking the United States market by storm with more than $50 million worth of business being booked there in less than six months of trading.

This means Acorn in the States has already beaten its target figure for the first year by $10 million – with six months still to go.

"We are progressing very favourably", Harvey Lawner, Acorn's general manager in America told *The Micro User* from his headquarters in Woburn, Mass.

"In fact, we have done far better than we believed possible in the fiercely competitive education market here" he said.

The company demonstrated its capability of showing a clean pair of heels to its rivals when it won its largest single order recently.

It beat both Apple and Atari in a public bid to provide 170 machines for a secondary school in Phoenix, Arizona.

And to cope with the ever increasing demand for the BBC Micro in the USA, a shipment of 1,000 machines was despatched from the UK last month.

Acorn got off to a flying start State-side by booking 8 million dollars worth of business even before its official American campaign was launched last September.

This was achieved despite jibes from United States experts that the British company would end up with egg on its corporate face.

One of the prophets of doom, Clive Smith of Boston's Yankee Group, a leading market research concern, was moved to say: "I'm not sure why they've targeted the education market here. It seems a shortcut to disaster".

Additionally some US analysts went on record as saying the BBC Micro was overpriced.

But Acorn has proved them all wrong. So why has the machine been so successful to date?

"One of the reasons is because of our track record back in the UK", says Harvey Lawner. "Americans are still aware of the quality of education to be found in Britain.

"So when we tell them that 80 per cent of all computers in British schools are Acorns, they take notice. It's an excellent selling point".

This has been reinforced by the fact that in America, Acorn is offering up to 200 "schoolware packages", each including its own lesson plan.

"What we are able to give them are total solutions the like of which they have never seen before", claims Harvey Lawner.

Adverts like this are spearheading Acorn's American sales drive

TELESOFTWARE 'PATCHED' UP

CONSIDERABLE improvements have been made to the BBC's Telesoftware service, launched last September to provide free software over the airwaves.

Previously there were problems in downloading some Basic programs, but now a software patch broadcast over the telesoftware system allows any BBC Basic program to be downloaded onto a BBC Micro.

Not content with this, they have also provided patches which allow programs which make use of tokenised Basic to be broadcast, allowing more efficient use of the micro's memory.

Finally, a method has been developed which allows the broadcasting of machine code programs, considerably broadening the range of software that can be broadcast.

Given this increase in the scope of the programs it can offer and the rumours that the BBC is going to provide proper funding from its software profits, the future looks set fair for the service.

Tube problems solved

PROBLEMS with the Tube have been delaying the second processor add-ons for the BBC Micro, Acorn chief Chris Curry revealed in a speech at the opening of the Acorn Information Centre in Brussels.

But he claimed the difficulties were now over and promised that the Z80 second processor would be available in the spring, followed by the NS16032 in the summer.

During his visit to Belgium he also released prices for the Advanced Business Machine, due to be launched this summer.

Featuring an on-board Z80 and NS16032 second processor, prices will range from £1,500 to £3,000.

Chris Curry also disclosed that Acorn plan to market two or three of the more popular BBC Micro games on serial ROMs.

These plug into the "ashtray" on the micro, allowing instant loading of games.

Fibre optics network

SYMBIOTIC Computer Systems has announced the first "Symbnet" local area network for the BBC Micro using fibre optics.

Stations up to 9km apart can be interconnected without electrical noise problems, claims Symbiotic, and the modular design allows the user to add stations wherever required.

Five shows will be major draw

A SERIES of five shows devoted to the BBC Micro and the Electron are expected to attract more than a quarter of a million people this year.

Four of the shows are scheduled for London and one for Manchester.

Each will be held under the banner of "The Electron and BBC Micro User Show" and all five events are being sponsored jointly by *The Micro User* and its new sister publication, *Electron User*.

The London shows are to take place from March 29 to April 1 at the Westminster Exhibition Centre; July 19 to 22 at Alexandra Palace; October 25 to 28, also at Alexandra Palace; and from December 6 to 9, again at the Westminster Exhibition Centre.

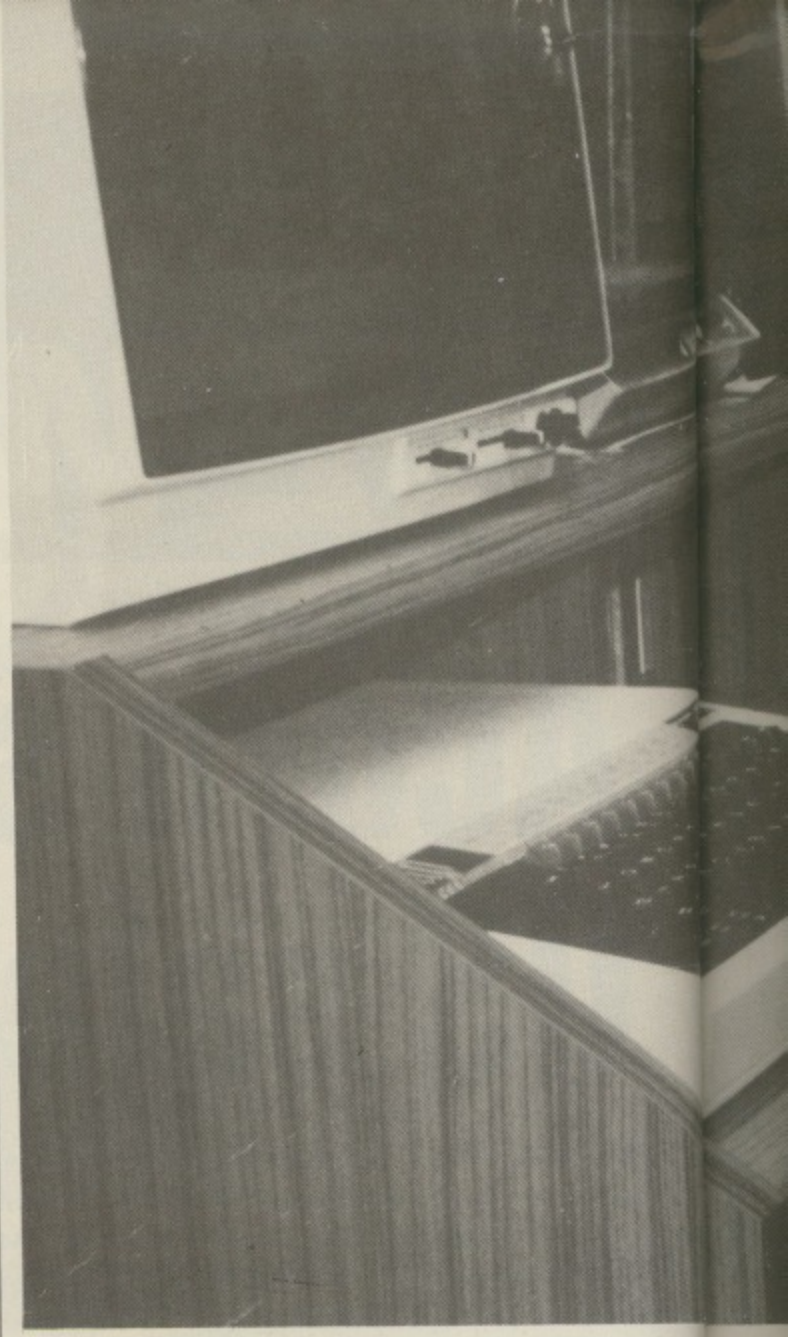
Ambitious

UMIST in Manchester is to host the single show outside the capital from August 31 to September 2.

"We are well aware that this is the most ambitious project ever to be undertaken by the organisers of computer shows", says Derek Meakin, joint managing director of Database Publications.

"But let us not forget we exist in a rapidly changing market. As a result, we will be able to unveil a batch of new and exciting products at each of the shows.

"The London shows in particular are to be held at around three month intervals – which is a long time in the computer marketplace".



More micro aid for handicapped

A WEST Midlands man who pioneered the use of "talking" BBC Micros for the blind is now looking at the problems of the mentally handicapped.

Bob Hinds, of Shrewsbury, who has appeared on Pebble Mill with his Dalek-voiced Beeb, is nearly blind himself.

He is two thirds of the way through an Open University computer science degree, and the BBC Micro helps him with his studies by telling him what is on the screen.

Now he wants to adapt one to help mentally handicapped children.

Last month Mr Hinds visited local sheltered accommodation for the mentally handicapped, where he demonstrated his equipment. "The effect was startling", he told *Micro User*.

Totally withdrawn patients with no speech ability responded to on-screen colour patterns and to the sound of their names on the speech synthesiser.

Some of them pressed the keys again and again to hear the machine say their names.

Soon Mr Hinds is to meet parents of the handicapped children, along with hospital administrators, to discuss setting up a scheme for unlocking the hidden potential he believes the children possess.

He hopes to get the go-ahead this summer for a full-blown scheme, possibly with official funding. Failing that, he hopes for donations.

Keith Waterhouse

THE more astute among our readers might have noticed that the eminent journalist, Keith Waterhouse, has "joined" the staff of *Micro user* writers.

The article "Impious Thought for the Day" was, with only minor adaptions, Mr Waterhouse's own work.

When it was submitted – not by the author – we published it in good faith, and now apologise without reservation for having used it without permission or due credit.

Those of you who found Mr Waterhouse's style appealing will be interested to know that his latest book, "Mrs Pooter's Diary", is currently available.

Transfer program problem

THE recent controversy over software protection took a new turn with the temporary withdrawal of Clare's cassette-to-disc transfer program Replica.

Was this due to a previously undiscovered bug? Dave Clare said firmly: "Definitely not".

Declining to elaborate, Dave refused to comment on reports that a warning shot had been fired across his bow by one of the largest producers of software for the BBC Micro.

"However", he continued, "we are glad to announce that Replica is now back on sale and we have great plans for the future".

In the meantime, Acornsoft have released further details of their cassette-to-disc exchange service for Acornsoft products. In exchange for the cassette, Acornsoft will supply a disc version of the same title at 50 per cent discount.

Customers should return the cassette (without the outer box), together with the money, to:

Disc Replacement Service, Acornsoft Ltd., c/o Vector Marketing, Dennington Industrial Estate, Wellingborough, Northants NN8 2RL.

More micro

THE BBC celebrated the second birthday of its Computer Literacy project recently by publishing a book on its history and announcing three new micro orientated television series for 1984.

The booklet, "Towards Computer Literacy", gives a brief but thorough history of the project from its humble beginnings to the money spinning giant it has now become.

Aubrey Singer, managing director of BBC Television, described the project as "a story of success in high endeavour".

He felt that the project had resulted in the fact that "people have stopped being afraid of computers. Computer anxiety has become computer enthusiasm."

Evidence of this is shown by the three programmes planned for BBC television this year.

The first, "Computers in Control", is a series of five programmes giving an introduction to robotics, monitoring and control applications using the microcomputer.

Practical

In addition the National Extension College is producing a practical course on control for BBC Micro owners and the BBC Buggy will be available in kit form. The programme starts on BBC-2 on March 2, with two BBC-1 repeats during the week.

April 12 sees the start of the "Electronic Office".

GAMES ON THE BOX

FOR the first time games for the BBC and Electron are being advertised on TV, with Ocean Software promoting Mr Wimpy (BBC Micro), Hunchback (Electron) and Chinese Juggler (both machines).

It's the cat's whiskers for Gemma

THE BBC Micro is kid's stuff for baby Gemma Smith at her home in Grimsby.

For ever since her industrial chemist father Dennis devised a program depicting a cat, he hasn't been able to drag her away from the keyboard.

And that's much to the annoyance of the other three Smith children – Wayne, aged 14, Andrew, 12, and Darren, 9.

"Gemma knows that when she presses the Escape key up pops the cat, so we can't keep her off it," says Dennis.

£5,000 BAIT TO BEAT PIRATES

A COMPUTER games company is offering £5,000 to anyone who can beat the software pirates.

The directors of A & F Software – makers of the best-selling Cylon Attack and Chuckie Egg games – say they are sick of having their best games copied.

Now they want a foolproof way of making their tapes copy-proof.

Already, they've had several replies to their offer, including one from a mystery sixth-former who insisted on a mid-night meeting in a car-park.

A & F director Martin Hickling told *Micro User* that some computer club members spend hours every week duplicating tapes for their friends – thereby risking hefty fines or jail sentences.

Now A & F are mounting a two-prong anti-pirate campaign.

They intend to prosecute every pirate they catch for copyright infringement. And they plan to attack the problem at source by manufacturing copy-proof tapes.

TV is scheduled

a series of five programmes presented by the evergreen Ian McNaught-Davis, who attempts to explain the revolution in office technology. BBC Publications also plan a book to accompany the series.

The programme will be seen on BBC-2 on Thursday evenings with a repeat on BBC-1.

Looking further ahead there are plans for a regular topical television series for micro users to start in the autumn, a sort of 'chip shop' for television.

1985 will see two further programmes. "The Learning Machine", will be a series aiming to increase understanding of how the micro can assist learning, while "Technology and the Handicapped" will seek to explore the many possibilities of information technology for helping handicapped people.

BARRY WOOD'S TAILPIECE

WE were chatting with one of those lovely people from Acorn the other day, and the subject of naughty foreigners copying the Electron came up.

"Oh I don't think there's much chance of that," commented one of Acorn's best. "We can't even copy the thing ourselves . . ."

★ ★ ★

OUR technical editor's wife rang up the other day to say he was ill.

"He's sitting up in bed writing flow charts for his programs – so he must be ill."

★ ★ ★

LOVELY little footnote at the end of a piece of software sent in for review to the effect that "when you've completed your review, please check up to see if we've released another version of it before you publish anything".

In other words, the product supplied is fit enough to be sold to the public but not fit enough to be discussed in public . . .

★ ★ ★

A PROGRAMMER, selling his latest game to a leading software house, asked for an advance of several hundred pounds for equipment to develop his latest idea on.

When asked what he wanted to use the money for, he replied, "I'm going to buy a piano".

Was his next program going to be musical then?

"No, it's for my wife – to keep her busy so I can get on with my programming".

★ ★ ★

ACORNSOFT had to deal with one very irate customer, complaining that their 'compute-a-mate' program, I Do, was grossly innaccurate – it proved he was compatible with his wife.

★ ★ ★

I WAS admiring the matching case used by one company for their latest BBC add-on.

"Acorn sold us some of their second processor boxes", said the proud designer.

Well, Acorn aren't using them for much at the moment, are they?

BBC Soft sales top the £1m mark

BBC Soft has sold more than £1,000,000 of software since the start of the Computer Literacy Project – and they plan to sell a lot, lot more this year.

The list of proposed software releases by BBC Publications reads like a beginners guide to software for the BBC Micro.

Three titles will be released this month.

The first is Structured Basic, a book exploring the role of BBC Basic in writing well-structured programs. The book will be accompanied by a software cassette.

Absorbing

There will also be Game Core, a utility which, it is claimed, will aid the creation of simple and highly absorbing board games.

Finally there is Wargames, intriguingly called "a family computer activity".

As might be expected, education is not being neglected, advanced music and science topics being among the further titles planned for later in the year.

No BBC divorce, says Acorn

ACORN has hit out against "mischievous speculation" over the future of its contract with the BBC to market the BBC Micro.

The company has been particularly displeased by reports which suggested it may lose out to a competitor when the agreement comes up for renewal in August this year.

In the light of this, it has released an official statement denying any rift exists and claiming that the two organisations are "working towards the renewal of the marriage vows, not a divorce".

The full text of the statement reads:

"Some reports that Acorn Computer's three-year relationship with the BBC could soon be terminated overlook some pertinent facts which ought to suggest the opposite.

The alliance of the BBC and Acorn has been – and continues to be – an outstanding British success story.

More than 250,000 BBC Microcomputers, which are designed and marketed by Acorn, have been sold, with sales currently running at 25,000 units per month; eight out of ten schools with microcomputers have chosen the BBC Microcomputer System; many hundreds of new jobs have been created at Acorn and at its sub-contractors' plants.

The system has won international acclaim and is now making an important contribution to the British export drive; and, last but not least, the BBC has earned several million pounds in royalties from sales.

'Mischievous speculation' rapped

Achievements

All these achievements in the most competitive of all technology markets!

The BBC, surely, would have to have very strong reasons for breaking off such a successful collaborative venture to enter into a new partnership.

The more so, since educational establishments and viewers would be less than pleased to discover that, having made a major financial investment in the BBC Microcomputer System, subsequent computer literacy programmes were to be based on a quite different microcomputer system.

The facts are these:

- Acorn enjoys a close relationship with the BBC and is collaborating with the Corporation on future computer literacy projects and products.
- The present three-year agreement does not expire until August 1984 but, as is normal business practice, the terms of the new contract are already being discussed.
- As is also normal business practice, other microcomputer companies have approached the BBC.
- While the BBC did not seek tenders, we recognise that it is obliged to give proper consideration to proposals put forward by Acorn's competitors.

It is not true, incidentally, that if another manufacturer were chosen to produce the next generation of BBC computers, Acorn would be prevented from selling the present model altogether.

But that's hardly relevant. Contrary to mischievous speculation, we – and the BBC – are working towards renewal of the marriage vows, not a divorce.

Despite these words of assurance, it seems safe to speculate that the contract is not yet cut and dried.

For over at the BBC it still appears to be "make your mind up" time.

Aubrey Singer, managing director of BBC Television, let this out of the bag when he acknowledged that the Corporation is discussing new models with several manufacturers.

However he declined to say how many firms were involved.

Meanwhile other top sources in the Corporation are adamant that there is no reason to talk to anyone other than the tried and trusted Acorn.

ACORN CHIEF WINS 'OSCAR'

A COMPUTER industry Oscar has gone to Hermann Hauser, the Acorn executive with overall responsibility for the company's research and development.

The joint managing director of Acorn was recently named as winner of this year's RITA (Recognition of Information Technology Achievements) award as personality of the year.

As he is currently on company business in Japan, he was unable to attend the presentation ceremony in Birmingham, so his wife Pamela received the trophy on his behalf from Ian McNaught Davis, who fronts the BBC Series "Make the Most of Your Micro".

Hermann Hauser

Hermann Hauser holds a doctorate in physics from Cambridge where he attended the world famous Cavendish Physics Laboratory.

It was while he was involved in post doctorate studies that he met Chris Curry, his fellow joint managing director. As a result, they eventually formed Acorn in December, 1978.

Another RITA went to Micronet 800, which received the award for the most outstanding system innovation in 1983.

This is the first time that any part of British Telecom's Prestel network has won an award for its service. It comes less than a year after launching the telesoftware venture.

Pamela Hauser receives the award on her husband's behalf from Ian McNaught Davies

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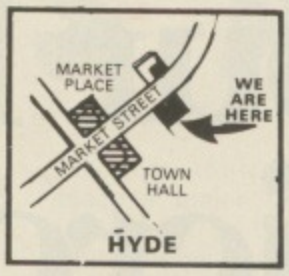

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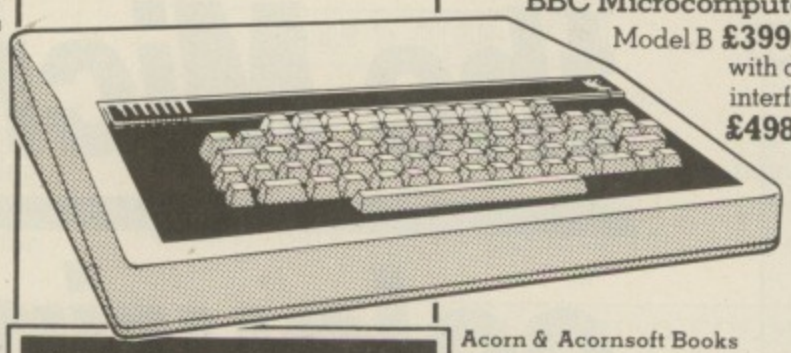

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Part 11 of MIKE BIBBY'S introduction to programming

Let's dip into the Micro's colouring box

AS promised last month, we'll be covering colours this time, and seeing how easy they are to use.

In fact, before I give you the theory, try running Program I, and see what happens:

```
10 REM *** PROGRAM I ***
20 MODE 5
30 COLOUR 1
40 PRINT'' "Colour 1"
50 COLOUR 2
60 PRINT'' "Colour 2"
70 COLOUR 3
80 PRINT'' "Colour 3"
```

It writes in three different colours! The way you get the micro to change the colour of its writing (we should really say text) is to use the COLOUR command.

COLOUR 1 causes it to print text in colour 1 from then on. In Mode 5 colour 1 is red.

COLOUR 2 causes text to be printed in colour 2. As you can see, in Mode 5 this is yellow.

COLOUR 3 obviously gives white.

So, in Mode 5 COLOUR 1 gives red text, COLOUR 2 gives yellow text, and COLOUR 3 gives white text. Actually, you can fiddle with this, but more of that later.

When you think about it, there are four colours on the screen – the red, yellow and white writing in the foreground plus a black background.

You can actually choose to write in black if you want to by using COLOUR 0, but you won't notice it against the black background. If you don't believe me try adding these lines to Program I:

```
90 COLOUR 0
100 PRINT '' "Colour 0"
```

Now Mode 5 is a four colour mode, as is Mode 1. Can you remember the difference from last month? If not, try altering line 20 of Program I to:

```
20 MODE 1
```

and then run the program.

That's right, Mode 5 gives you 20 characters per line and Mode 1 gives you forty. The colour numbers still refer to the same colours, though.

What happens if we alter it to a two colour mode? Change line 20 to:

```
20 MODE 0
```

You should only see "Colour 1" and "Colour 3" displayed, both in white. "Colour 2" has disappeared. This is because in this mode you have only two colours to play with, black and white.

As before, COLOUR 0 gives black. COLOUR 1 then has to be white. When it reaches COLOUR 2, the micro has run out of fresh colours so it goes back to black – hence the disappearance of "Colour 2".

The next colour is then white so Colour 3 appears as white. I think you can guess what COLOUR 4 and COLOUR 5 produce!

Now try Program II. At first glance this should produce the same results as Program I, this time using a loop. However, all is not as it seems, since it's in Mode 2, a 16 colour mode. Try running it and see.

```
10 REM *** PROGRAM II ***
20 MODE 2
30 FOR loop%=0 TO 3
40 COLOUR loop%
50 PRINT' "Colour ";loop%
60 NEXT loop%
```

COLOUR 1 still gives red, but COLOUR 2 now gives green, and COLOUR 3 yellow.

An important point coming up. These colour numbers do not mean fixed colours. As we've just seen, 2 is not always yellow, 3 not always white, and so on. The meaning of the colour numbers varies according to mode.

To sum up, the meaning of the colour numbers depends on the "logic" of the situation. So they are officially called logical colour numbers.

So, in the correct jargon, COLOUR 2 causes foreground text to be written in logical colour 2. As we have seen, in Mode 5 this is yellow, in Mode 2 it is green and in Mode 0 it is black.

The point is that logical colour numbers can be interpreted as different actual colours on the screen depending, for instance, on the mode.

To see all 16 colours in Mode 2, alter line 30 to:

```
30 FOR loop%=0 TO 15
```

and run it. Notice that it's 0 to 15 – this does in fact give 16 different colours!

The logical colours from 0 to 7 should be fairly obvious, but what's going on with all those flashing colours from 8 to 15?

Well, logical colour 8 flashes between black and white, logical colour 9 between red and cyan, and so on. If you can't make out all the pairs yourself, Figure I summarises them.

It may seem odd that there are two pairs flashing between black and white. This is because colour 8 flashes black then white, while colour 15 flashes white then black.

None too clear, is it? Program III should help.

```
10 REM *** PROGRAM III ***
20 MODE 2
30 COLOUR 8
40 PRINT TAB(0,12)"Colour 8"
45 COLOUR 15
50 PRINT TAB(0,13)"Colour 15"
```

This shows that while they flash between the same two colours, they are not in step. When colour 8 is showing white, colour 15 is showing black and vice versa. The same logic applies for the other flashing pairs.

One irritating point about Program III is the fact that it leaves text in colour 15 – everything you type in flashes. Most annoying!

You can stop this by entering:

```
COLOUR 1
```

after which the rest of the text will appear in red.

So far the logical colour numbers we've been using have changed the colour of the foreground text. Let's try altering the background colour.

Change mode with:

```
MODE 5
```

Then enter:

```
COLOUR 129
```

and then type in some random letters.

Hey presto, you still get white letters, but each individual letter is on a red background.

What happens is that if you want a red background to your numbers you simply add 128 to the logical colour number for red (1) and use the sum in the colour statement. Hence the use of COLOUR 129.

So, to put the letters on a yellow background you would use 128 plus 2, the logical colour for yellow. That is, COLOUR 130.

However, white letters on a yellow background look awful, so let's change the foreground text colour to red at the same time.

Entering:

```
COLOUR 130
COLOUR 1
```

should have the desired effect.

Actually we could have achieved this by entering the one line:

```
COLOUR 130:COLOUR1
```

The colon separating the two statements allows us to put them on the same line. It's the Basic equivalent of putting a full stop between sentences.

Try:

```
COLOUR 2: COLOUR 129
```

Can you work out how this gives you yellow foreground text on a red background?

Now, when we changed background colours, only the background of subsequent text characters has been altered.

At the moment the background colour is red. Try:

```
CLS
```

The whole screen is cleared to the background colour, so from now on your characters appear in a yellow foreground on a red background.

To prove that Colour 0 really does give a black foreground text – I'm sure you still doubt me – try:

```
COLOUR 0
```

and type away. All should be revealed!

```
  10 REM *** PROGRAM IV ***
  20 MODE 2
  30 FOR loop%=0 TO 15
  40 COLOUR loop%+128
  50 CLS
  60 PRINT TAB(0,15)"Background
Colour";loop%+128
  70 pause$=GET$
  80 NEXT loop%
  90 COLOUR 128
 100 CLS
```

Program IV illustrates the background colours available. Each time through the loop (lines 30-80), the background colour is increased and line 40 chooses a new background colour (*loop%*+128) as loop% increases each time through the loop, and line 50 clears the screen to this colour.

Line 60 prints out the new colour number for all the world to see, while line 70 introduces a pause, by waiting for a key to be pushed. The loop then takes you onto the next background colour.

Lines 90 and 100 are to ensure that you aren't left with an annoying flashing background when you drop out of the bottom of the loop.

FLASHING COLOURS

Colour pair	Logical colour number
Black-White	8
Red-Cyan	9
Green-Magenta	10
Yellow-Blue	11
Blue-Yellow	12
Magenta-Green	13
Cyan-Red	14
White-Black	15

Figure I: The logical colours' flashing pairs

```
   10 REM *** PROGRAM V ***
   20 MODE 2
   30 FOR loop%=0 TO 15
   40 background%=loop%+128
   50 COLOUR background%:CLS
   60 PRINT TAB(0,15)"Background
Colour";background%
   70 pause$=GET$
   80 NEXT loop%
   90 COLOUR 128:CLS
```

Program V does exactly the same as Program IV, and if you look carefully you'll see that it's equivalent – I've just used a variable *(background%)* instead of *loop%*+128 (it's calculated in line 40). I've also put the CLS on the same lines as the Colour statements (lines 50 50 and 90), separating them with colons.

Well, that's all for this month. I told you it was easy! More on colour next month.

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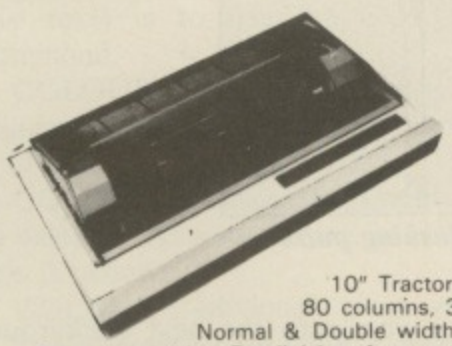

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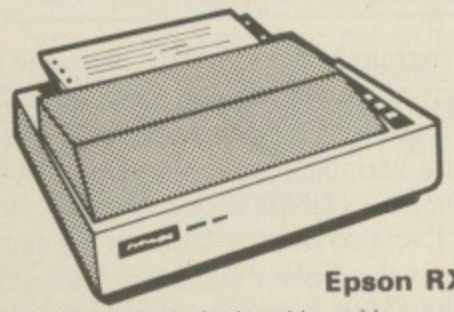

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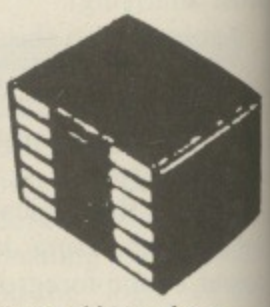

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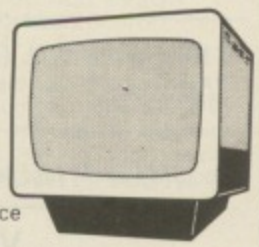

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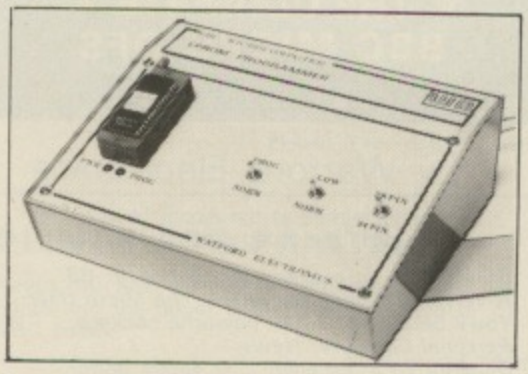

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IAN MURRAY takes an in-depth look at pitfalls facing the programmer writing educational software

PUT yourself in the mind of a 10-year-old youngster. Sorry you are a 10-year-old youngster... hop along now and fetch your mum or dad!

Good. Make certain Susan or Mike are not peeping over your shoulder. Now we can pretend what it must be like to sit in front of the screen at an age when being a teenager is like being grown-up.

There are zaps, whams and pows. You press keys and – wow! the machine obeys you.

The rocket takes off. Another key is pressed and the screen changes colour. It's wonderful.

For the first time in your short life, you are the boss and completely in control.

The machine doesn't shout at you. Mum and dad think you're great – well you haven't emptied the kitchen sink over the floor. And it's fun!

The problem for the writers of educational software is that youngsters love to experiment. Even with those simple (and dreadful) addition programs.

You are asked to choose two numbers. The first time you obey the instructions and choose two reasonable numbers.

The next time you choose two very large numbers – lots of noughts in them. The answer miraculously appears – or does it?

Type in:

PRINT 1234567890 + 345600000000

The answer: 3.46834568E11 appears.

Horror! The machine is faulty. The youngster rushes into the garden to tell dad that his computer must go straight back to the shop.

We know that the answer is in exponential format because the machine cannot handle very large integers. But your excited youngster doesn't.

The desire to experiment with the extremes of the machine can cause yet further havoc.

The screen display may collapse or be insufficient for the answer – despite the answer being correct. Type in the following and see what happens:

```
10 CLS
20 VDU 28,10,20,16,19
30 INPUT A
40 INPUT B
50 PRINT A+B
```

Run the program with two sensible numbers – like 23 and 47. The result of 70 appears. Now run the program with 3456 and 1234567. The answer you see is 023. This is correct?

What has happened is that the VDU 28 is the command for defining a text window, and the window is not large enough for the whole answer.

This may be a trivial example – but I have seen it several times in educational software.

Alternatively, if the screen display collapses it often is impossible to get it back without reloading the software completely.

The youngster gets quickly fed up. An otherwise good piece of work lies unused because the programmer did not think like a child.

A young person will go to extraordinary lengths to experiment – not with the lesson, but with the software teaching the lesson.

The job of structuring and limiting the range of possible replies by the youngster is called validation. Good validation is the secret to good software.

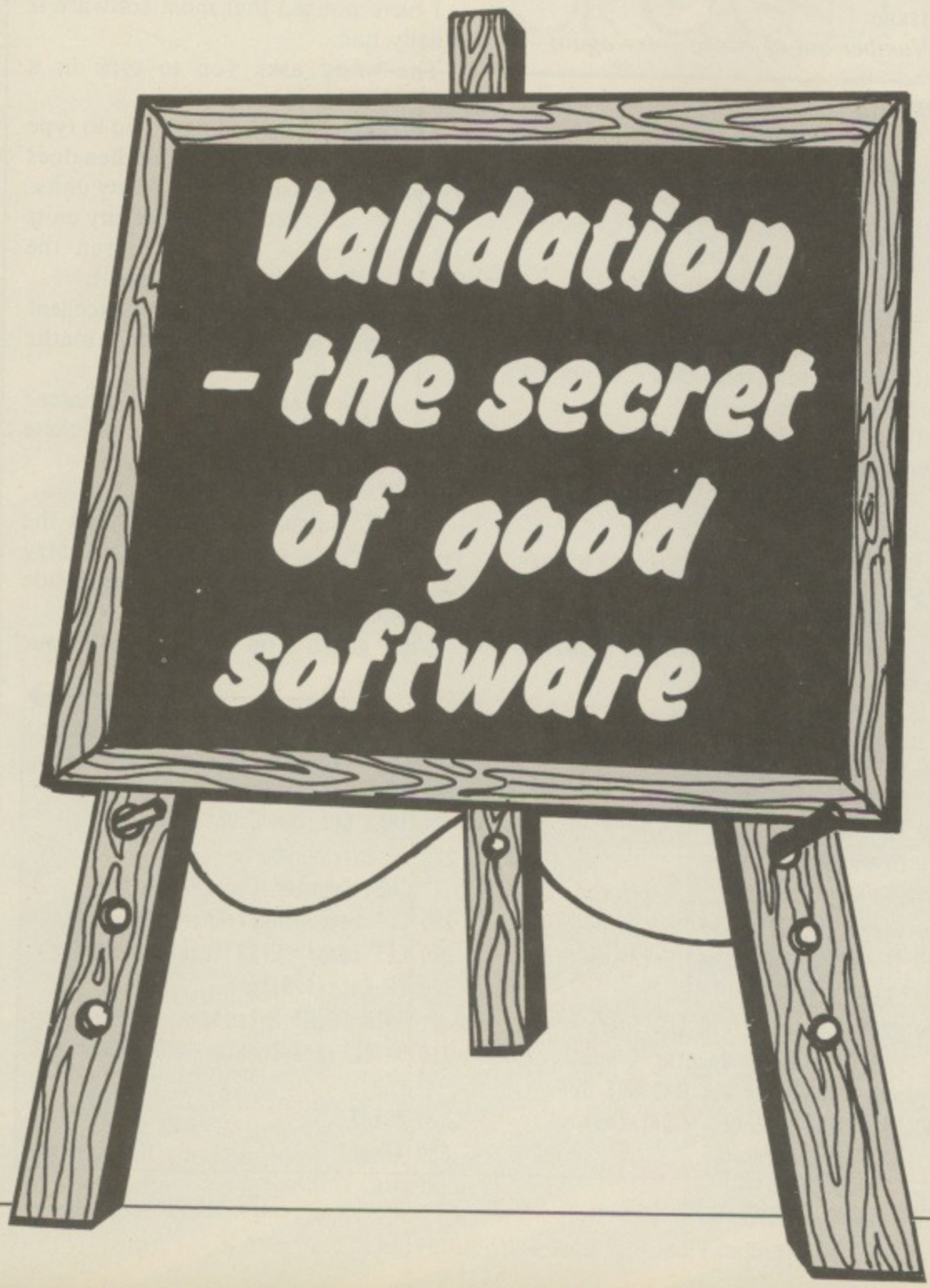
Bad validation either gives us £00.00 in our wage slip or a gas bill for £200,000.00 when we have been on holiday for two weeks.

The object of validation is not only to make software robust, but also to direct the learning of the student.

Look back at the trivial addition example above. You may not want the youngster to discover that there is a valid method of writing numbers which includes the letter 'E'.

It may lead to running before walking or even the young person being frightened off numbers by concepts which are beyond their stage of development.

Your validation will therefore include, not only length of input checks



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and number range of answer checks, but also character checks to see that the correct type of keyboard character has been used.

As all validation is expensive on memory, you will need to develop general purpose procedures to perform the checks – and an example is given below.

Note, however, that in the BBC Micro there is a conflict between the amount of memory space given over to clever program ideas – and validation of those ideas – particularly in higher screen modes.

You have to decide whether the last screen shape is worth the possibility of the program crashing.

My general view is that with younger children – **the program must not crash.**

Listing I, deliberately overdocumented, shows the kind of validation routine you will need.

If you specify on entry to the function the highest and lowest letters acceptable and how many you will allow the routine will input routine to those specifications (see listing below).

As it stands this is a little limited. You may accept any length up to a certain number of characters.

Then you would have to alter line 310 to just catching the Return key.

You may decide to allow capitals and small letters. You would then need a line 215 such as:

IF Entry > High
THEN Entry = Entry – 32

This spots an Ascii character larger than Z and brings the Ascii character back down to capitals for processing purposes.

All data entry, once you have limited the number of characters to be entered, should be done via a screen window.

The screen window must be large enough to take the width of the data entry and deep enough to accommodate any error messages.

If you do this, you can keep on the screen any clever graphics, which is entertaining to the viewer without the cumbersome use of PRINT TABs to position your data entry.

You can happily clear the text window without worrying about the rest of the display.

Disc fault 18 at 00/50.

I had this error message while writing this article. It is totally uninformative, useless and encourages grown adults to tear their hair out in frenzy.

The younger generation may be more self-controlled about the hi-tech world, but useless error messages ruin software.

Youngsters are always going to examine your software and drive it to the limits. Expect it. Gently inform them that you've sussed this and they won't get away with it.

DO NOT use this as an error message:

Number out of range – try again

or:

Not valid

or worse – simply repeat the input question mark.

On data entry, you should always specify to the user what the expected range of numbers/letters is:

I like a WHOLE number from 1 to 100.
What is your number?

If then the prankster types in 999, he has done it because:

- It's a genuine error – so repeat instructions.
- He's misread – so use simpler language.
- It's deliberate over-play – so inform the user we know the prank.

Your number is no good.
Try a WHOLE number from 1 to 100.
Type in again?

Error messages occupy large amounts of memory space and are tedious to type in. So store bits of the message in string variables.

For instance:

LET Error1$ = "Your number is"
LET Error2$ = "Type in again?"
LET Error3$ = "Try a WHOLE number"

You then make your error messages combinations of pre-planned error messages. You will be surprised just how much memory and typing this saves. Make certain they will all fit inside the text window!

A full description on program assistance will be given in next month's *The Micro User*.

But you should always know when the user is likely to forget part of a data entry.

Science teachers scream blue murder if we leave the units off our experiments and calculations.

"Three whats!?", they howl. "Miles – biscuit tins what?"

I have noticed that most software is equally bad.

The worst asks you to type in a distance – no idea of units.

The moderately bad asks you to type in your distance in miles – but then does not expect the user to specify any units.

You have to decide whether any units are necessary – not just to run the program, but as a learning point.

There is a good example of excellent user assistance in London's Smile maths software.

How good are you at coordinates? Do you always remember the brackets round the number (6,3)

No? Why not!

The Smile maths software puts the brackets on the screen before data entry and the numbers must be fitted inside the brackets.

Very good! You see (,) and your

→

```
 10 CLS
 20 A$=FNinput("Z","A",6)
 30 PRINT A$
 40 END
100 DEF FNinput(High$,Low$,Num)
110 LOCAL High,Low,Counter,Entry
    ,Delete
120 LOCAL Return,Temp$,Entry$
130 LET Delete=127
    : LET Return=13
140 LET High=ASC (High$)
    : LET Low=ASC (Low$)
150 LET counter=0
160 REPEAT
170 REPEAT
180 REPEAT
190 Ok=FALSE
200 LET Entry$=GET$
210 Entry=ASC (Entry$)
220 IF Entry >= Low AND Entry <= High
    THEN Ok = TRUE
230 UNTIL (Counter = 0 AND Entry
     <> Delete) OR Counter < Num
     OR (Counter = Num AND NOT Ok)
240 UNTIL Ok OR Entry = Delete
    OR Entry =Return
250 LET Counter=Counter+1
260 IF Entry=Delete
    THEN Counter=Counter-2
270 IF Entry=Return
    THEN Counter=Counter-1
280 LET Temp$=Temp$+Entry$
290 LET Temp$=LEFT$(Temp$,Counter)
300 IF Entry<>Return
    THEN PRINT Entry$;
310 UNTIL (Num=Counter AND Entry=Retu
    rn)
320 PRINT
330 =Temp$
```

Listing I

BREATHTAKING IMAGES FROM DISC OR CASSETTE

BREATHTAKING IMAGES FROM DISC OR CASSETTE

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Finally, perhaps the best news for purchasers is that the CUB colour monitor represents a real investment. However dramatically computers or video systems may change in the coming years the means of displaying their output is unlikely to alter – you can't improve on the best.

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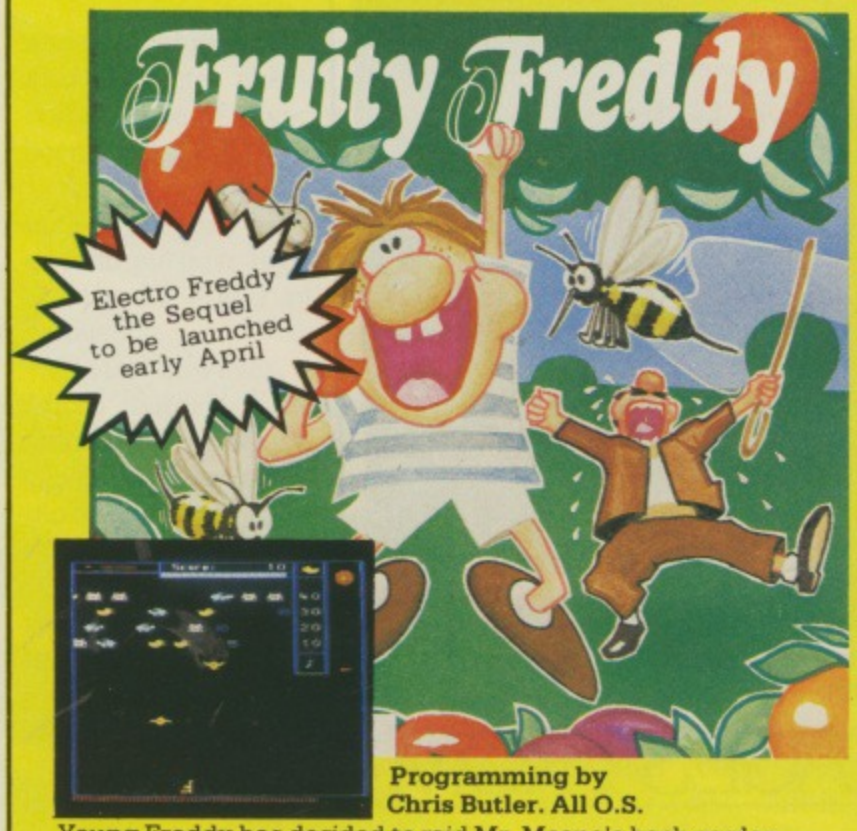

Programming by Chris Butler. All O.S.

Young Freddy has decided to raid Mr. Meano's back garden, collecting the growing fruit before they run to seed. Tread on the fruit before they're ripe and Mr. Meano will be after you. Avoid the pesky bees or kill them with the can of DDT. Look out for the Crazy Crimson Catapillar and the sparrow with its deadly droppings, but grab the sweets, drinks and other goodies. Can you make Freddy's perilous task fruitful? Smooth multi-coloured graphics and all arcade standard features make this a most enjoyable machine code game.

Programming by Stuart Low. OS1.2 only.

All the fun and thrills of the funfair are brought to life in your BBC Computer as you fire at the targets that can fly down and eat your limited supply of bullets. Hit the bell with the slider to prevent more targets appearing. Amusing graphics and realistic sound effects make this another 100% machine code winner from Softspot.

Programming by Marcus Altman. All O.S.

"Look out investors your local bank is being robbed!" Manoeuvre the bank manager around the building, collecting money bags and returning them to the vault – Dodge the ever chasing robbers or bop them on the head with a hammer. Beware of the time bomb which you must defuse or you will sprout wings and fly to heaven.
Enjoy a refreshing cup of tea for bonus points, game increases with difficulty on each level.
Features include fast smooth multicoloured characters, excellent sound effects, background music. Very addictive and fun.

Programming by Chris Butler. All O.S.

Your BBC Micro is under attack! The components on the circuit board are attacking the CPU. Can you stave off the many marauders by firing pulses of electricity along the data lines of the 6502. Beware of the deadly mains spikes zipping along the tracks and hit the tools on the edge of the circuit for bonus points. For emergencies only the ZAP button will destroy everything with an explosion of debris.

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first numbers enters to the left of the comma and the second to the right. To program this is easy – it just requires thought.

The £ sign is a constant problem. It can easily be catered for by typing:

PRINT "£";FNinput("0","9",4)

Then the user is in no doubt about what is required. There is always a conflict here between teaching and being too supportive.

With the brackets a happy compromise would be to generate the brackets from the program if the user had not done so within a specified period of time.

The INKEY command will help you here. A little teaching reminder about brackets would not go amiss when the user is late with the brackets – and then on with the software.

Mum gives Jonathan his computer for a birthday. Within weeks he settles down. She buys him educational software.

Before very long she's telling the neighbours: "He's so fast – he's learnt so much. He gets all the sums right".

Marge rushes straight off to buy her Sarah a BBC Micro hoping that the same brilliance will attack her youngster.

It does – well not really. Jonathan and Sarah have learnt the software – not the lesson.

Take those dreadful speed addition programs. The youngsters, as you watch them, hardly wait for the sums on the screen before they type in the answers.

Basically they are tackling the additions in the same way that Snapper or Frogger are played. They have spotted the "pattern" that makes the program work.

When you put fixed data into your programs, this will always happen. In some cases you cannot avoid fixed data, such as names of places and objects.

But where you can you should always try to use the random number generator in Basic to generate a sample of data.

It is an awful waste of the programmer's time and your money, when you purchase a very pretty program which the youngsters can learn to do in five minutes.

This is the case with the BP Oil Slick program.

It is an enviromental studies game, but the youngsters learn which way to disperse the slick by working out how to beat the program.

I have found that they end up with little understanding of the problems of pollution – which is a pity – unless they are restricted as to the number of times they can play.

With more random data this might not have happened. It also explains why the graphics programs are so good, because here the user selects the data for the graphics, using the computer as a tool.

This should give you some idea of the pitfalls facing the programmer writing educational software.

In next month's article I shall be discussing how to entertain the user.

The extended facilities of the BBC Micro allow us programmers a lot of scope for keeping the attention of the user.

Suffice it to say that a good monster can do wonders for a banal program.

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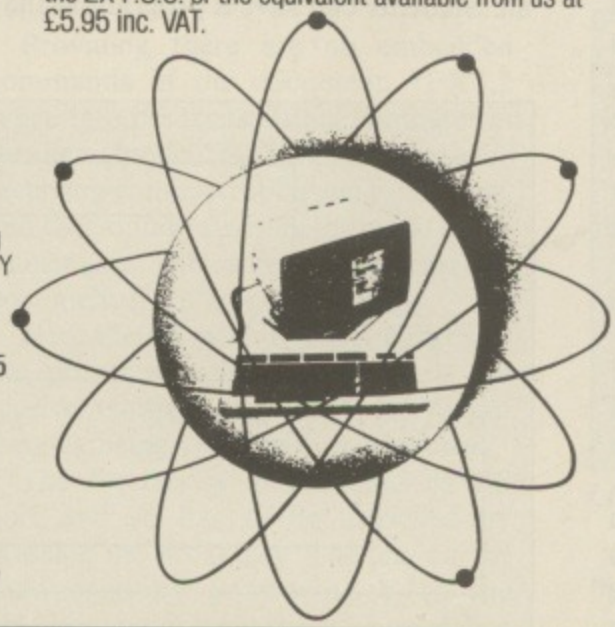

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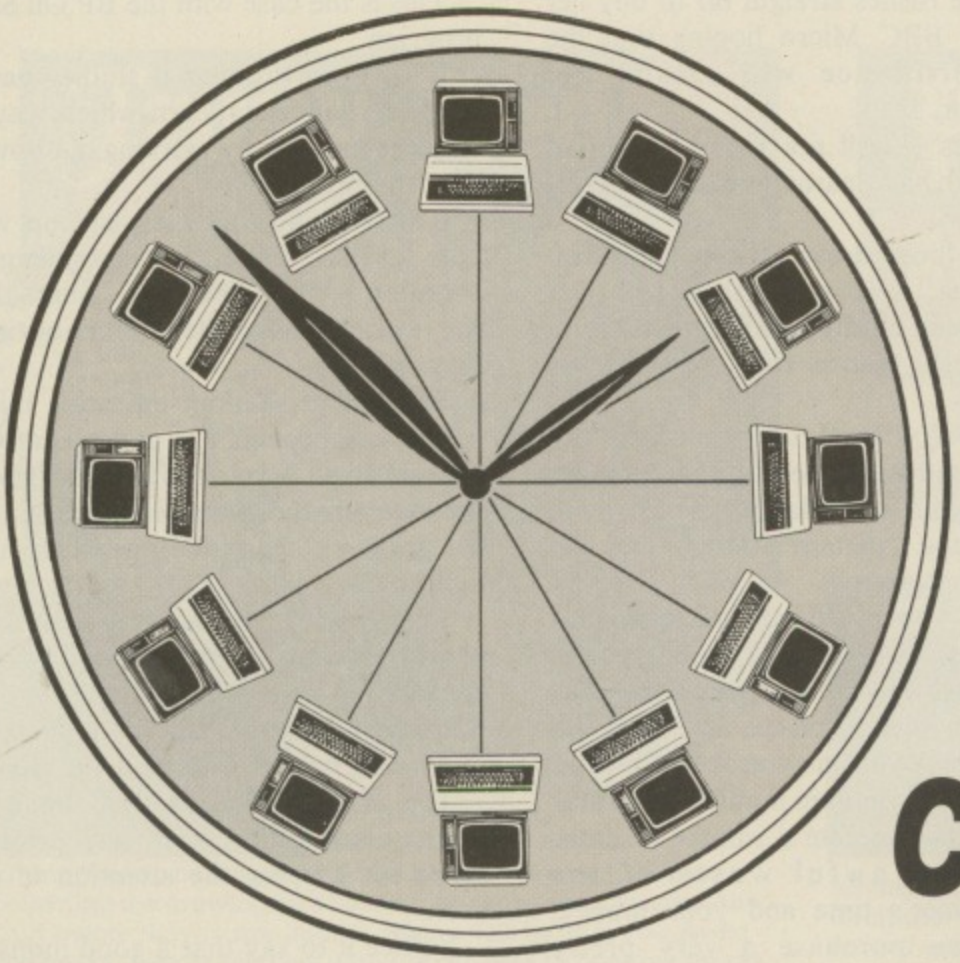

Economical answer to time shared CAL in school

By TONY CRAVEN

WE had a problem with our computers. How do you organise the use of ten BBC Micros in a sixth form college so as to give everyone as much time as you possibly can?

Some students knew more than any teacher, some had never seen a keyboard before.

Nine computers were tape based, one was a disc machine with a single sided 100k drive. The timetable demanded 40 minute slots.

We had a reasonable software library, something for everyone. Computer Studies groups were forever writing programs and wanting them saved until the following day, when they would drop in at lunchtime with 20 minutes to spare.

And those cheap tape recorders! Would they work reliably? You tell me!

I had to do something to sort out the fights for who got the disc machine. Fortunately, while browsing through the User Guide one day I came across the FX calls which direct data to the RS423 port, that middle DIN socket on the back of the BBC Micro.

Paul Beverley's article in the October edition of *The Micro User* about wiring up the RS port helped greatly, and within a couple of days we had a simple network running where each of the nine TFS (tape filing system) machines were loading from and saving to the one DFS micro.

Not very fast, but at 10k in about 10 seconds who is grumbling?

Now we don't use tape recorders at all. Students can save a program at the very end of a class, confident that it will be there tomorrow, when they can pop in with that quick amendment.

Classes can book the computer room for 40 minutes knowing that 39 of those minutes can actually be spent using the Computer Assisted Learning programs.

All for the price of a few five pin Domino DIN plugs, a multi wafer rotary selector switch and some scrap

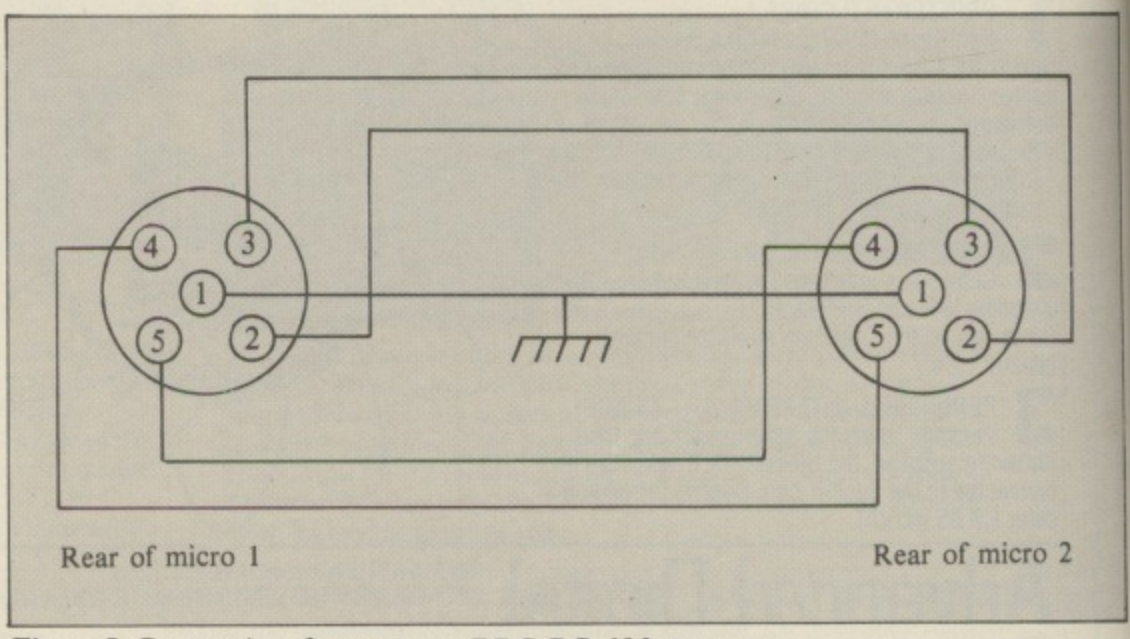

Figure I: Connections between two BBC RS 423 ports

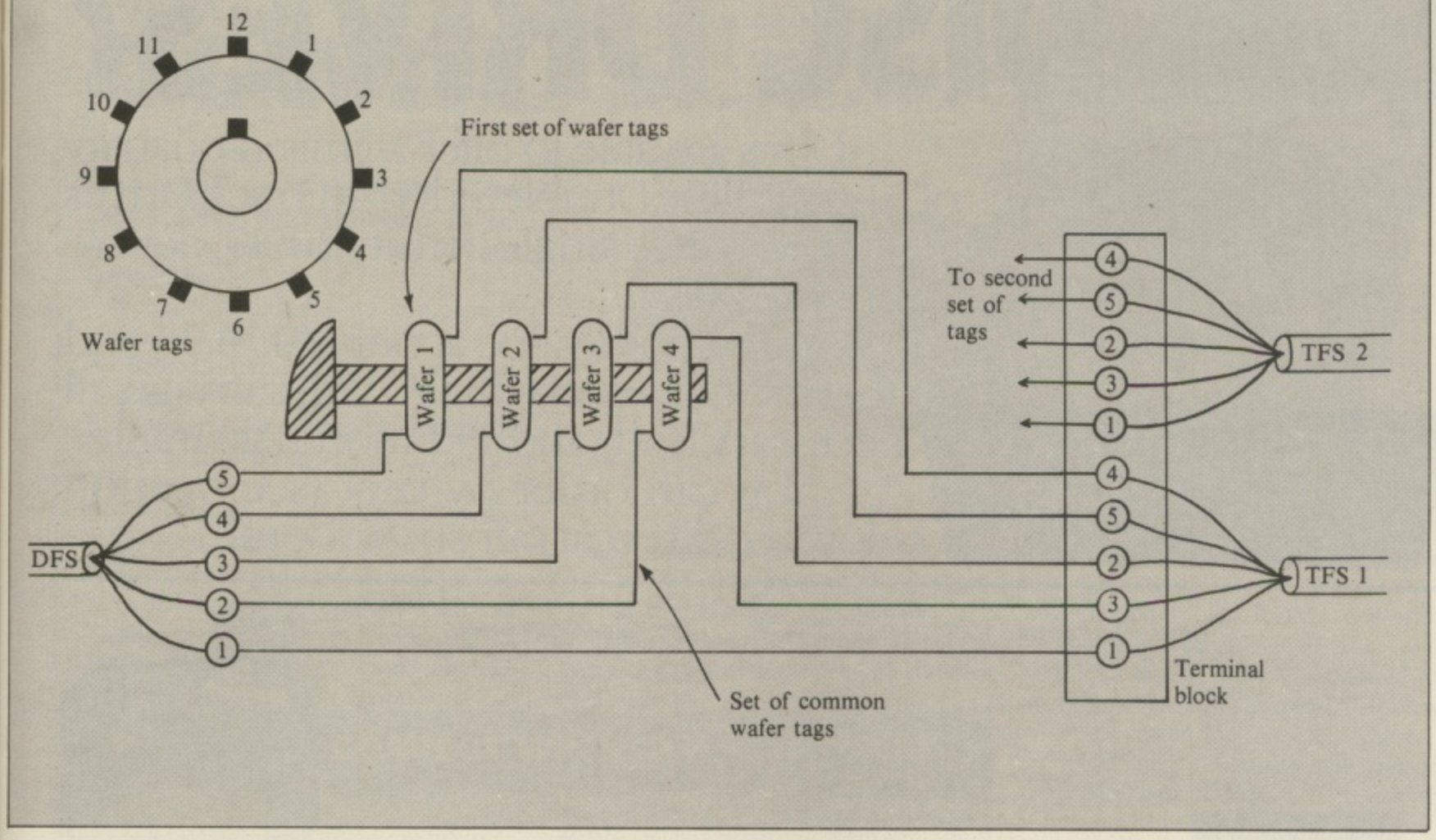

Figure II: Rotary wafer

five core cable that fell off the back of a telephone engineer's lorry.

Figure I shows the wiring necessary from the DFS micro to any number of TFS machines. I took the wires through a 12 position, four way selector switch, as shown in Figure II.

The software is very simple being contained in function keys. Each disc contains the program given in Listing I.

This program is CHAINed into the disc micro and then each TFS micro must be forced to listen to its RS port by typing in *FX2,1 followed by Return.

The particular TFS machine is selected on the rotary switch and f9 on the DFS is pressed.

This configures the function keys on the TFS machine so that f0 makes it listen to the network and f1 transmits its current program listing to the DFS, provided the DFS has been forced to listen by having its f0 pressed.

This configuration need only be done at the beginning of each day. After that single function key presses will suffice.

The students have taken to the system very easily. All they need to do is to place the right disc in the drive, select their micro number on the rotary switch, press f1 on their micro, f0 on the disc machine and they're off.

Saving is an equally easy process, and we have one disc dedicated per group. Everybody in that group saves their work one after the other on the same disc.

I have recently also found that simple Wordwise files can be sent over this network.

Providing there are no embedded commands in the document, *FX5,2 typed into the transmitting computer in the menu mode, *FX2,1 entered into the receiving computer followed by Escape, and then option six from the menu of the transmitter will dump the formatted document from one to the other.

Here the RS port is being selected as the printer for the transmitter – the receiver simply thinks that the document is being typed in, very quickly.

The receiver is locked onto its RS port and so has to be unlocked by pressing the Break key. The text can be recovered by answering Y to the old/new text prompt that occurs after a Wordwise break.

If you have more than three BBC Micros with one DFS, then rigging up this network is well worth doing.

The hands-on time is increased dramatically and it is also really viable to have a fast change over for CAL groups.

I know that Econet can knock this network into a cocked hat, but this one costs virtually nothing. What's more, it works now.

```
   10*KEY0*FX3,7|ML.|MP."*FX2,0"|M*
FX3,4|M
   20*KEY1*FX2,1|M
   30*KEY9*FX3,7|ML.|MP."RUN"|MP."*
FX2,0"|M*FX3,4|M
```

f0 = transmit current listing
f1 = listen to RS423 port
f9 = configure the function keys on the TFS that has been forced to listen.

Listing I

By the way, ignore any syntax error reports. It works!

Tony Craven is Microelectronics Co-ordinator at Shena Simon College, Manchester.

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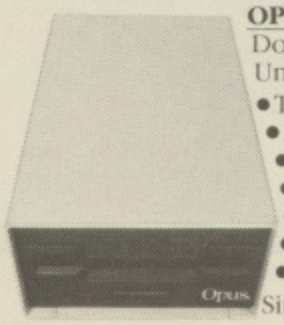

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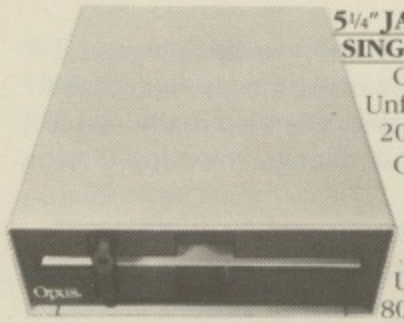

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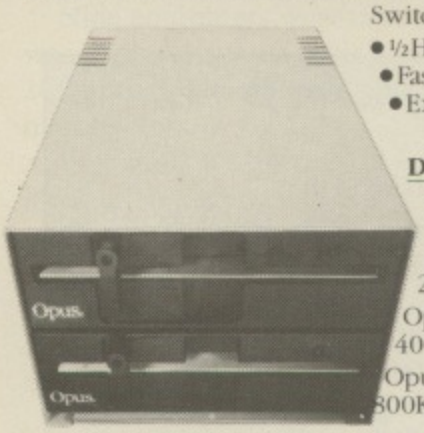

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G. Disassembler ROM – Watford's latest release.

H. The Watford DFS – claimed to be the most sophisticated DFS software yet written for the BBC Micro.

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All you have to do to win the lot is to list the eight ROMs in their order of usefulness to the average user.

Then, as a tiebreaker, tell us, in not more than 25 words, the piece of software that you would most like to see on ROM.

Send your entry, on the coupon below, to reach us no later than March 29, 1984.

DECEMBER CONTEST WINNERS

THE prize for our December competition – three complete Micronet systems – inspired many hundreds of readers to enter.

They had to describe the best use for an old 0.1 OS ROM. And their imaginations ran riot.

Sorting through the entries was a mammoth task but we eventually found three winners whose entries we give below:

● Sindy Old 0.1 ROM toast rack *(see picture)* – **Sam and Wendy Farr, Combe Haybath.**

● For testing neurological function. Placed on the patient's chair, the ROM detects ability to discriminate between 28 simultaneous stimuli. If positive, the investigation indicates hysteria. – **Dr B. Bedford, Brockenhurst.**

● To be issued to all those customers who are still waiting for a second processor, so that they can have a chip on both shoulders. – **R.C. Todd, Royston.**

Your FREE entry form

List the eight ROMs mentioned above in order of their usefulness to the average user. For example, if you think that a Beeb Printer ROM would be the most useful, put A in box 1, and so on.

Then in not more than 25 words complete the following sentence:

1 ☐ 5 ☐ **The piece of software I would most like to see on ROM is . . .** _____

2 ☐ 6 ☐ _____

3 ☐ 7 ☐ _____

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The count down is on!

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By KIM WEST and PAUL PASSANT

DENARY Derrick is designed to help young children to get practice with numbers, and in so doing, get used to a computer keyboard.

The program will play two games. The first requires the defender to fire rockets by pressing the key which has the same number as Derrick is carrying.

Once the correct key is depressed a rocket is launched, and can be guided by the Left and Right keys.

It is not very difficult to hit Derrick once the rocket is fired. The aim of the game is to stop him, but the essential tactic is to get the correct number.

Once the first game is mastered the major role of Derrick can be used. In the system of counting we use 10 is very important. The columns in base 10 (denary), represent units, tens of units, tens of tens, and so on.

It can be seen that relating numbers to 10 is very important. The numerical difference between a number and 10 is fundamental in subtraction, and thus in many more complex calculations. This is where Denary Derrick comes in.

The second game is almost identical to the first but rockets are only launched if the key representing the difference between Derrick's number and 10 is pressed.

For example, if Derrick has a 1 the rocket will only be fired if 9 is pressed.

If Derrick is hit he is merely teleported back to the top of the screen where he will collect a different number. A hit scores 10 points.

When Derrick lands for the third time a score card is displayed showing the last score and the total overall. The program then returns to the rule sheet and the player can reselect game one or two.

The program itself has a simple structure. PROCintro gives the idea of the game while PROCdefine sets up tables of data and defines characters.

Then there are three nested REPEAT loops. The outermost, a continuous loop, will rerun the game until BREAK or ESCAPE is pressed.

The second loop allows game one or two to be selected before each go, ending when Derrick has landed for his third time.

Inside this is a loop which keeps Derrick moving down until he is hit or has landed.

PROCbase checks to make sure the launch pad can be moved, and if so prints it in its new position.

Similarly PROCspider does the same for Derrick (note line 400 – VDU48+N% is used to print the required figure on Derrick).

FNhit acts as a shield around Derrick, checking if the rocket has reached him.

All the machine code for printing Derrick is assembled in PROCdefine along with all the data and characters.

To ensure Derrick carries different numbers on subsequent descents PROCinit sets NI% to the old value of N% (Derrick's number), and picks random values of N% until it is different to NI%.

KEY% is the Ascii value of the number which should be pressed. Lines 1530 and 1540 calculate KEY% depending on which version of the game is being played.

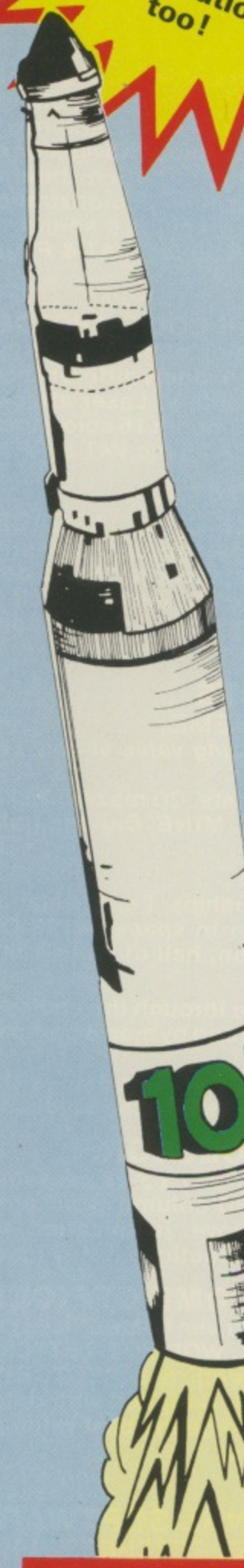
Several colours are changed with VDU19, the flash rate increased so Derrick's eyes move faster, and printing is sent to the graphics cursor ready to print Derrick.

PROCupdate briefly returns printing to the text cursor and prints the score.

On landing all colours are changed to blue except one for the printing, PROCland also plays a tune and then resets the colours ready for the next descent.

PROCanother gives the sheet, last score and running total. Finally PROCexplode teleports Derrick with the aid of some interesting machine code which fragments his part of the screen. Denary Derrick is a long listing, but a very educational program for youngsters.

And don't forget, if you haven't the time to type in the listing it is available on tape along with all the other programs in this month's *Micro User*.



FULL LISTING STARTS ON PAGE 163

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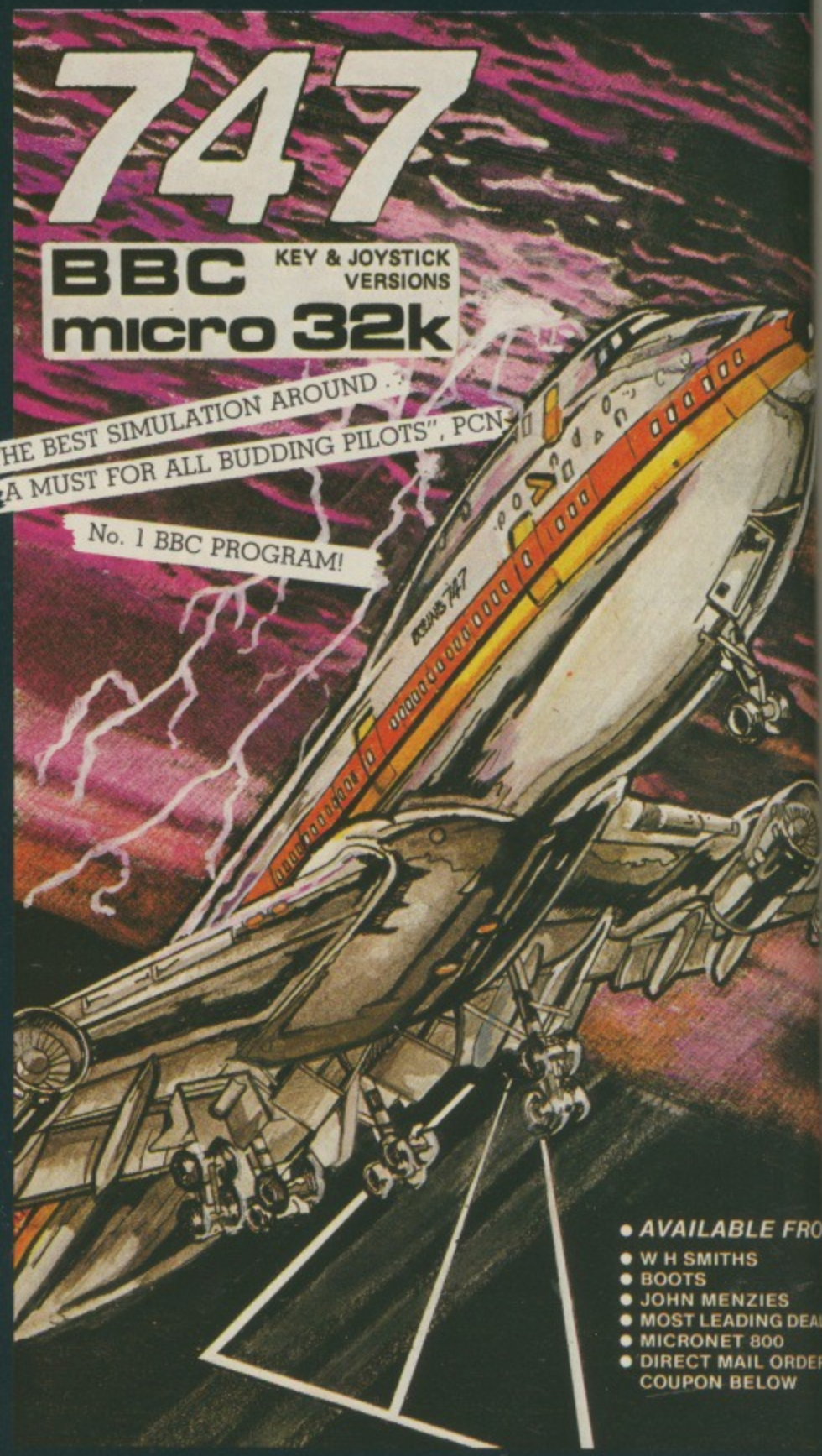

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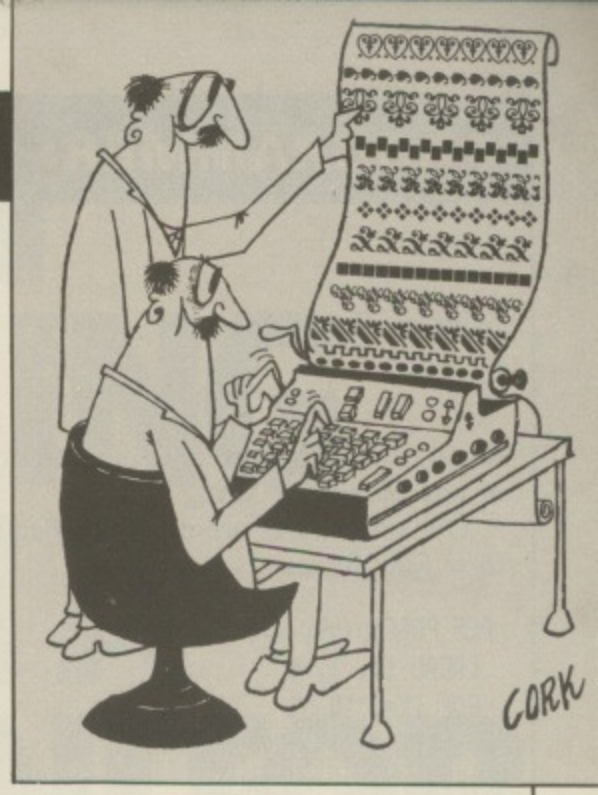

Pulling strings and handling arrays

By
ALAN WHITTLE

MANIPULATING arrays in BBC Basic is hampered by the fact that their names cannot officially be passed to procedures as parameters. In the case of numerical arrays we can get around this quite nicely by smuggling the names in as strings, and the system turns out to have surprising bonuses.

First let's look at the method itself. As an example, consider a straightforward procedure for adding two one dimensional arrays together element by element:

```
DEF PROCadd1(n%)
 LOCAL i%
 FOR i%=0 TO n%
  result(i%) = a(i%)+b(i%)
 NEXT i%
ENDPROC
```

The call ***PROCadd1(10)*** then has the effect of adding the first 11 elements of ***a*** and ***b*** together and stores the sum in the array ***result.***

The usefulness of this is very limited, since we would have to rewrite part of it if the names of the arrays were other than ***a*** and ***b***, or we would have to copy the required arrays to ***a*** and ***b*** in advance, squandering both time and storage space.

The following technique improves on this a great deal.

```
DEF PROCadd2( n%, left$, right$)
 LOCAL i%
 FOR i%=0 TO n%
  result(i%)=EVAL(left$+"(i%)") +
  EVAL(right$ + "(i%)")
 NEXT i%
ENDPROC
```

This is a considerable improvement, because we can now feed the names of any two arrays we like to the procedure as parameters. The call:

```
PROCadd2(10,"a","b")
```

for example, has the same effect as our earlier call of ***PROCadd1.*** We still have to copy ***result*** to wherever we need it, but at least we've cut down on the copying.

There are further advantages of this system hidden just below the surface. If we want to add the absolute values, say, of the two arrays instead of the actual values, we can use the call:

```
PROCadd2(10, "ABSa", "ABSb")
```

This works because ***ABS*** – like all other ready-made functions except ***RND*** – doesn't need the parentheses which we often insert for tidiness.

Furthermore, the same procedure will serve to add two user-defined functions of ***i%,*** say ***FNfred(i%)*** and ***FNbill(i%),*** instead of arrays, provided we have suitably defined the functions named.

For this we need the call:

```
PROCadd2(10, "FNfred", "FNbill")
```

It would be nice to go yet further with this and add functions of array values. But unlike most of the ready-made functions, we can't drop the parentheses in expressions such as ***FNfred(x).***

So our procedure as it stands is not capable of adding, say, ***FNfred(a(i%))*** and ***FNbill(b(i%))*** for a sequence of ***i%.*** since it requires ***(i%)*** to be the last part of the string to be evaluated, and that final parenthesis gets in the way.

One way of gaining this extra flexibility is to simplify the procedure and pack more into the strings passed as parameters. The procedure becomes:

```
DEF PROCadd(n%,a$,b$)
 LOCAL i%
 FOR i%=0 TO n%
  result(i%) = EVALa$ + EVALb$
 NEXT i%
ENDPROC
```

and the call:

```
PROCadd(10, "FNfred(a(i%))",
"FNbill(b(i%))")
```

has the required effect.

This has the disadvantage that now we always have to incorporate the ***(i%)*** in the parameter strings, even when we're adding arrays without the frills we've been at pains to cater for, and this is a bit irksome when keying in.

We can get the best of both worlds by defining ***PROCAdd*** – note the capital ***'A'*** – as follows:

```
DEF PROCAdd(n%, a$, b$)
 PROCadd(n%, a$+"(i%)", b$+"(i%)")
ENDPROC
```

Thus a call of ***PROCAdd*** without the ***(i%)*** parts in the strings is the same as one of ***PROCadd*** with them, and we use ***PROCadd*** only when ***(i%)*** is *not* at the end of the string.

Even now we have not yet reached full flexibility. Our procedure will add all sorts of different arrays or functions of arrays, but it will still only add.

We might want to perform any of the usual arithmetic operations, logical operations or whatever, and we can do

→

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this by specifying the type of operation in one parameter string ***op$.***

Our procedures are now modified to their final forms:

```
DEF PROCop(n%, a$, b$, op$)
 LOCAL i%, a, b
 FOR i%=0 TO n%
  a=EVALa$ : b=EVALb$
  result(i%) = EVALop$
 NEXT i%
ENDPROC
DEF PROCOp(n%, a$, b$, op$)
 PROCop(n%, a$+"(i%)", b$+"(i%)", op$)
ENDPROC
```

The string ***op$*** must specify the term-by-term operation in terms of ***a*** and ***b,*** where ***a*** and ***b*** stand respectively for the elements of the array specified by ***a$*** and ***b$.*** We use ***PROCop*** or ***PROCOp*** analogously to ***PROCadd*** and ***FROCAdd*** above.

Thus ***PROCop*** is needed only when we are forced to include ***(i%)*** in the parameter strings – that is, when it doesn't appear at the end of them.

These final procedures are remarkably flexible. A few examples will illustrate their power, and then we will look briefly at some more procedures and functions that take advantage of the techniques outlined so far.

Example I: To subtract an array called ***second*** from another called ***first,*** each with ***n*** elements, use the call:

```
PROCOp(n-1, "first", "second", "a-b")
```

Example II: To multiply the sines of the elements of array ***A*** by the cosines of those of array ***B,*** each having 20 elements, use:

```
PROCOp(19, "SINA", "COSB", "a*b")
```

Example III: To divide ***FNpoly*** of the elements of array ***Fred*** by ***FNpoly*** of those of array ***Charlie,*** where ***FNpoly*** is defined somewhere in the program, we need ***PROCop*** instead of ***PROCOp:***

```
PROCop(n-1, "FNpoly(Fred(i%))",
"FNpoly(Charlie(i%)", "a/b")
```

Of course we must be careful that none of the ***b***s turn out to be zero!

Example IV: We can make that final string more complicated, using functions or whatever we like:

```
PROCOp(n-1, "COS", "SIN",
"SQR(a*a+b*b)")
```

can be used to help verify a result well known to those who have studied trigonometry.

Now, as promised, we'll look at a couple of different functions and a procedure.

First, one to evaluate the maximum element of a two-dimensional array given, as before, in two forms for maximum flexibility.

```
DEF FNmaximum(a$, m%, n%)
 LOCAL i%, j%, max%, temp%
 FOR i%=0 TO m%:FOR j%=0 TO n%
  temp%=EVALa$
  IF temp%>max% THEN max%=temp%
 NEXT j%: NEXT i%
= max%
DEF FNMaximum(a$, m%, n%) =
FNmaximum(a$ + "(i%,j%)", m%, n%)
```

If we also need to find the minimum element, we don't need to repeat the whole procedure with the obvious minor amendments.

Instead, we call on another variant of the techniques discussed earlier:

```
DEF FNminimum(a$, m%, n%) =
-FNmaximum("-"+a$, m%, n%)
DEF FNMinimum(a$, m%, n%)=
-FNMaximum("-"+a$, m%, n%)
```

I'll leave you to figure out how this works.

Again, calls such as:

```
x=FNMaximum("ABSa", 10, 4)
```

may be useful to find the element in the 11x5 array ***a*** with largest absolute size.

Finally, an example to show how Boolean conditions can also be passed as parameters:

```
DEF PROCchoose(a$, b$, n%, condition$)
 LOCAL i%, a, b
 FOR i% = 0 TO n%
  a=EVALa$ : b=EVALb$
  IF EVALcondition$
   THEN result(i%)=a
   ELSE result(i%)=b
 NEXT i%
ENDPROC
DEF PROCChoose(a$, b$, n%, condition$)
 PROCchoose(a$+ "(i%)", b$+"(i%)", n%,
 condtion$)
ENDPROC
```

This could be used, for example, to find the array that chooses, for each ***i%*** (0 to 15), the larger of the two elements ***left(i%), right(i%),*** by means of the call:

```
PROCChoose("left", "right", 15, "a>b")
```

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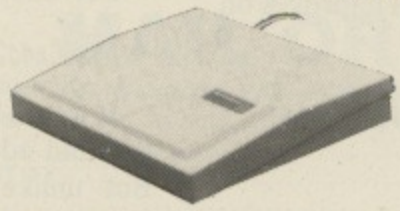

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– PC, Dec 83

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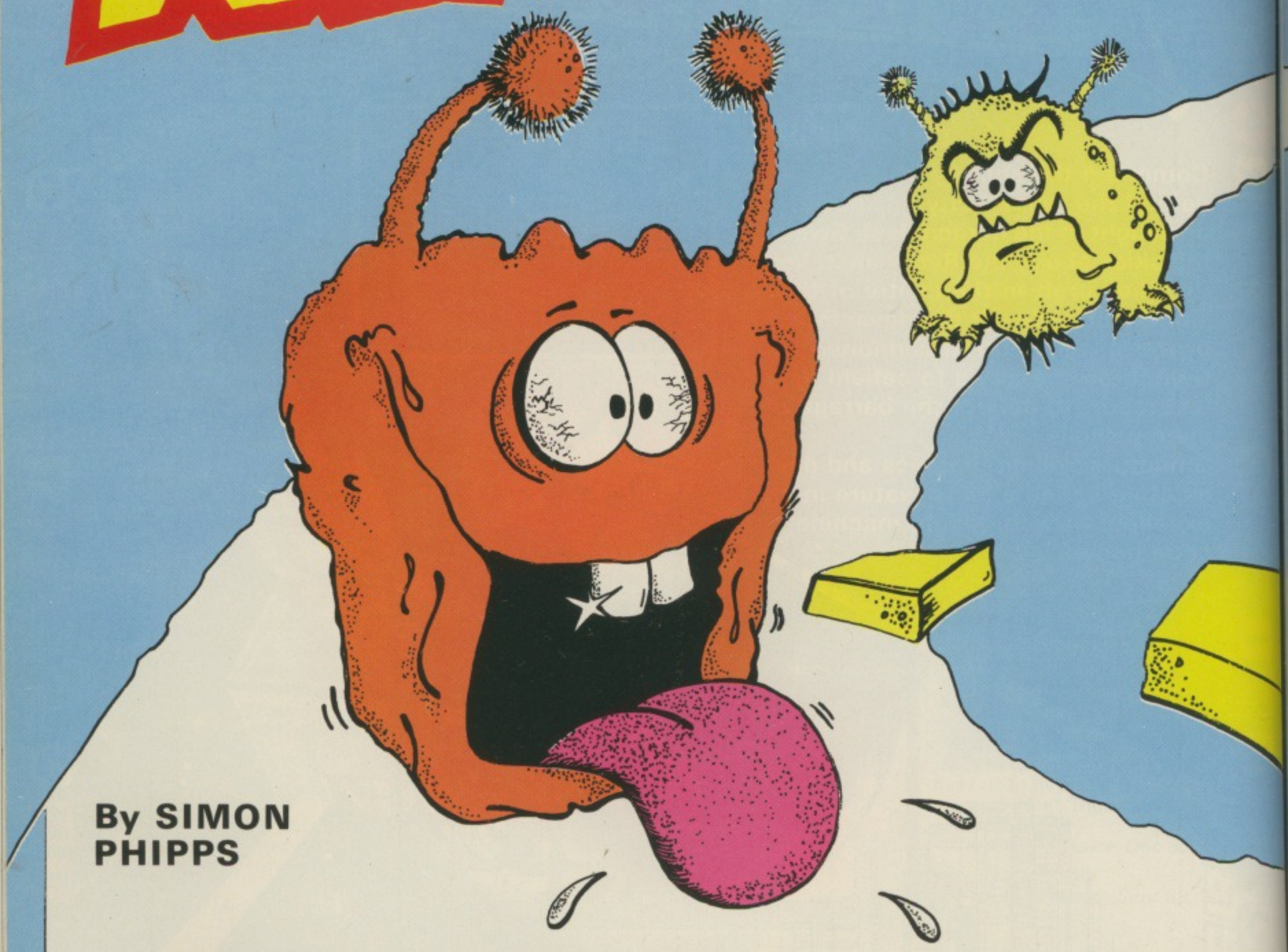
MAZEM



By SIMON PHIPPS

AT the beginning of the year 1984 a mad 17-year-old computer genius (huh!) produced nightmarish mutant creatures by disassembling the darkest recesses of his 1.2 MOS.

These creatures, obsessed with the task of chasing anything that moved, soon took over his BBC Micro and placed nasty bugs in exactly the wrong parts of the program.

The creatures, designated under the code name of Goojgies, ran riot and after a year of feverish work on school micros and programmable calculators, this whizz kid created a solution to the problem . . . the Munchers!

Operating under manual control, the Munchers were sent out to clear the bug-ridden logic mazes of Bits – small binary digits that would cause the terrifying Bad Program error if ever introduced in the wrong addresses.

To the assistance of our fearless pink heroes came the Nibbles – powerful bits that when eaten sent the Goojgies into fits of terror and while active, allowed the Munchers to devour these unsavoury creatures and temporarily stopped their evil doings.

Soon rogue graphics characters in the form of strawberries, birds, cherries, keys, bells and plums helped nourish the Munchers. But after a tough fight the graphics left and now my MOS is completely free of any problems.

Just to make certain that your BBC or Electron doesn't have any of these nightmarish fiends, start typing. Or better still, send for the cassette version – you never know when you will have trouble with your Goojgies!

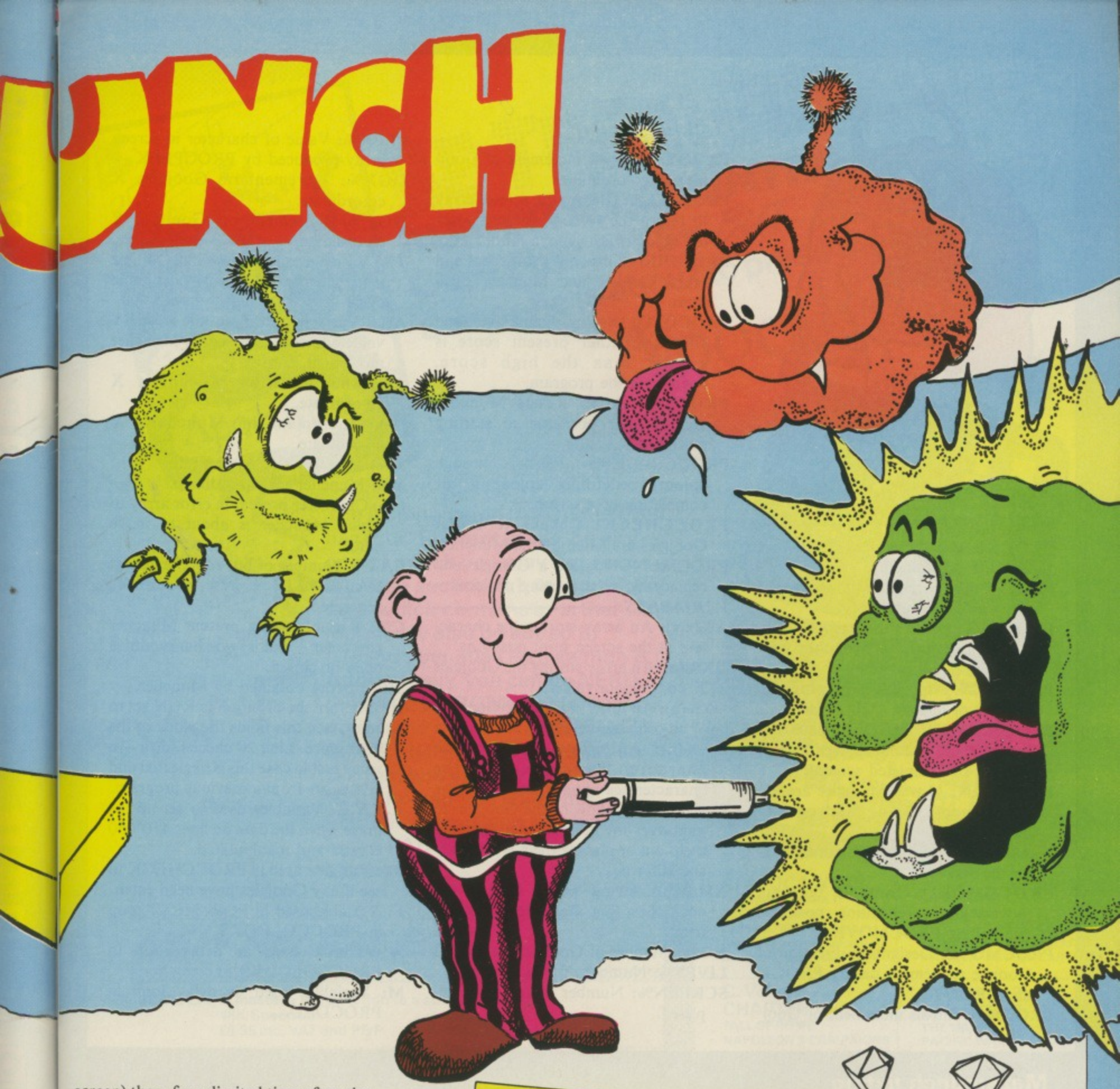
In case you didn't recognise it from the foregoing, the game is quite simply a version of a classic arcade game. For those of you who have never played it before, here's a short summary.

The object is to move the pink Muncher around the screen, eating the dots and bonus fruits.

To make things more difficult you are pursued by two evil monsters who kill on contact.

If one of the flashing Nibbles is eaten (there are four, one at each corner of the

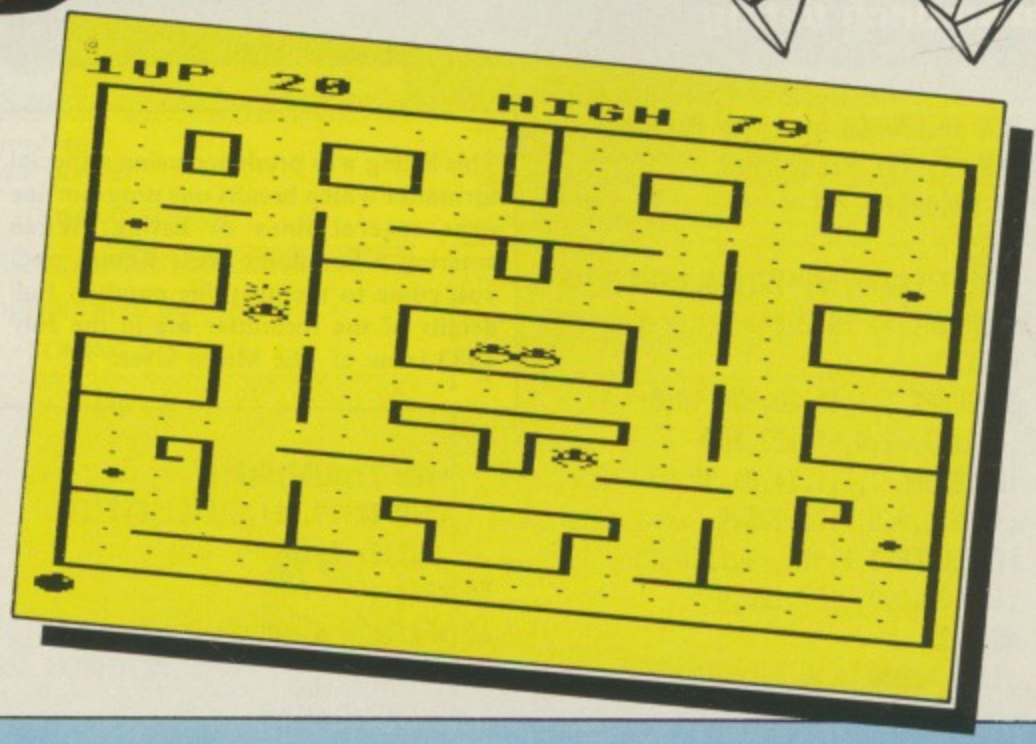
UNCH



screen) then, for a limited time after, the Muncher may chase the offending Goojgies around the screen and extra points are gained for eating them while they are flashing.

Completion of a whole screen gives a new screen with faster Goojgies and more chances for the Muncher to get indigestion.

Controls: A to move up, Z to move down and cursor left and right for the appropriate direction.



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PROCEDURES:

PROCCHARS: Defines characters 224-255 for game.
PROCSCREEN: Draws the maze and sets up the score display.
PROCINIT: Defines the strings for the fruit, positions of Muncher and Goojgies.
PROCMEN: Prints out the appropriate number of lines in the central box.
PROCSCREENCOUNT: Prints out the number of fruit representing the number of completed screens.
PROCMAN: Moves Muncher around the screen making appropriate checks.
PROCFRUIT: Prints out bonus fruit on the screen.
PROCGHOST: Controls Goojgie movement, incrementing positions and calling PROCMOVE.
PROCMOVE: Designates direction of Goojgie movement calling PROCX and PROCY.
PROCX: Controls increment of Goojgie's X co-ordinate.
PROCY: Controls increment of Goojgie's Y co-ordinate.
PROCPEEK: Checks the screen array to return the value of the character the Goojgie is to move onto.
PROCDIE: Kills the Muncher and resets Goojgie and Muncher positions.
PROCDED: Displays 'game over' and checks whether present score is greater than the high score, re-running the program.
PROCREPLACE: Resets Muncher and Goojgie positions to starting positions.
PROCCOLOURS: Flashes through colours redefining colour 4 for completion of a screen.
PROCCHECK: Checks to see if Goojgies are eaten by the Muncher.
PROCMUNCH: Eats a Goojgie and replaces it to its starting position.

VARIABLES:

A%(x,y): An array storing the characters at the screen print positions.
GX%(n): An array storing the Goojgies X co-ordinate values.
GY%(n): An array storing the Goojgies Y co-ordinate values.
OG%(n): An array storing which character was present on the character cell upon which a Goojgie now stands, allowing the Goojgies to pass over the dots without blanking them out or placing them where they shouldn't be.
A$(n): A string array storing the characters that make up the bonus fruit.
NG%: Number of Goojgies on screen.
LIVES%: Number of lives left.
SCREEN%: Number of screens completed.
PEEK%: Value of character in screen array produced by PROCPEEK.
DGX%: Increment on Goojgies X co-ordinate.
DGY%: Increment on Goojgies Y co-ordinate.
T%: Variable controlling which Goojgie is to be moved during one game cycle.
A%: Variable returning the INKEY value of the key pressed for Muncher movement.
P%: Increment on Muncher's X co-ordinate.
Q%: Increment on Muncher's Y co-ordinate.
X%: Muncher's X co-ordinate.
Y%: Muncher's Y co-ordinate.
L%: Character present in error array to which Muncher is about to move onto.
EAT%: Number of bits (dots) eaten. If EAT%>212 a new screen is generated.
C%: Variable swing present Muncher character – that is, whether mouth is open or closed.
SC%: Score obtained by Muncher.
H%: Before the program is RUN set to zero since this holds the value of the high score. Line 20 checks for a –ve value just in case this is neglected and H% exists from a previous program.
A,X,Y,C: Variables used to set up the maze when the data on lines 410-660 is read and manipulated.
J%: Variable used in PROCCHECK to see if any Goojgies have been eaten.
F: Variable used in FOR–NEXT loop in PROCCOLOURS.
J: Variable used as delay loop in PROCCOLOURS.
M: Variables used as delay loop in PROCDED.

Mazemunch listing

```
10 REM MAZEMUNCH by Simon Phipps
15 REM (C) THE MICRO USER
20 IF H%<0H%=0
25 CLS
   :PRINT TAB(0,16)"INITIALISING"
   :FOR WAIT=1 TO 2000
   :NEXT
30 ENVELOPE 3,1,10,20,-30,10,5
   ,15,127,-2,0,-1,127,100
   :ENVELOPE 1,1,1,34,86,25,25
   ,40,126,0,0,-126,125,0
   :ENVELOPE 2,1,-16,-6,1,10,45
   ,60,127,0,0,-127,126,0
40 MODE 2
   :TIME =6000
   :VDU 23;8202;0;0;0;
   :DIM A%(19,26),GX%(2),GY%(2)
   ,OG%(2),A$(5)
50 *FX4,1
60 *FX11,1
70 *FX12,1
80 ON ERROR GOTO 1040
90 PROCCHARS
   :PROCSCREEN
   :PROCINIT
   :PROCMEN
   :PROCSCREENCOUNT
   :REPEAT
   :FOR S%=0TO 12-SCREEN%
   :PROCMAN
   :NEXT
   :IF RND(200)<10 PROCFRUIT
   ELSE IF RND(200)<10 A%(10,10)=32
   :PRINT TAB(10,10);" "
```

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

Turn to Page 151

BE THE WAR LORD

RUN CITIES, COUNTRIES, CONTINENTS– *BUT, BE WARNED!*

Someone is about to press the button for Apocalypse

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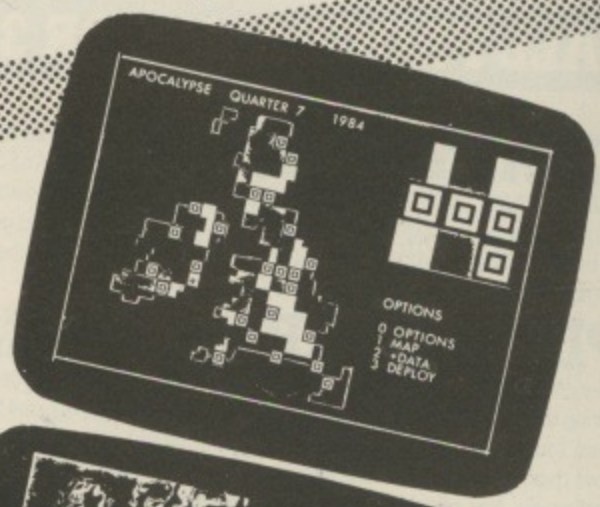

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THE Editor asked me what this month's article would be about. "The sound effects channel, sir", I answered meekly.

He staggered off to a lunch time planning meeting at the Ram and Buffer and I settled down to my work. I nearly leapt out of my skin when he crept up behind me and yelled "Boo".

"So that's how sound affects you", he cackled as he dodged the User Guide.

Rocket attack? No, it's just white noise

AS I told the Editor, this month we'll be covering the sound effects channel. This is the channel you select by making the first parameter of the SOUND command equal to zero.

You'll be using lots of SOUND commands such as:

```
SOUND 0,-15,2,40
```

With channel 0 you can create all sorts of weird and wonderful effects – especially when you start to use the ENVELOPE command which we'll come to in next month's *Micro User*.

In all there are eight basic sound effects available on channel 0. You can get them by making the pitch parameter of a channel 0 command equal to a number between 0 and 7.

Type in Program I, run it and you'll get a conducted tour through the various noises. Figure I summarises the result each value of the pitch parameter has on a channel 0 SOUND command.

```
 10 REM PROGRAM I
 20 REPEAT
 30 FOR pitch=0 TO 7
 40 CLS
 50 PROCnoise(pitch)
 60 NEXT pitch
 70 UNTIL FALSE
 80 END
 90 DEF PROCnoise(pitch)
100 PRINT TAB(5,5) "This is noise
number ";pitch;"."
110 IF pitch=3 OR pitch=7 THEN PRINT
TAB(5,15)"This can be varied by using"
TAB(5,17)" a sound on channel 1"
120 PRINT TAB(5,20) "Press a key for
next noise."
130 SOUND 0,-15,pitch,255
140 Wait=GET
150 SOUND &10,0,0,0
160 ENDPROC
```

So to use the sound effects channel we use a SOUND command such as:

```
SOUND 0,-15,pitch,20
```

where pitch has a value between 0 and 7. The value you give to pitch decides what kind of sound effect you get.

As you'll see from Figure I, putting in values of 0, 1 or 2 all give something called "periodic noise".

If pitch is equal to 0 you get high frequency periodic noise. Enter:

```
SOUND 0,-15,0,40
```

and you'll see (or, rather, hear) what I mean.

As you might guess, values of pitch of 1 and 2 give medium frequency and low frequency periodic noise respectively. Try:

```
SOUND 0,-15,1,40
```

and:

```
SOUND 0,-15,2,40
```

if you don't believe me.

To hear all three in order run Program II.

```
10 REM PROGRAM II
20 FOR pitch=0 TO 2
30 SOUND 0,-15,pitch,20
40 NEXT pitch
```

This should help you hear the difference between the three.

If you want you can use a selection of periodic noises to produce something approaching a "Close Encounters" noise.

Program III does this by playing each of the periodic noises in turn over and over, the duration of each note getting less each time round the REPEAT . . . UNTIL loop.

```
10 REM PROGRAM III
20 time=20
30 REPEAT
40 FOR pitch=0 TO 2
50 SOUND 0,-15,pitch,time
60 NEXT pitch
70 time=time-2
80 UNTIL time=0
```

Notice that it is time and not TIME in the above program. TIME refers to the internal clock of the micro and could cause some funny results if used!

For the moment let's ignore what happens when you make the pitch equal to 3 and go straight on to what happens when you make it 4, 5, or 6.

If pitch has these values, channel 0 produces "white" noise.

If you want to know what that is then enter:

```
SOUND 0,-15,4,100
```

This will give you five seconds of high

→

Value of P	Noise produced on channel 0
0	High frequency periodic
1	Medium frequency periodic
2	Low frequency periodic
3	Periodic – frequency depends on pitch of channel I
4	High frequency white
5	Medium frequency white
6	Low frequency white
7	White – frequency depends on pitch of channel 1.

Figure I: Pitch values on channel 0

More sound advice from NIGEL PETERS

From Page 69

frequency white noise. It won't come as a surprise to learn that:

```
SOUND 0,-15,5,100
```

will give you five seconds of medium frequency white noise and:

```
SOUND 0,-15,6,100
```

five seconds of low frequency white noise.

Try Program IV which plays all three one after the other for a gradually decreasing time.

It's very like Program III, so don't type it all in again. Just use the Copy key and change the lines you have to:

```
10 REM PROGRAM IV
20 time=20
30 REPEAT
40 FOR pitch= 4 TO 6
50 SOUND 0,-15,pitch,time
60 NEXT pitch
70 time=time-2
80 UNTIL time=0
```

Now what does all that white noise remind you of? A steam engine?

Try Program V. This uses the white noise pitch parameters in a REPEAT . . . UNTIL loop to make the sounds of an accelerating engine.

The REPEAT . . . UNTIL FALSE loop takes over when the engine is at full speed.

```
10 REM PROGRAM V
15 REM STEAM ENGINE
20 time=20
30 REPEAT
40 FOR pitch=5 TO 6
50 SOUND 0,-15,pitch,time
60 NEXT pitch
70 time=time-2
80 UNTIL time=10
90 REPEAT
100 SOUND 0,-15,5,time
110 SOUND 0,-15,6,time
120 UNTIL FALSE
```

Still, enough of this nostalgia. What about the two values we've ignored? What do they do?

It's quite simple really, if you think about it. We've been using the bit of the SOUND command that we normally use for selecting the pitch (higher or lower) to pick the kind of noise we want, white or periodic.

So how do we change the pitch of the noise we are making? Can we make the white noise and the periodic noise go up and down in pitch like normal notes on the other sound channels?

The answer is that we can, using values of 3 and 7 in the pitch parameter of a channel 0 SOUND command.

If you put these values in the pitch parameter then the pitch of the noise that is played depends on the pitch of a note that is playing on sound channel 1.

In other words, by using 3 or 7 you can use a SOUND command on channel 1 to alter the pitch, higher or lower, of periodic and white noise, respectively.

Program VI shows this being done with the pitch parameter in line 30 set at three. Run it and see what happens.

```
10 REM PROGRAM VI
20 FOR pitch=100 TO 200
30 SOUND 0,-15,3,20
40 SOUND 1,0,pitch,20
50 NEXT pitch
```

As you'll hear, the pitch of the noise goes upwards. This is because the FOR . . . NEXT loop is raising the note produced by the channel 1 SOUND command in line 40.

The pitch of the note produced by line 30's channel 0 SOUND command varies with the pitch of the note from channel 1.

If you look carefully at line 40 you'll see that the amplitude has a value of 0 which means that you can't hear what is being played on that channel.

It still varies the noise on channel 0, however. In fact it's a good thing that you can't hear the channel 1 note.

Run Program VII and you'll see what I mean.

```
10 REM PROGRAM VII
20 FOR pitch=100 TO 200
30 SOUND 0,-15,3,20
40 SOUND 1,-15,pitch,20
50 NEXT pitch
```

A mess, isn't it?

Now try Program VIII which, like Program VI, plays a rising sequence of periodic noises.

```
10 REM PROGRAM VIII
20 FOR pitch=50 TO 100
30 SOUND 0,-15,3,40
40 SOUND 1,0,pitch,40
50 NEXT pitch
```

Both of the duration parameters of the SOUND commands are the same. What would happen if they were different?

Try changing the duration parameter in line 40 to 20 or 10 or 60 and see what happens.

Can you explain the odd effects? I'll give you a clue if you just stand in the queue!

If you make the pitch parameter 7 instead of 3 in the last three programs you'll see that channel 1 has the same effect. Only this time it's a rising stream of white noises that are produced.

Finally, let's have some sound effects. Run Programs IX and X and you'll see what you can do with 3 and 7 as the pitch parameters.

The first uses periodic noises to produce a motorbike or moped sound:

```
10 REM PROGRAM IX
20 REM MOTOR CYCLE
30 FOR pitch= 100 TO 120
40 SOUND 0,-15,3,5
50 SOUND 1,0,pitch,5
60 NEXT pitch
70 SOUND 1,0,pitch,80
80 SOUND 0,-15,3,80
90 FOR pitch= 120 TO 100 STEP -1
100 SOUND 0,-15,3,5
110 SOUND 1,0,pitch,5
120 NEXT pitch
130 SOUND 1,0,pitch,20
140 SOUND 0,-15,3,20
```

The second uses white noise to imitate an unsuccessful rocket!

```
10 REM PROGRAM X
20 REM ROCKET
30 FOR pitch= 100 TO 200 STEP 4
40 SOUND 0,-15,7,5
50 SOUND 1,0,pitch,5
60 NEXT pitch
70 SOUND 1,0,pitch,80
80 SOUND 0,-15,7,80
90 FOR pitch= 200 TO 100 STEP -4
100 SOUND 0,-15,7,5
110 SOUND 1,0,pitch,5
120 NEXT pitch
130 SOUND 0,-15,6,60
```

Anyway, that's all for now. If you've liked these sound effects, just wait until we deal with the ENVELOPE command.

As it is, I've got to go and tell the Editor that we're not under rocket attack and that it's safe to crawl out from under the desk.

Sound affects him, too!

Nigel Peters

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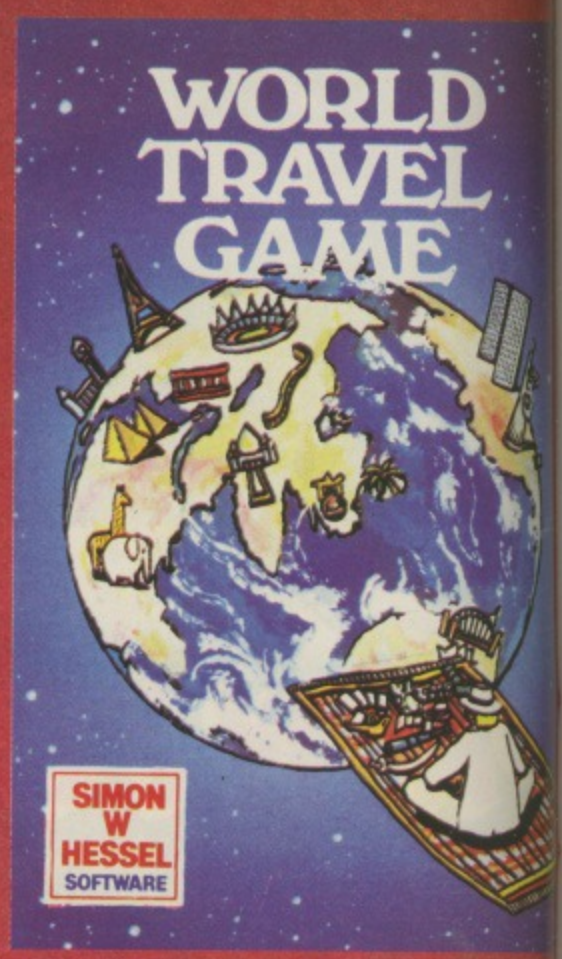

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You'll need the walls as windbreaks to shelter from the gusts of wind that threaten the flame. If they reach it, out it goes!

Watch out for those gusts. They keep on coming even if you don't move.

Worse still, some of these winds are fairly changeable. Every now and then a gust blows diagonally, cutting corners to catch the flame.

Even more devilish, they can combine, disguising two or more gusts as one.

Initially you are opposed by two gusts. But each time you're successful, you have an extra gust to face.

If you are blown out you get another go at the same level. After all, this is a birthday celebration!

If you're good enough you can keep going until you reach 20 gusts. So far we've only managed to survive 12!

This is how it works:

The program has to keep track of a lot of things – the positions of the walls (there are up to 80), the positions of the gusts (up to 20) and, of course, the position of the flame.

Constant checks have to be made to see, for example, that the gusts don't "blow down" walls.

Rather than record the x and y coordinates of each object, then check both against those of other objects. We've opted for recording positions with the formula:

position = x coordinate
+ 40 * y coordinate

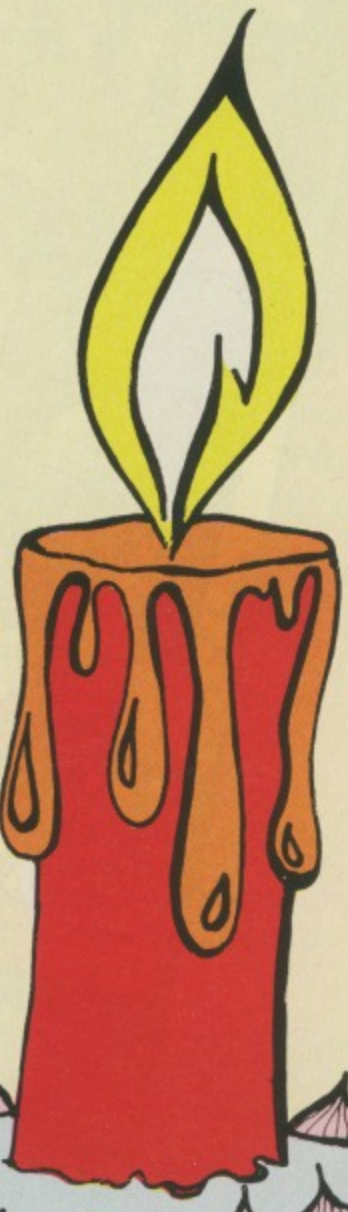
Since in Mode 1 there are 40 characters to a row this gives each character cell on the screen a unique number, which can be quickly compared with others.

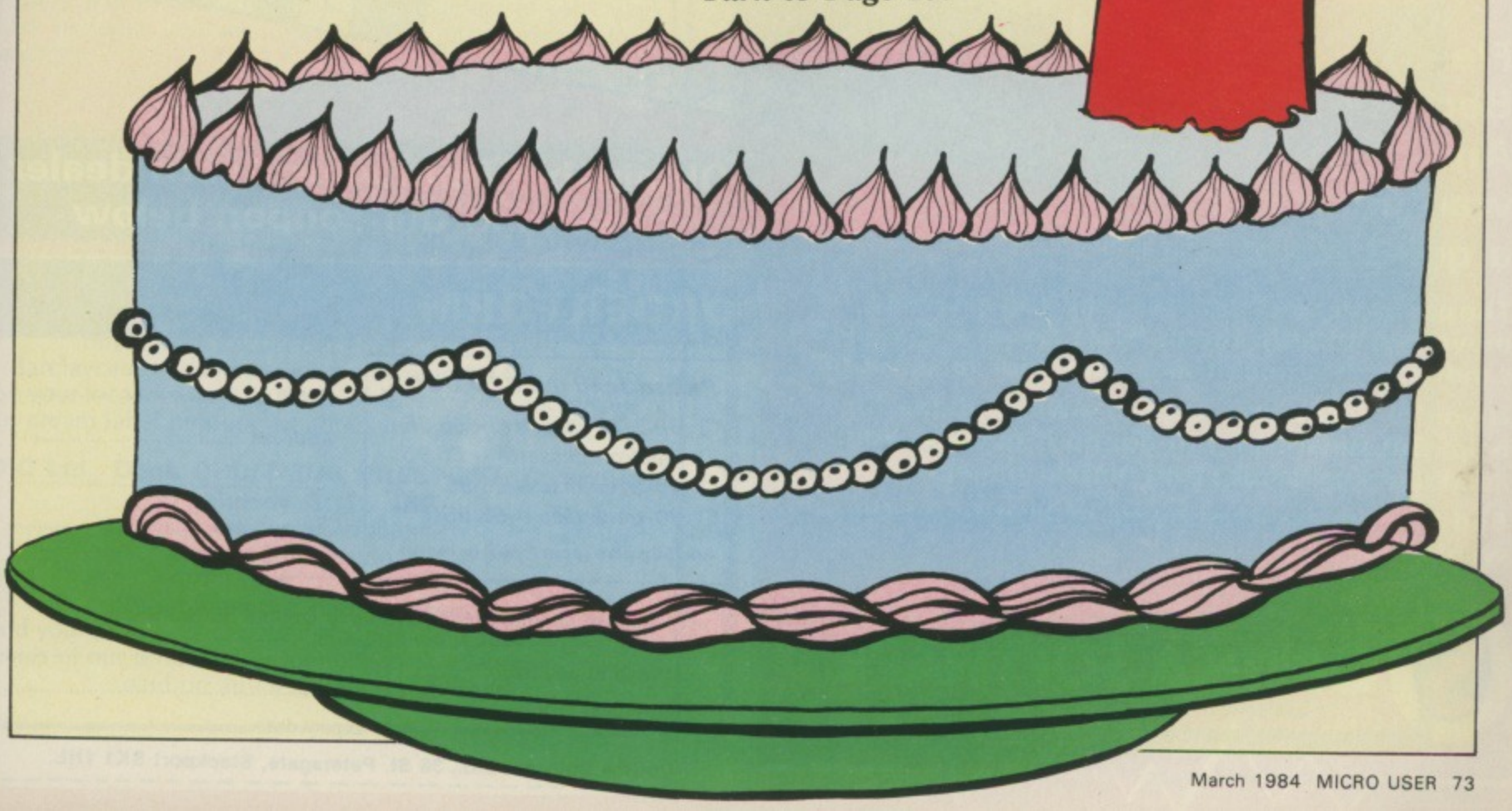
If we need the x and y coordinates we can find them with:

x coordinate = position MOD 40
y coordinate = position DIV 40

The procedure and variables descrip-

Turn to Page 159





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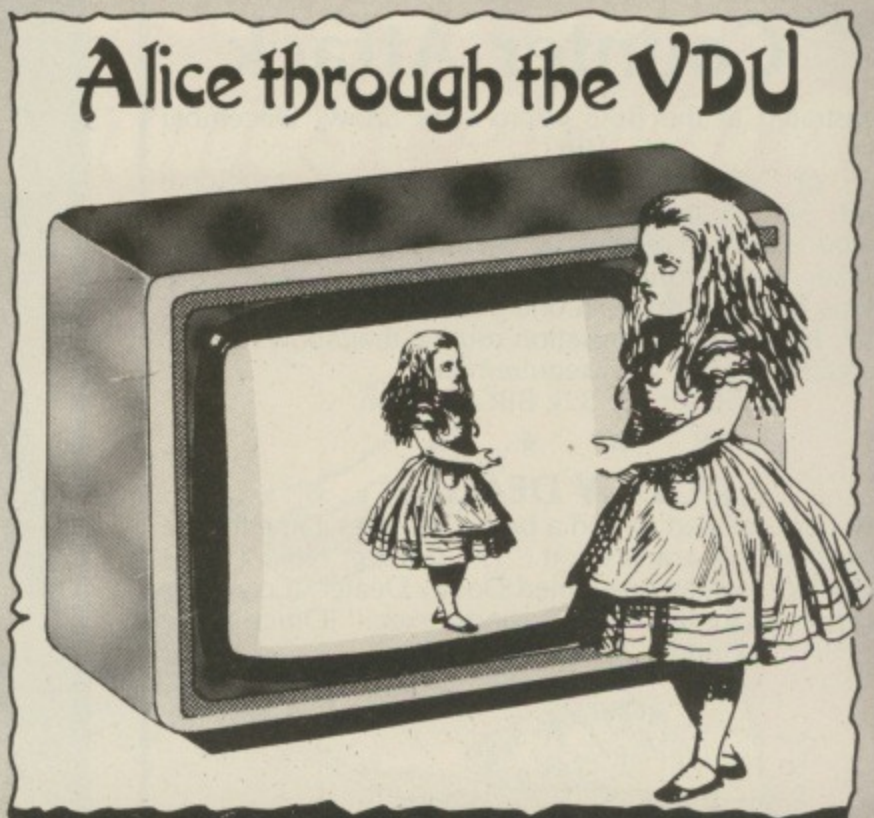


Our monthly foray into Adventure games

PI man's world hides big prize

THE types of puzzles and problems within an Adventure are unlimited. This month we've tried three games which include some new twists in the usual format such as clues in tunes, economic problems and a mixture of puzzles and keyboard dexterity. The last one was reviewed by nimble fingers Nigel.

Let's start with Pimania:

Remember the Masquerade hare which was buried somewhere in England? All you had to do was solve the puzzles in the book by Kit Williams and then go to the right place at the right time and dig it up.

Pimania is rather similar in that you have to make the program reveal a date and place where the promoters will meet and give to you a golden sundial, worth £6,000, providing you can tell them how you solved the puzzle.

That rule should stop any cheating because you might be able to decode the when and where but how to open the "Ultimate Gate Of Pi" appears to be a nasty factorial problem.

The puzzle has been out for over a year but only recently on the BBC Micro so I presume it is still unsolved.

The program has some animated pictures and begins with the Greek letter PI flying up into the air and the cryptic query, "A key fits the lock?". Give it the keyword and you meet the PI man, who can be helpful, annoyed, unhappy, hungry or bored.

The program is full of tunes which, after a while, will make you stuff the loudspeaker with cotton wool, but some of them are clues. For example one of them is a hint about how you move around in the PI man's world.

There appear to be, at the start, about 20 rooms to investigate with objects placed randomly in four of them. Their locations shift every time you start a new game.

The map of the game is simple but some rooms are only accessible randomly and the PI man's appearances are also slightly erratic.

The puzzle appears to be to locate a number of objects like a blackboard, calendar and telescope, and drop them at a certain location in the correct order.

There are 3,628,800 ways of dropping 10 objects but the PI man who helps you find the objects also tends to take them back, particularly when you do the wrong thing, so he's still actually helping you.

After a few hours I was still trying to reason out the correct order and getting a bit tired of going over the same ground again and again.

It seems that, like twisty mazes, the only way to make progress is to SAVE and then try, try, try again.

Of course the prize will keep many people at the keyboard. I actually got a

sundial but couldn't remember how did it and failed to drop it anywhere

It doesn't matter anyway computer professionals (such as myse are banned from the competition.

This version has been translated f the BBC and seems to have a few sligh bugs. For example, you are told there a telescope in the room but, when yo try to take it, you are told that th program can't see a telescope.

The program can take quite sophi ticated sentences like "Give the pork p to the PI man", which implies that th solution might require quite elabora commands.

It's an unusual Adventure whic with the prize incentive, should keep th more mercenary among you occupi for weeks.

Lesson in survival

ALTHOUGH it is not a true Adventure – because the object is to survive rather than solve puzzles – Community, from Ixion, has a number of features that should appeal to those whose sword arm has become weary and now wish to retire to a quiet life down on the farm.

It is derived from the Kingdom game on the BBC Welcome tape which has been popular in primary schools. But this is far more realistic and complicated.

The Magnificent Seven might have saved you from the old bandits in the hills but now you have to contend with bad weather, rats eating the grain and plagues. Your animals will die and your peasants are a particularly revolting lot.

At times you will have to visit the bank manager for a loan and his middle name must be Dracula. (Ah for the good old days when a stake through the heart was the answer and treasure just lay on the ground.)

Teachers, particularly of economics, should find this program very useful because it will not only keep their pupils occupied for hours but should also instil quite a few useful lessons in economic and business strategy.

A multitude of possibilities have to be simultaneously considered and balanced.

You can rear four types of animals and grow four types of grain.

Each type of grain is susceptible to different weather conditions which are predicted by a magician, who is right about half the time.

Having raised and grown some food you must feed your livestock and your peasants and then get the surplus to market.

It's a good idea to feed the rabble because you will need some of them for protection on the way to market as a number of nasty things can happen on this perilous trip.

This game has a number of useful ideas for the Adventure writer. But it is a good program in its own right, particularly if played by a group because then an element of competition can be easily introduced.

Like many other games in this genre you will probably last longer by making conservative decisions. But it's a lot more fun to take gambles.

Bridge over troubled territory

BRIDGE to the East is different again. It consists of five different screens of interactive games like Rocket Raid and Killer Gorilla, with a different background display for each screen.

Separating each screen is a riddle which has to be answered before you can try the next screen.

On each screen you, in the form of a wizard holding a staff, must protect a specified place – or, in one case, persons – and collect numerous items.

These feats are achieved by moving the wizard shape around the screen with the Z (left), X (right), / (down) and * (up) keys.

Before each screen you are asked if you want to practice or take the test, which means you are allowed to practice any screen for as long as you like.

This is helpful because if you fail the test you cannot go back – you have to go on to the next screen after answering the riddle.

This is the point where you are told what you must accomplish on the next screen and also the point where you can save the game.

As each screen and riddle is loaded into the BBC separately it is a good idea to save the game as often as possible as it can take a considerable time to progress back to, say, the fifth screen from the start of the game if you happen to fail one of the intervening tests.

Another unusual feature of this game is that, whenever you win or lose, each screen has its own piece of poetry which is displayed. Like:

They go, leaving a trail,
Of broken faith
They come, bringing venom
From rotten lakes,
Carved from lead mountains,
With a man's femur.

This does not have any relevance to the game but makes a change from the usual one line saying, "You have been killed", or words to that effect.

The idea behind the game is that once upon a time there were some crystals of power which were destroyed by evil fiends. It is your job to collect the two pieces of the crystal star and score more than 20,000 points, so that a seance can be held and the crystals can be rebuilt.

The two pieces of the crystal star are in the huts on screens 1 and 2, and to get them you have to win those two screens.

So to the screen displays, starting with screen 1 which is a display of a

From Page 77

Five into one goes down fine

valley, with a background of mountains and trees. It contains a red hut which you must protect from all the shapes, which range from birds to rocks, that try to attack it.

On this screen you have to score more than 2,000 points by destroying the attacking shapes and collecting ten crystals which shoot across the screen from right to left, which can prove fairly difficult.

The first riddle gives you a long, rambling monologue followed by a description of a door which is opaque and glowing.

You are also told that no amount of force will cause it to open but, being a wizard, you may effect the door in any other way you choose.

This is a bit like an Adventure type problem but with less clues, as the answer to the problem is to type in 'FREEZE DOOR'.

I think you have to work out this answer because the door is glowing so it must be hot, but if you say 'TOUCH DOOR' you are not given any clues like, 'You just burnt your hand'. All you get is, 'THAT HAD NO EFFECT'.

This example sums up all the following riddles and is the only major criticism that I have of the games.

Also the riddles are not random. So every time you take the tests you will have to answer the same old riddle, which could prove rather tedious.

To find some of the answers I had to resort to listing the program as the clues get even vaguer.

Screen 2 has a background similar in layout to screen 1, but this time your wizard has to protect a pinnacle of rock from a different assortment of shapes. He also has to collect five crystals which shoot across from left to right.

Although similar sounding to screen 1 this screen is a lot more difficult.

After progressing through the second riddle you arrive at screen 3, which has a totally different appearance.

Your viewpoint is from the inside of a cave looking out through the entrance to the sea where a red sun is setting.

Across the inside of the cave is a bridge over which two figures are trying to cross. Your wizard's job is to escort them safely. You may also collect flying crystals if you have time.

After the third riddle comes the sea hermit's hut, which you have to protect. On this screen the top half of the display is a mountain range running down to the bottom half of the display which is a beach with the sea coming onto it.

You have to collect 26 eggs which are dropped by attacking seagulls. But you have to be quick as the eggs will hatch in no time at all and attack the hut.

On this screen the sounds generated are excellent as you have the sound of the sea washing in on the beach as well as the usual sounds whenever you destroy anything.

And so past yet another riddle onto screen 5, which is a display of a mountain canyon spanned by a bridge, in the middle of which is a large cross.

Here you have to protect the cross from an array of objects. You also have to fight the black prince, who is represented by another figure the size of your wizard which is constantly attacking you.

Your source of magical power is the

cross, so when an attacking object hits the cross the prince gains in strength.

You gain strength by destroying the objects but the prince can do this as well.

You may attack the prince by striking him with your staff above the height of his sword but, of course, he can do the reverse to you and usually does so with more success.

All the time you are battling, your score and the prince's are displayed on the bottom of the screen.

This is the only screen which displays your scores while you are fighting, which is another minor criticism.

I found it exceedingly difficult, requiring the highest degree of manual dexterity of any of the many games I have mastered.

After plucking up courage and a little bit of skill you can take test 5. You then proceed onto the last riddle, which is the conclusive part of the game.

When you have answered this riddle you go into the seance to restore the crystals back to power.

Whether the seance is successful depends on your score and if you won on screen 1 and 2.

If the seance is a success then the crystals are returned to their original power and the forces of evil are left to roam the earth until you attempt the game again.

All of the five screens are laid out in a visually pleasing manner. This, coupled with the high standard of detail in all the moving figures, provides each screen with a different, top quality graphical layout.

The movement of all the figures is to a high standard, being smooth and judder free even when numerous moving objects occupy the screen at once.

The response of your own figure is smooth and responsive to the keyboard controls.

The varied sounds generated are also pleasing, as they don't drag on and on.

The riddles, however, prove to be tedious. Once you have read or answered the puzzle, you don't want to keep seeing and answering the same riddles on every game.

A score display while you are engaged in a game would have been helpful. It proved rather frustrating not knowing how many points you still required to progress further.

In conclusion I found Bridge to the East fairly compulsive and quite a challenge, and well worth the money, as this novel idea is like getting five games in one.

The answers to the riddles are in Figure I, which we've considerately printed upside down!

Alice and Nigel

Riddle

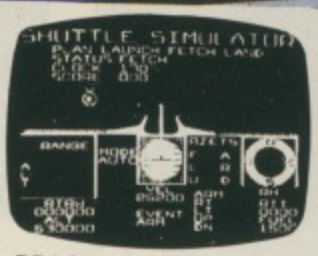
1 > FREEZE BLOCK
2 > DID YOU SAY RALLABATZ
3 > I AM LYING
4 > PTERODACTYL
5 > 41 , 101

Figure I

LIFT OFF with

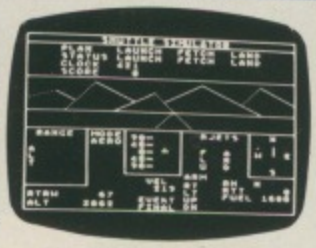
SPACE SHUTTLE

SPECTRUM LAUNCH STAGE



DRAGON 32 ARM STAGE

BBC FINAL STAGE



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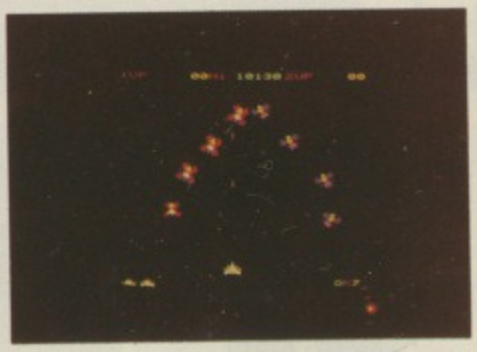

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YEAR OF THE DISC

ALL you wanted to know about using discs on the BBC Micro

JIM NOTMAN answers your basic questions

All the facts you need to get you started

RECENTLY there has been a great increase in interest in discs and disc drives for the BBC Micro. Many owners feel that once they have mastered the cassette filing system they need to move on to something better.

Why use discs?

● The most impressive feature of using any disc system is its speed. A program which could take many minutes to load from tape takes only a few seconds from disc.

Even if it is the last program that was put onto the disc it is found very quickly. Contrast that with a tape with several programs on it. It may take a considerable time to just find the program.

● Disc systems allow the more flexible use of files, like relative (random or direct) access files.

Tape files need to read from the start. Disc files can be read from or written to any position you like. Just as with a long playing record, you don't need to start from the beginning, but from the track you require.

● Disc systems load and save with far fewer errors than on the cassette system.

● Converting to discs may increase your use of the micro. It's rather offputting waiting 10 minutes to load some software from tape when you have only half an hour to spare.

Are there disadvantages?

● Cost is the main one. About £300 for the simplest system, though by keeping your eyes open (looking through *The Micro User*!) you may pay considerably less.

● The disc system reserves $2\frac{1}{4}$k of memory for its own use. In a cassette-only system, the memory from 3584 (&E00) is available for program use. In the Acorn disc system only the memory from 6400 (&1900) is free.

● Discs need to be looked after more carefully than cassettes as they are more vulnerable to damage. A fingerprint or a piece of cigarette ash could be all it takes to ruin a disc.

● Many software companies have been slow to issue their programs on disc. The excuse has been that there are not enough disc users to make it viable.

This is no longer true, as a large number of BBC Micro owners are converting to disc.

What do I need to get started?

● Disc interface.
● Disc Filing System (DFS). This may come with the interface.
● Floppy disc drives.
● Connecting leads.
● Utilities disc.
● Blank discs.

Why do you need an interface?

● The interface can be thought of as an electronic translator which allows communication between the BBC Micro and disc drives. While most of the components cost only a few pence each, the floppy disc controller chip costs more than £40.

The Acorn interface includes the DFS, which is plugged into one of the sideways ROM sockets. It does not, however, come with a manual. The "official" BBC manual is only issued with BBC disc drives.

The standard interface is single density. This refers to how closely the information is packed on the disc.

At least two firms are working on a double density system (requiring a different floppy disc controller) which can put twice as much information onto a disc.

These systems need to have their own special DFS to instruct the different disc controller. (This is not the same as having 40 or 80 track drives.)

Why do you need a filing system?

● Whenever the BBC Micro is switched off any programs or data that were in RAM are lost. If you want to keep any of this information it must be recorded in some way. File systems allow you to do this.

Since each method of saving the information is different, each must have its own filing system.

The DFS interprets any filing commands you give and carries them out without you having to know how it does it.

The operating system of the BBC Micro is arranged so that commands are not changed with filing system changes. Any command associated with filing is directed to the correct filing system.

Changing the file system is very easy:

☐ For the DFS type in *DISC (or *DISK).
☐ For the tape system *TAPE (for 1200 baud), *TAPE3 (for 300 baud).
☐ For the Econet system *NET.

Will I have to learn a lot of new commands?

● All the commands that you learned for the cassette filing system will work

equally well with the DFS.

In addition there are extra commands just for the DFS.

*HELP (Return) gives a list of the paged ROMs that are in the BBC Micro.

*HELP DFS (Return) lists the extra DFS commands, as illustrated in Figure I.

```
DFS 0.90
  ACCESS <afsp> (L)
  BACKUP <src drv> <dest drv>
  COMPACT (<drv>)
  COPY <src drv> <dest drv> <afsp>
  DELETE <fsp>
  DESTROY <afsp>
  DIR (<dir>)
  DRIVE (<drv>)
  ENABLE
  INFO <afsp>
  LIB (<dir>)
  RENAME <old fsp> <new fsp>
  TITLE <title>
  WIPE <afsp>
```

Figure I

Most of the commands manipulate program or data files that already exist.

Many are self explanatory like *RENAME for changing a files name, *COPY and *DELETE. *TITLE allows the disc itself to be given a name.

*DESTROY seems somewhat over dramatic, but is able to delete a number of files at the same time.

*INFO gives information about the file like its load address and where the file is physically located on the disc.

As well as the main DFS commands there are a number of disc utilities. The commands are given by *HELP UTILS, illustrated in Figure II.

```
DFS 0.90
  BUILD <fsp>
  DISC
  DUMP <fsp>
  LIST <fsp>
  TYPE <fsp>
```

Figure II

DUMP gives the hexadecimal value and Ascii equivalent of each byte of a named file. This can be helpful if you like to see what is being put onto the disc.

Discs can be made far easier to use than tape. The DFS will look for a file called !BOOT when the Shift key is held down together with the Break key.

This allows programs to be loaded and run – that is, if you've given the disc the correct instructions!

Are there other DFSs?

● There are a number of alternatives to the official Acorn 0.90 DFS. Watford Electronics and Amcom both produce their own.

One of the main problems with these others is software compatibility. This is especially true of software packages which employ software protection.

The main advice here is to ask the dealer whether the programs you buy are compatible with the DFS you have.

Why bother with alternative DFSs?

● They usually have a number of features in them which are lacking in the Acorn version, some of which are very useful.

For example, with the Acorn system only 31 different files can be held on one side of a disc. Several different DFSs increase this limit to about 60.

Can I copy my programs from tape to disc?

● With Basic programs this is very easy. Select the tape system with *TAPE, LOAD the Basic program, select the disc system with *DISC then SAVE the Basic program.

If this program is now too long because of the memory space the DFS has reserved for itself, move the program down in memory using the following:

```
1 *KEY 0 *TAPE!M N%=PAGE-&E00
  : FOR L%=PAGE TO TOP STEP 4
  :!(L%-N%)=!L%
  : NEXT
  : PAGE=&E00!M OLD!M
```

Machine code programs are a little more awkward. They must be put into exactly the same memory locations they would have occupied in the cassette system if they are to work correctly.

First switch to the tape system with *TAPE. Now type in *OPT1,2.

Looking at the program with *CAT will give you the load address of the program, the execution address (where a machine code program is run from) and the length of the program.

Once these details are known the program may be loaded into memory above the area the DFS reserves, then moved to the memory locations it would have occupied with the tape system.

All that remains is to CALL the execution address.

Further details on transferring cassette programs to disc are given in the August issue of *Micro User*.

Not all programs can be copied easily, because many companies are now using some form of software protection.

I've heard of hard discs and floppy discs. What's the difference?

● Nearly all discs used with the BBC are floppy discs, so called because they are thin flexible discs of plastic coated with a magnetic recording emulsion.

Hard discs are much more sophisticated. A unit consists of a number of magnetic coated metal discs, mounted in a sealed unit and turned at high speed.

The reading and recording heads "float" a very small distance above the disc. Even very small particles of dust, human hairs or tobacco smoke may damage the discs if they come between the heads and the disc surface. Hence the sealed unit.

They are more expensive than floppies but can hold much more information, several megabytes rather than the hundreds of kilobytes the floppies have to offer.

A number of companies are working on hard discs for the BBC, though in several cases the software seems rudimentary. Hopefully this should be resolved shortly.

What sorts of floppy disc drives can you get?

● It is possible to use the BBC Micro with 8in floppy discs, a size associated more with larger or older computers.

More recently 3in micro floppies have started to appear, though there is more than one type of these. They are very compact and should prove popular, but at the moment there is little software written on them.

The commonest drives use the 5¼in mini floppy disc. Whatever the size of drive, the information is written on it in circular tracks.

There are two main groups of disc drives, those having 40 tracks and those with 80.

The 80 track machines are more

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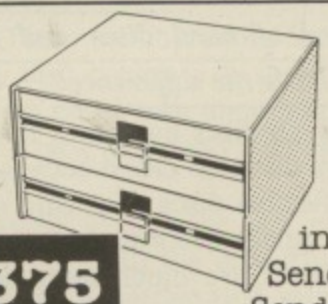

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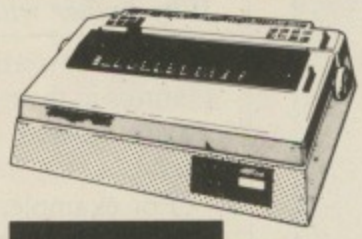

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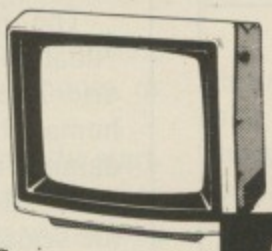

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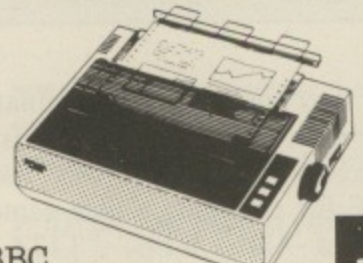

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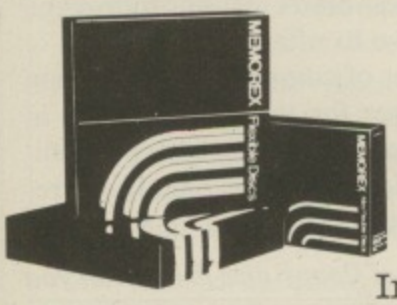

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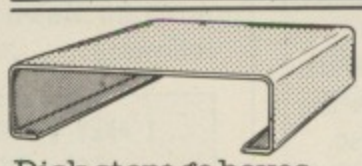

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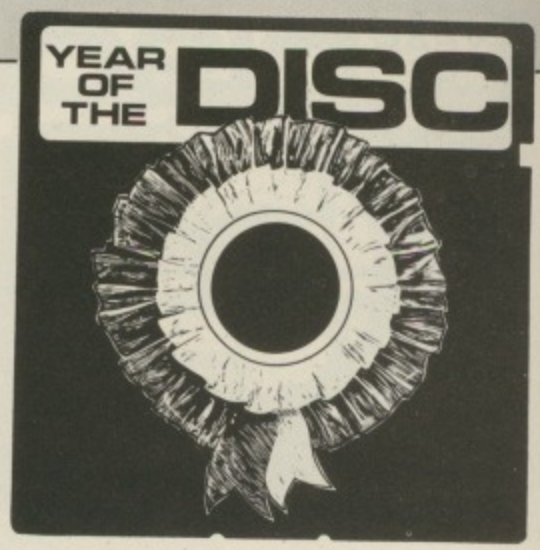

From Page 83

expensive because their tracks are much narrower and therefore must be made more accurately. A 40 track disc can store 100k of information on one side, an 80 track disc 200k.

Some drives use only one side of the disc and are known as single sided. Others which use both sides are called double sided.

Then you may have a single drive or two drives in the same box. These are known as dual drives.

There is also a choice of having either a power supply from the BBC itself or having a separate supply in the drive unit. As there are a number of combinations the choice becomes bewildering.

Which disc drive should I get?

● For small business use you really need to use an 80 track system with dual drives, preferably double sided.

For home use the main consideration will probably be cost. 40 track drives are perfectly adequate. Even the least expensive, a single sided, single 40 track drive is better than not having discs at all.

If you can afford dual drives you'll find them more useful, especially when using data files from different discs and file copying.

I prefer drives which have their own separate power supply as this leaves the power point on the BBC for other uses.

Do I need a utility disc?

● This will depend on which DFS you buy. To be able to use a new, blank disc it must be formatted.

This involves putting a number of magnetic marks on the disc so that the floppy disc controller knows where it can place or read data.

Some of the alternative DFSs have a format command included in the DFS ROM – unlike the Acorn system where the format program is on a utility disc.

The other useful utility needed is VERIFY. This looks through the disc checking that it can be correctly read.

Apart from the basic utility disc, you may want some other utilities.

One that is particularly useful is a package which transfers tape programs onto a disc. Even many programs which are software protected can be transferred, though not all.

When you have spent hours punching in a program you want to be sure that it really is saved correctly on disc. MARK SMIDDY shows you how with his verify routine . . .

Verify what you SAVE, then you won't be sorry

THE object of this verify routine is to check that the contents of a program file on disc (or tape) are exactly the same as the contents of memory. Or to put it another way, to check that the five hours of work you have just SAVEd will actually be what you typed in when you reload it.

The program, which is assembled at &1800, is suitable for use with model A or B with Acorn DFS or standard cassette, and is compatible with all operating systems.

After running the program you can call the verify routine by using CALL &1800. Of course, the program you wish to verify should be in memory!

Instructions showing how to save the assembled code are displayed when the program is run. It will remain resident during most filing operations, but it is wise to reload the assembled code whenever it is required.

Here's a full program description. In the following text A refers to the 6502 accumulator, X refers to the 6502 index register X, and Y refers to the 6502 index register Y.

The program can be split into five main sections:

1. *GET the filename.*
2. *Open a read only file.*
3. *Check the file byte by byte.*
4. *Close the file.*
5. *Output any messages.*

1. This section uses the rarely used call OSWORD with A=0 to input a string of Ascii characters of specified range up to a specified string length. The string input will be used as the filename.

The maximum string length is set to 7 in line 130, and should be changed to 10 if the utility is to be used with cassette.

2. This uses the OS call OSFIND

→

From Page 85

with A=&40 to open a file for read only. The file handle (the number assigned to it) will be returned in A and not in Y as is stated in the User Guide.

OSFIND returns with the zero flag set if no file could be opened.

3. This uses OSBGET to take each byte sequentially from the file and check to see if it is the same as the next byte in memory.

4. OSFIND is used again to close the file whose file handle is held in Y.

5. This outputs any messages using OSWRCH, starting at a point in the text pointed to by the X register.

Lines:

10-60 Initialise variables.
70-80 Output 'Input Filename' message.
90-180 Set up OSWORD parameter block.
190-220 Set up X and Y and call OSWORD with A=0.
230 Jump out if ESCAPE is pressed.
240-310 Initialise M/C variables, and call OSFIND with A=&40 to open a file for read only.
320 Test to see if any file was opened.
330 Save file handle.
340-360 Get next byte from the file.
370 Test for End Of File marker.
380-480 Compare with next byte in RAM and increment pointers.
490-520 Output End Of File error.
530-560 Output file not found message.
570-590 Output Verify error.
600-640 Close the file.
650-710 Output messages.
720-760 Make a BEEP.
770-820 Reserve some space for the OSWORD control block.

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

```
 10 MODE 7
 20 osword=&FFF1
    :osfind=&FFCE
    :osbget=&FFD7
 30 FOR N%=0TO 2STEP 2
 40 P%=PAGE -256
 50 [OPTN%
 60 .START
 70 LDX #10
 80 JSR message
 90 LDA #(msg) MOD 256
100 STA block
110 LDA #(msg) DIV 256
120 STA block+1
130 LDA #7
140 STA block+2
150 LDA #33
160 STA block+3
170 LDA #126
180 STA block+4
190 LDX #(block) MOD 256
200 LDY #(block) DIV 256
210 LDA #0
220 JSR osword
230 BCS out
240 LDA #0
250 STA &70
260 LDA &18 \ =PAGE e.g.(&1900)
270 STA &71
280 LDA #&40
290 LDX #(msg) MOD 256
300 LDY #(msg) DIV 256
310 JSR osfind
320 BEQ error1 \ No file error
330 STA &72
340 .loop
350 LDY &72
360 JSR osbget
370 BCS error \ End of file
380 LDY #0
390 CMP (&70),Y
400 BNE error2 \ Bad Byte error
410 LDA &70
420 CLC
430 ADC #1
440 STA &70
450 LDA &71
460 ADC #0
470 STA &71
480 JMP loop
490 .error
500 LDX #25
510 JSR message
520 JMP close
530 .error1
540 LDX #28
550 JSR message
560 RTS
570 .error2
580 LDX #41
590 JSR message
600 .close
610 LDA #0
620 LDY &72
630 JSR osfind
640 RTS
650 .message
660 LDA msg,X
670 CMP #13
680 BEQ out
690 JSR &FFEE
700 INX
710 JMP message
720 .out
730 JSR &FFE7
740 LDA #7
750 JSR &FFEE
760 RTS
770 .block
780 NOP
790 NOP
800 NOP
810 NOP
820 NOP
830 .msg
840 ]
850 NEXT
860 $P%=""
870 $(P%+10)="Input Filename"
880 $(P%+25)="OK"
890 $(P%+28)="No such file"
900 $(P%+41)="Verify error ?"
910 PRINT TAB(12,0)"VERIFY UTILITY"
920 PRINT TAB(8,2)"(c) 1984 The Micro
    User"
930 PRINT TAB(12,4)"by Mark Smiddy"
940 PRINT '"Call with"'"CALL PAGE-256
    "'"OR"'"CALL &";~PAGE -256
950 PRINT '"SAVE M/C COPY WITH"'
    "*SAVE ""VERM/C"" ";~PAGE -256;
    " ";~P%+57
```

This listing is included in this month's cassette tape offer. See order form on Page 169.

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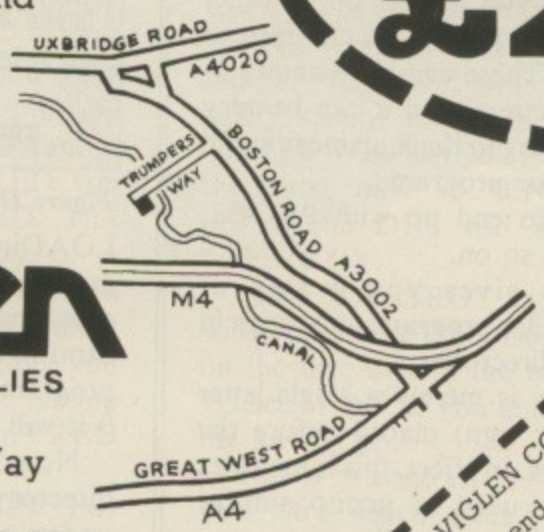

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NIGEL PETERS advises . . .

How to use the DFS commands

SO you've finally got up the nerve and spent £300 on a DFS and disc drive. Now you've got them, how do you use them?

Well let's have the DFS come to your rescue. Type in *HELP DFS, press Return, and you'll see Table I come up on the monitor.

These are the DFS commands that I'll be concentrating on in this article.

I'll be ignoring normal OS commands such as *SPOOL and *SAVE and refer you to the User Guide for explanations of them.

To return to the DFS commands, you'll notice that each of the capitalised keywords like DELETE and RENAME has one or more arguments following it.

An "argument" in this context is just an additional piece of information needed by the command, and not what happened when you explained to your dear ones how much it all cost.

They're fairly self explanatory and I'll deal with each as they come up.

For the present let's just take a disc that we've formatted (with the aid of the formatter that came with the DFS) and see how it is configured.

Put a disc (any disc at all) into DRIVE 0. If you've got double drives this is usually the left hand one. If you've only got one drive then DRIVE 0 is the one you've got.

Now enter *CAT 0 and something like Figure I will appear on the display. I say "something like" because there is no guarantee that it will be identical.

```
DFS 0.90
  ACCESS <afsp> (L)
  BACKUP <src drv> <dest drv>
  COMPACT (<drv>)
  COPY <src drv> <dest drv> <afsp>
  DELETE <fsp>
  DESTROY <afsp>
  DIR (<dir>)
  DRIVE (<drv>)
  ENABLE
  INFO <afsp>
  LIB (<dir>)
  RENAME <old fsp> <new fsp>
  TITLE <title>
  WIPE <afsp>
```

Table I

However if it's a blank disc that's just been formatted it won't be too different, if at all.

What we now have is the catalogue of the disc which tells us how the disc is configured and what is on it.

```
(10)
Drive 0              Option 0 (off)
Directory :0.$       Library :0.$
```

Figure I

The top left item is the name of the disc. At the moment it hasn't got one but we'll remedy that later.

"Drive" is straightforward. It's the number of the drive that the disc is in. "Option" and "Library" we'll leave until later, and for the present we'll concern ourselves with "Directory".

As you'll probably already know, you LOAD and SAVE on disc in just the same way you used to do on tape.

However, on disc you're confined to only 31 files. These can have names of up to seven letters, and it can be very frustrating trying to think up meaningful names for your programs.

You tend to end up with PROG1, PROG2, and so on.

The DFS gives you a way of collecting similar programs in groups in the form of directories.

A directory is merely a single letter (or the dollar sign) placed before the program name. In effect, this is an index letter and is used to group similar programs under one prefix.

To see what I mean, type in a program – anything at all – and save it on your newly formatted disc. If you call it FRED and then *CAT 0 you'll see that the program appears on the catalogue as in Figure II. And, even though it isn't shown, it has a directory symbol.

The reason that you don't see it is that it is the default directory that's in operation. This is the directory that prefixes all the program names with the dollar sign.

If you look at the catalogue heading you'll see that it tells you that the $ directory is in operation.

Saving a program while that directory is in operation automatically gives it $ as an index.

However it doesn't bother showing it in front of the filenames when you *CAT. After all, the heading tells you that you're in the $ directory – there's no need to repeat the information in front of every file.

If you wanted you could try LOADing $.FRED. The DFS knows exactly what you mean and will do it, even though you only saved FRED. Similarly you could save another program $.DICK and when you *CAT 0 it will just be shown as DICK.

```
(11)
Drive 0              Option 0 (off)
Directory :0.$       Library :0.$

  FRED
```

Figure II

Now you're not stuck with that directory – you can save programs under any of the 27 available. You could, if you wanted, save another program A.DICK.

The micro won't mind that the name

is the same as the previous program you saved as the two programs are in different directories.

Try it and see. Notice how when you *CAT 0 you get the A directory shown with the later DICK. The DFS always shows the directory of a file if it isn't the default directory.

We'll cover how to change the default directory later, but for the time being let's stick with $. This is the one the DFS uses when you switch on, or after a Break.

Another default that you may have noticed if you have two drives is that when the micro is switched on or after Break is pressed it always goes to drive 0. This is the default drive.

If you want to work with drive 1 as the DFS's first choice then enter *DRIVE 1. To go back to drive 0 enter *DRIVE 0 or, more drastically, press Break.

Now that you know how to get to drive 1 you probably want to know how to catalogue it. As you might guess, you just enter *CAT 1. If you're lazy like me you can use abbreviations.

To catalogue the disc in drive 0 you use *.0 and for drive 1 you use *.1 as you might have guessed. Just typing in *. will catalogue the disc that's in the default drive.

So we've got our discs which we save to and load from in the usual manner. We can also see what files are on them and know about directories.

The trouble is that they get full up quite quickly as only 31 files are allowed.

How do we get rid of what we don't want?

Well, there are five ways of doing it, three intentionally and two unintentionally!

If you just want to get rid of a track you can use the *DELETE command with the name of the track you want to get rid of. In the case of FRED you would enter *DELETE FRED. This will delete the file straight away.

You could also use *WIPE FRED to get rid of FRED. This gives you a safety margin in that it asks you whether you really want to get rid of FRED. Pressing anything other than Y results in FRED not being wiped.

Another feature that WIPE has which *DELETE doesn't is that it allows the use of "wild cards". These allow you to substitute # or * for parts of a file name.

If you then operate on that pseudo filename the DFS will supply all the filenames that fit the wild cards.

It's much easier to understand with an example. Try saving a few programs on disc with similar names such as PROG1, PROGTWO, PROGOFF.

To get rid of them we could use *DELETE or *WIPE three times but using wild cards allows *WIPE PROG* to do it. The DFS will then question us for each filename, allowing us to select which files are erased and which remain.

As we've mentioned, there are two wild cards, # and *. The hash sign, #, represents just one character of the file name while the star, *, represents all the letters to the end of the file name.

Let's use a wild card to get rid of all the various PROGs. We enter *WIPE PROG*. The DFS will now go through all the PROGs on the disc and give us the option of wiping them.

As you can see from this the wild cards can save a lot of typing and time. You can use wild cards with any of the DFS commands in Table I that have afsp after them.

They also come in useful where there are several programs with the same name on different directories. Save some programs such as A.PROG, F.PROG, K.PROG. You get the choice of deleting them all with *WIPE #.PROG.

In other words, we've used a wild card to represent the directory letter. If you want to take this to its limit then try *WIPE #.* and see what happens.

As if all this isn't enough there is yet another way to get rid of unwanted files. This is the use of *DESTROY.

You use *DESTROY when you want to get rid of a group of files such as the PROGs we met before. What you do is type in *ENABLE (which is a sort of safety catch) and then enter *DESTROY PROG*. If you make a mistake then you have to *ENABLE again before the DFS will allow you to *DESTROY.

Using *DESTROY with a wild card will result in the DFS listing all the files on the disc that fit the bill and asking "Delete Y/N". If you answer "Y" then the lot will go.

This is in contrast to *WIPE with a wild card which gives you the erase option on each file.

With *DESTROY it's all too easy to get rid of a wanted file along with the unwanted ones. For this reason I stick to *WIPE. I still make mistakes, though!

As mentioned previously there are two other ways you can get rid of files on a disc and it nearly always happens when you don't want it to.

The first is to format the disc. This will destroy all the files on it.

The second is to use the *BACKUP command which produces a duplicate of a disc. To do this you use *ENABLE (the safety catch) and then *BACKUP followed by the appropriate drive numbers.

If you were copying the disc on drive 0 to the disc on drive 1 you would enter *BACKUP 0 1. If you just have a single disc drive you would use *BACKUP 0 0 and the DFS will prompt you when to put in the source disc and the destination disc.

The trouble with *BACKUP is that if you're careless and mix up the source and destination discs you can end up with a perfect copy of a blank disc.

Also this command can use part of the micro's memory and cause you to lose whatever was in it – usually a vital Wordwise file in my case.

A milder form of *BACKUP is *COPY, which is used to copy a file from one disc to another. *BACKUP copies everything from one disc to another whereas *COPY only makes a copy of one file.

It can however use the micro's memory so, as with *BACKUP, beware if you've got anything important in it.

*COPY is simple to use. To create a copy of FRED you just use something like *COPY 0 1 FRED which copies the file FRED, which is on the disc in drive 0, to the disc in drive 1.

As it only copies FRED, not deleting the original, you end up with two FREDs, one on each disc.

If you only have one drive then *COPY 0 0 FRED will do the job for you, the micro prompting you when you have to put in the appropriate disc.

Having told you all these ways of destroying files, you might wonder if there was any way of protecting them, as they do seem rather vulnerable.

The obvious way is to put a write protect tab over the notch on the disc. This will physically stop the DFS altering the disc. The trouble is that it's not selective, all the files on the disc

— *Turn to Page 93*

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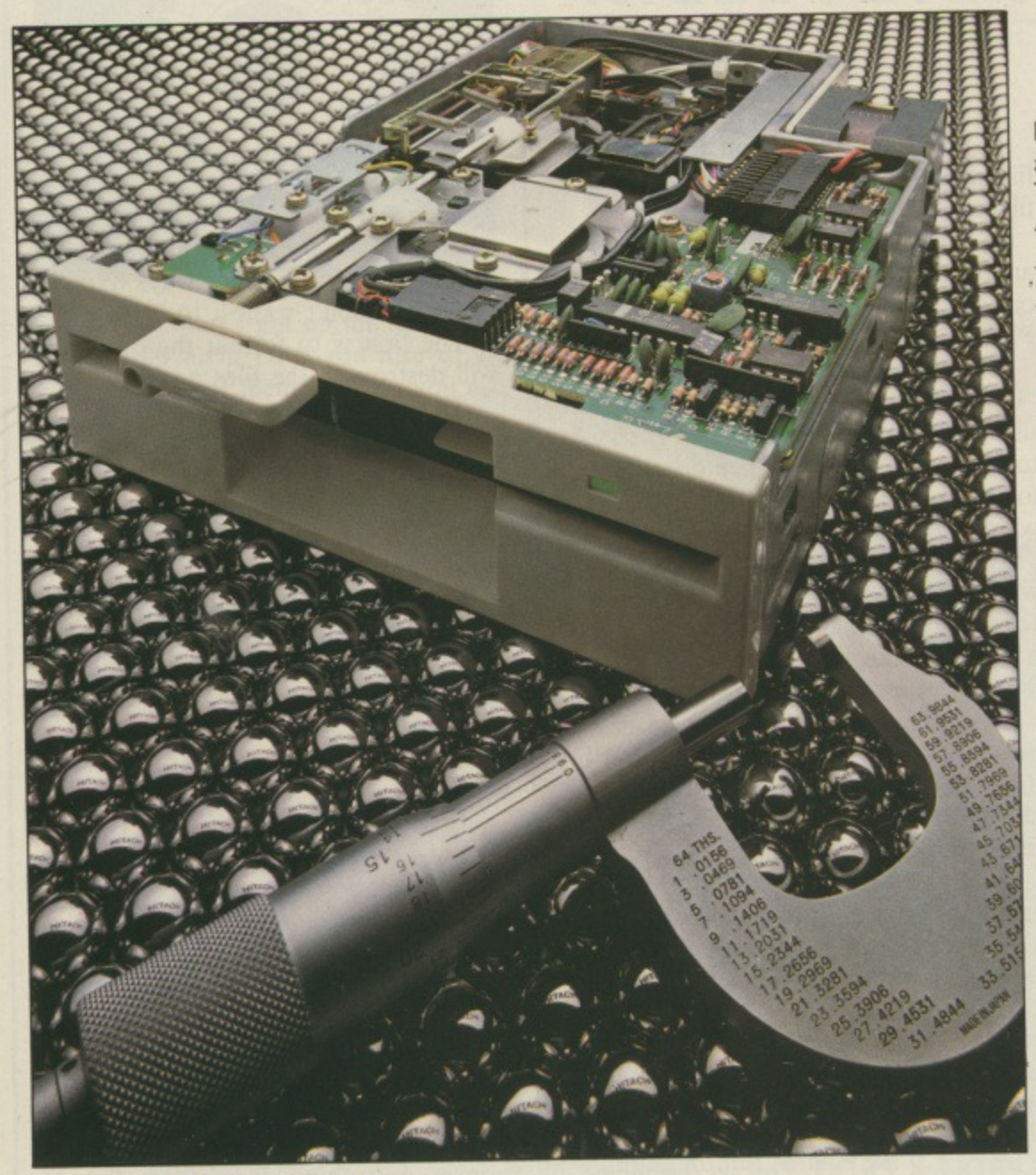

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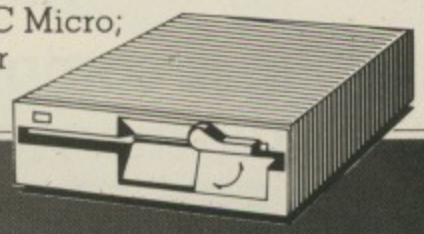

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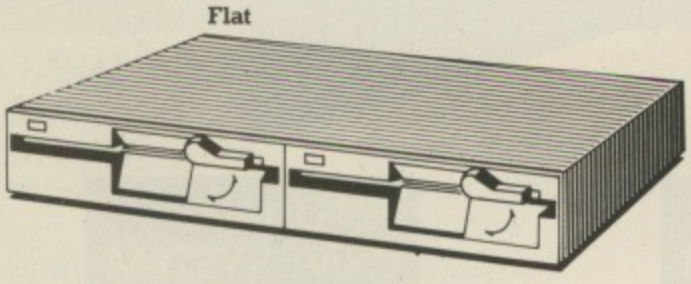

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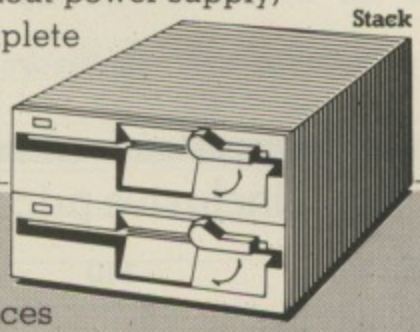

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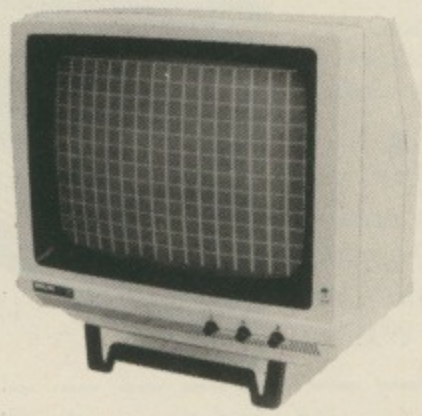

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being shielded whether or not they are important.

To get around this the DFS has the *ACCESS command which allows you to lock a file. Suppose you had a file HARRY that you didn't want deleted. You could lock it with *ACCESS HARRY L and then *DELETE, *DESTROY and *WIPE won't touch it.

Sadly it won't protect against formatting and *BACKUP.

To unlock HARRY you just use *ACCESS HARRY, that is, you leave off the L. You'll see from the DFS command list that *ACCESS can be used with wild cards. *ACCESS *.* L will lock a whole disc. As you might guess *ACCESS *.* will unlock every file on a disc.

Locking a file will also stop you from renaming it with the self explanatory *RENAME.

If we wanted to rename a locked file HARRY with the new name TOM we would have to unlock it with *ACCESS HARRY then use *RENAME HARRY TOM.

It's quite simple to use and can help keep discs tidy and orderly.

You might have found, with all these programs going on your disc, that you've been running out of room to store things.

One way around this is to *COMPACT the disc. This tidies it up and releases extra space for new files.

To compact the disc on drive 0 you use *COMPACT 0. While this is happening the DFS displays the information about each file's structure.

Beware though, for like *BACKUP and *COPY, *COMPACT can corrupt what is already in the micro's memory.

The information displayed for all the files when you *COMPACT can also be gained by using *INFO.

To get the information about a file HARRY you just use *INFO HARRY

```
$.HARRY  L  FF1900 FF8023 00000D 003
```

Figure III

and the display will tell you whether the file is locked, its load and starting addresses and its length. Figure III shows how it's displayed.

During the normal course of events the DFS won't display this information about a file. You can, however change this by entering *OPT 1 1.

Now the file details will be displayed everytime it is used, rather like an automatic *INFO. To stop this just enter *OPT 1 0 and things return to normal.

To finish this tour of the DFS commands let's take a look at the catalogue again by entering *CAT (as my tabby is known).

Remember I said we could give a disc a name. To do this we use *TITLE. The name can be up to 12 letters long.

To name the disc in the current default drive EXAMPLE all we do is type in *TITLE "EXAMPLE" and press Return. Now enter *. and you'll see the name.

I also said that we could change the default directory of a disc. Usually it's $ but if we wanted (for reasons best known to ourselves) to change it to A we would enter *DIR A which makes the default directory A. Any programs we now save onto the disc will have the

```
EXAMPLE (15)
Drive 0              Option 0 (off)
Directory :0.$       Library :0.$

  FRED                HARRY   L
```

Figure IV

directory A (unless we do something about it).

Now the A won't show when you *CAT. This is because the default directory never does. What does happen is that files which were saved when $ was the default directory magically appear with $. in front of them when you *CAT after a change of directory.

Figure IV shows the catalogue of a disc named EXAMPLE. The default directory is $, the usual one after switching on or pressing Break.

Figure V shows the result of changing the default directory to X with *DIR X and saving a couple of more programs. You'll see that the previous programs now show their $ directory.

The programs recorded under the new default, X, don't show their directory.

Now try entering another default directory, say *DIR Z, and you'll see the files with both $ and X directories as in Figure VI.

The point to remember is that the proper name of each file always includes the directory it was saved under. It just so happens that if it is the default directory it doesn't appear on the catalogue.

As you've seen, we can have files on

```
EXAMPLE (17)
Drive 0              Option 0 (off)
Directory :0.X       Library :0.$

  DICK                TOM

  $.FRED              $.HARRY   L
```

Figure V

the disc with different directories and we can save and load programs with their full name such as A.PROG1 or $.PROG2.

In fact, if the default directory of a disc is different from the directory of the file we want to load, we have to give it its full name or the DFS says it's not on the disc.

If you don't follow that then try saving a program A.GEORGE on a disc where $ is the default. Now try to load GEORGE from that disc and see where you get!

It's not only the directory that you can specify in a filename. You can even choose a drive.

You do this by putting the drive number at the beginning of a filename but after a colon which tells the DFS that the number following specifies a drive.

If you wanted to save a program EILEEN on the disc on drive 1 with the

```
EXAMPLE (17)
Drive 0              Option 0 (off)
Directory :0.Z       Library :0.$

  $.FRED              $.HARRY   L
  X.DICK              X.TOM
```

Figure VI

directory A then you would SAVE ":1.A.EILEEN". Try it and see.

The good thing about this is that you can use the non-default drive without having to type in *DRIVE 1 and

— ***Turn to Page 99***

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National Micro Centre, Stockport. Tel: 061-483-3605. Sir Computers, Cardiff. Tel: 0222-21341. P.J. Microsystems, Crowthorne. Tel: 0344-772351.

The Micro User up-to-the-minute survey of disc drives available for the BBC Micro

Supplier	Tracks	Capacity	Single or Double sided	Integral PSU	Single or Dual	Price (ex VAT)	Size LxHxW (mm)	Drive type
Advanced Memory Systems	40	200k	Double	No	Single	£195.65	90x40x150	Hitachi 3" drive
	40	200k	Double	No	Dual	£346.95	180x40x160	Hitachi 3" drive
Carson Developments	40	100k	Single	*Opt	Single	£140	218x43x147	Tandon
	40	200k	Double	*Opt	Single	£170	218x43x147	Tandon
	80	800k	Double	*Opt	Single	£220	218x43x147	Tandon
	40	200k	Single	*Opt	Dual	£280	218x125x147	Tandon
	40	400k	Double	*Opt	Dual	£340	218x125x147	Tandon
	80	800k	Double	*Opt	Dual	£400	218x125x147	Tandon
							Also versions using TEAC and Mitzi	
Chase Data	40	100k	Single	No	Single	£148	146x57x196	Canon
	40	100k	Single	Yes	Single	£170	146x57x196	Canon
	40	200k	Single	No	Dual	£278	146x57x196	Canon
	40	200k	Single	Yes	Dual	£300	146x57x196	Canon
	40	200k	Double	No	Single	£172	146x57x196	Canon
	40	200k	Double	Yes	Single	£194	146x57x196	Canon
	40	400k	Double	No	Dual	£322	146x57x196	Canon
	40	400k	Double	Yes	Dual	£343	146x57x196	Canon
	40/80	400k	Double	No	Single	£205	146x33.5x215	Canon
	40/80	400k	Double	Yes	Single	£227	146x33.5x215	Canon
	40/80	800k	Double	No	Dual	£380	146x33.5x215	Canon
	40/80	800k	Double	Yes	Dual	£402	146x33.5x215	Canon
Computer Village	40	100k	Single	No	Single	£168	258x59x152	Shugart
	40	200k	Single	No	Dual	£295	258x89x152	Shugart
	40/80	400k	Double	No	Single	£230	258x47x152	Shugart
	40/80	800k	Double	No	Dual	£475	258x90x152	Shugart
Cumana	40	100k	Single	No	Single	£185	241x51x152	TEC

Supplier	Tracks	Capacity	Single or Double sided	Integral PSU	Single or Dual	Price (ex VAT)	Size LxHxW (mm)	Drive type
MW Systems	40/80	800k	Double	Yes	Dual	£399	419x51x375	Toshiba
	40/80	400k	Double	Yes	Single	£233	419x51x375	Toshiba
	40	200k	Double	No	Single	£159	254x51x146	Seiko
Oakleaf	40	100k	Single	No	Single	£163	218x51x147	Shugart (Chinon)
	40	100k	Single	No	S/expandable	£163	218x102x147	Shugart (Chinon)
	40	200k	Single	No	Dual	£260	218x102x147	Shugart (Chinon)
	80	800k	Double	No	Dual	£500	218x83x147	Shugart (Chinon)
Opus	40	100k	Single	No	Single	£149.48	229x44x152	Various
	40	2x100k	Single	Yes	Dual	£323.39	305x88x152	
	40	200k	Double	No	Single	£192.95	229x44x152	
	40	2x200k	Double	Yes	Dual	£392.95	305x88x152	
	40/80	400k	Double	No	Single	£253.82	229x44x152	
	40/80	2x400k	Double	Yes	Dual	£514.69	305x88x152	
	40	200k	Double	No	Single**	£192.95	178x38x83	
	40	2x200k	Double	Yes	Dual**	£392.95	178x44x190	
	80	400k	Double	No	Single	£219.04	229x44x152	
	80	2x400k	Double	Yes	Dual	£427.73	305x88x152	
Pace	40	100k	Single	No	Single	£185	218x43x147	TEAC/TEC
	40	100k	Single	No	Dual	£338	218x86x147	TEAC/TEC
	40	200k	Double	No	Single	£235	218x43x147	TEAC
	40	200k	Double	No	Dual	£449	218x86x147	TEAC
	40/80	100/200	Single	No	Single	£235	218x43x147	TEAC
	40/80	100/200	Single	No	Dual	£449	218x86x147	TEAC
	80	400k	Double	No	Single	£285	218x43x147	TEAC
	80	400k	Double	No	Dual	£538	218x86x147	TEAC
	40/80	200/400	Double	No	Single	£305	218x43x147	TEAC
	40/80	200/400	Double	No	Dual	£579	218x86x147	TEAC
Techno-matic	40	100k	Single	No	Single	£150	254x44x152	TEAC
	40	2x100k	Single	Yes	Dual	£320	279x121x229	TEAC

	40/80	400k	Double	No	Single	£230	258x47x152	Shugart
	40/80	800k	Double	No	Dual	£475	258x90x152	Shugart
Cumana	40	100k	Single	No	Single	£185	241x51x152	TEC
	40	100k	Single	Yes	Single	£199	312x51x152	TEC
	40 ◊	100k	Single	Yes	Single	£185	312x51x152	TEC
	80	200k	Single	No	Single	£214	241x51x152	TEC
	80	200k	Single	Yes	Single	£229	312x51x152	TEC
	80 ◊	200k	Single	Yes	Single	£213	312x51x152	TEC
	80	400k	Double	No	Single	£245	241x51x152	Mitsubishi
	80	400k	Double	Yes	Single	£259	312x51x152	Mitsubishi
	80 ◊	400k	Double	Yes	Single	£249	312x51x152	Mitsubishi
	40	2x100k	Single	Yes	Dual	£345	312x51x152	TEC
	80	2x200k	Single	Yes	Dual	£389	312x51x152	TEC
	80	2x400k	Double	Yes	Dual	£469	312x51x152	Mitsubishi
	40/80	2x200k	Single	Yes	Dual	£469	300x125x200	TEC
	40/80	2x400k	Single	Yes	Dual	£525	300x125x200	Mitsubishi
GSL	40	100k	Single	No	Single	£149.95	216x64x146	Shugart
	40	100k	Single	No	Dual	£298	216x128x146	Shugart
	80	200k	Single	No	Single	£240	229x38x146	Shugart or TEAC
	80	200k	Single	No	Dual	£480	229x76x146	Shugart or TEAC
	80	400k	Double	No	Single	£280	229x38x146	Shugart or TEAC
	80	400k	Double	No	Dual	£560	229x76x146	Shugart or TEAC
	40	100k	Single	Yes	Single	£191	279x38x146	Cumana
	40	100k	Double	No	Single	£180	279x44x83	Hitachi 3" drive
	40	100k	Double	No	Dual	£360	178x88x83	Hitachi 3" drive
I.T.L. Cathmill	40	2x100k	Double	No	Single	£167.28	124x73.5x152	Hitachi Nat. Panasonic
					Power supply is £25.93 extra			
Kaydee	40	100k	Single	No	Single	£169	218x43x147	TEAC
	40	100k	Single	Yes	Single	£205	218x43x147	TEAC
	40	200k	Double	No	Single	£230	218x43x147	TEAC
	40	200k	Double	Yes	Single	£266	218x43x147	TEAC
	80	200k	Single	No	Single	£230	218x43x147	TEAC
	80	200k	Single	Yes	Single	£266	218x43x147	TEAC
	80	400k	Double	No	Single	£290	218x43x147	TEAC
	80	400k	Double	Yes	Single	£326	218x43x147	TEAC
	40	2x100k	Single	No	Dual	£304	218x43x294	TEAC
	40	2x100k	Single	Yes	Dual	£340	218x43x294	TEAC
	80	2x200k	Single	No	Dual	£365	218x43x294	TEAC
	80	2x200k	Single	Yes	Dual	£401	218x43x294	TEAC
	80	2x400k	Double	No	Dual	£520	218x43x294	TEAC
	80	2x400k	Double	Yes	Dual	£556	218x43x294	TEAC
	40	2x100k	Double	No	Single	£195	90x40x150	Hitachi
LVL	40	100k	Single	No	Single	£230.43	305x76x127	Shugart
	40	200k	Single	No	Dual	£338.26	305x76x127	Shugart
	40	200k	Single	Yes	Dual	£359.57	305x76x127	Shugart
	40	400k	Double	No	Dual	£499	305x76x127	Shugart
Micro Resources	45	100k	Single	No	Single	£129.57	210x83x146	3" drive
	45	100k	Single	No	Dual	£216.53	210x83x146	3" drive
Midwich	40	100k	Single	No	Single	£153	218x43x147	Shugart (Chinon)
	40	100k	Single	No	S/expandable	£160	218x43x294	Shugart (Chinon)
	40	100k	Single	No	Dual	£291	218x43x294	Shugart (Chinon)
	40/80	400k	Single	No	S/expandable	£264	218x43x294	Mitsubishi
	40/80	400k	Single	No	Dual	£479	218x43x294	Mitsubishi
	40	100k	Single	Yes	Single	£173	218x43x147	Shugart (Chinon)
	40	100k	Single	Yes	S/expandable	£180	218x43x294	Shugart (Chinon)
	40	100k	Single	Yes	Dual	£311	218x43x294	Shugart (Chinon)
	40/80	400k	Single	Yes	S/expandable	£284	218x43x294	Mitsubishi
	40/80	400k	Single	Yes	Dual	£499	218x43x294	Mitsubishi

*Opt = optional integral PSU = £35
◊ NOT including formatting diskette, drive connecting cable and user manual.
40/80 means the drive is switchable between 40 and 80 tracks

	80	400k	Double	No	Dual	£538	218x86x147	TEAC
	40/80	200/400	Double	No	Single	£305	218x43x147	TEAC
	40/80	200/400	Double	No	Dual	£579	218x86x147	TEAC
Technomatic	40	100k	Single	No	Single	£150	254x44x152	TEAC
	40	2x100k	Single	Yes	Dual	£320	279x121x229	TEAC
	40/80	200k	Single	No	Single	£180	254x44x152	TEAC
	40/80	2x200k	Single	Yes	Dual	£400	279x121x229	TEAC
	80	1x400k	Double	No	Single	£195	254x44x152	Mitsubishi
	80	2x400k	Double	Yes	Dual	£420	279x121x229	Mitsubishi
Torch	80	400k	Double	Yes	Dual	£730†	415x70x370	Mitsubishi
Twillstar	40	100k	Single	No	Single	£146.95	New Slimline	TEAC
	40	100k	Single	Yes	Single	£181.95	New Slimline	TEAC
	40	100k	Single	No	Dual	£286.95	New Slimline	TEAC
	40	100k	Single	Yes	Dual	£321.95	New Slimline	TEAC
	40/80	200k	Single	No	Single	£191.30	New Slimline	TEAC
	40/80	200k	Single	Yes	Single	£226.30	New Slimline	TEAC
	40/80	200k	Single	No	Dual	£382.60	New Slimline	TEAC
	40/80	200k	Single	Yes	Dual	£417.60	New Slimline	TEAC
	40/80	400k	Double	No	Single	£233.91	New Slimline	TEAC
	40/80	400k	Double	Yes	Single	£268.91	New Slimline	TEAC
	40/80	400k	Double	No	Dual	£468	New Slimline	TEAC
	40/80	400k	Double	Yes	Dual	£503	New Slimline	TEAC
	80	400k	Double	No	Single	£233.91	New Slimline	Mitsubishi
	80	400k	Double	Yes	Single	£268.91	New Slimline	Mitsubishi
	80	400k	Double	No	Dual	£468	New Slimline	Mitsubishi
	80	400k	Double	Yes	Dual	£503	New Slimline	Mitsubishi
	40	100k	Single	No	Single	£146.95	New Slimline	Komori (Chinon)
	40	100k	Single	Yes	Single	£181.95	New Slimline	Komori (Chinon)
	40	100k	Single	No	Dual	£286.95	New Slimline	Komori (Chinon)
	40	100k	Single	Yes	Dual	£321.95	New Slimline	Komori (Chinon)
Viglen	40	100k	Single	No	Single	£139.20	235x46x150	TEAC
	40	100k	Single	Yes	Single	£167.20	295x46x150	TEAC
	40	200k	Single	No	Dual	£278.40	235x92x150	TEAC
	40	200k	Single	Yes	Dual	£306.40	295x92x150	TEAC
	40	200k	Double	No	Single	£200	235x46x150	TEAC
	40	200k	Double	Yes	Single	£228	295x46x150	TEAC
	40	400k	Double	No	Dual	£400	235x92x150	TEAC
	40	400k	Double	Yes	Dual	£428	295x92x150	TEAC
	40/80	200k	Single	No	Single	£173	235x46x150	TEAC
	40/80	200k	Single	Yes	Single	£201	295x46x150	TEAC
	40/80	400k	Single	No	Dual	£346	235x92x150	TEAC
	40/80	400k	Single	Yes	Dual	£374	295x92x150	TEAC
	40/80	400k	Double	No	Single	£217.39	235x46x150	TEAC
	40/80	400k	Double	Yes	Single	£245.39	295x46x150	TEAC
	40/80	800k	Double	No	Dual	£434.78	235x92x150	TEAC
	40/80	800k	Double	Yes	Dual	£462.78	295x92x150	TEAC
	40	200k	Double	No	Single	£160.86	35 mm high	Canon
	40	200k	Double	Yes	Single	£188.86	46 mm high	Canon
	40	200k	Double	No	Dual	£321.72	70 mm high	Canon
	40	200k	Double	Yes	Dual	£349.72	70 mm high	Canon
	40/80	400k	Double	No	Single	£200	46 mm high	Canon
	40/80	400k	Double	Yes	Single	£228	46 mm high	Canon
	40/80	800k	Double	No	Dual	£370	70 mm high	Canon
	40/80	800k	Double	Yes	Dual	£399	70 mm high	Canon
Walters	40	100k	Single	No	Single	£181	218x43x147	TEAC
	80	400k	Double	No	Single	£299	218x43x147	TEAC
	40/80	200/400	Double	No	Single	£309	218x43x147	TEAC
Watford ★	40	100k	Single	No	Single	£139	Slimline	TEAC
	80	400k	Double	No	Single	£188	Slimline	Mitsubishi
	40/80	400k	Double	No	Single	£215	Slimline	Mitsubishi
	80	800k	Double	No	Dual	£375	Slimline	Mitsubishi
	40/80	800k	Double	No	Dual	£385	Slimline	Mitsubishi
	80	400k	Double	Yes	Single	£275	Slimline	Mitsubishi
	80	800k	Double	Yes	Dual	£499	Slimline	Mitsubishi

† Including Z80 and power supply and CP/M and software
40/80 means the drive is switchable between 40 and 80 tracks

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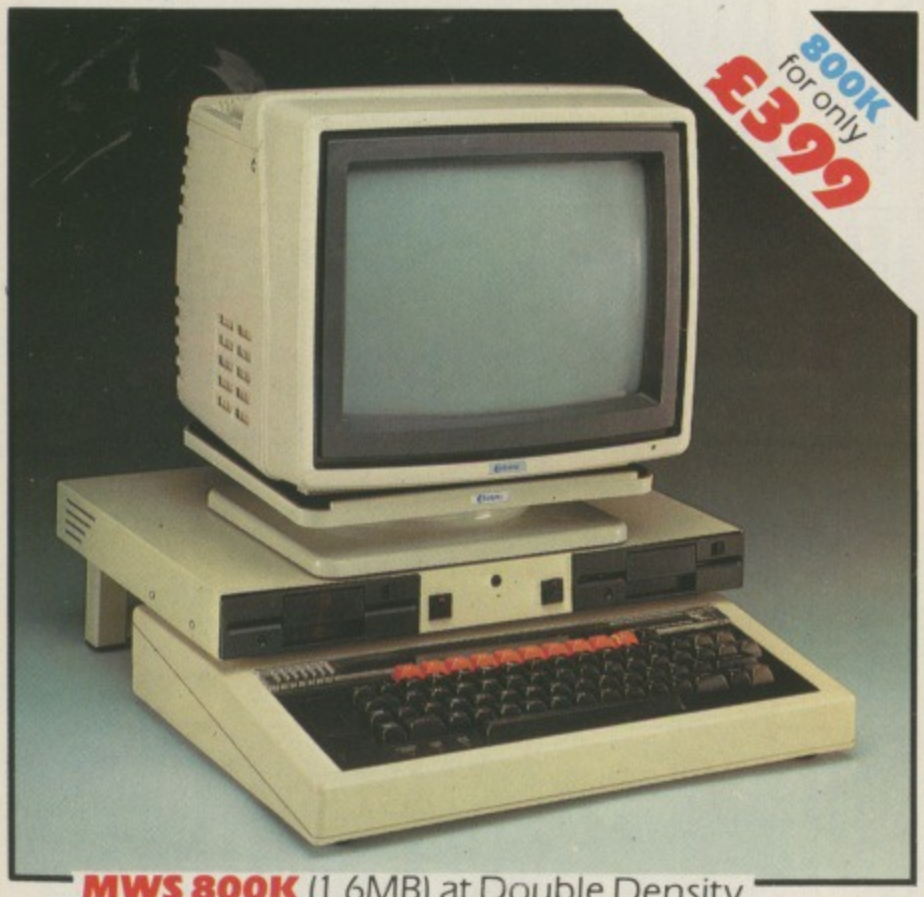

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From Page 93

*DRIVE 0 all the time.

Another way to get at programs that are on a disc on the non-default drive is to use *LIB. You'll have noticed something like LIBRARY:0.$ when you've catalogued a disc and probably wondered what it does.

The library tells the micro what drive and what directory to have a look at if it can't find what it's looking for on the current default drive and catalogue.

Don't worry too much if that doesn't make sense. It will when you try it in practice.

Normally the library is set to drive 0 and the $ directory. If you've got a Basic program on the disc such as BODGER, under the default directory you'll find that you can now load it with *BODGER.

This is the influence of the library, which is set to the default values. Purists say that you should use *L.BODGER or your micro might crash, but I've never had any problems.

This can be changed using the *LIB command. Before you do this, however, SAVE a few programs on the disc under another directory, for example, A.KATIE or A.PAUL.

Next change the library to the A directory on drive zero. *LIB:0.A will do this. Now the DFS has another default to look at when you want a program.

The good thing about this is that you can load programs that aren't on the current default directory without messing about changing directories.

Try it. If you want A.KATIE you can load it with *KATIE if it's a Basic program. If it's a machine code program it will actually run it for you as well.

This comes into its own when you've got two drives. You can use the first drive as normal but also you can access the second drive without having to use *DRIVE or LOAD using the full file specifications.

All you have to do is to change the library option to specify drive 1 and whatever directory you want to get at on that drive. Then just *FRED or whatever will load it from the non-default drive. It saves a lot of time and trouble.

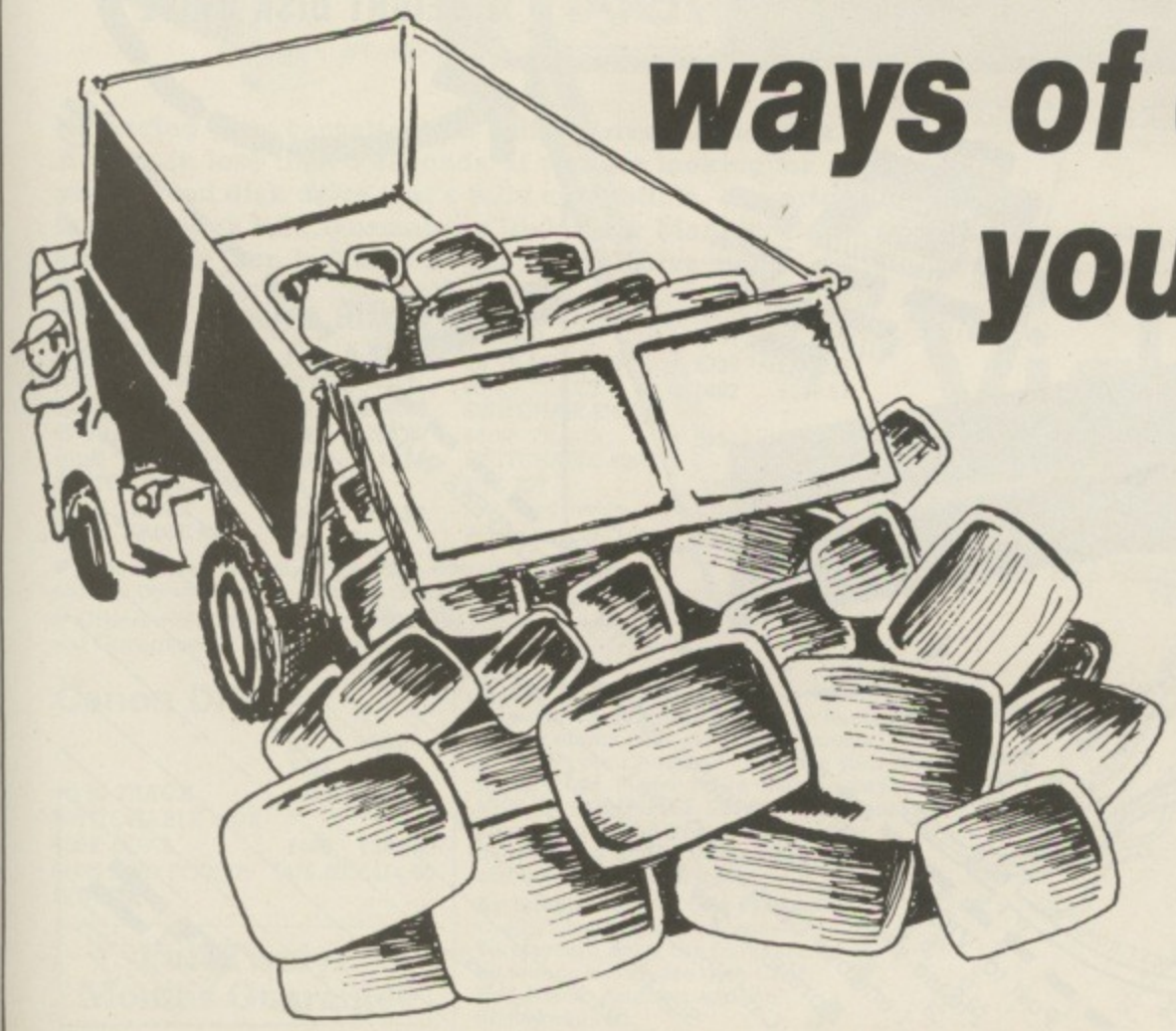
And that's it for this tour of the DFS commands.

You'll notice that I've ignored the "option" part of the catalogue. I'll cover this in a later article when I plan to deal with all the commands you find when you enter *HELP UTILS.

As for now, I'll leave you to format a couple of discs and have fun playing around with the DFS.

It's not half as complicated to use as it is to read about.

There are easier ways of dumping your screen



. . and ERIC CRISP knows one of them

OUR friendly Editor walked up to me the other day and stated: "I want to dump my screen!". "Fine", I responded, "the tip's just down the road".

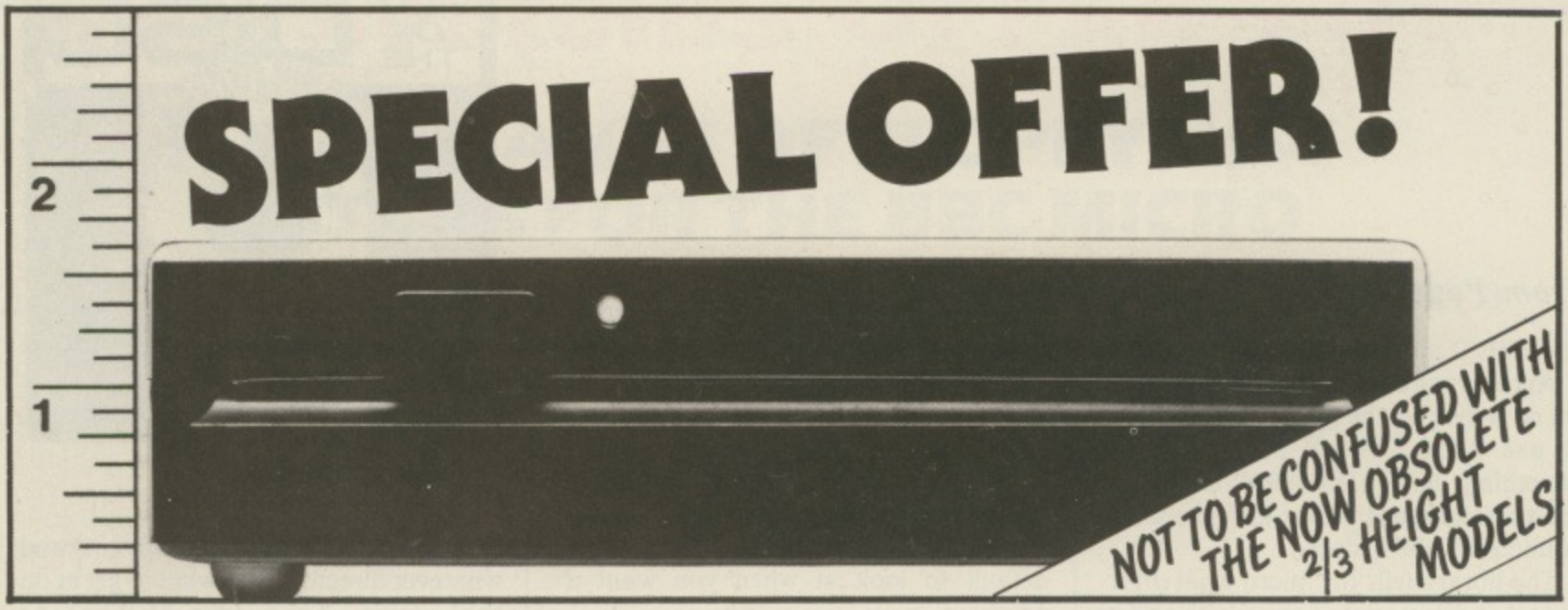
"No!" he said, "I want to dump it on the printer".

"Won't the printer get its ribbon squashed?"

"Idiot!" he screamed, "I want to be able to play a game like Asteroid Miner and then dump the screen onto a printer!"

"Ah!" I sighed, "you want a program

Turn to Page 102



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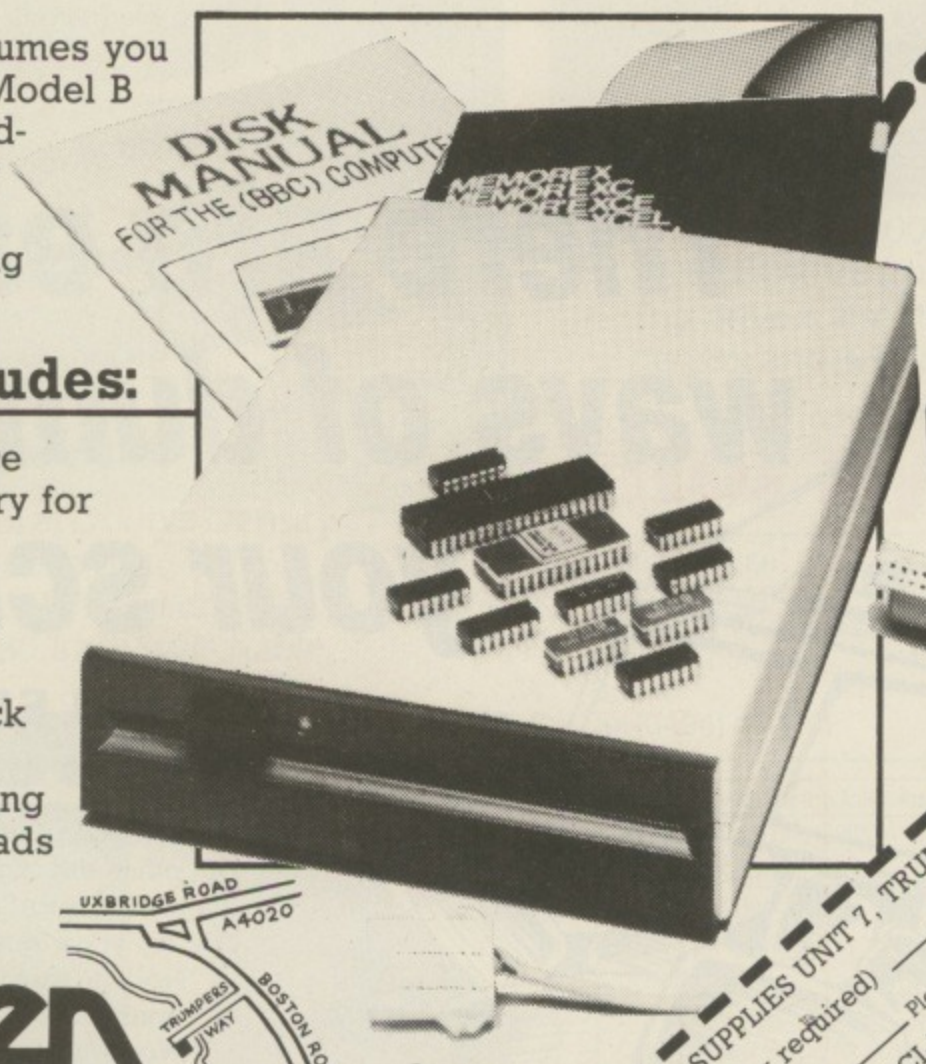

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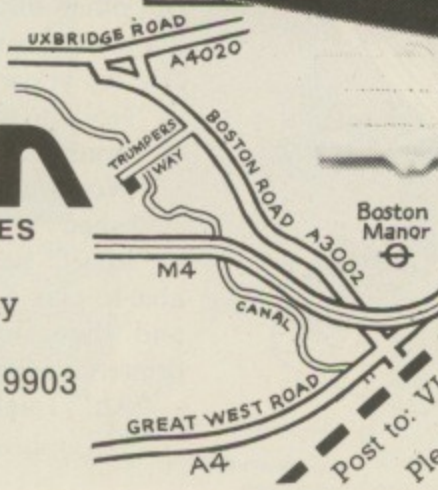

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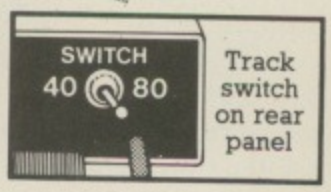

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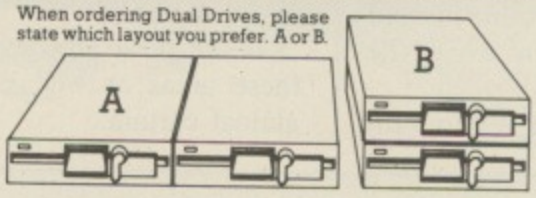

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From Page 99

that responds to a particular key and saves the screen display even though another program was running at the time, so that the display can be dumped to a printer later – probably with that superb screen dump we featured in the January issue".

"Yes", wept our weary Editor.

A few hours later his dream had come true in the form of the two programs listed on this page.

Program I is in assembler and contains three separate routines.

The set interrupt program (lines 40 to 140) changes the IRQ vector to include the key test routine in the interrupt.

The key test routine (lines 180 to 300) tests to see if the _ key has been pressed.

If it has not been pressed it returns to the normal interrupt handling procedure.

If it was pressed, the return from interrupt address on the stack is altered before returning to the normal interrupt handling procedures.

At the end of the interrupt control is transferred to the loader routine instead of the program being run when the interrupt occurred.

The loader routine (lines 320 to 540) sets up a zero text window, clears the buffers, sets up KEY0, puts function key 0 into the keyboard buffer and executes a *BASIC command.

Data for KEY0 and *BASIC is on lines 570 and 590 and the CALL on the last line calls up the set interrupt routine.

Program II, which is "chained" in by the loader program, is in Basic and simply *SAVE s the whole of a Mode 2 screen onto disc. At this point it is advisable to press the Break key to reset the pointers and variables in memory.

The screen display can be loaded back into memory by *LOAD "SCREEN". If this is done from within a screen dump program, it is possible to then dump this to a printer.

This package was written for a disc system and will not work on a tape-only system.

Care was taken in fitting the program into areas of memory that are not generally used by games programs – part of the cassette filing system used for the BPUT and BGET from &380 to &3AF, and the printer buffer from &880 to &8BD.

If the program being used accesses these areas as well a system crash is almost certain.

```
10 *SAVE"SCREEN"3000 8000
20 VDU 6
30 MODE 7
40 PRINT "SCREEN SAVED"
50 PRINT "DO NOT SAVE ANOTHER SCREEN
   ON THIS DISC UNLESS YOU RENAME
   THIS SCREEN DUMP OR   IT WILL
   BE OVERWRITTEN"
60 PRINT "THE SCREEN DUMP IS CALLED
   'SCREEN'.     TO RELOAD THE
   SCREEN TYPE :-              *LOAD
   SCREEN"
```

Program II

The area of memory used from &900 for the set interrupt rountine is only used for initialisation and can be safely overwritten.

The key chosen to initiate the screen save is not normally used in games and it will be all right in most cases. If a different key is required then the CMP instruction on line 190 of the key test routine can be changed.

The number &A8 (168 in decimal) for key "_" is 127+41, where 41 is the negative inkey value shown as –41 on page 275 of the User Guide.

To use this utility, simply save both programs on a disc. Make sure the Basic program is called "SCDUMP". Load the assembler program and run it.

The computer is then ready to receive the game program or whatever it is. This can be on either tape or disc.

When the game is running, press the chosen key and the screen should be saved as it stands as "SCREEN" on the disc. *RENAME it as necessary.

The utility may not work if the other program changes the interrupt or uses the same areas of memory.

```
10 FOR I=0TO 3
   STEP 3
20 P%=&900
30 [OPTI
40 .SETINT SEI
50 LDA &204
60 STA SD-2
70 LDA &205
80 STA SD-1
90 LDA #TEST MOD 256
100 STA &204
110 LDA #TEST DIV 256
120 STA &205
130 CLI
140 RTS
150 ]
160 P%=&880
170 [OPTI
180 .TEST LDA &EC
190 CMP #&A8
200 BNE RET
210 TXA
220 PHA
230 TSX
240 LDA #SD MOD 256
250 STA &103,X
260 LDA #SD DIV 256
270 STA &104,X
280 PLA
290 TAX
300 .RET JMP &0000
310 .SD
320 LDA#28
330 LDX#5
340 .R JSR &FFEE
350 LDA#0
360 DEX
370 BNE R
380 LDA#15
390 JSR &FFF4
400 LDA#18
410 JSR &FFF4
420 LDX#KMEM%MOD 256
430 LDY#KMEM% DIV 256
440 JSR &FFF7
450 LDA#138
460 LDX#0
470 LDY#128
480 JMP B
490 ]
500 P%=&3A6
510 [OPTI
520 .B JSR &FFF4
    :LDX#BAS% MOD 256
530 LDY#BAS% DIV 256
540 JSR &FFF7
550 ]
560 KMEM%=&380
570 $KMEM%="KEY0|MPA.=&
    1900:*D.|MCH."+
    CHR$ (34)+"SCDUMP"+
    CHR$ (34)+"|M"
580 BAS%=&3A3
590 $BAS%="B."
600 NEXT
610 CALL &900
```

Program I

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Cumana 5¼ inch slimline dual disk drives for the BBC Micro are now available from well known high street outlets, including W. H. Smith, John Lewis and Spectrum UK, as well as from Cumana's national dealer network.

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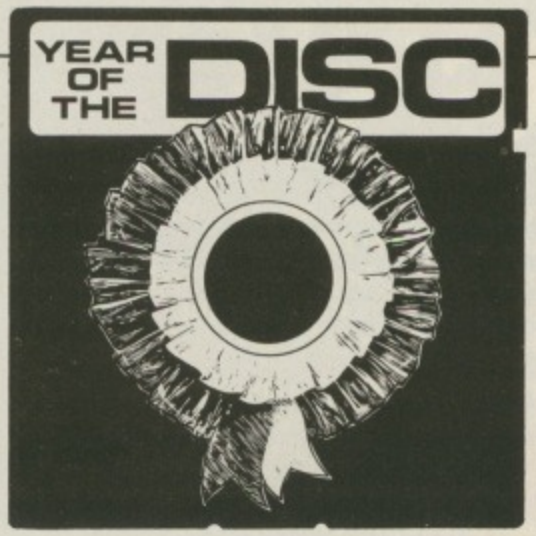

Dig that mixed up square disc – find out what makes it tick

THE words disc and disc drive are often used when talking about computers, but I wonder how many people really know what makes a disc drive work?

By understanding the physical nature of discs and disc drives you will be more able to cope with the situation when things start to go wrong.

A disc storage system is a fast and convenient way to store programs and data.

The large mainframe computers (and some expensive small computers) use hard discs.

These are made of rigid aluminium and require a very precise drive mechanism as well as very clean air to operate in.

Most micros use flexible or floppy discs. These have a much smaller capacity for storing data and are much slower.

Generally they are more than adequate for the single user, as they are cheaper and require less finicky conditions than the hard discs.

The first point to strike a newcomer when looking at discs is the unmistakable fact that they are SQUARE! A moment's inspection will reveal that, inside the square envelope, there is a round disc made of a thin plastic (milar).

Coated on the plastic is a dark brown (sometimes black) layer of magnetic material. This is usually some form of metal oxide, ferric being the most common.

The coating is just like the one you get on tapes, so you can see a disc is a cross between a long playing record and a tape.

Do you remember the old riddle: "How many grooves are there on a long playing record?"

The answer, of course, is two – one on the front and one on the back.

For a floppy disc however, there are no physical grooves. Data is stored as a series of tracks (see Figure I).

The tracks are concentric rings of data. All tracks hold the same amount of data despite those on the outside being longer than those on the inside.

Some computers do have different amounts of data on different tracks but most are like the BBC Micro and have the same.

This simplifies the disc filing system and, as outer tracks tend to be more frequently used, it also slightly increases reliability.

Normally only one side of a floppy disc is used, but you can get drives that will use both sides.

The disc drive is the "record player", a device to read and write data. The components of one are shown in Figure II.

Basically it consists of a drive motor to rotate the disc inside its envelope. It does this by gripping the centre of the disc.

Some discs have a thin plastic re-inforcing hub at the centre to improve the grip and give a longer disc life.

Once the disc is spinning the read/write head is moved across the surface to position itself over the correct track.

The head is usually moved by means of a stepping motor. This is a motor that moves through a small angle, usually 7.5 degrees, every time it receives a pulse.

The rotational movement of the motor is converted into lateral head movement by a helical worm gear.

Thus the head can be moved with precision over the surface of the disc.

However, when the drive is switched on the head can be in any position, so there must be some way of finding

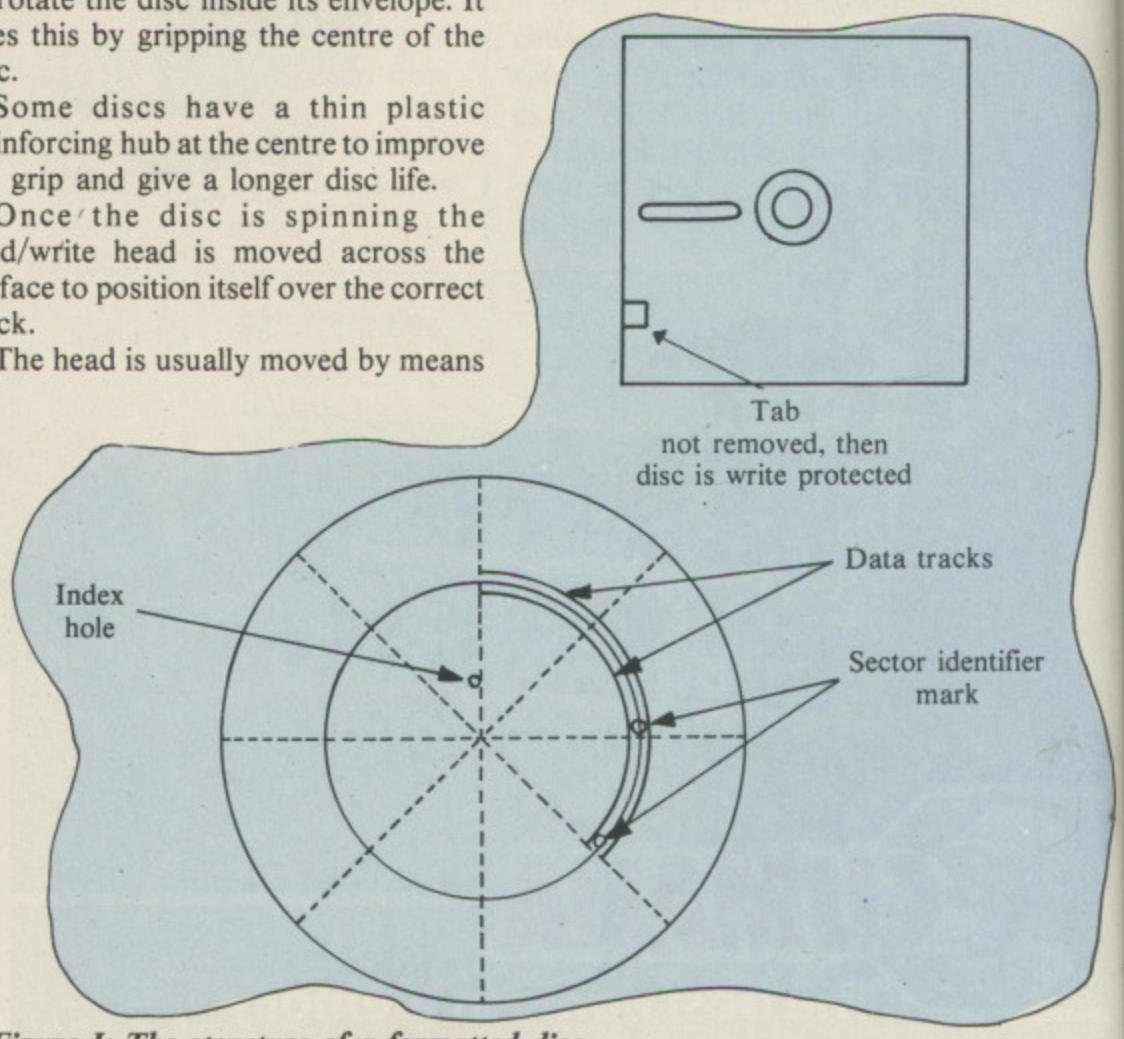

Figure I: The structure of a formatted disc

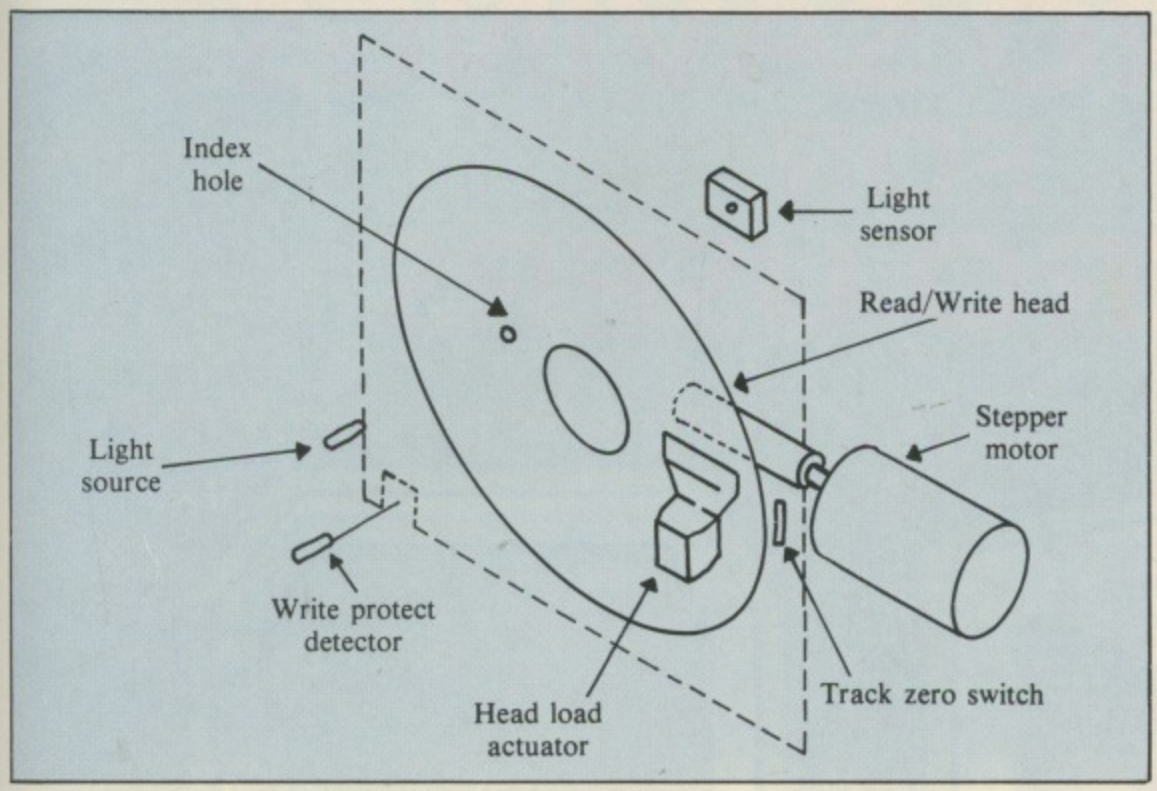

Figure II: Major mechanical components of a disc drive. The drive motor has been omitted for clarity.

precisely where it is.

This is usually done by a small micro switch which is tripped by the head when it is over track zero. The computer will keep issuing pulses to step the head backwards until this switch is tripped. This is known as restoring the head.

In order for the computer to find a precise position on any track, it must be given a signal at a fixed point on every disc rotation. This is provided by the small index hole near the rim of the disc.

Once every revolution this hole allows light through from an LED to a photoelectric sensor. This sends a pulse to the computer to indicate the start of the track.

Another photo sensor detects a notch on the outside of the disc's envelope. This is the write protect notch, and it can be covered up if you do not want to write onto the disc.

This will prevent accidents, as the software always looks at the signal from these sensors before performing any write operation.

There is also a head load actuator, a small lever controlled by an electromagnet. On the end of the lever is a small felt pad which pushes the disc against the read/write head.

This reduces disc wear by ensuring the disc is in contact with the head only when it needs to be.

On some disc units this actuator is very noisy and it may be heard clunking away while the disc is being accessed. This is not however a sign of a bad drive, merely a characteristic of the design.

In addition to the mechanical parts, a disc drive contains the electronics required to turn the motors on and off as well as reading and writing to the disc.

These electronics communicate with

By MIKE COOK

the computer over the disc bus. A bus is just a series of signal wires used to connect several devices together.

Most disc drives stick to a standard bus layout on the edge connector at the back of the drive. This means that manufacturers can have their own design of disc drive electronics and still be compatible with other people's products.

The standard disc bus is shown in Table I. As more than one disc drive can be connected to a bus each drive must be assigned a number. This is done by making a link on the electronics board.

Each drive on the bus must have a unique number to prevent more than one drive being active at any one time.

The signals on the bus marked SELECT will therefore activate only one drive. The other signals convey information we have already covered.

At the computer end of the disc bus there is the disc controller chip.

This is a very complex device. It accepts command numbers from the computer's microprocessor and generates the sequence of pulses on the disc bus to enable the disc drive to carry out the required action.

This is because the microprocessor is not fast enough to perform these actions by itself.

For example, the microprocessor can simply issue a command to move the read/write head to track 10. The disc controller chip then looks to see where the head is, and works out how many steps, and in what direction they will be needed to get to track 10.

It then issues that number of head step pulses.

Finally, when the head is in position it reads the track identification number to confirm it is at the correct track. Having completed the task it then reports back to the microprocessor that the move has been made successfully.

If the move was not a success this fact is reported and it is up to the disc filing system software to take appropriate action.

Usually the head is restored (moved to track zero) and another attempt is made. Several such attempts may be made before the disc filing system signals an error.

Just then I mentioned the track identification number. This is information that is put onto the disc during the formatting procedure which every disc has to go through before it can be used. This writes on the disc track and sector information.

We have already seen that a track is a ring of data stored on the disc, but this is too large a chunk of storage to be convenient. This is because disc storage would have to be allocated in tracks, thus wasting a lot of space.

To remedy this, each track is broken down into a number of sectors. A sector is the smallest unit of storage the disc

STANDARD DISC DRIVE BUS

Pin	Use
2	Not connected
4	Not connected
6	Not connected
8	Index pulse (start of a track)
10	Drive select 1
12	Drive select 2
14	Drive select 3 (not used on BBC)
16	Motor on (spin disc)
18	R/W Head direction select
20	Step (a pulse causes head movement)
22	Data to be written
24	Write gate (enables data to be written)
26	Track zero switch
28	Write protect notch is covered
30	Mixed data and clock read from the disc
32	Surface select (for double sided drives)
34	Not connected

Note all the odd numbers are on the other side of the edge connector and carry the signal ground (or earth).

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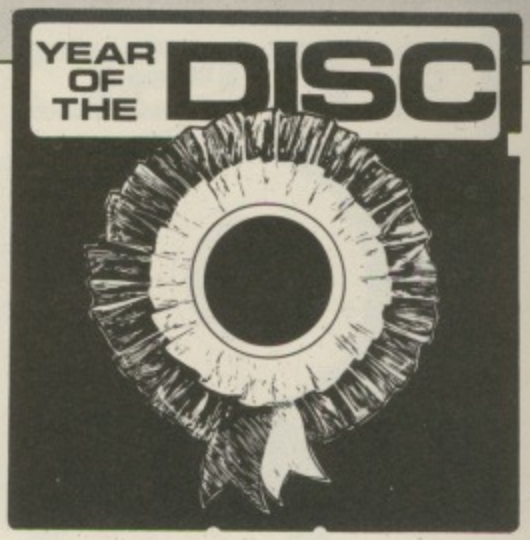

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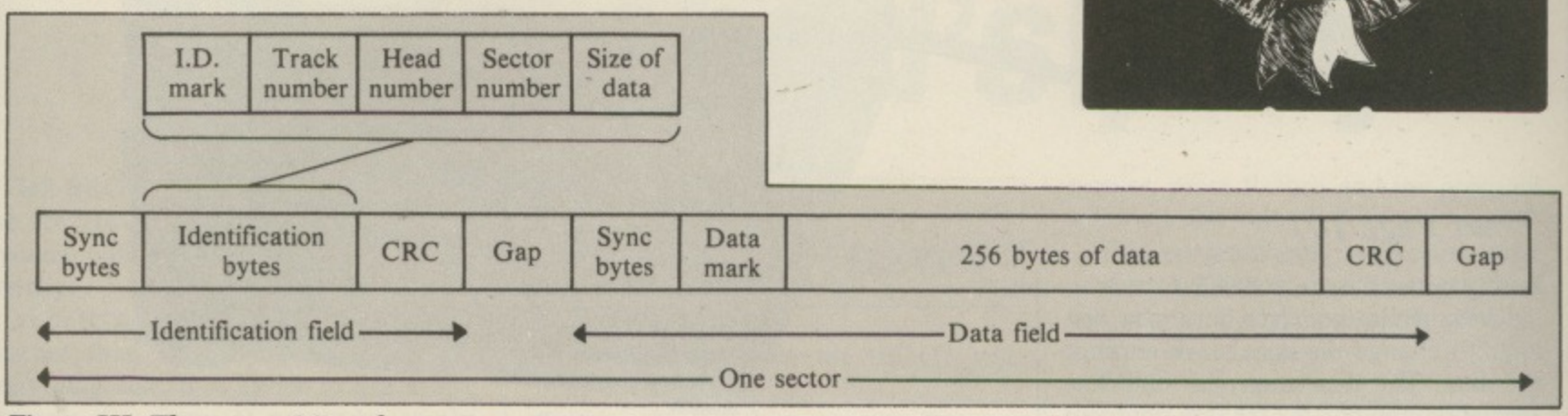


Figure III: The composition of a sector

holds, and all data transfer to and from the disc is done with sectors of data.

In the BBC Micro each track contains 10 sectors and each sector can hold 256 bytes (characters) of data.

Each sector has a few bytes of sector identification information before the actual data. This is shown in Figure III.

The CRC information is a Cyclic Redundancy Check, a simple method of testing the data for errors.

When data is written onto a track the disc controller chip calculates a 16 bit number from this data. This occupies the two CRC bytes and is written after the data.

When reading back the data the CRC is also calculated and compared with the CRC originally written with the data. If these are the same it is assumed there is no error.

However, if they are different then there has definitely been an error. The method used by the disc controller chip to calculate the CRC value is shown on page 399 of the User Guide.

In order for the start of a sector to be uniquely identified, a special code is written on the track – it is known as a mark. You will see in Figure III that there is an identification mark and a data mark.

In order for us to understand exactly what a mark is, we must first see how normal data is stored on the disc.

It is stored in serial form just like the cassette tape system. But instead of the logic zeros and ones being represented by audio tones they are represented by a system of pulses.

Each pulse is represented by a magnetic field placed on the disc by the read/write head. Figure IV shows the form that one byte takes. Note that, unlike the tape system, there are no start and stop bits.

This is known as synchronous data, as opposed to the tape's asynchronous system and it allows more data to be packed into a limited space.

However, before we can make any sense of data in this form the disc controller chip needs to synchronise to it.

This is easily achieved by using clock pulses in every byte of data. The pulses are also needed due to the nature of magnetism – if they were not included the data could not always be correctly recovered.

Each bit starts with a clock pulse and if the bit is a logic one there is a data pulse in the middle of the bit time. There is a limit as to how fast these pulses can be put onto the disc so the capacity of the disc is fixed.

The electronics surrounding the disc controller chip separate the clock pulses and the data pulses from the mixed stream which is read back off the disc.

A mark byte is a byte where some clock pulses are missing.

If you consider the clock component in a normal byte to be &FF (that is all ones, a clock pulse every time) then a mark will have a different number associated with the clock component.

There are a number of standard mark signals and these are shown in Table II. Remember that for normal data the clock component is always &FF. It just differs for the marks.

The disc controller automatically copes with the marks when finding a specific sector.

There are two types of data marks. The first indicates there is data in the sector and the second indicates the data

→

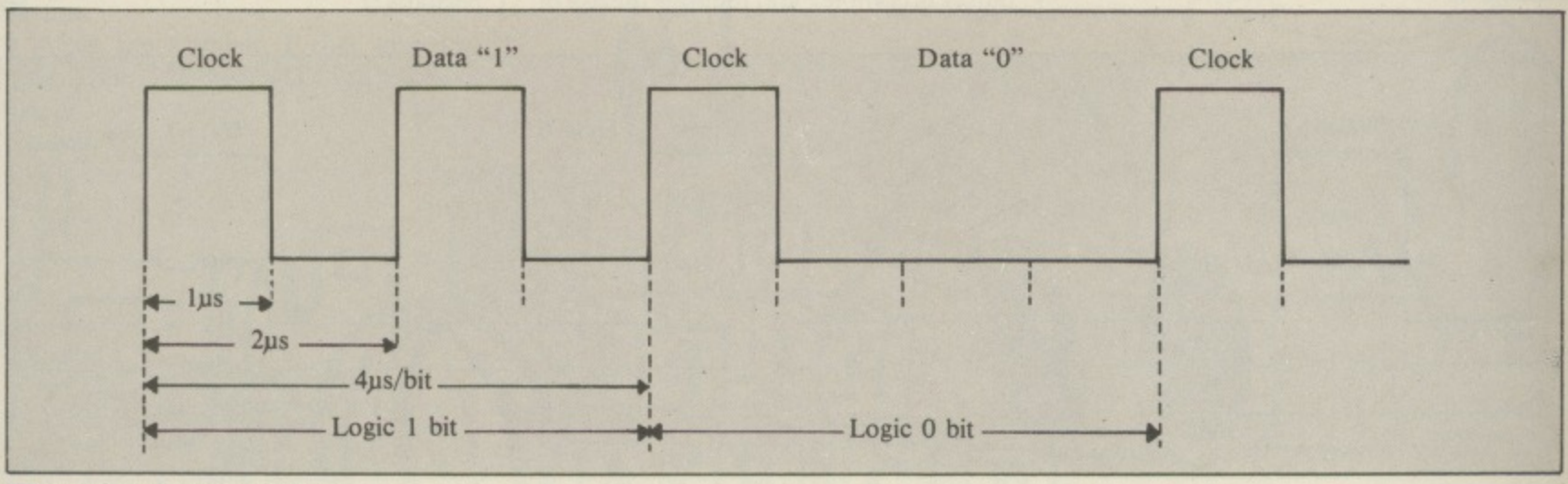
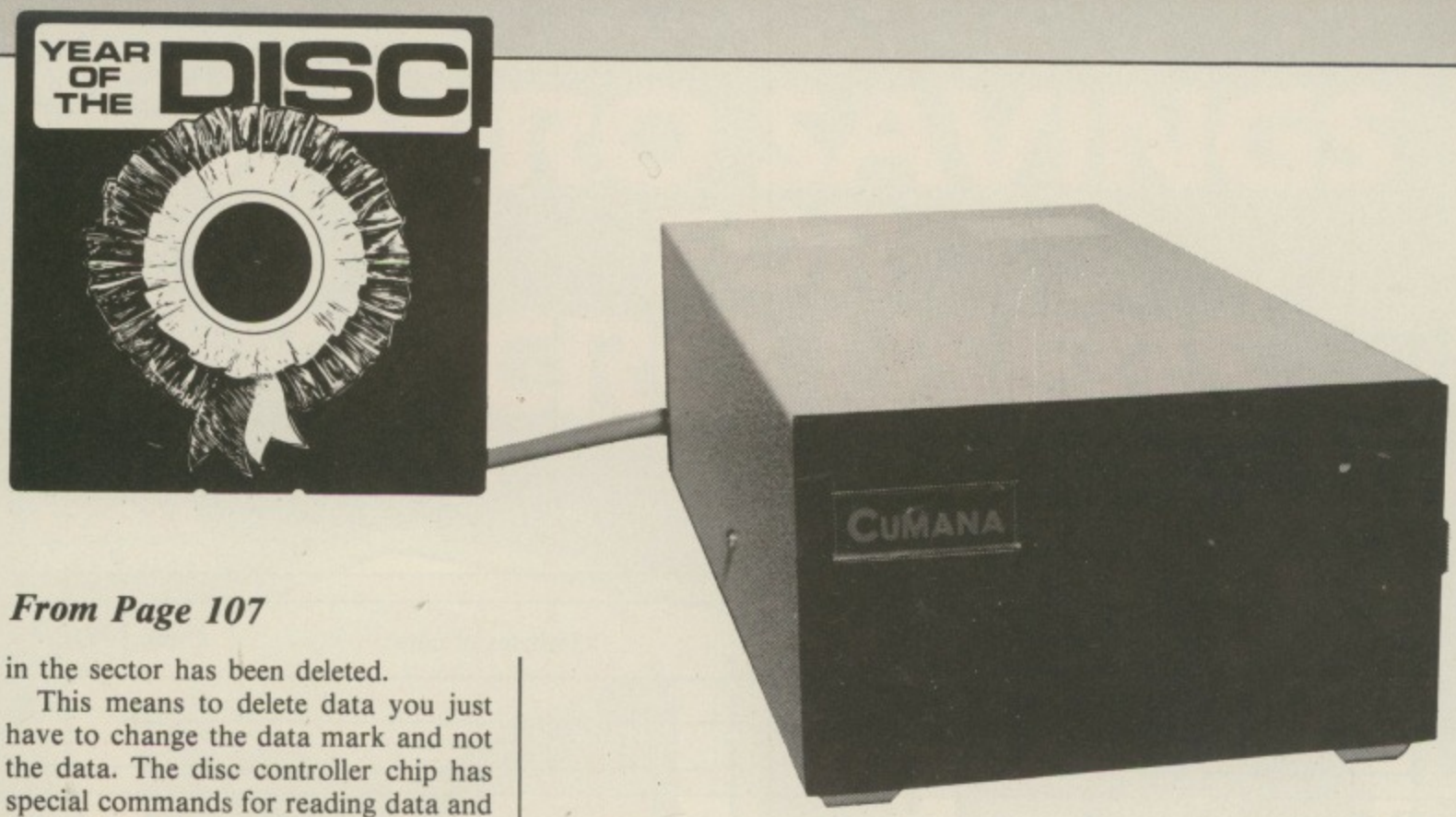


Figure IV: Data encoding



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in the sector has been deleted.

This means to delete data you just have to change the data mark and not the data. The disc controller chip has special commands for reading data and deleted data. So sometimes, if you have the right software tools, it is possible to recover a deleted file.

The index mark is used at the start of each track and is placed just after the index hole has passed the detector.

Before each block of information there are the "sync bytes" that synchronise the decoder inside the disc controller chip. These six bytes are always data bytes with a hex value of 00.

This method of coding the bits in terms of pulses is not particularly efficient. Its main advantage, however, is that it is easy to separate data pulses and clock pulses, and also marks are easy to generate.

There is another way of encoding bits using fewer pulses and, as there are fewer, more bits can be put on any one track.

It is known as double density encoding and must not be confused with double track density, which is merely the result of the tracks being closer together.

The disc controller chip in the BBC Micro will not cope with double density encoding. However plug-in boards are available which allow the BBC Micro to cope with it. The method of double density encoding is shown in Figure IV.

It might seem a little difficult at first to see what is going on. Normally the clock pulse is missing and only the data pulse is present.

However, when the bit is a logic zero AND the previous bit was also a logic zero there is a clock pulse at the start of the bit time.

This keeps up the minimum number of pulses needed to keep the magnetic material happy.

You can see that in any one bit there are half the number of pulses, and so we have double the density.

Separation of the data from the clock pulses is complex and requires the use of a circuit known as a phase locked loop. This circuit would require a whole article just to explain, so we are better off skipping that!

If you remember that discs store data in the form of magnetic pulses you can probably predict how to handle them.

Basically, don't touch the magnetic surface of the disc, as the grease from your finger will damage the head.

Don't put the disc near any magnetic fields as this will remove the magnetic pulses. Someone I know had a loudspeaker perched on top of his disc drive with the effect that most of the data was rubbed out when the drive made its first rotation.

Discs should not be subjected to extremes of temperature, and although they are floppy it does not mean they should be flopped.

Particles of smoke, not to mention cigarette ash, are also quite lethal to a disc.

Given reasonable care a disc should last at least five years of normal use, and some manufacturers guarantee their products for a lifetime. (The lifetime of what they do not say – the disc, perhaps?)

STANDARD MARKS

Clock pattern (Hex)	Data pattern (Hex)	Type of mark
D7	FC	Index mark indicates sector start
C7	FE	Sector ID mark
C7	FB	Data mark
C7	F8	Deleted data mark

Table II

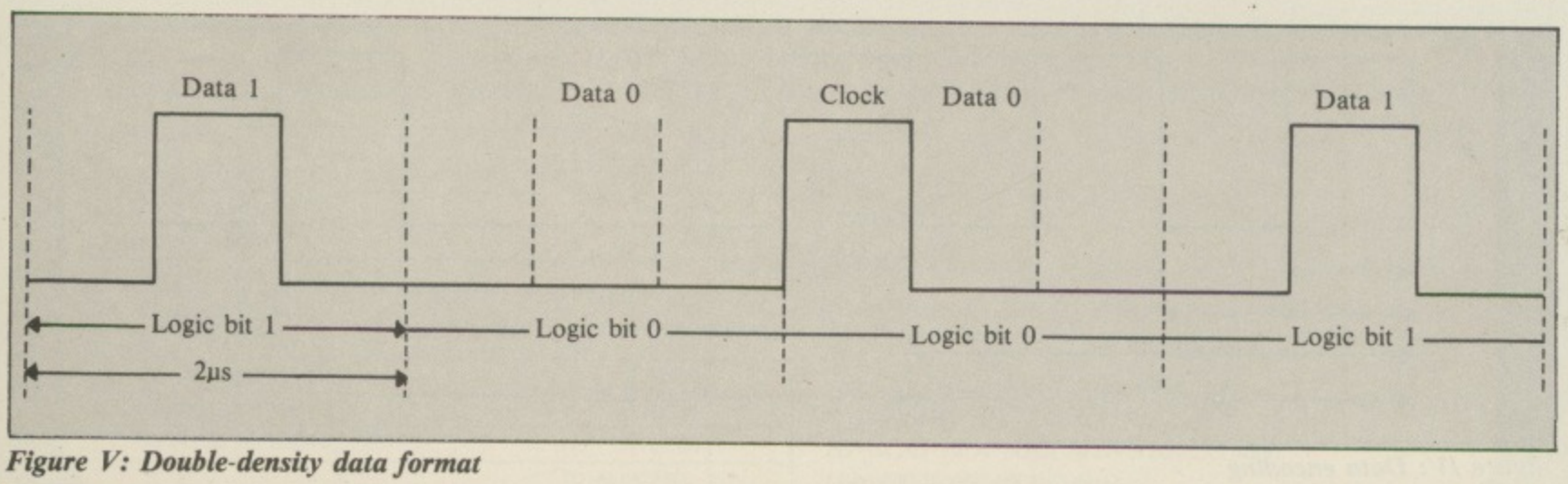


Figure V: Double-density data format

Disc loading made child's play

THE BBC disc system is extremely easy to use. However some people, especially young children, find even this system tricky.

For those who wish to use a program, rather than change it, write it or do anything else, it is easier to use a disc system if a menu of programs on the disc appears and the user types a number to select a choice. It is with that in mind that I wrote this program.

The program can be used in two ways. People with an Acorn DFS should use PROCreadmem, which reads the copy of the catalogue from the memory. The same program can then be used on any disc.

As different disc systems store the catalogue in memory in different ways, PROCread allows the user to put the file names into DATA statements.

The DATA statements are then changed if the program is used for different discs.

If you are not sure which make of DFS you have, the make is indicated on the screen when you switch your computer on.

Here are the instructions to set up an automatic loading system:

- Type in the program as shown. You may type in just the part you require as indicated by the REM statements. Note that lines 1000 onwards should contain the names of the programs on your disc, rather than PROG1, etc.
- Save under the program with the name "MENU".
- Type *BUILD !BOOT and press Return.
- After the number 1 that appears, type CHAIN"MENU" and press Return.
- Press Escape. The file !BOOT will then be saved to disc.
- Type *OPT4,3 and press Return. (This is required so that booting the computer will automatically run the program !BOOT.)

Once you have set up the system, to use it you boot the computer by pressing Shift and Break together, then releasing Break but continuing to hold down Shift until the disc starts.

A menu will appear on the screen. Select the number of the program you require, press Return and the program will load and run.

This program only works for Basic programs. The message "Bad program" will appear if anything else is selected.

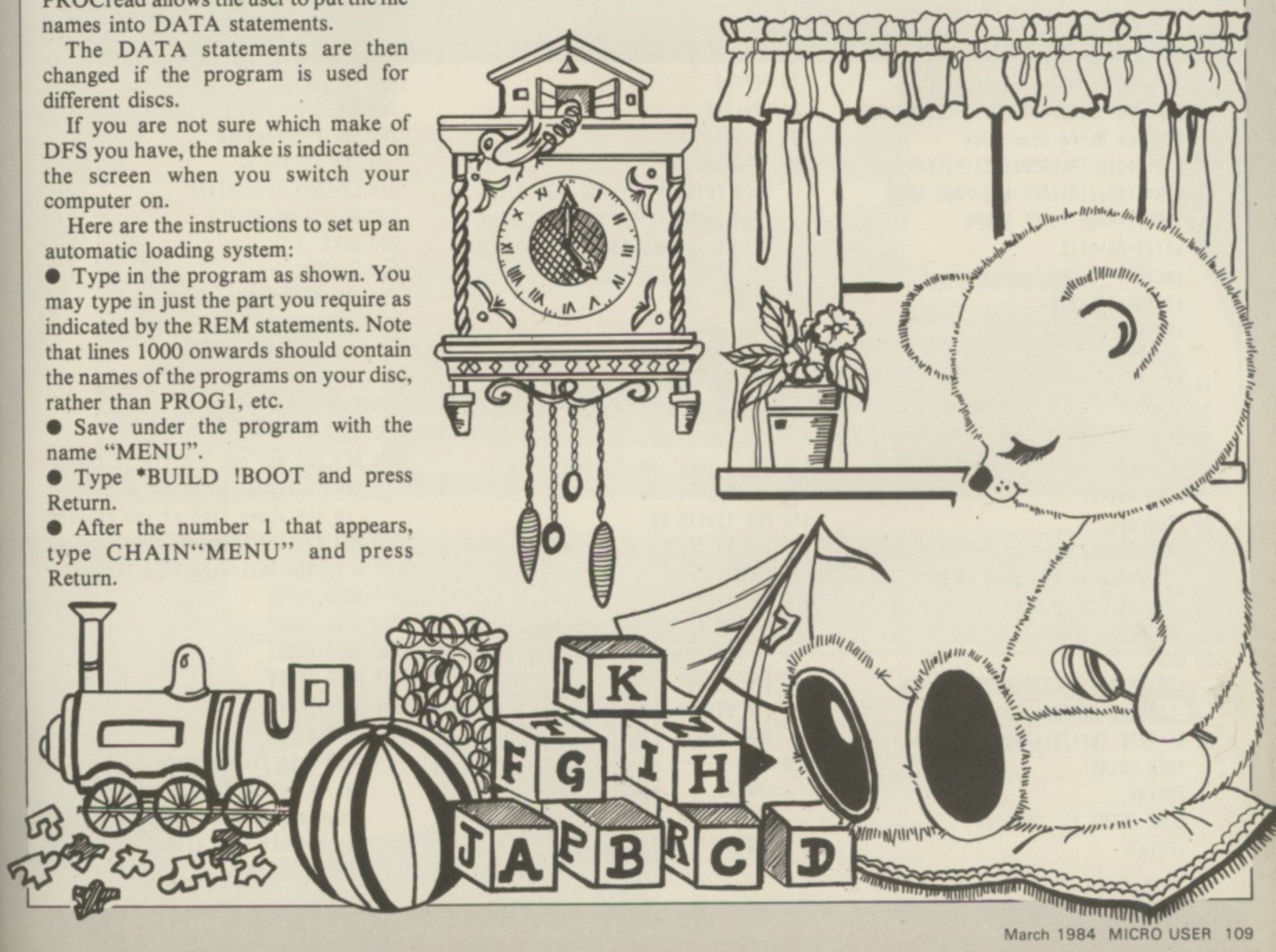
How does it work?

With the Acorn DFS, memory locations &E00 to &E07 contain a copy of the first part of the title of a titled disc. From &E08 onwards is a copy of the names of the files on the disc in blocks of 8 (the 8th byte is not part of the name).

PROCreadmem reads these blocks of memory, while PROCread obtains the same data from DATA statements.

Note that if you have an Acorn DFS, you do not need lines 190 onwards and

→



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lines 40 and 110 should read PROCreadmem.

With any other DFS, omit lines 190 to 240 and put the program names in DATA statements from line 1000. Lines 40 and 110 should be PROCread in this case.

The file names are stored in a string array and the appropriate element in the array loaded, moved lower down in memory to give longer programs room to run (downloaded), and run.

5 Sets up KEY0 to load, download and run the program.

10 Moves the display down one line (optional).

20 Selects MODE.

30 Initialise variables. J% is a program number. L% is start location for each program (with Acorn DFS). W$(J%) are the program names.

40 Calls whichever procedure you have chosen.

50-60 Title lines. If you have an Acorn DFS (and are using PROCreadmem), put a title on the disc using *TITLE (see DFS manual). If you have any other DFS (and are using PROCread), put the title in place of the @ in line 280. The first seven characters of the title will be printed by this program.

70-120 Reads the next file name and stores it in the next element of the array. It uses either PROCreadmem or PROCread as described below. A check is made that there are not too many programs to fit in one column on the screen (line 100).

130 Sets N% to the number of programs.

140 Prints the program on the screen.

150-160 Takes in request and validates it.

170 Prints a message.

180 Calls KEY0 (see line 5).

190-240 PROCreadmem reads the next 7 bytes starting at L% and stores them in a string WS(J%). These lines are only required if you have an Acorn DFS. In that case lines 40 and 110 should read PROCreadmem.

250-270 PROCread reads the next item of data, converts it to a length of 7 and stores it in WS(J%). These lines (and the DATA statements) are only required if you have a DFS other than Acorn. In that case lines 40 and 110 should read PROCread.

280-5000 The DATA required by PROCread.

This program is written for clarity rather than efficiency.

It is hoped that, while working well for beginners, more experienced users will use the ideas to write more efficient programs themselves.

Colour control codes were entered using shifted function buttons. In the listing these show in PRINT statements as numbers in brackets, underlined. 129 corresponds to shifted f1, 130 to shifted f2 and so on.

The menu is set for 20 programs (which looks neater as a single column display). Change 140 to:

```
140FORI%=1TON%:PRINTI%"...
"W$(I%);:NEXT
```

and omit 100 to allow more names to appear.

Disc Loading listing

```
 1 REM DISC LOADING PROGRAM
 2 REM INCLUDING AUTOMATIC DOWNLOADER
 3 REM (c) Micro User 1984
 5 *KEY0*DISC¦MLOADW$(W%)¦MIFERR<>0T
   HEN*FX15,1¦M*TAPE¦MD%=PAGE-&E00
   :FORI%=PAGE TOTOP STEP4
   :!(I%-D%)=!I%
   :NEXT
   :?(TOP-D%)=255
   :PAGE=&E00¦MOLD¦MMODE7
   :RUN¦M
10 *TV255
20 MODE 7
30 J%=0
   :L%=&E00
   :DIM W$(40)
40 PROCread
   :REM Change this to PROCreadmem
    if you wish the menu to be
    automatically read if you have
    an Acorn DFS.
50 CLS
   :PRINT "<136><130>PETE'S SUPER
    LOADING SYSTEM<137>";
60 IF (ASC (W$(J%))AND 191)=0
   THEN PRINT
   :PRINT
   ELSE PRINT "..."W$(J%)
   :PRINT
 70 REPEAT
 80 L%=L%+8
 90 J%=J%+1
100 IF J%>21
    THEN PRINT "<129>TOO MANY FILES
     FOR THIS SYSTEM"''"<130>CHANGE
     LINES 100 AND 140 AS DESCRIBED"'
    "<130>IN THE ARTICLE"
    :END
110 PROCread
    :REM Change this to PROCreadmem
     if you wish the menu to be
     automatically read if you have
     an Acorn DFS.
120 UNTIL (ASC (W$(J%))AND 191)=0
130 N%=J%-1
140 FOR I%=1TO N%
    :PRINT "<129>"I%"..."W$(I%)
    :NEXT
150 PRINT
    :PRINT "<134>TYPE REQUIRED NUMBER
     ( THEN<136>RETURN<137>)";
160 INPUT ""W%
    :IF W%<1OR W%>N%
    THEN 160
170 CLS
    :PRINT
    :PRINT
    :PRINT "  <133>  LOADING "W$(W%)
180 *FX138,0,128
185 END
190 DEF PROCreadmem
200 FOR I%=0TO 6
210 L$=CHR$ (?(L%+I%))
220 W$(J%)=W$(J%)+L$
230 NEXT
240 ENDPROC
250 DEF PROCread
260 READ W$(J%)
    :W$(J%)=LEFT$(W$(J%)+"
     ",7)
270 ENDPROC
280 DATA @
290 REM you may put a title (7 charac
    ters maximum) in place of @
     in the above line if you require.
990 REM Put the names of your progra
    s in the following DATA lines.
1000 DATA PROG1
1010 DATA PROG2
1020 DATA PROG3
1030 DATA PROG4
1040 DATA PROG5
5000 DATA @
    :REM this line must be left
     as an end of file marker. Put
     your own program names in DATA
     statements from line 1000 to
     4999.
```

- The complete AMS disc drive package, tailored to your BBC micro, is compatible with all disc interfaces and includes cables, a comprehensive manual and utilities on disc and EPROM. Housed in a steel case, matching the BBC micro, these reliable and robust Hitachi 3″ disc drives are the ultimate for home, office and classroom.
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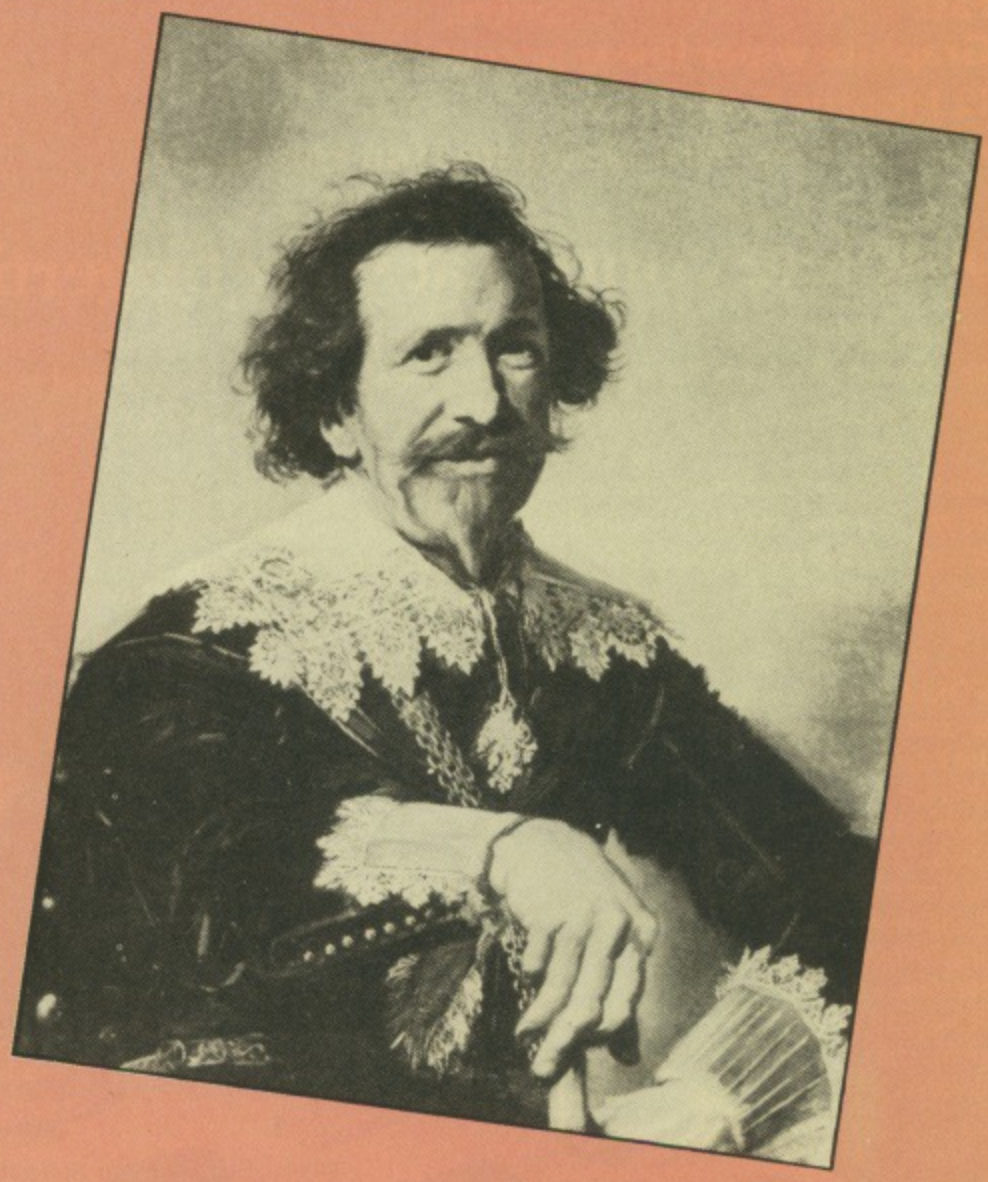
Saving grace



FRANK DART shows how to rescue your latest masterpiece when the tape refuses to load correctly

"THE difficulty experienced in loading a program from tape is inversely proportional to the number of copies of the program you have made".

Even with a sound understanding of the stated law, there are occasions when it is only possible to save your latest masterpiece once. It may be a long program and you are short of either time or tape!

Whatever the reason, the fact that you have only one copy puts you at risk of losing the whole program.

If just one block refuses to load correctly, pressing Escape is likely to prompt a rather curt, and singularly unsympathetic, "Bad Program" in reply.

A student who had been typing for two hours on a previous day suffered this precise fate. He was, quite correctly, convinced that the part that had been loaded was in there somewhere.

The problem was that the machine would not let him at it.

Fortunately, his lost block being near the end, it was possible to retrieve the situation so that he could LIST the complete lines which had been loaded.

He had then to retype only the last few lines which had been lost.

To follow how this can be done it is necessary to understand how a Basic program is stored in memory. The best way to do this is to examine the appropriate area of memory using the operator.

First, set up a function key to show the contents of locations PAGE, where your Basic program is stored, up to PAGE+20.

For example:

```
*KEY9 FOR I=PAGE TO PAGE+20
:PRINT I,?I :NEXT!M
```

Then type NEW, press Return, and enter the simple program which we shall then examine:

```
10REM
20REMARK
```

Note that there are no spaces.

Pressing key f9 will now display Figure I.

On machines with the Acorn Disc Filing System installed the addresses will run from 6400 to 6420. These

ADDRESS	CONTENTS	COMMENTS
3584	13	START OF BASIC LINE
3585	0	LINE NUMBER,HIGH
3586	10	LINE NUMBER,LOW
3587	5	LENGTH OF LINE
3588	244	TOKEN FOR REM
3589	13	START OF BASIC LINE
3590	0	LINE NUMBER,HIGH
3591	20	LINE NUMBER,LOW
3592	8	LENGTH OF LINE
3593	244	TOKEN FOR REM
3594	65	ASCII A
3595	82	ASCII R
3596	75	ASCII K
3597	13	START OF BASIC LINE
3598	255	LINE NUMBER,HIGH
3599	?	LINE NUMBER,LOW
3600	0	does not matter
3601	0	does not matter
3602	141	does not matter
3603	72	does not matter
3604	160	does not matter

Figure I: Basic program storage

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SAE for more detailed information.

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figures will vary with other DFS.

Basic is stored in a compressed fashion using "tokens" for the keywords – that is, one byte is used as a code for the keyword. The tokens are listed on page 483 of the User Guide.

Of greater interest at the moment are the four extra bytes on each line. In line 10 these are 13, 0, 10 and 5. In line 20 they are 13, 0, 20 and 8.

Each line of the Basic program can be distinguished by the 13s which can be thought of as start of line markers.

The two numbers which follow each 13 are a coded version of the Basic line number.

The first (LINE NUMBER,HIGH) is "how many 256s in the line number". The second (LINE NUMBER,LOW) is "how many leftover". So line 10 is recorded as:

0 256s
10 left over

Line 300 would be:

1 256s
44 left over

and line 1000 would be:

3 256s
232 left over.

The third number after each 13 is of particular importance. This gives the length of the stored version of each line.

A consequence of the way that this value is worked out is that the "line length" byte gives the address of the next 13 when added to the address of the previous 13.

In our example the first line, 10REM, is stored from location 3584 and upwards. Since the line length of this line is 5, the next line is stored from location 3584+5=3589 and upwards.

One advantage of this method is that the Basic interpreter can quickly scan through the program, looking for a particular line number without having to read all the text.

Let's refer to the line length bytes as "links", since they link one line to the next.

A correctly linked program is one in which you can keep adding the link to the address of the previous 13 to get the address at which the next line starts. This should contain 13.

If it does not, then something has gone wrong and it is a "Bad Program".

A lost block would, at some point, give a link to an address which had not been loaded with the required 13, hence "Bad Program".

To retrieve what has been loaded correctly it is necessary to make the interpreter think it has reached the last line of the program before it reaches the bad link.

Fortunately this is relatively simple. Looking at the example once more you will see that the last line links correctly to a 13 (3589+8=3597) which should mark the start of the third line.

"But", I hear you say, "there is no third line".

Well, this is the way the end of the program is stored – the physical end that is, whether or not it be an END statement.

There is a 13 just as if it is another line, but the LINE NUMBER,HIGH is a rogue value. A 255 in this position would mean a line number of at least 255*256=65280.

Since the highest you can use is 32767 this particular value signals the end of the program.

All we need to do to stop the "Bad Program" error is to put 255 into the first of the two line number bytes before the bad link is reached.

This will fool the interpreter into believing it has reached the end and it will therefore look no further. The bad link will not be seen.

The secret is to put the 255 in the correct position to maximise the number of lines retrieved.

The program below does just this:

```
10 P%=3584
20 REPEAT:PRINT256*(P%?1)+P%?2
30 L%=P%?3:P%=P%+L%
40 UNTIL?P%<>13:PRINT"FAILS HERE"
50 P%=P%-L%:P%?1=255
60 PAGE=3584
```

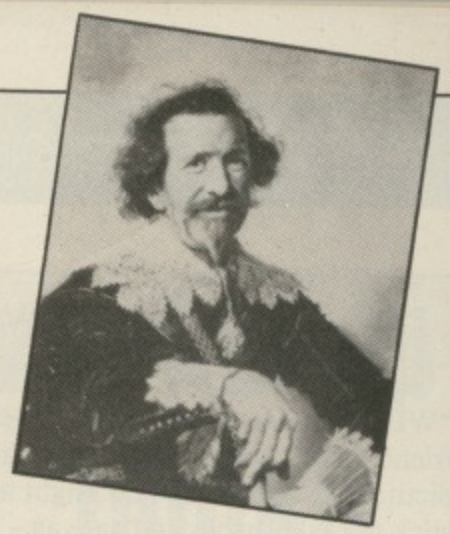
This may be typed in when needed, or can be loaded from tape. In either case it is vital that it is located in some free area of memory so that it does not overwrite the program that is being retrieved.

A convenient way of doing this would be to ensure you were in Mode 7. This gives the maximum room to play with. Since HIMEM is &7C00 and the retrieve program is less than one block long, it can be safely placed at &7B00.

The way it works is to use a pointer, P%, to point at each successive 13 starting at PAGE. The line number is calculated from the coded form and printed onto the screen.

The link, L%, is picked up from location P%+3 and is used to calculate the address at which the next line should start.

So long as this address contains a 13, the process continues.



When a 13 is not found in the calculated position – in other words, the link is broken – L% is taken off the pointer to go back to the previous 13.

P% is now pointing at a line which does not link. The 255 is then put in at P%+1 to terminate the stored version correctly.

Finally PAGE is set back to its original value so that typing LIST will display what has been recovered. This can now be edited or added to in the normal way.

Try it out using the following procedure:

1. Load a fairly long Basic program but press Escape before it has finished loading. You should get the "Bad Program" error message.

Having thus simulated the problem of the lost block:

2. Type:

MODE 7 **Return**
PAGE=&7B00 **Return**
NEW **Return**

The use of &7B00 for PAGE is convenient, being safe for both cassette and disc machines.

NEW will not lose your previous program as PAGE has been reset so that the retrieve program will be stored well out of the way.

3. Type in, or load, the retrieve program.
4. If using an Acorn DFS change the number 3584 to 6400 in both lines 10 and 60. For other DFS change this number to the appropriate page number.
5. RUN the program. You should see the retrieved line numbers scrolling the screen.
6. Type LIST to display what has been recovered.

Should you need to use this utility in earnest then you should perform steps 2 to 6 only.

You may never need this program but, being so short, it is worth typing in and saving just in case you do.

Make a note of the instructions (2 to 6 above) and copy the listing on a piece of paper. Store this in the cassette box with the program on cassette. The copy of the listing is just in case the program won't load.

But isn't this where we came in?

The micro-age answer to Michelangelo?

Paintbox *Oakleaf*

"WHAT'S the point?" said a learned friend when I told him I was painting pictures on a micro. "You might as well stick to real brushes and canvas – you'll get a much better effect".

Well, yes I suppose so. But then again, you could have told Michelangelo to stop messing about with a chisel and a block of marble – or scoffed at the early photographers experimenting with their new-fangled cameras.

The point is that you can use just about any kind of medium to produce something artistic, so why not a computer?

There are quite a few methods to do this – a light pen is perhaps the one that most accurately captures the feel of drawing.

Paintbox, however, uses keyboard, graphics tablet and joysticks to create images – with very interesting results once you get used to painting by proxy.

You get a choice of Modes 0, 1 or 2 but I found the first two difficult to work with as the palette or bar of colours at the top of the screen was so tiny. And anyway you are limited to just a few colours.

So I began in Mode 2, and after several minutes cursing the cassette player, the micro and the program itself I discovered that in order to get an image it helps if you don't try painting in black on a black screen!

Perhaps the programmer could have worked it so that the cursor's colour defaults to white at the beginning.

There are lots of facilities. It's easy to create geometrical shapes and lines by pressing just one or two keys and moving the cursor around.

But even better, from an artist's point of view, is the command that enables you to build up tones – combining several colours by using a dot pattern instead of solid or flat areas of colour.

I found that using joystick and keyboard together was the best way to control the cursor – joystick for general areas of colour, with a freer style and keyboard for finer detail.

Pressing keys 1 and 2 alters the speed in the keyboard mode, useful if you want to do carefully controlled intricate detail. But why, oh why, did this command have to be put next to the Escape key, which wipes out the image on the screen?

I'd spent more than an hour on my masterpiece and was putting on the finishing touches when I accidently hit Escape and the whole thing disappeared.

Surely it wouldn't have been too difficult to arrange things so that you have to press Escape twice before the screen clears?

The instruction manual is fairly comprehensive and easy to understand.

The manual claims that the program lends itself to serious applications such as computer aided design but from my experience I think this might be asking too much.

I don't have a graphics tablet, s perhaps it is unfair of me to judge it o that score – certainly keyboard an joysticks are not able to reproduc images as accurately as CAD demand

But Paintbox would really come int its own in the classroom. It has alway been one of my complaints that arts an sciences are kept too much apart, an inevitably that leads to specialisation i one field with little knowledge about th other.

Using a computer in the art clas might convince the person who is bore to tears by aggressive arcade games (a I am) that there is a lot more potenti for creativity on a computer than is a first apparent.

Also, the type who curls up in horro at the thought of sitting in front of drawing board might just be tempted b the prospect of using a micro.

If you want to paint traditional styl works of art then stick to brush an canvas, as this package can be n substitute.

But there is a lot of scope fo experimenting with images using t computer, and Paintbox provides a flexible way of doing just that.

Every school should have thi program.

Heather Sheldric

PLAY A BIT BELOW PAR - BUT NOT THE PROGRAM

Supergolf *Squirrel*

I'VE never played golf and, having had a go at Squirrel Software's game Supergolf, it's unlikely that I ever will.

Not that it's a bad game, in fact it's very good. For your money you get an 18 hole course, a score card and a set of golf clubs.

Also, if you're as bad at it as me, you get humiliated into the bargain.

You see, no matter which club I choose from the set of nine irons, I can't get it right.

I've tried all the different strengths o swing (from one to 99) and I still can judge it.

My ball has a terrible affinity for th bunkers or, even worse, water. And m putting is agonising to watch.

Nor does it improve matters when get a scorecard at the end of each hol telling me how far below par I am.

It's an interesting game for up t four players, well conceived and wel worth playing.

Yet, terrible though I was at it Supergolf remained fun and left m wanting to play again. Enough said?

Nigel Peter

Well set-up workshop toolkit

BBC Micro Toolbox *BBC Soft*

THIS set of 25 utilities comes from Ian Trackman, the "Making the Most of Your Micro's" programmer extraordinaire. As you would expect, it contains some very useful programs.

They are in two sets. One contains routines that can be included in your own programs, while the other is intended purely as program development aids.

The first set contains six sorting routines, circle generating codes, three character generating/printing programs, a graphics dump and a speech unit utility. Most of these are written in Basic and are well annotated with REMs.

I particularly liked the Shape Maker program which allows one to convert a shape on the screen into user defined characters.

The second set of programs seem to be what every writer of large Basic programs on the BBC Micro has been waiting for – if he/she hasn't already written them.

There are, for instance, three utilities that help to shorten Basic programs. The first is a REM stripper which not only removes REM statements but also lines with only colons or spaces.

Follow this with a space removing program and then a packer that tucks as many statements as possible on to one line and your original program is considerably shorter, and hopefully faster.

With a disc system the whole process is easily automated and is explained in the manual.

Conversely, if you have a packed program that you would like to make understandable you can use the unpacking and spacer programs that unravel most of the mess that the above programs have created.

Add to these a cross-referencer, a variable dump, a global replacer and a resequencing program, and a good deal of the drudgery of writing in Basic is obviated.

The programs come on tape but with full instructions on how to write them on to disc.

A colleague wrote a small program which automatically transferred the programs from tape to disc for me, and this would have been a nice addition to the package.

The manual is large (208 pages) and has complete listings together with concise explanations.

This is a very useful addition to any Basic programmer's toolkit.

Alan Plume

Get to know the lie of the land

County (SM) *Bryants*

TWO related programs provide a useful aid to familiarisation with local geography. For this review just County (SM) will be described. Its companion program, County (SW) deals with the south west peninsula of England.

County (SM) covers the counties of Dorset, Hampshire, West Sussex, Surrey, London, Berkshire, Wiltshire and Avon. There are two options on the menu – identifying towns, and identifying rivers or counties.

The first option displays an attractive four-colour map with the locations of 20 different towns marked on the map by a cross.

The user is prompted to find, for example, Lyme Regis. This is done by flying a small aeroplane over the map, using the cursor keys, until it is over the cross which you think marks the town you are looking for.

If the location you choose is not the correct one, then the computer responds with "That's Dorchester" or whichever town it is.

When you do get the location right, it plays a little tune and responds with "Good – you found it". After two questions you're told how long you took to correctly locate the two towns.

This part of the program is good. The aeroplane doesn't move all that fast and tends to leave a smudge when you stop over a town, but the graphics are colourful and the controls easy to use.

The second part of the program, identifying rivers and counties, covers the rivers Frome, Stour, Avon, Wylye, Yeo, Cherwell, Thames, Wye, Test, Itchen, Rother, Arun and Wey.

The map display has the counties shown as before, but this time they are each numbered, as are the rivers. To help you a little adjoining counties are named to provide a few ideas of scale and reference.

The user is prompted to name, for example, river R12 or county C5. If the input is wrong then the computer beeps and gives the right answer, but if it is correct then it responds with "Correct – well done!".

Every now and then you are told how long it took you to answer the last question, which helps keep you on your toes a bit, and after 10 questions you go back to the menu.

There really ought to be a scoreboard to tell you how many answers you got right, and whether you were better at the rivers or at the counties. But there isn't, so you would have to note this for yourself if you wanted to know which to practice on to improve your answers.

Overall, though, this is quite a nice and useful program. It doesn't come with any documentation, which could be useful, and isn't quite as polished as it could be, but probably represents good value for money nevertheless.

Jane Jackson

Business Games *Acornsoft*

Make a profit with your micro

THE Business Games cassette from Acornsoft contains two business games, Stokmark and Telemark.

Stokmark allows one to eight players to deal in the shares of four different companies on the Stock Exchange. The aim is to make as much money as possible.

As in real life, a player's wealth is increased through the receipt of dividends – a share of a company's profits – or through making a capital gain if the share price rises.

Of course the share price could fall, so that a player could make a loss.

The guide accompanying the tape explains some of the terms used in investment analysis.

Using these the program produces regular reports on each player's wealth and on each share's performance so that they can plan their next moves.

The main influence on the value of the shares is whether they are being bought or sold. If there is heavy selling then this depresses the share price. If a share is sought after, however, then the price will be forced up.

As in real life, there are also random economic factors, such as strikes, which affect a share's performance and make planning difficult.

The game is a well-presented and useful introduction to some investment terms, but I thought that it became rather repetitive after only a short time.

Telemark is a game for four players or teams involving the manufacturing and marketing of TV sets.

Players start with the same amount of cash and are then asked to make capital investment decisions, such as the size of the factory, which will determine the production and storage capacity of the businesses.

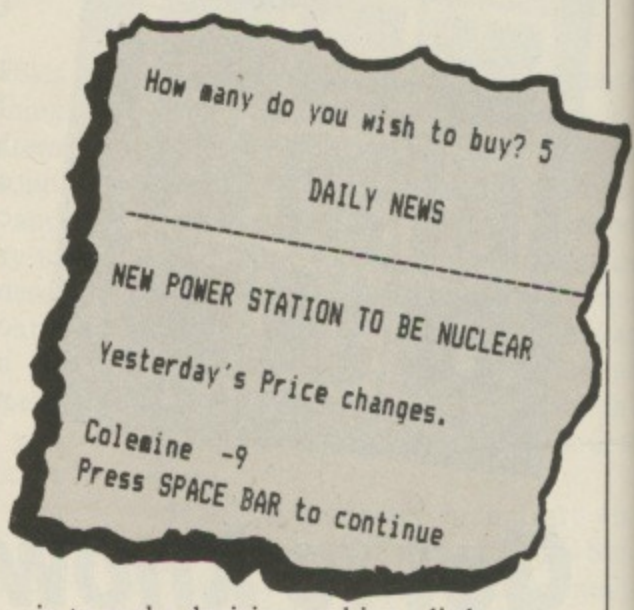
The larger the factory the more can be made, stored and potentially sold but the factory overheads or expenses will also rise.

The players are then asked to make production, marketing and pricing decisions, all of which can influence the profits which will be made.

For example, if your prices are set too high then other suppliers may win part of your market share.

If your prices are pitched too low then, although you may gain a large share of the market, you may not be charging enough to make a profit.

Certain random effects are also built in to make decision making a little more difficult – and realistic.



At each stage the program checks to see if a player's decisions are feasible. There may not be enough production capacity, market share or cash to enable the plans to be fulfilled.

To help, each player is given frequent opportunities to have information vital to decision-making displayed on screen.

At the end of each round financial and market share reports are produced so that the players can see how they are getting on.

This is a good game and to be properly appreciated must be played seriously.

Rather than making decisions by blind guesswork, which will teach little and quickly becomes dull, players should carefully plan the development of their businesses.

They must ensure, for example, that they will have enough cash for future operations and that they will charge a price that will return them a profit. A pencil and paper are indispensable.

Acornsoft have obviously realised that this is an important aspect of the game and they have provided some blank charts in the program guide to help players work out their cash flows and to estimate suitable selling prices.

As a small point, I think that many people would appreciate a worked example in the program guide showing how the profits and, in particular, the balance sheets are calculated. This would help make a good game even better.

Ken Garrett

QUICK RUNS

A first look at some of the latest releases

Trafalgar: *A wargame between two fleets, English and French, as in the battle of Trafalgar, for two players or one against the micro. Combat is on the basis of ship to ship engagements with cannon broadsides trying to take out the opposing guns.*

When firing you have to take into consideration wind speed and direction, deck height and distance. Victory goes to the first to sink his enemy's fleet. (Squirrel)

★ ★ ★

Chuckie Egg: *Moving around a multi-level hen house by climbing ladders, jumping, dropping through holes or taking convenient lifts, your task is to collect 12 eggs and as much corn as you can.*

Opposing you initially are three roving birds. As the game progresses you encounter a vicious, intelligent flying duck, which takes over and follows you relentlessly. (A & F)

★ ★ ★

Space Shuttle: *Your mission, as pilot of the US Space Shuttle, is to launch it, retrieve a malfunctioning satellite and then make a safe landing. Weather conditions are preset for each "run" and you are debriefed at the end of your performance.* (Microdeal)

★ ★ ★

Missile Control: *By cunning use of your three missile batteries, you must defend a city from showers of enemy missile attacks.*

With each successive wave the attack strengthens, incorporating planes, satellites and intelligent missiles. A game for up to four players. (Gemini)

Free software, only £225.

If you own a BBC Micro, you can now download, store and run programs (transmitted free of charge via Ceefax) with the new Teletext Adaptor, priced £225 inc. VAT.

These programs make up the BBC Telesoftware Service (which is intended to become a computer software broadcasting channel) and although primarily educational, they will soon develop into general interest and business areas.

And, as they will change every two weeks, you'll soon be able to build up a vast bank of top quality software without ever having to put your hand in your pocket.

But that's not all the adaptor has to offer. It also enables you to gain access to the normal teletext store of data. This is different to simply having a teletext TV because it means this data can now be transferred to memory and manipulated in any way you wish (making graphs or bar charts for instance).

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(You can also find out the address of your local BBC Micro dealer by calling the same numbers.)

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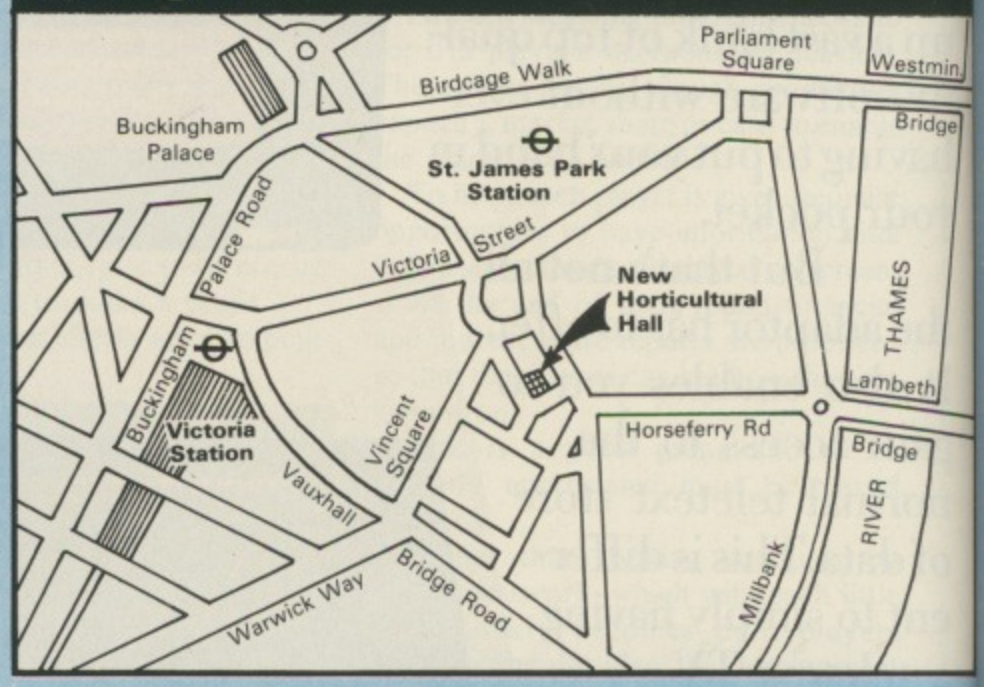

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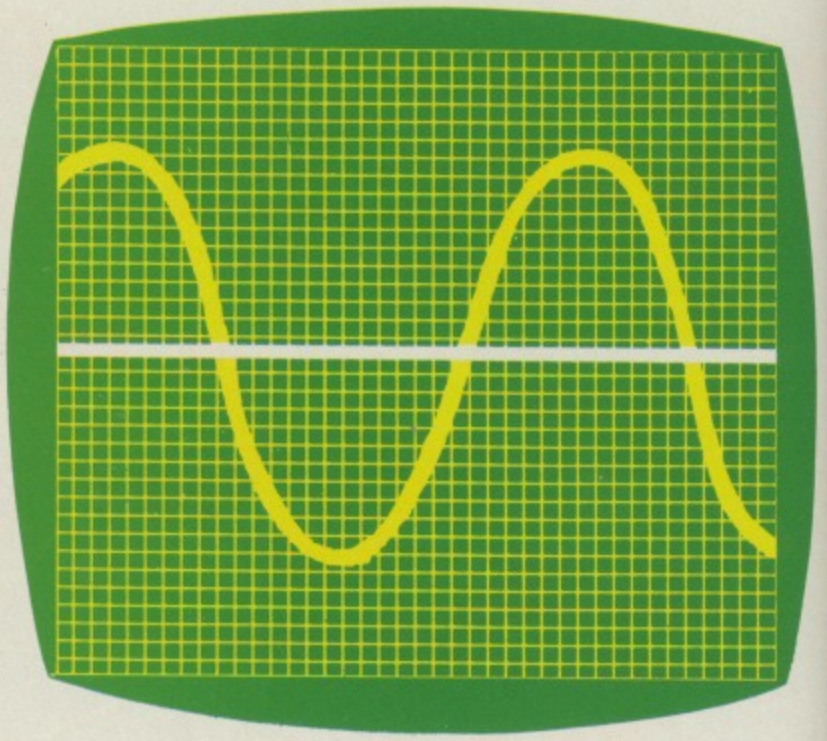
Here's an easy way to turn your Beeb into a real time oscilloscope



WHILE the BBC Micro has more additional inputs than most other computers, it cannot hope to have all the different types we might need for every situation.

This is very pleasing for me as it keeps me in employment! However, it can be quite frustrating when you find the machine will not do quite what you want.

This occurred recently when a teacher asked me if it was possible to use the BBC Micro like an oscilloscope.

"No trouble," I said, "just use the built-in analogue input port".

Well it turns out that this is fine for slow waveforms, but anything over 30 Hz and the converter is just not fast enough to cope.

As the teacher wanted to display audio waveforms to the class, something extra needed to be built.

There are many analogue to digital (A/D) conversion techniques, and they are mainly a three way compromise between speed, accuracy and cost. So on a fixed budget you have to trade off speed for accuracy.

In all fairness, the BBC Micro has done very well with 10 bits accuracy and a 10 mS conversion speed. But, good as it is, it will not cope with all situations.

In the case I've just mentioned it is not fast enough to display an audio frequency waveform. There are other applications which we will meet later on in the Bodybuilding Course where a faster A/D converter is needed. So for this month's exercise we will look at how to add one to your micro.

The fast A/D converter board plugs into the user port and enables signals to be digitised over a range of ±5 volts. Each sample takes about 15uS to acquire, and is of 8 bits accuracy.

You see we have traded speed for accuracy. With 8 bits we can get a

By MIKE COOK

number from 0 to 255 whereas with the built-in converter we can have 0 to 1023.

Although the Basic ADVAL command returns a number between 0 and 65,536, there are only 1,024 significant increments.

So the built-in converter is four times more accurate but about 600 times slower.

The built-in A/D converter uses a technique known as a dual-ramp conversion process.

This is a very good way of getting a very accurate conversion but it is notoriously slow. In fact the one in the BBC Micro is the fastest one I have come across.

We will be covering the dual ramp

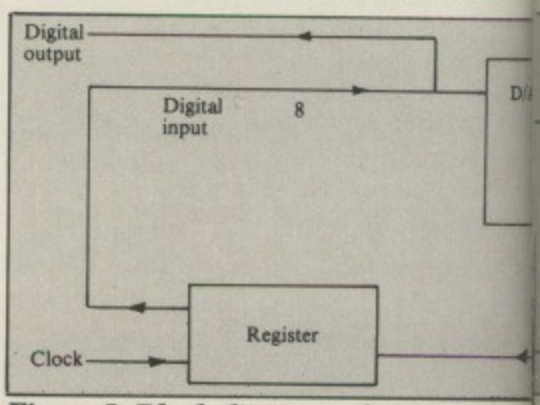


Figure I: Block diagram of a successive approximation A to D converter

THE BEEB BODY BUILDING COURSE

PART 13

process in a later article, so we will leave it there for the moment.

The A/D converter I have used here uses what is known as a successive approximation process. Most of the required components are on one chip, the Ferranti ZN427.

Successive approximation is a technique you may be familiar with, but you may not know it by that name.

Most people owning a computer must have played a number guessing game at some time or other.

It is the one where a computer guesses a number and you have to match it.

After each guess you enter you are told whether you are high, low or just right.

You start off just guessing wildly but pretty soon you develop a successive approximation technique.

Suppose the number is in the range 1 to 100. Your first guess should be 50, half the range.

If your guess is too high the number must be between 1 and 50. So your next guess should be 25, again half the range.

You can continue halving the range and eventually you are bound to find the correct number.

The successive approximation A/D converter works in a similar way. The block diagram is shown in Figure I.

An unknown voltage is presented at the analogue input. This feeds into a comparator.

A comparator is simply an amplifier with two inputs whose output is high or low depending on which input has the higher voltage.

The second input is taken from a D/A (digital to analogue) converter.

As the name suggests this takes a digital number and converts it into a voltage. The register then makes a guess at the voltage by chosing the mid-point.

This is represented by the most significant bit of the digital input being high and the rest low.

The output of the comparator is fed back into the register which then decides whether to keep that bit high (if the input voltage is in the upper half of the range) or set it back to low (if it is in the lower half).

The register does this for each bit in turn in order of decreasing significance (bit 6, then bit 5 and so on).

After it has made the decision on all 8 bits, the number it is left with represents the value of the input voltage.

Note however that these are in arbitrary units and are relative to the maximum voltage produced by the D/A converter.

This does not matter in many applications as all we want is a number proportional to the size of the input voltage.

The speed of conversion is governed by a clock signal.

The slowest unit in the circuit is the comparator and the clock has to be sufficiently slow to allow it to settle.

However, as only one clock cycle is needed for each bit of accuracy (plus one to start it off) the technique is very fast.

Figure II shows the complete circuit of our fast A/D board. You will notice that as well as the ZN427 there are some other components.

The A/D chip needs feeding with a clock signal to govern its speed of operation.

This is generated by IC 2 which is a 74LS13 consisting of two 4-input Schmitt input NAND gates.

One gate is wired up as a relaxation oscillator and basically it acts as an inverter.

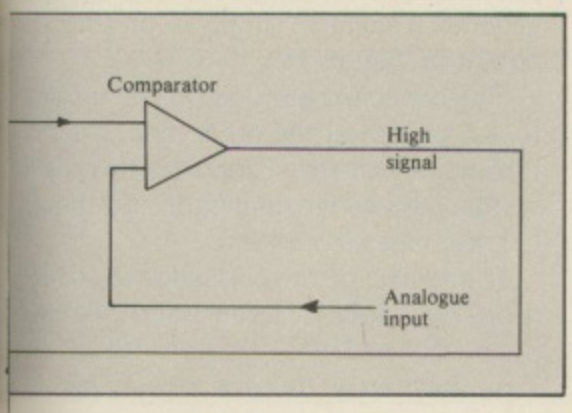
When there is a logic one on all the inputs, there is a logic zero on the outputs.

Conversely, when there is a logic zero on one or more inputs there is a logic one on the output.

The gates have what is known as a Schmitt input, where the threshold voltage on the input – that is the voltage needed to make the input a zero or one – depends on what logic level is currently on the output.

This difference in threshold is known as the input hysteresis.

The oscillator works by connecting



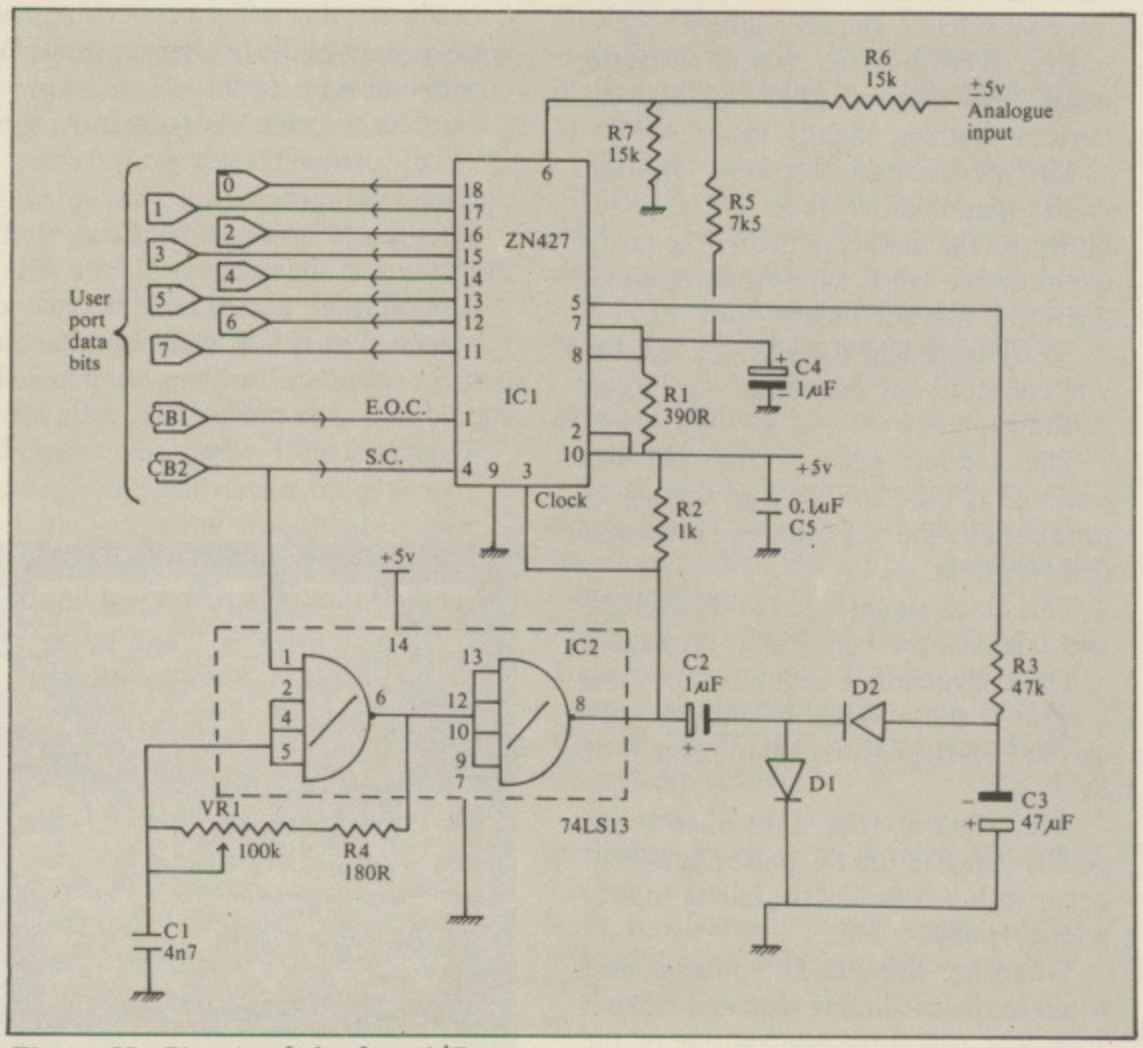


Figure II: Circuit of the fast A/D

From Page 123

the output back to the input.

If the input is low then the output must be high. But if the output is high then the input is high therefore the output must be low!

What actually happens is that the logic state of the output constantly changes or oscillates.

If there were just a direct connection between input and output the frequency of oscillation would be determined by the propogation delay of the gate.

The propogation delay is the time it takes for a change on the input of a gate to affect the output.

This alone would produce an output of too high a frequency and so we have to introduce an extra delay. This is done by using a capacitor from the inputs to earth and a resistor in the feed-back path.

So as the voltage on the output goes high the capacitor will start to charge through the resistor until it reaches the positive threshold point where it switches the output to low.

The capacitor then starts to discharge through the resistor until the negative threshold point is reached when the output goes high again.

This produces a fixed frequency clock signal on the output of the gate, shown in Figure III.

The resistor is split up into a fixed and variable resistor to allow the clock frequency to be altered slightly.

The ZN427 has a guaranteed conversion time of 15uS but, like all devices, can run slightly faster.

The speed depends on fine variables in the manufacture such as the exact purity of the semiconductor, the stray capacitance and what the machine operators had for lunch!

So by including the variable resistor you can get your converter working at its limit.

The second gate in the 74LS13 package is used to clean up the signal produced by the oscillator and provide a fast rise-time.

This clock signal is fed to the ZN427 and controls the conversion process.

The conversion is begun by applying a negative pulse to pin 4. This is known as the "Start of Conversion" signal or SC.

According to the data sheets, the positive edge of the SC pulse should not occur within 200nS of the falling edge of a clock pulse.

To ensure this, the SC pulse is also wired to the oscillating gate and when it goes low will force the output of the clock to go low also. When the SC goes high the oscillator will start again.

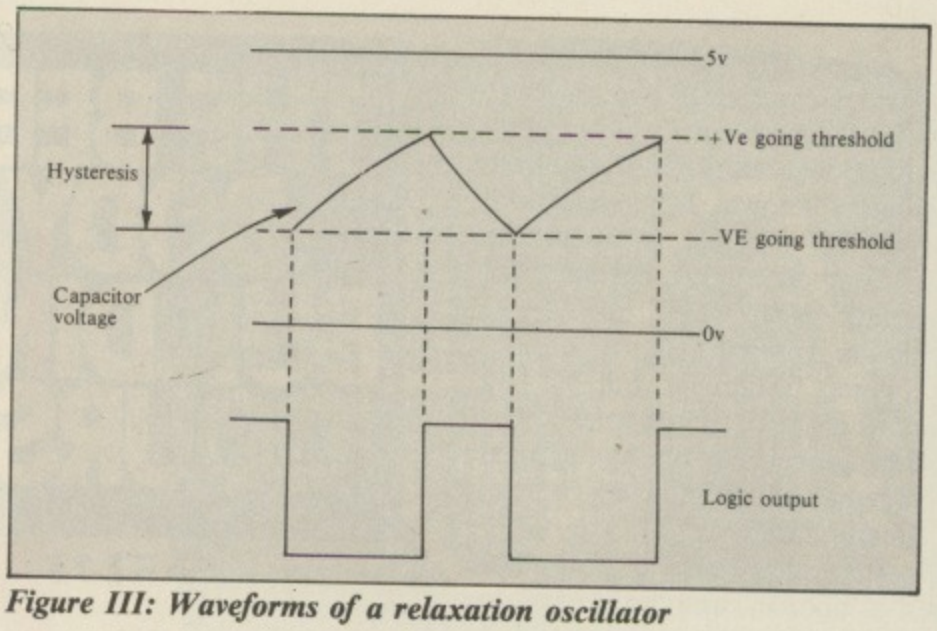


Figure III: Waveforms of a relaxation oscillator

The SC pulse is wired up to the CB2 control line which can be made to pulse every time a number is written to the B side of the VIA.

As all the VIA data pins will be inputs this is known as a dummy write as it does not matter what is written only that something is written.

When the conversion has been completed the EOC line (end of conversion line) makes a positive transition.

This is connected to CB1 and can be made to generate an interrupt or set a flag.

In Basic programs, however, it is not necessary to look at this as the delay between starting off a conversion and getting the results is longer than the conversion time itself.

In order to make any form of A/D or D/A conversion it is necessary to have a voltage reference.

This is a voltage against which everything is measured.

The ZN427 has a built in voltage reference. But if you want to put your own in this can be done on pin 7. It should be in the range 1.5 to 3.0 volts.

This is useful when several A/D converters are being used so that they all have the same reference point.

The input circuitry consists of resistors R5-R7 which are arranged so that when the input is at earth, R6 is in parallel with R7.

As the latter pair are the same value (15k), their total resistance is halved (7k5), forming a potential divider with R5 to present half the reference voltage to the converter's input.

If the input goes below earth (negative) then the voltage on the input will drop below half way. Similarly when higher than earth it will rise to above half way.

The limits of conversion should be reached with the input voltage at ±5 volts.

As there are resistors in the input circuitry you would have to supply in excess of ±10 volts to do the chip any damage.

The only fly in the ointment is that the comparator in the A/D chip needs a negative supply.

This could be taken from the auxiliary power socket on the BBC computer. But there is a better way.

As the current needed on this negative supply is very small it is possible to generate it from the positive supply.

As we already have an oscillator running it is fairly easy. We use something called a diode pump to generate a negative supply. Consider the circuit in Figure IV.

The capacitor has one side connected to +5 volts and the other side to earth through a resistor. Therefore there is a voltage across the capacitor and thus it has a charge stored in it.

If one end of the capacitor suddenly drops by 5 volts then the other end must also drop by 5 volts because instantaneously there is no change in charge.

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So as one end drops from 5 volts to 0 volts the other end must drop from 0 volts to −5 volts.

The capacitor will then start to discharge through the resistor.

When the capacitor is discharged (no voltage across it) the input end is taken quickly to +5 volts again.

The other end responds by trying to rise to +5 volts to preserve the charge or lack of it. However the diode D1 then starts to conduct and rapidly charges the capacitor again.

This diode is said to clamp the capacitor to earth.

In Figure II diode D1 acts in the same way with diode D2 preventing any of the negative voltage getting back to the capacitor.

Therefore the capacitor pumps charge into the circuit which is stored in C3, producing our negative supply.

An alternative explanation is that if you waggle one end of a capacitor and clamp the other to earth you will get the inverse of the waggling at the clamped end.

To be honest that's the way I think of it as it is so much easier.

So with the circuit explained we can get on with the construction.

You can make it on Veroboard and connect it up to the user port using Body Build packs 1 and 2. That's the way I constructed the prototype.

Alternatively Body Build pack 10 contains all the parts and a printed circuit board.

```
10 MODE 7
20 PRINT TAB(0,5);"THE BEEB BODY
   BUILDING COURSE No. 13"
30 PRINT "By Mike Cook"
40 PRINT
50 PRINT "FAST A/D CONVERTER TEST"
60 PRINT TAB(0,12);"CURRENT VALUE"
70 ?&FE62=0
80 ?&FE6C=(?&FE6C AND &F) OR &B0
90 ?&FE60=0
100 A%=?&FE60
110 PRINT TAB(0,10);A%;"  "
120 GOTO 90
```

Listing I

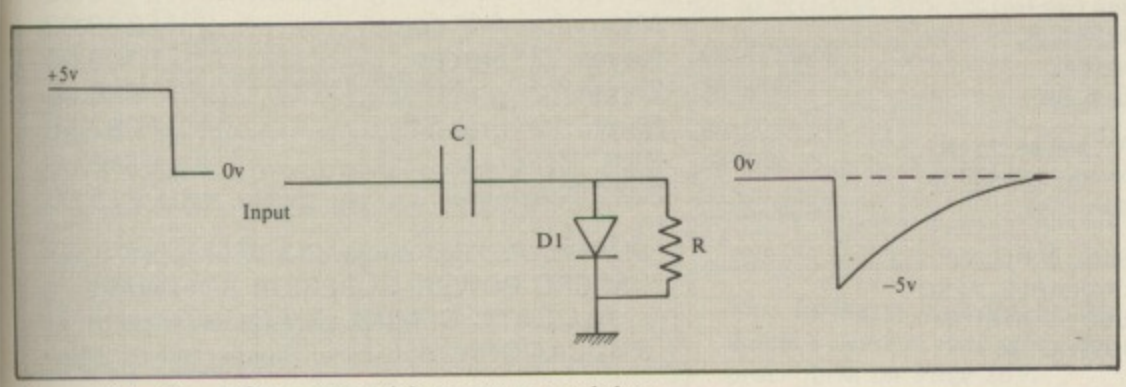

Figure IV: The voltage transitions on a capicitor

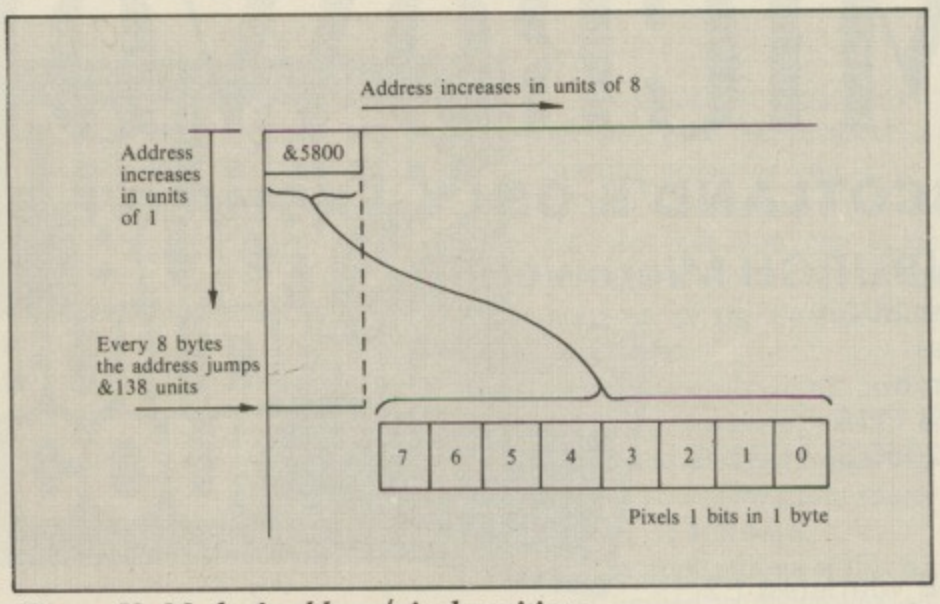

Figure V: Mode 4 address/pixel positions

You will still need a cable (Pack 2 or similar) to connect it up to the user port.

Just identify the component numbers on the screen printed circuit board with the component list or diagram and solder away.

The capacitors are marked with a + and the diodes are marked with a band to help you insert them the correct way round.

Having constructed it, the program in Listing I should test it out. Line 70 ensures all the data lines on the user port are inputs. Line 80 sets the CB2 line to give a SC pulse when written to without affecting any control lines for the printer (side A of the VIA).

Line 90 starts the conversion, which is completed by the time line 100 is executed.

The result is plotted on the screen and the program then loops to get another sample. Forgive the GOTO but I have not been feeling well lately.

Run the program and apply a voltage to the input. As this voltage changes the number should respond.

Now to put it to some serious use. We could arrange the converter to generate an interrupt every time a conversion is completed just like the built in converter.

But, as the conversion time is very short, the computer would spend most of its time getting samples and you would think you had a ZX80 instead of a BBC! So we are only going to use it when it is necessary.

The program in the listing starting on Page 127 is for a digital storage oscilloscope using the fast A/D converter.

It can show signals quite clearly up to 2 KHz in real time and display even faster changes in the expanded mode.

The program works by first gathering 256 samples as fast as it can and storing them in memory. While it is doing this the interrupts are disabled so that the time between each sample is constant.

It then displays these samples as a dot plot, at the same time rubbing out the dot from the previous scan.

At first I tried using the operating system OSBYTE calls. This resulted in the program taking too long to run. The display was not updated fast enough.

So I had to write the program so that it altered the display by writing directly to memory.

To do this we need to know how the pixels on the screen relate to the memory locations. This changes depending what mode you are using.

I have written the program to use Mode 4 and it cannot easily be changed.

Figure V shows the relationship between address locations and screen position.

Each bit in a byte corresponds to one pixel. So if we set bit 7 in memory location &5800, the top left hand pixel will come on.

As we move down the column the address location increases by one until it reaches &5807 and then the address jumps by &138. So the one under that is at address &5940.

In the X direction the address increases in steps of 8 from the first column.

It is obviously time consuming to make the calculation from an X-Y

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From Page 125

THE BEEB BODY BUILDING COURSE

co-ordinate location to an address for each point plotted. So we do most of the calculations beforehand and store them in a look-up table.

This look-up table of the address of the first byte in each column is performed in lines 220 to 280.

The most significant byte is stored in a table starting at address &5700, and the least significant byte in a table at &5600. It is more convenient to split the values up in this way.

As we are plotting every possible X value we have to keep track of the number to add to the first column address.

A mask with a single bit in it is stored at &86 to tell us which bit in the pixel to change.

Whenever we plot a bit we store the address in a table (&5400) so that the next time round we can use the address directly to erase the point.

The first time the routine is entered there is no point to erase and so this table is filled with dummy points in the procedure WIPE. The addresses used are in ROM and so nothing will be affected.

This results in a very fast and responsive display. Try to alter the speed of the clock oscillator so that the data is gathered as fast as possible.

In order to view a stable trace it is necessary to start taking the samples from the same point on the waveform each scan.

This is made possible by supplying a trigger or threshold point.

The waveform must cross this point on a rising edge to trigger the data scan. If the waveform never reaches this point then there will be no display and the only way out is to press Break.

When the trigger point is set to zero there is no waiting, the scan proceeds immediately.

By pressing the space bar the trace can be frozen. You can then alter the trigger point or expand the scale of what you have. The dots may be isolated or joined up.

The scale factor may be any integer from 1 (no scaling) to 100 (quite a lot). The display always starts from the trigger point. You can make this a variable as well if you like. It is found in line 1290.

Well that just about raps it up for this month. Like all projects it is just a starting point for you.

You can calibrate the data capture rate so that you can guide a cursor through a frozen display and have a read-out of the time and amplitude at that point.

You could even include more complex triggering such as negative slope and delayed triggering. It is up to you. The hardware is there. It's just a matter of software.

The applications of this board are not just limited to displaying waveforms. I already have at least two projects in mind that will use this board so you should get your money's worth from it.

Well I'm not superstitious, but it's nice to get number 13 out of the way. See you next month.

Body Build Pack No. 10 consists of:

IC1 ZN427 A/D converter; IC2 74LS13 NAND Gate; R1 390R; R2 1k R3 47k; R4 180R; R5 7k5 1%; R6 15k 1%; R7 15k 1%; VR1 100R preset; C1 4n7; C2 1uF electro; C4 1uF tant; C5 0.1uF disc ceramic; D1 D2 1N4148 diodes; 18 pin IC socket; 14 pin IC socket; 20 way IDC Header; Fast A/D printed circuit board; 3 way terminal strip.

● ***You can order this pack and previous ones with the order form on Page 132.***

Oscilloscope listing

```
10 MODE 4
20 HIMEM =&52FF
30 DIM CODE% &90
40 PRINT TAB(0,5);"THE BEEB BODY
   BUILDING COURSE"
50 PRINT "Number 13 March 1984"
60 PRINT
   :PRINT
70 PRINT "By Mike Cook"
80 PRINT
90 PRINT
100 PRINT "FAST A/D CONVERTER OSCILLO
   SCOPE"
110 PRINT
120 PRINT "PRESS ANY KEY TO START"
130 A$=GET$
140 PRINT
150 PRINT "INITIALISING"
160 ?&FE62=0
170 ?&FE6C=(?&FE6C AND &F) OR &B0
180 ?&86=&80
    :?&80=00
    :?&81=00
190 ?&FE6E=&90
200 M%=&5600
210 FOR A%=0 TO 31
220 FOR B%=0 TO 7
230 T%=A%*&140+B%+&5800
240 ?M%=T% MOD 256
250 M%?&100=T% DIV 256
260 M%=M%+1
270 NEXT
280 NEXT
290 FOR I%=0 TO 3 STEP 3
300 P%=CODE%
310 [
320 OPT I%
330 .START SEI
340 LDA &81 \GET TRIGGER VAL UE
350 CMP #0
360 BEQ NTRIG \TO NO TRIGGER POINT
370 \WAIT FOR A POSITIVE TRANSITION
    OF THE TRIGGER POINT
380 .TLOW JSR SGET \LOOP TILL BELOW
    TRIGGER
390 CMP &81
400 BCS TLOW
410 .THI JSR SGET \LOOP TILL ABOVE
    TRIGGER
420 CMP &81
430 BCC THI
440 .NTRIG LDX #0
```

This listing is included in this month's cassette tape offer. See order form on Page 169.

Turn to Page 130

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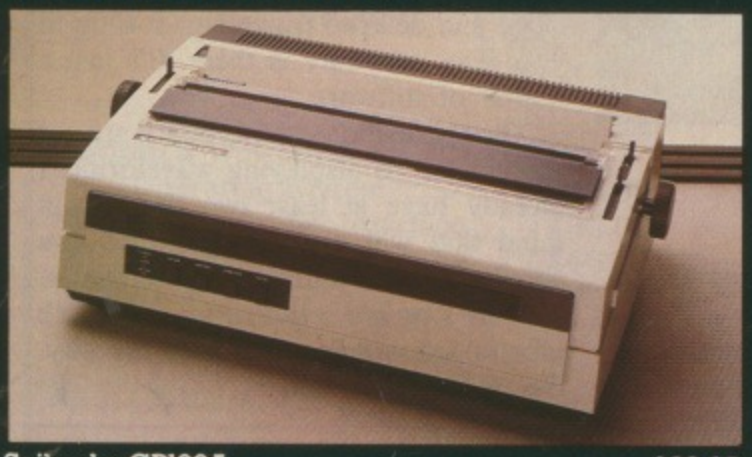

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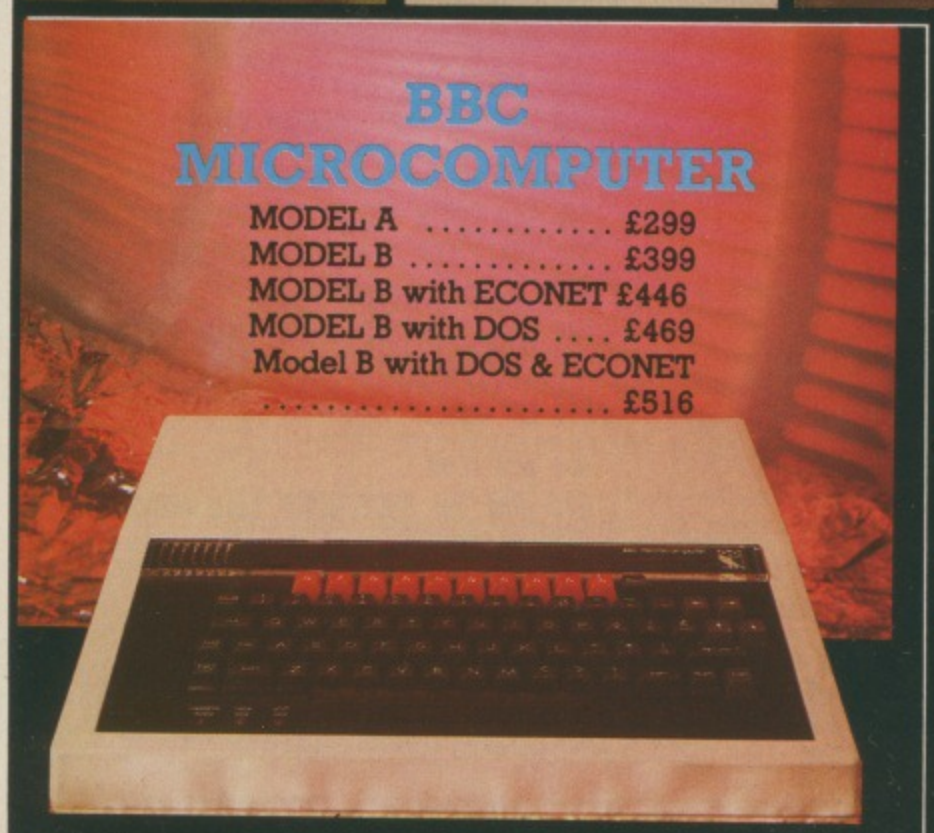

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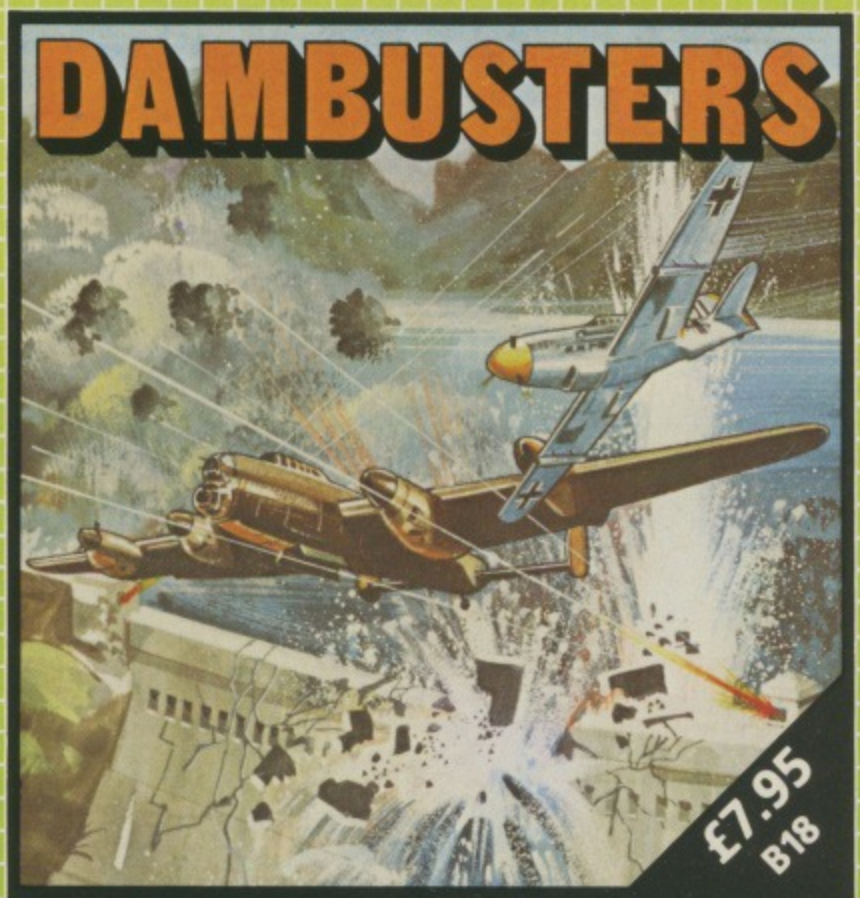

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THE BEEB BODY BUILDING COURSE

From Page 127

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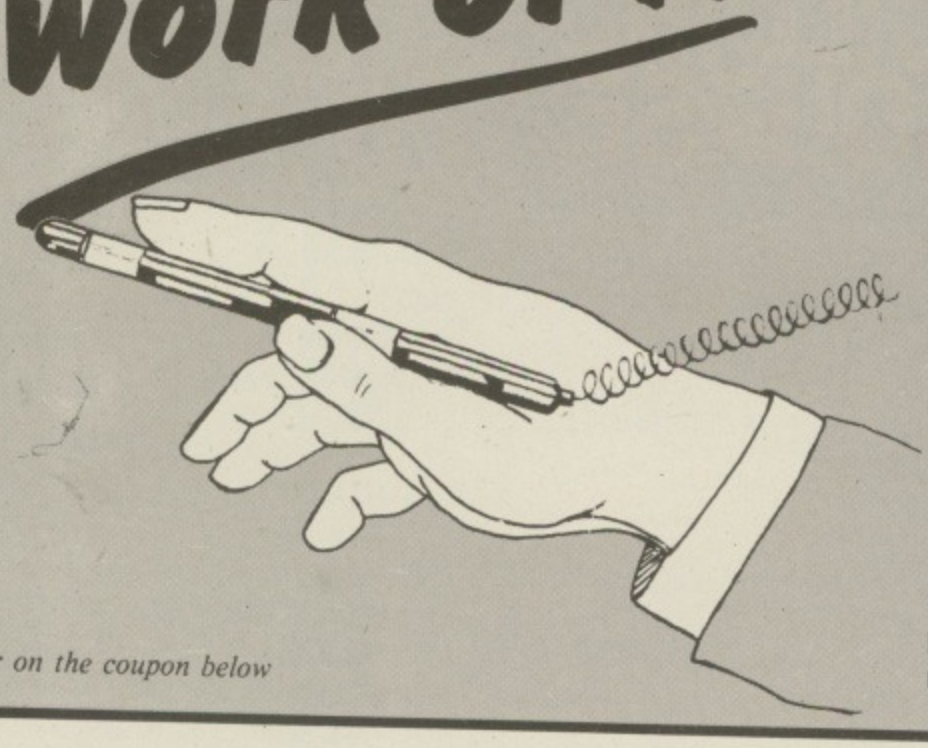
500 CLI
510 \DISPLAY SAMPLES
520 .SLINE LDX #0
530 STX &87
540 .LOOP LDX &80
550 \GET ADDRESS OF POINT TO ERASE
560 LDA &5400,X \GET LSB OF ERASE
    POINT
570 STA &82
580 LDA &5500,X \GET MSB OF ERASE
    POINT
590 STA &83
600 LDA &5300,X \GET VAL UE TO PLOT
610 EOR #&FF \INVERT TO COMPENSATE
620 TAY
630 LDA &5600,Y \LOOK UP LSB OF
    FIRST COLUM
640 CLC
650 ADC &87 \ADD X VAL UE
660 STA &84 \STORE MSB OF PLOT ADDRESS
670 STA &5400,X \STORE ERASE ADDRESS
680 LDA &5700,Y \LOOK UP MSB OF
    FIRST COLUM
690 ADC #0 \ADD X VAL UE
700 STA &85 \STORE MSB OF PLOT ADDRESS
710 STA &5500,X \STORE ERASE ADDRESS
720 LDX #0
730 \REM OVE OLD POINT
740 LDA (&82,X) \GET OLD DISPLAY
    BYTE
750 EOR &86 \INVERT APPROPRIATE
    BIT
760 STA (&82,X) \WRITE TO SCREEN
770 \PLOT NEW POINT ON THE SCREEN
780 LDA (&84,X) \GET DISPLAY BYTE
790 OR A &86 \SET APPROPRIATE BIT
800 STA (&84,X) \WRITE TO SCREEN
810 \MOVE POINTERS TO NEXT X POSITION
820 INC &80 \X POINTER
830 ROR &86 \PIXEL MASK
840 BCC LOOP
850 LDA #&80 \RESTORE MASK BIT
860 STA &86
870 LDA #7 \ADD 8 TO X VAL UE
880 ADC &87 \IT IS 8 AS CARRY IS
    SET
890 STA &87
900 BNE LOOP \LOOP IF NOT FINISHED
    ALL POINTS
910 LDA #129
920 LDX #&9D
930 LDY #&FF \TEST FOR SPACE BAR
940 JSR &FFF4
950 TXA
960 CMP #&FF
970 BNE START
980 RTS \FINISH WHEN SPACE PRESSED
990 .SGET LDA #&10 \SUBROUTINE
    TO GET A SAMPLE
1000 STA &FE60 \START CONVERSION
1010 .HOLD BIT &FE6D
1020 BEQ HOLD \LOOP TILL +VE TRANSITIO
     N OF CB1
1030 LDA &FE60
1040 RTS
1050 ]
1060 NEXT
1070 CLS
1080 VDU 24,0;0;1023;1023;
1090 VDU 28,32,31,39,0
1100 CLG
1110 PROC_SETUP
1120 PRINT "Expand"
1130 PRINT "Trigger"
1140 PRINT "Run"
1150 PRINT "?";
1160 A$=GET$
1170 IF A$="R"
     THEN PROC_WIPE
     :PROC_SETUP
     :PRINT "RUNNING"
     :CALL CODE%
     :PRINT
     :PRINT "NOW:-"
     :GOTO 1120
1180 IF A$="T"
     THEN PRINT
     :INPUT "VALUE",T%
     :?&81=T%
     :GOTO 1120
1190 IF A$<> "E"
     THEN 1160
1200 PRINT
1210 PRINT "SCALE"
1220 INPUT S%
1230 IF S%<1 OR S%> 100
     THEN PRINT "TOO MUCH"
     :GOTO 1210
1240 PRINT "JOINED ?"
1250 A$=GET$
1260 IF A$="Y"
     THEN J%=5
     ELSE J%=69
1270 P%=&5300
1280 CLG
1290 X%=-S%*4
1300 MOVE 0,?P%*4
1310 REPEAT
1320 X%=X%+S%*4
1330 PLOT J%,X%,?P%*4
1340 P%=P%+1
1350 UNTIL X%>1019
1360 GOTO 1120
1370 DEF PROC_WIPE
1380 CLG
1390 FOR A%=&5400 TO &55FF
1400 ?A%=&C0
1410 NEXT
1420 ENDPROC
1430 DEF PROC_SETUP
1440 CLS
1450 PRINT
1460 PRINT " SCOPE "
1470 PRINT
1480 PRINT "TRIG ";?&81
1490 PRINT
1500 PRINT "SPACE TO";
1510 PRINT " FREEZE"
1520 PRINT " TRACE"
1530 PRINT
1540 ENDPROC
```

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

Make light work of it



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If you're looking for new ideas, try Mike Cook's article on page 141 of this issue. He shows you how to achieve what many people thought impossible – single pixel resolution!

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Printer Monitor ROM *Watford*

Give your printer more brains than it was born with

THE Watford Printer Monitor ROM is a very interesting new product which positively reeks of Cambridge knowledge engineering.

The BBC MOS – Magnificent Operating System – makes provision for a printer driver routine to be attached to the MOS to which all characters intended for a printer will be sent.

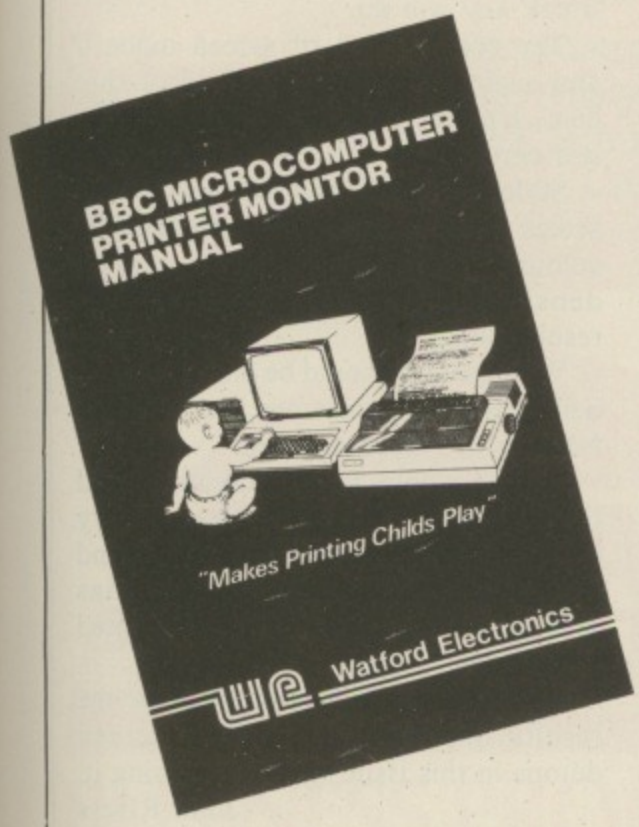
This is to allow printers which either do not conform to the Centronics or RS432 interface standards to be attached to the BBC Micro. Or, as in this instance, to give the printer more intelligence than it was born with.

The monitor performs three functions:

1. It can be set up to print with a left margin and top and bottom margins and to provide form feed and other paper feeding commands on printers which do not have these functions built in.
2. It will replace multiple, forgettable control codes for the printer's functions by single codes.
3. It will print user defined characters – provided the printer has a graphics mode which can be switched on and off in the middle of a line.

The ROM is supplied with a 50 page manual and a function key strip for your printer. The function keys are used to provide manual access to a range of printer functions – form feed, line feed, setting margins, selecting a character set and so on.

The manual is written at a high level and clearly the author is an expert on the BBC MOS.



However, fascinating though the technical notes are, the non-expert user, and even some who have been publicly exhibited as experts, find it hard going.

It needs quite a lot of digging to get things to work. Using the codes to turn on and off the various printer fonts is quite easy but when it gets on to setting margins it is difficult to find out how it should be done.

Setting up the monitor is however, quite easy. It needs the following commands:

- ***PRAM1** or **<1><D><D BREAK>** to allocate workspace. When using a word processor it is best to choose the private workspace option as it is usually not clear what part of memory which may be free under Basic will also be free under the word processor.
- ***PRINTER** <printer code> to select the required set of printer functions.
- ***PAPER66** or ***PAPER72** or ***PAPERCON** to choose a form length and top and bottom margins. The latter is for use with word processors and stops the Printer ROM interfering with the word processor's page layout.
- ***MARGIN hh** to select a left margin – 0 to be selected when using a word processor.

Using ***HELP STATUS** will now show that everything is in order. It will say:

1 private page
PMON parallel printer selected.

"1 private page" means that the machine operating system has given it a page of memory which, if the other ROMs are well behaved, will be kept for the printer ROM's use.

"PMON parallel printer selected" means that the printer is being assumed to be connected to the Centronics interface. If this is not so then issuing the command *FX5,6 will select the serial (RS423 or RS232C) output routines.

The printer monitor is now in control of the printer and every character sent to the printer – selected as usual by VDU 2 or CTRL-B – will pass through the monitor and be checked for job codes.

These are character codes which are not printed as characters but interpreted by the printer monitor as a command.

The job codes are detailed in the appendix corresponding to the printer type selected.

For instance, to use an Epson FX-80 appendix 6, for printer type EPb, gives an introductory discussion of what the printer monitor does and what is left to the printer's own functions, followed by a list of the character codes sent to the printer which are intercepted and interpreted by the monitor.

Without the printer monitor to start printing in italics you would have to send ??? and, what is worse, find it in the manual.

With the printer monitor you simply send code 184 and return to the normal font with the code 168.

The ROM recognises nine printers – Seikosha GP100, Tandy LPVII, DMP100 and DMP200, NEC PC8023 and Epson FX, RX and MX printers.

It will also work with the Seikosha GP80 and Tandy DMP120 but these do not support some of the functions of their more expensive or newer brethren, so the full range provided with the ROM cannot be used.

As has been mentioned before, it can be used with word processors. Unfortunately, although it can be used with Wordwise (using the Output Control code command) it cannot be used with View (with the Highlight commands).

It also seems unlikely that it can be used with Merlin Scribe as only printer codes in the range 0 to 31 can be embedded in Merlin Scribe text.

It is an excellent program though the manual could do with more examples and explanation for the novice user. Even so, to avoid looking up the codes in your printer manual and to be able to print user defined characters this ROM is worth buying.

C.W. Martin

● *Since this review was written Watford have announced that a more user friendly version of the manual is shortly to appear. The original manual was only a temporary version.*

ROM STANDS YOUR TEXT ON ITS END

Screen Dump ROM
D.A. Computers

I HAVE been looking for a handy way of copying graphics from the screen for some time.

As a teacher, the possibilities of children making a hard copy of their work has always appealed to me.

True, I could always load a screen dump program into the computer beforehand. But that did not give me the flexibility I was looking for.

What I wanted was a simple, and fast, way of telling the computer to send the information on the screen to the printer.

Just as I was pondering further on the problem, I found an advertisement in this magazine that seemed to fit the bill. It also said that it would magnify the dumped hard copy, too. Needless to say, a cheque went in the post the next day.

After two weeks, a small envelope came winging its way into my classroom.

On opening it I was rather surprised to find another, much smaller, envelope. On opening that, I found a well-wrapped and protected ROM chip.

On the front of the small envelope was a typed label telling me how to get further instructions, once I had fitted the ROM.

After the usual 10 minutes to fit, the ROM was ready to be utilised.

*H.G. was the command I was told to use, utilising the *HELP facility. This means that you would need a series 1.0, or later, operating system.

The instructions were, in turn, made into a hard copy by entering Ctrl B before using the *H.G. facility.

The resulting instructions, delivered in a novel and effective way, were on the whole quite clear.

The information section tells of the effects you can accomplish using the ROM.

It will enable you to print upright or sideways – the latter I have found useful for larger images – in single, double, triple, or quadruple size.

It will also select a portion of the screen, if desired.

BBC modes 0, 1, 2, 3, 4 or 5 can be used. Any printer mode can be used for Epson, Seikosha, CTI, NEC and others.

The syntax section, was not, at first, as clear as it could have been for someone, like myself, who is used to Wordwise.

I was confronted with the following syntax:

***GDUMP pc sc st mg bg x1 yb xr yt**

I admit I was told to follow the command *GDUMP with up to nine numeric arguments. But I nevertheless continued my *W. habit of putting numbers after what I thought to be command letters.

After three attempts it struck me quite by chance to try just the numbers.

I think, for the slow learners like me, it would have been simpler to have used the term WHERE. That is, where the letters stand for a series of up to nine spaced numeric arguments.

The numeric arguments themselves are very easy to use:

pc stands for PRINTERCODE. Examples are given, for the different printers, and your attention is drawn to the Escape * codes in the printer handbook. Default setting is 0. For example, Epson MX, and others, use 0 or 1 (where 1=Double density).

sc stands for SCALE. The range is 1 to 4. The value 3 is not strictly triple size, but rather a useful 1.5 × horizontal with a 2 × vertical scale.

Value 4, in conjunction with st, gives 3 × horizontal and 4 × vertical scale. Default setting is 2 × scale (H. & V.).

st stands for STYLE. 0 = upright or 1 = sideways print. You have to add 4 to these for four-colour shading, or 8 for eight-colour shading.

mg stands for MARGIN. This shifts the hardcopy print to the right where mg = normal character spaces.

bg stands for BACKGROUND. This sets the GCOL number of the background, normally 0 or 128. All other colours will print, and changing the bg will alter the allocation of shadings to colours.

WINDOW x x1 yb xr yt. These stand for the four sets of graphics co-ordinates, as in VDU24, enabling you to pick a specific part of the screen to be copied.

Default setting – all four zero (or omitted) treated as the whole screen.

There then follows a series of notes, among which is advice on halting the printing. Escape held down will not leave the printer hung-up as the Break key will do.

The combination of screen mode 0 and scale = 1 can cause loss of thin lines. Upright printing, in dual density, will cure this.

Styles 4 and 8 will not work with scales 1 and 2, presumably because the colour-shading dumps need a scale * density high enough to give full resolution.

Window size should be limited for the Seikosha (<479 dots per line) and the NEC (<639 dots per line).

On the whole, I have already found this ROM to be dependable and very useful and on present performance and versatility, this Screen Dump has proven to be well worth the £15 quoted at present.

For those of you wishing to use the results of the ROM, all the screen dumps in this issue were done using it.

John Rivers

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Edit Couldn't be simpler—just use the cursor keys.

Jump A very handy feature, allowing you to jump to any particular file you require.

Sort Not just the normal first field sort, but one which allows **you** to define the sort field.

Status Not found in normal data files, this is useful for it tells you the file name, when updated, files used, and most important how many files free.

Print A most important facility, allows the printing of the files, as required.

Delete Delates unwanted files, and at the same time the remaining records will be closed up.

Save Allows you to save the entire file to cassette. This can be loaded at the start when Data File is run.

To facilitate the ease of operation, all the above functions are on the red function keys, so needing just a single key stroke to bring into operation.

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There is also a list facility, even allowing the scrolling through the entire file.

Facility is also provided for alteration of any entry, with automatic update of the current balance. The balance itself can be altered, which is useful when using as a credit card account, as a monthly payment is made.

There is a clever little routine which allows you to estimate the effect any particular payment may have on your account, so you can see if you can really afford it or not!

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C) MERRY MUSIC turns the keyboard into a musical keyboard.
D) FUNNY FACES presents a line up, which one is the suspect?
E) FRED THE FROG needs co-ordinated help to get across the pond.

EARLY YEARS 2
A) THE POND seems very active today.
B) SPEED is required to keep the cake on the conveyor belt.
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D) ORDER the blocks.
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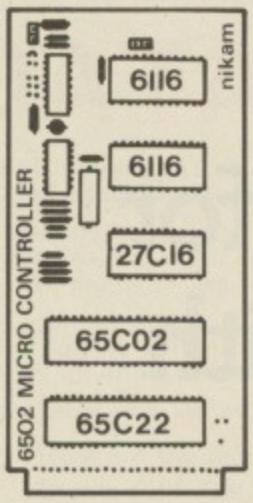

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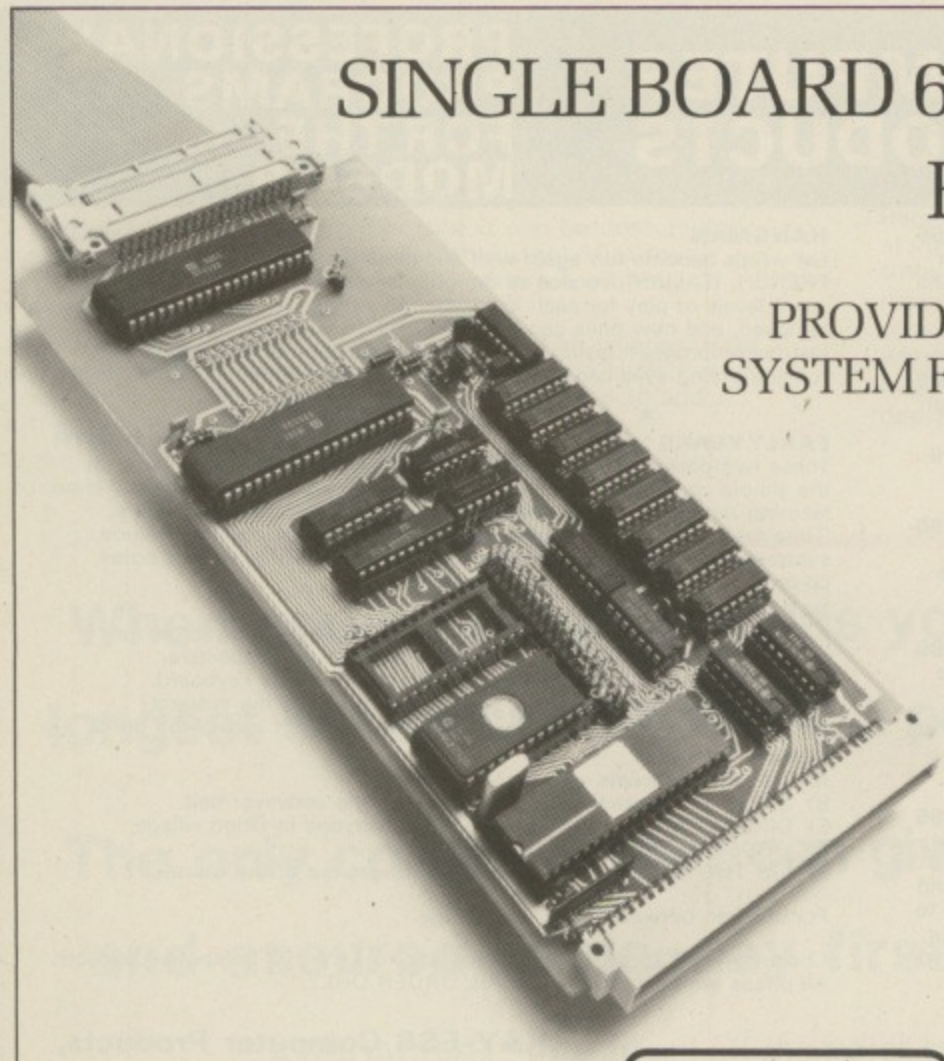

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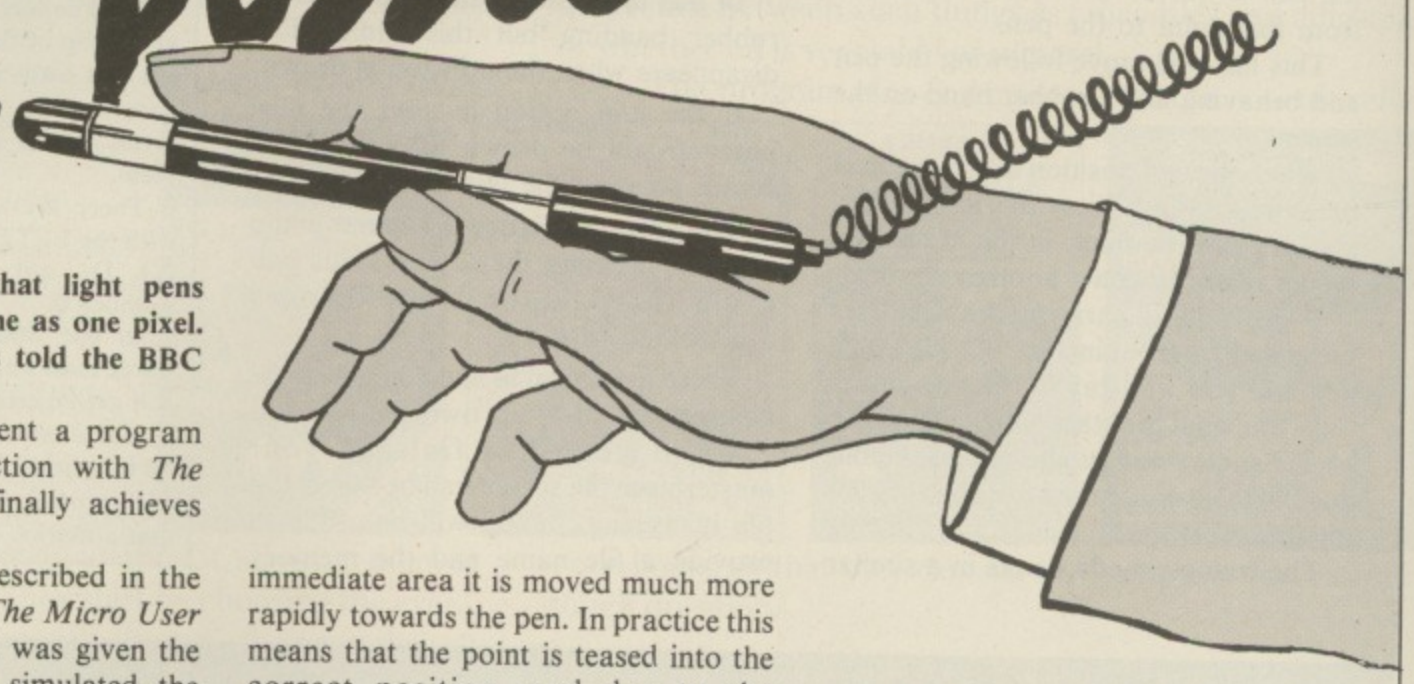
Light pen breakthrough!

Pixel resolution IS possible



EVERYONE knows that light pens cannot draw lines as fine as one pixel. Fortunately no-one has told the BBC Micro that!

This month we present a program which used in conjunction with *The Micro User* light pen finally achieves pixel resolution.

The pen itself was described in the October 1983 issue of *The Micro User* and a painting program was given the following month. This simulated the action of a paint brush and produced broad and flowing strokes.

Some artistic endeavours however, are more suited to a clean-cut graphical presentation and so the Draughtsman program has been produced.

The basic light pen is only capable of character resolution – that is, the computer can only sense the position of the pen to the nearest printing character. So in order to achieve pixel resolution we have to resort to some software trickery.

Those of you who have used the painting program will have noticed a small offset between the pen's position and the paint on the screen.

This is naturally compensated for by the brain, and leads to no difficulty in use. However, to coax pixel resolution out of the pen we can use this ability of the brain to good effect.

Consider Figure I. This shows one character position being pointed at by a light pen. If the pixel point we are interested in is in this square then it is not changed.

However if it is in one of the adjacent squares (shown shaded) it is moved one pixel position towards the pen.

If the point of interest is outside the immediate area it is moved much more rapidly towards the pen. In practice this means that the point is teased into the correct position, and due to the cleverness of the human brain is quite naturally achieved.

By MIKE COOK

As we now have a basic method of defining a pixel's position we are able to build the software around this.

Obviously a freehand sketch using the pen would be difficult to control. But as a draughtsman is concerned with straight lines we can use rubber banding techniques to position our line exactly.

When it is in position the press of a key will fix it permanently on the screen.

As well as rubber-banding single lines, we can also use triangles and rectangles and there is a routine for coping with circles.

When running the program the screen will go white to allow the pen to

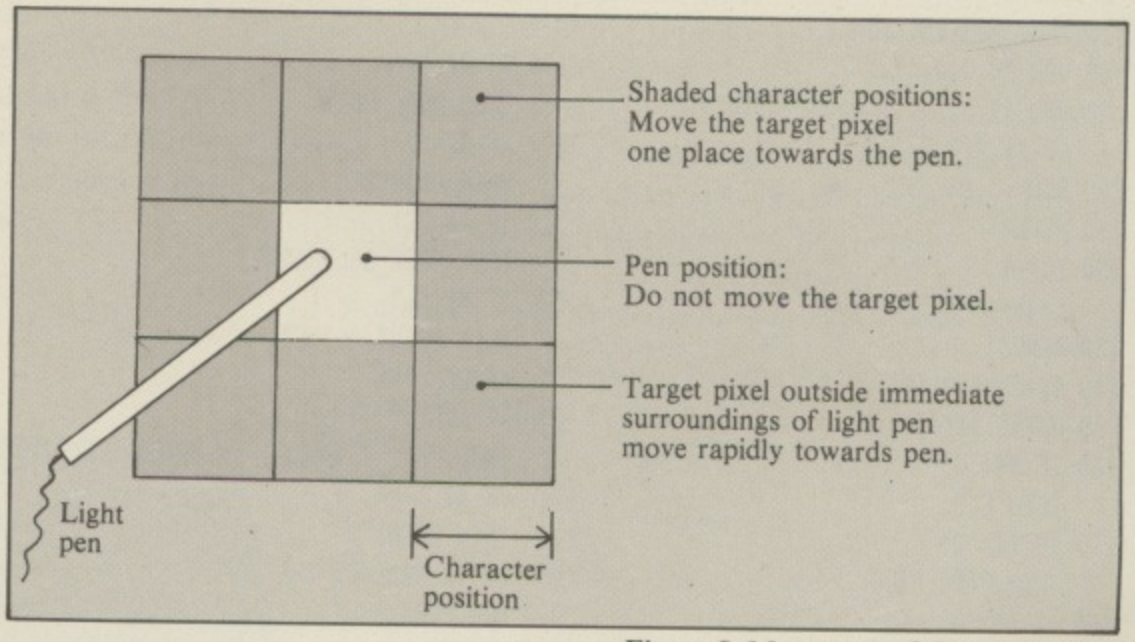


Figure I: Movement of the target pixel

From Page 141

pick up light. Nothing will happen until one of the modes is entered.

To do this type the letter for the appropriate mode. For example let's draw a straight line by pressing the L key.

The top line of the display should now say LINE. Take up the light pen and you should see a single lit pixel following the pen.

When it is in the correct position for the start of the line press any key. When the pen is moved a line will be drawn from this point to the pen.

This line will move following the pen and behaving like a rubber band on the screen.

When the end position of the line is at the correct place press the Return key and you will be back in the command mode, ready to draw another shape.

If you want to carry on drawing lines press the space bar instead of the Return key and you will stay in the line mode.

If you want the start of the new line to be the same point as the end of the old line then instead of the space bar press J for join.

The triangle mode works in a similar manner with first a line being rubber-banded and then the full triangle. In this mode the J key will join up the new triangle to the last side of the old one.

When drawing a rectangle the first point will fix one corner and the second point will fix the opposite corner. The join key will join the next rectangle to the last corner of the previous one.

When selecting the polygon mode you will be asked how many sides the polygon is to have. If you require a circle then a large number like 40 should be used.

In this mode the radius is defined by rubber banding but this radius line disappears when the polygon is drawn.

If the join option is used the new polygon will be drawn with the same centre point as the last one.

You can also change the colour of the lines by pressing the C key. This will cycle through the three colours available in Mode 1.

These are set up in line 90 and can be changed to suit your own preferences.

When you have finished your masterpiece the screen can be saved as a file by typing S. You will be asked to provide a file name and the memory locations that make up the screen will be saved.

For those of you with discs this file will be placed in the directory S for screen dump.

This will reduce the confusion between a screen dump file and a program. If you have tape then the characters S. will be added to the beginning of the file name.

The program also allows you to load a previously dumped file back to the screen to be worked on further. This is done by typing L.

Hints on typing in the program:

Line 80 defines a text window of one line at the top of the screen. This line is best left out until all the typing errors are corrected as any error messages will scroll off the top before you can read them.

There are some variables that start with the LETTER O such as OX% (Old X). Do not confuse these with the number 0.

In line 300 the space between the quote marks and the number is vital. You will get an error message if it is left out.

Unfortunately the error message is not all that helpful. In various lines (such as 150) note there is no space between the quote marks.

Draughtsman listing

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

```
 5 REM LIGHT PEN DRAUGHTSMAN -
   Mike Cook
10 M%=1
   :C%=3
20 MODE M%
30 PROC_LINT
40 TRIANGLE=FALSE
50 BLUE_IN_THE_FACE=FALSE
60 CLS
70 PROC_INSTRUCTIONS
80 VDU 28,0,0,39,0
90 VDU 19,0,7,0,0,0,19,7,4,0,0
   ,0,19,2,2,0,0,0
100 GCOL 3,C%
110 REPEAT
120 X%=-1
   :Y%=-1
130 REPEAT
140 A$=INKEY$ (0)
150 UNTIL A$<>""
160 IF A$="W"
   THEN CLG
170 IF A$="S"
   THEN PROC_FILE
180 IF A$="G"
   THEN PROC_GET
190 IF A$="P"
   THEN PROC_POLY
200 IF A$="R"
   THEN PROC_REC
210 IF A$="C"
   THEN PROC_COLCHANGE
220 IF A$="L"
   THEN PRINT "LINE";
   :PROC_LINE
230 IF A$="T"
   THEN PROC_TRIANGLE
240 IF A$<>"C"
   THEN PRINT
250 UNTIL BLUE_IN_THE_FACE
260 DEF PROC_FILE
270 PRINT
280 INPUT "FILE NAME FOR SAVED SCREEN
   ",F$
290 IF LEN (F$) < 1
   THEN ENDPROC
300 $CLI%="SAVE P."+F$+" 3000 8000"
310 X%= CLI% MOD 256
   :Y%=CLI% DIV 256
320 CALL &FFF7
330 X%=-1
   :Y%=-1
340 ENDPROC
350 DEF PROC_GET
360 PRINT
370 INPUT "FILE NAME OF SCREEN"
   ,F$
380 IF LEN (F$) < 1
   THEN ENDPROC
390 $CLI%="LOAD P."+F$
400 X%= CLI% MOD 256
   :Y%=CLI% DIV 256
410 CALL &FFF7
420 X%=-1
   :Y%=-1
430 ENDPROC
440 DEF PROC_COLCHANGE
```

The BBC Micro can now give your children a private education.

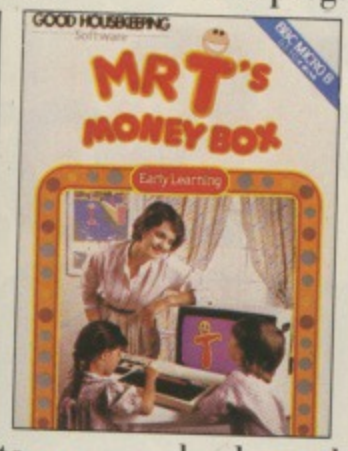
The BBC Microcomputer now accounts for 80% of the computers being ordered under the current D.O.I. Primary School Scheme.

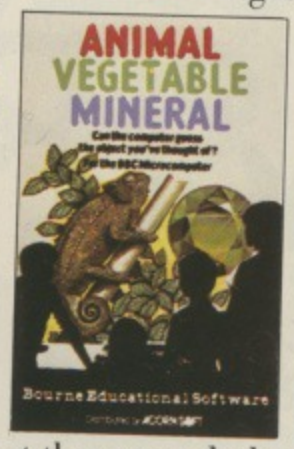
It's also the computer which a rapidly increasing number of people are choosing for their homes.

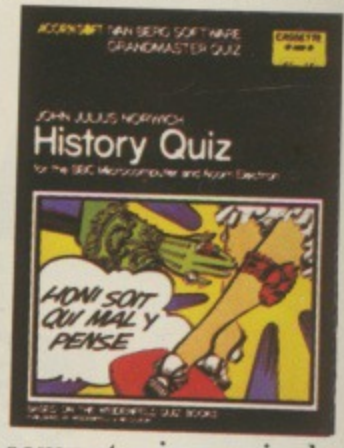
One of the reasons for its success is that it makes learning highly entertaining for everybody. From children who are getting to grips with the alphabet, to adults who want a gentle but intensive introduction to the complex world of computing.

Now, there's a substantial new catalogue of educational programs specially for the BBC Microcomputer.

It has been developed by Acornsoft, the software division of Acorn Computers who manufacture the BBC Micro.







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And if they really fancy dressing up, they can add earrings and hats.

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In Money Match, the challenge is to collect a set of coins, matching them according to shape, size and value.

In Money Box, you can give your child and Mr. T. a helping hand to get all the coins on the screen into the box. (It's always different, because the coins on the screen are based on the small change you have to hand.)

A chance to teach the Micro a thing or two.

With the Animal, Vegetable, Mineral program, the children can get the computer guessing.

They think of an object. The BBC Micro has to decide what it is.

If it doesn't come up with the answer, the children can keep giving it hints.

In doing so, they are encouraged to question the difference between such things as crocodiles and alligators, or whether oil is vegetable or mineral.

The program also encourages them to consult reference books so that they can ask the computer increasingly tough questions.

Questions on Julius Caesar from J. Julius Norwich.

John Julius Norwich's History Quiz is one of the new BBC Micro Grandmaster quiz series which also covers theatre, crime and detection, music, science fiction and royalty.

On the history front, there are 300 brain-testing questions, covering all aspects of British history from Julius Caesar to Margaret Thatcher.

And to increase the educational value, Mr. Norwich has posed the questions from angles which will give a broader understanding of events.

For the full catalogue, clip the coupon.

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Draughtsman listing

From Page 142

```
450 C%=(C%+1) AND 3
460 IF C%=0
    THEN C%=C%+1
470 COLOUR C%
    :GCOL 3,C%
480 PRINT "NEW COLOUR ";
490 ENDPROC
500 DEF PROC_BAND1
510 REPEAT
520 PROC_FOLLOW
530 A$=INKEY$ (0)
540 UNTIL A$<>""
550 OX%=X%
    :OY%=Y%
560 XT%=X%
    :YT%=Y%
570 ENDPROC
580 DEF PROC_BAND2
590 REPEAT
600 PROC_FOLLOW
610 MOVE OX%,OY%
620 PLOT 13,XT%,YT%
630 MOVE OX%,OY%
640 PLOT 13,X%,Y%
650 XT%=X%
    :YT%=Y%
660 A$=INKEY$ (0)
670 UNTIL A$<>""
680 MOVE OX%,OY%
690 PLOT 13,X%,Y%
700 ENDPROC
710 DEF PROC_LINE
720 REPEAT
730 IF A$<>"J"
    THEN PROC_BAND1
740 PROC_BAND2
750 GCOL 0,C%
760 MOVE OX%,OY%
770 DRAW X%,Y%
780 GCOL 3,C%
790 T1X%=OX%
    :T1Y%=OY%
800 OX%=X%
    :OY%=Y%
810 UNTIL A$=CHR$ (13) OR TRIANGLE=TRUE
820 ENDPROC
830 DEF PROC_TRIANGLE
840 PRINT "TRIANGLE";
850 REPEAT
860 TRIANGLE=TRUE
870 PROC_LINE
880 TRIANGLE=FALSE
890 REPEAT
900 T2X%=X%
    :T2Y%=Y%
910 PROC_TRIBAND(X%,Y%)
920 REPEAT
930 PROC_FOLLOW
940 PROC_TRIBAND(OX%,OY%)
950 OX%=X%
    :OY%=Y%
960 PROC_TRIBAND(X%,Y%)
970 A$=INKEY$ (0)
980 UNTIL A$<>""
990 PROC_TRIBAND(X%,Y%)
1000 GCOL 0,C%
1010 PROC_TRIBAND(X%,Y%)
1020 GCOL 3,C%
1030 IF A$<>CHR$ (13)
     THEN PLOT 69,X%,Y%
1040 T1X%=T2X%
     :T1Y%=T2Y%
1050 UNTIL A$<>"J"
1060 UNTIL A$=CHR$ (13)
1070 ENDPROC
1080 DEF PROC_TRIBAND(X%,Y%)
1090 MOVE T1X%,T1Y%
1100 PLOT 13,X%,Y%
1110 MOVE T2X%,T2Y%
1120 PLOT 13,X%,Y%
1130 ENDPROC
1140 DEF PROC_REC
1150 PRINT "RECTANGLE";
1160 REPEAT
1170 PROC_BAND1
1180 REPEAT
1190 PROC_RECBAND
1200 REPEAT
1210 PROC_FOLLOW
1220 PROC_RECBAND
1230 OX%=X%
     :OY%=Y%
1240 PROC_RECBAND
1250 A$=INKEY$ (0)
1260 UNTIL A$<>""
1270 PROC_RECBAND
1280 GCOL 0,C%
1290 PROC_RECBAND
1300 GCOL 3,C%
1310 IF A$<> CHR$ (13)
     THEN PLOT 69,X%,Y%
1320 XT%=X%
     :YT%=Y%
1330 UNTIL A$<>"J"
1340 UNTIL A$=CHR$ (13)
1350 ENDPROC
1360 DEF PROC_RECBAND
1370 MOVE XT%,YT%
1380 PLOT 13,XT%,OY%
1390 PLOT 13,OX%,OY%
1400 PLOT 13,OX%,YT%
1410 PLOT 13,XT%,YT%
1420 ENDPROC
1430 DEF PROC_POLY
1440 INPUT "POLYGON NUMBER OF SIDES"
     ,N%
1450 PRINT N%;" SIDED POLYGON";
1460 REPEAT
1470 PROC_BAND1
1480 REPEAT
1490 PROC_BAND2
1500 PROC_DPOLY(X%,Y%,OX%,OY%,N%)
1510 IF A$="J"
     THEN MOVE OX%,OY%
     :PLOT 13,X%,Y%
1520 UNTIL A$<>"J"
1530 UNTIL A$=CHR$ (13)
1540 ENDPROC
1550 DEF PROC_DPOLY(X,Y,XT%,YT%,N%)
1560 LOCAL C1,S1,P,R,A%,X1,Y1
1570 GCOL 0,C%
1580 P=2*PI /N%
1590 N%=N%+1
1600 C1=COS (P)
1610 S1=SIN (P)
1620 MOVE X,Y
1630 FOR A%=1 TO N%-1
1640 X1=XT%+(X-XT%)*C1-(Y-YT%)*S1
1650 Y1=YT%+(X-XT%)*S1+(Y-YT%)*C1
1660 X=X1
     :Y=Y1
1670 DRAW X,Y
1680 NEXT
1690 GCOL 3,C%
1700 PLOT 69,X%,Y%
1710 ENDPROC
1720 DEF PROC_FOLLOW
1730 PROC_LPOINT
1740 XT=PXPOS*32
1750 YT=(32-PYPOS)*32
1760 PLOT 69,X%,Y%
1770 IF ABS (XT-X%) >96
     THEN X%=X%+((XT-X%)/2)
     ELSE IF ABS (XT-X%)> 32
     THEN X%=X%+4*SGN (XT-X%)
1780 IF ABS (YT-Y%) >96
     THEN Y%=Y%+((YT-Y%)/2)
     ELSE IF ABS (YT-Y%) >32
     THEN Y%=Y%+4*SGN (YT-Y%)
1790 PLOT 69,X%,Y%
1800 ENDPROC
1810 DEF PROC_LINT
1820 DIM TLAG(7),LPC(7),GRAB% 20
     ,CLI% 27
1830 P%=GRAB%
1840 [
1850 LDX #16
1860 LDA #17
1870 STX &FE00
     :LDX &FE01
1880 STA &FE00
     :LDA &FE01
1890 RTS
1900 ]
```

Draughtsman listing

From Page 145

```
1910 RESTORE 1950
1920 FOR A=0 TO 7
1930 READ TLAG(A),LPC(A)
1940 NEXT
1950 DATA 1542,1,1542,2,1543,4,2053
     ,1
1960 DATA 2820,1,2820,2,3076,1,10248
     ,1
1970 ENDPROC
1980 DEF PROC_LPOINT
1990 REPEAT
2000 A%=ADVAL (1) DIV 64
2010 UNTIL A%>100
2020 PROC_LPOS
2030 ENDPROC
2040 DEF PROC_LPOS
2050 *FX19
2060 PVAL=(USR (GRAB%) AND &FFFF)-TLAG
     (M%)
2070 IF PVAL<0
     THEN PVAL=0
2080 LPR=80
2090 IF M%>3
     THEN LPR=40
2100 PYPOS=PVAL DIV LPR
2110 PXPOS=INT ((PVAL MOD LPR)/LPC(M%))
2120 ENDPROC
2130 DEF PROC_INSTRUCTIONS
2140 PRINT
2150 PRINT SPC (9);"LIGHT PEN DRAUGHTS
     MAN"
2160 PRINT SPC (13);"By Mike Cook"
2170 PRINT
2180 PRINT "First select a mode by
      typing a letter:-"
2190 PRINT
2200 PRINT "L - Draw a LINE"
2210 PRINT "T - Draw a TRIANGLE"
2220 PRINT "R - Draw a RECTANGLE"
2230 PRINT "P - Draw a POLYGON or
      CIRCLE"
2240 PRINT
2250 PRINT "Then move the dot with
      the light pen."
2260 PRINT
2270 PRINT "Press RETURN at the end
      of each stage"
2280 PRINT "or to stay in the mode
      press SPACE."
2290 PRINT "Alternatively pressing
      J as the last key";
2300 PRINT "will Join up the next
      shape."
2310 PRINT
2320 PRINT
2330 PRINT "Other commands are:-"
2340 PRINT
2350 PRINT "C - To change the COLOUR"
2360 PRINT "W - To Wipe the screen
      clean"
2370 PRINT "S - To SAVE the screen
      as a file"
2380 PRINT "G - To GET a screen previo
     usly saved"
2390 PRINT
2400 PRINT "Press any key to begin."
2410 A$=GET$
2420 CLS
2430 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 169.

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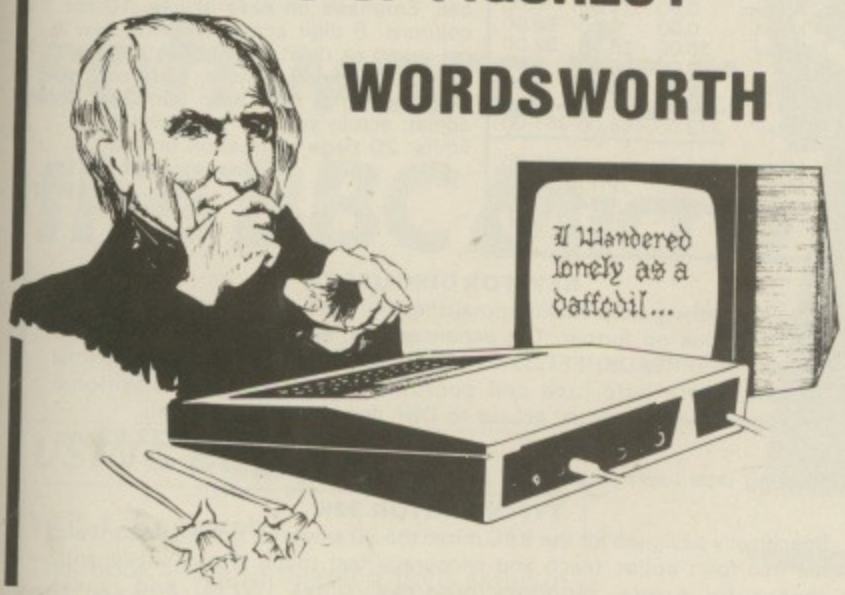

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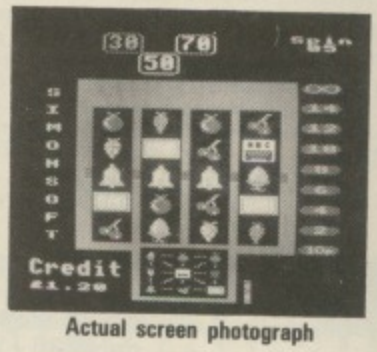

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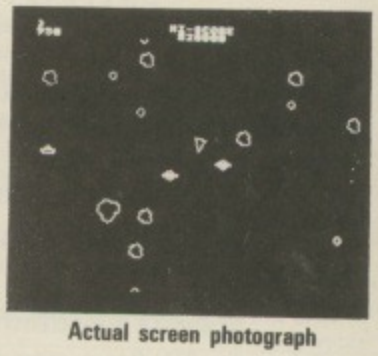
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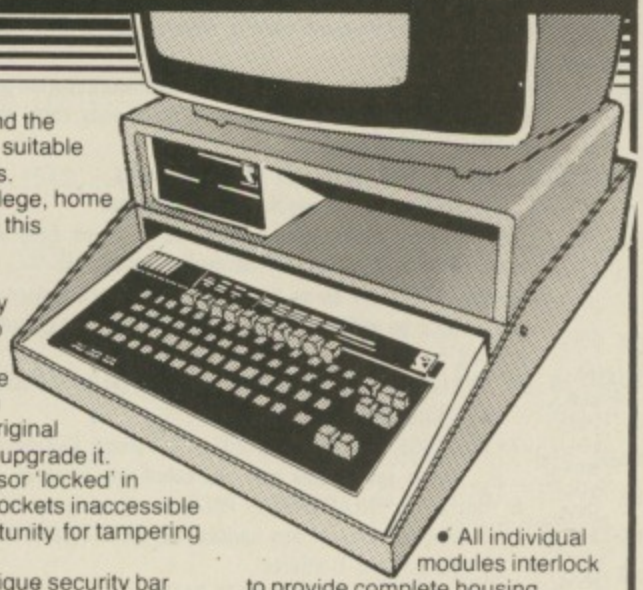

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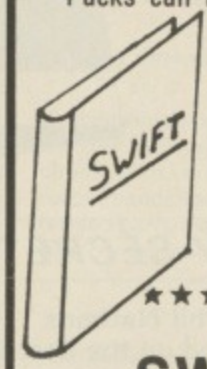

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Mazemunch listing

From Page 66

```
100 FOR T%=0TO NG%-1
    :PROCGHOST
    :NEXT
    :UNTIL LIVES%=0
110 RUN
120 DEF PROCGHOST
    :PROCMOVE
    :COLOUR 3
    :IF OG%(T%)=225 COLOUR 13
    ELSE IF OG%(T%)=238 COLOUR 0
130 IF TIME <(12-SCREEN%)*100
    VDU 19,T%+1,8;0;
    ELSE VDU 19,T%+1,T%+1;0;
140 IF PEEK%=-1 A%(10,10)=32
    :PRINT TAB(10,10);CHR$ 32
150 IF X%=GX%(T%)+DGX%AND Y%=GY%(T%)+
    DGY%AND TIME >(12-SCREEN%)*100
     PROCDIE
160 PRINT TAB(GX%(T%),GY%(T%));
    CHR$ (OG%(T%));
    :A%(GX%(T%),GY%(T%))=OG%(T%)
    :OG%(T%)=A%(GX%(T%)+DGX%,GY%(T%)+
    DGY%)
    :GX%(T%)=GX%(T%)+DGX%
    :GY%(T%)=GY%(T%)+DGY%
    :COLOUR T%+1
    :PRINT TAB(GX%(T%),GY%(T%));
    CHR$ 238
    :A%(GX%(T%),GY%(T%))=238
    :ENDPROC
170 DEF PROCMOVE
    :DGX%=0
    :DGY%=0
    :PROCX
    :IF TIME <(12-SCREEN%)*100 DGX%=-
    DGX%
    :IF DGX%+GX%(T%)>19OR DGX%+GX%(T%
    )<0 DGX%=0
180 PROCPEEK
    :IF PEEK%>225 DGX%=0
190 PROCY
    :IF TIME <(12-SCREEN%)*100 DGY%=-
    DGY%
200 PROCPEEK
    :IF PEEK%>225 DGY%=0
210 ENDPROC
220 DEF PROCX
    :DGX%=SGN (X%-GX%(T%))
    :ENDPROC
230 DEF PROCY
    :DGY%=SGN (Y%-GY%(T%))
    :ENDPROC
240 DEF PROCPEEK
    :PEEK%=A%(GX%(T%)+DGX%,GY%(T%)+DG
    Y%)
    :ENDPROC
250 DEF PROCMAN
    :COLOUR 5
    :Q%=0
    :P%=0
    :A%=INKEY (0)
    :*FX15,1
260 IF A%=-1ENDPROC
270 C%=C%+1
    :IF C%=238C%=236
280 IF A%=136P%=-1
290 IF A%=137P%=1
300 IF A%=90Q%=1
310 IF A%=65Q%=-1
320 PRINT TAB(X%,Y%);CHR$ 32;
    :A%(X%,Y%)=32
    :IF X%+P%>19 X%=0
    :P%=0
    ELSE IF X%+P%<0 X%=19
    :P%=0
330 L%=A%(X%+P%,Y%+Q%)
340 IF L%=-1 A%(10,10)=32
    :SC%=SC%+10*RND(5)
    :SOUND 1,1,100,10
350 IF L%=224 SC%=SC%+1
    :EAT%=EAT%+1
    :SOUND 0,2,125,1
360 IF L%=225 SC%=SC%+10
    :EAT%=EAT%+1
    :TIME =0
    :SOUND 1,2,255,20
370 IF L%>225AND L%<>238 P%=0
    :Q%=0
380 IF L%=238AND TIME >(12-SCREEN%)*1
    00 PROCDIE
    ELSE IF L%=238AND TIME <(12-SCREE
    N%)*100 PROCCHECK
    :PROCMUNCH
390 IF EAT%>=212 COLOUR 5
    :PRINT TAB(X%+P%,Y%+Q%);CHR$ (C%)
    ;
    :PROCCOLOURS
    :PROCSCREEN
    :EAT%=0
    :PROCMEN
    :PROCREPLACE
    :SCREEN%=SCREEN%+1
    :PROCSCREENCOUNT
400 X%=X%+P%
    :Y%=Y%+Q%
    :PRINT TAB(X%,Y%);CHR$ (C%);
    :A%(X%,Y%)=32
    :COLOUR 3
    :PRINT TAB(4,0);SC%;
    :ENDPROC
410 DATA 8,3,3,3,3,3,3,3,3,4
420 DATA 2,0,0,0,0,0,0,0,0,2
430 DATA 2,0,8,9,0,8,3,9,0,2
440 DATA 2,0,2,2,0,2,-1,2,0,2
450 DATA 2,0,10,11,0,10,3,11,0,10
460 DATA 2,0,0,0,0,0,0,0,0,0
```

```
470 DATA 2,0,3,3,0,2,0,3,3,4
480 DATA 2,1,0,0,0,2,0,0,0,2
490 DATA 6,3,3,9,0,6,3,3,0,10
500 DATA 2,-1,-1,2,0,2,0,0,0,0
510 DATA 2,-1,-1,2,0,2,0,8,3,3
520 DATA 10,3,3,11,0,2,0,2,-1,-1
530 DATA 0,0,0,0,0,0,0,2,-1,-1
540 DATA 8,3,3,9,0,2,0,10,3,3
550 DATA 2,-1,-1,2,0,2,0,0,0,0
560 DATA 2,-1,-1,2,0,2,0,8,3,3
570 DATA 6,3,3,11,0,2,0,10,3,9
580 DATA 2,0,0,0,0,0,0,0,0,2
590 DATA 2,0,8,9,0,3,3,3,0,10
600 DATA 2,0,10,2,0,0,0,0,0,0
610 DATA 2,1,0,2,0,2,0,8,3,3
620 DATA 6,3,0,2,0,2,0,10,9,-1
630 DATA 2,0,0,0,0,2,0,0,2,-1
640 DATA 2,0,3,3,3,5,3,0,10,3
650 DATA 2,0,0,0,0,0,0,0,0,0
660 DATA 10,3,3,3,3,3,3,3,3,3
670 DEF PROCSCREEN
    :FOR T=0TO 15
    :VDU 19,T,0;0;
    :NEXT
    :CLS
    :RESTORE
    :FOR Y=1TO 26
    :FOR X=0TO 9
    :COLOUR 4
    :READ A
    :IF A=-1 A%(X,Y)=32
    :A%(19-X,Y)=32
    :GOTO 740
680 IF A=0 COLOUR 3
    :PRINT TAB(X,Y);CHR$ 224
    :A%(X,Y)=224
    :PRINT TAB(19-X,Y);CHR$ 224
    :A%(19-X,Y)=224
    :COLOUR 4
    :GOTO 740
690 IF A=1 COLOUR 13
    :A%(X,Y)=225
    :PRINT TAB(X,Y);CHR$ 225
    :GOTO 730
700 COLOUR 4
    :PRINT TAB(X,Y);CHR$ (224+A);
    :A%(X,Y)=224+A
    :IF A>=6 A=A+1
```

Mazemunch listing

From Page 151

```
710 COLOUR 4
    :C=0
    :IF A=8 A=9
    :C=1
    ELSE IF A=10 C=1
    :A=8
720 IF A=10AND C=0 A=11
    ELSE IF A=12AND C=0 A=10
730 PRINT TAB(19-X,Y);CHR$ (224+A)
    :A%(19-X,Y)=224+A
740 NEXT
    :NEXT
    :A%(10,10)=32
    :PRINT TAB(10,10);CHR$ 32
    :VDU 20,19,8,1;0;19,9,2;0;
    :COLOUR 8
    :PRINT TAB(0,0);"1UP ";TAB(9
    ,0);"HIGH ";
    :COLOUR 3
    :PRINT ;H%
    :ENDPROC
750 PRINT TAB(19-X,Y);CHR$ (224+A)
760 DEF PROCCHARS
    :VDU 23,225,0,0,24,60,60,24
    ,0,0,23,226,24,24,24,24,24,24
    ,24,24,23,227,0,0,0,255,255
    ,0,0,0,23,228,0,0,0,255,255
    ,24,24,24,23,229,24,24,24,255
    ,255,0,0,0,23,243,16,40,116
    ,116,116,254,24,0,23,244,0,16
    ,8,8,8,8,0,0
770 VDU 23,245,12,30,30,12,48,120
    ,120,48,23,246,0,2,0,0,16,0
    ,0,0,23,247,128,96,64,32,0,0
    ,0,0,23,248,111,172,237,185
    ,63,28,8,56,23,249,15,72,8,0
    ,0,0,8,56,23,250,0,128,128,128
    ,0,0,0,56,23,252,0,0,86,32,74
    ,36,72,16
780 VDU 23,230,24,24,24,31,31,24
    ,24,24,23,231,24,24,24,248,248
    ,24,24,24,23,233,0,0,0,248,248
    ,24,24,24,23,232,0,0,0,31,31
    ,24,24,24,23,242,56,40,56,16
    ,16,48,16,48,23,238,24,189,90
    ,90,255,129,66,36,23,251,0,126
    ,255,255,255,126,124,56
790 VDU 23,255,0,0,0,0,0,0,0,0,23
    ,254,145,82,0,195,0,36,65,129
800 VDU 23,234,24,24,24,31,31,0
    ,0,0,23,235,24,24,24,248,248
    ,0,0,0,23,224,0,0,0,16,0,0,0
    ,0,23,236,90,60,90,255,129,129
    ,66,60,23,237,90,60,90,255,129
    ,126,126,0,23,240,0,108,234
    ,254,254,254,124,56,23,241,24
    ,16,16,0,0,0,0,0
    :ENDPROC
810 DEF PROCINIT
    :X%=10
    :Y%=20
    :Q%=0
    :P%=0
    :L%=32
    :C%=236
    :EAT%=1
    :SC%=0
    :NG%=2
    :LIVES%=3
820 A$(0)=CHR$ 5+CHR$ 18+CHR$ 0+
    CHR$ 5+CHR$ 240+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 9+CHR$ 241+CHR$ 4
    :A$(1)=CHR$ 5+CHR$ 18+CHR$ 0+
    CHR$ 3+CHR$ 242+CHR$ 4
    :A$(2)=CHR$ 5+CHR$ 18+CHR$ 0+
    CHR$ 3+CHR$ 243+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 7+CHR$ 244+CHR$ 4
830 A$(3)=CHR$ 5+CHR$ 18+CHR$ 0+
    CHR$ 8+CHR$ 245+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 3+CHR$ 246+CHR$ 8+
    CHR$ 18+CHR$ 0+CHR$ 9+CHR$ 247+
    CHR$ 4
840 A$(4)=CHR$ 5+CHR$ 18+CHR$ 0+
    CHR$ 6+CHR$ 248+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 4+CHR$ 249+CHR$ 8+
    CHR$ 18+CHR$ 0+CHR$ 3+CHR$ 250+
    CHR$ 4
    :A$(5)=CHR$ 5+CHR$ 18+CHR$ 0+
    CHR$ 8+CHR$ 251+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 3+CHR$ 252+CHR$ 8+
    CHR$ 18+CHR$ 0+CHR$ 9+CHR$ 241+
    CHR$ 4
850 FOR T=0TO NG%-1
    :GX%(T)=7+T
    :GY%(T)=15
    :OG%(T)=224
    :NEXT
    :SCREEN%=1
    :A%(X%,Y%)=32
    :COLOUR 5
    :PRINT TAB(X%,Y%);CHR$ (C%);
    :ENDPROC
860 DEF PROCDIE
    :COLOUR 13
    :PRINT TAB(X%,Y%);CHR$ 254
    :FOR G=255TO 0STEP -10
    :SOUND 1,-15,G,1
    :NEXT
    :LIVES%=LIVES%-1
    :FOR T=0TO NG%-1
    :COLOUR 3
    :IF OG%(T)<>224 COLOUR 13
870 IF LIVES%=0 PROCDED
880 PRINT TAB(GX%(T),GY%(T));
    CHR$ (OG%(T));
    :A%(GX%(T),GY%(T))=OG%(T)
```

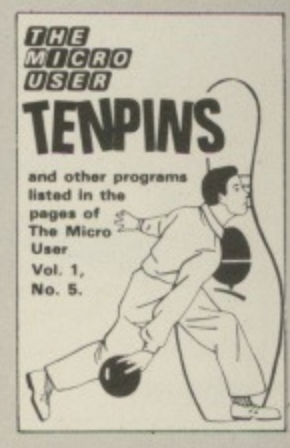
```
    :GX%(T)=7+T
    :GY%(T)=15
    :OG%(T)=A%(GX%(T),GY%(T))
    :A%(GX%(T),GY%(T))=238
    :COLOUR T+1
    :PRINT TAB(GX%(T),GY%(T));
    CHR$ 238;
    :NEXT
890 A%(X%,Y%)=32
    :PRINT TAB(X%,Y%);CHR$ 32
    :C%=236
    :COLOUR 5
    :X%=10
    :Y%=20
    :P%=0
    :Q%=0
    :PRINT TAB(X%,Y%);CHR$ (C%);
    :DGX%=0
    :DGY%=0
    :PROCMEN
    :ENDPROC
900 DEF PROCMUNCH
    :SOUND 3,3,100,10
    :SC%=SC%+50
    :COLOUR 3
    :IF OG%(T%)<>224 COLOUR 13
910 IF OG%(T%)=225 SOUND 3,3,100
    ,10
    :TIME =0
920 PRINT TAB(GX%(T%),GY%(T%));
    CHR$ (OG%(T%));
    :A%(GX%(T%),GY%(T%))=OG%(T%)
    :GX%(T%)=7+T%
    :GY%(T%)=15
    :OG%(T%)=A%(GX%(T%),GY%(T%))
    :A%(GX%(T%),GY%(T%))=238
    :COLOUR T%+1
    :PRINT TAB(GX%(T%),GY%(T%));
    CHR$ 238;
    :ENDPROC
930 DEF PROCCHECK
    :J%=-1
    :T%=0
    :REPEAT
    :J%=J%+1
    :IF GX%(J%)=X%+P%AND GY%(J%)=Y%+Q
    % T%=J%
940 UNTIL J%=NG%
```

March Issue
DEATHWATCH, a superb arcade game **BINGO,** clever uses of the randomise function; **BUBBLESORT** routines; **TESTS** function keys in machine code. 0.1 **COLOUR** and **GRAPHICS ROUTINES:** create a kaleidoscope of screen designs.

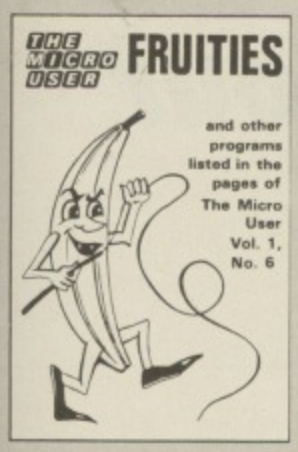
April Issue
KING KONG, rescue girls from the Empire State Building before killing Kong. **NIM,** a structural game of strategy. **TOKENS,** unravel the Basic ROM; **FORMATTER,** an essential disc utility; **DISASSEM,** a full machine code disassembler.

May Issue
AIR STRIKE, a fast and furious arcade game; Test your mental powers with **PELMANISM; ANAGRAMS,** the word game. **CHARACTER,** generate vertical and inverted text. **TELETEXT,** animation in Mode 7. **BEEB,** two joystick exercises.

June Issue
SPACE PILOT, lost in space you must fight off repeated attacks from alien life forms. **NOMISM,** you are a nomadic herdsman desperately trying to eke out a living on the plains of Africa. **COLOURFUL CHARACTERS PLUS** other listings from the June issue.



July Issue
TENPIN, a simulation of Tenpin Bowling; **SPACEPODS,** beat the alien hordes; **CUP,** Exciting 3D graphics techniques **TEST** and **STEADY,** programs to accompany the Beeb Body Building Course. **BREAKFIX,** Don't let Break destroy your precious variables!



August Issue
FRUITIES, driven by strange urges you climb the ladders of adventure to risk all in the gardens of unearthly frights. **ANIMATION,** a suite of programs that really bring your screen alive; **CASDISC,** the machine code downloader for your disc system; **MODE** 7 colour routines.

September Issue
ROBIN & MARIAN, rescue Maid Marian from the Sheriff of Nottingham. **GALACTIC INVADERS,** an exciting arcade game. **DFS BENCHMARKS,** 14 DFS test programs. **ANIMATION,** new techniques. **TERMINAL,** connect a BBC Micro to a mainframe.

October Issue
FISHING, a compulsive day's angling. **JOYKEY,** convert programs to joystick. **PENTEST** and **BELLRINGER,** for Micro User light pens. **CONTOURS,** an educational program. **LINK** BBC Micros to each other. **PLUS** all the listings from the first Electron User.

Micro User programs now on disc as well as on cassette!

Since we started our highly successful cassette service to readers we have been inundated with requests to supply each month's programs on disc.

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We've even incorporated an automatic menu downloader. Just boot up the disc, make your choice from the menu, and away you go!

And all for £5.75 a disc, including post and packing.

Of course, our very popular cassette tapes of the month's programs are still available. The price for these is unchanged – £3.75 a cassette, including post and packing.

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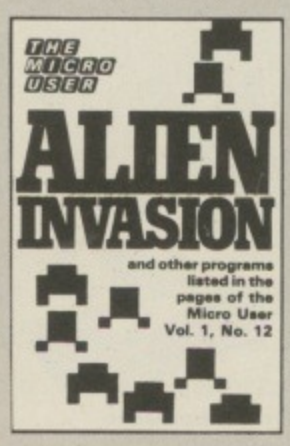
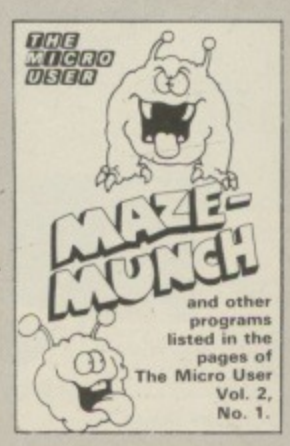
November Issue
GOBLINS, an enchanted journey. **BLACKJACK,** the casino favourite. **CHARGE** and **PENDULUM,** Body Building Course part 9. **SIDEWAYS:** programs in ROMs. **PENDRAW,** a light pen sketching program. **PLUS** all the programs from the second Electron User.

December Issue
TOWER, rescue London's treasure **SANTA,** help Father Christmas deliver his presents. **VDU 23,** an invaluable character defining utility. **PAGED,** the listing from our paged graphics article. **PLUS** all the listings from the third issue of Electron User.

January Issue
BARRELS, an all-action arcade game. **NOTEPLAY,** an entertaining musical utility. **DUMP1** and **DUMP2,** multitone screen dumps. All the programs from our **SOUND, BEGINNERS'** and **GRAPHICS** articles **PLUS** 12 programs from the fourth Electron User.



February Issue
INVASION, the classic arcade game. **FROGS,** fun for all the family. **ENGVGEN,** a logic game. **BALANCE,** a number learning program. **KEY,** single key entry for the BBC Micro **PLUS** nine other programs from The Micro User.



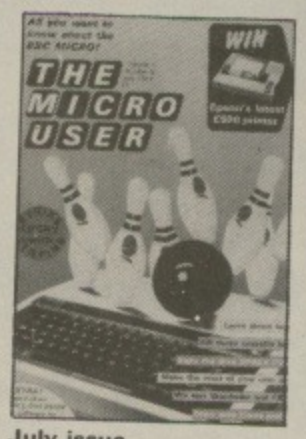
March Issue
MAZEMUNCH, blockbusting arcade action. **BIRTHDAY,** family fun for our anniversary. **DERRICK,** number fun for infants. **PIXELPEN,** high resolution for lightpens. **LOADTAPE,** a recovery utility. **PLUS** 18 other programs from the pages of Micro User.

March issue
Beginners: guide to the keyboard. Build your own games paddle. Word processor review. Guide to text colours and graphics. BBC operating system, Part 1. How to avoid cassette loading problems. Deathwatch listing. Upgrade Model A to B at half the shop price. Shapes program. Bingo listing. Sorting routines. Test for function keys in machine code routines. Colour monitors, Part 1.

April issue
Beginners: simple programming. Impressive graphics with Teletext Mode 7. Common copying errors revealed. How to draw multi-coloured lines. King Kong listing. BBC Operating System, Part 2. Colour monitor review, Part 2. Upgrade Model A to B, Part 2. Finding the ROM's action addresses. Binary code and how to use it. Disc formatter listing. Plus 8-page pullout for Basic programmers.

May issue
Beginners: string variables. Pelmanism listing. Mode 7 animation, Part 2. Interfacing in the laboratory. How to generate vertical or even inverse text. Graphics course: triangles and rectangles. Build yourself a joystick. The Osbyte routine: full investigation. Air Strike listing. Anagrams listing. Structured programming, Part 1. How to make full use of the BBC's editing function.

June issue
Beginners: Use of the INPUT statement. Editing course: LIST and LISTO. Structured programming, Part 2. Solve cassette problems. Build your own graphics digitiser. Hidden *FX calls. Guide to indirection operators. Single key memory display program. Space Pilot listing. Graphics course: text and graphics windows. Nomsim listing. Bring user defined characters to life. Speed chip review.



July issue
Beginners: loops. Ten Pins listing. Editing course: the PRINT statement. Graphics course: creating sunburst effects. Structured programming, Part 3. How to use the user port to maximum effect. Space Pods listing. Wordwise review. Epson FX80 printer review. The BBC Micro as a sophisticated design tool. Hexadecimal highlights. How to edit with impunity, and fix that break key.

August issue
Beginners: more help on loops. BBC Micro User's Manchester show reviewed. Animation, Part 1. BBC Buggy and Edinburgh Turtle reviewed. Techniques for switching from tape to disc. Structured programming, Part 4. Inside King Kong: case study of the popular game. Fruities listing. A guide to logical operators. Machine code routines to give Mode 7 colour. Build your own dual cassette system.

September issue
Animation Part 2. Editing course: use of TAB. Turn your BBC Micro into a graphics terminal. Galactic Invaders listing. Structured programming. Part 5. Two new DFS and APTL Eprom blower reviewed. Control the outside world safely with your BBC Micro. Robin and Marian listing. Workshop: variable storage explained. Beebcalc investigated. Inside the Electron: Acorn's latest micro reviewed.

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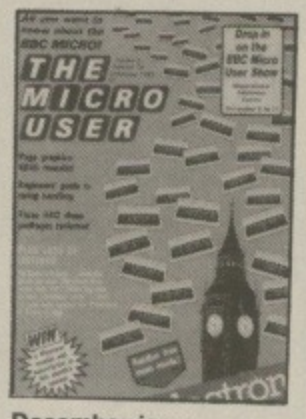
October issue
Graphics: How to draw circles. Fishing. Structure, the last of the series. Format: We update the program. Make a light pen with Body Building Part 8. Editing: Print fields. The Hobbit reviewed. Workshop: Add joysticks to your games. Link Up: Join two BBC Micros. For . . . NEXT loops in Beginners' Part 7. Contour plotting program. Basicode, a computer communications language.

November issue
Beginners: guide to character codes. Light Pen, more useful software. Forth ROM reviewed. Blackjack, a compulsive simulation of the card game. Putting Basic programs into sideways ROMs. Goblins, a fun packed enchanted journey. Body Building Part 9, projects for the Physics lab. The SOUND command explained, Part 1. Games design: improve your programs.



December issue
Tower Bridge – ghostly encounters in the nation's capital. Paged Graphics: 6845 animation techniques. Character Definer an indispensible utility. Smartmouth reviewed. Sound explained, part 2. Body Building, a sound-to-pattern converter. Beginners, working with strings. Slow Down, alters pace of your programs. Graphics: User defined characters. Santa's Saucer and Christmas Card.

January issue
Barrel Battle – an all action arcade game. Graphics, an easy to follow introduction to multiplane images. Noteplay, an entertaining musical utility. Body Building: add a DFS to your micro. Printing, Pixels, a multitone screen dump for Epson printers. Sound advice, flushing sound queues. Beginners, the use of TAB. Adventures, our regular column begins. Bits and Bytes investigates binary operations.

February issue
Alien Invasion – Mode 7 action in this arcade blockbuster. Frogs'n'Dogs, a delightful game for all the family. Number Balance – simple sums for children. Body Building, a real time clock. Sound Shaper, an easy-to-use envelope generator. Single Key Entry, save wear and tear on your fingers. DIY ROM board, full constructional details. Gallery, an intriguing logic game. Sound Advice, synchronising channels.

Mazemunch listing

From Page 152

```
    :IF OG%(T%)>32 EAT%=EAT%+1
950 ENDPROC
960 DEF PROCMEN
    :COLOUR 5
    :IF LIVES%>0 PRINT TAB(9,13);
    STRING$(LIVES%-1,CHR$ 236);"
     ";
970 ENDPROC
980 DEF PROCREPLACE
    :FOR T=0TO NG%-1
    :GX%(T)=7+T
    :GY%(T)=15
    :OG%(T)=A%(GX%(T),GY%(T))
    :A%(GX%(T),GY%(T))=238
    :COLOUR T+1
    :PRINT TAB(GX%(T),GY%(T));
    CHR$ 238;
    :NEXT
    :DGX%=0
    :DGY%=0
    :X%=10
    :Y%=20
    :P%=0
    :Q%=0
    :COLOUR 5
    :PRINT TAB(X%,Y%);CHR$ (C%);
    :A%(X%,Y%)=32
    :ENDPROC
 990 DEF PROCSCREENCOUNT
    :IF SCREEN%<=20 FOR H=0TO SCREEN%
    -1
    :MOVE H*64,156
    :PRINT A$(H MOD 6);
    :NEXT
    :ENDPROC
    ELSE MOVE 0,156
    :PRINT A$((SCREEN%-1) MOD 6);
    :COLOUR 2
    :PRINT TAB(1,27);"=";SCREEN%
    :ENDPROC
1000 DEF PROCCOLOURS
    :FOR F=15TO 1STEP -1
    :FOR J=0TO 400
    :NEXT
    :VDU 19,4,F;0;
    :NEXT
    :CLS
    :ENDPROC
1010 DEF PROCFRUIT
    :PRINT TAB(10,10);" ";
    :MOVE 640,700
    :PRINT A$((SCREEN%-1) MOD 6);
    :A%(10,10)=-1
    :ENDPROC
1020 DEF PROCDED
    :COLOUR 3
    :PRINT TAB(5,15);"GAME OVER"
    :IF SC%>H%H%=SC%
1030 COLOUR 8
    :PRINT TAB(0,0);"1UP ";TAB(9
    ,0);"HIGH ";
    :COLOUR 3
    :PRINT ;H%
    :FOR H=0TO 10000
    :NEXT
    :RUN
1040 IF ERR =17RUN
    ELSE REPORT
    :PRINT " at line ";ERL
    :*FX12,0
```

This listing is included in this month's cassette tape offer. See order form on Page 169.

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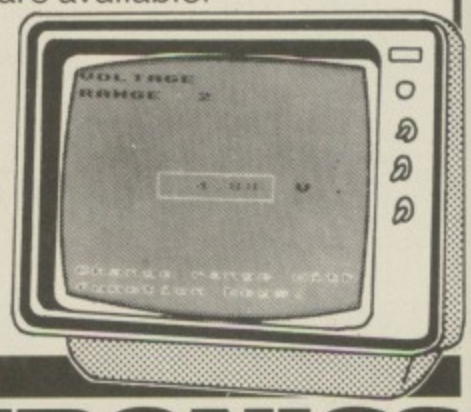

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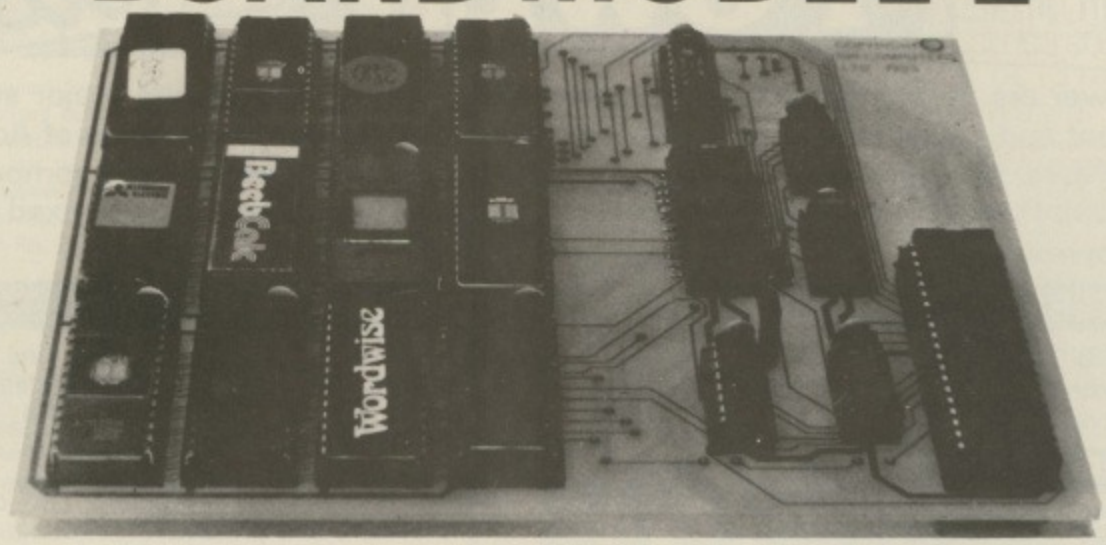

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tion should make the rest of the game clear.

PROCEDURES

PROCinstructions [1300] prints out the instructions for the game in Mode 7.

PROCinit [1460] sets up the constants for the game, dimensions the arrays, defines characters and logical colours and sets the initial numbers of gusts *(number%)*.

PROCsetup [200] sets the scene for each new "sheet". It calculates the number of walls needed *(W%)*, clears *out* and *lit*, puts the candle and flame on the screen and calls procedures to place the walls and gusts.

PROCplacewalls [1070] randomly places walls on the screen. A REPEAT ... UNTIL loop ensures that no wall is placed on top of another by using FNtest.

PROCplacegusts [370] randomly places the required number of gusts on the screen using FNposition to make sure there isn't another gust too close and FNtest to avoid walls.

PROCMOVEgusts [300] uses a loop to call PROCmovegust the required number of times.

PROCmovegust [520] "intelligently" moves the gusts towards the flame by using the sign of the difference between the x coordinates, and that of the difference between the y coordinates to decide the directions horizontally and vertically the gust should move. It then picks one of these at random, occasionally allowing both – to give the dreaded diagonal movement. No movement is allowed if you run into the wall or the candle's wick (FNtest takes care of the rest of the candle!). Also, if a gust hits the flame, *out* is set.

PROCmoveflame [680] flushes the keyboard buffer, then quickly checks to see if any movement keys are pressed, and if the move is legal. If you're slow you miss your go. The procedure beeps, then checks to see if any gust has landed on the flame – if so *out* is set.

PROCmusic [860] when you light the candle this plays ... well, it's obvious isn't it?

FNtest [1220] checks to make sure a position doesn't contain a wall (using OSBYTE 135) or the bottom bits of the candle. We don't check for the wick here as we want the flame to be allowed to reach it. Gusts are prevented from blocking it within PROCmovegust [650].

FNpostion [990] makes sure that the gusts are not placed too close to each other initially.

Error Check [1580] traps the Escape key. It also prints out details of other errors you may have made.

VARIABLES

w%	Number of walls.
number%	Number of gusts at that flame.
light%	Position of the moving flame.
flame%	The position of the wick, used for checking a win.
w%( )	Holds the positions of walls.
gust%( )	Holds positions of gusts.
out	Logical variable set if a gust "lands" on the flame.
lit	Logical variable set if flame reaches the wick at *flame%*.
candle$, wall$, flame$	Strings containing the user defined character shapes plus any necessary colour changes and cursor movements.

Birthday listings

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

```
10 REM (C) MICRO USER 1984
20 REM Michael Noels
30 ON ERROR GOTO 1600
40 MODE 7
50 PROCinstructions
60 MODE 1
70 PROCinit
80 REPEAT
90 PROCsetup(number%)
100 REPEAT
110 PROCMOVEgusts(number%)
120 IF NOT out
    THEN PROCmoveflame
130 UNTIL out OR lit
140 IF lit
    THEN PROCmusic
    :number%=number%+1
150 IF out
    THEN SOUND 0,-15,5,20
160 UNTIL number%>20
170 CLS
    :PRINT TAB(14,16)"Okay, you win"
180 END
190 REM ========================
200 DEF PROCsetup(n%)
210 CLS
220 w%=40+2*n%
    :light%=20
230 out=FALSE
    :lit=FALSE
240 PRINT TAB(20,31)candle$;
250 PRINT TAB(light% MOD 40, light%
     DIV 40)flame$;
260 PROCplacewalls
270 PROCplacegusts(n%)
280 ENDPROC
290 REM ========================
300 DEF PROCMOVEgusts(n%)
310 LOCAL loop%
320 FOR loop%=1 TO n%
330 PROCmovegust(loop%)
340 NEXT loop%
350 ENDPROC
360 REM ========================
370 DEF PROCplacegusts(n%)
380 COLOUR 2
390 LOCAL temp%,placed%,loop%
400 FOR loop%=1 TO n%
410 placed%=FALSE
420 REPEAT
430 temp%=120+RND(24*40)
440 IF loop%>1 AND FNposition(temp%
    ,loop%) AND FNtest(temp%)
    THEN placed%=TRUE
450 IF loop%=1
    THEN placed%=TRUE
460 UNTIL placed%
470 gust%(loop%)=temp%
480 PRINT TAB(temp% MOD 40, temp%
     DIV 40)gust$;
490 NEXT loop%
500 ENDPROC
510 REM ========================
520 DEF PROCmovegust(loop%)
530 LOCAL x%,y%,lx%,ly%,l%,h%,v%
    ,npos%,decide%
540 lx%=light% MOD 40
    : ly%= light% DIV 40
550 x%=gust%(loop%) MOD 40
    : y%=gust%(loop%) DIV 40
560 h%= SGN (lx%-x%)
    :v%= SGN (ly%-y%)
570 IF h%=0
    THEN npos%=v%*40 + gust%(loop%)
580 IF v%=0
    THEN npos%=h% + gust%(loop%)
590 IF h%=0 AND v%=0
    THEN npos%=gust%(loop%)
600 decide%=1-RND(2)
610 IF h%<>0 AND v%<>0 AND decide%

    THEN npos%=v%*40+gust%(loop%)
620 IF h%<>0 AND v%<>0 AND NOT decide
```

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```
    %
    THEN npos%=h%+gust%(loop%)
630 IF h%<>0 AND v%<>0 AND (RND(2*num
    ber%+3)=1)
    THEN npos%=h%+v%*40+gust%(loop%)
640 IF npos%=light%
    THEN out=TRUE
    :gust%(loop%)=npos%
650 IF FNtest(npos%) AND npos%<1279
     AND npos%<>1180
    THEN PRINT TAB(x%,y%)" ";
    :PRINT TAB(npos% MOD 40, npos%
     DIV 40)gust$;
    :gust%(loop%)=npos%
660 ENDPROC
670 REM ========================
680 DEF PROCmoveflame
690 LOCAL key%,npos%,L%
700 npos%=light%
710 *FX15,1
720 FOR L%=0 TO 10
730 IF INKEY (-66)AND light%>39
    THEN npos%=light%-40
740 IF INKEY (-98) AND light%<1239

    THEN npos%=light%+40
750 IF INKEY (-104) AND (light%
     MOD 40 <>0)
    THEN npos%=light%-1
760 IF INKEY (-105) AND ((light%+1)
     MOD 40<>0) AND light%<1278
    THEN npos%=light%+1
770 NEXT
780 SOUND &11,-10,50,4
790 IF npos%=flame%
    THEN lit=TRUE
800 IF npos%<>light% AND FNtest(npos%
    )
    THEN PRINT TAB(light% MOD 40
    , light% DIV 40)" ";
    :light%=npos%
810 PRINT TAB(light% MOD 40, light%
     DIV 40)flame$;
820 FOR L%=1 TO number%
    :IF gust%(L%)=light%
    THEN out=TRUE
830 NEXT L%
840 ENDPROC
850 REM ========================
860 DEF PROCmusic
870 REPEAT
880 READ pitch,duration
890 SOUND 1,-15,50+pitch,3*duration
900 SOUND 1,0,0,0
910 UNTIL pitch=256
920 RESTORE
930 DATA 0,1,0,1,8,2,0,2,20,2,16
    ,4
940 DATA 0,1,0,1,8,2,0,2,28,2,20
    ,3
950 DATA 0,1,0,1,48,2,36,2,20,2
    ,16,2
960 DATA 8,2,40,1,40,1,36,2,20,2
    ,28,2,20,3,256,0
970 ENDPROC
980 REM ========================
990 DEF FNposition(temp%,loop%)
1000 LOCAL okay%,L%
1010 okay%=TRUE
1020 FOR L%=1 TO loop%-1
1030 IF ABS (gust%(loop%)-temp%)<25
     THEN okay%=FALSE
     :L%=loop%-1
1040 NEXT L%
1050 =okay%
1060 REM ========================
1070 DEF PROCplacewalls
1080 LOCAL loop%
1090 COLOUR 131
1100 w%(1)=120+RND(26*40)
1110 PRINT TAB(w%(1) MOD 40,w%(1)
      DIV 40)wall$;
1120 FOR loop%=2 TO w%
1130 REPEAT
1140 temp%=120+RND(26*40)
1150 UNTIL FNtest(temp%)
1160 w%(loop%)=temp%
1170 COLOUR 135
     :PRINT TAB(temp% MOD 40, temp%
      DIV 40)wall$;
1180 NEXT loop%
1190 COLOUR 128
1200 ENDPROC
1210 REM ========================
1220 DEF FNtest(temp%)
1230 LOCAL C%,A%
1240 okay%=TRUE
1250 VDU 31,temp% MOD 40,temp%
     DIV 40
1260 A%=135
     :COLOUR 135
1270 C%=(USR (&FFF4)AND &FFFF)
     DIV &100
1280 COLOUR 128
     :=(C%<>35) AND temp%<>1220
     AND temp%<>1260
1290 REM ========================
1300 DEF PROCinstructions
1310 VDU 23;8202;0;0;0;
1320 PRINT TAB(10,4)CHR$ (141)
     CHR$ (132)CHR$ (157)CHR$ (131)
     "BIRTHDAY  "CHR$ (156)
1330 PRINT TAB(10,5)CHR$ (141)
     CHR$ (132)CHR$ (157)CHR$ (131)
     "BIRTHDAY  "CHR$ (156)
1340 PRINT TAB(4,8)CHR$ (129)"MICRO
      USER'S ANNIVERSARY GAME"
1350 PRINT TAB(4,11)CHR$ (130)"You
      must steer the flame from"
1360 PRINT TAB(4,12)CHR$ (130)"the
      top of the screen to the"
1370 PRINT TAB(4,13)CHR$ (130)"candle'
     s wick, at the bottom."
1380 PRINT TAB(12,15)CHR$ (131)"left
      ..... >"
1390 PRINT TAB(12,16)CHR$ (131)"right
      ..... ?"
1400 PRINT TAB(12,17)CHR$ (131)"up
       ..... A"
1410 PRINT TAB(12,18)CHR$ (131)"down
      ..... Z"
1420 PRINT TAB(4,22)CHR$ (132)
     CHR$ (157)CHR$ (131)"Press space
      bar to continue  "CHR$ (156)
1430 REPEAT
     :UNTIL INKEY (-99)
1440 ENDPROC
1450 REM ========================
1460 DEF PROCinit
1470 number%=2
1480 flame%=29*40+20
1490 VDU 19,0,3,0,0,0
     :VDU 19,2,4,0,0,0
     :VDU 19,3,0,0,0,0
1500 VDU 23;8202;0;0;0;
1510 DIM gust%(20),w%(80)
1520 VDU 23,225,0,0,0,0,16,16,16
     ,16,23,226,56,56,56,56,56,56
     ,56,56,23,227,16,56,56,124,124
     ,56,16,0,23,228,36,60,255,60
     ,60,255,60,36
1530 wall$=CHR$ (17)+CHR$ (2)+"#"
1540 candle$=CHR$ (17)+CHR$ (2)+
     CHR$ (225)+CHR$ (8)+CHR$ (10)+
     CHR$ (226)+CHR$ (8)+CHR$ (10)+
     CHR$ (226)
1550 flame$=CHR$ (17)+CHR$ (1)+
     CHR$ (227)
     :gust$=CHR$ (17)+CHR$ (3)+
     CHR$ (228)
1560 ENDPROC
1570 REM ========================
1580 REM ====== Error Check ======
1590 REM ========================
1600 IF ERR =17
     THEN RUN
     ELSE MODE 6
     :VDU 19,0,4,0,0,0
     :REPORT
     :PRINT " at ";ERL
     :END
```

This listing is included in this month's cassette tape offer. See order form on Page 169.

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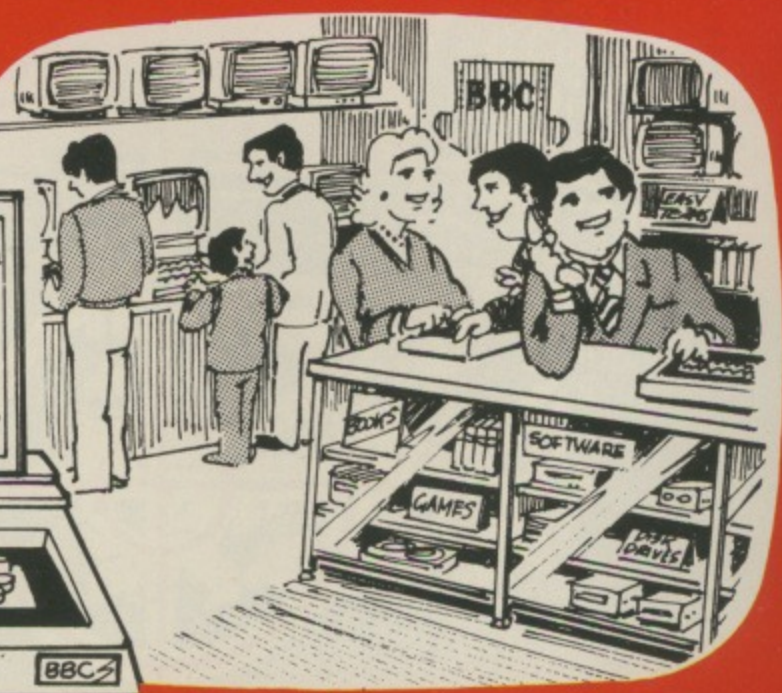

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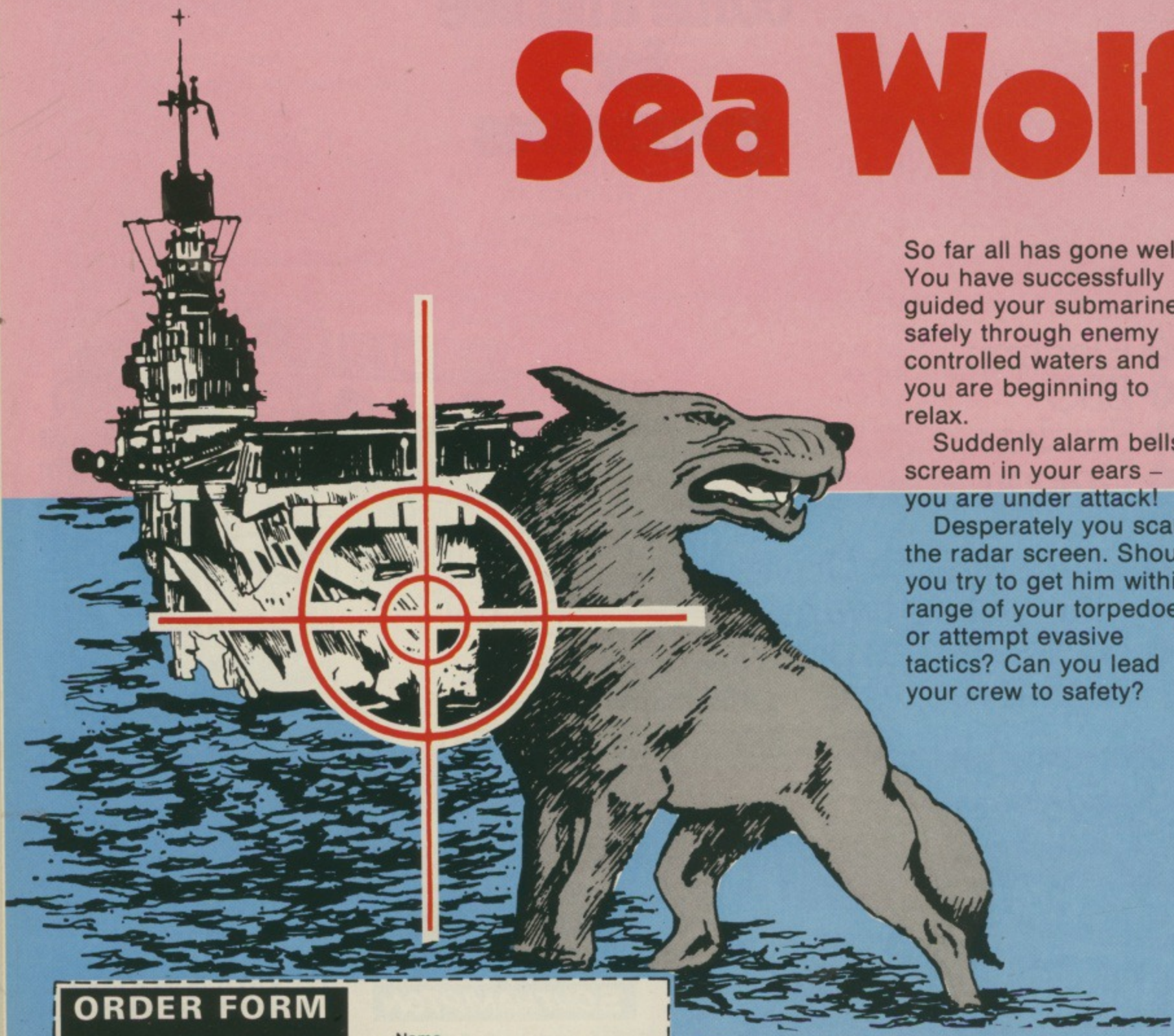

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Denary Derrick listing

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```
10 MODE 7
   :PROCintro
20 VDU 23,0,8202;0;0;0;
30 PROCdefine
40 REPEAT
50 REPEAT
   :A$=GET$
   :UNTIL INSTR("12",A$)<>0
60 men=3
   :score=0
70 REPEAT
80 MODE 2
   :PROCinit
   :CALL RESET
90 REPEAT
100 PROCspider
110 *FX15,1
120 T%=INKEY (10)
   :IF T%=KEY% ?&70=-1
   :S%=-15
130 PROCbase
140 UNTIL B%<280 OR FNHIT(A%
   ,B%)<>0
150 IF B%<280 PROCland
   ELSE PROCexplode
160 PROCupdate
170 UNTIL men=0
180 MODE 7
   :PROCanother
190 UNTIL FALSE
200 END
210 REM _____
220 DEF PROCbase
230 SOUND 1,-7,30,1
240 IF INKEY (-104)=-1
   CALL CHRI
250 IF INKEY (-103)=-1
   CALL CHLE
260 IF ?&70=255 SOUND 0
   ,S%,30,10
   :S%=S%+.3
   :CALL CHUP
270 CALL BASE
280 ENDPROC
290 REM _____
300 DEF PROCspider
310 B%=B%-16
   :IF A%<100 CH%=RND(12)
320 IF A%>1000 CH%=-RND(12)
330 A%=A%+CH%
340 MOVE A%-32,B%+32
   :VDU 18,0,0,255,255
   ,255
350 MOVE A%-64,B%
   :VDU 255,231,8,18,0
   ,3,224,225
360 VDU 18,0,0,8,232,255
   :MOVE A%-32,B%-32
   :VDU 233,8,18,0,3,229
   ,9,230,8,18,0,0,234
   ,8,8,255
370 MOVE A%,B%
   :VDU 18,0,15,227,227
380 MOVE A%,B%
   :VDU 18,0,8,226,226
390 MOVE A%+32,B%
   :VDU 18,0,1,228
400 MOVE A%+32,B%-38
   :VDU 18,0,0,255,8,18
   ,0,7,48+N%
410 ENDPROC
420 REM _____
430 DEF FNHIT(a%,b%)
440 =POINT(a%,b%)+POINT(a%+12
   8,b%)+POINT(a%+32,b%-64)+
   POINT(a%+96,b%-64)+
   POINT(a%+64,b%+8)
450 REM _____
460 DEF PROCdefine
470 G%=0
   :H%=0
480 DIM X% 600,Y% 500
490 P%=X%
500 [OPT0
510 .BASE LDX#47
520 .LOOP1 LDA Y%-1,X
   :STA&7228-624,X
530 DEX
   :BPL LOOP1
   :LDX#55
   :.LOOP2
540 LDA Y%+31,X
   :STA&74A8-632,X
550 DEX
   :BPL LOOP2
   :LDX#55
   :.LOOP3
560 LDAY%+71,X
   :STA&7728-632,X
570 DEX
   :BPL LOOP3
580 LDX#60
   :.LOOP6
   :LDA#00
   :STA&7730,X
   :DEX
   :BPL LOOP6
590 LDX#111
600 .LOOP4 LDA Y%+119,X
   :STA&7490-640,X
610 DEX
   :BPL LOOP4
   :LDX#111
   :.LOOP5
620 LDAY%+215,X
   :STA&7710-640,X
630 DEX
   :BPL LOOP5
   :RTS
640 .RIGHT CLC
   :LDAX%+6
   :ADC#16
   :STAX%+6
   :LDAX%+7
   :ADC#0
   :STAX%+7
650 CLC
   :LDAX%+&11
   :ADC#16
   :STAX%+&11
   :LDAX%+&12
   :ADC#0
   :STAX%+&12
660 CLC
   :LDAX%+&1C
   :ADC#16
   :STAX%+&1C
   :LDAX%+&1D
   :ADC#0
   :STAX%+&1D
670 CLC
   :LDAX%+&26
   :ADC#16
   :STAX%+&26
   :LDAX%+&27
   :ADC#0
   :STAX%+&27
680 CLC
   :LDAX%+&3C
   :ADC#16
   :STAX%+&3C
   :LDAX%+&3D
   :ADC#0
   :STAX%+&3D
690 CLC
   :LDAX%+&31
   :ADC#16
   :STAX%+&31
   :LDAX%+&32
   :ADC#0
   :STAX%+&32
   :RTS
700 .CHRI LDAX%+&3C
   :CMP#&80
   :LDAX%+&3D
   :SBC#&75
   :BCC RIGHT
   :RTS
710 .LEFT SEC
   :LDAX%+&31
   :SBC#16
   :STAX%+&31
   :LDAX%+&32
   :SBC#0
   :STAX%+&32
720 SEC
   :LDAX%+&26
   :SBC#16
   :STAX%+&26
   :LDAX%+&27
   :SBC#0
   :STAX%+&27
730 SEC
   :LDAX%+&3C
   :SBC#16
   :STAX%+&3C
   :LDAX%+&3D
   :SBC#0
   :STAX%+&3D
740 SEC
   :LDAX%+&1C
   :SBC#16
   :STAX%+&1C
   :LDAX%+&1D
   :SBC#0
   :STAX%+&1D
750 SEC
   :LDAX%+&11
   :SBC#16
   :STAX%+&11
   :LDAX%+&12
   :SBC#0
   :STAX%+&12
760 SEC
   :LDAX%+&6
   :SBC#16
```

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

→

Denary Derrick listing

From Page 163

```
    :STAX%+&6
    :LDAX%+&7
    :SBC#0
    :STAX%+&7
    :RTS
770 .CHLE LDAX%+&3C
    :CMP#&90
    :LDAX%+&3D
    :SBC#&73
    :BCS LEFT
    :RTS
780 .FIRE SEC
    :LDAX%+&6
    :SBC#&80
    :STAX%+&6
    :LDAX%+&7
    :SBC#2
    :STAX%+&7
790 SEC
    :LDAX%+&11
    :SBC#&B0
    :STAX%+&11
    :LDAX%+&12
    :SBC#2
    :STAX%+&12
800 SEC
    :LDAX%+&26
    :SBC#&80
    :STAX%+&26
    :LDAX%+&27
    :SBC#2
    :STAX%+&27
810 SEC
    :LDAX%+&1C
    :SBC#&80
    :STAX%+&1C
    :LDAX%+&1D
    :SBC#2
    :STAX%+&1D
    :RTS
820 .CHUP LDAX%+&7
    :CMP#&32
    :BCS FIRE
830 LDY#&30
    :LDA#00
    :.LOOP9
    :LDX#0
    :.LOOP8
    :STA&3000,X
    :DEX
    :BNE LOOP8
    :INY
    :STY LOOP8+&2
    :CPY#&38
    :BCC LOOP9
840 LDA#0
    :STA&70
850 .RESET LDAX%+&3C
    :CLC
    :ADC#&A0
    :STAX%+&26
    :LDAX%+&3D
    :ADC#2
    :STAX%+&27
    :LDAX%+&26
    :STAX%+&11
    :LDAX%+&27
    :SEC
    :SBC#5
    :STAX%+&12
    :LDAX%+&31
    :CLC
    :ADC#&A0
    :STAX%+&1C
860 LDAX%+&32
    :ADC#2
    :STAX%+&1D
    :LDAX%+&1C
    :CLC
    :ADC#8
    :STAX%+&6
    :LDAX%+&1D
    :SEC
    :SBC#5
    :STAX%+&7
    :RTS
870 .TEAR LDA#&30
    :STA TEAR+&14
    :STA TEAR+&18
    :STA TEAR+&1C
    :STA TEAR+&20
    :LDY#60
880 .LOOP10 LDX#00
    :.LOOP11
    :LDA&3000,X
    :ASL A
    :STA&3000,X
    :DEX
    :LDA&3000,X
    :LSR A
    :STA&3000,X
    :DEX
    :BNE LOOP11
    :INC LOOP11+&2
    :INC LOOP11+&6
    :INC LOOP11+&A
    :INC LOOP11+&E
    :DEY
    :BNE LOOP10
    :RTS
890 ]
900 FOR P%=0TO 15 STEP 4
    :Y%!P%=&00000000
    :Y%!(P%+31)=&00000000
    :Y%!(P%+71)=&00000000
    :Y%!(P%+119)=&00000000
    :Y%!(P%+215)=&00000000
    :Y%!(P%+311)=&00000000
    :NEXT P%
910 Y%?-1=00
920 Y%!15=&03010101
    :Y%!19=&03030303
930 Y%!23=&02000000
    :Y%!27=&02020202
940 Y%!47=&01010101
    :Y%!51=&01010101
950 Y%!55=&03030303
    :Y%!59=&03030303
960 Y%!63=&03030303
    :Y%!67=&03030303
970 Y%!87=&02030301
    :Y%!91=&00000002
980 Y%!95=&A1A10303
    :Y%!99=&5050F0F0
990 Y%!103=&A0A10303
    :Y%!107=&000000A0
1000 Y%!111=&02020200
    :Y%!115=&00000002
1010 Y%!139=&00000000
    :Y%!135=&00101000
1020 Y%!147=&10101010
    :Y%!143=&30103000
1030 Y%!155=&30202030
    :Y%!151=&20203000
1040 Y%!163=&30000000
    :Y%!159=&20103000
1050 Y%!171=&30100010
    :Y%!167=&20003000
1060 Y%!179=&30102010
    :Y%!175=&00003000
1070 Y%!187=&30000000
    :Y%!183=&20103000
1080 Y%!195=&30000010
    :Y%!191=&20003000
1090 Y%!203=&30303030
    :Y%!199=&30303000
1100 Y%!211=&00000000
    :Y%!207=&20103000
1110 Y%!231=&10000000
    :Y%!235=&00000000
1120 Y%!239=&30000010
    :Y%!243=&30101030
1130 Y%!247=&30303030
    :Y%!251=&10101030
1140 Y%!255=&20000000
    :Y%!259=&20000000
1150 Y%!263=&10000000
    :Y%!267=&30101010
1160 Y%!271=&30202020
    :Y%!275=&10101010
1170 Y%!279=&00000000
    :Y%!283=&20000000
1180 Y%!287=&30101010
    :Y%!291=&30101010
1190 Y%!295=&30202030
    :Y%!299=&10101030
1200 Y%!303=&30000000
    :Y%!307=&20000020
1210 VDU 23,224,33,127,227
    ,231,127,60,121,144
    :REM HEAD
1220 VDU 23,225,132,254,199
    ,231,254,60,158,9
    :REM HEAD
1230 VDU 23,226,0,0,8,8,0
    ,0,0,0
    :REM EYES
1240 VDU 23,227,0,0,16,16
    ,0,0,0,0
    :REM EYES
1250 VDU 23,228,0,0,0,0,0
    ,60,102,60
    :REM MOUTH
1260 VDU 23,229,18,36,68
    ,66,65,32,32,16
    :REM LEGS
1270 VDU 23,230,72,36,34
    ,66,130,4,4,8
    :REM LEGS
1280 VDU 23,231,222,128,28
    ,24,128,195,134,11
1290 VDU 23,232,123,1,56
    ,24,1,195,93,146
1300 VDU 23,233,237,219,187
    ,189,190,223,223,239
1310 VDU 23,234,183,219,212
    ,189,125,251,251,247
1320 VDU 23,255,255,255,255
    ,255,255,255,255,255
1330 ENVELOPE 1,3,10,20,-10
    ,40,20,60,20,0,-5,-2
    ,126,126
1340 ENDPROC
1350 REM _____
1360 DEF PROCintro
1370 FOR Q=1TO 2
    :PRINT TAB(10,Q);
    CHR$ 141;CHR$ 131;"DENARY
     DERRICK"
    :NEXT
1380 PRINT TAB(9,3);CHR$ (130)
    ;"=================="
1390 PRINT TAB(0,4);CHR$ (134)
```

→

ROMS SOFTWARE FOR THE BBC MICRO

GREMLIN

This is a machine language monitor ROM designed for use as an aid to development and debugging of machine code programs.

Anyone writing machine code programs will at some time come across a bug in the program. Trying to track down the bug is usually far from easy and this is where GREMLIN will prove invaluable. The ROM contains a full machine code monitor including features such as a disassembler, memory move and search routines etc.

GREMLIN includes many advanced features like a full expression evaluator, and an assembler. It can single step through programs both in RAM and ROM and allows operation on any sideways ROM. Variables may be declared and used in expressions and with most commands much like BASIC. This makes the system very powerful but simple to use. Other features include —

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TERMI

TERMI is a general purpose communications ROM for the BBC micro. It will allow communication between the BBC and practically any other machine with an RS 232 interface. This ROM is not dedicated to emulating a particular terminal but has several modes of operation. It can be used as a slave graphics terminal or, in the custom mode, as a DEC VT52 terminal emulator. It will also act as a dumb terminal. The user is free to swap between 40 and 80 column screen modes even while on-line.

The most powerful feature of this package allows the user to send ASCII files from a BBC disc down the line or to receive files from the RS 232 and to save these on disc. It also allows a copy to be kept on the printer.

TERMI is supplied with a "CUSTOM" program on disc that allows the user to set up his own protocols i.e. line speeds, screen modes, start & stop bits etc., and to have these loaded from the disc every time TERMI is used.

TERMI is an 8K ROM supplied with a manual, fitting instructions and a customisation disc. £28.00 plus £1 p&p plus VAT.

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Communicator

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COMMUNICATOR is a single chip that plugs into a normal BBC Micro and turns it into an advanced DEC VT100 terminal emulator. The combined cost of a BBC Micro and this software is considerably less than a new VT100 — and you get all the advantages of one of the best micro computers available. A large range of high quality software is already available for this micro — word processors, spreadsheets etc.

Computer Concepts commissioned Specialist Software Products Ltd. to produce the most advanced emulator possible for the BBC microcomputer, its features include:

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★ Independent windowing — for split screen operation.
★ VT100 character graphics.
★ Disc spooling and transmission of ASCII files.
★ Application keypad mode — including generation of these escape sequences.
★ VT52 mode.

Nearly a full VT100, the most notable omission is the 132 character mode — impossible to implement on the BBC Micro.

While COMMUNICATOR can be used for direct communication to a mini or mainframe, it also allows access to the world of electronic mail. This ROM is already widely used with the DAILCOM electronic mail service. Text may be prepared off-line with the BBC machine and transmitted at full speed via a modem when on-line to the system.

COMMUNICATOR is a 16k ROM supplied with a spiral bound manual and clear fitting instructions. £59.00 plus £1 p&p plus VAT.

Both TERMI and COMMUNICATOR may be used for any of the following

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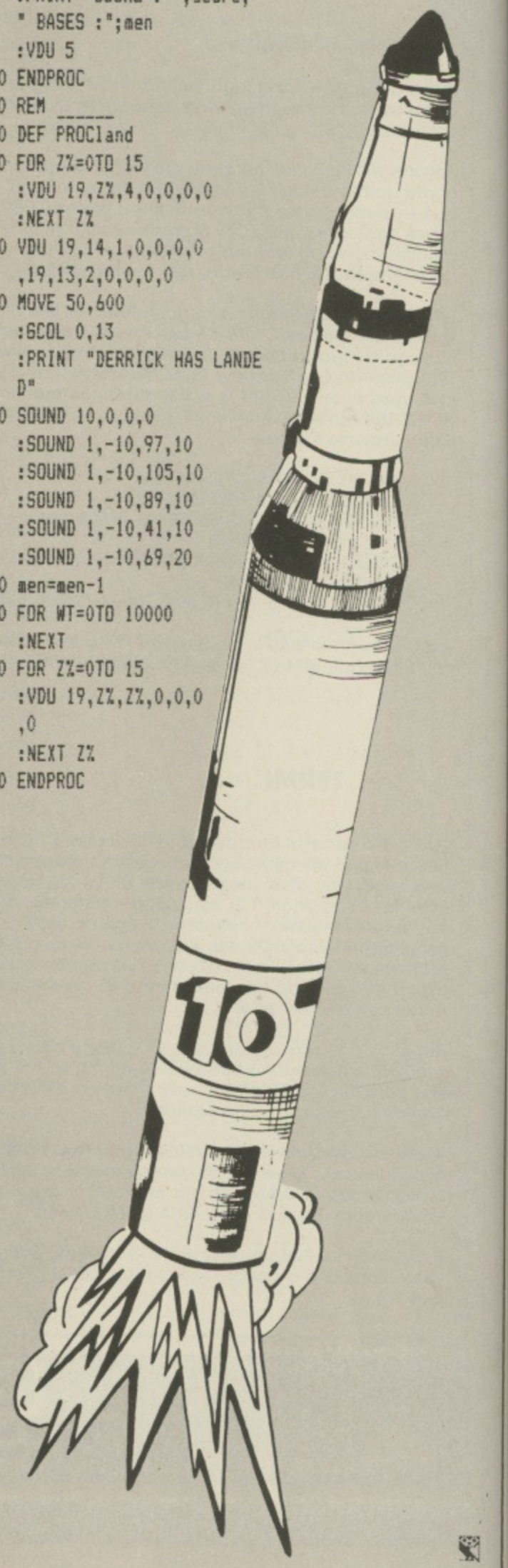
VISA

Denary Derrick listing

From Page 164

```
    ;"  Denary Derrick is
     a bad spider who   ";
    CHR$ (134);"must be stopp
    ed. He is carrying a"
1400 PRINT TAB(0,6);CHR$ (134)
    ;"number with which he
     will try to land."
1410 PRINT TAB(0,8);CHR$ (134)
    ;"There are two ways
     of stopping Derrick:"
1420 PRINT TAB(5,10);CHR$ (129
    );"(1)";CHR$ (134);"By
     sending up a rocket
     with   ";CHR$ (134);
    "         the same number
     as Derrick."
1430 PRINT TAB(9,12);CHR$ (134
    );"This will help you
     to get";TAB(9,13);
    CHR$ (134);"used to using
     a key board."
1440 PRINT TAB(5,15);CHR$ (129
    );"(2)";CHR$ (134);"By
     sending up a rocket
     with"TAB(9,16);CHR$ (134
    );"the number which when
     added"
1450 PRINT TAB(9,17);CHR$ (134
    );"to Derrick's makes
     ten."TAB(9,18);CHR$ (134
    );"E.g. If Derrick has
     a 7"
1460 PRINT TAB(9,19);CHR$ (134
    );"you must use 3 to
     fire.";TAB(0,21);
    CHR$ (134);"To guide
     the rocket use:";
    CHR$ (131);"< Left";
    TAB(25,22);CHR$ (131);
    "> Right"
1470 PRINT TAB(0,24);CHR$ (130
    );"Choose game by pressin
    g key 1 or 2."
1770 REM _____
1780 DEF PROCanother
1790 G%=G%+1
1800 PRINT TAB(10,6);CHR$ (131
    );"END OF GAME: ";G%
1810 PRINT TAB(9,7);CHR$ (130)
    ;"================"
1820 PRINT TAB(9,10);CHR$ (134
    );"Your score was: ";score
1830 H%=H%+score
1840 PRINT TAB(9,12);CHR$ (134
    );"Your total is : ";H%
1850 PRINT TAB(10,15);
    CHR$ (130);"PRESS ANY
     KEY"
1860 *FX15,1
1870 VDU 23,0,8202;0;0;0;
    :Z$=GET$
    :CLS
    :PROCintro
1880 ENDPROC
1890 REM _____
1900 DEF PROCexplode
1910 A%=A%+64
    :B%=B%-32
1920 score=score+10
    :SOUND 1,1,30,30
    :SOUND 2,1,50,30
1930 FOR D%=0TO 20
1940 DRAW RND(400)-200+A%
    ,RND(400)-150+B%
1950 VDU 224+RND(10)
    :GCOL 0,RND(15)
1960 CALL TEAR
1970 NEXT D%
1980 ENDPROC
1480 ENDPROC
1490 REM _____
1500 DEF PROCinit
1510 B%=1024
    :A%=RND(900)+100
    :COL%=8
    :CH%=RND(20)-10
1520 NI%=N%
    :REPEAT
    :N%=RND(9)
    :UNTIL N%<>NI%
1530 IF A$="1" KEY%=N%+48
1540 IF A$="2" KEY%=58-N%
1550 ?&70=0
1560 VDU 19,0,4,0,0,0,19
    ,4,0,0,0,0,0,19,14,1
    ,0,0,0,0,19,13,2,0,0
    ,0,0
1570 VDU 28,0,31,19,29,17
    ,142,17,13,12,4,10
1580 PRINT "SCORE : ";score;
    " BASES :";men
1590 VDU 5
1600 *FX9,5
1610 *FX10,5
1620 ENDPROC
1630 REM _____
1640 DEF PROCupdate
1650 VDU 4,12,10,17,142,17
    ,13
    :PRINT "SCORE : ";score;
    " BASES :";men
    :VDU 5
1660 ENDPROC
1670 REM _____
1680 DEF PROCland
1690 FOR Z%=0TO 15
    :VDU 19,Z%,4,0,0,0,0
    :NEXT Z%
1700 VDU 19,14,1,0,0,0,0
    ,19,13,2,0,0,0,0
1710 MOVE 50,600
    :GCOL 0,13
    :PRINT "DERRICK HAS LANDE
    D"
1720 SOUND 10,0,0,0
    :SOUND 1,-10,97,10
    :SOUND 1,-10,105,10
    :SOUND 1,-10,89,10
    :SOUND 1,-10,41,10
    :SOUND 1,-10,69,20
1730 men=men-1
1740 FOR WT=0TO 10000
    :NEXT
1750 FOR Z%=0TO 15
    :VDU 19,Z%,Z%,0,0,0
    ,0
    :NEXT Z%
1760 ENDPROC
```



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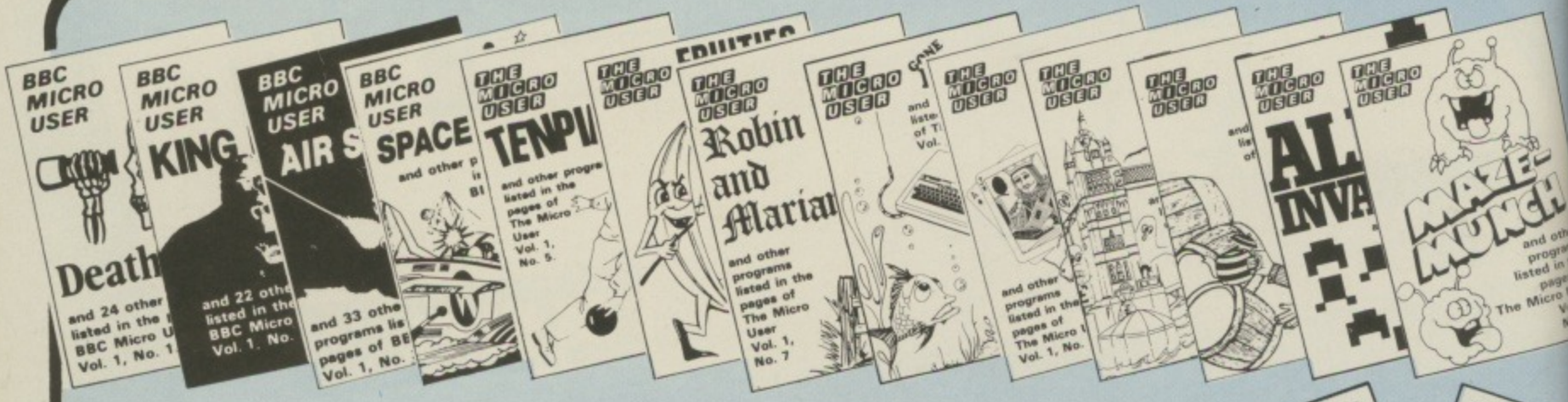

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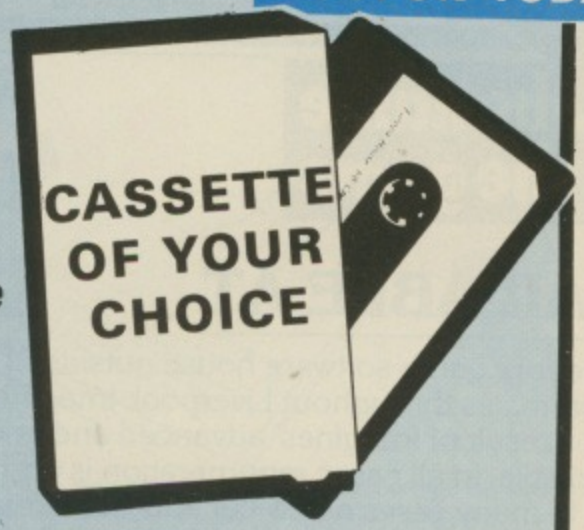

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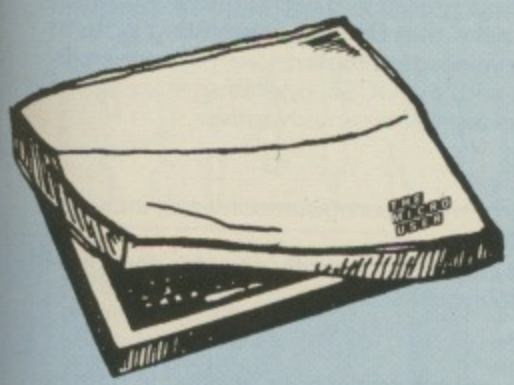

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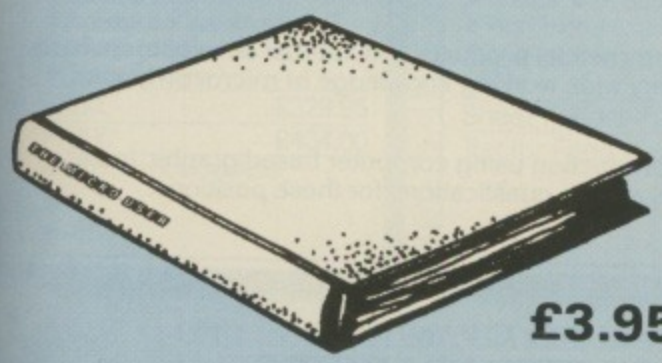

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Thirty positions exist for programmers working in a team environment on many diverse aspects of microcomputer software, including the conversion and adaption of games to new microcomputers.
Applicants should be fluent in at least, one assembly language and have great familiarity with at least one currently popular consumer microcomputer. Experience is not necessary but provable ability is a qualifying factor.

GRAPHICS PROGRAMMERS

Two positions are available for programmers with skills, experience and knowledge of microcomputer graphics as applied to games software.
Applicants must be fluent in at least one popular microcomputer assembly language and preferably have a working knowledge of one other, plus familiarity with currently available microcomputer capability. Provable experience and/or ability essential.

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Two openings are available for programmers who have the ability to write music and sound effects for popular micros.
The applicants must have a good knowledge of an assembly language and proven musical skills.

GAME DESIGNERS

Two positions exist for game designers to design a wide variety of entertainment software. Applicants will have both experience in general games design and theory plus a working knowledge of microcomputers.

TECHNICAL WRITER

An opening exists for a technical writer to prepare software manuals for both commercial products and internal development tools.
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GRAPHIC ARTISTS

There are six positions available for artists working on games design and production using computer based graphic tools.
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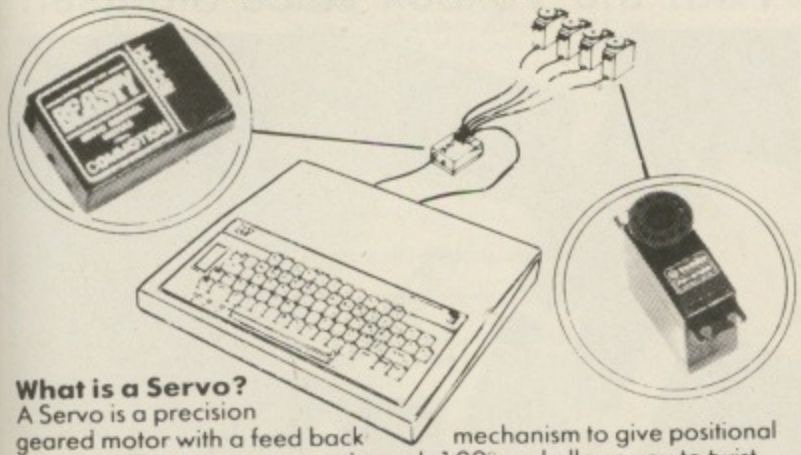
An introduction to Microrobotics



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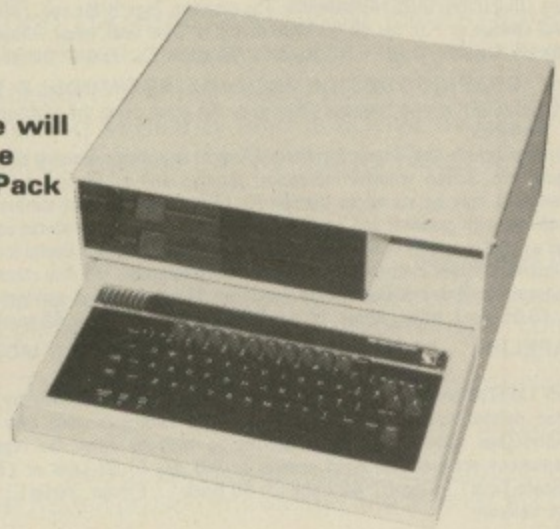

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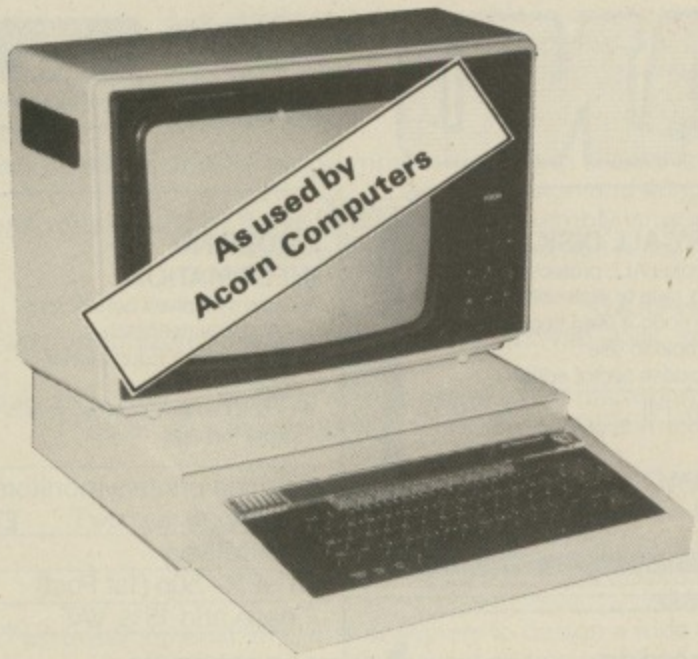

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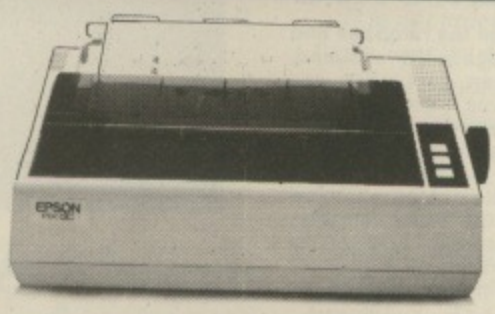

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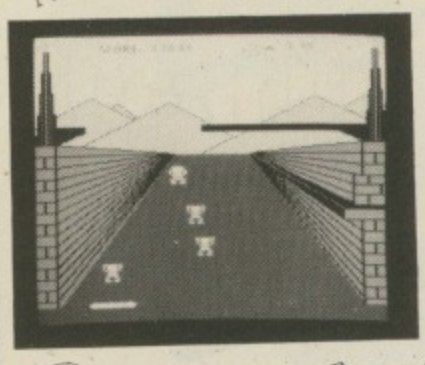

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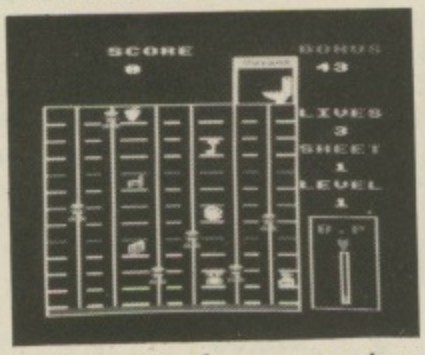

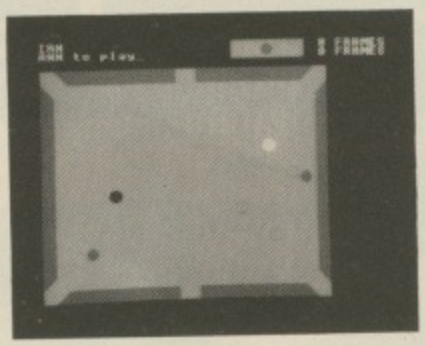

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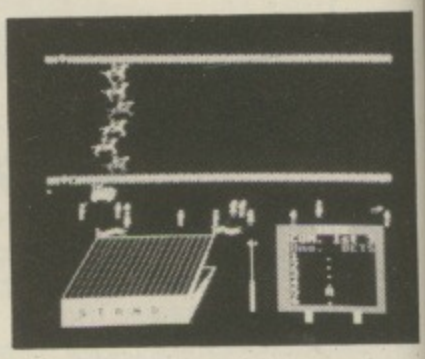

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MICROMAIL

Time manufacturers gave discs their due

I READ with no little sympathy the letter from Mr Palmer in the January 1984 Micro User in which he complained about the problems of transferring programs from tape to disc.

The simple fact is that software suppliers in this country themselves are responsible for forcing users to resort to criminal extremes to be able to use the software that they have purchased.

The software manufacturers are simply going to have to take a more responsible attitude toward their customers if they hope to survive in an increasingly competitive marketplace.

Consider this: In Cambridge where I live there are at least half a dozen software retailers selling products for the BBC.

In the last two days I have conducted an unofficial survey and I am sorry to have to report that, apart from a few Acornsoft games (about half of their line), I was unable to find a single disc copy of any game for the BBC for sale.

This is the situation that disc-users must face.

You cannot buy a disc copy of software for the BBC and if you buy a cassette copy and upload it to disc (assuming that you are clever enough to figure out how to do it in the first place), you are threatened with prosecution.

It is unfair that Acornsoft have taken the brunt of the criticism recently over this matter. At least they do manage to distribute a few disc copies of some of their products, which is more than any other software house can say.

Yes, I know that other software manufacturers advertise disc copies, if you are willing to mail-order the product. In addition to having to wait from between one and four weeks to get the disc in the post, in some cases you have to pay an outrageous additional charge of up to £4 for the disc.

An additional charge of £1-£2 is fair for the extra handling and packaging necessary to insure the safety of the discs, but £4 is immoral.

So what are the alternatives? In addition to learning how to transfer most of the software himself, a disc user can buy special products to upload programs for him.

I have a copy of the new and improved version of the most popular of these items, but there are some games (and not only long adventure games) that it still will not handle.

There is still the unresolved legal question of which the user of these items must be aware. But this is not a long-term solution to the problem.

In the end the only possible solution lies with the software manufacturers, distributors, and retailers.

They are simply going to have to realise that cassette storage is rapidly becoming an obsolete medium, even for the home user.

The change is going to be forced upon them in the next few years whether they like it or not.

Hopefully the more responsible of them will take the initiative by seeing that disc versions of their products are readily available to the purchasers.

Only by doing that will the suppliers have a basis for distinguishing the pirates from the legitimate users who simply want to enjoy the software that they purchased.

In the meantime I have decided not to purchase software from those houses that protect the material to such an extent that it cannot be uploaded to disc without extreme effort.

It is not much, but it is all that I can legally do.

At the moment there are two software houses on my personal "blacklist" and they can rest assured that they will be getting no more money from me.

My only hope is that they go out of business as soon as possible. – **D.L. Adams, Cambridge.**

How to save the Sphinx

REGARDING Alice's review of Sphinx Adventure (The Micro User, January 1984, Page 40), it IS possible to save the game during play, although Acornsoft does not tell you how to do it.

To save Sphinx Adventure:

When you are ready to save the game, press Escape.

*Enter *SAVE"SPHINX" 0400 7C00 to save the first part.*

*Enter *SAVE"ZERO" 0 90 to save the second part. The game is now saved on tape.*

To Reload:

*Enter *LOAD"SPHINX" to load the first part.*

*Enter *LOAD"ZERO" to load the second part.*

Enter GOTO 236 to restart the program.

The micro will now display the last location you visited before you saved the program, then it will wait for your next command.

It is important that the two parts should be reloaded as shown above, otherwise certain variables will have the wrong values. – **R.W. Crisp, Leeds.**

Improved joystick

I HAVE a tip for all the BBC Micro owners who own the Cambridge joystick – the non-self centering one.

The idea came to me while playing Rocket Raid, and I felt the need for the joystick to go back to the middle after each movement.

All you do is put two thick elastic bands round the lever. Pull one round the bottom and the other round the cable at the top.

This will affect the joystick so that after any movement it will return to the centre. – **Matthew Lemmings, Staines.**

Cherished facility

I WAS very interested to read the letter from David Bye in your December 1983 issue.

If he feels like that about the use of the features of the BBC machine why is he reading your magazine anyway?

He could have bought a cheaper machine which didn't allow him to use procedures, functions and such.

It strikes me that he must not have used one of the machines or he would not have written some of the things that he did.

He says, for instance, that the Acorn compilers were waywardly silly in using a value of –1 for TRUE and so denying him the facility of writing "IF X and IF NOT X".

If he had tried this he would have found that it would work exactly as it should.

It is true that IF X would be satisfied by any value other than 0, but none of these other values would satisfy the statement IF X =TRUE.

A study of the way in which computers work would have shown that –1 is the only value that could be used for TRUE and still allow FALSE to be zero, as the value of NOT 0 is –1.

So far as procedures are concerned he says that "the only advantage of PROCs lies in their control variable facility" and that most people don't need this.

I am not sure what he means

→

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by this but I know that many people are very glad of a facility which allows them to pass parameters to a subroutine without altering the value of a variable in another part of a program.

Even then I suspect that the major advantage of procedures and functions is their use of LOCAL variables.

Because of this facility I am gradually building up a library of functions and procedures which I can, after they have been tested, store on disc and call in to any program without needing to know which variable names have been used.

I also know that these procedures will work and that any error must be because I have passed an incorrect value rather than an unsuspected interaction with another part of the program.

An additional advantage of programming in this way is that, if the program needs changing – and it almost certainly will if it does anything useful – it is much easier to see where the changes should be, and what their effect will be.

In 1970 and 1971 I was very much involved with the amendment of computer programs to cope with decimalisation.

Anyone who has had that sort of experience will not need much persuading of the virtues of the modular construction of programs.

All the programs worked but finding out how, so that they could be modified, was a herculanean task.

I have not had my machine long enough to try all the features of BBC Basic but it is my understanding that procedures are, in fact, faster than GOSUBs in large programs as the system records their position.

When I started programming some of the existing programmers looked down on Cobol because "real programmers use assembly languages".

It seems to me that some of this attitude still lingers and it is very much on a par with "good drivers don't need seat belts" and "I know when I have drunk too much to drive".

Mr Bye isn't forced to use the facilities he doesn't like, but I hope that nothing of mine ever depends on one of his programs! – **David H. Wild, Hemel Hempstead.**

Recorded delivery

MOST of us at times find trouble with cassette loading, and I have had some success in overcoming the problem by resorting to my audio equipment.

I have a BBC Model B (OS 1.2) and being very interested in graphics had, among my Christmas presents, a copy of the Acornsoft "Creative Graphics" cassette.

I found that while side A of that cassette loaded without the slightest trouble, side B just would not load at all and produced nothing more interesting than a flood of "Rewind Tape", "Data", etc.

It would seem the copying for side B had not been up to the standard of side A – I can think of no other cause.

So I resorted to my audio method of solving the difficulty as I had successfully done so before, and indeed did on this occasion solve the problem.

I simply place the offending cassette into a cassette recorder and transfer the "sound" from it to a reel to reel machine running at 7½ ips (19cm), using manual control over recording levels on the reel to reel machine, and so far as I can, ensuring optimum modulation of the reel to reel track recording.

I then reverse the process and transfer the "sound" from the reel to reel machine and re-record it on to a cassette at normal cassette speed.

I do not usually transfer it back on to its original cassette tape, preferring to retain that recording – warts and all – as a master.

So I use a separate cassette to record the "copy" track, and again I control recording levels manually.

I have usually found that this re-recorded cassette track will load quite satisfactorily into the computer, as indeed it did on this occasion.

So I now have a perfectly usable copy of side 2 of "Creative Graphics" which works well on my computer without any loading problems, and the original master cassette track works beautifully as far as its side 1 is concerned.

Your readers may find this method a useful way out of trouble. A reel to reel machine is not essential – the system works with two cassette machines, but a transfer to reel to reel recording at 7½ ips is more satisfactory and reliable. – **Norman Gill, Wakefield.**

Hong Kong take away

A LETTER from Mr D.R. Stafford, Camberley House, Surrey was published in your January 1984 issue. Mr Stafford's letter made nonsense of my May 1983 letter to you (published in your August 1983 issue), whereby I was adamant in stating that all BBC Micros, sold in the UK, are manufactured in the UK.

As I am sure you and your readers are aware, the demand level for the BBC Micro continues to be extremely high. As an exceptional action, to balance the demand, approximately 1,000 Hong Kong-assembled machines were imported for sale in the UK. These machines were the exception.

Elsewhere in your January 1984 issue mention was made of the fact that recently purchased machines had Basic I fitted. I hope you can appreciate that the BBC Micro takes a varying amount of time from the kit to the final product, so that at any time BBC Micros offered for sale can represent a range of versions. – **Colin Malone, for Head of Merchandising, BBC Enterprises.**

Unconditional surrender

I FEEL compelled to "put my oar in" on the structured v. unstructured debate.

While I do agree that GOTO is essentially a poor instruction, especially it jumping forwards, why write code then slip over it?

This has to be silly and wasteful – I do not agree that GOSUB should be considered in the same class.

Not so long ago I wrote a piece of quite involved code for simulation purposes. During this, it was found that one piece of code would suffice for several different operations provided different entry points were used for each.

In Basic this was simple – a series of GOSUB calls all utilising the same RETURN.

With PROC I cannot, yet, see an easy solution. It would be possible to use a dummy variable to cause a jump over the (temporarily) redundant code, but oops, that's GOTO isn't it?

Actually I do have another suggestion, whether it would work I don't know:

```
10000 PROCA(. . .)
10400 GOTO 10600
10506 PROCB(. . .)
10600 . . . .
```

But that wouldn't be popular with the "structuralists" either, would it?

As a final comment, while I agree with Dr E.T. Freshwater of Leeds, (Micro User February 1984), I think that the main thrust of the structuralists is against the unconditional GOTO rather than the conditional.

The latter would seem essen-

tial if branching in programs is to occur at all! – **J. Comerford, Leicester.**

● Actually you can obtain this sort of an effect by having several different procedure starts defined (that is, DEF PROCs) with only one ENDPROC to finish. The following program should make the point.

```
  10 PROCA
  20 PROCB
  30 PROCC
  40 END
  50 DEFPROCA
  60 PRINT "NOW IN PROCA"
  70 DEFPROCB
  80 PRINT "NOW IN PROCB"
  90 DEFPROCC
 100 PRINT "NOW IN PROCC"
 110 PRINT "ENDING THIS
CALL"
 120 ENDPROC
```

Capacitor can clear screen

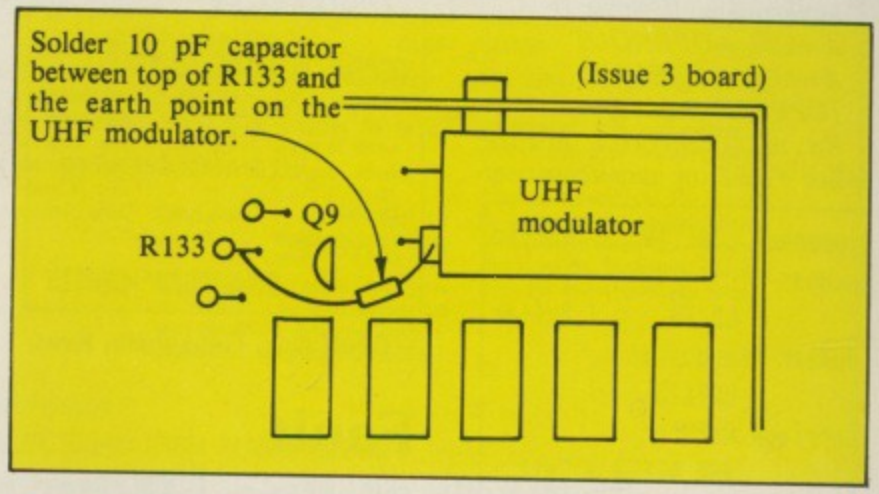
WITH reference to the Micromail letter concerning "drifting lines" that occur across the screen, I would like to say that this is common not only to Sony TVs but to many others used with certain BBC computers.

I have written to Acorn about the problem and according to them it is a fault in the TV.

This is not so, and differing BBC computers suffer the problem to greater or lesser extents – a few, not at all.

The problem is probably either due to beating between the chrominance and luminance signals or between the chrominance and a subharmonic of the CPU crystal oscillator.

Adjusting the trimmer will only offer temporary alleviation and is no real solution.



I have found that for many TVs, Sony included, the set requires only a very small chrominance signal to give good colour, so a simple but effective long term solution is to solder a small 10 pF capacitor across the base of the chrominance output transistor Q9 (across the resistor R133, 120k).

This is very simply done without removing the PCB and without the need for a very steady hand, as shown in the diagram.

It may be easily removed at a later date if required, and will cause no harm to the computer. – **Andrew Mackay, Northwood, Middlesex.**

Lowdown on OSCLI

COULD you please explain OSCLI? The listing I enclose gives my computer's full spec, then a disassembly of the OS routines, which indicates that as per handbook OSCLI vectors through &208.

But the disassembly from &200 does not have a &208 in it – why?

The memory dump of that area shows &208.

The other strange thing is that if I type as a direct command OSWORD or any of the other routines I get "Mistake" as a reply, but when I type in OSCLI I get "No such variable". Why? – **G. Coventry, Chippenham, Wiltshire.**

● &208 is an area of vector data. This part of the memory contains numbers which point or vector to another part of the computer where there is machine code.

The idea is that the bytes around &208 aren't machine code, they just point to the start of something that is, so disassembling them gives nonsense.

In your hex dump &208, contains &89, &209 contains &DF. These locations store the address &DF89, backwards.

When the micro sees JMP(&208), it "decodes" this address from where it is hidden at &208 and &209 and jumps to that address, in this case &DF89.

You might ask why you go round the houses like this – it's usually easier to jump directly to the address with JMP&DF89.

The point is that this way you can fiddle with the address at &208, &209, since they are in RAM (unlike the JMPs at &FFCE onwards).

This way you can make the micro jump to your own routine and to what you want – in other words, you can tailor the machine to your own specifications.

It also allows Acorn to modify things later. If they change the address of a routine in ROM, all they have to do is alter the vector table.

So long as you call through the jump table, as it is known (&FFCE etc), you won't notice a thing.

This means your programs work on both "old" and "new" machines.

As for OSWORD, it isn't a word that the computer recognises, so it says "Mistake".

I know we talk about OSWORDs, but the computer doesn't know it by this name – you have to CALL it through the jump table. You can set it up as a variable by using OSWORD = &FFF1.

As for OSCLI, you must have Basic II. This has a word called OSCLI, but it needs values or parameters to go with it.

If you just type OSCLI it looks for them and fails to find them, so says "No such variable", a slightly confusing message.

On Basic I, OSCLI isn't recognised at all and you simply get "Mistake".

Tape handling

*IN answer to Mr Pentecost's query on tape handling (Micro User, January 1984), if he uses *FX138,0,13 immediately before each OPENOUT he will not need to type a Return at the keyboard. Details of this call are given on Page 433 of the User Guide.*

OPENOUT, OPENIN, OPENUP, CLOSE all effectively call the OSFIND routine at &FFCE. This is described on Page 451/2 of the User Guide.

Astute readers will notice that

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the value of A on entry produces operations exactly equivalent to Basic II functions.

A=0, Y=? → CLOSE Y
A=&40 → OPENIN (not implemented in Basic I)
A=&80 → OPENOUT
A=&C0 → OPENUP (OPENIN Basic I)

So to OPENOUT a File called FRED in assembler use:

```
.openout LDA£138   / osbyte
number
        LDX£0      / Buffer
number (keyboard)
        LDY£13     /
Carriage Return
        JSR &FFF4 / Call
Osbyte
        LDX£ FILENAME MOD
256
        LDY£ FILENAME DIV
256 / get address of
filename
        LDA£&80
  /openout
        JSR &FFCE
  /Call Osfind

OSBPUT ROUTINE TO FILE

        RTS
     / Return to language
(Basic)
.FILENAME
        EQUS"FRED"+CHR$13
```

– Geoff Cox, Gillingham, Kent.

Fault at line 50

WITH regard to the Beasty Competition (Micro User, February 1984) I have programmed line 30 according to the book, that is 30 PROCpic(0,0,1) but when I attempt to RUN the program the machine indicates Arguments at line 30.

As I only had the system at Christmas I am afraid I do not understand where I am going wrong. – **Rodger Gregory, Nottingham.**

● Thanks for your letter, especially for giving us the page number and issue. If only everyone were so kind.

Line 30 CALLs a procedure, which is another part of the program. You tell the computer what this part of the program does by defining it – look at line 50.

Now when you call a procedure, you have to hand on values to it – passing parameters. What you're handling on is in the brackets of line 30, separated by commas. These are called arguments.

The computer needs something to receive what has been passed to it. If you look at line 50, you can see three variables, X%, Y%, S, ready to catch what line 30's procedure has passed to it.

The X% receives 0, the Y% gets 0 and S gets 1.

If the number of things your passing doesn't match up, or you try to pass a string to a numeric variable, you get the arguments message for the line you called the procedure from.

The point is, if you've made a mistake on line 50, perhaps missing out a comma, the micro believes this line be the true definition of procedure, so it decides that the line you call it from is at fault.

In this case it says line 30. However, the version you've got in your letter looks correct. Therefore, we think you'll find the fault is at line 50.

And finally, with tongue firmly in cheek . . .

TILTING AT WINDMILLS . . .

Dear Trev,

Sorry that I haven't written for so long, but I think I'm going quietly and irrevocably mad. And it's all the fault of Micro User.

They asked me to try out a new game they were thinking of printing called Lancelot and Guinevere. Well I've always fancied that I'd make a good jouster, so I decided that I'd type it in.

As you know, and Andrea keeps telling me, I've been stupid since the day I was born, but since I've had my micro I've been able to prove it.

The first mistake I made (or second, if you count starting the damn thing in the first place) was to turn over two pages at once and start typing in the wrong listing halfway through.

When you think about it I should have realised sooner. After all, it's unlikely that a listing with PROCchivalry and PROC-Merlin and lines like IF virgin THEN PROCunicorn would contain a PROC-lightpen. As it was, I typed in a whole page before I realised.

Mind you, it wasn't much better when I got back onto the right listing. Do you know the Number of the Beast? Well it's not 666 as you might think, it's line 340. It took me 27 attempts to get that one right, and even now I'm sure that Beeb only accepts it out of sympathy.

Not that I got much from Andrea. Sympathy, I mean. She couldn't see what all the fuss was about, but eventually, saying she couldn't stand the screaming any longer, she decided to help. And I accepted – my morale and judgement were that low!

A. said that she'd read the listing out to me while I typed it in and it seemed like a good idea at the time. I wiped the tears and sweat off the keyboard (the blood nearly came later) and settled down for what would be positively my last attempt.

And it seemed to work. She dictated and I typed. Then came the moment of truth. I entered RUN and pressed Return (as they say in the beginner's books). I was so nervous that I closed my eyes as the opening tune, "Colonel Bogey", played. I knew disaster had struck when I heard A. ask:

"Should Lancelot be doing that with his lance?"

No he shouldn't. And I had grave doubts that Mark Smirky, the guy who wrote the program, really meant the score table to be round. Against my better judgement I listed the program. It was rubbish.

"What have you done?" I screamed at A., my fingers curling menacingly around the User Guide. "You were supposed to be reading it all out".

"Well, I only corrected the punctuation", she screamed as she beat a hasty retreat, leaving me with my loathsome listing and a near coronary.

Still that wasn't the worst. The worst was my nasty nephew Nigel who just "happened" to call round. I suspect A., but can't prove it. The little horror has an Electron (which explains the "If it doesn't use Mode 7, it isn't worth doing" sticker on my Beeb).

Of course A. told him of my predicament and he offered to help. In my less paranoid moments I've little doubt that it was all done in a spirit of charity, but I did object to his groaning and laughing as he sorted it out. I particularly objected to the way he kept muttering "Dim, dim" under his breath.

Eventually the little horror had it working and he left, but not before he'd had a word with A. I was listening from the top of the stairs and distinctly heard the phrases "at his age" and "ZX81".

And now I have a working version of Lancelot and Guinevere and the challenge seems to have gone out of life. I haven't even bothered to play the game.

Who was it said "it is better to travel than to arrive"? He'd obviously typed in a few listings in his time.

Yours in adversity, **Bob**

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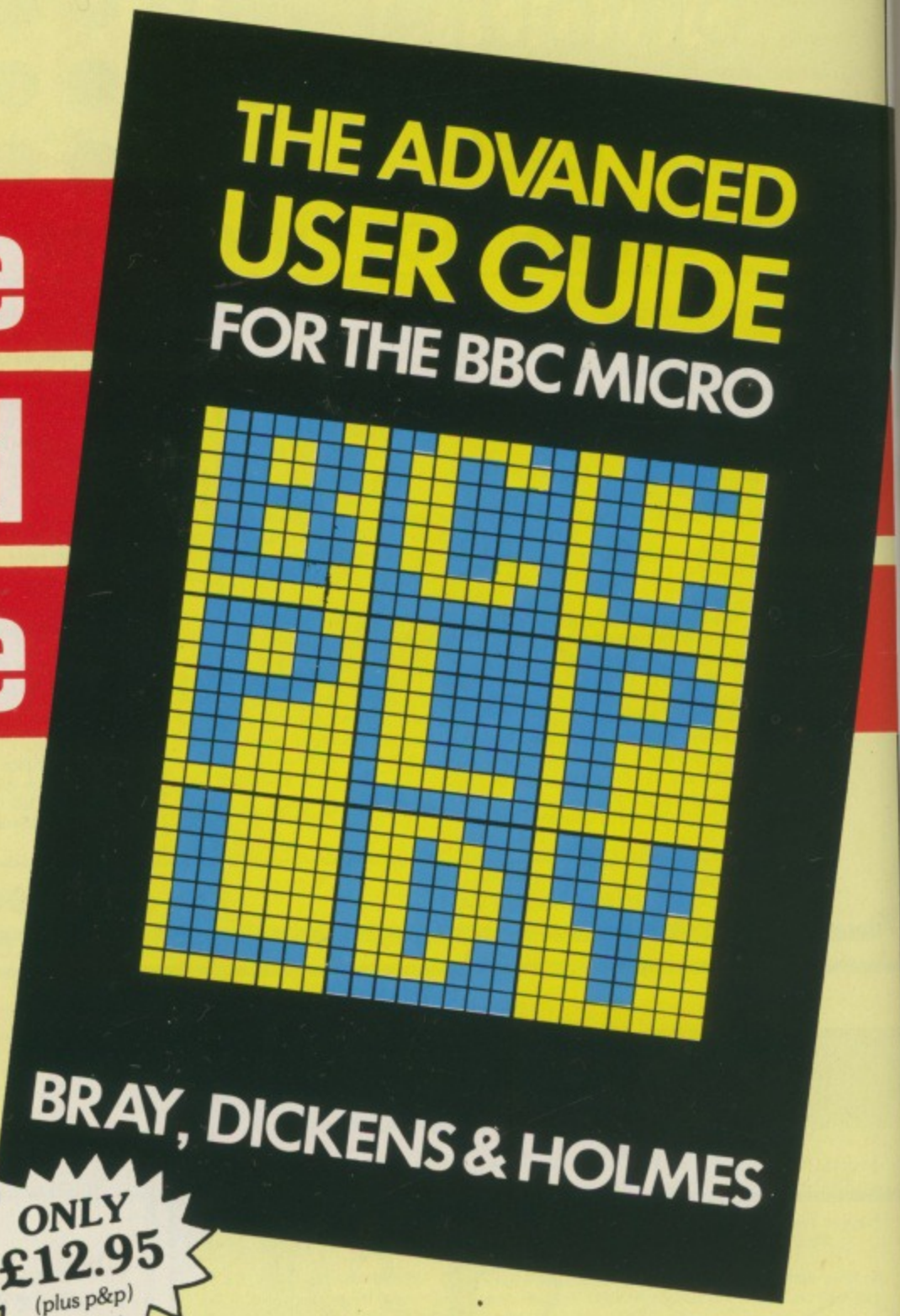

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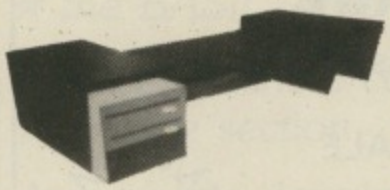

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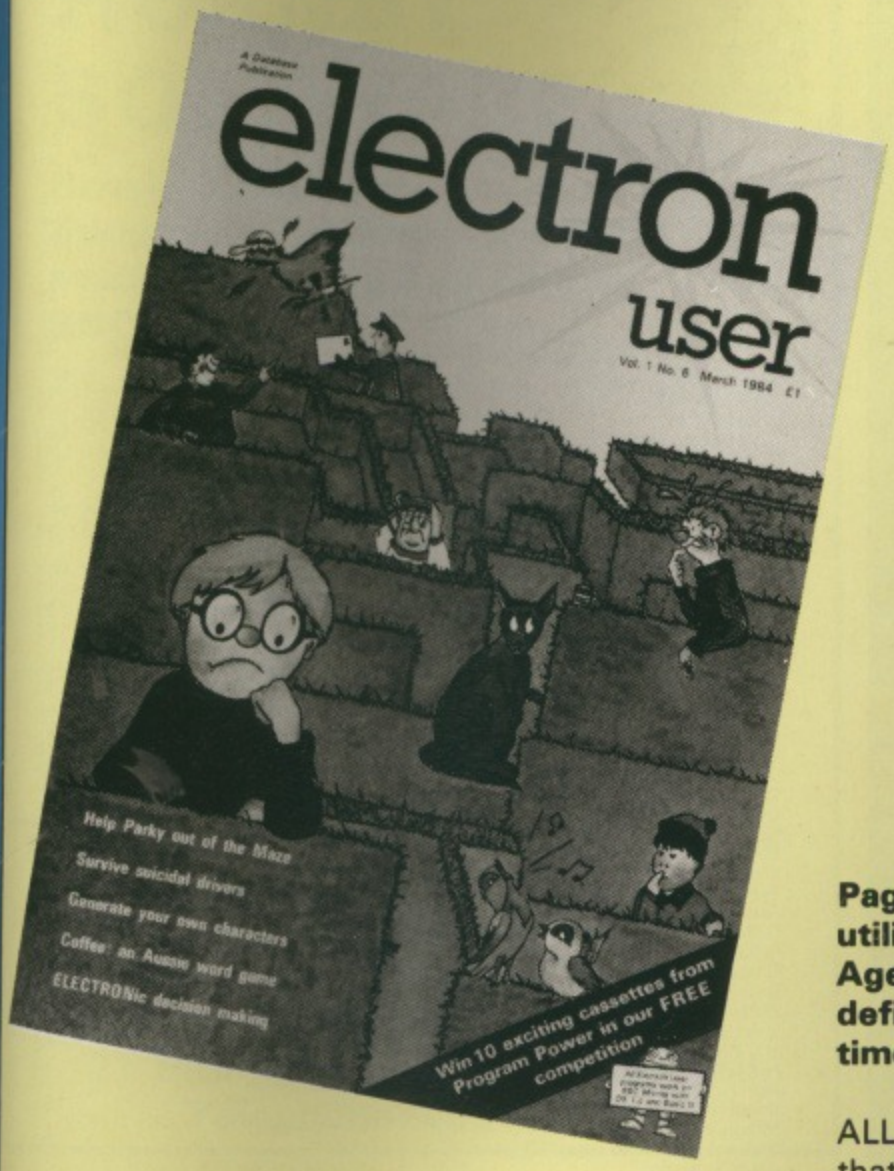

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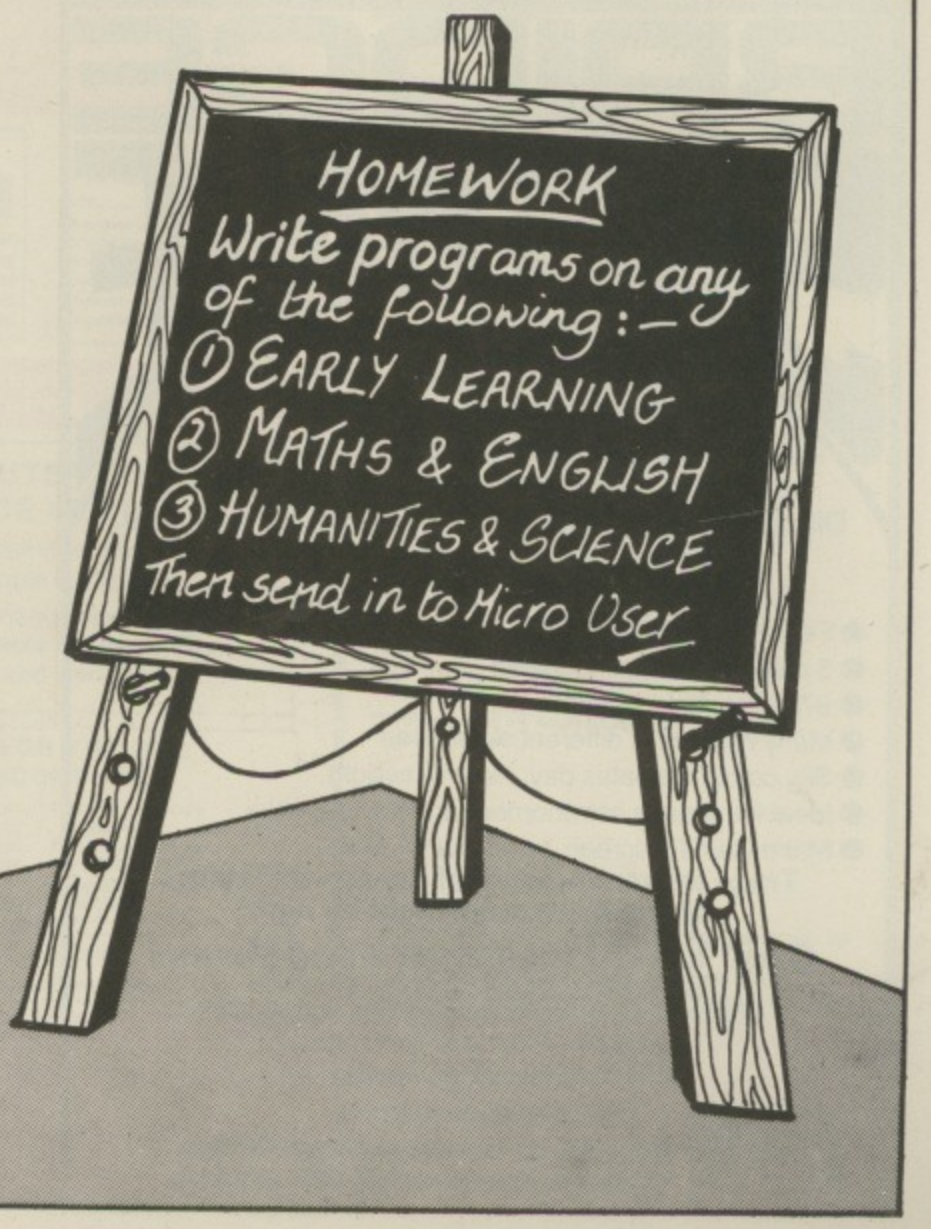

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