

All you want to  
know about the  
**BBC MICRO!**

# THE MICRO USER

Volume 1  
Number 7  
September 1983  
£1

## Robin to the rescue

Help him to save  
Maid Marian  
on Page 60

... then cut out the  
**£1** voucher for the  
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Show in Nottingham



### Inside the Electron

We strip off the cosmetics and  
reveal the bare facts about the  
BBC Micro's baby brother

More graphics techniques revealed

Program editing made easy

Save Earth from Galactic Invaders

Three rival DFS compared

Win  
the  
unique

## HOBBIT

in a contest  
that everyone  
can enter - Page 45



# ANDROID ATTACK ANDROID ATTACK ANDROID ATTACK

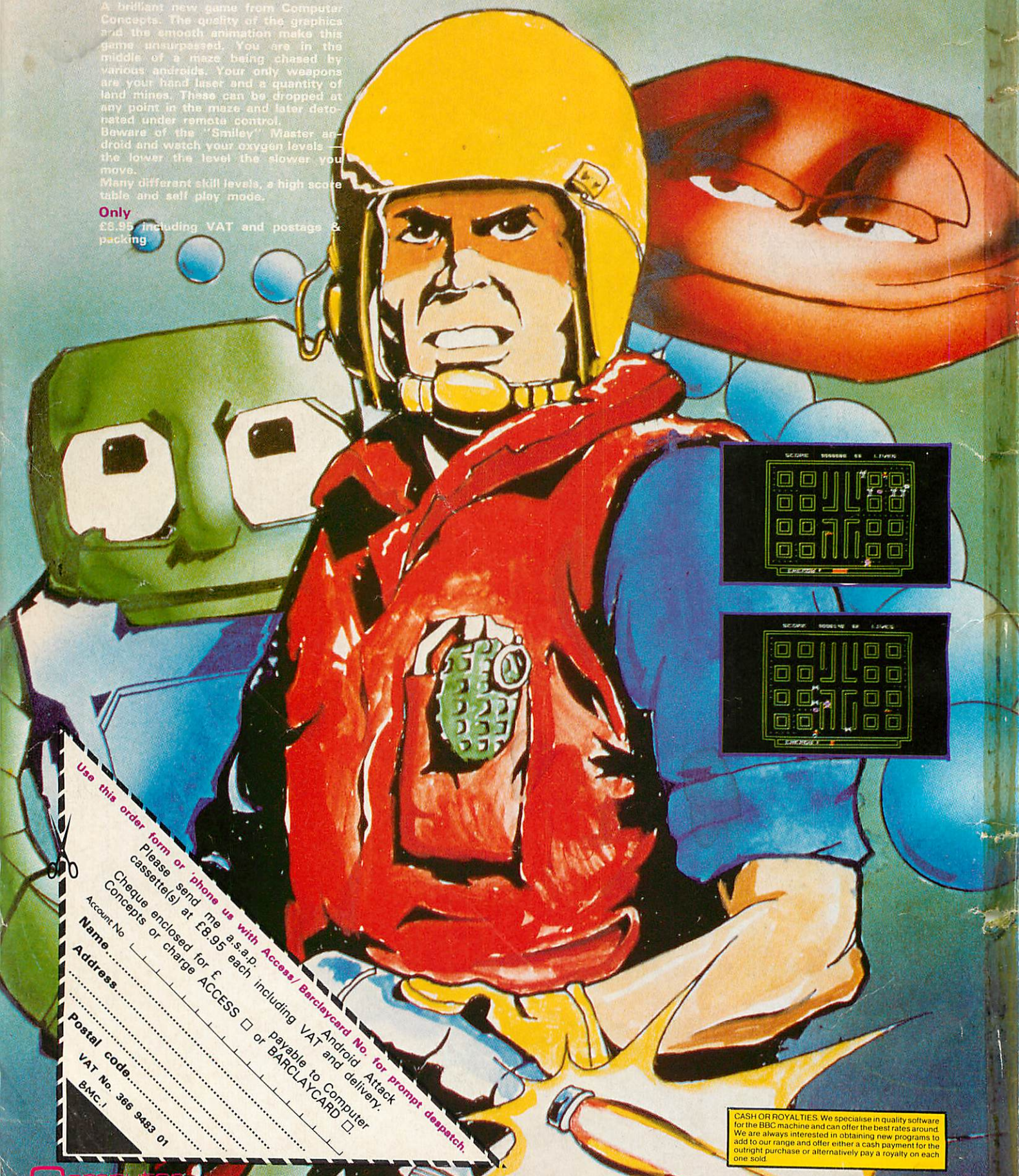
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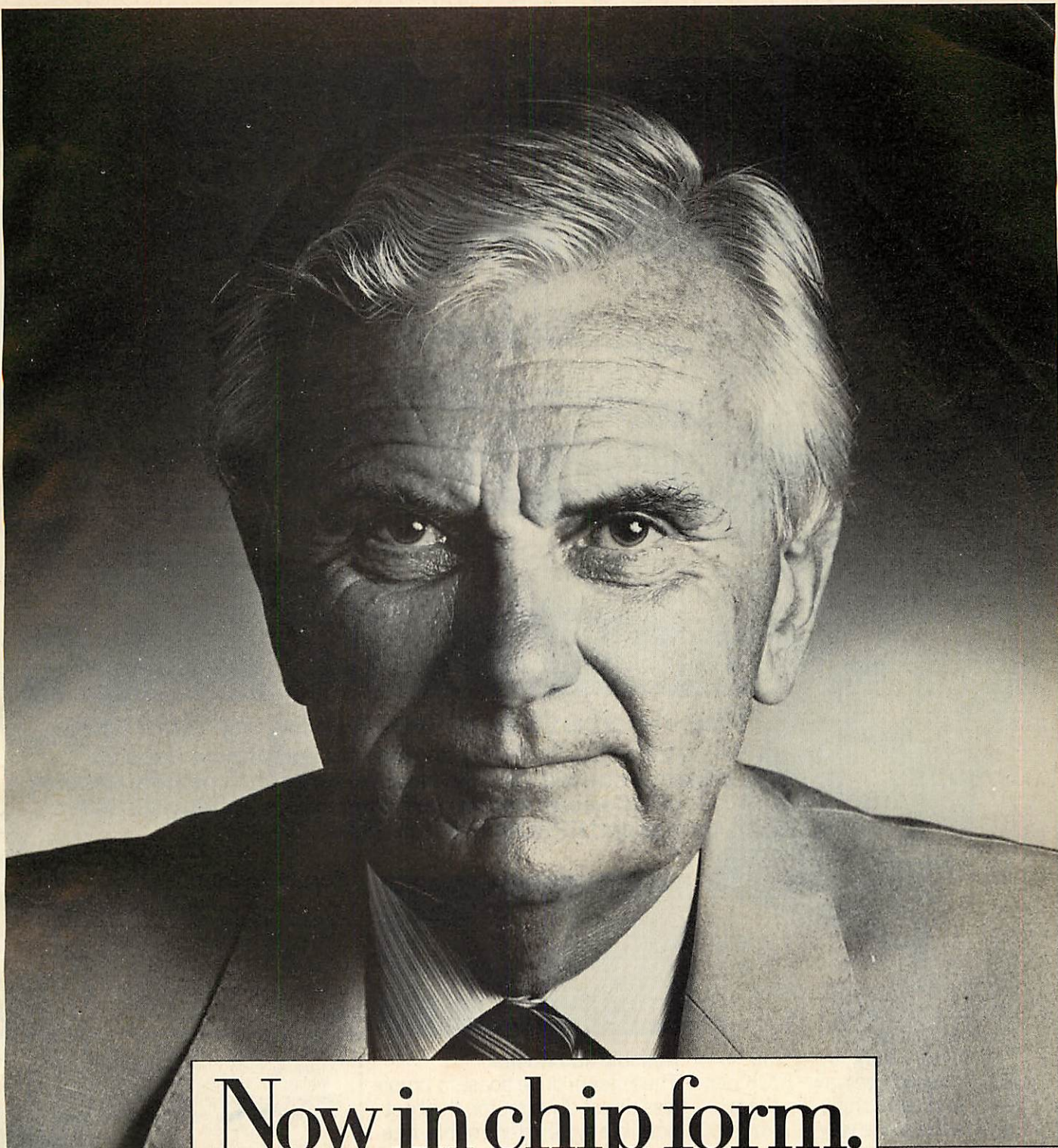
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Which is exactly why Acorn Computers, who designed and built the machine, have produced its very own speech chip featuring the dulcet tones of Kenneth Kendall.

Called Speech Synthesis, it's a pair of chips that can be plugged into your BBC Micro by your local BBC/Acorn dealer. On them, you'll find 164 words/syllables spoken in familiar fashion by the famous retired newscaster, all of which can be

combined to form several hundred other words.

The chips also provide the 'serial' processing capability whereby future software cartridges can also be plugged into the front of your BBC Micro. (The machine's vocabulary will be widened via such cartridges.)

Priced £55, Speech Synthesis is available from your local BBC/Acorn dealer. (To find out where that is, simply call 01-200 0200.)



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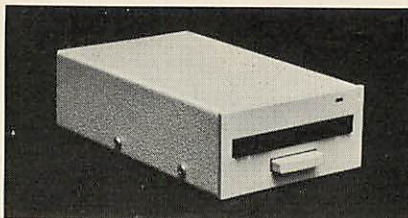
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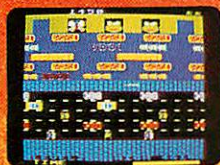
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The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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## CONTENTS

### NEWS

9

Keep in touch with the latest happenings in the bustling world of the BBC Micro.

### ELECTRON

19

Our technical editor looks inside the BBC Micro's baby brother and finds some surprises.

### DISC SYSTEMS

22

Acorn's DFS is joined by two newcomers from Pace and Watford. We report the differences.

### ANIMATION

31

Second part of our series teaching you how to put more colourful action into your programs.

### EDITING

36

We show how use of the TAB ( ) statement can produce clear screen displays with ease.

### LINK-UP

40

Turn your BBC Micro into a colour graphics terminal to link into a mainframe computer.

### COMPETITION

45

Step back in time, write a review of Space Invaders - and win yourself a Hobbit.

### BOOKSHELF

49

Our team of critics review four books that will help teach you more about the BBC Micro.

### DIRECTORY

51

More additions to our pull-out guide to many hundreds of BBC Micro software programs.

### GALACTIC INVADERS

53

A game to get your nerves a-tingle... a clever cross between two top arcade games.

### TAPE OFFER

55

Save yourself the chore of keying in programs from this issue with this month's cassette.



**60**

## Game of the Month



## Robin and Marian

*Put on your suit of Lincoln green and take a trip to Nottingham to rescue Maid Marian from the villainous Sheriff...*



*...and if you go there between September 16 and 18 don't miss our big show!*

**57**

## EPROM BLOWER

We dissect the new ATPL eprom programmer and ask: "Is it really worth the money?"

**59**

## SHOWTIME

Your invitation to the BBC Micro User Show in Nottingham – plus a £1 voucher.

**65**

## SPREADSHEET

Beebcalc, the spreadsheet program that turns the BBC Micro into a business computer.

**66**

## BACK ISSUES

Find out about the articles you missed in the last six issues of The Micro User.

**71**

## SOFTWARE

Our reviewers give frank appraisals of the latest games and educational programs.

**74**

## STRUCTURE

Our series on structured programming deals with the value and importance of flowcharts.

**77**

## SUBSCRIBE NOW

A year's subscription to The Micro User will bring you a FREE copy-holder and crib sheet.

**79**

## WORKSHOP

If you've ever wondered how your BBC Micro stores its variables this article tells all.

**85**

## UPGRADE

Our popular Beeb Body-building Course on how to control devices with your micro.

**98**

## BOOKSHOP

We've chosen 10 of the best books for the BBC Micro for this month's offer to readers.

**109**

## MICROMAIL

The pages you write yourself – just a small selection from the letters that are flooding in.



# SOFTWARE WITH BITE FOR BBC

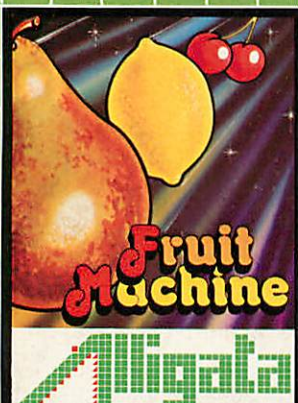
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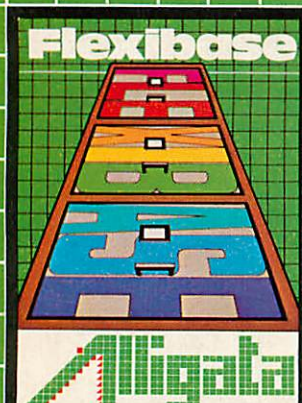
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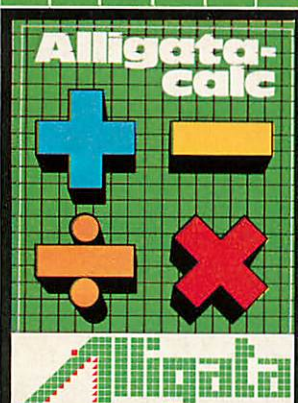
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SOFTWARE  
WITH BITE



# NEWS

## MARGINAL CONCERN

THE low dealer margins offered by Acorn on sales of the BBC Micro have raised the hackles of the Computer Retailers Association — the watchdog body for the micro trade.

Acorn's margins are notoriously small, and the CRA says it is very concerned and wants to

do something about it.

It has sent a circular to dealers asking whether they can conduct a proper business under the present discount schedule.

"If they are not happy with the arrangement", said a spokesman, "then the CRA will take the matter further".

# Beeb's baby brother is on the way!



Tom Hohenberg

ACORN hopes to sell more than 50,000 Electron micros before Christmas, according to Tom Hohenberg, the company's marketing manager.

Hohenberg anticipates some initial supply problems "because of the incredible demand". But he is confident that Acorn will be able to avoid the production snags that bedevilled the early and recent history

of the BBC Micro.

"We will come up to a very high level of production very quickly", he said. "But despite our preparations we still won't be able to meet initial demand."

### Planned

"We've pretty well sold all our planned production for the rest of the year — and that situation was reached even before the product launch."

"However we will build up our production to 20-25,000 Electrons a month before Christmas", he added.

The Electron, baby brother to the BBC Micro, is expected to be available this month.

It will cost £199 and will be sold through Acorn dealers and W.H.



The Electron: "incredible demand"

Smith branches — the only High Street multiple store to be allowed to handle the machine, at least until Christmas.

Acorn describes the Electron as being "upwards compatible with the BBC Micro".

That means that the BBC Micro will be able to run all Electron

software, but not vice versa.

The Electron has no Mode 7 feature and so won't run BBC Micro software that uses it.

Hohenberg says the Electron is also much slower than the BBC Micro.

● Inside the Electron — see Page 19

## Hot seat for Hohenberg

THE launch of the Electron and the impending assault on the American market for the BBC Micro has put Tom Hohenberg of Acorn into the hot seat.

He was recently appointed marketing manager, and in his new role will be directing the company's advertising, public relations and sales promotions activities.

### Research

He is also responsible for product planning and market research.

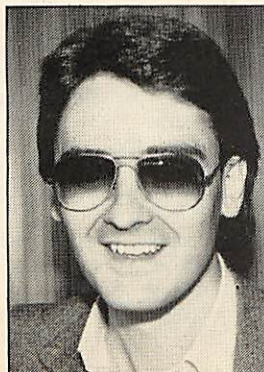
He told *Micro User*: "There is so much happening at Acorn that my only real problem is deciding what to do first!"

Hohenberg joins the company from A.M. Amdel, the engineering graphics division of A.M. International, where he

was director of marketing.

Another new face at Acorn is John Caswell who, as art and promotions manager, will be in charge of exhibitions, literature, point of sale and all design.

He spent the last three years working for a design company, Optimus, in Cambridge.



John Caswell

## Free offer on disc pack

FOUR CP/M software packages which cost £1,150 are being offered free to buyers of the Torch disc pack.

This is the twin 400k drive unit which incorporates a Z80 card, the CP/M operating system, 64k RAM and its own power supply, and is compatible with the BBC Micro.

The new disc pack bundle, which costs £825, includes four inte-

grated packages — PerfectCalc (a spreadsheet), PerfectWord (word processing), PerfectSpeller and PerfectFiler (a database program).

BBC Micro owners who have already bought the Torch disc pack have not been left out in the cold.

"We are offering them a special retro-pack which includes extra ROMs, software and the

four Perfect packages for £300", said a spokesman for Torch.

He said the special package meant that people buying the disc pack could have it up and running with good quality software almost as soon as they had bought it.

Torch also manufactures a range of dual and triple processor micros, all of which have a 6502 chip running BBC Basic.



# BBC Micro is top of the pops as a prize

A PRIZED possession and a popular prize – that's the BBC Micro.

Hundreds of people throughout the country are working on competition entries to try to win a Beeb.

And St Cuthbert's primary school in Darwen, Lancashire, has already done so.

Its project detailing the applications of micro technology in the classroom won the recent *Lancashire Evening Telegraph* Computer Competition.

More than 40 children aged between eight and 11 collaborated on the project, with most of the work being done during lunch hours and after school.

Most of the pupils were on hand to receive the prize, which included a cassette and a Welcome starter pack, from Christopher Walder, assistant editor of the *Evening Telegraph*.

The school will use the machine to improve language development, mathematics and general knowledge.

## Safety

A BBC Micro is also the prize in Micro 83, a road safety competition organised by Devon County Council. Pupils in 200 Devon schools and colleges have been challenged to produce a computer program which could help reduce road accidents.

It is based on a study of a fictitious accident involving a car, a motorcycle and a 12-year-old schoolgirl

pedestrian who dies as a result of the accident.

"The entrants may come up with an original idea for a computerised piece of equipment on the car or motorcycle which might have helped prevent the accident", said Peter Gimber, Devon's Road Safety Officer.

"Or they may take an educational approach, using computers to stress road safety messages".

Even the national newspapers are joining in on the craze for the BBC Micro.

The *Mail on Sunday* recently gave away 10 machines to people who placed relevant features of the micro in the correct order of importance, and *The Guardian* lists the BBC Micro as one of the prizes in its "Is the Office Dead" essay competition.

## Prowess

Cherry Tree School in Watford is now the proud owner of a BBC Micro, thanks to the programming prowess of two of its pupils.

Hundreds of primary school pupils entered the Win a Computer for Your School competition organised by the *Watford Evening Post-Echo* newspaper.

Youngsters Martin Coupe and Darren Howells won the first prize, which included £50 worth of educational books with their game, "Filling Attack".

Two more of the school's pupils, Matthew Sharkey and Mark Harvey, were among the winners of runner-up prizes.



At Cuthbert's school children receive a BBC Micro from Chris Walder. Picture courtesy the *Lancashire Evening Telegraph*

## IT'S ON THE AIR

ALTHOUGH it is not officially launched until the middle of this month, the BBC has already started a full service of downloading software over Ceefax.

The seven programs are all educational, but plans are under way to include games and utilities shortly.

To pick up the software off the air you need a Model B, an ordinary TV set and a teletext adapter costing £196.

## The Micro takes a

A NEW teaching package that could, from the title, add sauce to any lesson is The French Mistress.

Described as a versatile and fully user-programmable learning aid, the program covers an extensive range of French vocabulary subjects.

These include complete phrases and lists of verbs, fully conjugated in

five tenses. Each lesson can be used in a variety of learning modes.

Finally there is a test mode where the micro checks speed and accuracy of translation.

New lessons can be created by the student or teacher and stored on cassette for later use.

The package is made up of two cassettes, each





# TAKING BBC SOFTWARE TO THE US

A BRITISH company plans to be one of the first firms to market software for the BBC Micro in the United States.

DACC has established a subsidiary in Chula Vista near San Diego in California.

It will produce arcade games and utility programs and will start selling them as soon as the machine is released in the American market.

"The BBC Micro is the Rolls-Royce of computers and Americans can't wait to get their hands on it", claims DACC managing director Derek Ashton.

"Every model sold in the US will be grabbed up and I want to be first on the scene to meet the demand for software".

Ashton's father, Frank, has lived in the USA for 16 years and will run the new subsidiary.

He is already arranging an advertising campaign and setting up a production capability.

DACC claims an im-

maculate track record for its UK production of programs.

"We've sold more than 2,000 copies of our 747 Flight Simulator package worldwide since last November - and we've not had a single BBC tape returned as being faulty or unsuitable", said Ashton.

He claimed the secret of this success lay in producing the programs "direct from the BBC Micro" with no audio copying involved.

Three BBC Micros are used constantly to churn out the tapes and Ashton says production capability is now 2,000 a month.

"We will use the same methods in the USA", he said. "All our tapes will be produced on the Beeb - virgin tapes. There will be no horror stories for us".

In the pipeline is a utility package which Ashton says will extend the BBC operating system and give a considerable boost to its graphics capabilities.

## New languages now available

### mistress

covering different areas of vocabulary. Each cassette costs £9.95.

The authors, from Kosmos Software, say they started writing educational material "determined to liberate micros from the incessant threat of space invaders and gulping Pacmen in the interests of some down-to-earth education".

THREE new languages - Forth, Lisp and BCPL - are now available for the BBC Micro.

They turn the machine into a powerful tool for the professional software developer, according to a spokesman for Acornsoft, Acorn's software division.

"The spur that these languages will give to new software development will place the BBC Micro firmly in new computer application areas. These will include expert systems and robot con-



trol", he added.

BCPL, widely used in universities, is a flexible structured language that provides an effective high level alternative to assembler.

It is also memory efficient and can handle programs 10 times the size of the machine's resident memory.

Acornsoft says it expects BCPL to be widely used in the development of commercial packages and system software such as screen editors and control systems.

It is available in ROM and comes with a disc containing compiler, screen editor, 6502

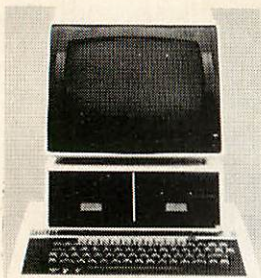
assembler and other utilities for £99.95.

Lisp is the fundamental language of artificial intelligence research and is the basis of many expert systems, including medical diagnostic computers.

Forth is a fast compiled language which runs five times quicker than Basic and is suitable for machine control and high speed graphics.

Lisp and Forth come on either cassette (£16.85) or disc (£19.90) with user guides costing £7.50.





HAVE you ever wanted to jump on your micro?

Crofton Electronics has released a replica of the BBC Micro case made of sheet steel. It claims that it is strong enough to support the weight of an eleven stone man – let alone a monitor and two disc drives.

The case is simple to fit and the user only has to transfer the keyboard surround, back label and input/output labels from the original case, using double sided tape, to achieve a cosmetic "lookalike". Cost: £39.50.

## New Epson printer

A PRINTER combining both tractor and friction feed has been launched by Epson.

The RX80F/T, costing £350, has dot-addressable graphics, condensed and double width printing, Centronics parallel interface as standard and a print speed of 100 cps.

## Are YOU a MUG yet?

PLANS are now well under way for setting up a network of local Micro User Groups – or MUGs for short – dedicated solely to the BBC Micro.

If you want to get in touch with your nearest group – or help in setting one up – please fill in and return the coupon below.

### SEND TODAY!

- ☐ I would like to become a member of my local Micro User Group.
- ☐ I would like to help in setting up a local Micro User Group.

Name .....

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POST TO: MUG, Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

# MAKING THE MOST OF MICRONET

MICRONET stands for Micro Network. But unlike a local area network – which consists of computers sited within a few yards of each other linked together by cable – Micronet covers the whole country, and is run via British Telecom phone lines.

The advantage of using Micronet to get computers talking to each other – and sending mail electronically to each other – is that by the end of this year 92 per cent of the country's phone population will be able to dial into Micronet as a local telephone call. Which makes Micronet a cheap clearing house.

In fact, as an example of this, these words were typed into Micronet in London at 7:40am on Friday July 29.

### Transferred

As soon as the editor got into the *Micro User* office at around 9am he turned on the Micronet outfit – an acoustic modem in which you rest the telephone receiver, with a BBC Model B Micro and a display screen – and the words were simply transferred from the phone line onto a printer or a floppy disc.

Anyone with a BBC B – or an upgraded A with an RS432 socket and 32k of RAM – can use Micronet for person-to-person electronic mail.

But more importantly Micronet carries a directory of all those who use the BBC B service.

This means you can find out who all the other Beeb owners are, and can send messages to particular individuals or organisations.

It's like using the

phone, but it's generally faster, cheaper, and the person you're addressing doesn't have to be in at the time you're sending your message.

When they next turn on their Beeb and its modem kit they'll discover your mail waiting for them.

It seems daft that with the incredible speed of computing, you still have to wait days or even weeks, for a mail order program cassette to be sent back through the post.

But Micronet carries software down the phone

right into your home.

Dial Micronet, browse through what's on offer, select a program like Candyfloss or from dozens of others – there are around 200 changing programs up on Micronet for the Beeb alone – and simply press button f5 on your micro to LOAD the program.

You then SAVE it to tape or disc directly from the phone line.

It takes just a minute or two instead of days!

The *Micro User* is, of course, a user of Micronet. The system allows you to write letters to the

Editor using your BBC Micro.

Every month from now on *The Micro User* will be carrying regular updates on what's happening on Micronet.

The current hardware to couple your Beeb costs £59.74. That includes an acoustic modem, power pack, a lead to plug into the RS432 socket and a tape to configure your micro.

Next month *The Micro User* will carry a rundown of users' comments, and a sample of the programs available on Micronet.



## Picture the scene

*A BBC Micro for £3.99? Well, not quite – but you can buy a laminated photograph of one at this amazing bargain price.*

*The plastic pix of BBCs and other popular micros are being sold to schools by Computer Training Aids – as training aids. They claim pupils*

*can get keyboard practice without even needing a real machine.*

*The existing device has limited capacity, but if Sellotape is used to connect to a photograph of a disc drive goodness knows what the outcome would be when you punched in a program!*

## Keep it safe

AS people do steal micro-computers, Selmor Engineering Industries have designed a simple security device for the BBC Micro.

An upper frame is bonded to the micro. This locks into a lower frame which in turn is bolted to the working surface.

The complete security device costs £26.

## Upgrade answer

CLARES latest utility, Replica, should, they claim, end one of the major problems for those upgrading from tape to disc.

Previously many BBC Micro users found it impossible to transfer commercial packages they had bought on tape onto disc.

According to Clares, Replica should allow almost all machine code

and Basic programs on cassette to be uploaded onto disc and run.

The copied programs are actually stored as a library on the Replica disc, the maximum being about 10 programs.

Since Replica sells at £9.95, this means a cost of around a pound a program – considerably cheaper than having to re-purchase all your programs in disc format.



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All prices include VAT

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Word Wise Word Processor .....	£45.00
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STOCK**

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Single Drives Switchable 40/80 Track	
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200K .....	£399.00
400K .....	£450.00
800K .....	£599.00
Disc Cable .....	Single £9.50 Dual £13.50
Disc Operating Manual & Formatting	
Disc .....	£10.00
Floppy Discs in packs of 10	
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Juki 6100 Daisywheel with 2K Buffer .....	£431.00	★ STAR BUY
Silver Reed Printer/Typewriter inc. RS232 Interface (just plugs into your BBC) .....	£431.00	

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Green Screen Zenith 12" .....	£89.00
BBC Official 12" .....	£95.00

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Ferguson TX .....	£199.00
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## Colour Monitors

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## Word Processing Package

BBC Model B plus Disc/Interface fitted  
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**ONLY £1,360**  
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Official Joysticks .....	£13.00
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Sanyo DR101 .....	£44.85
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Complete range of books including:	
Programming and Interfacing the 6502 .....	£14.40
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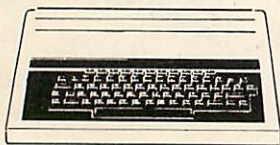


# WATFORD ELECTRONICS

33/35 CARDIFF ROAD, WATFORD, Herts, England

Tel: Watford (0923) 40588/37774 Telex: 8956095 WAELEC

## BBC MICROCOMPUTER



**BBC Model A – £260**

**BBC Model B – £346**

### BBC Micro Model A to Model B UPGRADE Kits:

Upgrade your Model A with our  
Upgrade Kits and save yourself £ s s s

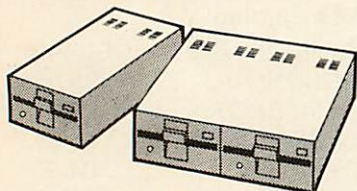
- BBC1 16K Memory (8 x 4816AP-3 100nS) **£16.00**
- BBC2 Printer User I/O Port **£6.98**
- BBC3 Disc Interface Kit **£85.00**
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(Protects your expensive Micro  
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- **CS50A – TEAC** Cased with own Power Supply, S/S 40 track, 5 1/4", 100K **£170**
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- **MITSUBISHI Slimline** – Uncased, double density. Double track, 5 1/4", 1 Megabytes, track density 96TPI, track to track access time 3mSec. Plugs directly to BBC Micro. **ONLY £220**
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**DFS KIT for BBC MICRO**  
Complete Kit including Watford's highly sophisticated (Acorn compatible)  
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10" Tractor Feed,  
80 columns, 30CPS  
Normal & Double width Char.  
Dot res graphics. Parallel Interface standard.  
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## SEIKOSHA GP250X:

10" Tractor Feed, 80 columns, 60 CPS, normal and double – width/height characters, 128 characters with true descenders in ROM, 64 user definable characters in RAM (384 bytes)  
Programmed printing (80 bytes of memory) for storing your own print sequences, dot addressable graphics with repetitive graphics data printing, RS232 and Centronics parallel interfaces standard, paper empty function and buzzer, self test routine. All this for

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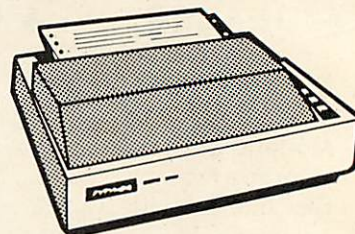
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### Epson RX80

100 CPS, 9 x 9 matrix, dot addressable graphics, condensed and double width printing. Normal, Italic and Elite Characters. Tractor feed, 10" max width, bi-directional, logic seeking. Centronics Interface standard.

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FX80	<b>£4.75</b>
RX80	<b>£4.75</b>

## DUST COVERS

MX80 FT	<b>£4.50</b>
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FX80	<b>£4.95</b>
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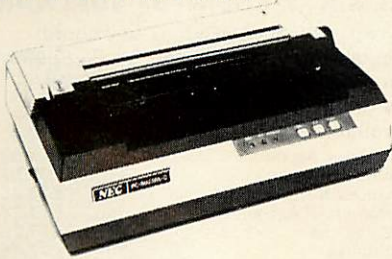
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## NEC PC8023BE-C:



100 CPS, Bi-directional, logic seeking, 80 columns, 7x9 Dot Matrix head, true descenders on lower case, Superscript, subscript and underlining. Single sheet Friction or Tractor feed. Hi-resolution block graphics. All this for only **£320 (£7 carr.)**

## INTERFACES

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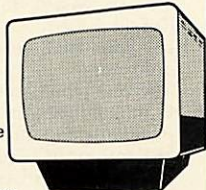
## BBC Micro WORD-PROCESSING Package

A complete word processing package consisting of: BBC Model B, Zenith 12" Green Monitor, Twin 200K highly reliable (1 year warranty) Twin Cased Disc Drives with own power supply, the popular WORDWISE word processor, Watford's own highly sophisticated 62 File DFS interface fitted, the world renowned Brother 8300 Daisy Wheel Printer/Typewriter, Gemini's Beebplot & Beebcalc Spreadsheet Analysis Software tapes, 10 blank diskettes, 500 sheets of Fan-Fold paper, Manuals and all the leads. All you require is a mains power point to have it up and running (we even supply the 4 way mains socket).

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14" Colour Monitor, RGB Input. (as used in BBC programmes) FREE Interface Lead. **£249 (carr. £7)**



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All parts available as per Acorn User's 'SHINE A LIGHT' Light Pen article.  
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Ready made printer lead to interface BBC Micro to EPSON, SEIKOSHA, NEC, etc., Printers.

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## BEEBLOTTER

The Unique Graphic Tablet

Watford Electronics' BEEBLOTTER will work with 32K BBC Micro. Connects to Analogue port. The unique design makes it accurate and simple to use. Attractively finished. The comprehensive booklet supplied describes its use in detail and shows some of the possible applications.

The special features include:-

- Works in all graphics mode and any colour selectable.
- Commands printed on Tablet and On-screen instructions.
- Special routines enable pictures to be quickly loaded from tape.
- Works with all operating systems and ECONET. Tape and Disc versions available.
- Large drawing area (32cms x 23cms).
- Maps, Pictures and Diagrams produced quickly and easily.
- Transparent tablet enables maps and diagrams to be copied directly from books.
- Commands include line, circles and rectangle drawings, infilling, full editing and an easy to use copy and move feature.
- Screen dump routines included for Seikosha and EPSON printers.
- Routines are included to allow user to incorporate pictures in their own programs.
- Designed by a professional teacher with educational uses in mind.

**ONLY £75 (£3 carr.)**

## 13 ROM SOCKET BOARD

Are you wondering where to fit new ROM based software inside your computer in addition to the BASIC, WORDPROCESSOR, DFS, and FORTH ROMS? Then our add-on 13 ROM Socket Board is the answer. Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 4 solder connections to be made. Full instructions are supplied.

Our 13 ROM SOCKETS BOARD enables the User to increase the Sideways ROM capacity from the basic four sockets on the main board upto the full SIXTEEN capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User plenty of freedom to explore the possibilities of the new pagged ROMs due in the coming months and offers them the chance to develop their own. All essential lines are buffered and the Board meets or exceeds all timings for operation in the BBC Microcomputer.

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## EPROM PROGRAMMER for BBC MICRO

At last! - the EPROM Programmer for BBC Micro Computer from WATFORD ELECTRONICS that will suit both your pocket and all your requirements. Programs all popular types of EPROMS from 2K bytes up to 16K bytes - **2764 - 2516 - 2532 - 2564 - 2764 - 27128.**

This extremely powerful system is designed for your needs of TODAY & TOMORROW! - BBC Basic programs can be copied into EPROM and subsequently re-loaded faster than from a disc! Suitable for both hobbyist and professional users!

Just look at these features:

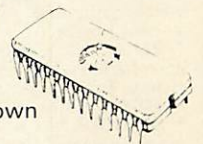
- **COMPLETELY SELF CONTAINED** - Housed in its own sturdy case - Uses its own Power Supply - Connects directly to the 1MHz Bus - Simple and Safe!
- **FULL SOFTWARE SUPPORT** - Comes complete with simple to use ROM based software - Facilities include Verification, Reading, Virgin Testing, Writing, Editing, Saving, Loading and more! NOTE!! - This software does NOT simply comprise hastily prepared routines to get you going, but is a professional, purpose designed applications package.
- **ACORN BUS COMPATIBLE** - Use of the 1MHz connection complies with all Acorn addressing recommendations - That means you can still add-on such things as the TELETEXT, IEEE 488 and PRESTEL Adaptors without having to disconnect everything.

You don't need just any Eprom Programmer - you need **WATFORD ELECTRONICS EPROM PROGRAMMER** System.

**ONLY £78 (£2 carr.)**

Price includes software in ROM (and Manual)

**NEW - NEW - NEW**



## Watford Electronics' own BEEBMON

A ROM based machine code Monitor for the BBC Micro. It enables machine code programs to be debugged and altered easily and quickly. Being a ROM, its Commands are always readily available and occupy no USER memory.

The special features includes facilities like: TABULATE, MODIFY, FILL, COPY, COMPARE, SEARCH (Hex & ASCII), CHECKSUM, DISASSEMBLE, RE-LOCATE, SINGLE STOP, SET BREAK POINTS, SCREEN DUMP ROUTINE, DUMB TERMINAL and many more facilities.

**£22**

## LOGO in ROM

This popular language now available in ROM. Manual included with the ROM.

**PRICE: £36.00**

## WATFORD ELECTRONICS

Continued



## ★ NEW ★ BBC MICRO DFS

by  
Watford Electronics

This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

- \* The system can either use the ACORN standard 31 files per disc side or DOUBLE THE CAPACITY to 62 files. The size is selected at formatting time. Copying between discs with different catalogue sizes works perfectly normally.

- \* A FORMATTING PROGRAM is built in, permitting formatting to 35,40,80 track formats with either 31 or 62 files. Since the formatter is built in to the DFS it can be used without affecting whatever program you are using.

- \* A DISC VARIIFIER is also built in. This checks the internal checksums on each sector to identify any corrupted data. This is extremely useful when saving valuable data as it shows faulty discs quickly and easily. Again it does not affect the program you are using.

- \* A built in DISC SECTOR EDITOR gives a screen window onto the disc enabling detailed editing of any byte on the disc. This is very useful for recovering accidentally deleted files and can save weeks of work.

- \* A double step mode allows the user of 80 TRACK DRIVES TO READ 40 TRACK DISCS. This mode is software selected for each drive individually, thus allowing a 40 track disc to be copied onto an 80 track one very easily. THIS ELIMINATES THE NEED FOR EXPENSIVE SWITCHABLE DRIVES.

- \* A WORKFILE function sets the name to be used when the null filename is issued. This allows a program to be edited and repeatedly saved having only typed its name once.

- \* When using LOAD, CHAIN, etc. it is possible to specify an ambiguous filename. This will result in the first file whose name matches the specification being used. This saves typing the end of a filename that you know is uniquely identified by its first few characters.

- \* Two commands exist to simplify the transfer of programs from TAPE TO DISC. These load the file to &1200, switch off the disc system and then move the file to its correct load address; thus saving a lot of complicated programming. This command can be used to load files up to 27K5 long.

- \* An advanced COPY command is included which will prompt the user, requesting whether to copy each file.

- \* RENAME has been extended to allow the use of ambiguous filenames. This allows you to change BERT1, BERT2, BERT3 to FRED1, FRED2, FRED3 with only one command.

- \* OPENOUT has been improved to give you fewer annoying 'Can't extend' errors, as it automatically picks the biggest space on the disc in which to put a file. A SPACE command lets you know how much space \*COMPACT could create before you waste time doing it.
- \* 1.75K of RAM can be taken over from the DFS for your large BASIC programs while still retaining LOAD, SAVE and \*CAT and other simple commands.

- \* Comprehensive and clearly written Manual (available separately) gives the user a complete package deal.

Price DFS ROM ONLY £42

Complete interface kit incl. DFS ROM £85

Comprehensive and clearly written manual £7.50

### P.S.

We will exchange your existing ACORN DFS for the highly superior Watford's DFS ROM for £35.

**Wordwise**

Without doubt the most sophisticated piece of software yet written for BBC Micro. It has all the features of a professional word processor yet is easy to use.

**SPECIAL OFFER: ONLY £34**

**ONLY THE BEST AT  
WATFORD**

## FORTH ROM for BBC

This superb compiling language now available in ROM. Simply plugs into one of the ROM Sockets. Full FORTH manual included. **£39**

## BBC FORTH on Cassette

Follows FORTH-79 standard and has fig-Forth facilities - Provides 260 FORTH words - infinitely extensible - Full screen editor - Allows full use of MOS - Permits use of all graphic modes, even 0-2 (just) - Easy recursion - Runs faster than BBC BASIC. ONLY **£13** FREE 70 page manual and a Summary card.

## BBC FORTH TOOLKIT

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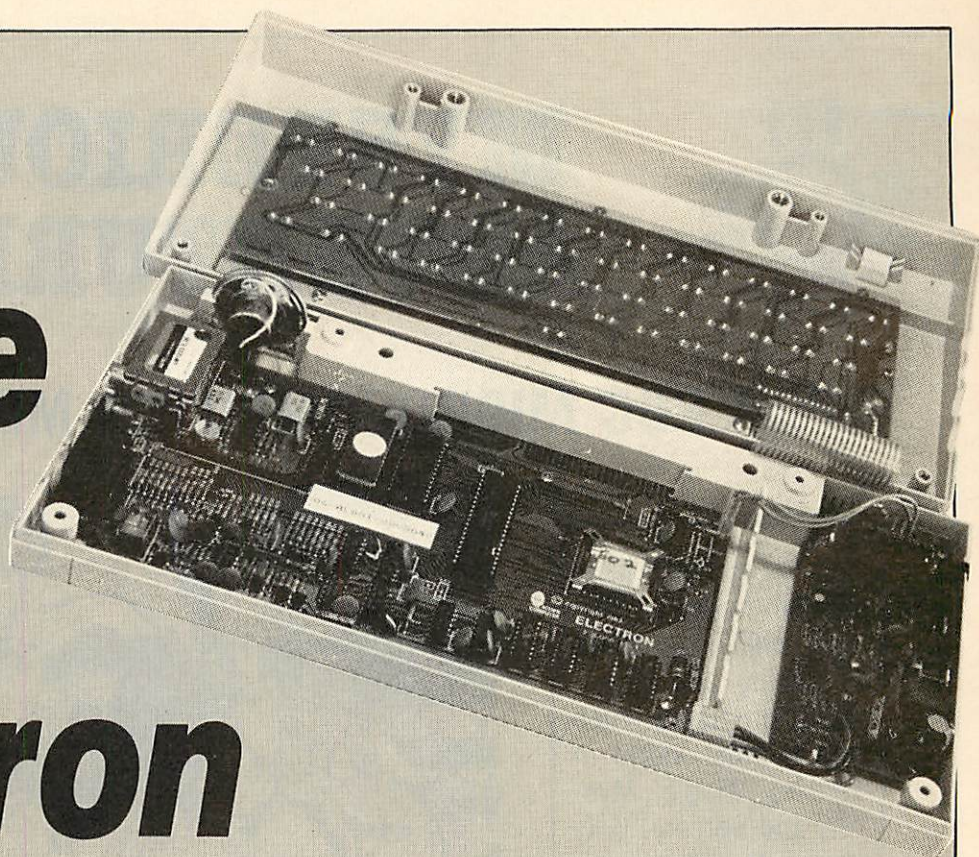
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# Inside the Electron



THE *Micro User* magazine is devoted solely to the BBC Micro, and as such we would not normally review other computers. However, from time to time a computer comes along that is going to have an impact on users of the BBC Micro and we feel that you would like to be kept abreast of these developments. Be assured that your favourite magazine is going to remain devoted purely to your favourite micro.

A chip off the old block – the Electron – is Acorn Computers' entry in the low budget computing market. Pictures of it do not really do it justice as, when you handle one, it has a very slick neat feel.

The keyboard is good quality and is more steeply raked than that of the BBC Micro. It has certainly been professionally styled. Part of its lightweight feel is due to the fact that the mains transformer has been incorporated into the mains plug.

Acorn have decided to slim down the BBC Micro and produce a near-compatible machine. The basic philosophy seems to be, to retain all the software-related features of the BBC Micro, while taking advantage of the latest developments in large scale integration of custom built circuits, by which I mean the ULA.

The one used in their Electron is a whopper! It is the very large square chip you can see on the right of the main computer board.

This type of package is known as a flat pack and it is the first time I have

## Mike Cook casts a critical eye over the BBC Micro's baby brother

seen one in a home computer. Flat pack packages are normally used in military applications, and as Ferranti do a lot of work for the military, maybe this was the only package they could produce with so many connections.

It is a ceramic package and, while this is more expensive than plastic, it does conduct the heat a lot better. It could be this was the reason for the choice of package as it does run very hot.

The inclusion of this large ULA allows the Electron to be made very cheaply, as one of the major costs in assembling any electronic device is the chip count.

Like any boxer who has slimmed down to a lower weight, it has lost something, in this case most of the built in extras that make the BBC Micro so attractive.

Out goes the analogue input port, the user port and printer interface, the disc interface, the Tube and serial ports.

Also, by putting the ULA to work, a few of the remaining hardware features are not what they were. For example, the sound synthesiser has only one channel and is not as flexible, that is, you do not have the same control over

the sound it produces.

As the ULA also performs functions previously performed by the 6845 CRT controller, some of the controller's special features are not implemented, such as the light pen input and the ability easily to scroll sideways.

On the BBC Micro graphics Mode 7 is generated from a separate chip from the other modes, which allows full colour with a remarkable economy of memory. As this chip is missing in the Electron it cannot use this mode.

If you try to call up Mode 7 the Electron will go into Mode 6. In a lot of programs Mode 7 is used for fancy coloured titles and instructions and will still be readable in Mode 6.

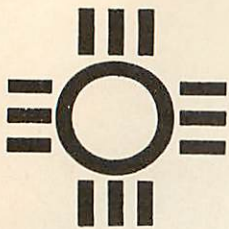
However, the control characters are displayed as user-defined and any such characters left over from a previous program will show up. This usually means that a line of text is preceded by a funny squiggle.

The Electron has also lost speed. Whereas the BBC Micro runs at 2MHz, only slowing down to 1MHz to access peripherals, the Electron also performs its memory access at 1MHz.

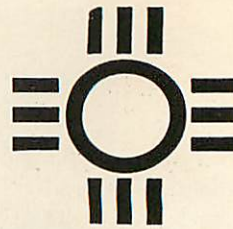
This is done to save money on the memories, but has the effect of slowing down the whole machine. This is most noticeable when running graphic-intensive programs.

However, the Electron has also gained a few features, the most notable being the single key entry of Basic





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## From Page 19

commands. But, unlike the competition in this price range, it also accepts commands typed in a letter at a time.

The Electron is also less bulky, making it more portable. But I suspect that the major plus for the Electron will be the price – £199 – and it would not surprise me to see that come down after a year or so.

The Electron comes with two books and an introduction tape. One book is a spiral bound User Guide very much like the BBC one.

However, it is laid out in a more compact way and has an excellent section on assembly language where each machine code instruction is described and explained.

Unfortunately the guide has no index but it does have a six page detailed table of contents at the front.

It is somewhat slimmer than its BBC counterpart as it makes little attempt to teach you how to program. This is done by the second book, "Start Programming With The Electron", by Masoud Yazdani.

This 138 page volume takes you through writing a program as well as using the sound and graphics commands. The book is also to be available separately from book sellers price £6.95.

The introduction tape has programs of similar ilk as the Welcome tape.

Some are straight off this tape and the rest have been culled from other Acornsoft products, like the picture of the island from the Creative Graphics package.

The Electron has a 48 way gold-plated edge connector on the back to allow for expansion. This is protected by a plastic cover.

There are also threaded inserts to allow the add-ons to be mechanically secured and prevent the edge connector from taking the strain, as it does in so many of the competition machines.

This will allow the Electron to be fitted with all the features of the BBC Micro bar Mode 7 graphics.

It is wired in such a way as to let future expansion modules supply the power to drive the Electron so the cumbersome power plug can be disposed of. Unfortunately the documentation makes no mention of the pinout of this connector.

With the obvious exception of the

commands concerning the missing hardware, the Electron has almost total software compatibility with the BBC Micro.

Even the commands that will not work, like ADVAL, return numbers and do not give error messages. This means that most programs not relying on Mode 7 and written in simple Basic will run on both machines with the proviso that the Electron will be about 40 per cent slower.

This does not matter for a lot of



## A chip off the old block?

programs, as most of them use delay loops to slow the machine anyway.

We tested the Electron on several games recently published in the *Micro User* and found that they would all load and run. There seemed to be no effect on games like Nomsim (June), Anagram (May) and Horoscope (April).

However, the arcade-type games did suffer from lack of speed. Deathwatch (March) lacked pace and you could see the discrete movement of the missiles and hear the single notes that made up the firing effect. Likewise, King Kong (April) was very slow and I managed to get a decent score on it for once.

The positioning of the square brackets keys on the Electron is different than on the BBC Micro. They are fitted onto one key and are accessed by shift and control for left and right brackets. This made Space Pilot (June) very difficult to operate as it relies on these keys for movement.

All in all, playing these games was rather like trying to run through a field of treacle. On the other hand, Spacepods (July) was still quite playable, although the cute tune at the end announcing that you are dead is totally ruined and degenerates into a slow and seemingly random sequence of notes.

Tenpins (July) uses Mode 7 and it did run using the alternative Mode 6. There was no colour, however, and you could not see the ball! Also the sound effects for the falling pins was not as good.

It seems that all the noise/sound effects like crashes and bangs are not as well implemented on the Electron as the BBC Micro.

So who then will be likely to be tempted into buying an Electron? Possibly people who already have a BBC Micro but want a second machine for the children.

Just like the two-car family, the two-computer family is already with us.

Also it could be a useful machine to get for the children if their school has a BBC Micro, as the language it uses will be the same.

People buying a computer for the first time might be tempted to buy the Electron with a view to upgrading it to BBC standards in the future.

I would advise against this course. I think they would be better off getting a bank loan for a BBC Micro now, as the Electron, however expanded, is never going to have Mode 7 graphics or the speed of the BBC Micro.

If you ignore the BBC Micro and just take the Electron on its own merits, its big selling point must be the dialect of Basic it uses, as BBC Micro owners know it is well structured and has many powerful features.

Also, compared to other machines in its class, the Electron is quite fast. The graphics capabilities again are excellent in the price range, but the lack of a printer port without spending extra cash is a big drawback.

The machine seems to be totally upward compatible with the BBC Micro, so any program written for the Electron will run on the BBC.

However, as we have seen, the compatibility does not always work in the other direction.

All in all, the Electron is a machine that is going to cause waves in the world of computers. We will all watch its progress with great interest.



# On your benchmarks

I HAVE been comparing version 0.90 of the Acorn Disc Filing System with the two alternatives that are now available – the Amcom DFS, from Pace Software Supplies, and Watford Electronics' DFS 1.00.

The vast majority of software that is available at the present time for disc based BBC Micros uses the standard Acorn 40 track disc format, commands and operating system calls.

Hopefully all new systems that come along will remain compatible to ease the software problems that will otherwise arise.

The only compatibility problem discovered with Watford's DFS was the inability to use files which had a control character in the file name.

On the other hand the Amcom DFS had a number of differences.

\*ACCESS does not exist. Files are locked by preceding the file name by a ~ and unlocked by using \*RENAME.

\*CAT is no longer alphabetical, so it's not so easy to find the file you are looking for among the increased number files.

\*COPY would not copy files from more than one directory at a time.

\*DESTROY does not exist, though there is a \*CLEAR command if you want to delete all the files on the disc.

\*HELP is handled very differently. For example, if \*HELP has a word following it, it will look for a file on the utility disc.

This means that the Amcom DFS eeprom must be inserted into the leftmost ROM socket. Otherwise, if you have a ROM like View which has two HELP options (Cmode and Store), you would not be able to have a look at

## JIM NOTMAN compares the Acorn, Pace and Watford systems

these options.

Some of the operating system calls were not handled in the standard way.

For example, in OSGBP 5, 6 and 7 (8 was missing) the parameter block itself was used to pass information, not a buffer pointed to by the parameter block.

Both new filing systems can greatly increase the number of files that can be held in the directory – 61 in Watford's DFS and 63 with the Amcom DFS, which will also allow longer file names (up to 15 characters).

Both also allow use of non standard disc drives. Watford's will format 35, 40 and 80 track systems. With Amcom the number of tracks and sectors on each track can be set.

Figure I shows the additional commands available for each DFS.

While reviewing the different disc filing systems I got a strong impression that they did not all work at the same speed.

To check this a number of benchmark tests were devised. While not testing every aspect of disc function they do give some indication of the performance of each system.

Listings are given for each benchmark, and the results summarised in Figure II. In the main they consist of loops that test the main functions of the DFS.

	Amcom	Watford
*FORM	(*FORMAT)	yes
*VERIFY	no	yes
*CLEAR	yes	no
*SYS	yes	no
*MLOAD	no	yes
*MRUN	no	yes
*MOVE	no	yes
*WORK	no	yes
*HELP SPACE	no	yes
*HELP FILES	no	yes
*EDIT	no	yes

Figure I: Extra commands not in Acorn DFS 0.90

\*LOAD and \*SAVE give an indication of how fast a 16k segment of memory is loaded and saved.

\*BACKUP was used in direct mode, as the program space is overwritten using this command. Amcom had the advantage here in that it is possible to define which part of memory may be overwritten thus preserving any program that was present.

PROG1 gives an idea how long it takes to open and close a file. Please note that these were listed using BASIC 1. This means that whenever you see the OPENIN statement here this is the same as OPENUP on a BASIC II machine.

PROG2a to PROG5 include writing and reading integers, bytes and strings.

PROG6 moves the file pointer through the file.

PROGS 7a, 7b, 8a and 8b are all concerned with testing the basic ability to have relative files. The beginning of each file was spaced at 260 bytes, to ensure that the test strings stretched over two blocks on the disc.

All of the programs contain VDU7

## Check them

```
5 REM SAVE 16K
10 VDU7
20 S%=TIME
30 *SAVE"RUBBISH"8000 +4000
40 F%=TIME
50 VDU7
60 PRINT"Time ";(F%-S%)/100"
   seconds"
```

```
5 REM LOAD 16K
10 VDU7
20 S%=TIME
30 *LOAD "RUBBISH" 8000
40 F%=TIME
50 VDU7
60 PRINT"Time ";(F%-S%)/100"
   seconds"
```

```
10 REM PROG1
20 VDU7
30 S%=TIME
40 FOR I%=1 TO 1000
50 X=OPENIN("DATA")
60 CLOSE X
70 NEXT
```



# ...for the great disc filing systems race

statements to aid in timing the tests. This was necessary because of a fault found in the Amcom DFS.

At the simplest level it did not allow the BBC Micro's clock to be correctly updated. This meant that the TIME function under-read by a wide margin.

It also appeared to interfere with the normal interrupt sequences. This prevented use of the keyboard buffer in the usual "type ahead" manner.

The strangest effect was that the initial VDU7 command in each loop could last for up to 10 seconds!

All the tests were carried out on the same disc drive — a dual disc 40 track Cumana. Obviously different drives might give slightly different timings, so when looking at the figures it is important to look at the comparative timings.

No.	Benchmark	Acorn 0.90	Watford 1.00	Amcom
	*SAVE 16k	2.7	3.6	9.1
	*LOAD 16k	2.5	2.4	5.7
	*BACKUP	28.0	28.0	31.0
1	OPEN + CLOSE files *1000	4.2	6.4	18 for 10
2a	PRINT 1000 numbers	15.1	10.4	49.8
2b	PRINT 100 strings	59.6	45.1	209.7
3a	INPUT 1000 numbers	13.0	9.1	40.3
3b	INPUT 100 strings	55.2	42.4	214.7
4	BPUT 1000 bytes	4.9	4.3	13.0
5	BGET 1000 bytes	4.6	4.1	9.3
6	Move PTR 1000 places	2.3	2.7	9.4
7a	Write test relative file	60.9	45.6	274.3
7b	Read test relative file	56.8	44.1	273.3
8a	Write relative file backwards	234.6	137.6	519.0
8b	Read relative file backwards	97.5	56.0	*

\* The benchmark for reading the relative file backward would not run with the Amcom DFS, even though it ran with the other two systems.

Figure II: Comparative benchmark results

## out with these programs

```
80 F%=TIME
90 VDU7
100 PRINT"Time ";(F%-S%)/100"
seconds"
```

```
10 REM PROG2A
20 VDU7
30 S%=TIME
40 X=OPENOUT("DATA")
50 FOR I%=1 TO 1000
60 PRINT EX,I%
70 NEXT
80 CLOSE EX
90 F%=TIME
100 VDU7
110 PRINT"Time ";(F%-S%)/100"
seconds"
```

```
10 REM PROG2B
20 A%=STRING$(25,"TESTSTRING")
30 VDU7
40 S%=TIME
50 X=OPENOUT("STRINGS")
60 FOR I%=1 TO 100
70 PRINT EX,A%
```

```
80 NEXT
90 CLOSE EX
100 F%=TIME
110 VDU7
120 PRINT"Time ";(F%-S%)/100"
seconds"
```

```
10 REM PROG3A
20 VDU7
30 S%=TIME
40 X=OPENIN("DATA")
50 FOR I%=1 TO 1000
60 INPUT EX,A%
70 NEXT
80 CLOSE EX
90 F%=TIME
100 VDU7
110 PRINT"Time ";(F%-S%)/100"
seconds"
```

```
10 REM PROG3B
20 VDU7
30 S%=TIME
40 X=OPENIN("STRINGS")
50 FOR I%=1 TO 100
```

```
60 INPUT EX,A%
70 NEXT
80 CLOSE EX
90 F%=TIME
100 VDU7
110 PRINT"Time ";(F%-S%)/100"
seconds"
```

```
10 REM PROG4
20 VDU7
30 S%=TIME
40 X=OPENOUT("BYTES")
50 FOR I%=1 TO 1000
60 BPUT EX,255
70 NEXT
80 CLOSE EX
90 F%=TIME
100 VDU7
110 PRINT"Time ";(F%-S%)/100"
seconds"
```

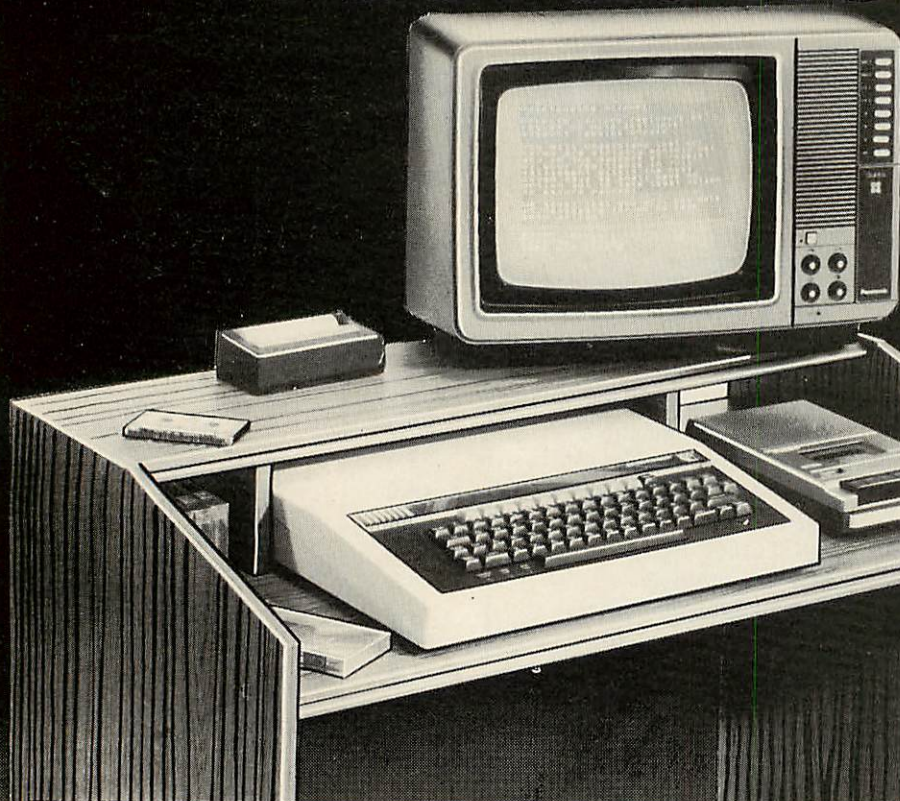
```
10 REM PROG5
20 VDU7
30 S%=TIME
```

```
40 X=OPENIN("BYTES")
50 FOR I%=1 TO 1000
60 A%=BGET EX
70 NEXT
80 CLOSE EX
90 F%=TIME
100 VDU7
110 PRINT"Time ";(F%-S%)/100"
seconds"
```

```
10 REM PROG6
20 VDU7
30 S%=TIME
40 X=OPENIN("DATA")
50 FOR I%=1 TO 1000
60 PTR EX,I%
70 NEXT
80 CLOSE EX
90 F%=TIME
100 VDU7
110 PRINT"Time ";(F%-S%)/100"
seconds"
```



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# Amcom DFS

Reviewed by **CHRIS MARTIN**

THE advent of the new Disc Filing Systems means that many people may start considering changing their Acorn DFS for one of the newer versions. Others, upgrading to disc for the first time, will need to know what each system offers.

In this article I shall be investigating the Amcom DFS. What exactly are its advantages?

First of all, it offers compatibility. You can either use discs in what they call extended mode or in Acorn mode.

Secondly, it offers an extended mode in which the catalog will hold 63 files on one disc and the filenames can contain up to 15 characters.

In either mode discs are formatted using a built-in command – not a program off disc. \*COMPACT, \*COPY and \*FORMAT can be done without overwriting the program in memory, provided there is enough room left for a disc buffer.

On switching on, or after a hard break, the Amcom DFS will probably be in extended mode. I say probably as this is set by the keyboard links which are usually unmade.

To get it into compatible mode you type \*SYS0. In this mode you can catalog, read and write to discs written by the Acorn DFS. The only difference is in the way the catalog and the output from the \*INFO command is printed.

Provided the command \*SYS0 was issued I had no difficulty in working with all the old discs I have accumulated.

It does seem that printing from the

catalog and info commands is slower than with the Acorn DFS. But this may be deliberate so that you can read it before it flashes off the screen.

Unfortunately the change in format of the catalog command puts the files which are not in the current directory on separate lines. If you have a lot of files in different directories, page mode must be set to read the catalog.

Another difference is that files must be named exactly as in the directory with every letter in the correct case.

With Acorn a file called "Freddy" can be loaded as \*LOAD FREDDY or \*LOAD freddy. In the Amcom DFS either of these will give "File not found". It must be \*LOAD Freddy.

There are two commands which Acorn have that do not appear in the Amcom DFS. One is \*DESTROY – which is similar in function to \*WIPE – and the other is \*ACCESS.

In the Acorn DFS it is used to lock and unlock files – to do this in the Amcom DFS you can use SAVE "÷\$.FRED" to save the Basic file FRED, locking it at the same time – a very nice touch.

In the manual you are told that you can unlock files using \*RENAME ÷\$.FRED \$.FRED. But you cannot.

This appears to be a bug in the program. To unlock poor FRED you must say \*RENAME ÷\$.FRED

X.FRED and then \*RENAME X.FRED \$.FRED.

There are two other bugs that I found.

You are told that you can have disc titles up to 12 characters in length. If you try the example given in the explanation of the \*TITLE command you will get an error. It will only accept 11 characters or less.

The second bug concerns the abbreviated \*RUN command. The command \*RUN fsp (fsp means a file specification) can be abbreviated to just \*fsp.

If you have a file called FRED in directory U on drive 0 then its full specification is :0.U.FRED.

The Amcom DFS will accept \*:0.U.FRED but not \*U.FRED, which should also work as the drive is assumed to be 0 if omitted.

Being of a bold – nay, foolhardy – disposition I decided to put several hours work on the line and use the Amcom DFS with Wordwise to write this review.

The first part was saved with the Acorn DFS and the following evening I swapped filing systems to continue. It worked!

But for some time I thought that I had ruined everything by trying to unlock the old file in order to read it. Something

## From Page 19

10 REM PROG7A	10 REM PROG7B	10 REM PROG8A	10 REM PROG8B
20 A\$=STRING\$(25,"TESTSTRING")	20 VDU7	20 A\$=STRING\$(25,"TESTSTRING")	20 VDU7
30 VDU7	30 S%=TIME	30 VDU7	30 S%=TIME
40 S%=TIME	40 X=OPENIN("RELFILE")	40 S%=TIME	40 X=OPENIN("RELFILE")
50 X=OPENOUT("RELFILE")	50 FOR I%=1 TO 100	50 X=OPENOUT("RELFILE")	50 FOR I%=100 TO 1 STEP -1
60 FOR I%=1 TO 100	60 PTR EX=I%*260	60 FOR I%=100 TO 1 STEP -1	60 PTR EX=I%*260
70 PTR EX=I%*260	70 INPUT EX,A\$	70 PTR EX=I%*260	70 INPUT EX,A\$
80 PRINT EX,A\$	80 NEXT	80 PRINT EX,A\$	80 NEXT
90 NEXT	90 CLOSE EX	90 NEXT	90 CLOSE EX
100 CLOSE EX	100 F%=TIME	100 CLOSE EX	100 F%=TIME
110 F%=TIME	110 VDU7	110 F%=TIME	110 VDU7
120 VDU7	120 PRINT "Time ";(F%-S%)/100"	120 VDU7	120 PRINT "Time ";(F%-S%)/100"
130 PRINT "Time ";(F%-S%)/100"	seconds"	130 PRINT "Time ";(F%-S%)/100"	seconds"
seconds"		seconds"	



## From Page 25

in Wordwise together with the Amcom DFS makes it impossible to read locked files back into memory.

Every time I tried to load it the disc seemed to go into a loop with the head going back and forth across the surface continually.

I tried to recreate the file by writing a Basic program using BGET and BPUT to copy the (supposedly) ruined file byte by byte.

I then discovered that it didn't seem to like two files open at once. After the first sector it gave the error message: "Disc changed at line 20".

In the end I read it all into memory and then opened the output file and wrote it all out again.

While it was doing this I noticed that while writing the head seemed to be going back and forth across the disc ... endlessly.

It turns out that this is a characteristic of this filing system. With a bit of patience I set it to load under Wordwise and waited and waited. But it finished loading ... eventually.

Table I gives the commands available in the Amcom DFS and gives a short explanation of each. There are two new instructions offered and five extra OPTs. The extra instructions are \*FORMAT and \*CLEAR.

\*FORMAT will format a disc using the number of sectors set by \*OPT2 and the number of tracks set by \*OPT3. The default sectors/track is 10 and the default tracks/disc is 40.

\*CLEAR will empty a disc removing all the files from the catalog. It is quicker than reformatting, though formatting is faster on this system (including verify) than with the Acorn utility FORM40.

Further options are \*OPT5 and \*OPT7 which set up a buffer for use by \*BACKUP, \*COPY and \*COMPACT.

\*OPT5 sets the start address of the buffer, so you can set it above the program in memory you want to keep.

\*OPT7 sets the length of the buffer. The longer it is, the shorter the copying will be.

\*OPT6 allows the information output

*BACKUP	Makes an exact copy of a disc on a second disc.
*BUILD	Makes a file from lines typed in at the keyboard.
*CAT	Displays the names of all the files on the disc.
*CLEAR	Removes all files from the disc.
*COMPACT	Moves files to release unused space between them.
*COPY	Copies a file to another disc.
*DELETE	Deletes a file from the disc.
*DIR	Makes another directory the current directory.
*DRIVE	Makes another drive the current drive.
*DUMP	Dumps the contents of a file in hex.
*ENABLE	Must be used before the destructive commands *BACKUP, *CLEAR and *FORMAT.
*EXEC	Reads lines from a disc file as if they were typed in at the keyboard.
*FORMAT	Formats a disc.
*INFO	Displays all information in the catalog about a file.
*LIB	Changes the current library directory.
*LIST	Lists a file as text with line numbers.
*LOAD	Loads machine code programs.
*OPT	Used as *OPTn where n may be 1 to 7. *OPT1 sets the amount of information printed about a file when it is loaded or saved. *OPT4 sets the auto-boot option.
*RENAME	Changes the name of a file.
*RUN	Loads and runs a machine code program.
*SAVE	Saves a machine code program or a section of memory.
*SPOOL	Sends all lines written to the screen to a disc file as well.
*SYS	Changes from compatible (Acorn) to extended mode and vice versa.
*TITLE	Puts a title on a disc.
*TYPE	Lists a file without line numbers.
*WIPE	Deletes a selection of files from a disc.

Table I: Amcom DFS commands

when a file is read or written to be chosen field by field. For instance, with the command \*OPT6,39 (the second parameter must be in decimal) you will get just the directory, filename (always), drive and load address displayed.

The DFS comes with a utility disc, two manuals, a page of additions and corrections and installation instructions for the disc upgrade kit.

The utility disc contains the Help pages for the DFS. When you type \*HELP DFS, it reads a header page off the disc from which you can find out which page the command you are interested in is on.

Typing \*HELP n will then display this page with two or three lines explaining each command. A nice touch.

It also contains screen dumps for both the Epson and the NEC printers for each mode from 0 to 5.

The Epson dumps I tried left blank gaps between each strip of the screen it printed and I could see no way to make it work properly. A colleague has since

discovered that the Epson LF enable switch must be off.

There is also a program to edit a disc byte by byte. This also allows you to read and write sectors to the disc and to edit memory.

With this utility and a knowledge of the disc format you would be able to recover a file erased in error.

Finally, the utility disc contains a program to allow discs with peculiar titles to be read.

The DFS distinguishes between an Acorn type disc and an extended one by looking at the first bit of the first sector of the disc. If this is a "1" then it takes the disc to be in extended mode.

If the disc has, for instance, a coloured title this bit will be set and the DFS will treat it as extended though it is Acorn.

This utility (Acorniser - the utility disc is extended, of course) tries to break the deadlock.

The manual is very well laid out and I haven't noticed any errors. The section on technical information is much clearer



# Watford DFS

NOT everyone who is lucky enough to have disc drives is entirely happy with the Acorn Disc Filing System. Not even Acorn themselves, judging by the number of different versions of their DFS that seem to be around in addition to the official 0.90 version.

Two new disc filing systems have recently been released that try to improve on the original. I have been looking at the one produced by Watford Electronics to find out what it offers.

It is available either as part of their disc interface kit or by itself as a plug-in sideways ROM. The Amcom DFS comes with a detailed manual, which is more than can be said for the Acorn DFS or Watford DFS.

Incidentally, they give a discount if you exchange your Acorn DFS for it.

Installation is no problem if you already have a disc interface fitted. Simply remove the old DFS and insert the new.

For those of you fitting the whole

## Reviewed by JIM NOTMAN

interface kit you have some work to do.

If you have an issue 3 or older printed circuit board in your BBC Micro – the issue number is printed towards the back on the left hand side of the board – be prepared to cut one of the tracks on the board. You must cut and lift one IC pin and solder a link wire onto that pin before inserting the 10 ICs and the DFS eeprom.

On issue 4 and later boards it's more straightforward. Just plug in the chips, divide a link and away you go.

The Watford Electronics DFS was supplied on a 16k eeprom, unlike the Acorn DFS which is squeezed onto an 8k eeprom.

As a result of this increase in software size you no longer need to have a separate utility disc with the for-

matting and verifying programs on it. You will find these are included on the eeprom, along with some extra commands and utilities.

Watford's DFS is able to read discs created on the Acorn DFS. It can even read 40 track discs on an 80 track system. This may well prove rather important to those with 80 track discs as most of the software available on disc at the moment seems to be for 40 track discs.

All the Acorn commands are here, using the same syntax. However, one problem that did arise was that Watford's DFS does not allow control characters in file names. It comes up with the message, "Illegal character".

This is to make it compatible with the latest Acorn DFS.

So if you have some software which, for example, puts teletext characters in the file name – I've just come across one package which does this – you'll have difficulty using that file.

One way around the problem would be to change the filename using the built in sector editor. But this is not an easy task for the novice.

The only other problems arise if you try to use the extra facilities on the Acorn system.

So what are the advantages of Watford's DFS over Acorn's?

A number of people have expressed disappointment at being limited to only 31 files on the Acorn DFS. With the Watford one the maximum is 62.

You must decide when formatting the disc whether you want the large (62 file) catalog or the standard (31 file) format.

However when using a disc with a large catalog on an Acorn system only the first 31 files may be accessed, and part of the catalog may be overwritten if you try to write to that disc.

Other differences are seen in new commands and extensions to the old commands.

So what does the new DFS look

and more helpful than Acorn's and the information on the OSGBPB call and OSWORD with A=&7F should be read by everybody who wants to know what is going on.

To conclude, I have found no serious errors in this DFS though there are a number of bugs to be corrected and alterations to be made which were probably overlooked in the rush to get it to market.

The DFS does its job and in most cases – such as cataloging, loading and saving Basic and machine code programs – it is at least as good as the Acorn one.

As I have mentioned, there are one or two blemishes which I expect will have been removed by the next release.

Finally, if you want a disc upgrade and you can't get it from Acorn, it is well worth while considering Pace's upgrade with the Amcom DFS.

If you already have a disc system then it is worth changing to the Amcom chip but perhaps waiting until the next release.

```
ACCESS <afsp> (L)
BACKUP <src drv> <dest drv>
COMPACT <drv>
COPY <src drv> <dest drv> <afsp>
DELETE <fsp>
DESTROY <afsp>
DIR (:<drv>.) <dir>
DRIVE <drv>
ENABLE
FORMnn <drv>
INFO <afsp>
LIB (:<drive>.) <dir>
MLOAD <afsp>
MOVE <src drv> <dest drv> <afsp>
MRUN <afsp>
RENAME <old afsp> <new afsp>
TITLE <title>
WIPE <afsp>
WORK <fsp>
```

```
where fsp = file specification
      afsp = ambiguous file
              specification
      dir = directory
      drv = drive
      src drv = source drive
      dest drv = destination drive
```

Figure 1: The HELP DFS



## From Page 27

like? On typing \*HELP the following appears:

### Watford Electronics DFS 1.00

DFS  
FILES  
SPACE  
UTILS

The DFS and UTILS are recognisable from the Acorn system. When used with \*HELP they list all the commands – with their syntax – that are available to that filing system.

Typing \*HELP DFS displays the DFS commands (see Figure I). Table I summarises those that are familiar to Acorn DFS users.

Table II contains the commands that are new to the Watford DFS. \*FORM and \*VERIFY were previously available on the Acorn utilities disc but are now in ROM.

To display the utilities available type \*HELP UTILS. They are summarised in Table III.

The most interesting utility is EDIT, the disc sector editor. With this you can read and alter any byte of any block of any sector of the disc.

This is useful but you really need to know what you are doing otherwise you may do more harm than good.

The manual recommends taking a backup copy of the disc first before experimenting. It's a very wise precaution!

The main reservation with the editor is that it uses an 80 column mode which makes it difficult to read on an ordinary TV set.

The \*HELP FILES command gives you the details of any active files on the disc. These include the channel number, drive, directory, file name, where the pointer is (PTR), the extent of the file (EXT) and the file type (whether read only, write only or read and write).

The \*HELP SPACE command looks for all the pieces of available space on the disc and tells you how much is left. With this you can see if \*COMPACT is going to be helpful.

The \*HELP command has also been extended to allow you to ask for the syntax of each command individually.

Other commands available are \*FX110, which sets or clears the double step mode, allowing 40 track discs to be read on an 80 track system,

*ACCESS	Locks and unlocks files
*BACKUP	Copies the whole of one side of a disc onto another
*COMPACT	Tidies up the disc so that all the spare space is brought together
*COPY	Copies a file or group of files from one disc to another
*DELETE	Gets rid of unwanted files
*DESTROY	Deletes more than one file at a time
*DIR	Sets the current directory
*DRIVE	Sets the current drive
*ENABLE	Must be used before *DESTROY, *BACKUP (and *FORM)
*INFO	Gives details of load, execution address and length of file
*LIB	Sets the current library
*RENAME	Changes the name of a file
*TITLE	Gives your disc a name
*WIPE	Deletes more than one file by replying to a prompt for each file

Table I

and \*FX111, which is used to return the drive number of the last CHAIN, LOAD, \*LOAD or \*RUN command.

The calls often used in assembly language to handle file such as OSARGS, OSFIND, OSFILE and OSGBPB are all supported in the standard Acorn fashion, so there should be no trouble with program compatibility.

The only manual I have seen is a preliminary spiral bound version, which is generally well written.

There is a useful beginners' section, a guide to indispensable and useful commands, a reference section with all the commands (each on a separate page), and notes on using the filing system from assembler language.

The commands that are not standard or non-standard extensions are all indicated. This would make the manual worth having even if you only have the Acorn system. A number of calls, such

*FORM	Formats 35, 40 and 80 track discs
*VERIFY	Checks that each block on the disc can be read
*MOVE	Similar to COPY but with a Y/N prompt to each file
*MLOAD	Similar to *LOAD
*MRUN	Similar to *RUN but allows files to be loaded, then moved over the disc workspace. Useful if you have cassette based programs you have difficulty relocating.
*WORK	Sets the file name to be inserted whenever a null file name is used as in SAVE" "or LOAD" ". A boon for the slow typer!

Table II

*BUILD	Produces a disc file directly from the keyboard
*DISC	Switches back to the DFS from another filing system
*DUMP	Hex and Ascii dump of a disc file
*EDIT	A disc sector editor
*LIST	Prints an ascii text file with line numbers
*TYPE	Prints an Ascii text file without line numbers

Table III

as OSGBPB 5, 6, 7 and 8, OSWORDs &7D and &7E, \*FX199, which are not documented by Acorn, are documented here. Also included are a list of drive and disc fault numbers.

Save in one small detail the Watford system is compatible with Acorn's DFS. It has a number of useful extensions which, once you have started to use them, you would rather not be without.

The current advertised price of £42 seems a little expensive until you realise that the software is on a 16k eprom, and there is no need for a utility disc. Documentation, however, is £7.50 extra. Overall a very worthwhile package.



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# the OWL PERCH ©1983

The 'Owl Perch' Stand is a heavy duty, sand-cast aluminium alloy support designed to enable a monitor or television set to be placed above the BBC Computer. It prevents damage to the plastic case of the computer and allows the VDU screen to be positioned at a comfortable viewing angle. The 'Owl Perch' may be earthed to provide screening for the computer.

The top surface of the stand is recessed to prevent the monitor sliding off the stand and prevents liquids or small objects falling onto the computer. It is finished in an attractive cream coloured epoxy enamel and is fitted with rubber feet to obviate damage to table or desk tops. The 'Owl Perch VDU Stand provides ample clearance to prevent overheating. The price quoted is for the single-tier unit but various extras are available including a second tier kit to provide an additional shelf for mounting disc drives, etc., below the VDU.

**£35** incl. VAT & p&p (UK)  
alternatively, a D.I.Y. Kit!

The 'Owl Perch' is now available in an 'as cast' form. The specification remains the same but the casting requires filing to smooth the corners, etc., and is not painted. The self-adhesive rubber feet are supplied unfitted. The corners are not drilled and tapped for the second tier extension but this can be done at an extra cost of £2.00 plus 30p VAT.

**Price £14.00** (plus £6.00 p&p and VAT)

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## BBC Micro Users AT LAST . . . The real alternative D.F.S. AVAILABLE NOW!!! FROM



### THE NEW AMCOM DISC FILING SYSTEM

This amazing new disc filing system adds greater flexibility to your BBC Computer. It has two distinct modes which auto select on booting the system. Mode zero is the standard mode which retains compatibility with presently available software.

Mode one, the extended mode, allows for sixty-three file names per disc, over 100% increase on existing DFS, and also permits the file names to be up to fifteen characters in length providing much greater scope for meaningful file names. In both modes page is set at 1500. This gives 10% more usable memory than Acorn's DFS, in modes 0, 1 and 2.

If you already have a Disc interface, it is very easy to upgrade, you simply remove the DFS Eprom and replace it with the Amcom DFS Eprom. If not, then it is possible to purchase an entire Disc interface kit (consists of 11 I.C.'s). With this DFS no track cutting is required, and soldering is unnecessary.

#### NINE NEW COMMANDS ARE NOW AVAILABLE

- \*Clear Quickly and easily erases an entire disc.
- \*Format Formats drive 0 to 3 in either 40 or 80 tracks.
- \*OPT2,n Alters the number of sectors per track to n.
- \*OPT3,n Alters the number of tracks per disc to n.
- \*OPT5,n Sets the start address of the DFS buffer (see OPT7).
- \*OPT6,n Provides control over which part of the file spec. will be displayed ie. only display directory and program length, or just display drive and load address etc.
- \*OPT7,n Sets the length of the DFS buffer.
- \*OPT8,n Allows 80 track drives to read 40 track diskettes.
- \*SYS Selects either Acorn mode or Extended mode.

There is a built-in formatter which will format in either forty or eighty tracks in both modes of operation. This formatter also allows for user definable parameters to be included for the development of software protection.

With this disc filing system a user definable buffer can be used while compacting the disc. This will enable disc compacting to be carried out without overwriting any program in memory. Alternatively a new disc may be formatted without any resident program being overwritten. This DFS also allows for the use of wildcard characters, using either the # symbol for a single wildcard and the \* character for multiple wild characters. (e.g. CHAIN "P\*" could be used to chain a program called PRINTER as long as there are no other files whose names begin with P).

Has many friendly features such as assisting in transfer of cassette files to disc. This DFS is totally compatible with Econet etc., and is complete with a utilities disc and comprehensive manual. The utilities disc contains many useful programs including machine language printer screen dumps in all modes, including High Res. (Epson & NEC 8023). It also has a nibble editor to scan discs, read data, edit them, and then write back to the disc.

Also included is an eight way DIL switch which may be used to select the start up options these are:

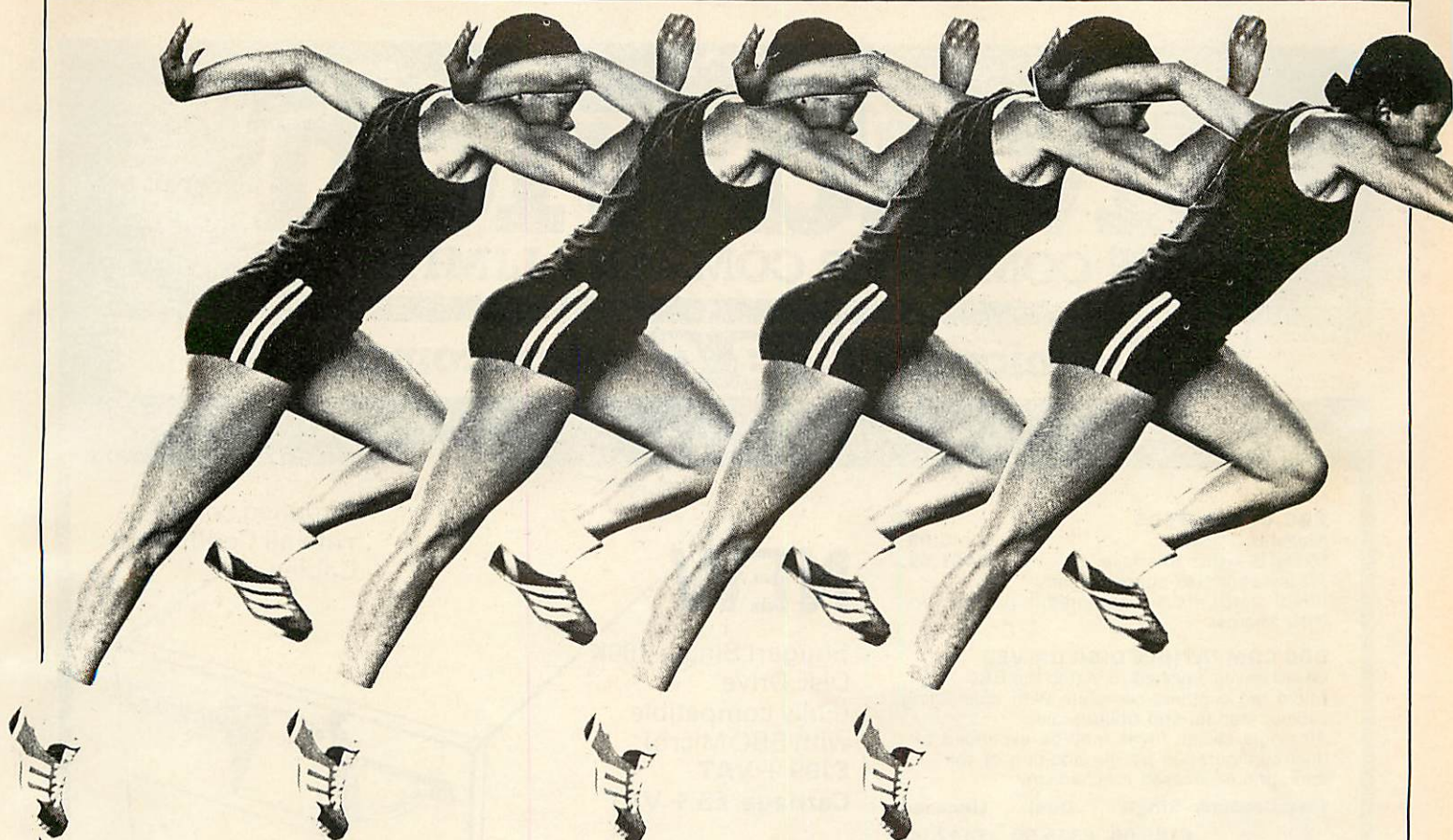
- Link 1 Determines if the system starts up in 40 or 80 tracks.
- Link 2 Select Acorn or Extended model at start up.
- Link 3 & 4 Selects type of drive ie. Shugart, Teac etc.
- Link 5 Select auto-boot or not, on "break".
- Link 6-8 Select screen mode on start up, ie. mode 0 to 7 etc.

DFS AVAILABLE NOW DIRECT FROM **PACE** OR CONTACT YOUR LOCAL DEALER. Comes complete with Disc, Manual and full fitting instructions at **£34** inclusive of VAT. Also available as a complete Disc Interface (including DFS and 8 way DIL switch) at **£95** inclusive of VAT.



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# Go fast, go smooth go GCOL

If you want to display a graphic moving in a complex manner or perhaps a wire frame drawing rotating in real time then the methods discussed in last month's article are not really practicable.

One method is to use a palette change to hide the next image while drawing it, then changing the palette to hide the old image and display the new one.

The obvious approach of using a different logical colour for each image will cause problems if adjoining frames overlap and parts of images will disappear (or change colour).

This can be overcome easily with

**By ALAN PLUME**

careful use of the logical actions within GCOL and VDU 19 statement. Program 1 is a simple program to illustrate how it is done.

This is how it works:

*Line 15* picks an actual colour to plot in, say white.

*Line 20* Makes logical colours 1 and 3 be this colour.

*Lines 25-35* assign the value 1 to variable C%, and draws the first image using GCOL0,C%

*Line 40* makes logical colour 3-C% black

*Line 50* Lets C%=C% EOR 3. (eg, if C%=1 then C% EOR 3=2.)

*Lines 55-65* draw next image using GCOL1,C%, the OR operation. Logical colour C% is now black, the overlapping section (if any) will be in logical colour 3, thus not removing the image on the screen.

*Line 70* switches the palette and makes logical colour 3-C% black and logical colour C% white. The old image is hidden and the new image appears.

*Line 75* draws the old image using GCOL2,C%, the AND operation. This will delete the image leaving over-

```

5 MODE 1
10 VDU 23;8202;0;0;0;
15 COL%=7
20 VDU 19,3,COL%;0;19,1,COL%;0;
25 C%=1
30 X%=0
   Y%=0
35 GCOL 0,C%
   :PROCdraw(X%,Y%)
40 VDU 19,3-C%,0;0;
45 REPEAT X%=X%
   :Y%=Y%
50 C%=C% EOR 3
55 X%=X%+50
   Y%=Y%+50
60
65 GCOL 1,C%
   :PROCdraw(X%,Y%)
70 VDU 19,C%,COL%;0;19,3-C%,0;0;
75 GCOL 2,C%
   :PROCdraw(X%,Y%)
80 UNTIL X%>1000
85 END
90 DEF PROCdraw(x%,y%)
95 MOVE x%,y%
   :PLOT 1,100,0
   :PLOT 1,0,100
100 PLOT 1,-100,0
   :PLOT 1,0,-100
105 ENDPROC

```

Program 1



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## From Page 31

lapping areas in logical colour 3.

Repeat sequence from line 45. The operation C% EOR 3 swoops C% from 1 to 2 and vice-versa each time through.

Program II demonstrates this technique in displaying a real time transformation of a square to a star.

As mentioned in last month's article, redefined characters can be used together with this method to give very smooth animation. Program III will display last month's shaded sphere orbiting a larger fixed sphere. Notice that two arrays are used as tables of sines and cosines to minimise computation in the display sequence.

A 16-colour mode such as MODE 2 can be considered to be made up of four planes overlaying each other.

Suppose we make a sequence of four frames in colours 1, 2, 4 and 8 but have made these four colours black by use of the VDU 19 command. We can instantly display the frames in sequence by switching each colour to white and then back to black one at a time.

Using this technique, however, creates a major problem. If any image is drawn over the top of another then "holes" will appear as the animation occurs.

As before this problem can be easily overcome with the use of the OR action in GCOL. The only problem comes in deciding which colours will be white and which will be black in each frame.

Program 4 demonstrates this technique by rotating a grid about a horizontal line.

Lines 20 to 125 define the grid and draw it at prescribed rotated positions with perspective in the colours 1, 2, 4 and 8. Note that this section does not need to be fast.

Line 130 is a delay to let you see all four superimposed images before altering the palette.

Lines 135 to 155 reserve and define the bytes that are used in the palette changing operations for each frame, B% for black and W% for white.

If you want to really understand this technique it is a good idea to sketch out the overlapping colours after the OR actions have been performed and check them for yourself.

Lines 160 to 185 black out all the images then switch on image 1 in white.

Lines 190 to 250 repeatedly take you through the sequence.

Note that the speed can be altered with the parameter to PROCwait at line 210.

```

10 DATA 0,4,3,0,4,4,1,1,4,0,0,3
15 DATA 4,-4,-1,1,0,-4,-3,0,-4,-4,-1
   ,-1
20 DATA -4,0,0,-3,-4,4,1,-1,0,4,3,0
25 DIM X1%(8),Y1%(8),X2%(8),Y2%(8)
30 DIM X2%(8),Y2%(8)
35 DIM X3%(8),Y3%(8)
40 FOR I%=0 TO 8
45 READ X1%(I%),Y1%(I%),X2%(I%),Y2%(I%)
50 NEXT I%
55 MODE 1
60 VDU 29,640;512;23;8202;0;0;0;
65 RZ=1
70 CX=3
   :VDU 19,3,CX;0;19,1,CX;0;
75 DX=1
80 FOR J%=0 TO 8
85 X%(J%)=X1%(J%)*100
90 Y%(J%)=Y1%(J%)*100
95 NEXT J%
100 GCOL 0,DX
105 PROCdraw
110 VDU 19,DX,CX;0;19,3-DX,0;0;
115 FOR NZ=1 TO 100
120 DX=DXEOR 3
125 UX=100-RZ
130 FOR J%=0 TO 8
135 X3%(J%)=X1%(J%)*UX+X2%(J%)*RZ
140 Y3%(J%)=Y1%(J%)*UX+Y2%(J%)*RZ
145 NEXT J%
150 GCOL 1,DX
   :PROCdraw1
155 VDU 19,DX,CX;0;19,3-DX,0;0;
160 GCOL 2,DX
   :PROCdraw
165 FOR I%=0 TO 8
170 X%(I%)=X3%(I%)
175 Y%(I%)=Y3%(I%)
180 NEXT I%
185 RZ=RZ+1
190 NEXT NZ
195 END
200 DEF PROCdraw
205 MOVE X%(0),Y%(0)
210 FOR I%=1 TO 8
215 DRAW X%(I%),Y%(I%)
220 NEXT I%
225 ENDPROC
230 DEF PROCdraw1 *FX19
235 MOVE X3%(0),Y3%(0)
240 FOR I%=1 TO 8
245 DRAW X3%(I%),Y3%(I%)
250 NEXT I%
255 ENDPROC

```

## Program II

```

10 DIM C(40),S(40)
20 FOR I%=0 TO 40
25 R=RAD (I%*9)
30 C(I%)=COS (R)
   :S(I%)=SIN (R)
40 NEXT I%
50 VDU 23,224,0,3,27,5,45,24,7,8
60 VDU 23,225,224,208,156,76,252,118
   ,86,255
70 VDU 23,226,1,6,36,5,42,19,9,0
80 VDU 23,227,238,254,252,68,252,240
   ,224,0
90 MODE 1
100 VDU 5
110 VDU 29,640;512;
115 GCOL 0,3
116 PROCsphere
120 RZ=200
130 A$=CHR$ 224+CHR$ 225+CHR$ 10+
   CHR$ 8+CHR$ 8+CHR$ 226+CHR$ 227
150 COLZ=7
160 VDU 19,1,COLZ;0;
170 CX=1
180 X=RZ
   :Y=0
190 GCOL 0,CX
   :PROCput(X,Y)
200 VDU 19,CX,COLZ;0;19,3-CX,0;0;
210 IZ=0
220 REPEAT x=X
   :y=Y
230 X=RZ*C(I%)
   :Y=RZ*S(I%)
240 CX=CX EOR 3
250
260 GCOL 1,CX
   :PROCput(X,Y)
270 VDU 19,CX,COLZ;0;19,3-CX,0;0;
280 GCOL 2,CX
   :PROCput(X,Y)
290 IZ=(IZ+1) MOD 40
320 UNTIL FALSE
330 DEF PROCput(x,y)
340 MOVE x-32,y+32
   :PRINT A$
350 ENDPROC
360 DEF PROCsphere
370 RZ=64
   :SZ=RZ*RZ
380 FOR Y%=-RZ TO RZ STEP 4
390 X%=SQR (SZ-Y%*Y%)
400 TX=2*X%
405 FOR IZ%=-X% TO X% STEP 4
410 IF RND (TZ)<IZ+X% PLOT 69,IZ,Y%
415 NEXT IZ%
420 NEXT Y%
425 ENDPROC

```

## Program III



From Page 33

```

5 MODE 2
10 VDU 29,640;512;23;8202;0;0;0;
15 DIM K%(20),X%(20),Y%(20),Z%(20),Y
  Z%(20)
20 READ NZ
25 FOR IX=0 TO NZ
30 READ K%(IX),X%(IX),Y%(IX)
35 NEXT
40 DATA 16
45 DATA 4,2,2,5,2,-2,5,-2,-2,5,-2,2,
  5,2,2
50 DATA 4,1,2,5,1,-2,4,0,2,5,0,-2,4,
  -1,2,5,-1,-2
55 DATA 4,2,1,5,-2,1,4,4,0,5,-4,0,4,
  2,-1,5,-2,-1
60 DX=800
65 CX=1
70 FOR AX=22 TO 157 STEP 45
75 GCOL 1,CX
  :CX=2*CX
80 C=COS (RAD AX)
  :S=SIN (RAD AX)
85 FOR IX=0 TO NZ
90 Y%=Y%(IX)
95 Y=Y%*C
100 Z=Y%*S+6
105 X%(IX)=X%(IX)*DX/z
110 Y%(IX)=Y%*DX/z
115 NEXT
120 PROCdraw
125 NEXT
130 K%=INKEY (200)
135 DIM B% 16,W% 16
140 !B%=&080A0C0E
  :B%!=&0105090D
145 B%!=&02030A0B
  :B%!=&04050607
150 !W%=&01030507
  :W%!=&02060A0E
155 W%!=&04050C0D
  :W%!=&08090A0B
160 FOR IX=0 TO 15
165 VDU 19,IX,0;0;
170 NEXT
175 FOR IX=1 TO 15 STEP 2
180 VDU 19,IX,7;0;
185 NEXT
190 REPEAT
195 FOR FX=0 TO 3
200 G%=FX*4
210 PROCwait(10)
215 FOR IX=G% TO G%+3
220 VDU 19,B%?IX,0;0;
225 VDU 19,W%?IX,7;0;
230 NEXT ,
250 UNTIL FALSE
255 END
260 DEF PROCwait(T%)
265 now=TIME
270 REPEAT UNTIL TIME -now>T%
275 ENDPROC
280 DEF PROCdraw
285 FOR IX=0 TO NZ
290 PLOT K%(IX),X%(IX),Y%(IX)
295 NEXT
300 ENDPROC

```

Program 4

# Electronequip

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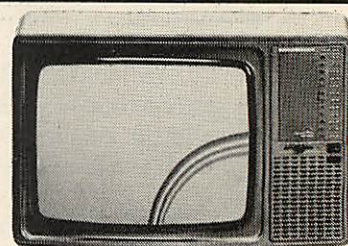
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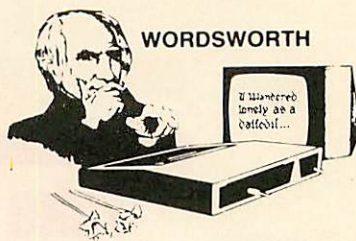
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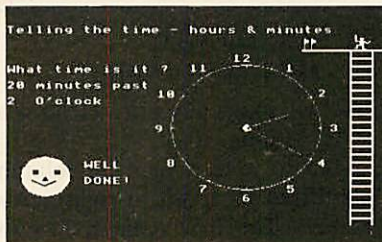
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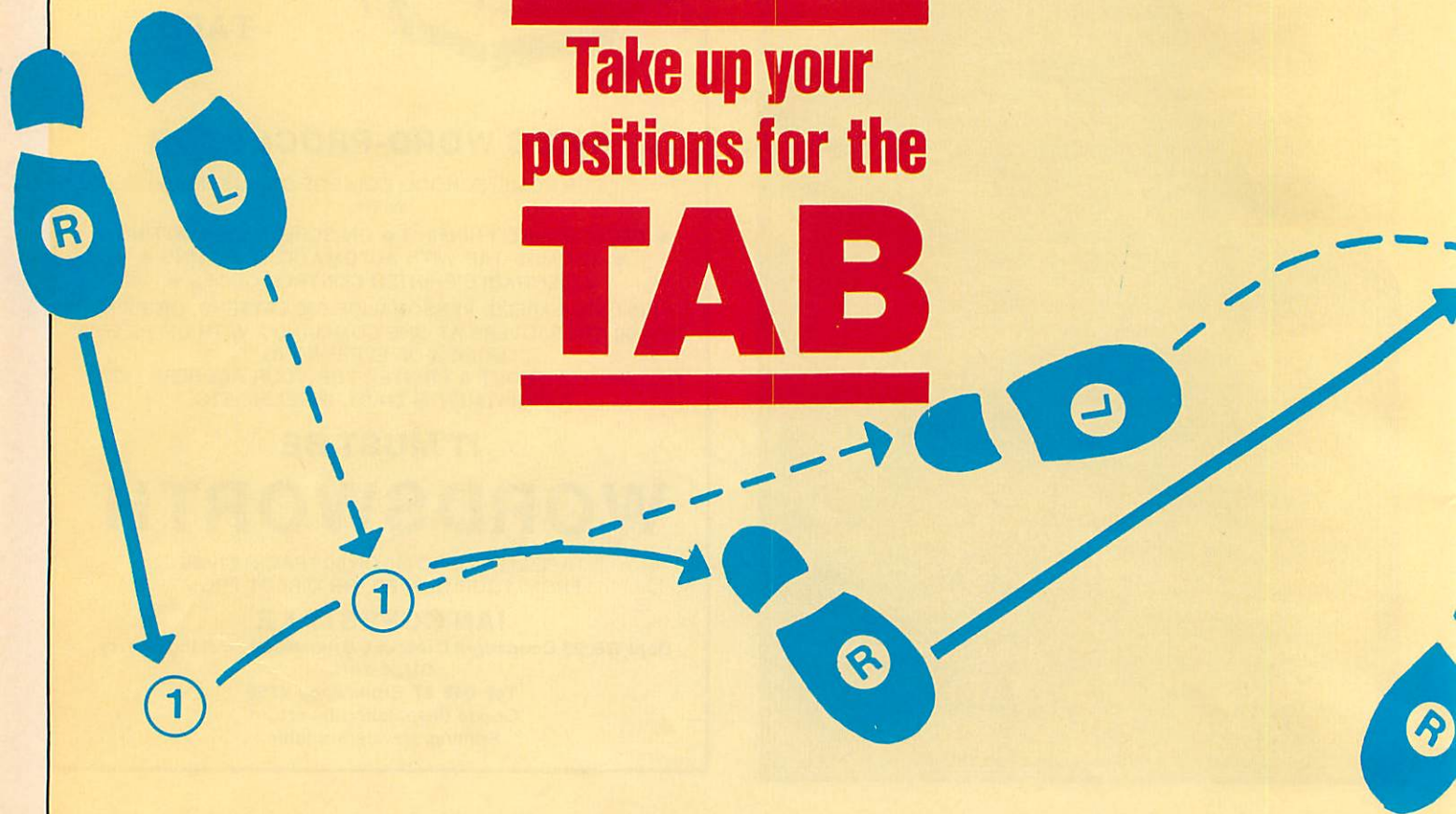
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# Take up your positions for the **TAB**



*THINGS* are becoming tough at the offices of *The Micro User*. The editor has started to come into work earlier, with a drastic effect on the habits of the rest of us. We now have to leave the pub before last orders at lunchtime in order to be back before he arrives.

**LAST** month the editor had me talking about the **PRINT** statement and what you can do with it. As you've no doubt found by now, it's rather limited. You can print things anywhere you want on the screen using the methods I've described, though it becomes a bit laborious.

Why, you might ask, didn't those awfully clever Acorn people do something to make our lives easier?

Well they did. It's called the **TAB( )** statement and with it you can **PRINT** to anywhere on the screen with ease. You can even override those screen fields I mentioned in the last article.

It's a remarkably easy thing to use. If you want something printed at a particular position on a line, say the inevitable Hello, starting at column 10, you just combine a **PRINT** statement

## By NIGEL PETERS

with a **TAB** statement:

```
PRINT TAB(10) "Hello"
```

and this will magically print Hello with the H in column 10.

A point to note is that the columns are numbered from left to right across the screen. The first column has the number 0, the second number 1 and so on, each column being the space taken by one letter. This means that column number 10 is in fact 11 spaces from the left of the screen.

Of course the actual number of columns can be 20, 40 or 80 depending what mode you're in at the time — though the final column numbers will be 19, 39, 79 respectively.

The format of the command is that the **TAB** comes after a **PRINT** statement. Immediately following the **TAB** comes the column number you want the printing to start at, the number being enclosed in brackets.

For example:

```
PRINT TAB(15) "Hello again"
```

prints its message with the first letter in

column 15, the second in 16 and so on.

Remember that the column number specified is surrounded with brackets and *there is no space between the tab and the brackets*. If you put one in you'll get an error message.

Try:

```
PRINT TAB (20) "You've put in a space"
```

and you'll see what I mean.

Using the **TAB** statement you can position your text wherever you want it on a line. If the cursor is already beyond the point on a line you select in a **TAB** command it will just move to the next line and obey you on that.

For example:

```
PRINT TAB(2)"Hello" TAB(9)"Goodbye"
```

puts it all on one line. But:

```
PRINT TAB(2)"Hello" TAB(2)"Goodbye"
```

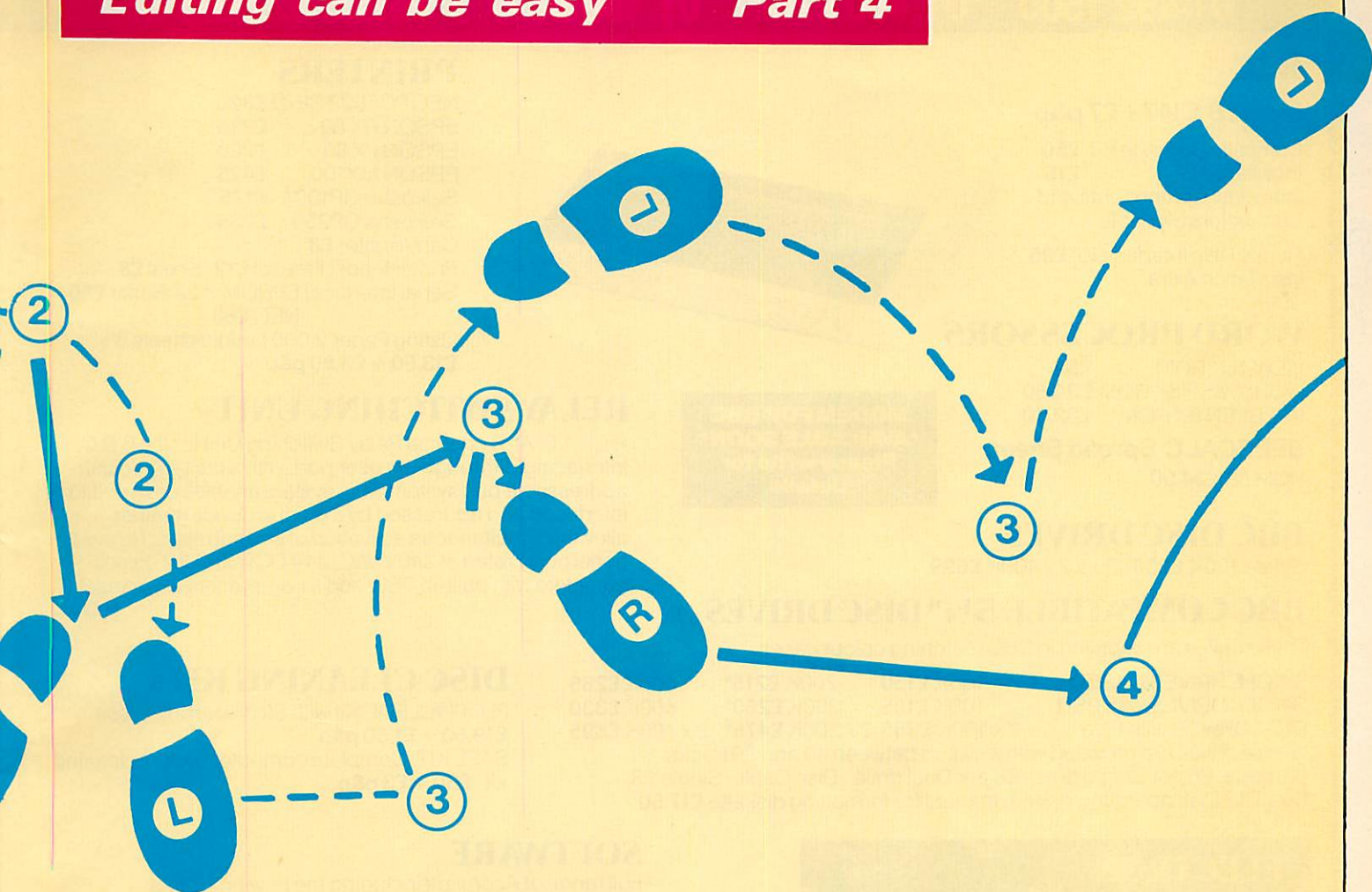
obviously isn't going to work on the same line. Try it and see for yourself that it just moves to the next line.

But again it's all a bit pedestrian. What if you want to print Hello in the middle of the screen?

Do you do something like:

```
PRINT
PRINT
PRINT TAB(15)"Hello"
```





Or is there a simpler way?

There is. You can use the TAB statement in the form:

```
PRINT TAB(P,Q)
```

where P and Q are coordinates, that is numbers describing the screen in terms of its rows and columns.

The P coordinate is exactly what we used before, a number that gives the position across the screen where we want the printing to start. You just pick a column number and it starts printing there.

The new bit is the Q coordinate which gives the number of the line you want the thing to be printed on. The top line on the screen is line 0, the next one down is line number 1 and so on down the screen.

Again the number of the last line will depend on which mode you are in. It will be 24 or 31 (don't forget that the first line is 0).

Suppose you want to say Hello starting at the third column of line 14. You enter:

```
PRINT TAB(3,14)"Hello"
```

and you get Hello printed on the

fifteenth line of the screen starting at the fourth column.

If you don't understand that and think it should be the third column of the fourteenth row then you've not allowed for the fact that the first lines and columns have the number 0.

By now it's fairly clear that using the TAB and the PRINT statements together you can put things anywhere you want in the screen. You tell the micro where you want it and it will print it there, overwriting any previous bit of display. The cursor then appears on the next line, ready for action.

As has been seen in an earlier example, you can use more than one TAB with a PRINT, so one line can put stuff all over the screen if you want.

For example:

```
PRINT TAB(11,11)"Hello"  
TAB(17,14) "again"
```

You'll probably realise that there's not much point in putting punctuation marks after the TAB to influence the display. After all, you can get what you want where you want by specifying the right coordinates without the bother of punctuation.

However, if you do put punctuation marks in what is to be printed they are obeyed just as if it were a normal PRINT command.

For example:

```
PRINT TAB(8,8)"Hello","again"
```

is not the same as:


```
PRINT TAB(8,8)"Hello";"again"
```

or:

```
PRINT TAB(8,8)"Hello"'"again"
```

But this is of interest only to pedants – it's not really necessary if you use TAB to its full extent.

So by using PRINT,TAB and a little thought you can display stuff all over the screen easily and clearly. Nearly all the programs you write will print something to the screen, and the screen layout is a good guide to the skills of the programmer.

Using TAB you can produce clear, easily interpreted, user-friendly displays with very little effort in terms of the rewards gained. 

*Which is the exact opposite of my relationship with the editor – a lot of effort for little reward.*



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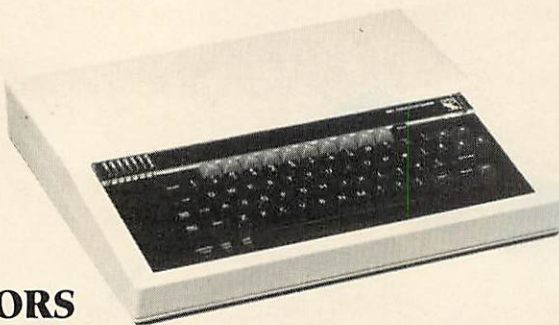
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A colour graphics terminal for a mainframe computer can cost hundreds or even thousands of pounds.

But the BBC Micro has the ability to communicate with a mainframe computer — and it has colour graphics facilities.

So if you already have a BBC machine you have the potential for making yourself a colour graphics terminal for the cost of an RS432 connector!

This is the saga of how two people attempted to connect a BBC Micro to a powerful Harris

mainframe computer at Norwich City College. Most of the groundwork was done by Nick Frankland as a project for his HND computer science course, while Paul Beverley acted as tutor.

Describing the different stages they went through in order to get a final working system may enable other people who want to do a similar thing with a different mainframe computer to spot the likely pitfalls and see how they may be avoided with their own mainframe.

# mainframe

THE THEORY of communicating between the BBC Micro and a mainframe computer is simple enough. The BBC machine has an interface known as the RS423, which is a serial interface through which the BBC can send and receive bytes of data.

The data is sent and received serially — that is to say, one bit at a time — in sets of eight bits to make up a byte, with one or two extra bits at each end for synchronisation purposes.

The 8 bit bytes of data can be regarded as either Ascii codes or as actual numerical data depending on how the receiving end interprets the information.

In all the following comments I shall be referring to the 1.2 operating system since in the 0.1 OS there are none of the software facilities available for using this serial interface.

When two computers are communicating with each other there may be different media carrying the information. Within one room, or at least one building, it is fairly easy to use cables which allow you to communicate at the fastest rate normally used. This is 9600 baud, which means 9600 bits per second.

Taking into account the synchronisation bits, this represents a speed of about 900 characters each second.

At greater distances you would need to use the public telephone system, unless you could afford to get British Telecom to install special cables for you. So you would have to work at a much slower speed — perhaps 300 or 1200 baud — because of the noise inherent in the system.

This is no problem for the BBC Micro. A single command in Basic or machine code can change the speed to any one of six between 9600 and 75 baud. What is more, you can set a different speed for sending than for receiving.

When different devices are communicating with the processor on the BBC Micro not only would there be different speeds of communication, but

also there would tend to be different processing speeds.

Because of this, Acorn have provided the BBC Micro with buffers. These are areas of memory in which either information can be stored as it comes in before being processed, or in the reverse direction, where the processor can store information ready to be sent out to the serial interface.

There are buffers on the RS423 input and output and there is also a buffer on the keyboard so that characters can be stored up as they are typed in.

The idea is that as soon as somebody presses a key this interrupts the processor, which responds by scanning the keyboard to find out which key has been pressed.

It then puts the Ascii code of the character into the keyboard buffer ready to be processed when the processor has finished its current job.

If the RS423 is enabled as output, then every time the user asks for the processor to print a character or a string of characters they are not only sent to the screen but also are placed into the RS423 output buffer.

The RS423 interface then sends them out a byte at a time down the RS423 line at the appropriate speed. This is done by the 6850 ACIA (Asynchronous Communications Interface Adaptor) under the control of the serial ULA.

The ULA is a chip Acorn designed to control all the serial interfaces, including the cassette interface and the serial ROM interface.

After each byte has been sent out,

## Adapting the BBC Micro as a colour graphics terminal



# Making the connection

By  
**PAUL BEVERLY**

the ACIA interrupts the processor. This then responds by taking another byte from the output buffer and putting it into the ACIA, which sends it out serially along the RS423.

As far as the RS423 input is concerned, every time the ACIA receives a character it interrupts the processor. This takes the character from the ACIA and puts it into the RS423 input buffer.

Then, if the RS423 is enabled as input, these characters are taken by the processor and processed as and when it is ready to do so.

The first stage in the saga of connecting up to the mainframe computer is represented by the program in Figure I, where the BBC is set up as a dumb terminal.

What the program does is to look

```

10 REM Dumb Terminal Program
20 REM P.E.Beverley 6/8/82
30 REM Only works on D.S. 1.0 / 1.2
40 REM Works even if Tube fitted.
50 OSASCII=&FFC3
60 OSBYTE=&FFFF4
70 OSWRCH=&FFEE
80 CLS
90 DIM CODE 50
120 FOR J=0 TO 2 STEP2
130   PZ=CODE
140   COPT J
150   .RS423
160   LDA #&91
170   LDX #1
180   JSR OSBYTE \ character in RS423 buffer?
190   BCS keyboard
200   TYA
220   JSR OSWRCH \ or OSASCII for CR_LF
230   .keyboard
240   LDA #&91
250   LDX #0
260   JSR OSBYTE \ character in keyboard buffer?
270   BCS RS423
280   TYA
290   LDA #&8A
310   LDX #2
320   JSR OSBYTE \ Put it in RS423 output buffer
330   JMP RS423
340   J
350 NEXT
360 *FX 7,7
370 *FX 8,7
380 *FX 2,2
390 CLS
400 CALL CODE

```

Figure I: Dumb terminal program

alternately at the RS423 input buffer and the keyboard input buffer. If it finds a character in the RS423 input buffer it writes it to the screen using the OSWRCH routine.

If on the other hand it finds a character in the keyboard input buffer, it takes it out and puts it in the RS423 output buffer so that it is sent off to the mainframe computer.

This program works well if all you want to do is send Ascii characters to and from the mainframe computer.

However, what we were interested in doing was to send codes which would enable the BBC to draw pictures and diagrams under instructions from the Harris computer.

The software on the BBC Micro has been arranged to make it easy to execute the various graphics commands. All you have to do is to send a series of bytes to the operating system in exactly the same way as you would if you were writing characters onto the screen.

If you look at the VDU code summary on page 507 of the User Guide you will see that each of the Ascii codes between 0 and 31 has a particular significance.

If any of these codes is sent to the operating system then the appropriate number of bytes following it are inter-

preted as the data for that particular command.

Look, for example, at Ascii code .19 which is used for controlling the colour palette, deciding which actual colour is displayed on the screen for each logical colour number.

If this is used in Basic you might say something like VDU 19,0,4,0,0. The effect would be to assign to logical colour 0, the actual colour 4, which is blue.

When you use that statement in Basic what actually happens is that the

```

10 MODE6
20 DIM CODE 100
30 OSWRCH = &FFEE
40 PZ=CODE
50 C
60 LDA #19
70 JSR OSWRCH
80 LDA #0
90 JSR OSWRCH
100 LDA #4
110 JSR OSWRCH
120 LDA #0
130 JSR OSWRCH
140 LDA #0
150 JSR OSWRCH
160 LDA #0
170 JSR OSWRCH
180 RTS
190 J
200 CALL CODE

```

Figure II: Machine code version of VDU19 command

numbers 19,0,4,0,0 are sent in turn to the VDU drivers using the OSWRCH routine. The equivalent of this single command is shown as a machine code program in Figure II.

All of the graphics commands which the BBC uses – known in Basic as COLOUR, GCOL, PLOT, DRAW and MOVE – are available as VDU commands.

For example, DRAW 1000, 1000 could be translated into a VDU command as VDU 25,5,232,3,232,3.

The 25 signifies that this is a PLOT command, the number 5 following it specifies that it is to DRAW to the absolute position. The next four num-



## From Page 41

bers represent the co-ordinates to which it is to draw.

In each case it is the low byte first followed by the high byte, so that 1000 is represented by 232,3 ( $1000 = 232 + 3 * 256$ ).

So since all the graphics commands can be done by sending single bytes of information to the VDU drivers through OSWRCH it should in theory be an easy job to get the mainframe computer to send those same characters down to the BBC Micro to instruct it to do the drawing, etc.

We tried this and soon met up with our first problem – it didn't work. Or at least it worked at first and then after doing one or two PLOTS or DRAWS it suddenly shot off at some strange angle and then produced seemingly random graphics and text.

When we used a machine code monitor to have a look at the bytes in the RS423 buffer we discovered that it occasionally seemed to be missing one

or two bytes.

Of course as soon as the bytes get out of step it interprets the bytes which follow as being the data for the position to which it should DRAW, and this is often way off the screen.

So the question is: "Why does the system miss out certain characters?" Is it that the BBC Micro is not receiving the characters correctly and putting them into the buffer? Or is the Harris mainframe computer not sending them properly?

To cut a long story short, the answer is that it is both.

It took a long time to work out what was causing the difficulty, simply because there were actually three entirely separate reasons for the characters being missed out.

These were:

● **PROBLEM ONE:** The BBC Micro does not like receiving ESCAPE characters – character &1B (=27). If one of these is sent down, the operating system interprets it as an ESCAPE and does not put the number into the buffer.

Thus it gets very confused if it

receives something like DRAW 27,27 (= VDU 25,5,27,0,27,0).

● **PROBLEM TWO:** As the Harris is preparing to send bytes down to the BBC it stores them up in a buffer, which is normally 80 characters long. Then when the buffer is full, or when a carriage return is sent, it passes them down to the BBC machine.

It then sends three bytes – 0D, 00 and 0A – which would normally be used to produce a carriage return and line feed in the receiving terminal. But these of course are interpreted by the BBC as data.

● **PROBLEM THREE:** Zero, as a code, is what is known as a "null" – that is, "do not do anything". So if you have a command which ends with one or more zeros, then before the Harris sends it, it strips the zeros off, knowing that no terminal is interested in nulls!

If, for example, you want to DRAW 100, 100 you would send 25, 5, 100, 0, 100, 0.

Now since the last byte is a null, it is stripped off and the next byte which follows it is interpreted as the high byte

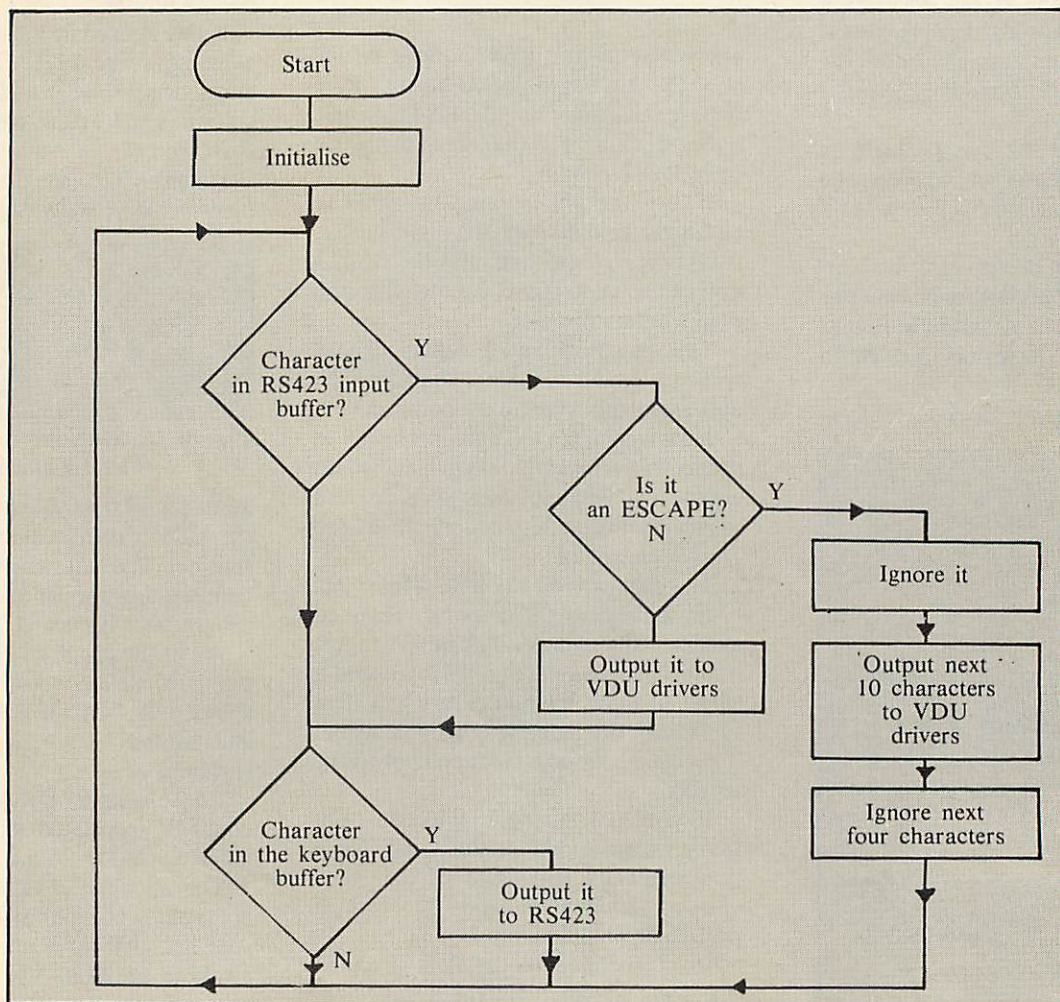


Figure III: Flow diagram of graphics terminal program



of the Y coordinate of the DRAW command.

So if it happens to be a carriage return (&0D=13), the operating system draws to 100, 3428! (3428 = 100 + 13 \* 256).

The solution to the first problem is simple. As part of the initialisation of the BBC Micro, you simply say \*FX229,1, or the equivalent in machine code. It then ignores ESCAPE codes and treats them as ordinary characters or as data. To re-enable ESCAPE after using the terminal program use \*FX229,0.

After various unsuccessful attempts, the second two problems have finally been solved by one expedient. This is to frame every graphics command in a block of known length starting with an ESCAPE character and ending with a carriage return, which ensures that the Harris sends it straight away without first storing it in a buffer.

The size of the block has to be big enough for the longest command, and therefore the shorter commands have to be padded out with nulls.

These nulls are not stripped off by the Harris because of the carriage return at the end of the block, but at the BBC end the nulls are not acted on anyway.

However, we do not want the carriage return to be acted on either, so this has to be stripped off by the terminal software in the BBC machine itself.

In fact, to get the Harris to send the graphics command we had to get it to PRINT "." – that is, to print a dummy character with a carriage return.

This produces four bytes – 2E 0D 00 0A – which are then ignored by the terminal software.

The software at the BBC end is shown in the form of a flow diagram in Figure III and as an actual listing in Figure IV.

It looks at each character as it comes in and, unless it is an ESCAPE character, sends it to the VDU drivers so that it will be printed out to the screen.

If it is an ESCAPE code the software ignores it, but uses counters in order to take in the next 10 characters and send them to the VDU drivers. Then it ignores the next four characters.

The format of the graphics command block is shown in Figure V.

If, as is the case with our Harris mainframe computer, you have no

```

10 *KEY0VDUI9;4;0;1M
20 *KEY1RUN;1M
30 *KEY2CLS;1M
40 *KEY3TAPE;1M
50 *KEY4LD;"";1M
60 *KEY5CH;"";1M
70 *KEY6TV0;1M
80 *KEY7OLD;M*TAPE;1M*MODE;1M
90 *KEY8OLD;M*TAPE;1M*MODE;1M
100 *KEY9CALL;C00;1M
110 *FX12,5
120 *FX11,25
130 *FX229,1
140 REM Set TAB key for BACKSPACE
150 *FX219,8
160 MODE0
170 VDU19;4;0;
180 OSBYTE=&FFF4
190 OSWRCH=&FFEE
200 FOR J=0 TO 2 STEP 2
210   PZ=&C00
220   LOPT J
230   LDA#2
240   LDX#2
250   JSR OSBYTE
260   .RS423G
270   JSR RSINP
280   BCS keyboard
290   CPY #27
300   BNE .print
310   .GTERM
320   LDA #10
330   STA &B7
340   .INP1
350   JSR RSINP
360   BCS INP1
370   TYA
380   JSR OSWRCH
390   DEC &B7
400   BNE INP1
410   LDA #4
420   STA &B7
430   .INP2
440   JSR RSINP
450   BCS INP2
460   DEC &B7
470   BNE INP2
480   .RS423T
490   JSR RSINP
500   BCS keyboard
510   CPY #27
520   BEQ GTERM
530   .print
540   TYA
550   JSR OSWRCH
560   .keyboard
570   LDA #&91
580   LDX #0
590   JSR OSBYTE
600   BCS RS423T
610   LDA #&BA
620   LDX #2
630   JSR OSBYTE
640   JMP RS423T
650   .RSINP
660   LDA #&91
670   LDX #1
680   JSR OSBYTE
690   RTS
700   J
710   NEXT
720   *FX7,7
730   *FX8,7
740   CLS
750   PRINT "Ready at 9600 baud."
760   PRINT "Press f9 for terminal mode."
770   PRINT "Use TAB key for BACKSPACE."

```

Figure IV: Graphics terminal program

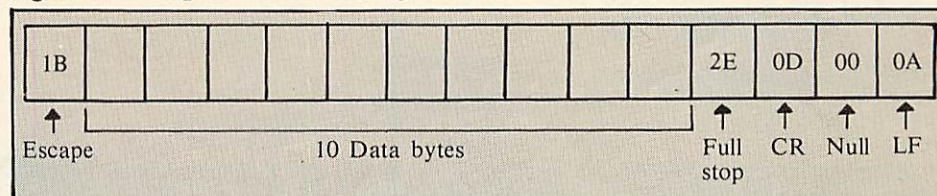


Figure V: Format of the graphics command block

hand-shaking lines available for the terminals, you may have problems if you write a program on the mainframe which sends down a lot of graphics commands in quick succession.

This is because the buffers on the RS423 input become full and there is no mechanism for stopping the flow of characters trying to fill up this buffer.

One solution would be to implement what is called "software handshaking". This means that when the buffer becomes full it generates an event within the micro which sends out an XOFF control code to stop the mainframe sending any more characters.

When the buffer is nearly empty you can then send an XON control code to start the communication from the Harris again.

The other method is simply to have some means of slowing down the program, such as by putting SLEEP commands into the program. This is only likely to be necessary if you are working at the full 9600 baud.

Nothing has been said so far about the software on the mainframe computer which is generating all these graphics commands.

In our case because of the limited development time available we decided

to use Basic to generate all the codes. Later we would be able to assemble these routines so that they could be provided as machine code subroutines which could be called from other languages on the Harris.

There is a lot of work still to be done on this, and in any case it is peculiar to the mainframe computer you are using. So no more need be said about it here.

In conclusion, I hope that you will see the potential which we have tried to set out in this article.

The BBC Micro CAN be used as a colour graphics terminal to a mainframe or a minicomputer although there are likely to be problems when you try to implement it. Hopefully we have shown some of the likely ones and the possible solutions.

If you have any particular queries or ideas to share regarding this link-up with the BBC Micro, please feel free to contact me at Norwich City College.

The address is Paul Beverley, Department of Electronics, Norwich City College, Ipswich Road, Norwich, NR2 2LJ.

● **NEXT MONTH:** Paul Beverley writes about how to link two BBC Micros using the RS423 port.



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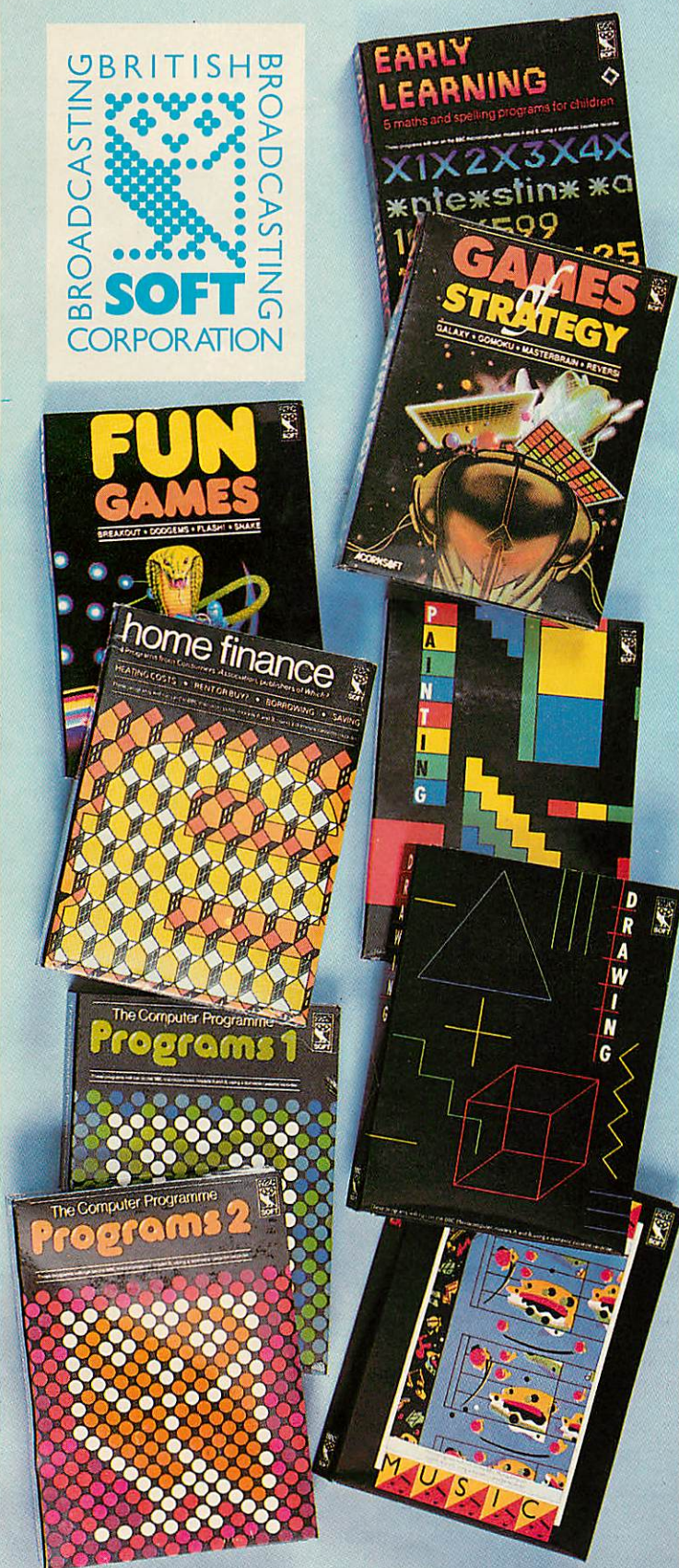
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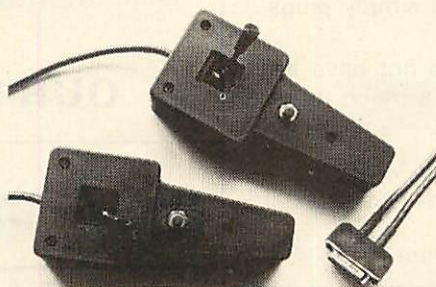
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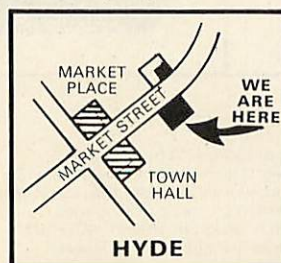
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# Guide in hand, go fearlessly through the micro jungle



UNTIL I got a copy of this book for review I'd never realised how much it was needed to fill a gap in the literature on BBC Micros (and gaps in my knowledge).

It is a book aimed at those who already know how to use the machine but would like to know a little more about how it works, its operating system and the hardware it controls.

If that describes you then have no fear, for with this book in hand you can safely explore the territory that the beginner guides mark with "here lie strange beasts".

Having said that, it's not a simple book but then its subject matter isn't simple either. It assumes that you have a fairly good grasp of Basic and are on nodding terms with the User Guide.

Given this you'll find it a clear and well thought out exposition on some of the more complex but intriguing features of the BBC Micro.

The aim of the book is to cover both the hardware and software of the BBC Micro and show how they function as a whole. All of the chapters except one are self-contained descriptions of one aspect of the micro — as much as anything can be self

## The BBC Micro — An Expert Guide By Mike James (Granada)

contained in such an intricate and interrelated whole.

And this is the beauty of the book. You can use it to suit your own needs and depth of knowledge.

I'm more at home with programming so I started on the software-based chapters. I began with the easily grasped descriptions of BBC Basic and the machine operating system and moved on to the short but thorough introduction to assembly language.

After this I found the formerly forbidding chapters on the sound generator and video display reasonably easy.

Then armed with the knowledge I'd gained — and the occasional dip into the hardware orientated chapters to clear up something I didn't understand — I had the confidence to attempt the chapters on the machine hardware and interfacing.

One aspect I liked was the author's honesty. He admits we won't grasp everything at once.

He uses the analogy of a

jig-saw puzzle. Bits will fall into place one by one, so if you don't understand something at first you might later in the light of something else you've read.

Also his chapter on interfacing ends by saying that you won't understand it fully until you've tried it in practice. And he warns you that assembly language IS difficult.

Because of this I felt comforted when I came to something that was beyond me and I could read on thinking it would probably come to me later. I must admit it was

nice to be given a book for review that is so clearly written that when you don't follow something, you know that it's you at fault and not the author!

Mike James has produced a well written, useful book. I leave it to you to decide whether it's an expert guide or not, but it's certainly a sensible, well-explained handbook on some of the more intricate parts of the BBC Micro.

The man is an unashamed enthusiast and with this book he's done other, less knowledgeable enthusiasts a great service: he's produced a readable, reasonable guide to both the ghost and the machine. **PB**

## For games fanatics

WHAT can I say? One look at the authors' names and you'll know what to expect. Games, good games, fun games, frustrating games.

There are some 40 listings covering all the games you might expect and also a few more unusual ones.

The programs have mostly been translated into BBC Basic from other

### Games BBC Computers Play by Hartnell, Gee, James (Interface)

dialects and they make good use of the Beeb's graphics and program structures. Each listing is well introduced, clear and easy to follow. If you're a games fanatic this book is well worth considering.



**Structured Programming With BBC Basic** by Roy Atherton (Ellis Harwood)

# Filling in those Basic gaps...

IF you are dissatisfied with the way you write programs, if you feel that your command of Basic is haphazard with large gaps and if you want a simple but thorough guide to better programming style on the BBC Micro, then this is the book for you.

In his introduction Roy Atherton states his belief that good programming in BBC Basic is possible for everyone, even the beginner, and in ten thoughtful, thought-provoking chapters goes on to prove his point.

The aim of the book is not just to teach syntax and the rules of the grammar of Basic but also to encourage problem analysis and program design and structure. Each topic is introduced at a simple level and treated in greater depth as the book goes on.

With emphasis on logic, data structures and graphics the teachings of the book come together in the

penultimate chapter, which uses what has been covered previously to show the construction of a logical game program.

With its copious examples and problems, each with a full solution, and its simple treatment of a complex subject, "Structured Programming With BBC Basic" will probably become the standard work on the subject.

**Further Programming for the BBC Micro** by Alan Thomas (Shiva)

IF you have already taken your first steps in Basic and want a little more depth and a lot more practice, then this is probably the book for you. It is a well presented, easy to follow guide to the stage just beyond beginning BBC Basic.

The subject is divided into easily-digested parts and is program based, which means you get a lot of simple, useful programs to illustrate the points raised. You also get hints and tips on how these can be improved or made more complex.

Simple and straightforward, this book is a worthy successor to "Easy Programming for the BBC Micro" in the same series.

## The games 16-year-olds play...

**Games For Your BBC Micro** by Alex Gollner (Virgin)

NO doubt you have come across those precocious youths – you might be one yourself – who seem to have cut their teeth on a micro's

keyboard. Well here is a book of games listings from one of them, a lad of 16. And very good value for money it is (other publishers please note).

For your money you get 20 games which vary from the bang-whizz favourites of the arcades to logic games

like Knightsbridge. Also included is an interesting game which turns your micro-computer into a micro-psychiatrist.

Add to all this an article on programming and a comprehensive glossary and you've got quite an impressive little book.

# GAMES WANTED

*"Everyone has got at least one novel inside him, and every BBC Micro owner has at least one original game waiting to be programmed."* – **Zen in the Art of Computer Programming.**

So says our editor in his forthcoming book. Is he correct though? Have you got a games program locked away in your subconscious, just waiting to see the light of day?

If so, get in touch with us right away – we're only too willing to hear from you. And

we've got our team of experts ready to help evaluate your work and add any necessary finishing touches.

Of course, if it's good enough, we shall want to include it in the pages of BBC Micro User. So send a copy of your original games program, on cassette or disc, to:

*The Editor, Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport.*

And please mark your envelope clearly "GAME".



# GALACTIC INVADERS



AS its name suggests Galactic Invaders is a cross between two well known arcade games. What the name doesn't reveal however, is the amount of pleasure to be had from this hybrid.

Here at Micro User the editor's had to ban it — otherwise we would never get any work done.

Certainly it would get our vote as one of the most enjoyable games we've ever played.

We couldn't resist squeezing this one into the issue, but space prevents us from giving full details of how it works — always assuming we could figure it out in the first place!

**Listing starts on Page 102**



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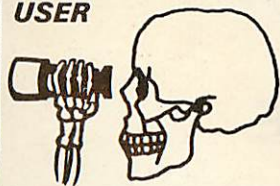
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**BBC  
MICRO  
USER**



## Deathwatch

and 24 other programs  
listed in the pages of  
BBC Micro User  
Vol. 1, No. 1.

### March Issue

**DEATHWATCH**, a superb arcade game that challenges you to use your skill to fight off enemy battleships, tanks and helicopters; **BINGO**, illustrating clever uses of the randomise function; **BUBBLESORT** routines; **TESTS** for function keys in machine code routines; a useful **CASSETTE BUGS FIX** for users with OS 0.1 ... and many **COLOUR** and **GRAPHICS ROUTINES** to help you create a kaleidoscope of screen designs which you can incorporate into your own programs.

**BBC  
MICRO  
USER**

## KING KONG



and 22 other programs  
listed in the pages of  
BBC Micro User  
Vol. 1, No. 2.

### April Issue

**KING KONG**, a fast moving game in which you pilot a helicopter to rescue girls perched on the Empire State Building before killing Kong; **GRAPHICS**, a suite of colourful demonstration programs; **NIM**, a structural game of strategy; **TOKENS**, first steps in unravelling the Basic ROM; **HOROSCOPES**, a fun program with useful error-trapping routines; **FORMATTER**, an essential disc utility; **DISASSEM**, a full machine code disassembler; **HEAT & LIGHT**, two measuring and plotting programs.

**BBC  
MICRO  
USER**

## AIR STRIKE!



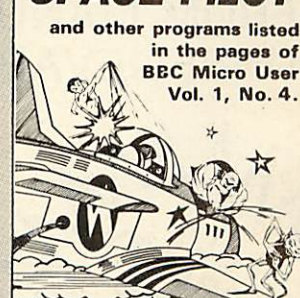
and 33 other  
programs listed in the  
pages of BBC Micro User  
Vol. 1, No. 3

### May Issue

**AIR STRIKE**, a fast and furious arcade game that invites you to put your wits against maurading warplanes; Test your mental powers with **PELMANISM**; **25 ANAGRAMS** for you to solve; **CHARACTER**, to generate vertical and inverted text; **TELETEXT**, animation in Mode 7, really brings the screen to life; **LAB**, a trio of programs to interface laboratory equipment; 10 programs to investigate the **OSBYTE** routine; **BEEB**, two joystick exercises; plus more **COLOUR** and **GRAPHICS** routines.

**THE  
MICRO  
USER**

## SPACE PILOT



and other programs listed  
in the pages of  
BBC Micro User  
Vol. 1, No. 4.

### June Issue

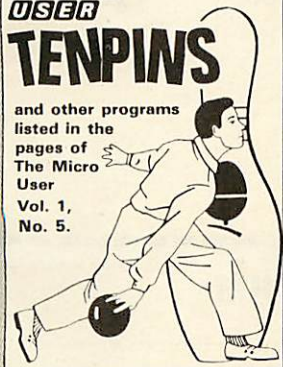
**SPACE PILOT**, lost in space with dwindling fuel supplies, you must fight off repeated attacks from alien life forms. To replenish fuel, you have to perform a tricky docking manoeuvre, while to repair the inevitable damage you must land on a mountainous planet. **NOMISM**, you are a nomadic herdsman desperately trying to eke out a living on the plains of Africa. Can you survive drought, tsetse fly and other hazards? A game that also helps to teach geography. **PLUS** other listings from the June issue.

# We've got it all taped!

**THE  
MICRO  
USER**

## TENPINS

and other programs  
listed in the  
pages of  
The Micro  
User  
Vol. 1,  
No. 5.



### July Issue

**TENPIN**, a highly entertaining simulation of Tenpin Bowling; **SPACEPODS**, Try to beat alien hordes; **CUP**, Exciting techniques to bring 3D graphics to the BBC Micro; **SCRSAVE** and **CSRLOAD**, Two programs to allow you to save and load screens to tape or disc; **TEST** and **STEADY**, A pair of programs to accompany the Beeb Body Building Course; **BREAKFIX**, Don't let the Break key destroy all your precious variables! **FORMAT**, Creates neater listings which are much easier to read.

**THE  
MICRO  
USER**

## FRUITIES

and other  
programs  
listed in the  
pages of  
The Micro  
User  
Vol. 1,  
No. 6



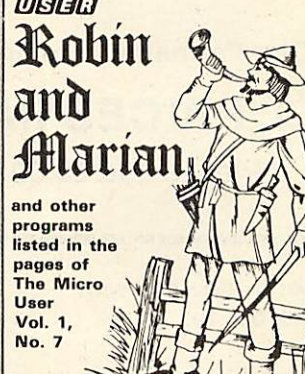
### August Issue

**FRUITIES**, driven by strange urges you climb the ladders of adventure to risk all in the gardens of unearthly frights. Can you survive all the terrors that await you. or will you, too, fall victim to the evil Fruities? A really superb game. **ANIMATION**, a suite of programs that show you how to really bring your screen alive — an essential part of our course on animation on the BBC Micro. **CASDISC**, The essential machine code downloader for your disc system; **PLUS** other listings from the August issue.

**THE  
MICRO  
USER**

## Robin and Marian

and other  
programs  
listed in the  
pages of  
The Micro  
User  
Vol. 1,  
No. 7



### September Issue

**ROBIN & MARIAN**, a highly-challenging game in which you play the part of Robin Hood rescuing Maid Marian from the clutches of the Sheriff of Nottingham. **GALACTIC INVADERS**, an extremely well-written cross between two well-known arcade games. **DFS BENCHMARKS**, 14 programs to test out disc filing systems. **ANIMATION**, four programs to teach new techniques. **TERMINAL**, three programs to connect a BBC Micro to a mainframe. **PLUS** other listings from the September issue.

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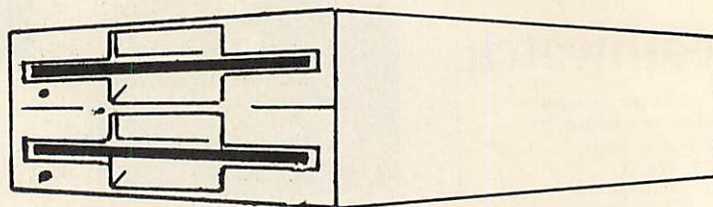
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ON PAGE 77**



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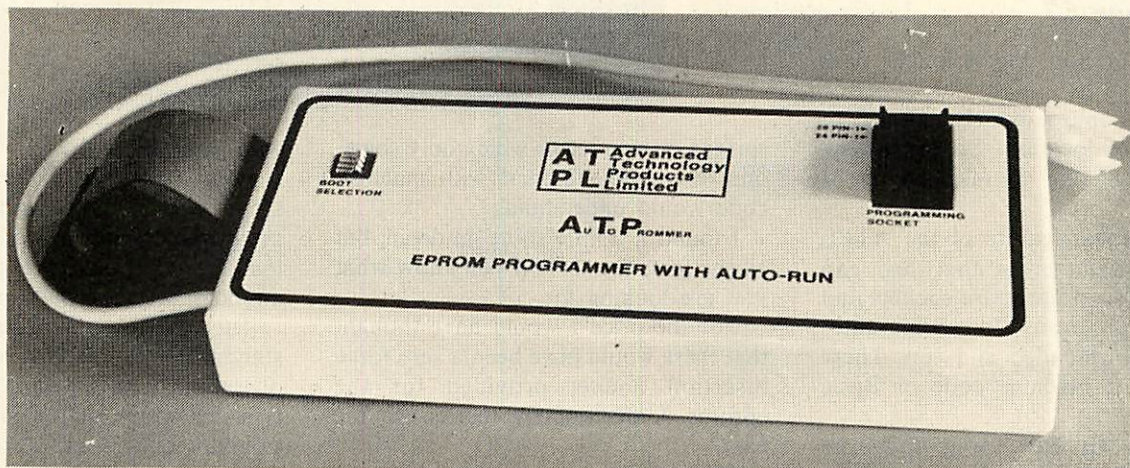
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# An eprom programmer.. *that's NOISY but NICE!*

THE first surprise with the ATPL eprom programmer is that it has no base. If you turn it over you can plainly see its innards.

The initial reaction is that for £120 you do not get a lot for your money. There are six ICs, three reed relays and a small handful of auxiliary components. There are also several empty sockets.

What you lack in hardware, however, you gain in sophistication of operation. As we shall see later, it is not *just* an eprom programmer.

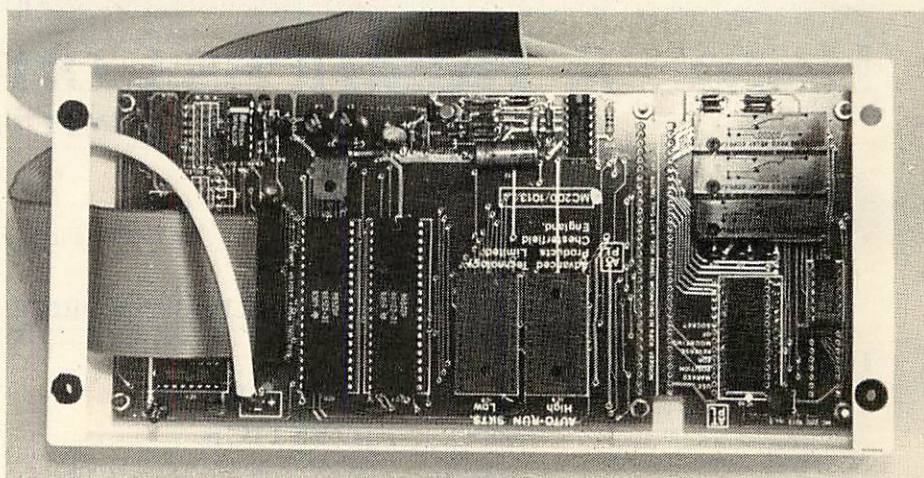
Coming out of the box is a ribbon cable for connection to the 1 MHz bus and a wire for connection to the BBC Micro's power supply socket.

If you have Acorn disc drives, you will have to disconnect them as they require this power socket.

The wires are just about the minimum possible length and at the price could have been slightly longer to enable you to have some choice about where the unit is placed.

The eprom programmer comes with software to enable you to read and blow eproms of many different type. Those supported are the 2516, 2716, 2532, 2732, 2564, 2764 and 27128.

For some types of eprom you have



*All is revealed: The underside of the ATPL eprom programmer*

to remove or make a link inside the programmer. I think this could have been brought out to a switch on the outside of the case for convenience.

It is also possible to read from one type of eprom and copy onto another. The software provided is basically an eprom copier and there are no provisions for altering the contents before the new eprom is programmed.

To do this you would have to save the buffer memory space and then write a program to edit it, which would be quite a tricky job. Nevertheless, as

an eprom copier it works very well.

As well as testing whether your new eprom is blank you can read and blow it and also verify that it has been programmed correctly.

When the device is in the act of programming, strange low level noises can be heard emanating from the speaker in the BBC Micro.

Also as each block is programmed a number is displayed giving both assurance that it is still working and an



## From Page 57

estimation of how much longer it is going to take.

It takes approximately 50mS to program one location. So for a 16k eprom it is going to take about 14 minutes.

An additional feature of the ATPL eprom programmer is that one can install eproms in the spare sockets and have the programs in them automatically downloaded and run. These can be either machine code or Basic programs.

So you can have your favourite program run instantly when you power up. The manual explains exactly how to do this.

Unfortunately the manual suffers from the usual problems, although it sets off by trying to be user friendly and explain every step.

For instance, it tells you to adjust your volume control if you have difficulty loading the tape in. Then it

springs on you terms which only someone reasonably familiar with machine code would understand.

I found it a little short on detail, but all the facts are there if you know what you are looking for.

For the price I would have thought that there would have been a zero force insertion socket provided for the eproms. Unfortunately this is not the case.

While the socket does not subject the eprom to the usual amount of strain it does require it to have its legs straightened. This oversight rather spoils the ship for a ha'peth of tar.

In conclusion the ATPL eprom programmer offers the capability of programming many different types of eproms – certainly most of those that you would want to programme for use

with your BBC Micro.

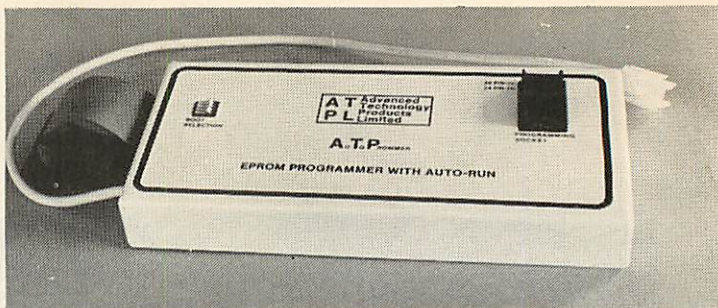
In my experience the capability to store programs within the eprom programmer and download them is unique and should prove valuable for anybody who has not got disc drives.

The unit is constructed to a high standard and should be reliable in operation. I have programmed several types of eprom with it and apart from trouble getting some of my devices into the programming socket, the unit has worked well.

If you need the capability for programming many different types of eprom then this certainly fits the bill.

Despite my criticisms of details of the design I have ordered one for my micro laboratory. But then, I wasn't spending my own money ...

Mike Cook



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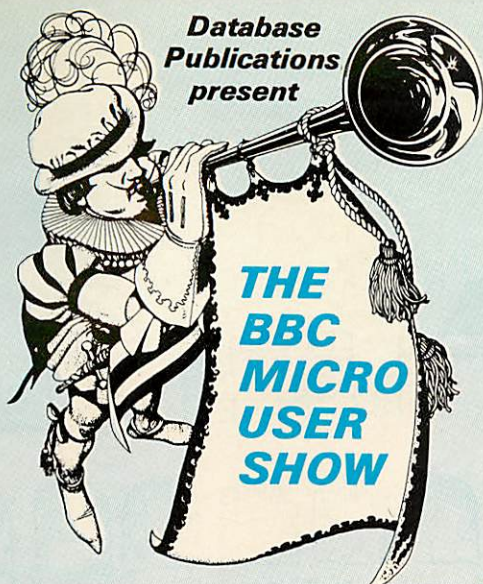
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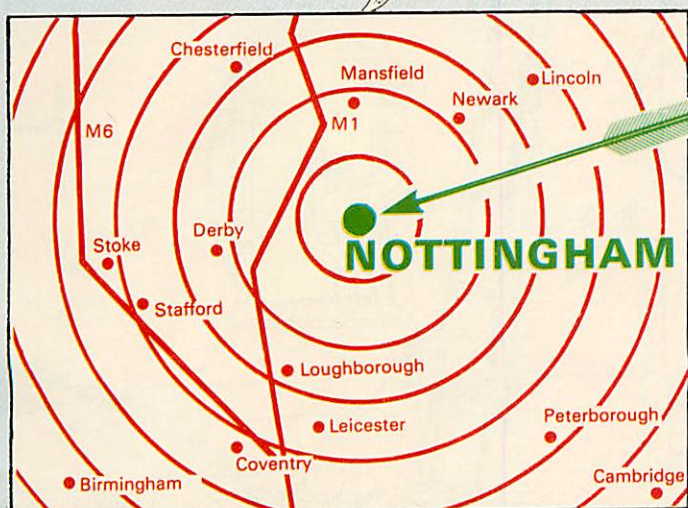
# ***We go right to the heart of England for the second BBC Micro User Show!***

## **Sherwood Rooms, Nottingham**

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### ***This is where you'll find the answers to all your questions about the BBC Micro***

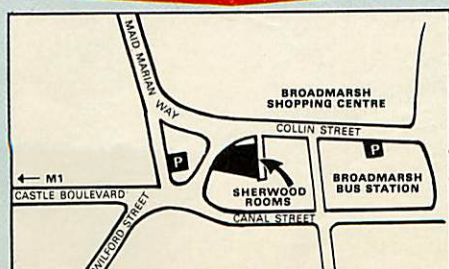
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All the major suppliers will be there, displaying all their latest products – some of which will be on show for the first time.

And in attendance will be leading experts on the BBC Micro, ready and willing to answer all your questions.

If you want to keep fully up to date on all that's new for the BBC Micro, this is a show not to be missed!

### **How to get there**



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# Robin to the rescue

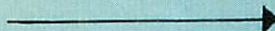


A WISTFUL Maid Marian, lonely prisoner of the wicked Sheriff of Nottingham, stands forlornly on the battlements of Nottingham Castle. Archers are in position, ready to let fly their arrows — or to fling down cauldrons of molten lead onto any foolhardy rescuers.

This is the scene that greets you at the start of this month's Micro User game that invites you to assume the mantle of brave Robin Hood and rescue Maid Marian from the evil Sheriff's clutches.

Every time you hit an archer another piece of magical ladder appears, which you will have to climb to pluck Marian to safety. But if you lose one of your four lives the ladder vanishes.

However time is not on your side, and the sky begins to darken as evening approaches...





# If you can buy it cheaper we'll refund the difference.\*

This month's offer is another winner – a consignment of 14" R.G.B. colour monitors manufactured by J.V.C. – at prices never seen before in the U.K. Suitable for use with BBC Micro.

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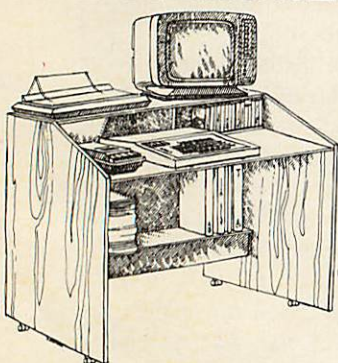
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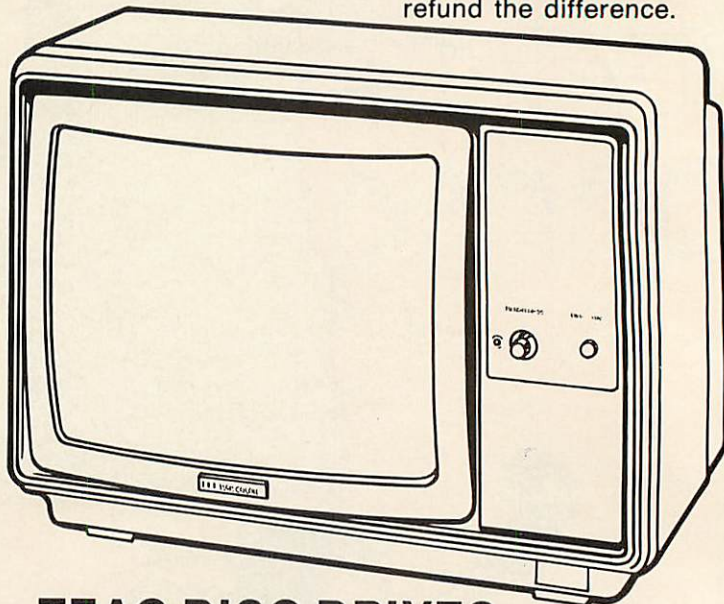
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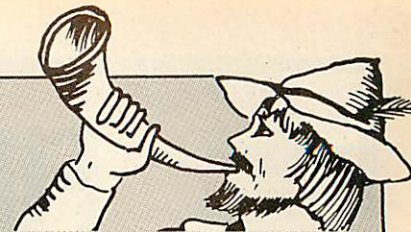


**Government and Educational  
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From Page 61



## MAJOR VARIABLES

A%	False if baddies are too animated
B%	True if bomb is to be animated
D%	True if Robin is dead
E%	Present (Y) position of the ladder
G%	True if Robin wins
J%	Present arrow X co-ordinates
K%	Ascii values of key being pressed
L%	Present arrow Y co-ordinate
M%	Loop counters
N%	Current level
R%	Last arrow X co-ordinate
S%	Last arrow Y co-ordinate
T%	Bonus remaining
W%	Baddy's X co-ordinate
X%	Robin's X co-ordinate
Y%	Robin's Y co-ordinate
Z%	Baddies Y co-ordinate
V%	Robin's X vector
AX%	Baddy's last X co-ordinate
BX%	Bombs X co-ordinate
AY%	Baddies last Y co-ordinate
BY%	Bombs Y co-ordinate
OX%	Robin's last X co-ordinate
OY%	Robin's last Y co-ordinate
OBX%	Bombs last X co-ordinate
OBY%	Bombs last Y co-ordinate
NCAR%	Robin's present character type
OCAR%	Robin's last character type
MAN%	Number of lives remaining
SC%	Score to date
name\$(N)	Array holding names on hi-score table
score(N)	Array holding scores on hi-score table

## MAJOR PROCEDURES

PROCerror	Error handling routine
PROCinit	Sets up envelopes, user defined characters, dimensions, arrays, and sets up hi-score table
PROCheader	Title header and hi-score display
PROctitles	Instructions
PROCsetup	Sets all variables for next screen
PROCdrawcastle	Calls procedures to draw the screen
PROCmoverobin	Sets up Robin's co-ordinates and fires if space bar pressed
PROCshoot	Animates Robin's "arrow"
PROCbomb	Animates Baddy's "bombs"
PROCdead	Flashes colour if Robin hit
PROCbadguys	Moves the baddies
PROCfire	Initialise to fire an arrow
PROCplotrobin	Animates Robin
PROCplotbaddie	Animates baddies
PROCthemhit	Increment score, kill and move displayed baddy
PROCwin	Plot heart, and add on any bonus
PROCend	Displays the ending sequence
PROChiscores	Decides if score is in top 20, and if so, asks for name
PROCdisplay	Displays high scores
PROCsky_moat	Draws sky and moat
PROctower	Draws the two towers
PROCcastle	Draws the main body of the castle
PROCwindows	Puts the windows in
PROCbattlement	Draws the battlements
PROClletters	Prints score, bonus, and lives remaining
PROCdoor	Puts the door on
PROCmarion	Draws Marian in 3 colours

**Listing starts on Page 95**

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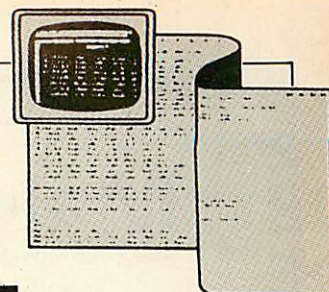
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– UNLIMITED GUARANTEE –





**CLOSURE! Liquidation! Bankruptcy!** In an era when such headlines are all too familiar, how can the micro computer help the businessman avoid them?

Forecasting and budgeting probably prevent more crises than any other financial or managerial techniques. Plans are made of monthly activity for one or two years ahead and actual performance regularly compared with the plan.

Departure from the plan or variance is easy to spot and its likely effect on the whole business calculated before it becomes too serious, allowing time for remedial action.

Such plans can cover many activities to a fine degree of detail. A factory's use of manpower can be categorised by different skills, by departments or cost centres, by age or sex or training requirements.

A transport organisation can plan its vehicle utilisation, broken down by type, tonnage or depot. A sales force can express its targets in terms of different products, territories or markets.

The most common plan is the financial budget, which expresses such ideas in financial terms, comparing income from different kinds of sales with the expenditure needed to achieve them.

This may cover wages and salaries, rent of premises, insurance costs, raw materials, and a wide variety of other resources and costs.

Such financial forecasting not only shows the likely profit or loss at the end of the coming year, but can also show cash flow, the vital blood supply by which businesses live.

So what's the problem? Why doesn't every business plan in this way? Time, of course! To carry out these admirable techniques properly takes many, many man hours.

Busy executives, caught up in the hurly burly of commercial life, tend to put them off until later – or too late!

And once done they need to be recast, perhaps time and again, to match changing policies or circumstances, a task that is often neglected because of the tedious labour involved.

A micro program to lighten such toil is thus extremely welcome to the competent manager and I predict that Beebcalc will soon attract a wide circle of admirers and sell briskly to small businessmen and industrialists.

Not only does it reduce the birth-

# Beebcalc ... the prudent businessman's lifesaver

pangs of the budget or plan, but it makes change and recalculation utterly painless.

Beebcalc is really very simple. It sets out a table of columns (any number up to 26) and rows (up to 50) into which the user can enter his budgets, using text or numbers.

It allows him to alter the width of columns, to define how each column entry is presented, and to use a formula to calculate every entry in a column or row.

This could be a function of some other entry or, for example, could be determined by the number of working days in a given month: normally a most laborious adjustment but peanuts with Beebcalc.

Most valuable of all, the entire table

operate dual disc drives.

Printing also suffers from too short an input "slot". Provision is made for defining a £ sign to suit the peculiarities of the individual printer, but with capacity for only three characters. My own printer, for example, requires no less than five.

Other criticisms concern the user guide. Any one of 11 routines can be selected by pressing a single key, but only if the caps lock is engaged. When I started using the program I entered my various expenditure sub-headings using lower case type, as a result of which the program appeared to jam whenever I selected a command. A telephone call to Gemini soon cleared this up, but a note in the guide could have avoided my frustration.

I also failed to understand an arrangement that offers dual choices of operating procedure. The user guide explanation depends upon the reader knowing what a "toggle" is. This small businessman is a newcomer to computers, and thought it was something used by boy scouts.

I would recommend compilers of micro guides to assume total ignorance of jargon among their readers. This apart, the guide is comprehensive and helpful, as is the sample file illustrated and provided on the disc.

The program is not, of course, restricted to business planning. It could be used wherever data needs to be presented as a spreadsheet, such as the presentation of scientific and technical data, the execution of engineering or other calculations or the production of timetables or fare charts.

It has often been said that computers win most friends where many calculations are performed on data that is subject to frequent changes, and Beebcalc demonstrates the truth of this.

It is an excellent small business program, well worth £19.95 on tape or £23.95 on disc.

**By JON VOGLER**

can be recalculated as required or, if wished, every time an alteration is made.

I can recall innumerable conversations with my accountant: "Take it away and see what it looks like if we increase the sales of these and reduce the cost of that".

He would go away with a glum face and, 24 hours later (if we were lucky), would reappear with the altered document.

Too many changes and he reached resignation point! With Beebcalc the effects of such changes could be visible within a couple of minutes in a wreath of accountant's smiles.

All necessary facilities are provided to save data on file. Tape would be little less convenient than disc. Sadly, no provision is made for including a disc drive number in addition to a seven character filename – a thoughtless oversight as many businessmen will



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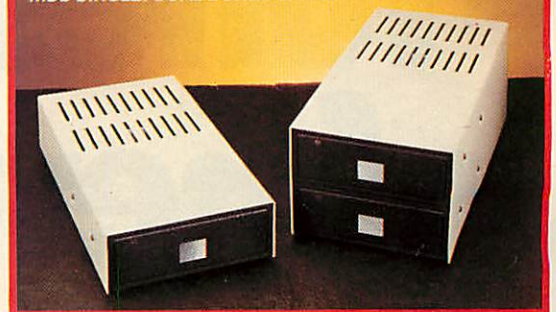
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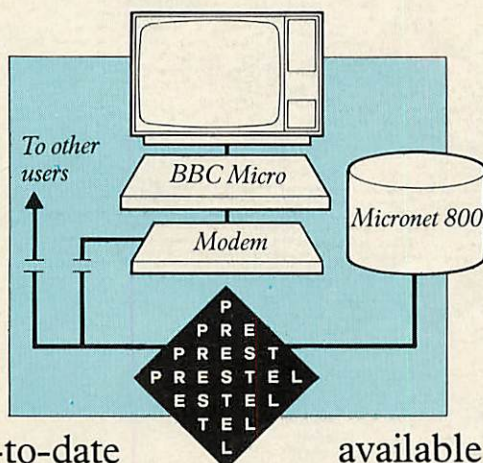
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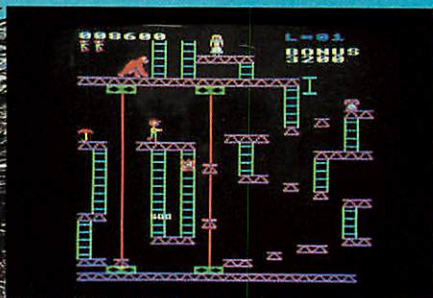
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# The long and winding road that leads to Satan's door

Devil's Causeway (Kay Dee Software)

I COULD tell I was on to something different when I saw the packaging that this game came in. It consisted of a very smooth, black plastic case that reminded me more of a video cassette than anything else.

But that was just the wrapping. As my mother always used to say, it's what's inside that counts.

Well I've played Devil's Causeway dozens of times and I can tell you that the game is every bit as well produced as the package it comes in.

The idea is that you have been captured by the Devil and have to make your way to safety by travelling his causeway, a long winding road that you leave at your peril.

In this respect it's just a maze game and a fairly simple one at that. But there are complications.

These come in the form of Satan's Fiendish Friends. (No this is not another dig at Acorn.) As you journey to freedom Old Nick's allies come to test and taunt you by making you play simple but trying games.

Donald the Demon Dice-thrower



challenges you to a game of dice. You lose at the risk of your life. Basil the Bomber makes you choose between three boxes, one of which contains a bomb.

Satan has at least half a dozen other allies that I've come across. There might be others but I don't want to meet them!

Devil's Causeway may be a little too simple for the experienced adventurer. But it is great fun both to play, and to watch others playing. Certainly if

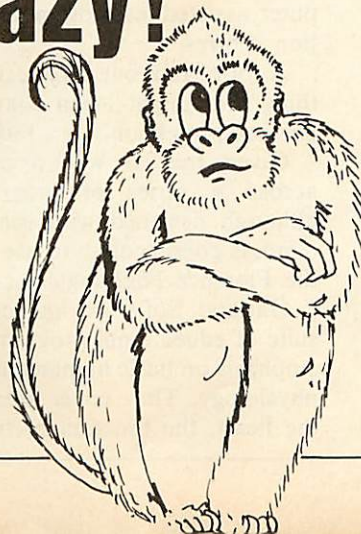
parents were looking for a game for their children that was fun and also mildly educational then this is the one to go for.

I might also add that if a child were looking for a game that would challenge a parent's abilities while not being too hard for them, the same would apply. With superb packaging enclosing a pleasant, enjoyable game, Devil's Causeway is a program to seriously consider buying.

John Knight

Zany Kong (Solar Soft)

## Gorilla crazy!



I DON'T know what it is about gorillas but they do something to people in the micro computing world.

Magazine editors will drop pages of priceless prose (i.e. mine) in order to print something which has a picture of a gorilla.

Beginners go to great trouble learning all about user defined graphics, construct some huge ape, stick it on top of a building and then torment it.

Did no one watch David Attenborough talking to the great apes in the jungle? I know they're not as pretty as Fay Wray but even so they deserve a little better treatment than they're getting in the Second Industrial Revolution!

Anyway, it was nice to come across Solar Soft's Zany Kong, a game where

the Gorilla Fights Back. The idea is pretty familiar to most micro users (is there anything new under the sun, I ask?).

Kong is at the top of a series of platforms or scaffolding or whatever, and he has a blonde as his prisoner. (Apes and gentlemen prefer blondes, it seems.)

Our Morris has to rescue her, climbing various ladders and leaping agilely over fireballs, barrels and other nasties. He picks up tools and bonus points on the way and eventually gets a chance at killing Kong. Boo.

It's hardly the most original game on the market but it's fun and it's nicely done. Pleasant but not anything to ape about.

Nigel Peters



Timeman One (Bourne Educational Software)

# Time to learn

THIS is an attractively presented package, designed to help children to tell the time and set the clock. Its recommended age range is from four to nine years.

Each of the first six available options uses a colourful screen display which consists of a large clock face, a ladder with a small man positioned half way up it, and a happy face or sad face depending on whether or not the correct answer is entered.

The first three options are telling hours, telling minutes, and telling hours and minutes together. For each of these the child has to enter the appropriate number of hours or minutes, or both together.

If the right answer is given they are rewarded with the appealing "happy face" smiling, and little ladder-man climbing up two rungs on the ladder.

If the wrong answer is given then the "sad face" grimaces, the incorrect time is displayed on the clock and the child is invited to try again.

If another incorrect answer is entered, after displaying the child's entry on the clock the correct answer is shown. Each incorrect entry made causes the ladder-man to climb down one rung of the ladder.

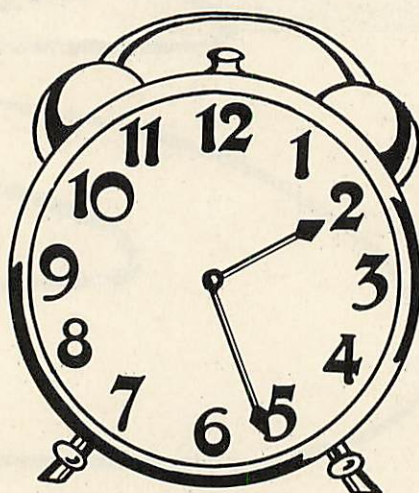
If the stage is completed so that the man reaches the top of the ladder before a total of 15 entries are made, he dances to a tune (the volume is adjustable!) and plants a flag.

This flag is carried over for each individual child to the next stage, so a series of flags can be collected.

For telling hours, the hour hand only is displayed and it points at random to any of the hour numbers on the clock face.

Similarly for telling minutes, the minute hand only is displayed and it points randomly to any number of minutes from 0 to 60 on the clock face.

One of the available menu options is to set the minute intervals to either one or five minutes so that this can be made



more challenging for older children.

If the child enters an answer within plus or minus three minutes of the correct time then "CLOSE!" appears on the screen, the ladder-man goes up one step, and the child is invited to try again.

The next three menu options are setting hours, setting minutes and setting both together. In these, the clock is required to be set, by pressing the H and M keys.

The response for a correct or incorrect entry is the same as for the first three options except that for incorrect responses the child is told what time he set the clock to, and then invited to have another go.

For setting both hours and minutes, moving the minute hand causes the hour hand to be correctly positioned relative to the hour marks, to give a more accurate representation.

The minute intervals can be set as before to one or five minute accuracy.

The seventh menu option is the BES monitoring system, which holds detailed information on the responses of the last six users of the program.

This lets the teacher or parent access each record and see each child's name, how much time he took, which options were attempted and the responses to each question.

These are shown with the time settings asked in white, correct entries

made in green and incorrect entries in red. It also shows whether one or five minute intervals were chosen and whether hours or minutes or both were being tested.

This comprehensive monitoring system is a particularly valuable feature of the package. It enables the teacher or parent to evaluate each child's particular difficulties or achievements.

This is an entertaining and highly instructive program which has been thoughtfully designed to appeal to children and to be as useful as possible for guided learning either at home or in the classroom.

Jane Jackson

Action of the Heart (Garland Educational)

## Finger nurse

THERE's been a lot of talk in nursing circles recently about the use of computer assisted learning in nurse education centres.

A lot of talk but, as is usual in anything that might mean change to the nursing profession, very little action.

Given this, it was nice to come across a series of programs that, although designed with schoolkids in mind, is good enough to use in training the Florence Nightingales of the '80s.

Garland Software has published a suite of educational programs with the emphasis on basic human anatomy and physiology. They cover areas such as the heart, the function of the kidneys



Swoop (Program Power)

## Bombing birdman

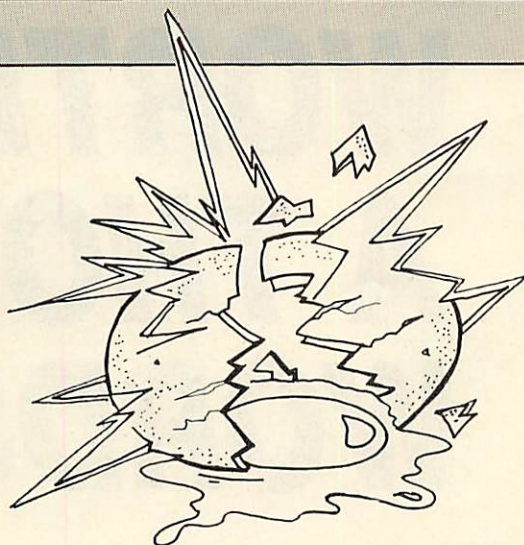
THEY say that you can't teach an old dog new tricks. But after playing Swoop I've realised that you can certainly produce a new game from an old arcade favourite.

If you remember Galaxians then you've got the basic idea of Swoop. It's one of the Space Invader generation of games where waves of hostiles peel off and dive-bomb you as you try to survive using your defensive laser for protection.

In this incarnation the scenario is that you are being attacked by homing, swooping birdmen who you naturally try to avoid.

Incidentally I dread to think what it is that they're dropping on your head!

This particular game has an innova-



tion that makes it considerably different – and a lot more fun to play. If a birdman reaches the ground it lays an explosive egg for you to run into and destroy yourself. Sweet aren't they?

The eggs disappear after you've managed to hit enough of the harpies but there are always more where they came from.

It's a really enjoyable version of

an old favourite, enhanced by good graphics, nice sound effects and easily used controls.

With eight levels of difficulty consisting of more bombs, more swooping birdmen and even more durable eggs Swoop is everything a good action game should be. A winner.

Eileen Young

Hopper (Acornsoft)

## Froggy fun from old favourite

ALRIGHT, so Hopper isn't the most original game that you're going to buy. But it is fun, and Acornsoft have produced a colourful, lively version of an old favourite.

In the unlikely event that you don't know or can't guess what it's about I'll explain. The idea is that you have to hop your frog across a road avoiding vehicular traffic (as the Highway Code would put it).

Having missed being squashed to death you then have to cross a stream by means of logs and the backs of sometimes treacherous turtles to reach one of five "froggy lairs". You mustn't fall in the water as apparently these frogs can't swim.

As you might guess the whole thing gets more difficult with snakes and crocodiles joining in the mayhem. And if that's not enough you have to beat the clock as well.

It's great fun and Acornsoft with their usual skill and inside knowledge have produced yet another excellent version of an old arcade favourite.

Sadly the only thing missing is the good old lady frog. Has Mrs Whitehouse invaded the micro world?

That thought cast the only shadow on the game. Highly recommended.

Trevor Roberts

Software)

## on the pulse of training ?

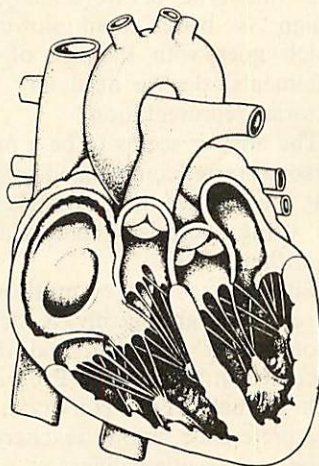
and the female reproductive cycle.

Each program is produced to a high standard, with a full set of printed notes as teacher aids and a fairly realistic attitude to how they are going to be used.

Taking the "Action of the Heart" as an example, what we get for our money is a well thought out introduction to the structure and functions of the heart, along with a series of questions to test our understanding.

It then goes on to the actual dynamics of the organ, and the whole thing is rounded off with a schematic model of the heart in action.

The graphics are excellent and the



whole package is an example of what well structured, useful educational software should be. Nurse educators and secondary school teachers should look at these closely.

Pete Bibby



*"I want to reach that state of condensation of sensations which constitutes a picture." Note du Peintre  
— Henri Matisse, 1908.*

# PICTURES WORTH A THOUSAND WORDS...

THE computer pioneers used flowcharts to help them to design, debug and update programs. Such flowcharts might become part of the documentation of a program and help to describe its function. Teachers also use them as an obvious learning aid. Consider the example in Figure 1.

Such a flowchart, or its more complex developments, might have three functions. These are: a tool of analysis and design, a description and a learning aid.

The corresponding word-design might be as follows:

1. Retire to bed.
2. Fall asleep.
3. Wake up.
4. If NOT time to get up THEN GOTO 2
5. Get up.

In passing, one might observe the twisting of the logic from asking in the flowchart "Is it time to get up?" to "IF NOT time to get up THEN" in the program design. The price of preserving the logic would be an extra GOTO statement.

But the main observation must be that in a structured approach we do not focus directly on flow of control. All we need to know is what structure is involved and what is its relationship with other elements of the program.

These are not difficult questions because there are only three necessary relationships between them. What, then, is the structured approach?

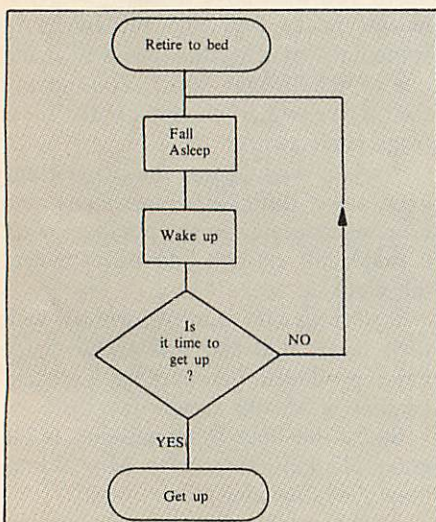


Figure 1: Flowchart

By **ROY  
ATHERTON**

Clearly we have a case of repetition, and the next question concerns the condition for terminating the loop. We are led to a design as follows:

1. Retire to bed.
2. REPEAT  
Fall asleep  
Wake up  
UNTIL time to get up
3. Get up.

This seems clear enough, and what is more important, we know that it embodies methods which will work well however simple or complex our program tasks may become.

If this type of word-analysis and design is better than flowcharting, which goes with the use of GOTO statements, do we need any kind of pictorial representation?

The answer seems to be a matter of personal taste, complicated by the fact that people have three possible reasons for using pictorial representation of algorithms.

There are three methods for representing graphically a structured algorithm or program, and they are discussed in "Structured Programming with Comal" (Ellis Horwood, 1982). The preference among teachers seems to be for structure diagrams.

A structure diagram reflects the three possible relationships between elements of a program: sequence, control, modularity.

The program design given earlier has

three elements in sequence at the first level. We represent this by placing boxes horizontally and we move left to right.

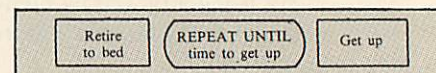


Figure II: Elements in sequence

The "Fall asleep" and "Wake up" elements are controlled by the REPEAT structure and we indicate this by placing them below the REPEAT UNTIL box.

The lines joining these statements to the controlling structure indicate this relationship, not flow of control.

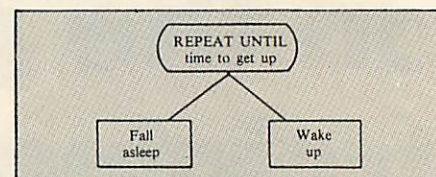


Figure III: Subordinate (controlled) elements

A similar arrangement applies to decision structures with a different shaped box.

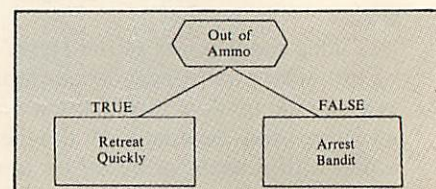


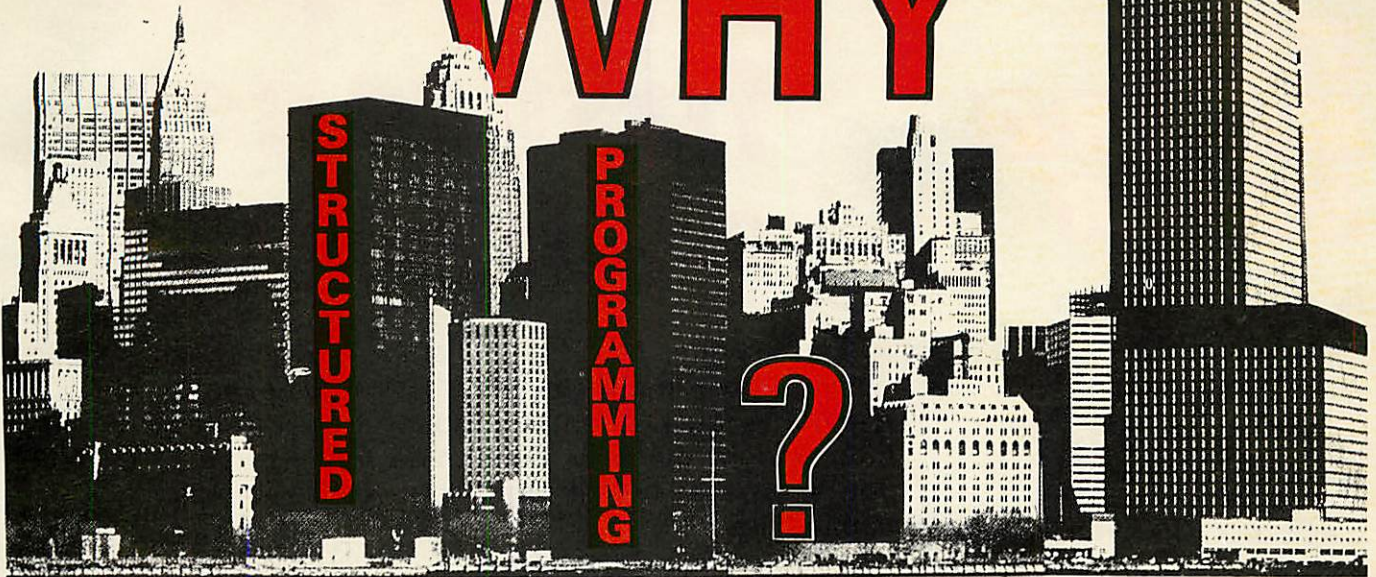
Figure IV: Elements controlled by a decision

A procedure definition is indicated by a double-lined box and drawn



## PART 5

# WHY



separately. The lines indicate that the elements belong to the procedure. The double-lined box is also used for a procedure call.

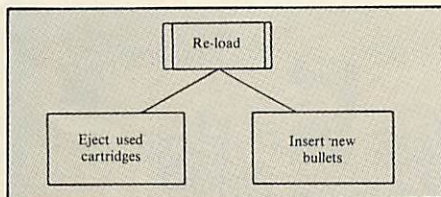


Figure V: Procedure definition

The elements of a main program obviously belong to it and are connected to a title box. If we start with this and look again at the program which we will call "SLEEP" we can see the relationship between program and structure diagram.

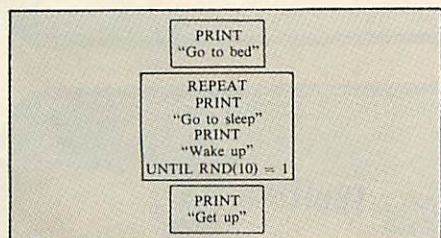


Figure VI: Program SLEEP

There are three main elements, so we place these boxes under the title box.



Figure VII: Outline of program SLEEP

Now we examine any structure boxes. There is only one and we ask, "What is its content?" There are two elements in the repeat loop in the program.

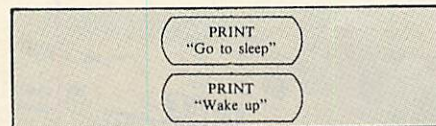


Figure VIII: Elements in REPEAT loop

These are placed under the structure box, to complete this simple example. The method holds for more complex programs.

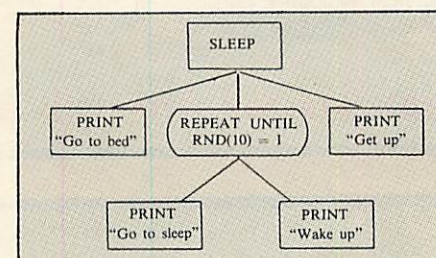


Figure IX: Final Structure Diagram

Some readers may feel that the more useful process is that which takes us from a structure diagram to a program.

This is equally simple. We perform what is sometimes called a "Natural Walk" around the structure diagram.

Imagine you are an insect crawling around the diagram. Start at the title and regard the lines as walls, always keeping them on your left.

Each time a rectangular box is encountered, write down a program statement. Open a structure when you

pass its box on the way down and close it on the way up.

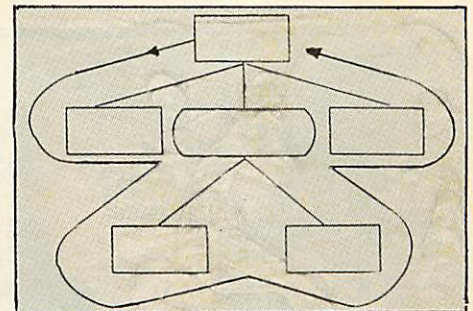


Figure X: Natural Walk

A program and its structure diagram are structurally equivalent. There is no twisting of logic. There is a unity between design, diagram and program.

Mathematicians would say that the three are isomorphic – that is, identical in structure. Dijkstra would say that the conceptual gap between the (static) design, diagram or program and the (dynamic) execution of the program has been reduced to the minimum.

Even so, many good programmers find the structures themselves perfectly adequate. Beginners have written quite good programs of hundreds of lines after only a few weeks experience without using structure diagrams.

Others find them helpful, and some teachers believe that they have considerable value for learning.

A structure diagram exhibits relations within a main program or procedure. It does not give a proper overview of a large program with many procedures. Structure charts do that, but they are beyond the scope of this article.

● To be continued



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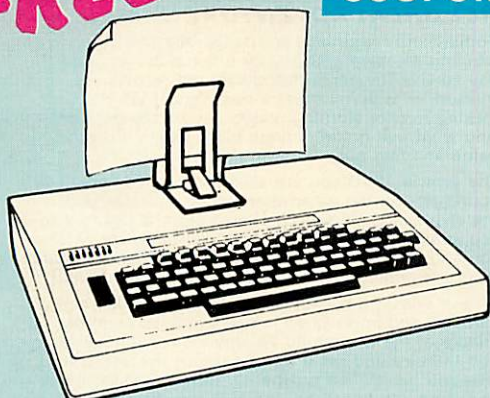
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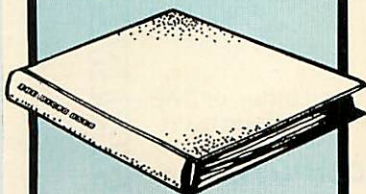
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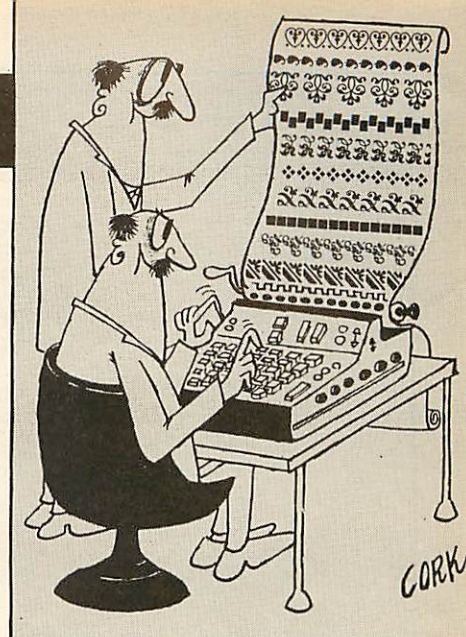
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# How your micro stores - and preserves those..

# VARIABLES

HAVE you ever wondered how your computer stores its variables? How it knows where each number or word is located in memory? This article will attempt to answer these questions.

Four classes of variables are in use on the BBC Micro - integer, floating point, string and array variables.

Integer variables end in a '%' sign. If the name is a single character letter it is a system integer variable and its value is stored as a four byte number in page 4 - that is from &400 to &4FF.

The value of @% is located in the four bytes starting at &400, A% at &404, B% at &408 and so on to Z% at &468.

All other variables are stored together after the end of the Basic program. Separate regions are not allocated to the different types of variable. They are stored in the order they are encountered in the program.

The memory from &482 is used to keep a catalogue of where the variables are stored in the computer's memory.

For example:

&482 points to the location of the first variable beginning with A,  
&484 points to the address of the first variable starting with a B,  
&4C2,3 points to the address of the variable starting with a,  
&4F4,5 points to the address of the variable starting with z

In addition to variables starting with

By JOHN LORD

letters they may begin with '£' or '\_' but not @. @% is used to control the way data is printed.

To find out more about the way the variables are stored examine the addresses indicated by the variables map. The program "Memory Display," described in the July issue of *Micro User*, displays 128 bytes, 8 bytes to a line, when the starting point M is defined. I suggest you use this to examine the way variables are stored.

Now type M=&400 press Return, f1 and Return. You should see displayed the contents of memory locations from &400 to &47F.

The first four locations contain 4000. Then follows a page of 0s if you have OS 1.0 or above. If you have OS 0.1 there should be 60 bytes with FF before the page is completed with 0s. This page is where the system integer variables are stored.

The 4000 is the hexadecimal value of @% stored LSB (least significant byte) to MSB (most significant byte). Each byte has two figures, if there is only one as in 4 it is really 04, so @%=&00000004 or &4 for short.

If this half page contains anything else then you will have to clear the con-

tents of these locations. Typing CLEAR and pressing Return does not clear the system integer variables, though it does clear the variable map. Neither a "soft" nor a "hard" break alters the system integer variables.

Switching the computer off clears all variables and also all the RAM, including your program. The following routine programmed into key f0 will clear the system variables.

```
*KEY0 CL.:?&4FF=&0D:M%=&480:A$=$M%:M%=&400:$M=A$:CL.1M
```

<CLEAR>

fills the half page from &480 full of zeroes.

```
M%=&480:A$=$M%:M%=&400:$M=A$
```

fills half a page of the system integer variables with zeroes.

<CLEAR>

is needed because the routine has used M and A\$.

If you have O.S. 1.0 or later you could call it in a program via

```
*FX 138.0.128
```

which puts 128 into the keyboard buffer and makes the computer think that f0 has been pressed.

You cannot put this routine into a procedure because CLEAR deletes the reference to the procedure and so when



## From Page 79

ENDPROC is reached the error handling routine reports 'No PROC'.

To see how the computer stores its variables initialise them with the following program:

```
10 LOMEM=&1000
20 A%=&6543:B%=&483620
30 Z%=-&3456:a%=&4923
40 F%=&1234:ZAD%=&3482
50 A=&3489:B=27.6
60 Z=489.7:_stu=25.63
70 adr=1.25:fred=6400
80 z=25.375:ABC$="abcdef"
90 Bcde$="efghijklm":Cab$="aaaaaaaaa"
100 DIM A%(5)
110 A%(1)=&4519:A%(2)=&1529
120 A%(3)=&2915:A%(4)=&1295
130 A%(5)=&152
```

Now run the program. Type M=&400 press Return, fl and Return and see how the values of the system variables have changed.

```
400  4  0  0  0  43 65  0  0  0%=&4, A%=&6543
408 20 36 48  0  0  0  0  0 B%=&483620
410  0  0  0  0  0  0  0  0
418  0  0  0  0  0  0  0  0
420  0  0  0  0  0  0  0  0
428  0  0  0  0  0  0  0  0
430  0  0  0  0  0  0  0  0
438  0  0  0  0  0  0  0  0
440  0  0  0  0  0  0  0  0
448  0  0  0  0  0  0  0  0
450  0  0  0  0  0  0  0  0
458  0  0  0  0  0  0  0  0
460  0  0  0  0  0  0  0  0
468 AA CB FF FF  0  0  0  0
Z% stored as 2's complement of &3456
470  0  0  0  0  0  0  0  0
478  0  0  0  0  0  0  0  0
```

## VARIABLE STORAGE FORMAT

LO	HI	Name of the variable	OO	Value
↑	↑	↑	↑	↑
Address of the next variable starting with the same letter		Includes all the characters in the name, except the first letter but includes the variable type %, \$ etc.		Has a format which depends on the type of variable

## VALUE FORMAT

Integer (4 bytes long)

LSB			MSB

String

LO	HI	LA	LEN
↑	↑	↑	↑

Points to the memory location where the string is stored

Number of bytes allocated to the string

Actual length of the string

FLOATING POINT (5 bytes long)

EXP				
	MSB			LSB

Power of 2

## ARRAYS

LO	HI	LO	HI	LO	HI	Value (0,0)	Value (0,1)	.....	Value (N,n)
↑	↑	↑	↑	↑	↑	↑	↑		↑
Number of bytes in the array name. Includes \$, % etc and (	Number of elements in the 0'th dimension	Number of elements in the N'th dimension		Formatted as appropriate for the kind of variable.					

## VARIABLE MAP

```
480  0  0  1A 10 22 10 86 10  A is stored at &101A
488  0  0  0  0  0  0  0  0  B is stored at &1022
490  0  0  C9 10  0  0  0  0  Cab$ is stored at &1086
498  0  0  C1 10  0  0  0  0  I is stored at &10C9
4A0  0  0  0  0  0  0  0  0  M is stored at &10C1
4A8  0  0  0  0  0  0  0  0  ZAD% is stored at &1010
4B0  0  0  0  0  10 10  0  0  _stu is stored at &1032
4B8  0  0  0  0  0  0  32 10  F% is stored at &1008
4C0 08 10  0  10  0  0  0  0  a% is stored at &1000
4CB  0  0  0  0  47 10  0  0  fred is stored at &1047
4D0  0  0  0  0  0  0  0  0  z is stored at &1052
4DB  0  0  0  0  0  0  0  0
4E0  0  0  0  0  0  0  0  0
4E8  0  0  0  0  0  0  0  0
4F0  0  0  0  0  52 10  0  0
4FB  0  0  0  0  0  0  0  0
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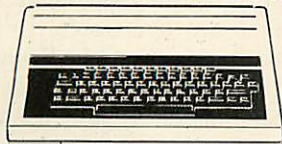
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## From Page 80

Table 1 illustrates the format for variable storage.

Type M=&1000 press Return f0 Return. You should see:

1000	3D	10	25	0	23	49	0	0	1070	0	75	10	11	9	65	66	67
1008	0	0	25	0	34	12	0	0	1078	68	69	6A	6B	6C	6D	0	0
1010	2A	10	41	44	25	0	82	34	1080	0	0	0	0	0	0	0	0
1018	0	0	5A	10	0	8E	52	24	1088	61	62	24	0	90	10	11	9
1020	0	0	6A	10	0	85	5C	CC	1090	61	61	61	61	61	61	61	61
1028	CC	CD	0	0	0	89	74	D9	1098	61	0	0	0	0	0	0	0
1030	99	9A	0	0	73	74	75	0	10A0	0	0	0	25	28	0	3	6
1038	85	4D	A	3D	71	0	0	64	10A8	0	0	0	0	0	19	45	0
1040	72	0	81	20	0	0	0	0	10B0	0	29	15	0	0	15	29	0
1048	0	72	65	64	0	8D	48	0	10B8	0	12	95	0	0	52	1	0
1050	0	0	0	0	0	85	48	0	10C0	0	D1	10	0	8D	4	0	0
1058	0	0	A1	10	42	43	24	0	10C8	0	DA	10	0	88	0	0	0
1060	64	10	6	6	61	62	63	64	10D0	0	0	0	4C	0	8D	3	C0
1068	65	66	0	0	63	64	65	24	10D8	0	0	0	0	4C	0	84	0

Table 1

1000 3D 10 25 0 23 49 0 0

With the help of the variable map it can be seen that the first variable stored is a%, and that the next variable beginning with a is stored at &103D.

1008 0 0 25 0 34 12 0 0

The second variable declared was £%. The '0 0' at the beginning of the variable signifies that there are no more variables beginning with £.

1010 2A 10 41 44 25 0 82 34 0 0

The third variable was ZAD%. Notice that it is two bytes longer than a% because its name has two additional letters.

101A 5A 10 0 8E 52 24 0 0

The next variable is A, which is a floating point number and its value is stored in a complicated way as a bicimal number, that is, a binary coded decimal number.

If you want to learn how it works see "Assembly Language Programming for the BBC" by Ian Birnbaum. As usual the first two bytes point to the next variable, in this case ABC\$ which is stored at &105A.

The other variables can be unravelled in a similar way.

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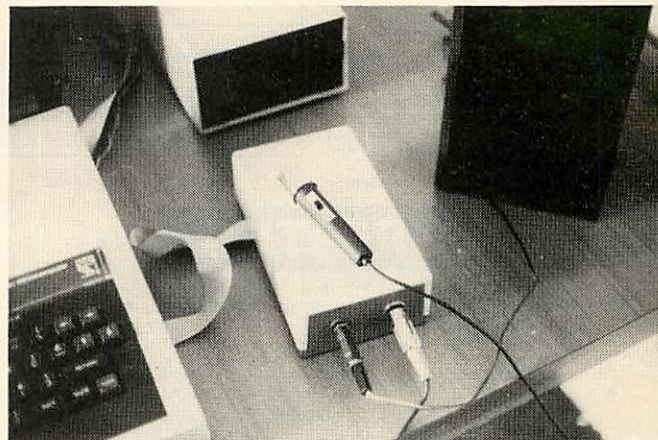


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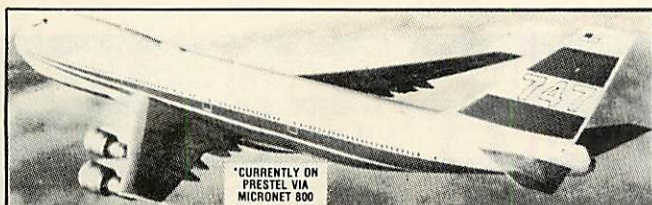
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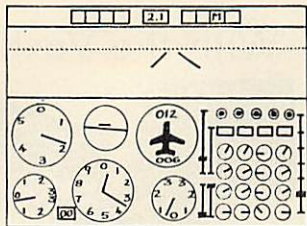


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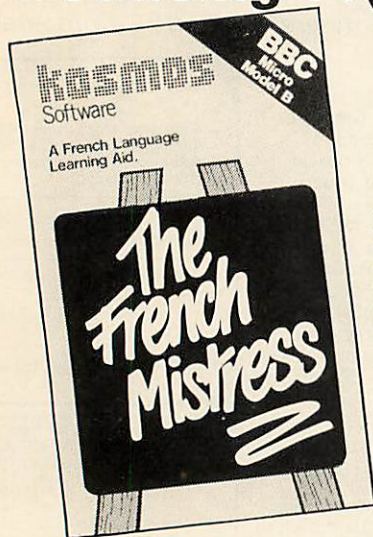
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## PART 7

**ARE** you a computer phobic? Scared to touch anything inside the machine lest you turn to stone or, even worse, your micro turns back into a passive lump of silicon? If so you have probably not got very far with interfacing your micro to the outside world.

This month we offer the solution to all your worries, and show you how you can preserve the health of your favourite micro by putting it in splendid isolation.

People often ask me how easy it is to damage a computer. Well, short of dropping it in front of a steam roller, the only surefire way is to feed an excess voltage into an input.

If you are lucky this will only blow the chip connected to the input. But if you really want to damage things, then put a high voltage such as the mains on a logic input.

What tends to happen is that the chip vaporises leaving a small blow-

hole in the plastic where the vaporised metal escaped from its lonely life in the solid phase.

Also the abnormally high voltage will leak onto the power supply rail and subject every device to an over-voltage. The result is that every chip is blown.

And it needn't necessarily be mains power that creates the havoc. I once

**By MIKE COOK**

had a board to repair where somebody had put a + 80 volt teleprinter signal into a TTL input with similar results.

For those of you who might be tempted to use a fuse in a circuit to protect it, I will remind you of one of the laws of electronics:

*A semiconductor is a device designed to burn out very quickly and in so doing*

*protect your fuses from harm.*

This tale of woe might be beginning to put you off. So this month we shall see how we can prevent any disasters from happening.

As we have seen in previous months, a lot of signals that we might wish to monitor are simple contact closures. All that is needed is a pull up resistor as shown in Figure 1.

However there are times when the

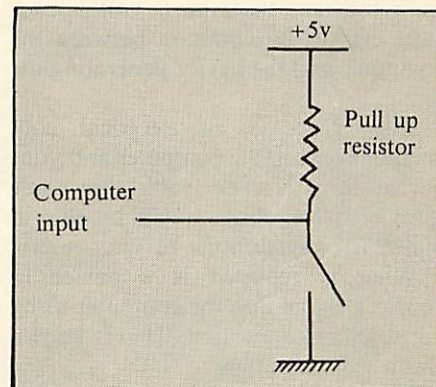


Figure 1: Contact closure input

signal we wish to monitor is in the form of a voltage. If this varies between 0 and 3.5 to 5 volts then we can simply use the same input configuration as we did for a contact closure.

We must be careful that the input voltage does not exceed 5 volts – or more strictly does not exceed the supply voltage on the input IC.

Also the voltage must not drop below 0 volts – that is, go negative.

If it is allowed to do either, then there is a chance of damage occurring to the input IC.

If any input signal is going to exceed the required voltage then we have to

**You and  
your  
micro in  
splendid  
isolation**





## From Page 85

knock it into shape so it conforms to what we want. This can be done by using the circuit shown in Figure II.

Any positive voltage will turn the transistor on and so put a logic 0 into the computer. The resistor R1 should be chosen so that there is about 1mA flowing through it when the input voltage is at its maximum.

This can easily be calculated using Ohm's law (see the July issue of *The Micro User*). The diode in the circuit is to prevent the transistor from being damaged when the input voltage goes negative.

If this will not happen the diode can be omitted. This type of circuit affords quite good protection against quite high voltages.

So, not only can you monitor voltages higher than TTL levels but also, if an accident results in an even larger voltage being fed in, only the transistor will blow and not your input IC.

Effective as the circuit is, it suffers from the fact that the 0 volt line or earth has to be common between the computer and the device generating the signal.

Also, there is an electrical connection between the computer and your device. So it is conceivable that some form of over voltage might be able to punch its way through to your micro.

What is required is a device to couple a signal into the computer using no physical connection. This is known as an isolated input.

The most common form of isolating device is a transformer. Don't think these are only used for making power supplies. They are used in many places requiring isolation.

A transformer couples signals using only magnetic flux. There is no direct connection.

It can also have a voltage or current step-up or step-down effect and thus has been very popular for isolating devices.

The transformer however, can only couple AC signals and so is not much use for coupling the steady levels of logic. Therefore some new type of isolating device is needed that will respond to a DC signal.

Consider Figure III. If we arrange a LED (Light Emitting Diode) to be close to a photo transistor then, when the light is on, the transistor is on and when it is off the transistor is also off.

So the state of the input signal has

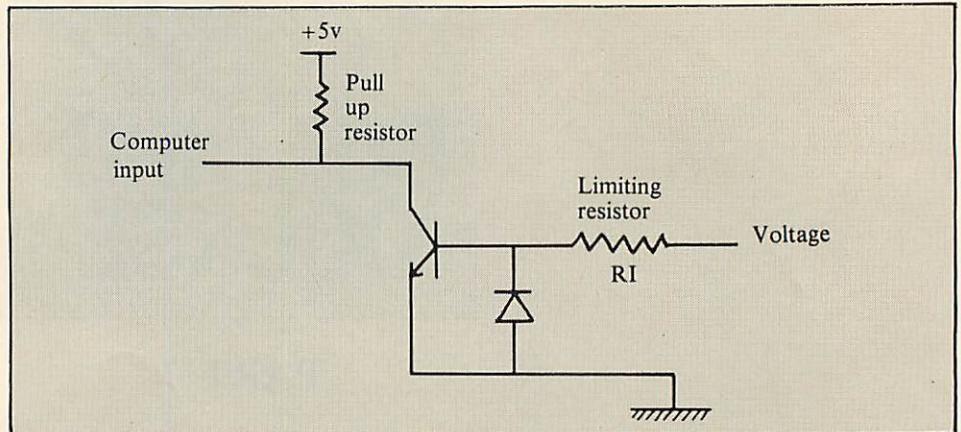


Figure II: Non TTL input circuit

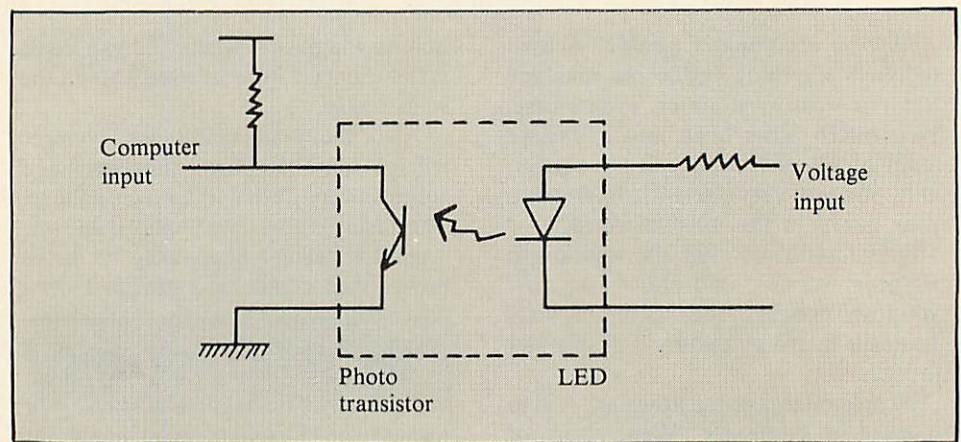


Figure III: An optical isolator

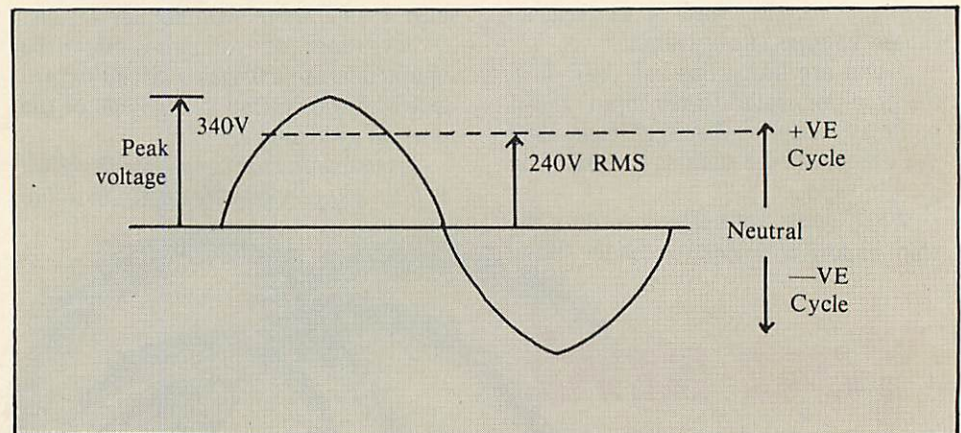


Figure IV: A mains cycle

been transferred into the computer with no common electrical connection. The information about the state of the input has been transferred by the light.

This combination of LED and photo transistor is known as an optical isolator (or opto-isolator).

Optical isolators are available in a number of forms, separately or in packages of four. As they are sealed they cannot be affected by external light, nor can you see the light they produce.

This is the one way to guarantee that the only thing to blow in the case of an accident is the opto-isolator itself. Most

of them are rated to withstand about 2,000 volts.

If you are working with voltages higher than that, I don't wish to know!

An opto-isolator is also useful when the computer is outputting signals. In that case the computer drives the LED just as if it were a conventional LED. The output transistor is used to switch the load, or switch a device to switch the load, such as a relay.

The main advantage is that the computer can then control loads that are not at the same common signal (earth) potential.

This is known as a floating output as



one end of the signal is not tied down to any potential. Even mains voltages may be switched directly using this form of isolation.

If you want to switch mains voltages you will need something more substantial than a transistor. The mains in Britain are 240 volt RMS AC.

RMS stands for Root Mean Square and is a mathematical way of equating the effect of an alternating current waveform to a direct current. As you can see from Figure IV, the peak voltage of the mains is very much higher but because it is constantly changing an RMS measure is more convenient.

In order to switch mains, a semiconductor device has to withstand the peak voltage of the mains in both the positive and negative direction. There are two semiconductor devices which do this.

Let us look at the simplest one first, the SCR.

The SCR (silicon controlled rectifier), sometimes also called a thyristor, is a four layer PNPN structure. It is pointless going into the physics of how the device works so I will concentrate on how it operates.

Figure V shows an SCR. When a positive voltage is applied to the anode there will be no current flow (the device is off).

If a small voltage is applied to the gate connection the SCR will turn on and the current flow will be limited only by the load.

If the gate voltage is removed the SCR will continue to be on. In that respect it is like a latching relay.

In order to turn the SCR off the voltage across the anode/cathode and the current flowing through it have to drop practically to zero. Turning off an

SCR is known as commutating it.

If the supply voltage is an AC waveform then the SCR will turn off the next half cycle after the gate voltage is removed.

The SCR will only conduct on one half of the mains cycle, and so any load will only be on for half the time. In other words it will only be consuming half the power.

What is needed is an SCR to conduct on the positive half of a mains cycle, and another connected in the reverse direction to conduct on the negative half cycle. Essentially this is the way a triac works.

A triac is shown in Figure VI. It will turn on when a voltage of any polarity is applied to the gate.

As it conducts on both halves of the

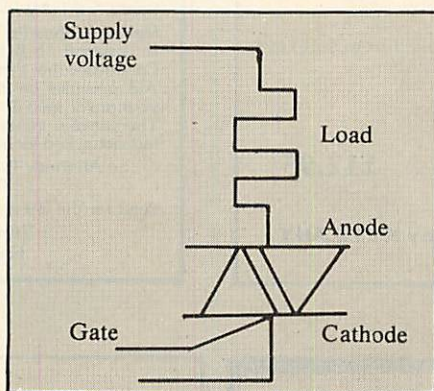


Figure VI: A Triac

mains cycle it will deliver full power to the load when it is switched on. We can use this arrangement to allow our micro to control mains equipment.

Triacs and SCRs are available with built-in opto-isolators so we need not worry about letting the mains get into our equipment.

However there is a small snag to using just a triac to switch a load. When a pulse is supplied to the gate the triac turns on irrespective of whereabouts in the cycle the mains voltage is.

This means that if the triac were turned on at the instant that the mains was at its peak there would be a very sudden rise in current in the load.

When there is a very rapid rise in current, electromagnetic radiation is generated. The effect of this will be to generate interference that can be picked up on radios, hi-fis and, worst of all, on cassette tape recorders – like the one you are trying to save your program on.

To prevent this we must arrange the triac to turn on when the mains cycle is at its smallest.

This is known as zero point switching, as the triac is turned on when the mains cycle is crossing the

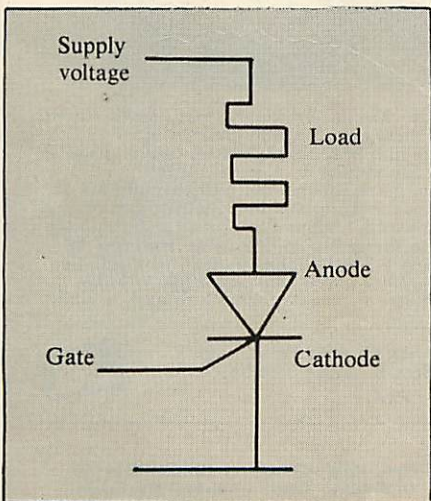


Figure V: An SCR

# THE BEEB BODY BUILDING COURSE

zero voltage axis. This will then minimise any radiated interference.

Fortunately there is no need to construct a zero point switching circuit. As it is such a common requirement, manufacturers have combined a triac, zero point switch and opto-isolator in a single package.

These are designed to switch mains devices and are known as “solid state relays”.

They are mainly characterised by the amount of current they can switch.

For switching large loads (10 Amps) they need to be mounted on a heat sink as they get quite warm, but the smaller ones (2 Amps) do not need one.

With a solid state relay there is a tendency for a small amount of leakage to take place. That is, when the relay is off it will pass about 6 mA.

Since this is negligible for virtually all loads, for most purposes the load will appear off. However, it is not a switch, so keep your fingers out if you want to avoid shocks!

As solid state relays are a little difficult to get hold of we have produced Body Build Packs Nos. 4 and 5.

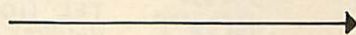
To gain access to the user port you can use the Body Build Packs No. 1 and 2, which were described in the July issue of *The Micro User*.

Pack No. 4 allows you to control mains equipment drawing up to 2 Amps (that's 500 watts). Pack No. 5 allows you to switch up to 10 Amps (that's 2.5 Kilo watts). This will allow you to control things like lights, heaters and fans.

The circuit is shown in Figure VII and is the same for each pack. You will see that the buffer transistor is arranged as a current shunt switch.

In this arrangement, when the transistor is on, current that would normally flow through the load is short-circuited, or shunted, through the transistor. This is so that when there is a logic one on the output, the relay is turned off.

If it is important to arrange it this way







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  - each occurrence highlighted within whole program line;
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  - useful for listing PROC & FN definitions & where used.
- Replace string**
  - same features as search: *plus* extra option to replace search string by a new string - any size from 0 to size of original string;
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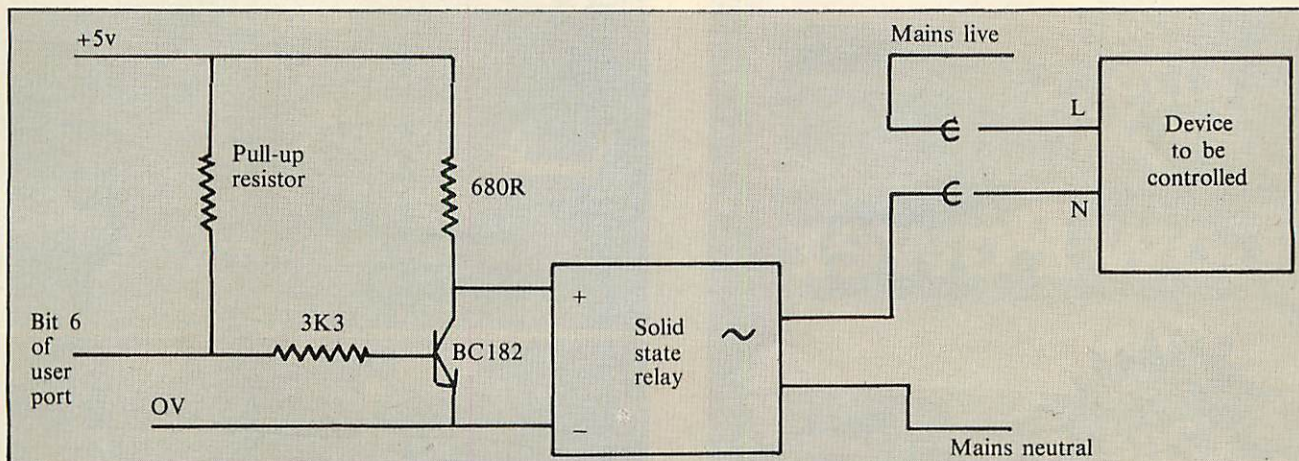


Figure VII: A solid state relay interface

## From Page 87

round as when the VIA is initialised as an input – as it is on power up – or when the BREAK key is pressed, the result appears to be a logic one. That is, the line floats high.

So by arranging the relay to be off with a logic one we prevent anything suddenly starting up and also make the BREAK key a panic button.

The circuit may be built up inside a wall-mounting mains socket with a plug and flying lead supplying the mains power, and the device needing to be controlled need not have its plug removed to be wired up.

The ability to control mains equipment opens up all sorts of possibilities for micro control.

For example you could easily make a light sequence controller for a disco. Or how about programming the real time clock to turn on your kettle in the morning ready for a cup of tea?

If you have not got an automatic kettle you could always get your micro to turn it off after the required amount of time.

Central heating control is possible, as is a really sophisticated video recorder timer.

You could even arrange your micro to turn your lights on and off while you are away so that potential burglars would know you had a computer set-up worth stealing!

In many applications you may want to vary the power of a device, such as a hair dryer or water heater. A simple way to do this is to rapidly turn the device on and off.

As you can switch each individual cycle with a solid state relay the result will appear to be that the device is running at a lower power. With lights, however, this will produce a flickering

which may or may not be desirable.

It is possible to write a simple program to switch the relay on and off in such a way that the normal operation of the computer is totally unaffected.

The way to do it is by using the timer in the BBC micro to generate an event. When the event is detected a simple machine code program is called to invert the condition of the relay and set the timer with the appropriate time before the next event.

Thus the on and off times for the relay can simply be stored in two

memory locations. If any program then changes the values in these locations, the on/off time ratio will be changed and so the power in the load varied.

A program to do this is shown in Program I. It firstly initialises the user port so that bit 6 is an output. Then the machine code event-handling routine is assembled into memory. You can change the routine's location by altering line 100.

Line 370 then places a pointer to the timer locations into memory, and the following loop initialises the on and off

```

10 PRINT"SEPTEMBER 1983 MICRO USER"
20 PRINT"BEEB BODY BUILDING COURSE"
30 PRINT"Mike Cook."
40 PRINT"DUTY CYCLE BACKGROUND TASK
"
50 PRINT"LOCATION &80 CONTROLS ON T
IME"
60 PRINT"LOCATION &85 CONTROLS OFF
TIME"
70 PRINT"BIT 6 ON USER PORT IS SWIT
CHED"
80 ?&FE62=?&FE62 OR &40
90 ?&FE60=?&FE60 OR &40
100 PLACE=&A00
110 FOR A=0 TO 2 STEP 2
120 PZ=PLACE
130 [
140 OPT A
150 PHP
160 CMP #5
170 BNE NO
180 STX &8B
190 STY &8C
200 LDA &FE60
210 EOR #&40
220 STA &FE60
230 LDY #0
240 LDA &8A
250 EOR #5
260 STA &8A
270 TAX
280 LDA #4
290 JSR &FFF1
300 LDX &8B
310 LDY &8C
320 LDA #5
330 .NO PLP
340 RTS
350 J
360 NEXT
370 ?&8A=&85
380 FOR A=&80 TO &89
390 ?A=&FF
400 NEXT
410 ?&220=PLACE MOD 256
420 ?&221=PLACE DIV 256
430 ?&80=&F0: ?&85=&F0
440 *FX14,5
450 AZ=5
460 CALL PLACE
470 END

```

Program I



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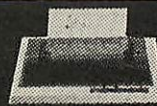
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## From Page 89

times to all ones (the minimum time).

Lines 410 and 420 direct the operating system to our event-handling routine and line 430 sets up an on-and-off time of 0.16 seconds.

Finally, line 440 enables the interval timer and lines 450 and 460 start off the background task.

When the program is run nothing will appear to happen and the computer will work normally except that bit 6 of the user port will be repeatedly switched on and off.

Any program that alters memory locations &80 and &85 will immediately change the on/off time. As the internal timer counts up, the value in these memory locations will have to be the inverse of the time you want — just swap the zeroes and the ones.

The machine code event-handling routine is called every time the internal timer times out. This is described in the User Guide.

It first puts the status register on the stack and tests the Accumulator to see if it has the number 5 in it.

This signifies that the event was a time-out condition. If this was not the

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cause then our routine is skipped.

The routine then salts away the value in the index registers, as the User Guide says that these should be preserved by any event-handling routine.

Then bit 6 on the user port is toggled along with the pointer to the memory location that has the on or off time in it.

This is then used to initialise the internal timer via an OSWORD routine. Finally the original values in the registers are restored.

This background task may be suspended at any time by disabling the internal timer event by a \*FX13,5 instruction. Note that this also happens when the BREAK key is pressed.

If you want the switch to be on any output line other than bit 6 then change

the mask in line 80,90 and 210.

Be it disco lights or electric toaster, with an optically isolated solid state relay you should be able to control them all with safety and ease using your micro.

Bear in mind, however, that no amount of isolation will protect you from a sloppy and dangerous job. You

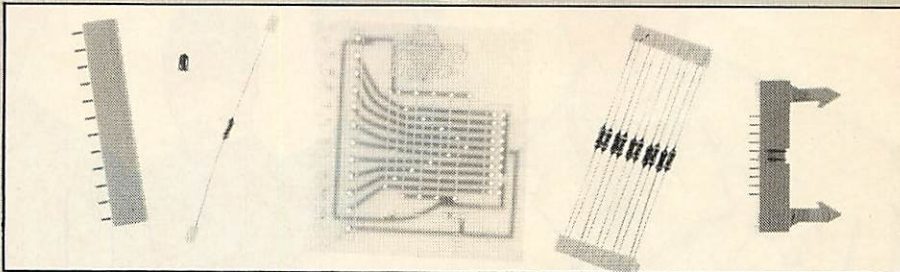
are dealing with the mains electricity so respect it and you should be all right.

If you have followed the information you should now be able to put your computer into "Splendid Isolation".

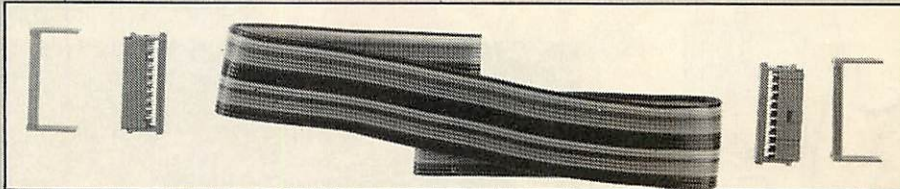
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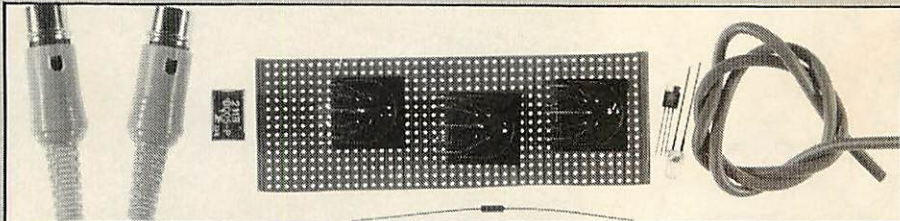
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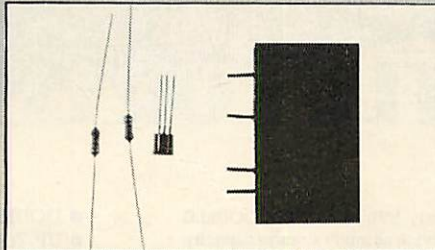
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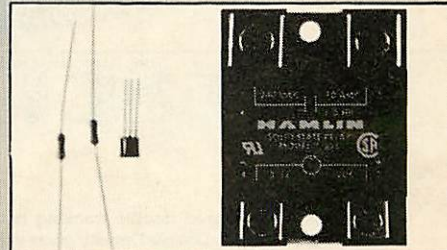
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Beeb Body Building packs cost £9.95 for Packs 1 to 4, and £12.95 for pack 5. The prices include VAT. Packs 1 and 2 were described on Page 83 of the July issue, Pack 3 on Page 85 of the August issue, Packs 4 and 5 on Page 91 of this issue.

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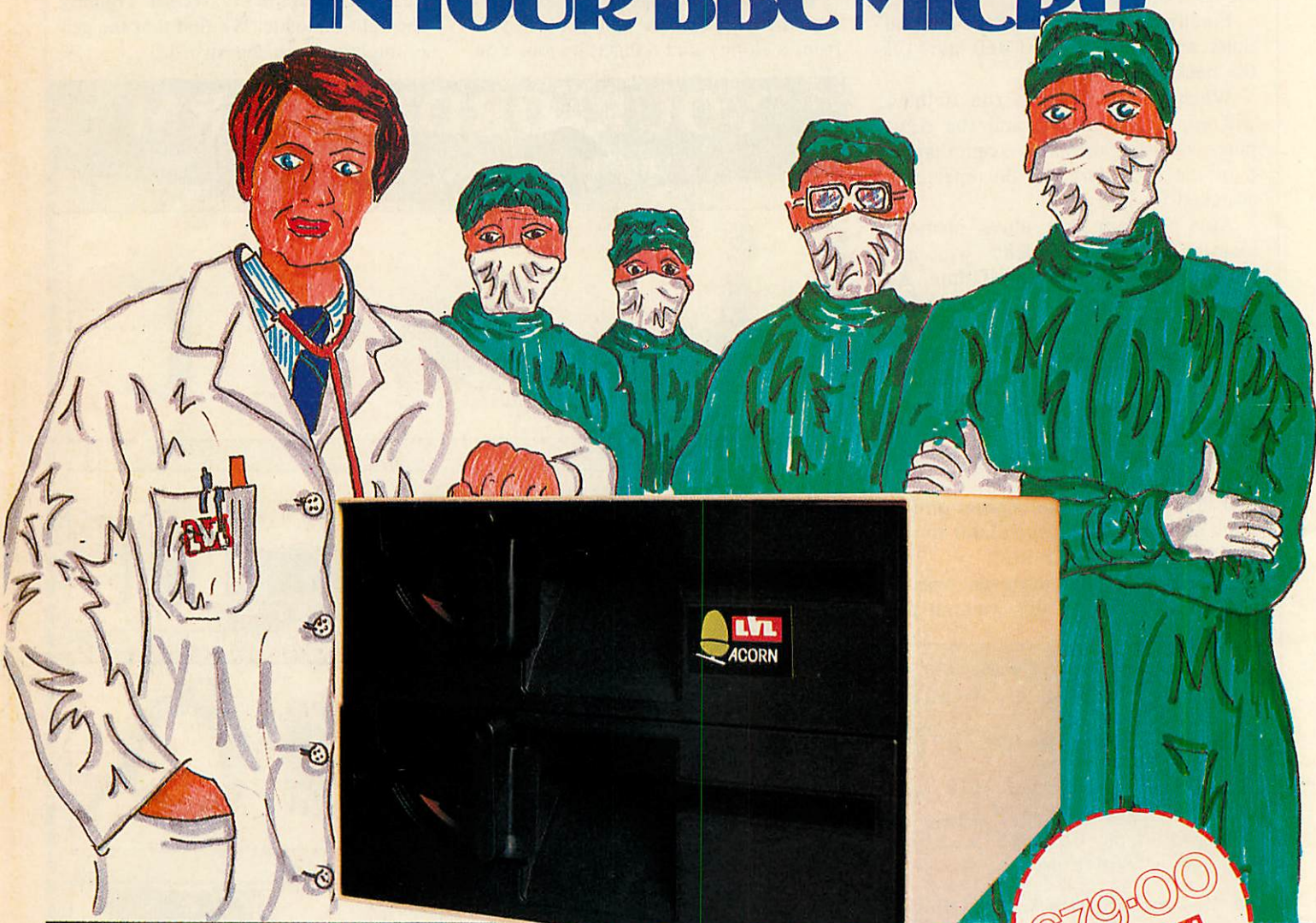
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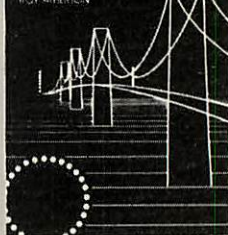
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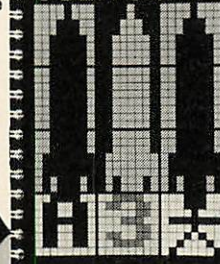
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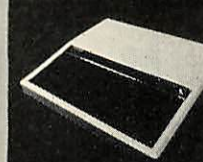
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## Robin Hood listing

### From Page 63

THE game may be a little too fast for the less dextrous and altering line 940 as indicated below should cure the speed handicap for all but the most pedestrian user:

940 IF BY% -RND (500)-800 A%=  
0: B% = 0

The 800 was originally 300, and this can be changed to suit individual needs.

```
10 REM *****
20 REM * ROBIN + MARIAN *
30 REM * GAME DESIGN BY *
40 REM * PETE BIBBY *
50 REM * WRITTEN BY *
60 REM * MARK SMIDDY *
70 REM * COPYRIGHT (C) *
80 REM * MICRO USER *
90 REM * 1983 *
100 REM *****
110 PROCinit
120 ON ERROR PROCerror
130 MODE 7
140 SC%=0
150 *FX12.0
160 *FX15.1
170 PROCtitles
180 REPEAT
190 *FX12.0
200 *FX15.1
210 MODE 7
220 PROCheader
230 PROCscores
240 PROCdisplay
250 PRINT TAB(0.24)"RETURN FOR INSTRU
   CTIONS.SPADE TO PLAY";
   :REPEAT G=GET
   :UNTIL G=32 OR G=13
260 IF G=13PROCtitles
270 MAN%=4
   :SC%=0
   :P%=1
280 REPEAT
290 MODE 2
300 VDU 23:8202:0:0:0:
310 PROCsetuo
320 PROCdrawcastle
330 IF P%=1 VDU 19.8.6:0:
340 IF P%=2 VDU 19.8.4:0:
350 IF P%=3 VDU 19.8.0:0:
360 IF P%>4VDU 19.8.6:0:
370 REPEAT
380 *FX15.1
390 PROCmoverobin
400 IF H% PROCshoot
410 IF NOT H%PROCbad guys
```

```
420 IF B% PROCbomb
430 IF BX%=X% AND BY%=Y%+4 D%=TRUE
440 IF J%=W% AND Z%=L%+4 PROCthemhit
450 UNTIL D% OR B%
460 IF D% PROCdead
470 UNTIL MAN%=0
480 PROCend
490 UNTIL FALSE
500 DEF PROCmoverobin
510 T%=T%-P%
   :IF T%<0 D%=TRUE
   :ENDPROC
520 COLOUR 132
   :COLOUR 3
   :PRINT TAB(10.31):T%:" ";
530 K%=INKEY (0)
   :IF K%=-1ENDPROC
540 IF K%=32 AND NOT H%PROCfire
   :ENDPROC
550 IF K%=46 X%=X%-V%
   :NCAR%=1
560 IF K%=47 X%=X%+V%
   :NCAR%=0
570 IF K%=65 AND (POINT(X%.Y%+4)=0
   OR POINT(X%.Y%+4)=8 OR POINT(X%.Y
   %+4)=7) Y%=Y%+32
   :NCAR%=2
   :V%=0
580 IF K%=90 Y%=Y%-32
   :NCAR%=2
590 IF POINT(X%.Y%+4)=0 V%=64
   :
   ELSE V%=0
600 IF X%<0 X%=0
   ELSE IF X%>1216 X%=1216
610 IF Y%<92 Y%=92
620 PROCplotrobin(X%.Y%.NCAR%)
630 IF POINT(X%.Y%+4)=8 PROCwin
640 ENDPROC
650 DEF PROCplotrobin(X%.Y%.NCAR%)
660 VDU 5
   :GCOL 3.3
670 MOVE X%.Y%
   :VDU 231+NCAR%
   :MOVE OX%.OY%
   :VDU 231+GCAR%
   :SOUND &10.-12.6.1
   :OX%=X%
   :OY%=Y%
   :GCAR%=NCAR%
```

```
:VDU 4
680 ENDPROC
690 DEF PROCbad_guys
700 RESTORE
710 MAX%=RND (24)
   :FOR O%=1 TO MAX%
   :READ W%.Z%
   :NEXT
720 PROCplot_baddy
730 ENDPROC
740 DEF PROCplot_baddy
750 SOUND &12.2.200.255
760 GCOL 3.6
   :VDU 5
   :MOVE AX%.AY%+28
   :VDU 229
   :MOVE W%.Z%+28
   :VDU 229
   :GCOL 3.1
   :MOVE W%.Z%
   :VDU 230.4
770 AX%=W%
   :AY%=Z%
   :BX%=W%
   :BY%=Z%
   :OBX%=W%
   :OBY%=Z%
   :A%=TRUE
   :B%=TRUE
780 ENDPROC
790 DEF PROCfire
800 J%=X%
   :R%=X%
   :S%=Y%
   :L%=Y%
   :H%=-1
   :VDU 5
   :GCOL 3.6
   :MOVE X%.Y%
   :VDU 230
   :
   :PROCshoot
   :SOUND &13.3.200.50
   :O%=TRUE
810 ENDPROC
820 DEF PROCshoot
830 GCOL 3.6
   :VDU 5
   :MOVE R%.S%
   :VDU 230
   :L%=L%+32
840 IF L%>640 H%=0
   :SOUND &10.1.4.40
   :ENDPROC
850 VDU 5
   :MOVE J%.L%
   :VDU 230
860 R%=J%
```

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 issue of The Micro User.



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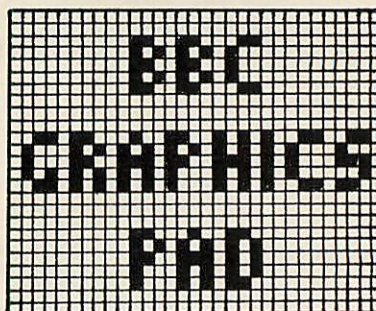
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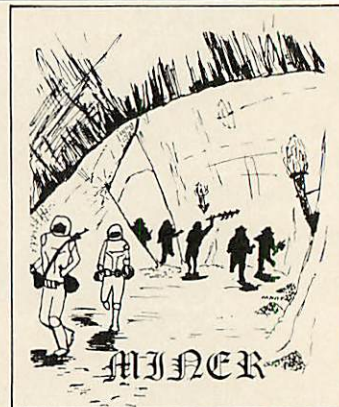
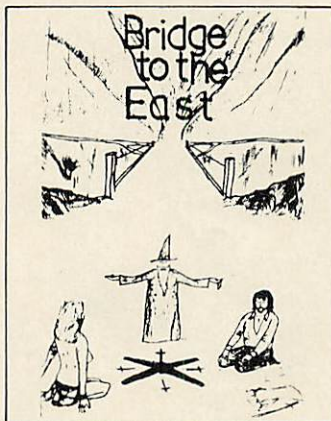
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## Robin Hood listing

### From Page 95

```

:SZ=L%
870 ENDPROC
880 DEF PROCbomb
890 VDU 5
:GCOL 3.1
:MOVE OBX%,OBY%
:VDU 230
900 BY%=BY%-32
910 MOVE BX%,BY%
:VDU 230.4
920 OBX%=BX%
:OBY%=BY%
930 IF BY%<-200 SOUND &12.0,0,0
940 IF BY%<-RND (500)-300AX=0
:B%=0
950 ENDPROC
960 DEF PROCthemhit
970 AX=FALSE
:B%=FALSE
980 VDU 5
:GCOL 3.1
:MOVE BX%,BY%
:VDU 230.4
990 SOUND 0.1,6,20
:SOUND &11.1,125,20
:SOUND &12.3,204,50
1000 FOR M%=0 TO 2
:FOR N%=0 TO 20
:VDU 19.6,RND (8);0;
:NEXT .
:VDU 19.6,6;0;
1010 COLOUR 136
:SC%=SC%+20
:PRINT TAB(11,0);SC%
1020 COLOUR 130
:COLOUR 7
:PRINT TAB(19,EX);
:VDU 234
:EX=EX+1
:IF EX=27 EX=26
1030 ENDPROC
1040 DEF PROCwin
1050 REPEAT
1060 VDU 5
:GCOL 0.1
:MOVE 1184,928
:VDU 239.4
1070 TZ=TZ-10
1080 SOUND &11.3,200,50
1090 SC%=SC%+10
:PRINT TAB(11,0);SC%
1100 *FX12,0
1110 UNTIL TZ<=10
1120 GZ=TRUE
:P%=P%+1
:IF P%>4P%=4
1130 ENDPROC
1140 DEF PROCdead
1150 SOUND &11.0,0,0
:SOUND &12.0,0,0
:NCAR%=4
:PROCplotrobin(X%,Y%,NCAR%)
1160 FOR M%=0 TO 10
:SOUND &13.3,RND (255),50
:VDU 19.3,RND (6);0;
:FOR N=0 TO 150
:NEXT .
:VDU 19.3,3;0;
:MANZ=MANZ-1
1170 ENDPROC
1180 DEF PROCend
1190 PRINT TAB(6,5);"THE END"
1200 FOR M%=0 TO 15
:SOUND &13.3,RND (255),50
:SOUND &12.2,RND (255),50
:VDU 19.3,RND (6);0;
:VDU 19.2,RND (6);0;
:FOR N=0 TO 150
:NEXT .
:VDU 19.3,3;0;
:VDU 19.2,2;0;
:SOUND &12.0,0,0
1210 ENDPROC
1220 DEF PROCscores
1230 N=0
:REPEAT N=N+1
1240 UNTIL SC%>score(N) OR N=21
1250 IF N<21 FOR N1=20 TO N STEP -1
:score(N1)=score(N1-1)
:name$(N1)=name$(N1-1)
:NEXT
1260 IF N<21 score(N)=SC%
:REPEAT
:CLS
:PROCheader
:PRINT TAB(3,10);"YOUR SCORE
IS IN THE TOP 20";TAB(6,12);
"PLEASE ENTER YOUR NAME"
:INPUT N$
:UNTIL LEN (N$)<10
:name$(N)=N$
1270 ENDPROC
1280 DEF PROCdisplay
1290 PROCheader
1300 FOR N=1 TO 20
:PRINT TAB(10,N+3);N;CHR$(128+
RND (6));TAB(13,N+3);name$(N);
TAB(25,N+3);score(N);
:NEXT
1310 ENDPROC
1320 DEF PROCtitles
1330 PROCheader
1340 PRINT TAB(12,5);"A = UP";
TAB(12,7);"Z = DOWN";
TAB(12,9);"> = LEFT";
TAB(12,11);"? = RIGHT";
TAB(11,13);"SPC = ";CHR$(136);
CHR$(129);"FIRE";
1350 PRINT TAB(0,15);"The";CHR$(129);
"EVIL";CHR$(135);"Sheriff of
Nottingham has"captured poor
Maid Marian. You as Robin are
going to get her back";
1360 PRINT ". A local"Warlock has
lent a hand, but he's not"
"too good at the job. When you
shoot a"baddie a piece of
ladder will appear." "But if
you die the whole lot goes."
"Come back Merlin -- all is forgi
ven!"
1370 PROCwait
1380 PROCheader
1390 PRINT "Before you rush off,
don't forget to"finish the
level. You must climb the"
"Warlock's ladder (OH NO!) and
rescue" Maid Marian from the
Sheriff's clutches" "...Doing
this adds any remaining bonus"
to your score.";
1400 PRINT "The rest is simple."
"you just start all over again.
Only" "you've got less time
to do it."
1410 PROCwait
1420 ENDPROC
1430 DEF PROCwait
1440 PRINT TAB(0,24);"PRESS ANY KEY
TO CONTINUE";
:G=GET
1450 ENDPROC
1460 DEF PROCheader
1470 CLS
1480 PRINT TAB(0,0);DH$;R$;BR$;Y$;
TAB(10,0);"ROBIN AND MARIAN";
TAB(0,1);DH$;R$;BR$;Y$;TAB(10,1);
"ROBIN AND MARIAN";TAB(8,3);
CHR$(136);CHR$(130);"HI";name$(
1);TAB(25,3);score(1)
1490 ENDPROC
1500 DEF PROCdrawcastle
1510 PROCsky_moat
1520 PRODtower
1530 PROCcastle
1540 PROCwindows
1550 PROCbattlement
1560 PROCletters

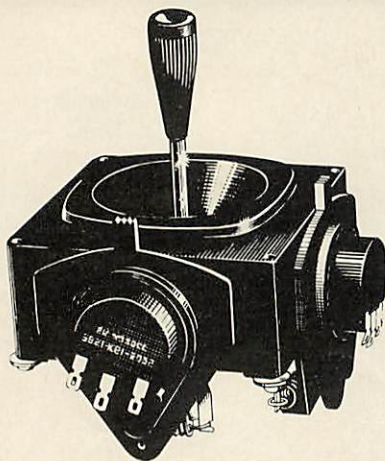
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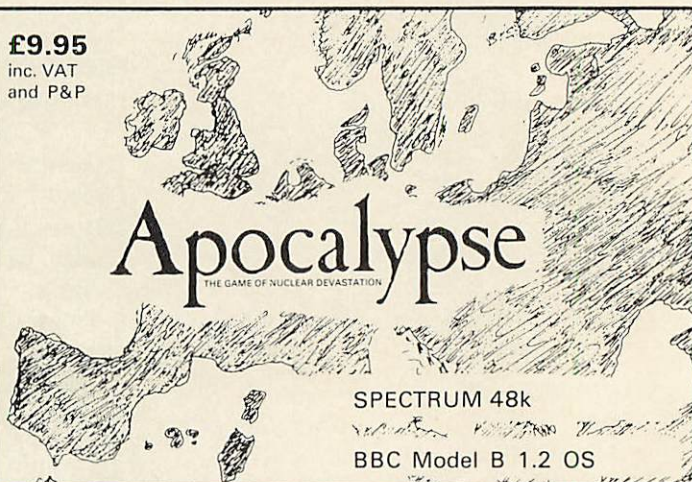
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## Robin Hood listing

### From Page 97

```

1570 PROCdoor
1580 PROCmarian
1590 ENDPROC
1600 DEF PROCTower
1610 LOCAL X%
      :COLOUR 2
1620 FOR X%=0 TO 1
      :PROCTow
1630 NEXT
1640 FOR X%=18 TO 19
      :PROCTow
1650 NEXT
1660 ENDPROC
1670 DEF PROCTow
1680 LOCAL Y%
1690 FOR Y%=5 TO 25
1700 PRINT TAB(X%,Y%);
      :VDU 224
1710 NEXT
1720 ENDPROC
1730 DEF PROCcastle
1740 LOCAL X%,Y%
1750 FOR X%=2 TO 17
1760 FOR Y%=15 TO 25
1770 PRINT TAB(X%,Y%);
      :VDU 224
1780 NEXT
1790 ENDPROC
1800 DEF PROCbattlement
1810 LOCAL X%
1820 FOR X%=3 TO 16 STEP 3
1830 PRINT TAB(X%,13);
      :VDU 224,224,8,8,10,224,224
1840 NEXT
1850 ENDPROC
1860 DEF PROCwindows
1870 LOCAL X%,Y%
1880 FOR X%=2 TO 18 STEP 3
1890 FOR Y%=16 TO 22 STEP 2
1900 PRINT TAB(X%,Y%);
      :VDU 228
1910 NEXT
1920 ENDPROC
1930 DEF PROCdoor
1940 COLOUR 3
1950 VDU 5
      :GCOL 0,3
      :MOVE 64,256
      :VDU 225,226,10,8,8,227,227,4
1960 ENDPROC
1970 DEF PROCsky_moat
1980 COLOUR 136
      :VDU 28,0,14,19,0,12
      :COLOUR 132
      :VDU 28,0,31,19,30,12,26
      :COLOUR 128
1990 ENDPROC

2000 DEF PROCletters
2010 COLOUR 132
      :COLOUR 7
      :PRINT TAB(5,0);"SCORE:";SC%;
      TAB(0,0);STRING$(MAN%,CHR$(
231));
      :COLOUR 132
      :COLOUR 7
      :PRINT TAB(4,31);"Bonus:";
2020 ENDPROC
2030 DEF PROCmarian
2040 VDU 5
2050 GCOL 0,1
2060 MOVE 1152,896
      :VDU 236
2070 GCOL 0,7
2080 MOVE 1152,896
      :VDU 237
2090 GCOL 0,4
2100 MOVE 1152,896
      :VDU 238
2110 VDU 4
2120 ENDPROC
2130 DEF PROCsetup
2140 *FX11,1
2150 *FX12,1
2160 DX=FALSE
      :AX=FALSE
      :BX=FALSE
      :GX=FALSE
      :EX=4
      :JX=0
      :LX=0
      :RX=0
      :SX=0
      :WX=0
      :ZX=0
      :TX=2000
      :XX=64
      :YX=156
      :AXX=-64
      :BXX=-64
      :AYX=0
      :BYX=0
      :OXX=-64
      :OYX=0
      :OCARX=0
      :NCARX=1
      :VX=64
2170 IF PX>=4TX=5000
2180 VDU 19,8,6;0;
2190 PROCplotrobin(X%,Y%,NCARX)
2200 ENDPROC
2210 DEF PROCinit
2220 DH$=CHR$(141)
      :BR$=CHR$(157)
      :R$=CHR$(129)
      :Y$=CHR$(131)
      :W$=CHR$(135)

2230 DIM name$(21),score(21)
      :SC%=0
2240 FOR N=1TO 20
      :score(N)=1000
      :name$(N)="Micro User"
      :NEXT
2250 ENVELOPE 1,1,4,-3,5,40,20,30,127,
      -1,0,0,126,0
2260 ENVELOPE 2,128,-1,0,0,200,0,0,127
      ,0,0,0,100,0
2270 ENVELOPE 3,1,20,-20,20,100,100,10
      0,127,-1,0,0,126,0
2280 VDU 23,224,238,238,0,119,119,0,23
      8,238
2290 VDU 23,225,4,15,31,31,63,63,127,1
      27
2300 VDU 23,226,224,248,252,252,254,25
      4,254,255
2310 VDU 23,227,255,255,255,255,255,25
      5,255,255
2320 VDU 23,228,129,129,129,129,129,12
      9,129,129
2330 VDU 23,229,24,24,60,126,126,102,6
      6,0
2340 VDU 23,230,24,24,24,24,24,24,24,24
2350 VDU 23,231,96,108,72,120,64,64,64
      ,96
2360 VDU 23,232,6,54,18,30,2,2,2,6
2370 VDU 23,233,66,90,74,126,24,60,36,
      36
2380 VDU 23,234,129,129,129,255,129,12
      9,129,255
2390 VDU 23,235,16,16,124,16,16,56,126
      ,255
2400 VDU 23,236,24,24,0,0,0,0,0,0
2410 VDU 23,237,0,0,231,0,0,0,36,36
2420 VDU 23,238,0,0,24,24,60,126,0,0
2430 VDU 23,239,34,119,255,254,126,60,
      24,16
2440 ENDPROC
2450 DEF PROCerror
2460 IF ERR=17 ENDPROC
2470 *FX12,0
2480 VDU 22,7,14
2490 REPORT
      :PRINT " IN LINE ";ERL
2500 END
2510 DATA 128,480,128,416,128,352,128,
      288
2520 DATA 320,480,320,416,320,352,320,
      288
2530 DATA 512,480,512,416,512,352,512,
      288
2540 DATA 704,480,704,416,704,352,704,
      288
2550 DATA 896,480,896,416,896,352,896,
      288
2560 DATA 1088,480,1088,416,1088,352,1
      088,288

```



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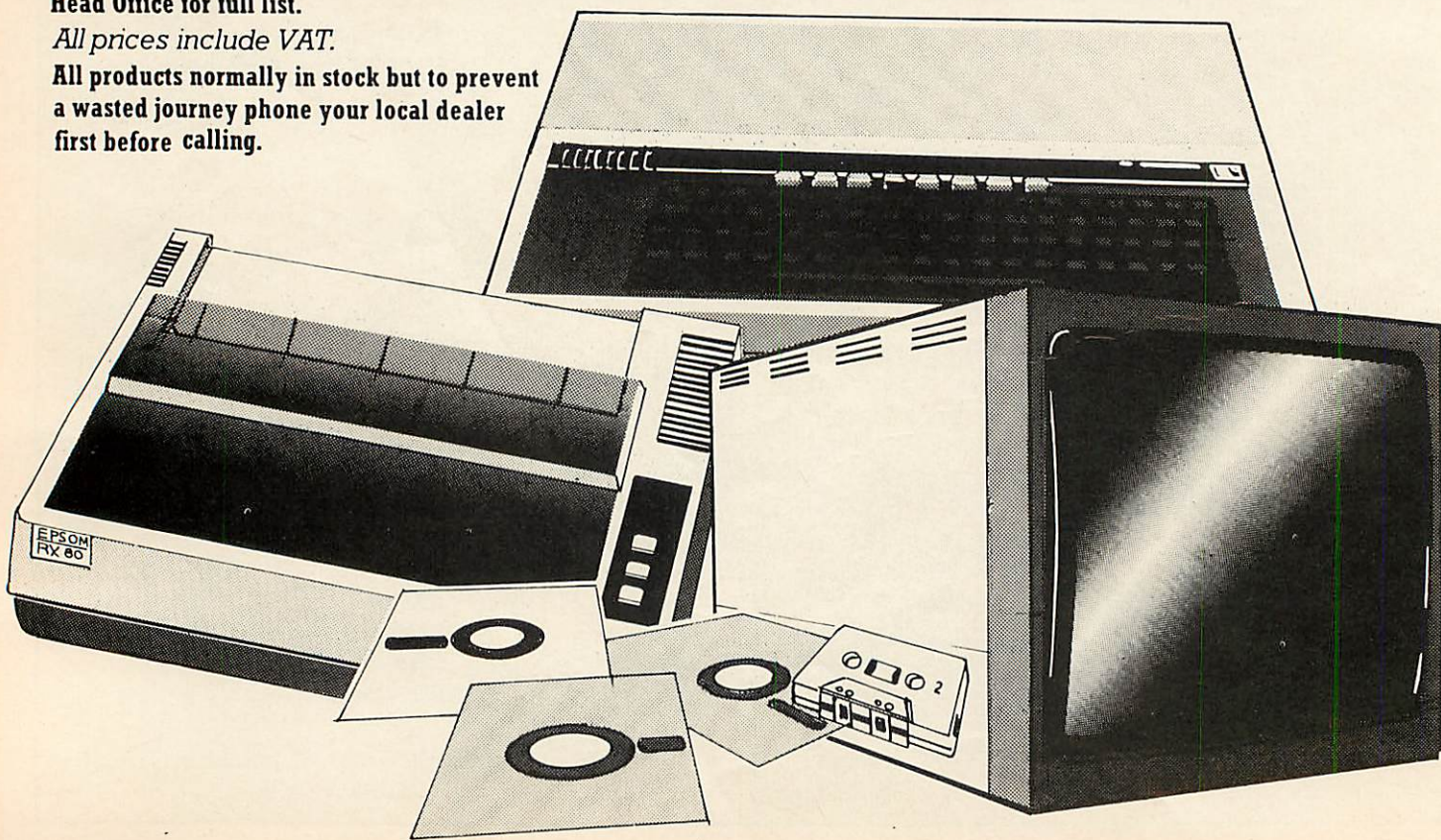
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## Galactic Invaders listing

### From Page 53

```
10 F% = 0: DIMA$(5), A$(5), B$(5), D$(5),
Q$(1), R$(1), W$(5)
```

```
20 ENVELOPE1, 0, 0, 0, 0, 0, 0, 127, -3, -
2, -1, 126, 63: ENVELOPE2, 3, 1, 1, 1, 1, 1, 70
, -1, -1, -1, 69, 0: ENVELOPE3, 2, 0, 50, -30, 2,
1, 2, 127, -4, -2, -1, 126, 0: ENVELOPE4, 1, 40,
-5, -10, 1, 2, 5, 127, -10, -5, -3, 126, 0
```

```
30 VDU23, 224, 24, 24, 60, 126, 60, 231, 23
1, 195, 23, 225, 24, 24, 24, 24, 24, 24, 24, 2
3, 226, 219, 60, 90, 126, 165, 60, 102, 204, 23,
227, 90, 60, 90, 255, 36, 60, 102, 51, 23, 228, 4
1, 0, 136, 18, 8, 34, 16, 133, 23, 229, 16, 68, 16
, 2, 72, 0, 33, 8
```

```
40 VDU23, 230, 24, 60, 60, 90, 255, 60, 102
, 195, 23, 231, 165, 153, 189, 90, 126, 60, 102,
195, 23, 232, 129, 90, 60, 90, 255, 189, 165, 36
, 23, 233, 9, 18, 36, 60, 90, 126, 60, 195, 23, 23
4, 144, 72, 36, 60, 90, 126, 60, 66
```

```
50 VDU23, 235, 0, 0, 0, 8, 32, 138, 32, 69, 2
3, 236, 0, 0, 40, 2, 80, 4, 32, 146, 23, 237, 16, 6
8, 33, 132, 16, 66, 16, 73, 23, 238, 119, 85, 0, 0
, 0, 0, 0, 0
```

```
60 GOSUB 700
```

```
61 MODE 2: BAX = 1: SHX = 1: SZ = 0: CZ = 0: UZ = 0
```

```
70 A$(0) = " +CHR$226+ " +CHR$227+ "
+CHR$226+ " +CHR$227+ " +CHR$226+ " :
A$(1) = " +CHR$231+ " +CHR$232+ " +CHR$
231+ " +CHR$232+ " +CHR$231+ " : A$(2) =
" +CHR$233+ " +CHR$234+ " +CHR$233+ "
+CHR$234+ " +CHR$233+ " "
```

```
80 A$(3) = " +CHR$227+ " +CHR$226+ "
+CHR$227+ " +CHR$226+ " +CHR$227+ " :
A$(4) = " +CHR$232+ " +CHR$231+ " +CHR$
232+ " +CHR$231+ " +CHR$232+ " : A$(5) =
" +CHR$234+ " +CHR$233+ " +CHR$234+ "
+CHR$233+ " +CHR$234+ " "
```

```
90 VDU23, 1, 0, 0, 0: REM VDU23, 8202, 0, 0
: 0 ON D5 0, 1
```

```
100 Q$(0) = 1: Q$(1) = 9: R$(0) = RND(6) + 4: R
$(1) = RND(6) + 4: COLOUR6: PRINTTAB(1, R$(0)
): CHR$225: TAB(9, R$(1)): CHR$225
```

```
110 NZ = 0: FOR I = 0 TO 2: A$(I) = 0: A$(I + 3
) = 0: B$(I) = I * 2 + 4: B$(I + 3) = I * 2 + 4: D$(I
) = 1: D$(I + 3) = 1: W$(I) = 5: W$(I + 3) = 5: CO
LOUR1 + 1: PRINTTAB(0, B$(I)): A$(I): NEX
T
```

```
120 J% = 0: X% = RND(20) - 1: M% = X%: V% = 26: CO
LOUR130: COLOUR4: PRINTTAB(0, 28): STRING$
(20, CHR$238): STRING$(40, " "): PRINTTAB
(0, 29): " SCORE " : COLOUR3: PRINTTAB(7, 29
): SZ: COLOUR7: PRINTTAB(13, 29): STRING$(B
AX, CHR$224+ " "):
```

```
130 K% = 1: L% = 0: Z% = 1: 6% = 0: COLOUR4: COLO
UR128: PRINTTAB(K%, 0): CHR$230: COLOUR5: P
RINTTAB(X%, 27): CHR$224
```

```
140 H% = 0: IF INKEY(-66) THEN H% = -1
```

```
150 IF INKEY(-82) THEN H% = 1
```



```
160 IF J% = 1 THEN 180
```

```
170 IF INKEY(-74) THEN SOUND 3, 4, 75, 1: J%
= 1
```

```
180 IF X% + H% < 0 OR X% + H% > 19 THEN H% = 0
```

```
190 X% = X% + H%: COLOUR5: PRINTTAB(X% - H%,
27): " " : TAB(X%, 27): CHR$224:
```

```
200 IF J% = 1 THEN 380
```

```
210 M% = M% + H%: COLOUR7: PRINTTAB(M% - H%,
26): " " : TAB(M%, 26): CHR$225:
```

```
220 R$(UZ) = R$(UZ) + 1: IF R$(UZ) = 27 THEN 4
20
```

```
230 COLOUR6: PRINTTAB(Q$(UZ), R$(UZ) - 1
): " " : TAB(Q$(UZ), R$(UZ)): CHR$225: UZ = (U
Z + 1) MOD 2
```

```
240 IF W%(NZ) = 0 THEN NZ = (NZ + 1) MOD 6: GOTO
240
```

```
250 COLOUR(NZ MOD 3) + 1: A$(NZ) = A$(NZ) + D
$(NZ): PRINTTAB(A$(NZ), B$(NZ)): A$(NZ): I
F A$(NZ) = 0 OR A$(NZ) = 10 THEN D$(NZ) = -D$(NZ)
```

```
260 NZ = (NZ + 1) MOD 6
```

```
270 IF 6% = 0 THEN 340
```

```
280 PRINTTAB(K%, L%): " " : IF RND(4) > 2 T
HEN K% = K% + RND(3) - 2: GOTO 300 ELSE IF K% < X% TH
EN K% = K% + 1
```

```
290 IF K% > X% THEN K% = K% - 1
```

```
300 IF K% < 0 THEN K% = 0
```

```
310 IF K% > 19 THEN K% = 19
```

```
320 COLOUR4: L% = L% + 1: IF L% = 28 THEN 460
```

```
330 PRINTTAB(K%, L%): CHR$230: GOTO 140
```

```
340 IF RND(39 - SH% * 3) = 1 THEN SOUND 2, 2, 10
0, 1, 6% = 1: Z% = 0: GOTO 280
```

```
350 IF K% + Z% < 0 OR K% + Z% > 19 THEN Z% = -Z%
```

```
360 K% = K% + Z%: COLOUR4: PRINTTAB(K% - Z%,
0): " " : TAB(K%, 0): CHR$230:
```

```
370 GOTO 140
```

```
380 IF M% = K% AND V% = L% THEN 440 ELSE V% = V% -
1: PRINTTAB(M%, V% + 1): " " : IF M% = K% AND V% =
L% THEN 440
```

```
390 IF V% = 0 THEN M% = X%: V% = 26: J% = 0: GOTO 2
20
```

```
400 IF POINT(M% * 64 + 32, (32 - V%) * 32 - 16) <
```

```
> 0 THEN 570
```

```
410 COLOUR7: PRINTTAB(M%, V%): CHR$225:
: GOTO 220
```

```
420 PRINTTAB(Q$(UZ), R$(UZ) - 1): " " : IF
Q$(UZ) = X% THEN 480
```

```
430 Q$(UZ) = RND(7) + A$(2) + 1: R$(UZ) = 5: U
Z = (UZ + 1) MOD 2: GOTO 250
```

```
440 SOUND 0, 1, 5, 1: SOUND 2, 0, 0, 1: COLOUR
3: PRINTTAB(K%, L%): CHR$228: FOR I = 1 TO 65: N
EXT: COLOUR1: PRINTTAB(K%, L%): CHR$229: FO
RI = 1 TO 65: NEXT: PRINTTAB(K%, L%): " " : K% =
1: L% = 0: 6% = 0: Z% = 1
```

```
450 M% = X%: V% = 26: J% = 0: SZ = SZ + 80: COLOUR
3: COLOUR130: PRINTTAB(7, 29): SZ: COLOUR12
8: GOTO 140
```

```
460 PRINTTAB(K%, L% - 1): " " : IF K% = X% TH
EN 480
```

```
470 6% = 0: K% = 1: L% = 0: Z% = 1: GOTO 140
```

```
480 SOUND 0, 1, 5, 1: COLOUR3: PRINTTAB(X%,
27): CHR$235: FOR I = 1 TO 100: NEXT: COLOUR5
: PRINTTAB(X%, 27): CHR$236: FOR I = 1 TO 100:
NEXT: COLOUR1: PRINTTAB(X%, 27): CHR$237: :
FOR I = 1 TO 140: NEXT
```

```
490 COLOUR5: PRINTTAB(X%, 27): CHR$236:
: FOR I = 1 TO 90: NEXT: COLOUR3: PRINTTAB(X%, 2
7): CHR$235: FOR I = 1 TO 80: NEXT: PRINTTAB(X
%, 27): " "
```

```
500 FOR I = 1 TO 3000: NEXT: BAX = BAX - 1: IF BAX
> 0 THEN CLS: GOTO 100
```

```
510 IF SZ > F% THEN F% = SZ
```

```
520 COLOUR1: W$ = "YOU HAVE BEEN": PROCs
low(3, 14): W$ = "DESTROYED BY THE": PROCs
low(2, 16): W$ = "GALACTIC INVADERS.": PROCs
low(1, 18): COLOUR3: W$ = "HIGH SCORE " + STR
$(F%): PROCs low(2, 21): COLOUR2: W$ = "ANOTH
ER GO ?": PROCs low(4, 24)
```

```
530 *FX15
```

```
540 Q$ = GET$: IF Q$ = "Y" THEN 61
```

```
550 IF Q$ < ">" THEN VDU7: GOTO 540
```

```
560 CLS: END
```

```
570 IF POINT(M% * 64 + 32, (32 - V%) * 32 - 16) =
6 THEN 140
```

```
580 IF RND(SH%) > 1 THEN J% = 0: M% = X%: V% = 26
: GOTO 140
```

*This listing is included in this month's cassette tape offer. See order form on page 77.*



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## Galactic Invaders listing

### From Page 102

```
590 SOUND0,1,6,1:P%=POINT(M%*64+32,(
32-V%)*32-16):PRINTTAB(M%,V%+1);" ";C
OLOUR3:PRINTTAB(M%,V%);CHR$228:FORI=1T
O45:NEXT
```

```
600 A$(P%-1)=LEFT$(A$(P%-1),M%-A%(P%
-1))+ " "+RIGHT$(A$(P%-1),10+A%(P%-1)-M
%):COLOUR1:PRINTTAB(M%,V%);CHR$229:FOR
I=1TO45:NEXT
```

```
610 A$(P%+2)=LEFT$(A$(P%+2),M%-A%(P%
-1))+ " "+RIGHT$(A$(P%+2),10+A%(P%-1)-M
%):PRINTTAB(M%,V%);" ";
```

```
620 W%(P%-1)=W%(P%-1)-1:W%(P%+2)=W%(
P%+2)-1
```

```
630 J%=0:M%=X%:V%=26:S%=S%+80-P%*20:
COLOUR3:COLOUR130:PRINTTAB(7,29);S%:CO
LOUR128:C%=C%+1:IFC%=15THENC%=0:SH%=SH
%+1:CLS:IFSH%DIV2<>SH%/2THENSOUND2,3,1
25,1:BA%=BA%+1:GOTO70ELSEIFC%=0THEN70
```

```
640 GOTO140
```

```
650 Q%(0)=RND(7)+A%(2)+1:R%(0)=8
```

```
660 M%=X%:V%=26:J%=0:GOTO140
```

```
670 DEFPROCslow(X%,Y%)
```

```
680 FORI%=1TOLEN(W%):PRINTTAB(X%+I%-
1,Y%);MID$(W%,I%,1):NEXT
```

```
690 ENDPROC
```

```
700 MODE7:PRINTTAB(7);CHR$141;CHR$12
9;"GALACTIC INVADERS":PRINTTAB(7);CHR$
141;CHR$129;"GALACTIC INVADERS"
```

```
710 PRINT'CHR$134;" This is a mixtur
e of two well known"
```

```
720 PRINTCHR$134;"arcade games. The
idea is to destroy"
```

```
730 PRINTCHR$134;"as many of the inv
aders as you can"
```

```
740 PRINTCHR$134;"before your single
proton base is"
```

```
750 PRINTCHR$134;"obliterated. You m
ove and fire faster"
```

```
760 PRINTCHR$134;"than the invaders,
but they have a"
```

```
770 PRINTCHR$134;"kamikase ship to h
it you with. Also on"
```

```
780 PRINTCHR$134;"each of the follow
ing sheets there is"
```

```
790 PRINTCHR$134;"less chance of kil
ling an invader in a"
```

```
800 PRINTCHR$134;"single shot."
```

```
810 PRINT'CHR$130;" You move using
A' and 'S' for left"
```

```
820 PRINTCHR$130;"and right and fire
using 'RETURN'."
```

```
830 PRINT'CHR$133;" You can only fir
e one shot at a time"
```

```
840 PRINTCHR$133;"as your base must
be recharged after"
```

```
850 PRINTCHR$133;"each shot. You can
fire again when the"
```

```
860 PRINTCHR$133;"missile appears on
the launcher of"
```

```
870 PRINTCHR$133;"your ship."
```

```
880 PRINT'CHR$131;"PRESS ANY KEY TO
BEGIN YOUR DEFENCE..."
```

```
890 *FX15
```

```
900 Q$=GET$:RETURN
```

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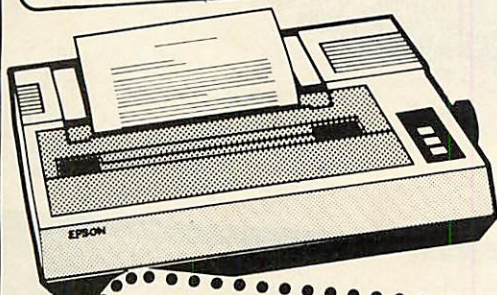
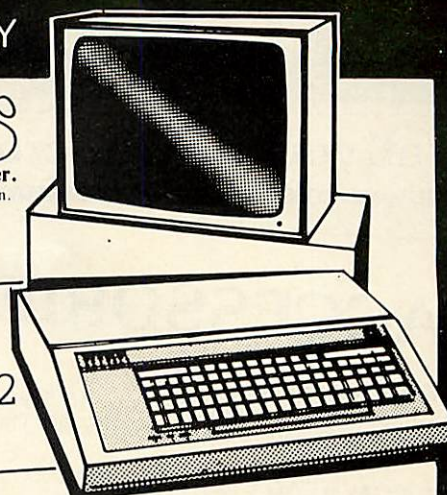
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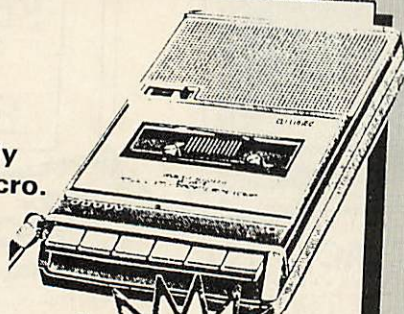
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# MICROMAIL

IN many programs it is useful to turn off the flashing cursor and having OS 0.1 I use VDU23; 8202; 0; 0; 0 as explained on page 77 of the User Guide.

However sometime in the past I was having trouble with a program and quite by accident I added an extra 0 on the end (ie, VDU 23; 8202; 0; 0; 0; 0) and found that the problems vanished!

Recently I was teaching myself to use files on cassette and found that the command OPENIN wasn't freeing the cassette recorder.

I had the VDU command mentioned above in my program and adding the magic extra 0 allowed the cassette motor light to come on. Why is this so?

On another question, when I change MODE within a program there is often an unpleasant flickering. Is there any way to avoid this? — John Tissandier, Bampton, Devon.

● Thanks for the VDU tip. As to the flickering on change of mode this is inevitable as the 6845 CRT controller is reprogrammed and so produces the next frame-sync pulse too early.

This happens with the ITV network when they switch between the national networked programs and the local adverts.

What they do to minimise the annoyance is to blank the screen while this is happening. You can do this by clearing the screen before the mode change and then using a delay loop for at least 0.1 second before continuing.

This will not cure the flicker but make it less objectionable.

## Answer in the PAGE

I HAVE a problem that is driving me crazy.

On tape I have some useful utilities. Occasionally after loading in some other tape, a game or application, something

goes wrong or I want to inspect the commands.

If I then load on a utility it overwrites what I have in RAM. Is there a way of loading in a utility after an object programme so that the two are in RAM and can interact? — Trevor M. Artingstoll, Zwolle, Netherlands.

● The answer is to alter PAGE, the value of which determines where Basic begins to store its programs.

PAGE increments in multiples of 256, so what you should do is add 256 to the end of the object with:

PAGE = TOP + 256  
NEW

Then you can load your utility in, and examine the first program.

You'll have to increment PAGE by more than 256 if you want to move back to the original page and run it, as the variables may overwrite your second program.

## Bug that wasn't

HOW disappointed I was that in Chris Martin's review of Wordwise in July's issue of *The Micro User* he didn't discover the bug that is so obviously present if he had checked out all the commands. I refer to "GF", the get file command.

On page 19 of *Computer Concepts'* operating manual for Wordwise, it states: "When the formatted document is being output (Menu options 6, 7 and 8), this command will make the computer attempt to load a file from tape or disc and dump it direct to the printer. This file

may consist of any data previously saved, for example, normal text saved with Menu options 1 or 3, or it may be a 'SPOOLED' BASIC listing".

I discovered, when writing an important report and trying to call in a section from another report I had previously written and saved on tape with menu option 1, that this GF command does not work.

I ignored the embedded commands (indeed, it actually printed them), printed about two lines then stopped. Everything I had written before and after was completely lost. No keys would respond except "Break".

On making enquiries of *Computer Concepts* I received a reply saying that the GF command "only dumps a straight Ascii file to the printer (one saved with menu option 8) and not a normal Wordwise file with embedded commands".

I have asked why the manual did not say this and enquired if they are planning an improved chip which will do what they specify (shades of the BBC Micro here!) but have received no reply to date. — Stephen Wallington, Colden Common, Winchester.

● This problem seems to be based on a misunderstanding of the manual. From the quoted extract we understood the program would input Ascii files, as indeed it does. It is therefore wrong to call it a bug.

Perhaps the error lies in the manual not underlining the fact that, once embedded commands are included in the text, menu options 1 and 3 no longer produce straight Ascii files.

This is because the embedded commands are not text

characters but control characters.

Once text has embedded commands in it menu option 8 should be used on files you wish to incorporate into other pieces of text.

The advantage of using menu options 1 and 3 over option 8 however, is that a text file is produced with no added carriage returns.

## Space stealers

I THOUGHT it was only my problem of "No room" on the King Kong program in the April issue of *The Micro User*. But with Mr Summers letter and your reply in the June issue, I see I am not alone.

On running the program "No room" appeared before the first game was completed. I then used a program compactor which reduced my typed programs length (1E 1EB9).

When this was run the "No room" did not appear until the fifth score in the Hall of Fame.

My final solution was to load it as two programs as:

```
10 REM KONG
20 MODE1
30 *FX15.1
then lines
170,180,190,200,210 and 220
230 PRINT""LOADING
-KONG-":CHAIN"KONG":END
```

This loads in 04 0422 followed by the main program less lines 170, 180, 190, 200, 210 and 220 which loads in 1A 1A79.

When it is now run I have the



# MICROMAIL

## From Page 109

full use of the Hall of Fame and the "No room" has not reappeared since. — John F.A.B. Childs, Huntingdon, Cambs.

● It appears that you had inadvertently added some blanks into the listing as the program compactor successfully removed them. There is perhaps some other bug lurking in your program that is stealing some extra space.

Nevertheless, thank you for your suggestion. We are sure it will be of help to others planning to write programs that will not fit in the computer without being broken up.

## Digging deep . . .

HERE are some tips acquired over the last few months which might interest readers.

● **How to get the keyboard scan value.**

Yes, I hear you all cry, ?215 . . . but that's only for the 0.10 OS! The location needed for all 1.20 owners is 236, for example LDA 236 : CMP 201 : BEQ RETURN will branch in assembler if RETURN is pressed.

● **What \*FX 154,X does (OS 1.20).**

Use this command in Mode 7 for the best results.

When X = 15 the cursor vanishes.

When X = 47 the cursor is double the normal width.

When X = 111 the cursor is triple the normal width.

When X = 235 the cursor is quadruple the normal width.

● **How to cheat at Acornsoft games.**

Some readers may have seen the sneaky Planetoid POKE published in another magazine. (Press ESCAPE after loading all Planetoid parts and type ?&276B = &99 : GOTO 200 RETURN directly. This will give you 99 lives and smart bombs.)

If you have the old Defender

by Acornsoft do exactly the same thing, but use ?&2638 = &99 : GOTO 200 instead.

If you have Meteors, load all parts, then press ESCAPE and type ?&1711 = 36 : GOTO 400. This will give you 36 lives!

Warning: If you try more than 36 lives, you can crash into them!

● **Want to recover Snapper after you pressed BREAK by a mistake?**

Before loading type \*KEY 10 CALL &657:M. (Version 1 owners use CALL &64F instead.) When BREAK is pressed in the middle of a game, SPACE will restart it (or FIRE on joystick). The Version 1 game doesn't need SPACE to start. Unfortunately, the hi-score table is lost, so press BREAK again for another game.

● **Four way scrolling.**

?850 = 1 for OS 1.20 or ?804 = 1 for OS 0.10 and hold down CTRL J to scroll to the left or CTRL K to scroll to the right.

● **Two abbreviated OS 1.20 commands.**

\*. = \*CAT and \*/ = \*RUN".

● **How to find the top left of the screen (even after scrolling).**

!&350 AND &FFFF (OS 1.20) or !&322 AND &FFFF (OS 0.10).

● **Solving the DFS space shortage.**

A lot of rubbish is talked about this problem. All that is needed is PAGE=&E00 before typing in or loading (don't forget \*TAPE) a program. The main problem is that memory below &1900 is corrupted when the discs are used, so don't save to disc if PAGE<&1900!

● **How to get more memory space on any BBC Micro.**

PAGE=&900 but don't use discs, user-defined keys or user-defined characters otherwise you'll lose your program!

● **One problem I'm stuck on (OS 1.20).**

Why does the SHIFT LOCK light go on when the sound buffer is full?

I hope you enjoyed these tips (especially the games ones) and I hope you publish them so

other BBC Micro owners can use them. — Richard K. Lloyd, Lower Heswall, Wirral.

● Thanks for the tips. You certainly have been busy digging in the depths of the operating system.

As you have found, the version of the operating system is vital to correct operation. This is just the sort of information that Acorn would prefer you not to use as it will tie your programs to one operating system.

Providing you don't want to sell your programs with these features in then we think they can be jolly useful. Thanks again.

## Still a mystery

FIRST the good news. Part 4 of Structured Programming by Roy Atherton has hit the nail on the head about GOTOs and explained how to avoid them extremely well. He has a very clear style of writing and doesn't assume too much. More articles by him please.

Now the bad news. The contents page of the August issue offers "A simple guide" to logical operators — something which has always been a dark mystery to me!

It is still just as dark a mystery. If this is a simple guide I would hate to see a complex one.

The first line mentions "bitwise operators" but doesn't explain this jargon. The rest of the article is so "unstructured" it is very difficult to follow Mr Hardy's train of thought.

He also assumes a knowledge of Boolean algebra. Is this still a "simple" guide?

Could he not have explained whatever we needed to know? Better still, couldn't you get Roy Atherton to write the article. — Chris Parry, Stratford-upon-Avon.

● The topic of logical operators is difficult for some people to grasp. It seems with logic some people can grasp a

concept easily while others have great difficulty.

To be fair to Mr Hardy he does not describe his article as "a simple guide", although it was in the table of contents.

When setting out to explain a complex topic, some measure of prior knowledge must be assumed. We think Mr Hardy assumed you had read page 205 of the User Guide which explained bitwise operations or, if not, page 81 of the same issue of *The Micro User* described them in even more detail.

On the question of style, this is mainly a matter for personal taste. Sometimes style can get in the way of understanding and other times enhance it. We are sure we will be returning to the important topic of logical operators again and hope that when we do so it will be more to your liking.

## Monitor selection

WE recently purchased a BBC Micro Model B, Wordwise and an Epson RX-80 printer to help us with the small mail order business my wife and I run.

I now want to purchase a colour TV to make the best use of the micro's colour capabilities. At present we have a black and white portable TV.

I'm particularly keen to get a monitor/TV or TV with RGB input. I would be grateful if you could tell me whether the BBC Micro works best with any particular model or brand.

Also I'm confused by the difference (if indeed there is any!) between a monitor/TV and a TV that provides RGB input. Surely in the case of the latter the input by-passes the TV tuner and hence is effectively a monitor.

The other thing that concerns me is that manufacturers or distributors rarely seem to quote the resolution that their products provide. Is there any guide that has been published



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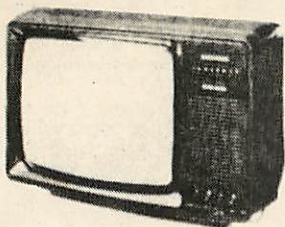


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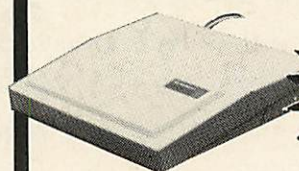
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# MICROMAIL

## From Page 110

that gives this information? — R.D. Hughes, Worthing, West Sussex.

● It is not our policy to recommend specific products.

While a monitor may appear to be just a TV without the UHF decoder, true monitors are quite unique beasts, designed specifically to deal with the demands a computer places on them.

In our March and April issues we published articles on choosing a colour monitor. These featured test programs that might be of some use to you.

## Naughty, but fast

As you know, the BBC has an inbuilt assembler and allows Basic and assembly language to be mixed within a program.

However, I have read that using assembler for moving graphics does not significantly speed up animation. Is this true? And, if it is, what are the advantages of using assembly language?

I wish to write games programs, and ultimately hope to write them in machine code to achieve speed. Is the assembler any use to me in this respect?

Lastly could you recommend a book which would help me achieve my aims? — R. Lloyd, Workson, Notts.

● If you use one of the straightforward routines Acorn provide, then assembler language graphics won't be all that much faster, since the VDU statement passes its parameter straight through to these routines with little delay.

If, however, you are "naughty" and directly address the screen, you do obtain significant speed increases.

At the moment the only book is "Assembler on the BBC", by Tom Birbaum (see Bookshelf), but this doesn't go into graphics much.

Acornsoft are to publish a book tentatively called "Crea-

tive Assembler" which should cover this area.

And, of course, Micro User will be covering machine code graphics in the future.

## Unstuck procedure

I THINK the answer to Fsa Al-Ramadhan's question (May Micro User) about passing arrays to procedures is contained within Jeremy Rushton's book *The BBC Micro Revealed*, but I have to admit that I did not fully understand it.

Second, writing a hangman program for the kids I tried to use an array in a procedure to keep account of all the letters already tried.

This works fine the first time around but then comes unstuck as the array is partly full thereafter. How can I clear an array for re-use or is there another method?

Finally, it was I that submitted the "almost an hour to execute" solution to the March competition. My wife thinks

that should qualify for a booby prize! — John Beken, Great Baddow, Essex.

● One way to be able to re-use the array would be to set all the strings to the null string by means of a loop. This assumes that the next array won't contain more than the first.

If you're going to want to re-dimension the array so that it contains a different number you'll have to use the command CLEAR.

This doesn't clear the screen, it just wipes out all the variables (so be careful), allowing you to re-dimension.

## Assessing memory

I WAS interested to read the letter by J.E. Pearson in the August issue of *The Micro User*. Apparently he has been having problems with the game King Kong taking-up too much memory space in his BBC Micro.

I may have missed a point in

the User Guide, or even this monthly magazine, but I still do not know how to tell how much memory is taken up by a particular program.

Presumably the numbers returned when you store a program on tape (or disc) are indicative of the memory taken up. As yet, however, the block numbers only tell me how much tape needs to be loaded.

I would be most grateful if you could enlighten BBC Micro users as to how they can assess the amount of memory used for a particular program. Surely, there must be an easy way of knowing that a particular program uses 'n'K.

I am familiar with using a mainframe computer, where program sizing is a matter of course.

I find the BBC Micro a first rate machine, which is well complemented by your magazine. — E. Nicholl, Stockton-on-Tees, Cleveland.

● To find out how much space

## Joystick routine for Deathwatch

I HAVE read the letters about Deathwatch with interest and some amusement. It seems that you can never please all of the people all of the time.

Some commented on the idea that a joystick routine would be nice, so for those that have them and are interested here it is.

Lines 355, 645, 1115 and 1600 to 1670 are new lines to be included.

Lines 690, 1010 and 1590 are modified.

These changes may give rise to the infamous "NO ROOM", in which case you will need to find some.

Dare I suggest deleting line 10 as the obvious choice to start with?

The BBC joysticks have been used for this purpose and we find that they can be held either

way. PROCJS can be modified to reverse the direction.

It may be noted that use of the joystick (singular, right hand in our case) is actioned by pressing the fire button to start the game. The space bar is used to start keyboard play.

The instructions are not amended for joystick use to keep the changes as simple as possible. — Brian Clark.

```

355 A=ADVAL(0) AND 3:IFA=260TO 370
645 IF JS% PROCJS:ENDPROC
690 T1%=TIME+150:REPEATUNTILT1%<TIM
E:6%=32:PROCST
1010 PRINTTAB(4,22)"Try for a high n
umber of hits:":PROCST:ENDPROC
1115 AD=128
1590 PRINTTAB(4,22)"Ready to try aga
in?":Q%=C%:PROCST:ENDPROC
1600 DEFPROCST
1610 REPEAT:I%=INKEY(0)
1620 JS%=ADVAL(0)AND 3:IF JS%=2 ENDPR
OC
1630 UNTIL I%=32:ENDPROC
1650 DEFPROCJS
1660 AD1=ADVAL(3) DIV 256:IF AD1 DI
V 20 < AD DIV 20 CALL LT:AD=AD-15:EN
DPR OC
1665 IF AD1 DIV 20> AD DIV 20 CALL R
T:AD=AD+15
1670 ENDPROC
    
```



# MICROMAIL

## From Page 113

it takes to store a program type: PRINT PAGE-TOP

If you want the answer in K then divide the result by 1024. However, this is not the whole of the story. Whereas a computer's memory may be big enough to hold a program it might not be big enough to run it.

This is because while a program is running, it takes extra space for variables, strings and graphics so you will see there is no way of telling if a program is too big to run.

This is exactly the same situation as when using a mainframe, but there the total amount of memory is very much larger so the problem does not arise as often.

As strings take up a variable amount of space, working near the limit of the computer's capacity poses problems for games like Kong that have a hall of fame.

If every player had a 256 character name then 10 players would grab another 2.5k of precious memory.

## Clearing the dregs

HERE are a few tips which may be of use to readers. I don't claim them all to be original, but maybe I have had my BBC longer than most...

Sometimes sound in a program can be corrupted by machine code left over from a previously run program. The answer to this is to make the first line of a program using sound

```
FOR A=&800 TO &8FF :  
?A=0 : NEXT
```

as this clears any unwanted dregs.

An easy way to do a screen dump to a printer is to have a line such as

```
ON ERROR CALL XXXX :  
END
```

where XXXX is the address of the dump program. Pressing

ESCAPE at the required moment produces a screen dump.

The way to have a program LIST or NEW etc. is to have lines like

```
ON ERROR NEW  
ERROR
```

at the appropriate place.

If a printer "hangs up", probably after pressing ESCAPE during printing, try flushing its buffer.

```
VDU 2 : FOR A=1 TO 256 :  
VDU 1,127 : NEXT : VDU 3  
- Paul F. Tolson, Dewsbury,  
West Yorkshire.
```

● Memory locations &800 to &8FF are designated miscellaneous workspace and are not for user machine code calls.

If you are putting machine code in this area you should expect trouble. We are always wary about using the ON ERROR function as it will trap real errors as well as the break key.

You do not want a screen dump every time there is a syntax error, do you?

Our favourite way of calling a screen dump is to use the INKEY command with a negative argument so the dump is only called when we want and the program is ready. This also does not stop the program.

## Format problem

JIM Notman's program to format program listings is excellent, producing a very clear printout of a Basic program.

I was therefore very disappointed when I found I could not use it on my cassette-based system.

I had very carefully typed in the program, checked a printed listing of the program and corrected any errors I had found. I then SAVED the program on cassette and ran the program to produce a listing on the saved cassette program.

It read in the first block, correctly listed it and then read in the next block. It then immediately jumped out of the program with the error message

BLOCK? at line xx.

As I have found out what caused this problem I thought you might like to publish the hint on how to use this program with a cassette-based system.

The basic problem is the cassette recorder itself. The clues to solving the problem are found on Page 398 of the User Guide. On this page it states the default settings of \*OPT1, 2 and 3.

When a program is SAVED using the normal Basic system, the time gap between the blocks is 0.6 sec.

If the cassette recorder does not stop instantaneously after reading in the first block (00) the next block it reads in is the third block (02) as the overrun of the cassette motor will have taken the header of the second block (01) passed the head. Thus the error message BLOCK?

If you want to see this happening then before running the program enter:

```
*OPT1,2
```

```
*OPT2,1
```

and the whole story is revealed.

The solution to the problem is given on page 369 of the User Guide. Before recording the program enter:

```
P.~TOP
```

This will give in Hex the top of the program (159E in my case).

```
P.~PAGE
```

To get the bottom of the program. (E00)

```
PAGE=H.-&200
```

To reset PAGE way above the program.

```
NEW
```

```
10X% = OPENOUT "FOR  
MATTER": FOR D% = &E00  
TO &159E: BPUT£X%,  
?D%: NEXT: CLOSE£X%:  
END
```

Enter RUN and save the program with inter-block gaps of 2.5 seconds. Then enter:

```
Page=&E00
```

Run the formatter program and the listing given in the July issue of The Micro User will be obtained.

I hope this explanation is understandable and will be of use to your readers. — P.J. Swan, Streatley, Berks.

● The problem, as you say, is in your cassette recorder. The

formatter works fine with all the recorders we have tried.

We think you should have it seen to or wire it up so that the cassette relay actually turns off the motor. Without knowing the type of recorder it is difficult to offer any suggestions.

However it may be possible that other people also have faulty recorders and this solution offers a way round the basic problem.

## Tuning your beep

HAVING read the article in your June edition filling in some of the missing OSBYTE numbers, I see a sequence 211,213,214 relating to channel, pitch and duration of the "beep".

It occurred to me that with the missing code of 212, these correspond to the operands of the SOUND keyword. Thus 212 ought to control the amplitude of the "beep", and indeed it does.

Whereas the SOUND keyword uses a signed integer in the range -15 to +16, in FX212 this value is reduced by 1, multiplied by 8 and treated as an unsigned integer.

Therefore, if given a value between 128 and 248 which is a multiple of 8, the volume levels corresponding to -15 to 0 may be obtained. Values between 0 and 120 correspond to envelope numbers 1 to 16.

However some caution is needed, as any value not divisible by 8 seems to kill the "beep" completely, requiring a break to restore it.

While on the subject of \*FX codes, I would like to seek some advice on \*FX139 or \*OPT.

When first starting up, or after a break, messages are only produced by LOAD, CHAIN, \*LOAD and \*RUN, not by \*EXEC or program file operations.

After a \*FX139 or \*OPT command has been used to set messages on, the only way of setting them off again seems to be to use \*FX139/\*OPT to set



ALL messages off.

Please does anyone know of a way, other than using break, to revert to the original condition? — Dave Moll, Faringdon, Oxon.

● We are a little puzzled as our operating system 1.2 gives messages with the \*LOAD and \*RUN straight from start up. Maybe some readers could help?

## Slow but sure

THREE cheers for your Bits 'n' Bytes series.

Please continue in your slow fashion, not presuming that we are all genius at maths. — Mark Lester, Hampstead Garden Suburb, London NW11.

● Thanks, we have always maintained that you need very little maths to understand computers.

## Saucer ahoy!

MANY thanks to Mike Cook for his super program in the July Micro User for drawing

wire frame solids.

He says we might want to tinker with it, so see what you think of this:  
Change:

```
770 R1=32
In line 420 change MODE0
to MODE1
840 FOR R=1 TO R1/2
```

Add:

```
835 VDU
19,1,11,0,0,0,19,2,12,0,0,
0
855 GC0L0,R MOD 2+1
915 GC0L0,3
935 VDU
19,1,3,0,0,0,19,2,4,0,0,0
936 K=GE1
```

Now try designing a flying saucer; then reach for the sea-sickness pills!

In the article Mike says it is possible to write a simple routine to eliminate the hidden lines, albeit with limitations.

Well now he's on your pay-

● **Want to write to Micromail? The address is: Micromail, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.**

roll, how about getting him to write one for us while his soldering iron is warming up one morning? — Paul Holgate, Nottingham.

● Glad you enjoyed the program. Your modifications did not produce any colour on my TV set as the lines were a bit too fine, but it works OK on a monitor.

As to the hidden line routine, well my soldering iron takes only 30 seconds to warm up and not even I am that good.

Don't despair however, as we have an article in the pipeline by John Thorpe describing exactly how to do it. — Mike Cook

## Accent on education

YOUR magazine has a good blend of articles likely to interest persons with different degrees of knowledge of computers and I shall continue to purchase it and the tapes for the

forseeable future.

The articles on graphics and learning how to program are easily comprehensible and of a high standard. The authors are to be congratulated.

However, programs of an educational nature, for example, geography would be welcomed.

I thought the Air Strike game was of an appalling low standard as compared to Death Watch or Space Pilot. You risk your reputation by publishing such inferior material.

In conclusion, I consider your magazine is good and I hope that it will maintain the standard that it has set.

I also hope that you will consider this as constructive comment. — Peter Hume-Spry, Nottingham.

● Thank you for your comments. We are committed to publishing educational programs and will be carrying more such features in future. However the truth is that there seems to be rather a shortage.

As for Air Strike, it's amazing how tastes differ — many readers consider it one of our best. However thanks for the feedback — we do take readers' comments very seriously.

And finally, with tongue firmly in cheek . . .

# The other woman was a micro

HISTORY was made at Ipswich Crown Court today when blonde, attractive 33-year-old Susan Smith was granted a decree nisi on the grounds of her husband's unreasonable behaviour.

"I still love him," she sobbed as she talked to reporters, "but how could I compete with a rival like that?"

The rival in question is a Model B BBC Microcomputer.

"George was never the same after he got it. He wouldn't talk to me. I'd be discussing new curtains or the garden and he'd be miles away with a stupid blank look on his face.

"And that was only when I actually saw him. He was always up in the attic bent over that, that, THING! The kids had started calling him Quasimodo".

Meanwhile husband George was talking to the clerk of court about a new scheme for computerising the court's records.

"Yeah, well," he said, "it did come as a bit of a blow as she's got custody of the kids and the micro, but I'm hoping to remedy it all 'cause all of this has given me a great idea.

"This divorce business is really complicated, so many rules and regulations, things to be done, letters to be

sent.

"I'm going to see if Sue will hire me the attic and the micro and I'll write an educational package about getting divorced. It'll sell like hot cakes."

So George carries on with his obsession while Susan cries for the man she loved. What will happen to the couple the micro came between? The future looks bleak.

As reporters left the court George was trying to interest them in a new piece of software he'd written using the BBC Micro's sound facility.

"It's great," he enthused "It's called Bellringer."



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## ADVERTISERS INDEX

AMS	4	LSA Systems	83
Acorn	3	Leaslink Viewdata	92/93
Aerospace	63	Leigh Computer Systems	117
Aimgram	84	Level 9 Computing	78
Alpha Disc	67	MFI	24
BBC Publications	46	MP Software Services	78
B S Dollamore	116	Mail Order Micros	90
Bourne Educational Software	35	Merlin Computer Products	111
Broady	30	Micro-Aid	112
C-Tech	48	Micro-Advent	98
Carson Developments	117	Micro Management	100/101
Chalksoft	84	Micronet 800	68/69
Clares Micro Supplies	47	Micropower	120/18/70
Computerama	81	Micro-Spares	90
Computer City	119	Microtest	117
Computer Concepts	2/118	Midwich Computers	32
Context Computing	83	Miracle Films	117
DACC	84	Multiplex Computer Services	83
DA Computers	98	Norsoft	98
DRG	54	Northern Computers	116
Datatech	117	Oakleaf Computers	108
Digital Fantasia	20	Opus Supplies	62
Doctor Soft	83	PJ Microsystems	96
Electronequip	34	Pace	30
Eltec	105	Paean Systems	111
Fairhurst Instruments	111	Red Shift	98
Gaelsett	35	Ricksoft	108
Geoff Croft	111	SP Electronics	117
Glengary Soft	88	Silent Computers	117
Golem	108	Silicon Centre	112
HCCS Associates	82	Simon Hessel	64
Hexagon Software	104	Simonsoft	90
Home & Business Computers	58	Skyleader	98
IJK Software	5	Small School Software	88
IQ Computer Products	96	Softsmith	88
Ian Copestake	35	Stack	103
Ikon	103	Starsoft	104
Inmac	29	Superior Systems	8
Ixon	96	Technomatic	38/39
J&H Software	82	Tekform Products	112
JP Magnetics	96	Torch Computers	44
Kingsley TV Services	112	Twilstar	13
Kosmos Software	84	Viglen	56
Kudosoftware	83	Voltmace	88
		Watford Electronics	14/15/16/17
		Wilmslow Micro Centre	106/107

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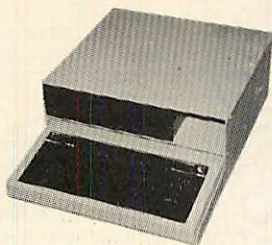
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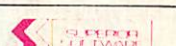
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