

# ACORN USER

BBC micro, Electron and Atom magazine

July 1983 £1

**SCHOOLS:** books and software

**BBC:** recursive graphics

**LOGIC:** unravel NOTs

**BBC:** numeric keypad

**ATOM:** sound practice

**ELECTRON:** the facts



**SCOOP!  
ELECTRON**

**Win  
£1000  
BBC micro  
disc system**



**Muproc music synthesiser reviewed  
BUMPER  
ANNIVERSARY  
ISSUE**



# BRIDGING THE GAP...

**BBC**  
Microcomputer  
Compatible.  
Disk Drives



Now  
Available  
From:

**Spectrum**

An example of superior technology, total reliability and outstanding performance, combine to produce the LVL 200K dual disk drive.

A truly professional unit designed to fill the gap between the Acorn 100K and 800K disk drives.

- Also available in a 100K single drive format.
- Powered from your BBC model B computer  
No chance of data corruption from on-board power supply.

- Compatible with the BBC single drive unit  
Disks are interchangeable with those formatted on the BBC 100K Drive
- Operates either from the BBC DOS (available with the unit) or from our optional Z80 card CP/M
- Supplied complete with all necessary connecting leads, utility disk and full operating manual.
- Available from all LVL Dealers.

To: Leasalink Viewdata Ltd Scientific House, Bridge Street, Sandiacre, Nottingham NG10 5BA

Please send me Name and address of my nearest LVL dealer.

\_\_\_\_\_ 200K Dual Disk Drive(s) £389.00 (inc VAT)

\_\_\_\_\_ 100K Single Disk Drive(s) £265.00 (inc VAT)

\_\_\_\_\_ Operating System(s) @ £110.25 (inc VAT) Current Price List Only\*  FREE

I enclose a Cheque For: £\_\_\_\_\_ Please Debit My Access/Barclaycard/Amex

No \_\_\_\_\_

Name: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Post Code: \_\_\_\_\_ Day time Tel No: \_\_\_\_\_

\*Please enclose s.a.e. Allow 28 days for delivery.



Scientific House, Bridge Street, Sandiacre, Nottingham  
NG10 5BA. Tel: 0602 394000



# TCL

# Twillstar Computers Limited

**Out of this world product and prices.**



## BBC Microcomputer

All prices include VAT

Model A .....	£299
Model B .....	£399
Upgrade Kit .....	£51.75
Disk Interface Kit .....	£109.25
* 2nd Processor (6502) .....	£195.50
* 2nd Processor (Z80) .....	£195.50
* with 64K RAM	
Teletext .....	£225.40
Dust cover .....	£3.95
Speech synthesizer .....	£59.80
1.2 Operating System .....	£11.50

Fitting Service available

## Disk Drives

All BBC compatible

Single 100K .....	£218.50
200K .....	£293.25
400K .....	£396.75
Double 200K .....	£414
400K .....	£552
800K .....	£701.50
Cable - single .....	£9.20
- double .....	£13.80

Free Cable + paper with printers

Full Graphics

## Dot Matrix Printers

CP-80 Tyle 1 **£305**  
(Friction and tractor feed)

★ STAR BUY

Star DP510 - 80 Col. ....	£373
Epson MX 100FT III .....	£454
Epson FX 80FT .....	£454

Sparkjet Olivetti - **£369**

★ STAR BUY

Seikosha GP 100 A .....	£207
Seikosha GP 250 X .....	£276

## Daisy Wheel Printer

Silver Reed inc RS 232 interface + 2K buffer - **£431**

★ STAR BUY

## Monitors

Microvitec 1431 - 14" colour inc. lead - **£287**

★ STAR BUY

Zenith 12" green ..... £92

## Odds

Official Joysticks - .....	£13
Compatible Joysticks - .....	£15
(Damping control)	
Stackpack - 10 cassettes C10 .....	£5.50
Micromanagement light pen ..	£34.50

12 month "no quibble" warranty on all products

## Cassettes

All BBC compatible	
Sanyo DR101 .....	£44.85
Elftone .....	£32.20
Koyo M8150 mini .....	£24.15

## Word Processing

BBC Model B, VIEW, Silver Reed daisywheel, Disk drive, Disk interface all leads and manuals ..... £1,199

## Books

Complete range of books including:

Advanced 6502 Interfacing .....	£11
Programming the 6502 .....	£9.95
6502 Software Design .....	£11.50
Programming and Interfacing the 6502 .....	£14.40
Practical Programming for BBC and Atom .....	£5.95
Easy Programming for BBC Micro .....	★ £5.95
35 Educational Programs for BBC Micro .....	★ £6.95
Further Programming for BBC Micro .....	£5.95
Programming for BBC Micro .....	£6.50
Learning to use the BBC Micro .....	£4.95
Basic Programming on the BBC Micro .....	£5.95
21 Games for the BBC Micro .....	£5.95
30 hour BASIC .....	£5.95
BBC Micro Revealed .....	£7.95
Games BBC Micro Play .....	£6.95

STAR BUY

## Software

Complete range from Bug-byte, Program Power, IJK, A+F, Aconsoft, including: Missile base · Castle of Riddles · Chess · Snooker · Starstrip Command · Countdown to Doom

SERVICE CONTRACTS TO EDUCATION AUTHORITIES AT DISCOUNT. INSTITUTIONAL AND EDUCATIONAL ORDERS ACCEPTED.



Barclaycard and Access



We can't possibly list all we stock, so pick up the phone and ring 574 5271 and just ask - we'll be pleased to give you our best prices.

**Twillstar Computers Ltd.,**  
17 Regina Road, Southall, Middx.

Tel: 01-574 5271

Open SIX DAYS A WEEK - 10.00 am - 8.00 pm



# ACORN USER EXHIBITION

BBC MICRO · ATOM · ELECTRON

Cunard Hotel London W6  
25 - 28 August

As you'll have read in last month's *Acorn User*, this year sees the first Acorn User Exhibition to be held at the Cunard International Hotel, Hammersmith, London W6, August 25-28.

You'll find everything you need to make the most of your micro at the Acorn User Exhibition:

- Hardware
- Software
- Add-ons
- Books

And, of course, Acorn User magazine.

Admission will be £2 for adults and £1 for children. If you're a subscriber to the magazine, look out for half-price entry vouchers nearer the time of the show.

Reduced price admission will also be available for school parties. For further details, write to:

John Jones or Susan Phipps  
Acorn User Exhibition  
20 Orange Street  
London WC2H 7ED  
Tel: 01-930 1612

5

## Electron: the latest

6

## Here is the news

Z80 software pack, plus latest dates, High Street computer moves, DoI school funding extended, Town Hall software, plus much more

14

## £1100 competition part 2

Your big chance to win a major disc system from Simon Dally

19

## Techniques

Hash tables, introduced by Stan Froco

22

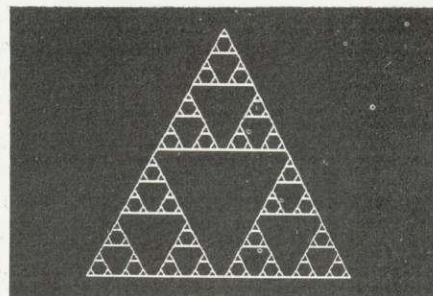
## Hints and tips

Logic made easy thanks to Joe Telford and the Beeb

31

## Recursion and graphics

Jim McGregor and Alan Watt translate some of the best ideas around for your Beeb



JULY 1983

NUMBER TWELVE



34

## Handling strings

It's a tricky task handling strings, so follow Ian Copestake's advice

44

## Procedure variables

Two very useful ideas for passing variables

47

## Beeb Forum

Experts units under Ian Birnbaum's banner

59

## Beeb aids the blind

Thomas Vincent outlines some OU techniques

61

## Second keyboard

Paul Beverley sets up a simple DIY project

69

## Atom Forum

Barry Pickles hands out the best wrinkles

73

## Atom sounds

Gabriel Gilson makes some crashing noises

**How to submit articles:** You are welcome to send articles to the Editor of *Acorn User* for publication. *Acorn User* cannot undertake to return them unless a stamped addressed envelope is enclosed. Articles should be typed or computer written with double line spacing. Black and white photographs or transparencies are also appreciated. If submitting programs a cassette or disc is vital. Payment is £50 per page or pro rata. Please indicate if you have submitted your article elsewhere. Send articles, reviews and information to: The Editor, *Acorn User*, 53 Bedford Square, London WC1B 3DZ.

**Subscription Information:** Send your cheque or postal order made payable to Addison-Wesley Publishers Ltd to: *Acorn User*, BKT (Subscription Services) Ltd, Douglas Road, Tonbridge, Kent TN9 2TS, England. Tel: (0732) 351216 Telex: 95573



77

Reviews

- Seikosha comes under George Hill's scrutiny
- Muproc by Quicksilva – a useful music package
- Speakers to improve the Beeb's squeaker from Microadvent
- Werom Atom utility assessed by Barry Pickles
- EPROM programmer from ATPL deserves wider recognition, says Vincent Fujut
- Books for schools are a mixed bunch, says Paul McGee

91

Subscription offers

Our easy get-richer-quick ideas to coax your cheque book

99

Reader classified service

Free page for readers' personal items

95

Readers' letters

We answer a mountain of problems and queries from the Alps to Canaries

100

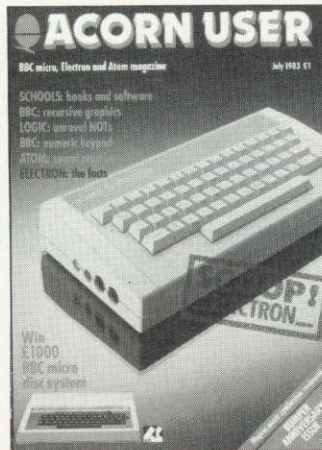
User Groups

Our ton-up page let's you know who's out there

102

Reader services

Back issues, photocopies and binders for your mag



Cover design: Phil Kanssen  
Photo: Malcolm Aird  
The first colour picture of the Electron  
— see page 5

Editor  
Tony Quinn

Editorial Assistant  
Kitty Milne

Production  
Peter Ansell  
Tina Teare

Marketing Manager  
Paul Thompson

Promotion Manager  
Pat Bitton

Publisher  
Stanley Malcolm

Designers and Typesetters  
GMGraphics, Harrow Hill

Graphic Designer  
Phil Kanssen

Printed in Great Britain  
by E.T.Heron & Co. Ltd

Advertising Agents  
Computer Marketplace Ltd  
20 Orange Street  
London WC2H 7ED  
01-930 1612

Distributed to the News Trade  
by Magnum Distribution Ltd.  
72-8 Fleet Street,  
London EC4Y 1HY.  
Tel: 01-583 0961  
Telex: 893340 Magnum G.

Published by  
Addison-Wesley Publishers Ltd.  
53 Bedford Square,  
London WC1B 3DZ  
Telephone: 01-631 1636  
Telex: 8811948  
ISSN: 201-17002 7

©Addison-Wesley  
Publishers Ltd 1983

WELL, you've stuck with Acorn User for a year and we're glad to see you're still here. If you're reading us for the first time, we hope you'll be here this time next year.

Launching this magazine into what was originally a vacuum of information on the BBC micro hasn't been easy, but the response has been amazing, overwhelming and rewarding for the editorial staff (all two of us).

The birth of the BBC micro system, and now the Electron, has been a saga-and-a-half, but there's nothing new about that in the micro world. *Acorn User* is here to help with advice and articles. But when it comes down to it Acorn users really support themselves and each other. This magazine is just a good way of doing it, after all, it's written for users, by users.

So thanks for reading, and for your patience when we get it wrong. See you in August.

Tony Quinn  
Kitty Milne

Coming soon in *Acorn User*:

- Electron:** the best review by the best people
- Projects:** all the fun of the fair
- Printers:** agony uncle George Hill answers your question
- Graphics:** simple listings
- Telesoftware:** how it all works
- Reviews:** interfacing equipment
- Colour filling:** includes 1.2 plotting
- Techniques:** linked lists

Authors please note

We've been inundated with articles for publication – many of an extremely high standard. It takes time to read them, try listings out and edit them – which is the only way to maintain standards. Also please remember that magazines work at least two months in advance.

So please bear with us if you hear nothing for weeks (although all submissions are acknowledged).

Thanks for your patience and apologies for any frustration caused.

Annual subscription rates

UK	£15
Europe	£18
Middle East	£20
The Americas and Africa	£22
Rest of the World	£24
These prices are inclusive of post and packing (air mail overseas) for 12 issues	

All rights reserved. No part of this publication may be reproduced without prior written permission of the publisher. The publisher cannot accept any responsibility for claims or errors in articles, programs or advertisements published. The opinions expressed on the pages of this magazine are those of the authors and do not necessarily represent those of the publisher, Acorn Computers Ltd, or Acornsoft Ltd. Acorn, Acornsoft, and the Acorn symbol are the registered trademarks of Acorn Computers Ltd and Acornsoft Ltd.



# Technomatic Official BBC Dealer

01-452 1500

01-450 9764

01-450 6597

Telex: 922800

## BBC

### Model B £399

(price includes VAT. Carr. extra £8)

Complete Upgrade Kit **£50**

Installation **£15**

Individual Components and Connectors available.

'VIEW' BBC Word

Processor ROM **£52**

Wordwise ROM **£34.50** Teletext Adaptor **£196**

Wide Range of Business, Education and Fun Software from **ACORNSOFT, PROGRAM POWER AND GEMINI** in stock.

### BBC COMPATIBLE 5¼" DISC DRIVES

These drives are self powered and supplied in BBC matching colour cases.

SINGLE DRIVES: 100K **£180** 200K **£250** 400K **£330**

DUALDRIVE: 200K **£350** 400K **£475** 800K **£590**

Carr. £6/Single drive £8/Dual drive. Disc Cable: Single £8 Dual £12

Disk operating manual & formatting diskette **£17.50**

### DISKETTES in packs of 10 (p&p £2/pack)

Single Sided 40 tracks **£15** Single Sided 80 tracks **£24**

Double Sided 80 tracks **£32** p&p £2/pack

Lockable Box 30/40 discs **£21** 60/70 discs **£32**

Library Case **£2** Drive Head Cleaning Kit **£15**

SEND or PHONE FOR OUR  
BBC LEAFLET

## PRINTERS

### NEC PC8023 BEC

• 80 Cols. 100 CPS • F&T Feed  
**£345 + £8 Carr.**

### EPSON RX80 & FX80

• RX80 100 CPS 80 Col. Tractor Feed  
• FX80 160 CPS 80 Col. F&T Feed. Full specifications on request.  
RX80 **£298** FX80 **£389** MX100 F/T3 **£425** Carr./Printer **£8**

**SEIKOSHA GP100A £180 + £6 Carr.**

**GP250A £250 + £8 Carr.**

Parallel Printer Lead **£13.50**; Serial Printer Lead **£13.50**  
2000 sheets 9½" x 11" Fanfold Paper **£13.50 + £3 p&p**  
Epson/NEC Serial Interface **£60**.

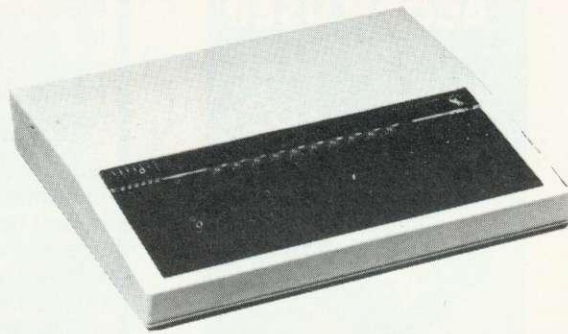
## MONITORS

Microvitec 1431 14" RGB 12" Hi Res Green Monitor  
**£249 + £8 Carr.** **£99 + £6 Carr.**  
Microvitec 2031 20" RGB Also available Sanyo &  
**£319 + £10 Carr.** Kaga RGB Monitors

Please send SAE for our detailed price list of electronic and computer components

We carry a wide range of connectors and assemblies, Microprocessors, RAMs, EPROMs, Crystals, etc.

Price Lists, Leaflets available on request. Large stocks enable same day despatch on most orders. Please check for delivery details.



### BBC DISC SYSTEM

Disc Interface inc. 1.2 operating System **£95** Installation **£20**

BBC Single Drive (100K)

**£230 + £6 Carr.**

BBC Dual Drive (800K)

**£699 + £6 Carr.**

### BOOKS (No VAT - £1 p&p/Book)

Basic Programming on BBC **£5.95**

30 HR Basic (NEC) **£5.95**

Let your BBC teach you to Program **£6.95**

BBC Micro Revealed **£7.95**

Assy. Lang. Program on BBC **£8.95**

Program the 6502 **£10.75** 6502 Games **£10.75**

6502 Software Design **£10.50**

BBC Micro An Expert Guide **£6.95**

BBC Computers Play **£6.95**

## BBC SYSTEM PACKAGE

**SPECIAL OFFER**

This package comprises of a BBC Model B computer fitted with disc interface and W.P. ROM 800K dual drive, NEC PC 8023 Printer and 12" Green Screen Monitor. The system is supplied complete with all manuals, connecting leads and software for stock control, invoice and statements and mailing lists.

Package Price **£1,500** a saving of **£139**.

The SMARTMOUTH — a speech synthesiser ready to plug into the user-port, having an unlimited vocabulary, yet simple to use. Very economical in memory usage — typical words using 5-10 bytes. (Has Aux. audio output socket).

SMARTMOUTH is supplied complete with demo and development programs on cassette, and full software instructions. **£37 + £2 p&p**.

### BBC Compatible Cassette Recorder

**£26 + £1.50 p&p**

SANYO Data Recorder

DR 101 A superior quality data recorder with dedicated computer output and monitoring facility on both RECORD & PLAY. **£39.50 + £1.50 p&p**

SLIMLINE Cassette Recorder

complete with counter and remote

control **£22.50 + £1.50 p&p**

Cassette Lead **£3.50**

Computer Grade Cassettes **50p** each or 10 for **£4.50**

## TECHNOMATIC LTD

MAIL ORDERS TO: 17 BURNLEY ROAD, LONDON NW10 1ED

SHOPS AT: 17 BURNLEY ROAD, LONDON NW10

(Tel: 01-452 1500, 01-450 6597. Telex: 922800)

305 EDGWARE ROAD, LONDON W2

PLEASE ADD 50p p&p & 15% VAT

(Export: no VAT, p&p at Cost)

Orders from Government Depts. & Colleges etc. welcome.



Detailed Price List on request.

Stock items are normally by return of post.







Like gold dust – the machine everyone's talking about, set for an August launch

# Electron set for battle at £199

THE Electron should be in the shops by the end of August – and it will cost £199.

Acorn has been keeping the launch date and price a close secret because of expected reductions by competitors.

Joint Acorn boss Chris Curry explained: 'The Electron is aimed at the Spectrum, Oric and Dragon market and it will have a massive impact on sales of these machines.'

The Acorn bosses clearly expect a battle. On the recent Sinclair price-cutting he said: 'We anticipated this price decrease.'

'We originally told people the Electron launch would be in March or April, and the Sinclair move was more than a coincidence. The Electron's performance is so much better.'

And Curry seemed unworried by rumours of a Sinclair ZX83. 'I'm waiting for my spies to report,' he said!

The Electron will go out to dealers and High Street chains. Projected sales are 100,000 by Christmas with W.H. Smith's selling the machine, Boots a second likely outlet, and talks

underway with others.

But Curry did not expect sales of the BBC machine to be affected: 'When it's expanded, the Electron costs more than the BBC machine.'

'We hope it will carry the (BBC Basic) language to a larger section of the population. It will be used as a second computer at home by children using the BBC at school.'

Curry saw this as an extension to the BBC's Computer Literacy Scheme: 'The BBC is happy,' he said, 'because they see it as support for the language,

making it as standard as possible.'

The model A will be phased out however. Acorn will no longer promote it, said Curry, and the great majority of orders were for the model B.

As for the Atom, Acorn has nothing in the pipeline (their last product was the BBC Basic board). However, the company will continue to support and sell the Atom.

The first add-on for the Electron (nicknamed 'The Elk' at Acorn), will be a general-purpose module comprising: printer interface, sideways ROM extension (to



Curry: 'massive impact'

take six), games paddle sockets, and RS232.

Great efforts are being made to get the module out for the launch, but this seems unlikely, and a price has not yet been fixed.

## Subscribers vouchers in next issue

SUBSCRIBERS will receive their £1 voucher towards entrance to the Acorn User Exhibition in the next issue.

The August issue will also give news of exhibitors and details of the special attractions being prepared.

And while some may hint at availability of second processors, Electrons, and the like, we know they'll be ready for the Acorn User Exhibition.

As we explain above, the

end of August is the official Electron launch date, with two of the three second processors appearing at about the same time.

Books by Acorn User authors Jim McGregor, Alan Watt, Tony Shaw, John Ferguson and Ian Birnbaum will also be there.

For details, and bulk discount information contact: Acorn User Exhibition, 20 Orange St, London WC2H 7ED. Tel: 01-930 1612.

**ACORN  
USER  
EXHIBITION**

**BBC MICRO · ATOM · ELECTRON**  
Cunard Hotel London W6  
25 - 28 August



## Take a holiday with your micro

HOLIDAYS related to computing are now offered by several companies.

Wardle & Wardle use BBC micros for their general, special interest, professional and handicapped holidays. Tel: (0703) 558621.

The Inter Schools Christian Fellowship organises camping holidays for boys and girls, aged 14-16. Topics include radio, electronics and computing. Tel: (0734) 792569.

Finally, there are home computing courses using Beeps in North Berwick, near Edinburgh, hotel residential and non-residential. Contact: Ian Goodall, 14 Ware Rd, North Berwick, East Lothian EH39 4BN.

## Brum hobby show

MICROSCENE is the title of a one-day computer exhibition to be held in Birmingham's Bingley Hall on September 10. It is a hobby and educational show designed to be non-profit making. Entrance will be 50p head.

Contact Eric Deeson, Microscene, Battenhall Rd, Birmingham 17.

## School seminar

SCHOOL computing at 'O' and 'A' level is the subject of a one-day seminar on July 5.

Imperial College, London is the venue and the event will preview IUCC recommendations for university entrance requirements.

Bookings through Prof. D. Giles, Computer Science Department, University, Glasgow GL2 8QQ.

## First three of the big chains muscle in

HIGH Street chains are moving into the computing market in a big way.

W.H. Smith's are set to stock their three computer shops in Birmingham Croydon and Northampton with BBC micros and Electrons. Ranges from seven software companies are already on their shelves, and firmware is being considered.

Boots are selling software from the BBC itself and Liverpool-based Bug-Byte. BBC micros could soon be in their larger stores - and the company has already taken delivery of several machines.

And music giant Virgin is to launch its own software range in June spearheaded by three games for the BBC micro. *Landfall*, *Bug Bomb*



and *Space Adventure* are all for the model B, and should be fighting for record space in June.

## Electrical goods come under software control

LIGHTING from single bulbs to theatre and disco rigs can come under the control of a BBC micro.

SJ Research of Cambridge make devices for just these purposes, from twin relays to 'intelligent' devices which allow dimming and fading of up to 32 channels.

The simpler versions are designed for domestic appliances such as TV, radio and central heating. A basic double relay costs £30.

The units plug into the RS232 port and mains supply. The appliance is then connected into the relay and comes under its control for power.

SJ Research claim several units can slave off one port, leading to a maximum of 1024 channels, under one micro.

Print statements from Basic are used to drive the devices, which were demonstrated in the BBC TV series *Making the Most of the Micro*.



## Trolley choice for the home user

SEVERAL readers and schools have written in about trolleys, so here's a bumper choice from manufacturers who have contacted us.

Top left is the 'Didsbury' by Store Stock Systems in Altrincham, Cheshire. It costs £60, and the company makes three other sizes costing £45 to £70.

Next, we have two offerings from Kaymar who have a range of products, and hail from Pinxton, Notts.

Then, bottom right is a unit from Zygon Products of Brentwood, Essex. This one costs £59. None of these prices includes VAT.



## Micro management market for managers

TOWN halls all over Britain look set to sprout Beeps to help local government executives cope with information technology.

The idea is that authorities buy a software pack designed to run on a Beeb with discs and monitor. It costs £350 and was written by Lamsac - a local

authority management committee.

Three discs cover applications such as accounting and traffic control as well as demonstrating graphics and other techniques. The aim is to introduce managers to computing, boost efficiency and cut waste.

Lamsac has so far sold

60 packs - and hopes to make a surplus (LAs don't make profits) by selling the software to the public and private schools.

The group is based in Vincent House, Vincent Square, London SW1 and already produces literature as part of a management awareness project.





# MYSTERIOUS ADVENTURES



## FOR BBC MICROCOMPUTER MODELS A & B\*

Join the growing band of Adventurers who are enjoying these absorbing and stimulating programs. Step into another world of Fantasy, Magic, Mystery and Sorcery. Only your wits and cunning can ensure success in these scenarios!



● WRITTEN IN ULTRA-FAST MACHINE CODE.

● SAVE GAME FEATURE.

● SPLIT SCREEN DISPLAY.

1. THE GOLDEN BATON — Venture into a strange province of Sorcery and Evil Magic to recover the Golden Baton, a priceless artifact whose powers are said to bring great Health and Prosperity to the Land.
2. THE TIME MACHINE — As a Newspaper reporter you are sent to investigate the eccentric professor who lives in the old house on the Moors. What is his secret and why is his house now deserted?
3. ARROW OF DEATH (Pt. 1) — A blight has fallen on your homelands, the Baton has become tarnished and now radiates a malevolent aura of Evil. Your mission is clear — trace the source of this Evil and destroy... or be destroyed. This is the first part of an Epic Adventure although each part can be played as a stand alone scenario.
4. ARROW OF DEATH (Pt. 2) — You now have the means to destroy your enemy... but you are far from home and this land is strange to you. Can you cope with the deadly perils which approach you and have you the strength to see your mission through to the final conflict?
5. ESCAPE FROM PULSAR 7 — Alone on a gigantic Space-Freighter... The rest of your crew have died horribly at the hands of a mutated Zoo-Specimen. Your only chance of escape is to reach the Frail Shuttlecraft. But the lurking Monster is hungry and you are the only food it has left...
6. CIRCUS — Your Car has run out of Petrol on a lonely road miles from habitation. As you trudge reluctantly down the road in search of help you are suddenly confronted by an amazing sight... in a nearby field is a Huge Circus tent! But this is no ordinary Circus as you will soon discover...
7. FEASIBILITY EXPERIMENT — Far across the gulfs of time and space, a dying race of super-intelligent beings search the Universe for a Hero to save their existence... At length their thoughts turn to planet Earth. You are chosen to be their saviour in a bizarre scenario where death is a mere thought away...

NEW

NEW

NEW

8. THE WIZARD OF AKYRZ — You are in the Royal Palace. The King beseeches you to rescue his daughter from the evil wizard. If you succeed your reward will be priceless... failure will bring certain death.
9. PERSEUS AND ANDROMEDA — Travel into the realms of ancient mythology. Battle with grotesque monsters and supernatural powers as you search for the hidden secrets of myth and legend.
10. TEN LITTLE INDIANS — This mystery begins with a train journey into a strange country. What secrets are held by the strange country mansion? What meaning is attached to the strange idols? Maybe you will find out if you live long enough...

\*Adventures 5-10 require 32K RAM

Each adventure comes attractively packaged for just £10.29 inc.

Dealer enquiries welcome

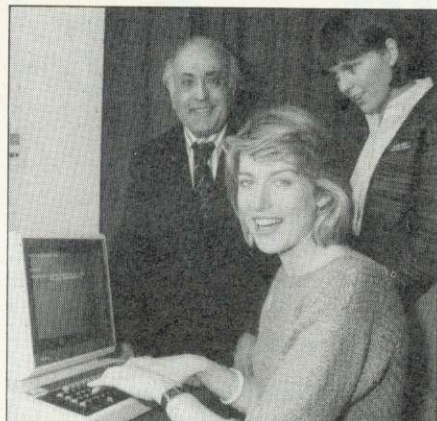
Available soon for ZX SPECTRUM, ZX81 (16K), APPLE II



SEND CHEQUE OR P.O. TO:

**DIGITAL FANTASIA** DEPT ACU,  
24 NORBRECK ROAD, NORBRECK, BLACKPOOL, LANCASHIRE.  
Tel: (0253) 56279





TV's Selina Scott, Hugh Rossi and therapist Alison Perry. The future for chemists. Intensive care under control

## Micro plays major role in medicine

TV personalities presenting micros is just the media gloss on a vital role of the BBC machine.

Hospitals in London, Manchester and other cities are using the machine as an intelligent interface and controller for sophisticated life support systems - with tremendous savings over traditional methods.

And a major role is appearing in helping the disabled and handicapped.

Charing Cross Hospital plans to use the Beeb handed over by Selina Scott in its speech therapy unit.

This is one of five centres using the micro to control speech synthesis and visual aids which are tailored to suit individual patients.

In Norwich, one weekend's loan convinced a disabled couple that the BBC micro could change their lives.

Jack and Margaret Wymer are both in wheelchairs, and Jack can only type one digit at a time. However, they run a local toy library and write a regular column for the *Norwich Mercury*.

Margaret explained: 'We were lent a BBC micro with discs one weekend and it

kind of took us over.

'We didn't realise at first how intriguing it was, but we were sad to see it go after just a weekend.'

They are now trying to get hold of a disc machine, but are having problems. *Acorn User* author Paul Beverley is designing a hardware change for the machine, while Charles Moir of Computer Concepts is trying to adapt *Wordwise* for their use.

The couple see the machine as invaluable for word processing, and for the rapid access it can give

them to information.

The machine has changed John Richardson's life too. He was a chemist in Preston, but now markets a drug labelling system based around a BBC micro with a 96k expansion board.

Discs, monitor and printer complete the package which is designed to meet the requirement for printed drug labels.

It all started less than two years ago when he bought a second hand micro. Now he hopes that 3,000 chemists will soon be using his systems.

## Games to follow

THE View printer driver cassette supports Ricoh, NEC, Epson, Olivetti, Diablo, Qume and Facit machines.

Codes dictate which of two facilities can be defined, with underlined and bold by default. A spreadsheet package is planned to accompany View.

Ten Acornsoft games are being converted for the Electron (the *Snapper* apparently goes berserk on the Beeb). Lisp and Forth are among them.

*Hopper*, *Snooker*, *Chess*, a personal money management pack, and four educational programs are on the way for the Beeb. Three of the last four are on chemistry, while the fourth, *Jars*, sounds like a version of *Jugs* which is available on the RML.



## Subs rise as issues sell out

THE February issue of *Acorn User* is now completely sold out, and is the second issue to do so (July/August 82 being the first).

Unfortunately, the only way to obtain these now is through our photocopy service, when the July/August issue will cost £3.75 and the February issue £5.50 (not including advertising pages)!

If you intend to order back issues, please do this as soon as possible as supplies of the several others are running down (see page 92 for details).

Also, the initial printing of *Acorn User* binders is selling fast, and it is unlikely that we will be able to hold the price at £3.95 inclusive for the next batch.

## Rosy future for micro gardeners

**SUPERWOMAN** Shirley Conran has enlisted the Beeb's aid to teach the tips outlined in her book *The Magic Garden*. A program by the evergreen Acornsoft will recommend plants to match the would-be gardener's needs.

Shirley, who makes a living writing about things she claims to be no good at, apparently took to the Beeb like a duck to water. And Acornsoft plan a series of software by women for women around the idea.

**ACORN USER EXHIBITION**  
BBC MICRO · ATOM · ELECTRON  
Cunard Hotel London W6  
25 - 28 August



# NOMINATIONS FOR BEST PRINTER AWARDS 1983



**STAR**

★ NOW ON RELEASE ★

ONE YEAR GUARANTEE

**Best Star — STAR DP 510/DP515 Matrix Printers**  
available for around **£289 and £399 ex VAT**

- ★ 80 Column (DP510), 136 Column (DP515)
- ★ 100 CPS, Bi-Directional Logic Seeking
- ★ Friction, Tractor and Roll Holder as standard
- ★ Full standard features including 2.3k Buffer



**JUKI**

★ NOW ON RELEASE ★

ONE YEAR GUARANTEE

**Best Performer — JUKI 6100 Daisywheel**  
available for around **£399 ex VAT**

- ★ 18CPS — Bi-Directional Logic Seeking
- ★ 10, 12, 15 CPI + Proportional Spacing
- ★ "Drop in" Daisywheel — Triumph Adler Compatible
- ★ Supports all Wordstar features
- ★ Diablo protocols — IBM Selectric ribbon
- ★ 2k Buffer as standard — 100 character Daisywheel



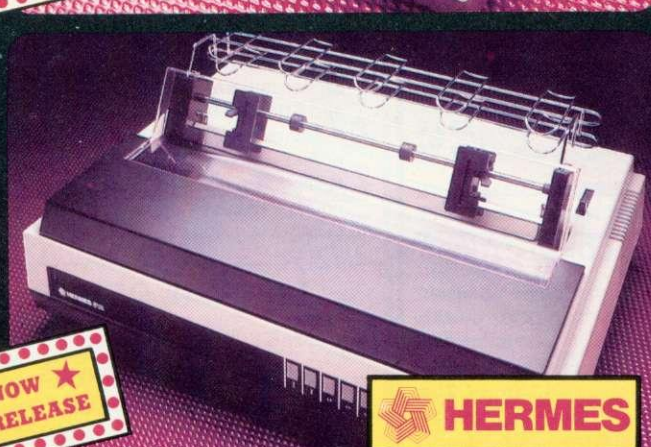
**SHINWA - CTI**

★ NOW ON RELEASE ★

ONE YEAR GUARANTEE

**Best Newcomer — SHINWA - CTI CP80 Matrix Printer**  
available for around **£289 ex VAT**

- ★ 80 CPS — Bi-Directional Logic Seeking 80 Column
- ★ Friction and Adjustable Tractor Feed
- ★ Patented Square Needles up to 9 x 13 matrix
- ★ Hi-Res Graphics and Block Graphics



**HERMES**

★ NOW ON RELEASE ★

ONE YEAR GUARANTEE

**Best Producer — HERMES 612 WPQ Printer**  
available from around **£1950 ex VAT**

- ★ Up to 400CPS and Word Processing Quality at 120 CPS
- ★ 10, 12 or 15 CPI — programmable to 1/360" spacing
- ★ 132 column at 10 CPI

*All now on general release — see them at your local dealer*

**Best Distributor:-**

**Micro Peripherals Ltd**

69 The Street, Basing, Basingstoke, Hants. RG24 0BY  
TEL: (0256) 3232 (12 lines) TELEX: 859669 MICROP G

Please send technical details, printout samples and local dealer details to:-

Name: ..... Position .....

Company: .....

Address: .....

Micro Peripherals, 69 The Street, Basing, Basingstoke, RG24 0BY







## ★ STOP PRESS ★ BBC MICRO DFS

by  
Watford Electronics

This new DFS is fully compatible with ACORN DFS and has many more features.

The extra features include:-

- Optional Double Directory (gives 62 Files per side)
- 40 Track disc can be read on 80 track drives (software switchable)
- Workfile saves typing of Filenames.
- All Format and Varyfy commands ROM resident, so no costly utility disc needed.
- Special Commands are included to ease transfer of Cassette programs to disc.
- Optional - Copy command available.

Price: DFS ROM only **£42**  
Complete DFS Kit **£85**

(P.S. We shall exchange your existing ACORN DFS ROM for this highly superior Watford's BeebRom for £38.)

## BBC GAMES SOFTWARE

### (BUG-BYTE)

SPACE PIRATES	£6.95
SPACE WARP	£7.80
GOLF	£4.75
DRAGON QUEST	£10.00
FRUIT MACHINE	£4.75
CITY DEFENCE	£6.75
MULTI-FILE	£8.75
BACKGAMON	£6.95

### (COMPUTER CONCEPT)

ASTEROID BELT	£7.80
CHARACTERS	£5.80
HITCH-HICKER	£5.95
SNAKE	£7.80
SPACE HAWKS	£7.80

### (MICRO POWER)

ADVENTURE	£6.95
ALIEN DESTROYER	£6.95
ASTRO NAVIGATOR	£4.95
CHESS	£6.95
COWBOY SHOOTOUT	£5.95
CAT & MOUSE	£4.95
CROACKER	£6.95
ELDORADO GOLD	£5.95
FOOTER	£5.95
GOMOKU	£4.95
GALACTIC INTRUDER	£6.95
LASER COMMAND	£6.95
MARTIANS	£5.95
MAZÉ INVADERS	£4.95
MUNCHYMAN	£5.95
MASTERMIND	£4.95
MOONRAIDER	£6.95
REVERSI	£4.95
STARTREK	£4.95
SWOOP	£6.95
SEEK	£5.95
TIMETREK	£6.95
ZOMBIES	£4.95

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

Introductory Offer: **£18**

## 13 ROM SOCKET BOARD

WATFORD's own 13 ROM Sockets Board for BBC Micro. It simply plugs into one of the four sockets currently available on the BBC Micro to give a full 16 ROM Socket capability (in which all ROMs may be resident at once). The circuit has been designed to allow the use of RAM in this area too.

Introductory Offer for the first 250 Boards:

KIT **Only £25.00**  
BUILT & TESTED **Only £29.95**

## APPLICATIONS Software

**CONSTELLATION (32K) £6.50**  
The great Bear! The Southern Cross! The Horned Goat! See the night sky gloriously depicted in hi-res graphics. Constellation has been adapted and enhanced from our successful ATOM program.

**DISASSEMBLER (16K/32K) £6.95**  
Relocatable disassembler program. Lists object code and Assembler mnemonics from and to any specified addresses. The listing can be stopped and restarted. Page mode option and output to a printer are available. ASCII symbols may be output if required. The Assembler code may be stored and modified and the program re-assembled.

**FILER £8.95**  
A powerful file handling program for BBC. FILER allows the user to build up, manipulate, store and retrieve data on the BBC. A very powerful package indeed.

**LOGO II £9.95**  
This language is very popular in American schools as it is an ideal educational program. It can graphically demonstrate the ideas of defined procedures, sub-routines, loops and even recursive programming. Gives excellent introduction to LOGO language for young and old alike.

## WORDWISE

**Special Offer only £35.00**

Without doubt the most sophisticated piece of Software yet written for BBC Micro. Wordwise contains all the usual word processing features. The more complex facilities such as search and replace or file handling commands are menu driven so that even a beginner can understand how to operate them.

Wordwise will work with whatever filing system is currently implemented. Supplied with full instructions and manual.

## EDUCATION Software

**ANIMAL/VEGETABLE/MINERAL £4.95**  
(Age 7-13) Provides an opportunity for children to teach the computer to differentiate between objects. The program tries to guess the object the child has thought of, using personalised responses like Mmm... I am thinking.

**BRITISH GEOGRAPHY £6.95**  
Teaches a child the locations of Cities and Ports using directional Keys.

**CAROUSEL £4.35**  
Aimed at junior school age. Sequences of colours and sounds teaches a child to concentrate.

**HAPPY NUMBERS £7.80**  
(Age 4-6) No reading skills are required to use this colour graphics number recognition and counting program. Children build patterns of flowers corresponding to figures, quickly learning their significance.

**INTRO TO ARITHMETIC £10.45**  
4 programs - Additions, Subtractions, Multiplications & Divisions. Helpstage, moving graphics and colours. Worksheet produced at the end of program. (5-7 yrs old)

**JUNIOR MATHS PACK (32K) £6.95**  
Makes learning fun for 5-11 year olds. This package consists of 3 programs (menu driven) that increase in difficulty as your child becomes competent. A very good supplement to standard educational methods.

**WHERE? £6.95**  
Do you know 'WHERE?' you are? This well written program, using high resolution graphics offers timed tests on the geography of Great Britain.

**WORLD GEOGRAPHY (32K) £7.00**  
Beautifully drawn Hi-Res colour map of the world illustrates and aids this graded series of tests on capital cities and populations of the world.

**WORDHANG £7.80**  
(Age 7-13) A word guessing program based on the well-known Hangman game. Uses full colour graphics. Complete with 260 words and the facility to save your own list of words.

**WORLDWISE £7.80**  
(Age 7-15) Two constructive geography programs allowing children to build detailed data bases covering both the UK and the world. Encourages children to refer to atlas and reference books. Save the database any time.

**WRITING £4.80**  
Full screen demonstration of correct formation of lower case alphabetic characters. Several choices of sequence. (5-7 yrs).

**PROGRAMMING MADE EASY Only £8.00**  
A new concept for schools - A set of workcards to introduce programming to primary school pupils. An invaluable asset to Teachers and Parents alike. The language has been carefully chosen to provide a balance between 'Computer Technology' and standard language. Bulky and often despised text books have been replaced by the set of Workcards. Each card can be handled easily at the Computer Keyboard. Also included are a SUPPORT PROGRAM specially produced to reinforce the work covered by the cards and a CHECK LIST for children and teachers to monitor progress. A must for primary schools undertaking computer learning.

## BOOKS (No VAT on Books)

30 Programs - BBC Micro	£4.95
30 Hour BASIC (BBC Micro)	£6.00
6502 Application Book	£10.25
6502 Assembly Lang. Programming	£12.5
6502 Assembly Lang. Subroutines	£11.80
6502 Software Design	£10.50
ACORN ATOM Magic Book	£5.50
Advanced 6502 Interfacing	£10.95
Assembly Lang. Programming for BBC	£8.95
BASIC Programming of BBC Micro	£5.95
BBC Micro Revealed	£7.95
BBC Micro Instant Machine Code including Software Cassette	£34.00
Creative Graphics on BBC Micro	£7.50
Discover FORTH - Osborne	£11.25
Easy Prog. for BBC Micro	£6.50
Further Prog. for BBC Micro	£6.90
FORTH Programming (Sams)	£12.50
Getting Acquainted/Acorn ATOM	£7.95
Graphs and Charts on BBC Micro	£7.50
Intro to Micro Beginners Book (3 Ed)	£9.90
Let your BBC teach you to program	£6.75
Micros in the Classroom	£4.90
Practical Prog. for BBC & ATOM	£5.95
Programming the 6502	£10.75
Mastering VISICALC (Sybex)	£11.95
Structured Prog. with BBC BASIC	£9.50
The BBC Micro - An expert Guide	£7.90

# WATFORD ELECTRONICS



# School subsidy scheme is extended

FOUR products have been added to the micro subsidy scheme for Britain's 6,500 secondary schools.

Micros in Schools funding now covers the Educational Electronics Vela intelligent interface, Walters dot matrix printer, Economatics Buggy, Microvitec colour monitor, and upgrading the model A to B specification with Econet and disc interfaces.

The main part of the package - monitor, upgrade and printer costs £700 plus VAT and comes with a suite of software.

Details and application forms are now going to local education authorities and the scheme will run for a year.

Vela - versatile laboratory instrument - costs £180 + VAT. is based around an 8k suite of machine code programs in EPROM, with a 4k memory, and it can be programmed.

The device can be used on its own or be linked to a BBC micro.

The £124 Buggy is a three wheeled programmable robot which comes in kit form. It is controlled by the BBC micro and can read bar codes, detect collisions, follow a light source as well as acting as a Logo pen turtle.

BBC's TV series *Making the Most of the Micro* featured the Buggy (Acorn User, March) and the NEC is planning a course on control using it.

Walters WM2000 is a British, nine-wire dot matrix printer with a speed of 125 characters per second. It comes with an ASCII character set as standard, with special foreign fonts available.

The department has been under pressure to include disc drives in the scheme, but has so far resisted this. However, the inclusion of the disc interface keeps this option open.



Walkers printer and Vela intelligent interface feature in new Dol incentive

## Z80 business package

ACORN'S Z80 business software package will include major licensed products from Digital Research and Microfocus.

The Z80 Second Processor will be launched in August at £285, and the package is aimed at the small business market.

It aims to tackle three major areas: accounting, office productivity and programming.

The first part is made up of a daybook with sales and purchase ledgers, as well as a 'nucleus system generator' to help write programs without any programming skills.

Office productivity is covered by wordprocessing, spreadsheet and database software, all linked to a graphics display.

The third aspect consists of a programming system

running CIS-COBOL (with Animator for debugging), a Microsoft specification Basic, and BBC Basic - all under the CP/M operating system with GSX graphics.

The ability to run CP/M with the Z80 processor will put the BBC machine into the mainstream of business computing.

The 6502 Second Processor also looks set for an August debut, but no firm dates for the 16032 machine are being given by Acorn.

## Telesoftware is getting nearer

TELETEXT adaptors have just finished field trials and are set for production. The first batch should be despatched in July to those who have the device on order.

The BBC has been broadcasting telesoftware

for several months, and is set to expand the range of programs carried.

Lawson Brown, head of the service expects to introduce games, utilities, reviews and general purpose programs.

## Publisher calls

Addison-Wesley's School Division needs the assistance of a micro expert. We get a lot of technical queries regarding the implementation of educational software on a variety of machines - BBC, Spectrum, RML, PET and Apple.

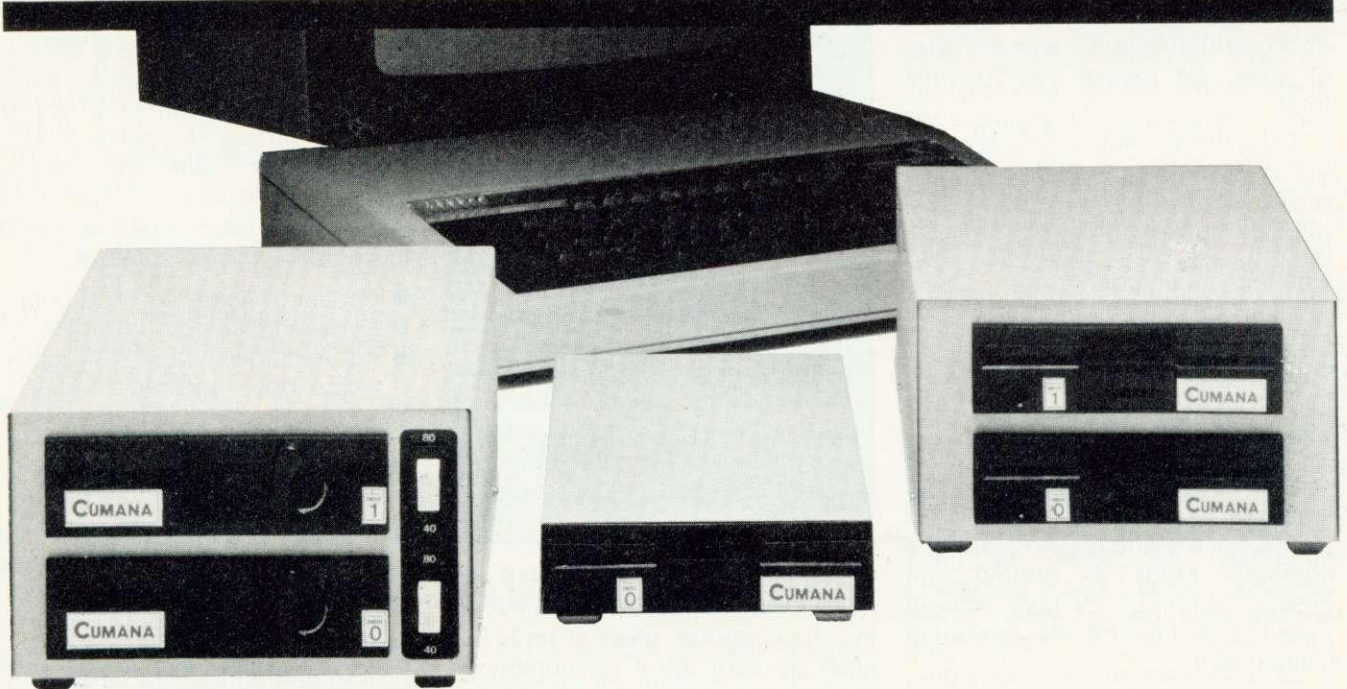
If there's anyone out there who would be prepared to help, either in our offices or at home (remuneration by arrangement), phone Fergus Hall on 01-631 1636 or write to him at 53 Bedford Square, London WC1B 3DZ, outlining your experience.



# CUMANA

## High quality Japanese

### 5<sup>1</sup>/<sub>4</sub>" Disk Drives



**Cumana** quality **DISK DRIVES** are complete with their own Power Supply Unit and the Disk Drives are fully compatible with the BBC Model B Micro Computer.

Storage capacities from 100K to 800K in single and dual units; 12 months Warranty.

Disk Formatter and User Guide £15.00.  
Disk Drive prices from £199.

Dealer enquiries welcome.  
Educational Discounts available.  
Add VAT to all prices.

## CUMANA LTD

The Pines Trading Estate,  
Broad Street, GUILDFORD, Surrey. GU3 3BH.  
Tel. (0483) 503121 Telex: 859380

For further details complete & return this coupon.

Name .....

Address .....

.....Tel. No .....

Interests:

Dealer

Education

Business

Home Use

Please send:

Brochure

Data Sheets

Dealer Address List

AU7





# WIN

**£1100**  
Disc system

- BBC micro
- Single drive
- Ink-jet printer

LAST month we invited you to set up a computer model of an animal world where members adopt different strategies when they meet one another. This month we want you to expand the model into a fully-fledged program. But read carefully: several factors have been introduced and the scoring has changed significantly—with this prize at stake we expect you to work for it!

For those who missed last month's issue, a copy of the relevant pages will be helpful – and remember you must include the answer to last month's quiz, whether you entered or not.

First, a recap and some expansion. In any meeting or conflict between two members of the species there are three possibilities for each participant.

The hawk strategy (H) is a savage attack upon the opponent (total war).

The dove strategy (D) means the character holds its ground and makes a furious display without maiming or injuring the opponent (limited war).

The retreat strategy (R) means running away and 'losing' the contest. In addition, if attacked by an individual adopting a hawk strategy, the character risks death or serious injury.

All animals are pre-programmed – they adopt their individual strategies blindly and without choice. They also have no memory of previous conflicts and cannot distinguish between members of the species. In other words, when a hawk meets a dove neither knows what type the other is.

The purpose of our model is to determine the most stable strategy for the group as a whole – so stable that it is immune to a mutant

**Simon Dally presents the second part of our Hawk Dove Competition. Last month he introduced the idea, now we refine it and ask you to produce a piece of software. The behaviour of our animal world is open to interpretation, and this will be taken into account when choosing the winner.**

strategy arising from within. As we saw last month, a society consisting entirely of hawks will be invaded by doves (according to our scoring) because individuals who run away score more points than those who engage in total war. And a society composed entirely of doves will be invaded by hawks because the first mutant hawk will do extremely well against a bunch of characters who merely run away.

The three characters we described last month were as follows: the hawk, always plays H; the dove, always plays D and runs away as soon as it encounters H; the bully plays H if making the first move, plays H in response to D, but runs away if its opponent plays H twice in succession.

Thus if A is a bully and B is a hawk the contest will look like this:

1 2 3  
A: H D Run  
B: H H

Now we introduce two new characters.

The *retaliator* wanders around quite peacefully. If it encounters another individual it behaves like a dove initially. But if it meets a hawk it meets force with force. Thus we can say a retaliator plays H in response to H and D in response to D.

The *prober-retaliator* (PR) behaves similarly to a retaliator except every now and again it pretends to be a hawk (ie it probes). Like a retaliator, it plays H in response to H, except that if it probes and receives H in return it reverts to D. If it encounters D it takes advantage like a bully and plays H again.

All contests take place between two individuals (call them, say, A and B). In addition, if a contest goes as far as 21 rounds it stops automatically with the second contestant playing R. At the end of each contest, calculate the individual scores of A and B:

- For each 'victory' ... +50 points
- For each loss (R) ... 0 points
- For each hawk blow (H) received which does not cause death or serious injury (a scratch) ... -2 points
- For death or serious injury ... -100 points.
- For each round or part of a round the contest lasts beyond round 1 (wasting time) ... -0.5 points.

If an animal is killed or seriously injured it scores only -100 points. All other scores are computed as a mixture of victory/loss points, time wasted and hawk scratches received.

The first contestant has a slight advantage (it gets in the first blow and wins if the contest goes a full 21 rounds). A useful analogy might be to think of A as being on its home ground.

Few computer models can function without random factors being introduced. For those unfamiliar with probability theory, here is a crash course! If an event is *certain* to happen it is said to have a probability of 1.0. If an event will *never* happen it has a probability of 0.0. All other

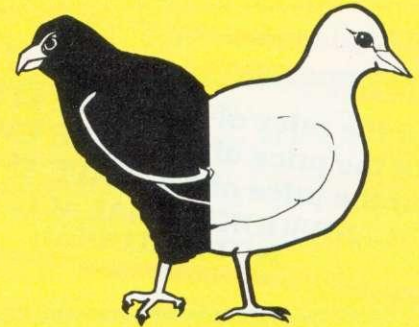


Once you've written your software, and answered last month's quiz, send it to Acorn User, 53 Bedford Square, London WC1B 3DZ. Entries should arrive by Wednesday, August 3 and must be clearly marked 'Hawks and Doves'.

The overall winner will receive: BBC model B fitted with disc interface; single disc drive; Olivetti ink-jet printer.

Two runners-up will each receive software to the value of £50. A copy of *The Selfish Game*, the inspiration of this competition, will also go to each winner. The result will be announced in November's *Acorn User*, and winners will be notified by post.

Our thanks to Acorn, Richard Dawkins and Oxford University Press for their help with the competition.



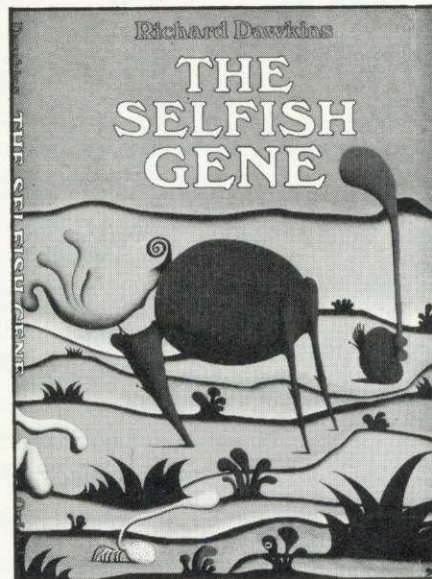
probabilities can be expressed somewhere in between. The probability of a tossed coin landing heads up is 0.5, which can be expressed in most Basics as RND(2).

The following probabilities occur in our model:

- That a single hawk strategy (H) will cause death or serious injury ... 0.10
- That a prober-retaliator will probe on its first or any subsequent move ... 0.05.
- That a retaliator of PR will retaliate against a hawk strategy (assuming it isn't dead or seriously injured) ... 1.0.

Our model is only a theoretical and abstract hypothesis. Real animal behaviour is vastly more complex (though the ritualised conflicts here will strike a chord with people who watch nature films on TV).

Do not attempt to read too much into our model (one person thought



**The Selfish Gene** by Richard Dawkins, OUP, £8.50

an early version of last month's article was an attempt to simulate CND and other nuclear strategies!) Nor should words like 'hawk' and 'dove' confuse you into thinking our

theoretical species is necessarily a type of bird.

Each of the strategies we're putting into the computer might be thought valid in one form or other. For example, the savage behaviour of hawks, carrying as it does a chance of death or serious injury might be applicable if we were examining a population of elephant seals, where the reward for winning a battle can be as high as a harem of 30 females. On the other hand, if we were analysing sea otters, who need to eat a quarter of their own body weight every day, we would clearly have to exact greater penalties for wasting time fighting instead of gathering food.

Once you've programmed your computer with the individual characters and their strategies you're ready to set them against each other in the silicon chip jungle. One technique would be a football league system whereby all play all at home and away. However, a system more in tune

page 20 ►

**Here are a few examples of possible conflicts:**

*Prober-retaliator v Retaliator*

	1	2	3	4	5	6	7	8	9	10	11	12	
A:	D	D	D	D	H	D	D	D	D	D	D	D	
B:	D	D	D	D	H	D	D	D	D	D	D	D	
	13	14	15	16	17	18	19	20	21	Score			
	D	H	D	D	D	D	D	H	D	+34.0			
	D	H	D	D	D	D	H	R	-16.0				

Here the PR probes on its fifth, fourteenth and twentieth moves. The retaliator responds in kind by playing

H and the PR immediately reverts to being a dove. On the twenty-first round both are still alive and B retires. Character A scores +50 for 'winning', plus (20\* -0.5) for wasting time, plus -6 for his three hawk scratches received = +34. B Scores 0 for 'losing', plus -10 for timewasting, plus -6 for his three hawk scratches = -16.

*Bully v Bully*

this contest will look like this unless one is killed:

	1	2	Score
A:	H	H	+49.5
B:	D	R	-4.5

A scores +50 - 0.5 = +49.5. B scores 0 - 4 - 0.5 = -4.5.

*Prober-retaliator v Hawk*

	1	2	3	4	Score
A:	H	D	H	H	-100.0
B:	H	H	H	H	+42.5

Here the PR probes on its first move and reverts to D when it encounters H. The hawk continues to play H and on his fourth move kills A. A scores -100 for death. B scores +50 - 6 + (3\* -0.5) = +42.5.



## GEMINI SPECIAL FREE OFFERS

3 for the price of 2 – SAVE £19.95!  
 5 for the price of 3 – SAVE £39.90!  
 7 for the price of 4 – SAVE £59.85!  
 (CASHBOOK & FINAL ACCOUNTS NOT INCLUDED)



**CASH BOOK ACCOUNTS PROGRAM FOR BBC 32K, TORCH, SPECTRUM 48K**  
**NEW . . . . . £59.95**

J.B. SHOOKER T/ADT/BLACK

\*\*\*\*\*  
 BALANCE SHEET AT 31/12/82  
 \*\*\*\*\*

ACCOUNT	DEBIT	CREDIT
1 Sales (1)		40000
2 Sales (2)		40000
3 Purchases (1) & WIP	2000	
4 Purchases (2)	2000	
5 Closing Stock & WIP		17500
6 Depreciation		5000
7 Wages	8000	
8 Rent & Rates	1200	
9 Heat & Light & Power	875	
10 Insurance	211	
11 Telephone	500	
12 Motor Expenses	140	
13 Repairs & Services	140	
14 Stationery	100	
15 Freight & Professional	100	
16 Advertising	100	
17 Bank Charges	100	
18 Bad Debts, Written Off	100	
19 Motor Vehicles, Dep'n	100	
20 Leasehold Property, Dep'n	100	
21 Cash in Hand	100	
22 Cash at Bank	300	
23 Bank (1)	500	24000
24 Financial Provisions	20000	
25 Leasehold Property	30000	
26 Leasehold Property, Acc. Dep'n		3000
27 Motor Vehicles	4000	500
28 Motor Vehicles, Acc. Dep'n		500
29 Plant & Equipment - All Dep'n	2000	500
30 Goodwill		2000
31 Dividends & Reserves		2000
32 Cash Credits & Advances		3000
33 H.P. Interest Pay (1)	100	300
34 H.P. Interest Pay (2)	100	300
35 VAT Output Tax	1400	
36 VAT Input Tax		4400
37 VAT Output Tax		1000
38 Capital Acc (1)		5000
39 Capital Acc (2)		5000
40 Dividends (1)	3000	
41 Dividends (2)	1000	
42 Long Term Loans	5000	4000
43 Stock & WIP		
TOTALS	174864	174864

N.B. Shooker's Exchanges defined by (C); due to rounding errors

One of the most innovative business programs on the market. Replaces a manual cash book system, e.g. Simplex and 'All-in-One'. Written by practising Chartered Accountants, this practical program is simple to use and will replace your manual cash and bank records. By giving you access to vital management information as and when you want it, it will enable you to keep more positive financial control of your business.

The software is extremely well and lucidly documented, and Gemini provide a full technical back-up and product up-date policy. Take a look at the information this program will provide:-

- \* Summary of VAT information for VAT returns
- \* Cumulative receipts and payments report analysed over the standard profit and loss and balance sheet headings
- \* Option for departmental analysis of sales and purchases
- \* Audit trail printout of all transactions.
- \* Journal routine for entering transfers between accounts and year end adjustment for debtors, creditors etc.
- \* Trial balance at any interval
- \* Interfaces to 'Final Accounts' program to produce balance sheet and trading and profit/loss account etc.
- \* Spectrum version may be used with Sinclair OR 80 column printer.



**FINAL ACCOUNTS PROGRAM FOR BBC 32K, TORCH, SPECTRUM 48K . . . . . £59.95**

Requires Cash Book module. This program will take your cash book data to the logical conclusion of balance sheet, trading and profit/loss account and notes to the accounts i.e. fixed assets, land and buildings and capital accounts. Final accounts (BBC version) links to 'Beebplot' for graphic data presentation.

Format: Torch disk, BBC disk/cassette, Spectrum cassette.  
**Special Offer – Cash Book and Final Accounts together – £95**

J.B. SHOOKER T/ADT/BLACK

\*\*\*\*\*  
 BALANCE SHEET AT 31/12/82  
 \*\*\*\*\*

1982	1981
Fixed Assets	
Goodwill	3000
Land & Buildings	2000
Plant & Equipment	2000
Motor Vehicles	2000
Stock & WIP	2000
Debtors & Prepayments	2000
Cash in Hand	2000
VAT receivable	2000
Other	2000
8000	7000
LESS CURRENT LIABILITIES	
Trade Creditors & Accounts	500
H.P.	1000
Bank Overdraft	3000
VAT payable	500
4000	13100
NET CURRENT ASSETS/LIABILITIES	
£4000	£22000
NET ASSETS/LIABILITIES	
£12000	£18000
Capital Acc (1)	5000
Capital Acc (2)	5000
Long Term Loans	5000
£18000	£27000

J.B. SHOOKER T/ADT/BLACK

\*\*\*\*\*  
 INCOME AND PROFIT LOSS ACCOUNT  
 PERIOD: 12 MONTHS ENDING 31/12/82  
 \*\*\*\*\*

1982	1981
SALES	
1 Sales (1)	40000
2 Sales (2)	40000
TOTAL SALES	80000
LESS CURRENT LIABILITIES	
Trade Creditors & Accounts	500
H.P.	1000
Bank Overdraft	3000
VAT payable	500
4000	13100
NET CURRENT ASSETS/LIABILITIES	
£4000	£22000
NET ASSETS/LIABILITIES	
£12000	£18000

NOTES TO THE ACCOUNTS - 31/12/82

1. FIXED ASSETS

Land & Buildings	Motor Vehicles	Plant & Equipment	Goodwill	1982	1981
Cost at Valuation	2000	2000	3000	7000	7000
Acc. Dep'n	500	2000	0	2500	0
NET	1500	0	3000	4500	7000
NET	1500	0	3000	4500	7000

2. LAND AND BUILDINGS

Land and Buildings	1982	1981
Freehold Property	2000	2000
Leasehold Property	0	0
TOTAL	2000	2000

3. CAPITAL ACCOUNTS

Capital Accounts	1982	1981
Opening Capital	5000	5000
Profit	7000	13000
Dividends	(2000)	(2000)
TOTAL	10000	16000

**"Gemini's range of software is in the vanguard of the releases for 'serious' micro users..."**  
 (WHICH MICRO AND SOFTWARE REVIEW)



### INVOICES AND STATEMENTS . . . £19.95

**Compatible with most micros. See table.** Ideal for the small business. A complete suite of programs together with generated customer file for producing crisp and efficient business invoices and monthly statements on your line printer. All calculations include VAT automatically, and the program allows your own messages on the form produced. This program gives you superb presentation and saves time on one of the most tedious tasks in the office.



### COMMERCIAL ACCOUNTS . . . £19.95

**Compatible with most micros. See table.** A gem of a program, all for cassette, with the following features:- Daily Journal. Credit Sales. Cash Sales. Credit Purchases. Purchases—other. Sales Ledger. Purchase Ledger. Bank Account. Year to date summary. A fully interactive program suitable for all businesses. Files can be saved and loaded and totals from one file carried forward to another on cassette. Particularly useful from a cash flow point of view, with an immediate accessibility to totals for debtors and creditors. Bank totally supported with entries for cheque numbers, credits and, of course, running balance.



### MAILING LIST . . . £19.95

**Compatible with most micros. See table.** A superb dedicated database to allow for manipulations of names and addresses and other data. Gemini's unique 'searchkey' system gives you a further ten 'user-defined parameters' to make your own selections. Features include the facility to find a name or detail when only part of the detail is known, it will print labels in a variety of user specified formats.



### 1 DATABASE . . . £19.95

**Compatible with most micros. See table.** The program that everyone needs, the most valuable and versatile in your collection. Facilities include sort search, list print if required. Can be used in place of any card index application; once purchased you can write your own dedicated database to suit your particular needs with a limitless number of entries on separate cassettes.



### STOCK CONTROL . . . £19.95

**Compatible with most micros. See table.** Dedicated software with all that's necessary to keep control of stock. This program will take the tedium out of stock control and save time and money. Routines include stock set up, user reference number, minimum stock level, financial summary, line print records, quick stock summary, add stock, delete/change record and more.



### HOME ACCOUNTS . . . £19.95

**Compatible with most micros. See table.** Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account, mortgage, H.P., etc. This program also allows you to plot graphically by Histograms your monthly outgoings.



### WORD PROCESSOR . . . £19.95

**Compatible with most micros. See table.** This program features routines found in much larger and more expensive packages with a typical word length of 5-6 letters it allows for around 1000 words in memory at one time. Ideal for the user who requires a simple program to write letters on his computer. Features include, block delete, block insert, search and replace, edit text, display text and more.

**"Simple to use ....."**  
**"Ideally suited to the way most offices run....."**  
**PERSONAL COMPUTER NEWS**



# ns for more computers!



## SPREADSHEET ANALYSIS BEEBCALC £19.95 DRAGONCALC £19.95

**NEW** FOR BBC AND DRAGON 32. Spreadsheet processors have proved to be important tools for using micros in business, scientific and domestic financial applications.

POSITION	A1	RC	SPACE	5185	T	II
II	A	II	B	II	C	II
1	-J.B. SNOOKER T/A POT-BLACK			YEAR	ENDED	
2	PROJECTED CASH FLOW			Oct.	Nov.	
3				£	£	
4						
5						
6	INCOME					
7	Sales			11786	10944	
8						
9	REVENUE EXPENDITURE					
10	Purchases			500	500	
11	Advertising			500	1000	
12	Director's salary			1596	1596	
13	Salaries			2216	2216	
14	Rent					
15	Telephone				300	
16	Insurance				200	
17	Printing, stationary				400	
18	Repairs & renewals					
19	Hire of equipment			60	60	
20	COMMAND BCDEFGPRSTW*?					

Without any programming knowledge at all, you may:-

- Set up a computerised spreadsheet, with chosen row and column names.
- Specify formulae relating any row or column to any other.
- Enter your source data and have the results calculated.
- Save the results on tape (or disk-BBC) for later reloading and manipulation.
- Print the tabulated results in an elegant report format.
- Experienced users may access saved files and write their own reporting or graphics presentation programs for the results.

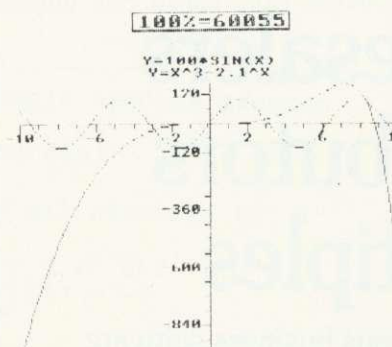
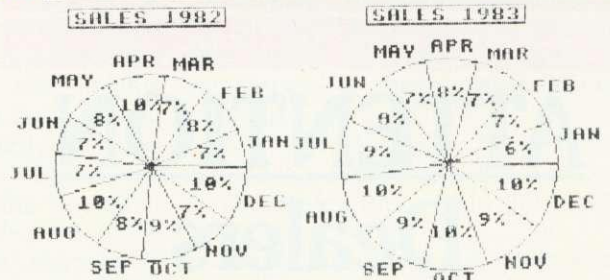
Some typical applications:-

- Small business accounting applications, e.g. profit and loss statements and cashflow projections, break-even analyses etc.
- Investment project appraisal— anything from double glazing to oil rigs!
- Comparing rent/lease/buy options.
- Processing the results of scientific experiments or field studies.
- Engineering calculation models.
- In fact, anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

## Program Availability Chart:-

	Database	Stock Control	Mailist	Invoices & Statements	Spread sheet Analysis	Cashbook Accounting	Word processor	Home Accounts	Commercial Accounts	Plot	Final Accounts
Sinclair Spectrum 16k or 48k	●	●	●			●		●	●	●	●
Dragon 32k or 64k	●	●	●	●	●			●	●	●	
VIC 20 (16k +)	●	●	●	●				●	●		
Sinclair ZX81 (16k +)	●										
Grundy Newbrain	●		●								
Sharp MZ80A	●	●	●	●				●	●		
Sharp MZ80K	●	●	●	●				●	●		
Sharp MZ80E	●	●	●	●				●	●		
BBC Micro model A or B 32k	●	●	●	●	●	●	●	●	●	●	●
Atari 400/800	●										
Torch	●	●	●	●	●	●	●	●	●	●	●
Epson HX-20	●	●	●								
Commodore 64	●		●					●			

## BEEBLOT & SPECTRUMLOT £19.95 NEW



Important new additions to the Gemini family. Present numeric and string data together in easily-understood pie chart, histogram or graph format. Beebplot has a built-in interface to Beebcalc, and both Beebplot and Spectrumplot have built in interfaces to the Final Accounts program of Cashbook. The facility for mathematical function

plotting is also provided. The BBC version has a high resolution screen dump for the Epson or CP-80 printers, and the Spectrum version dumps to the Sinclair printer via the 'copy' key. A very useful program that will give superb results either from direct input of data from the keyboard or via simple access to other software data files. A must for business and education.

**Dealer/Trade enquiries invited - generous trade discounts for quantity.**

**Special ACCESS card instant sales hotline for prompt despatch... 24 hr Ansaphone Service. All enquiries other than credit card sales to 03952-5832**

**Tel: 03952 5165**

**Gemini. Functional Software Specialists. 9, Salterton Road, Exmouth, Devon. EX8 2BR**

PLEASE SEND URGENTLY

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(Please note: Items as priced except BBC/TORCH DISKS. please add £4 extra for 40 track and £5 for 80 track format)

Name \_\_\_\_\_  
Address \_\_\_\_\_  
Machine Type \_\_\_\_\_ Memory Size \_\_\_\_\_  
I enclose \_\_\_\_\_  
Make cheques and postal orders payable to Gemini Marketing Ltd.  
Access Number \_\_\_\_\_  
Signature \_\_\_\_\_

ACCESS ONLY

**Gemini**  
MARKETING LIMITED

Gemini. Functional Software Specialists,  
9 Salterton Road, Exmouth, Devon EX8 2BR



# GEMINI

## ATTENTION

Dealers  
Wholesalers  
Distributors  
Multiples

The demand for serious/business software for the microcomputer is inevitably increasing rapidly!

Take a look at our exciting range of quality software. Interested? Then talk to us about our advantageous terms and ask for our dealer pack, or a visit by one of our qualified sales staff.

For a full description of our product range see previous two pages.

## ACT NOW!

FULL DEALER  
LIST NEXT MONTH.

# GEMINI

MARKETING LIMITED

Functional Software Specialists,

9 Salterton Road Exmouth Devon  
EX8 2BR Tel: 03952 5832

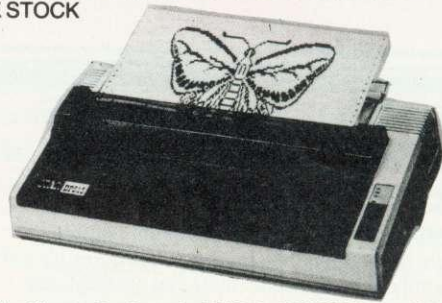
**BBC SPECIALISTS**

### A NEW STAR IS BORN

FROM THE LARGEST RETAILER IN THE UK OF STAR PRINTERS COMES THE:

### NEW STAR DP 510/515

EX STOCK



One Year Warranty, True Descenders 9x9 Matrix, 100 CPS Bidirectional & Logic seeking, 5, 6, 8, 5, 10, 12, 17 cpi 40, 48, 68, 80, 96, 136 cpi, Italics, Emphasized, Double strike, Super & Sub Scripts, Hi-Resolution & Block Graphics  
Continuous Underline, Backspace, Vertical & Horizontal Tabs Friction, Tractor Feed or Paper Roll (Roll holder standard) 2.4K Buffer Standard  
Centronics Interface Standard RS 232=£59.00 VAT  
DP 510 Accepts 10 Inch Paper  
DP 515 Accepts 15 Inch Paper

**DP 510 £280.00 + £42.00 VAT = £322.00**

**DP 515 £399.00 + £59.85 VAT = £458.85**

PACKAGE PRICE for BBC MICRO/DAGON/ORIC

STAR DP 510 + Cable + Delivery & VAT £345.00

STAR DP 515 + Cable + Delivery & VAT £483.00



**SPECIAL**

### NEW LOW PRICE ON STAR DP8480

EX STOCK

**DP 8480 £208.70 + £31.30 = £240.00**

RS232 Interface as standard 5, 6, 8, 5, 10, 12, 17 cpi 40, 48, 68, 80, 96, 136 cpi  
7 Needle Head 7x9 Character Matrix Block Graphics or Optional Hi-Res Graphics  
80 cps Bidirectional & Logic Seeking Friction & Tractor Feed accepts up to 10 inch Paper

Hi-res Graphics option for DP8480 £15/£20  
BBC Package  
(Star DP8480 + Hi-res option + Cable + Delivery & VAT) £260.00  
Printer Cables  
BBC to 36 Way Centronics Type Connector £17.50  
Dragon to 36 Way Centronics Type Connector £17.50  
Oric to 36 Way Centronics Type Connector £17.50  
Torch to 36 Way Centronics Type Connector £20.00  
BBC to 25 Way D Type (For use with RS423) £9.50  
BBC to 40 Way Edge Connector (Centronics 737/739) £20.00

Full A>B Upgrade Kit £60.00  
Ram Upgrade Kit £23.00

### Disk Drives From £190.00

Including Case, Cables, Utilities Disk & VAT Delivery £4.00  
Blank C15/C30 Cassettes Ten for £4.50 ANY MIX  
Send SAE for Full Price List of: -  
Books : Software : Leads (Cassette, Monitor, Data & Specials) : Upgrade Kits & Components

Prices incl VAT unless otherwise stated.  
Credit card/phone orders accepted.

Postage 50p per order or as stated  
24 hr Securicor Delivery for Printers/Disk Drives £8.00

## C. J. E. NEW SHOP NOW OPEN

## Microcomputers

Dept (Au), 78 Brighton Road  
Worthing West Sussex BN11 2EN  
Tel: (0903) 213900





# HASHING IS SMASHING

## Stan Froco uses hash tables for storing and retrieving data

IT IS often necessary to look up information associated with an item of data. For example in a compiler or assembler you may wish to know whether a variable has been used, and if so where in memory to find it. Such operations are usually done many times, and so must be efficient. This is where 'hashing' comes in as it is a compact and efficient technique for storing and retrieving such information.

Consider the following problem (courtesy Frank King, Cambridge University). A file Data, holds about 500 integer numbers in the range 0 to 9999. You have to find whether all the numbers are different, and if not how many duplicates there are.

This is similar to the above compiler problem. A simple method would be to take each number in turn and look at the rest of the file, to see how many times it was duplicated.

However, this would require 124,500 accesses of the file—which is tediously slow from memory, never mind tape!

Program 1 uses a hash table to solve the problem. An array of 650 elements, tab%, the hash table, is declared, and all the elements set to -1 (lines 30-60). Each number in the file is then taken in turn (line 210). The remainder after dividing this number (x%) is then calculated (n% in line 220). This conveniently gives us a number in the range 0 to 649, the same as the number of elements in the hash table, tab%. This element is then looked at (tab%(n%), lines 230 and 240). If its value is -1, nothing has been done to it since it was initialised (lines 70-90), so the number under consideration (x%) is stored in there and the next number taken (lines 320 and 330). If instead the value of the element is x%, then x% must have been stored there previously, in other words we have a duplicate.

The variable dup%, the count of duplicates (initially zero) is incremented by one, and the next number is taken (lines 240 and 330). The only other possibility is

that a value other than x% or -1 is stored there. This may have been because a previous value of x% had the same remainder n%. In this case n% is increased by one until an element that is empty or holds x% is found (lines 280-300).

Line 290 includes the operation MOD 650 so that if n% is 649 the next element tried is element 0, avoiding falling off the end of the

hash table. This process of looking for another element is rehashing (the initial process of taking a remainder, or hash value being hashing).

After all numbers have been looked at, dup% holds the number of duplicates found, and the result is printed.

Some care has to be taken with this technique. An array 30% bigger

```

10REM Example hashing program
20
30DIM tab%(649)
40
50REM Set all elements to -1
60
70FOR i% = 0 TO 649
80   tab%(i%) = -1
90NEXT i%
100
110dup% = 0
120handle% = OPENIN("DATA")
130
140REM Now take each element from the data file
    and look it up
150REM in the hash table.
160REM x% is the number being looked up
170REM n% is the possible element in the hash table
180REM dup% is the number of duplicates
190
200REPEAT
210   INPUT fhandle%,x%
220   n% = x% MOD 650
230   IF tab%(n%) = -1 THEN GOTO 320
240   IF tab%(n%) = x% THEN dup% =
        dup% + 1 : GOTO 330
250
260   REM Try the next element in the
        table until found
270
280   REPEAT
290     n% = (n% + 1) MOD 650
300     UNTIL (tab%(n%) = -1) OR (tab%(n%) = x%)
310     IF tab%(n%) = x% THEN dup% =
        dup% + 1 : GOTO 330
320   tab%(n%) = x%
330UNTIL EOF fhandle%
340CLOSE fhandle%
350
360REM Print out the answer
370
380PRINT "There are " ; dup% ; " duplicates"
390END

```

Program 1. Hashing with a closed table



than needed (650 as opposed to 500 elements) was used as the hash table. The technique is only efficient if there is a good chance of finding an empty element, otherwise a lot of rehashing is done. In this example even when the 500th number is examined, the table is only about 70% full, meaning on average only two rehashes will be required. A rule of thumb is to allow 20% - 30% spare room. If the table were ever to become full, lines 280-300 would repeat forever looking for an empty element.

A suitable function is also needed to obtain the remainder. Imagine instead the problem involved floating point numbers in the range 0 - 0.9999. Then line 220 would give 0 each time as the remainder. By the time the last number was examined 499 rehashes would be required. The trick here would be to multiply the number in question by 10,000 and then take the remainder. The important thing is that the initial hashing must give elements well distributed throughout the table.

The technique is easily extended. For a symbol table the array could be a string array, with possibly another array, the corresponding elements of which contained addresses of the variables. Here the names could be hashed by taking the ASCII values of the first and last letters, ANDing them and taking a remainder.

The system described is a closed hash table. An alternative is the open table, which does away with rehashing. The elements of the tables contain pointers to a linked list of items with the same hash value. Such a list can never become full, the lists just become longer. To look up an item involves searching down the relevant list, hence short lists are preferred. This sort of table is often more flexible if a lot of data is stored with each item. If you don't understand what a linked list is, all will be explained in a future article.

**If there is a programming technique or problem you would like Stan to look at, jot it on a postcard and send it in.**

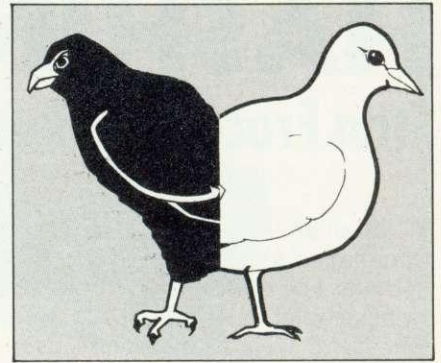
► page 15

with the real world would be to imagine each generation of animals indulging in a series of random conflicts. A new generation then arises whose composition is based on the performance of its predecessors (winners contribute more to the gene pool than losers) and battle recommences.

If you encounter genuine ambiguities don't call us! It's practically impossible to set this sort of problem in a totally unambiguous way. Suffice to say we're not trying to fox people with verbal quibbles. If in doubt, use your common sense and think about what happens in the real world. State your assumptions as REMs, if you want to.

Your model should allow the possibility of experimenting with different scoring systems and also allow any combination of characters the operator wants. Beyond these guidelines we're not going to tell you how to set up a model. However, in judging the entries the following criteria will be taken into account:

- Does the model accurately reflect the performance of the different strategies outlined?
- is the program clear to follow both when listed and when run.
- is the program visually pleasant to look at - ie is it free from spelling mistakes and has an attempt been made to interest the view with graphics?
- is it error-trapped, ie are unused



keys disabled, is the player's input checked?

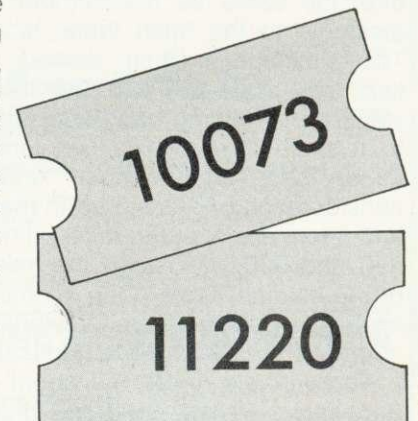
We don't expect all these points to be fully covered - but try! Also, entries are not limited to Beeps and Atoms - we will consider software for any comparable micro.

#### Remember the rules

- You must answer last month's first part, whether you entered or not, to qualify this month.
- Programs submitted should be on cassette or disc. With a listing if possible.
- All programs submitted will become the property of *Acorn User* and the magazine will retain all rights. We regret no material can be returned.
- Finally, the Editor's decision is final. We will not discuss the competition on the phone or by mail. The only possible form of correspondence will be through the letters pages, after the closing date of **Wednesday, August 3.**

## RESULTS OF MARCH COMPETITION

THERE was a fairly heavy response to our March problem concerning the raffle tickets: over 200 entries, although a surprising number (38%) got it wrong. The answer was that the winning ticket was 10073 and the second prize 11220. The winners were G. Kirby of Hemel Hempstead, who solved it on an Acorn Atom, and Edmundo Herrero of the BBC Micro Club, Tenerife. Acornsoft packages have been despatched to both winners.





# Eltec HOME & BUSINESS TECHNOLOGY computers

Probably the widest selection of software available by mail order.  
All the top manufacturers including Acorn Soft, IJK (Sinclair), Superior Software, Bug Byte, Program Power, Hessel, Procyon.

All NEW  
All in Stock  
(as long as you're quick)

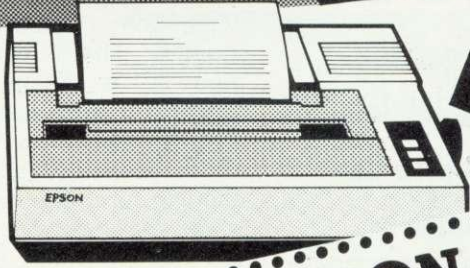
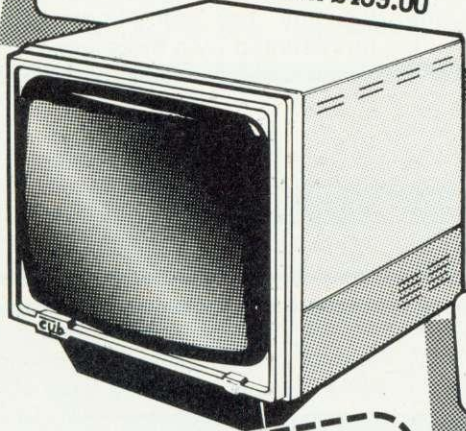
## BBC MICRO COMPUTERS

BBC MICROCOMPUTERS, with the latest 1.2 operating system Model B **£399** FREE Acornsoft game with every computer



### Microvitec

Microvitec "Cub" Monitor. True 80 Column Definition at a new low cost from **£459.00**



Full service for Education

**EPSON**  
New Epson FX80 F/T III Printer  
160 c.p.s. Parallel **£450.00**

**TEAC**  
TEAC 40T/80T Switchable Twin Disc Drive 200K/400K **£644.00**

Acorn user & BEEB user  
Acorn user & BEEB user, back issues **£1.25** each, orders for 2 or more **£1.00** per copy.

**PRESTEL**  
PRESTEL Available now on the BBC Micro OEL Acoustic Modem & Software & Lead. Converts the BBC Micro into a Prestel/private viewdata receiver. **£175.00** all inclusive.

**ATPL EPROM PROGRAMMER**  
Make your favourite programs full time residents with an ATPL EPROM PROGRAMMER **£138.00**, Program, verify, read and check for blank, 2516, 2716, 2532, 2732, 2564, 27128, 27256. Single Rail Eproms. Also Eprom Eraser **£55.20** incl.

**PROCYON DOS**  
PROCYON DOS Utilities Plus Manual (1 Disc for 40 Track and 80 Track) **£17.25**

- PROTECTIVE COVERS AND CARRYING CASES**
- Polyester Cotton Cover..... 3.97
  - Soft PVC Cover..... 4.45
  - Hard Carrying Case..... 55.20
  - Soft Carrying Case..... 23.00
  - Cassette leads..... 4.00
- SOFTWARE**
- Killer Gorilla, Program Power .6.95
  - Road Runner, Superior Software 7.50
  - Centipede, Superior Software .7.50

- JOYSTICKS AND SOFTWARE**
- BBC Joysticks - pair..... 13.00
  - BEEBSTICK - Fully proportional for Computer Aided Design.... 29.75
- JOYSTICKS GRAPHICS - Draw and Save your own Line Diagrams..... 5.75**
- JOYSTICK PACK 1 - Contains "ZAP" and "ETCH A SKETCH"..... 5.75
  - GRAPHSTICK - Computer Aided Design for any joystick..... 7.95

- HARDWARE**
- Sound Pick-off Module (Simple to fit)..... 6.95
  - Loudspeaker in cabinet plus cable for above pick-off..... 27.00
  - Loudspeaker plus Amplifier for above pick-off (Blaster)..... 37.50
  - BIG EARS Speech input for BBC Computer..... 56.00
  - CHATTERBOX Gives your BBC Computer unlimited vocabulary..... 56.00

All above prices include VAT  
For full price lists or further details of any products send s.a.e.



ELTEC COMPUTERS  
217 Manningham Lane, Bradford, BD8 7HH.  
AU Tel (0274) 722512.





# NOT THE BBC MICRO

If logic is getting you down, let Joe Telford explain the Beeb's built-in facilities

This month we look at some of the ways logic can be used with the BBC micro. We start off with the AND logical operator. Consider program 1 which shows how we might implement a simple range check. The program expects a number between 1 and 12 inclusive to be entered, and will not exit from the repeat... until loop until such a number is input.

Line 50 contains the logic which defines the range of numbers. It simply says 'only exit from the loop when both conditions are fulfilled together'. That is when the number input (M) is greater than 0 and at the same time is also less than 13.

To examine this combination of conditions, we should consider each in turn. The first is a  $M > 0$ , which may take two values. It may be true, in which case M is any value greater than 0, such as 1, 3,

12, 99... etc. Or the expression  $M > 0$  may take the value false. In this instance M is equal to zero or less, for example: 0,-2,-12,-89... Figure 1 shows the range of numbers for which  $M > 0$  is true.

Again, the second condition,  $M < 13$ , can also be true (M is less than 13) or false (M is 13 or more). Figure 2 shows the range of true values for this condition. The two conditions are connected by the AND operator, which specifies how combinations of true and false for each condition should be read. Figure 3 shows the range which allows exit from the loop.

It is also important to list all combinations of each condition, and their outcomes under the AND operation. Figure 4 does this.

Generally, the AND combination for any two conditions can be represented by a more general, and

Figure 1.  $M > 0$  true

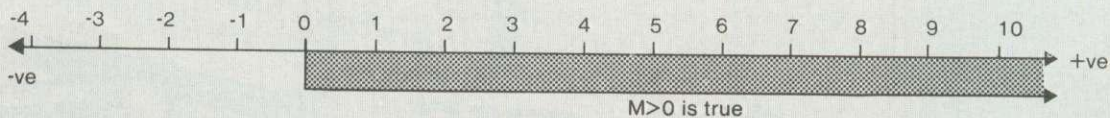


Figure 2.  $M < 13$  true

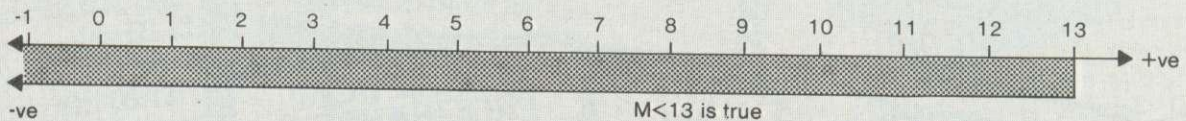
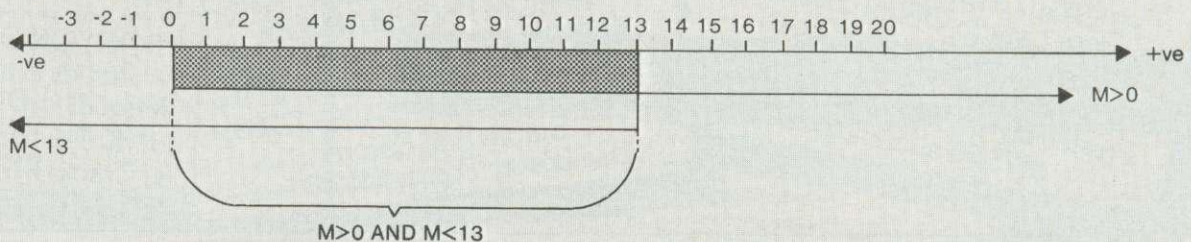


Figure 3.  $M > 0$  and  $M < 13$  true



```

10months=
*JANFEBMARAPR MAYJUNJUL AUGSEP OCTNOVDEC*
20REPEAT
30CLS
40INPUTTAB(0,9)"ENTER THE MONTH
(FROM 1 TO 12)"M
50 UNTIL M>0 AND M<13
60 PRINT "THAT MONTH'S NAME IS
*MID$(months,(M-1)*3+1,3)
    
```

Program 1. Repeat until range check

```

10REPEAT
20REPEAT
30CLS
40INPUTTAB(0,9)"ENTER MONTH (eg
JAN) " M$
50P =
INSTR("JANFEBMARAPR MAYJUNJUL AUGSEP OCTNO
VDEC",M$)
60 UNTIL P AND LENM$=3
70REPEAT
80CLS
90INPUTTAB(0,9)"ENTER THE DAY
NUMBER " D
100UNTIL (D)0)=(D<32)
110IFM$="FEB" AND D>28 PROCLepp:UNTIL
FALSE
120IFM$="SEP" AND D=31 PROCLepp:UNTIL
FALSE
130IFM$="APR" AND D=31 PROCLepp:UNTIL
FALSE
140IFM$="JUN" AND D=31 PROCLepp:UNTIL
FALSE
150 IFM$="NOV" AND D=31PROCLepp:UNTIL
FALSE
160CLS
170PRINTTAB(0,9)M$;" *D:" IS OK."
180 etc.
1000DEFPROCLepp
1010PRINT "Too many days for that
month"
1020PRINT "Press SPACE bar"
1030*FX15,0
1040REPEAT UNTIL GET=32
1050ENDPROC
    
```

Program 2. Getting the right date



Condition 1 M>0	Condition 2 M<13	AND function M>0 AND M<1	(Result)
FALSE	FALSE	FALSE	(Don't exit)
FALSE	TRUE	FALSE	(Don't exit)
TRUE	FALSE	FALSE	(Don't exit)
TRUE	TRUE	TRUE	(Exit)

Figure 4. Truth table for AND function

A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

Figure 5. Simplified Truth table

Condition A M>0	Condition B M<13	Condition C M=INT (M)	AND function M>0 AND M<13	(Result)
0	0	0	0	(Don't exit)
0	0	-1	0	(Don't exit)
0	-1	0	0	(Don't exit)
0	-1	-1	0	(Don't exit)
-1	0	0	0	(Don't exit)
-1	0	-1	0	(Don't exit)
-1	-1	0	0	(Don't exit)
-1	-1	-1	-1	(Exit)

Figure 6. Truth table for AND function

Conditions	Outcomes
1	2
2	4
3	8
4	16
5	32

Figure 7. Conditions to Outcomes table

more easily written truth table (figure 5). Here we replace condition 1 by the letter 'A' and condition 2 by 'B'. The true value is replaced by a number 1 (or -1 if you are a BBC purist) while false is replaced by 0. But how can we so blithely allocate number (particularly 1 and 0) to the outcome of the AND condition set up on the BBC micro? The answer is that providing that condition can only be satisfied in two ways, as for example a condition which can only be true or false, or a question which can be answered only yes or no, then we can accept 1 and 0 as shorthand terms.

The BBC micro goes one step further, however. Type:

```
PRINT 7=7
```

you should see the answer -1. Now try:

```
PRINT 7=1 or PRINT 7=14
```

you should see the answer 0.

O.K. so this is strange. Normally we are used to the = sign being an end in itself, but on the BBC micro, we need to alter our thinking. A better approach would be:

```
PRINT (Answer to question: 'is 7 equal to 7?')
```

or

```
PRINT (Answer to question: 'is 7 equal to 14?')
```

Obviously the answer to one question is yes and to the other no. The BBC simply translates the answers into terms it recognises, and which we can use further.

It would be extremely useful for readers to experiment with similar print statements, working through the normal operators. For example:

```
PRINT 5>2
PRINT 5>7
PRINT 4<2
PRINT 4<8
```

will help to give a feel for the machine's interpretation of these operators. Looking for extensions to program 1 at line 50, we require the computer to return a value of -1 or true when M>0 AND M<13. We should be able to provide this answer without the use of the AND connector. By clever (the Editor said that, honest) use of operators, we arrive at a new line:

```
50 UNTIL (M>0)=(M<13)
```

which mimics the AND statement.

The reason for the success is that M>0 becomes -1, and M<13 becomes -1 only when a number in the range 1 to 12 is entered. The = sign forces a final result of -1 only in this case. The other time when the = sign would present a -1 result is when M>0 and M<13 both return answers of 0, because in BBC logic 0=0 returns -1. However, because we are entering only 1

number, it cannot at one time be both less than 1 AND greater than 12. So the case of 0=0 never appears and the range can be checked adequately. It should be noted however that not every AND connector can be replaced by the formula in the new line 50.

Readers should make full use of the AND connector, as it enables quite complex one line branches to be constructed, combining the result of numerical calculations and string handling. Program 2 demonstrates this.

Program 1 has one major flaw. Run it and try typing a month number of 8.6. This results in the program displaying a month called 'UGS', which doesn't normally exist. The 'fix' for this is to ensure the number entered is an integer. This can be most efficiently done by replacing the variable M with M%. However for the purposes of examining further the AND operator we could alternatively alter line 50 to:

```
UNTIL M>0 AND M<13 AND M=INT(M)
```

Note that in this context M=INT(M) means: 'Is M a whole number (integer)'. Also M=INT(M) could be replaced with M=M DIV 1. We can use an extended truth table to examine which combination of true or false satisfies the repeat . . . until loop's exit condition. This is done in



# Software for the BBC Micro

# ...ROMS...

**Available Soon!**  
SEND FOR DETAILS

## Beeb-calc

A ROM based spread sheet program, like Wordwise this firmware is very fast and simple to use — yet is a powerful spread sheet analysis program, considerably better than the original 'calc' program — full floating point maths. Works in 80 or 40 column screen modes, variable column widths. Works with either cassette or disk.

This ROM coupled with Wordwise can turn your micro into an ideal small business machine.

£34.00 + VAT

## Debugging Program

2 machine code programs — one in ROM, one on tape. Essential for the machine code programmer. An ideal compliment to the assembler built into the BBC machine. Contains a full machine code monitor allowing examination and alteration of memory, registers, setting of break points and even single stepping through machine code programs.

ROM based £19.00 + VAT

cassette £10.00 + VAT

## Disk Doctor

A ROM containing useful disk utility programs. Enables the recovery of any data off the disk including deleted files etc. The full disk editor allows the alteration of any bytes directly on the disk (or in memory), or the loading and saving of any track or sector on the disk. Automatic transfer of programs from tape to disk and visa versa.

Includes a whole host of other useful utilities — string search, function key editing, the ability to format 35, 40 & 80 track disks.

£19.00 + VAT

## Printer toolkit ROM

This includes routines for high resolution screen dumps for both the EPSON and NEC printers. Will work in any graphics mode with automatic grey shading of all screen colours. The most useful feature of this program is its 'spooling' capability, this enables data such as a program listings or high res screen dumps to be automatically spooled from your disk to the printer while using your BBC machine for running other programs.

£19.00 + VAT

Quantity discounts, starting at five off.

# Wordwise

THE WORD PROCESSOR FOR THE BBC MICRO



**SUPERB REVIEWS!**

# Wordwise

The word processor for the BBC machine.

This ROM based word processor has received superb reviews.

A powerful and flexible system — it's greatest strength being that it is fast, simple and very easy to use. No other existing word processor (even ROM based, costing twice as much) can compare with the flexibility of this system.

Supplied with full spiral bound manual and cassette containing an example document and free typing tutor program.

£39.00 + £1.50 p&p + VAT

Now available from stock. Quantity discounts, starting at five off.

all ROM based software requires new series 1 Operating Systems. We are now in the position to supply 1.2 ROM's for £5.00 + VAT when you buy any of the above software.

**CASH OR ROYALTIES** waiting for any interesting software (not just games) for the BBC Micro. The better the program the more we will pay.

# Computer Concepts

Dept AC8

16, Wayside, Chipperfield,

Herts, WD4 9JJ. tel(09277) 69727





figure 6. For three outcomes, and this number is calculated by:

Number of possible outcomes  
 $= 2^{\text{number of conditions}}$

and this means the number of outcomes can be tabled as per figure 7.

As far as the AND function is concerned, only one outcome is true. Looking back at line 50 of program 1 we have:

```
50 UNTIL M>0 AND M<13 AND
M=INT(M)
```

this we know can be altered to:

```
50 UNTIL (M>0)=(M<13) AND
M=INT(M)
```

but we can further extend it to:

```
50 UNTIL ((M>0)=(M<13))<
((M=INT(M))=0)
```

Try altering line 50 as shown and confirm that only integers between 1 and 12 are accepted. The truth tables in figure 8 explain this. The third table shows only one true condition, when M lies between 1 and 12 and is an integer.

The logical OR operator connects expressions together in a different way. Examine program 3. Lines 40 and 80 show one way of handling input which may be in one of two states. Anything else is automatically rejected. However, we cannot take our truth table from either of these lines, because one possible condition never occurs, ie where we input on and off together. Of course, with one input we cannot enter two things, and so we need to look elsewhere for a suitable line to demonstrate the full OR function. The OR operator is also used in line 110, and the whole program will demonstrate its use.

Imagine you are in a room with only two light sources (no windows). You have two switches, each of which controls its own lamp. Program 3 simulates what happens as you open or close each switch (turn each lamp on and off). Figure 9 is an uncompleted truth table in terms of on and off which readers might like to complete as they run the program. We should be able to relate the answers from this truth table to the BBC logic states: -1 (true) and 0 (false). These produce the truth table of figure 10.

M>0	M<13	(M>0)=(M<13)
0	0	-1 N.B. This never occurs
0	-1	0
-1	0	0
-1	-1	-1

Figure 8a. Truth table for (M>0)=(M<13)

M=INT(M)	0	(M=INT(M))=0
0	0	-1
-1	0	0
0	0	-1
-1	0	0

Figure 8b. Truth table for ((M=INT(M))=0)

((M>0)=(M<13))	((M=INT(M))=0)	((M>0)=(M<13))<((M=INT(M))=0)
-1	-1	0
0	0	0
0	-1	0
-1	0	-1

Figure 8c. Truth table for full function

Condition of lamp 1 (On or Off)	Condition of lamp 2 (On or Off)	Room dark or light?

Figure 9. Truth table for OR operator

Condition A	Condition B	A OR B
0	0	0
0	-1	-1
-1	0	-1
-1	-1	-1

Figure 10. OR Truth table using logic states

It should be noted that the last line of the figure 10 truth table (when A is true and B is true) gives an acceptable true output. Readers needing to handle exclusively 'A or B' but 'A and B' will find this covered later.

It is of course possible to increase the number of OR

operators in a line. For example:

```
IF M$="FEB" OR M$="APR" OR
M$="MAR" THEN ...
```

is quite acceptable, and the IF condition is then satisfied if any one, or more than one expression is true. Figure 11 demonstrates the truth values for three OR operators.

```
10 REPEAT
20 CLS
30 INPUTTAB(0,9) "LAMP 1 ON OR OFF?"
L1$
40 UNTIL L1$="ON" OR L1$="OFF"
50 REPEAT
60 CLS
70 INPUTTAB(0,9) "LAMP 2 ON OR OFF?"
L2$
80 UNTIL L2$="ON" OR L2$="OFF"
90 CLS
100 PRINTTAB(0,9);
110 IF L1$="ON" OR L2$="ON" PRINT "YOU
CAN SEE!" ELSE PRINT "IT IS DARK!"
120 END
```

Program 3. Demo of OR logical operators



THE P.M.C.  
**WORDWORKER**

**PROFESSIONAL BBC WORDPROCESSOR\*  
 EASY TO USE AND VERY POWERFUL**

Includes full editing ability. Correct and change single words. Delete and insert any amount of text any time.

**AUTOMATIC REALIGNING  
 TEXT ALWAYS ON VIEW**

Set margins and page length to any size. Hold many pages at one time to print out together. Paper feed between pages allowed for. Print hard copy any time on any printer. Multiple copies.

**IDEAL FOR OFFICE OR HOME**

i.e. manuscripts/essays/documents and reports.

**ENORMOUS TIME SAVING**

Eliminate wasted work by typing errors etc.

**SAVE WORK AT ANY TIME**

Retrieve a hard copy (on printer) from pre-recorded work in seconds.

Sets out standard letters and inserts variable data. i.e. Change ... Name/Account No./Quotations in a widely used letter.

**DISK OR CASSETTE LETTER FILE  
 SEARCH FOR YOUR TEXT AMOUNT  
 MANY ON FILE**

40 or 80 Characters per line view on screen.  
 (Paper width is fully used which ever viewing mode is in use.)

**HOLDS OVER 1500 WORDS AT ONCE**

As powerful as Wordprocessors  
 twice (or more) the price.  
 STILL AT THE LOW PRICE OF

**£9.50**

Make cheque or P/O payable to: Paul Coker (Software)  
 Send to: 25, Farquhar Road, Crystal Palace, London SE19 1SS.  
 Telephone: 01-761 2087  
 Tape programme reproduction guaranteed.  
 Discounts on bulk orders.  
 Completely confidential printing service available.  
 Min - £2.00 per 200 lines.

We will adapt and supply hardware for disabled i.e. Dyslexics.

**OTHER SOFTWARE AVAILABLE**

MAZE GAME - move through the maze room by room to find the gold and the way out before time runs out . . . . £4.50\*  
 Educational MAZE GAME - learn as you play . . . . . £4.50\*  
 WORDHELP - improve childrens' basic skills with fun . . . £4.00  
 MATHS - fun as you learn . . . . . £4.00  
 REVERSE DICTIONARY - corrects spellings to ease writing. . . . . £6.50  
 (At the moment Reverse Dictionary runs on ZX81 64K/BBC to follow)

For learning programmes please state age range from 7-8/9-11/11-13

**ALL PROGRAMMES ALL PRICES  
 ALL INCLUSIVE**

\*Programmes need minimum of 32K RAM Memory.

Turn your computer into a powerful business tool and lessen your workload with the

P.M.C.

**WORDWORKER**

**BITS &  
 BYTES**

44 Fore St. Ilfracombe, Nth Devon. Tel: (0271) 62801

**ACORN DEALERS, BBC, DRAGON,  
 VIDEO GENIE SALES & SERVICE  
 EPSON HX20 COMPUTER**

Atom Micros	BBC Upgrade Kits
Colour Monitors	BBC printer interfaces
Seikosha GP100A Printers	5¼" Floppy Discs
Epson Printers	C-12 Cassette Tapes
Monitors - 12" B/W	Cassette Recorders
Monitors - 12" Green	Continuous Stationery Software
5¼" Disc Drives (C/W P.S.U. & CASE)	Software written to order

**REPAIRS  
 & SERVICE**  
 To all Micros

**USE A VDU?**

Now your BBC Model B can act as both micro and terminal. No more swapping to another keyboard for access to your main computer. Direct cursor control, protected fields, full handshaking and many more features all in the VDU Emulator Chip.

Emulation of Newbury Data Systems type 8003 VDU (subset) . . . . . £25

**NOW** - Full serial line communications support for your Basic programs. 'Call' routines for input/output giving automatic buffering and handshaking of serial line data. Assists straight forward file transfer and down-line program loading.

Serial Communicator Chip . . . . . £25

**SAVE!! Both programs on one chip . . . . . £35**

Software is fully licensed and runs with MOS 1.0 or later. Prices include full documentation, post and packing and 15% VAT. Make cheque/ postal order payable to 'Arts Ltd'.

*Special pricing for volume users.  
 Send S.A.E. for details of other emulators.*

Applied Real Time Systems Ltd.,  
 PO Box 32, Sunderland, Tyne & Wear.



OR and AND operators can be used together within a conditional line. Referring to program 2, we can replace lines 110 and 150 with:

```
110 IF(M$="FEB" AND D>28)
    OR ((M$="SEP" OR
    M$="APR" OR M$="JUN"
    OR M$="NOV") AND D=31)
    PROC_err:UNTIL FALSE
```

Brackets must be used with logical operators, so their sense is retained. The new line 110 has two main conditions. An error is flagged if the condition:

```
(M$="FEB" AND D>28)
```

is true, OR if the condition:

```
((M$="SEP" OR M$="APR" OR
    M$="JUN" OR M$="NOV")
    AND D=31)
```

is true. This latter condition can be further broken down to two other conditions:

```
(M$="SEP" OR M$="APR" OR
    M$="JUN" OR M$="NOV")
```

This becomes true if any of the months in the list has been selected. The true or false result of this is ANDed with D=31 so we can identify the other months with less than 31 days.

Looking at program 2, it is possible to convert the month names to numbers. The variable P does this in line 50. If we improve on line 60, we can guarantee that only the correct three letter abbreviations can be entered.

```
60 UNTIL P MOD 3=1 AND
    LENM$=3
```

Examining P, we find it takes the values 4,10,16,25,31 for the months Feb, Apr, Jun, Sept, and Nov. These are the months where the number of days is less than 31. Line 110 can be amended as follows:

```
110 IF ((P=4) AND (D>28)) OR
    ((P=25 OR P=10 OR P=16
    OR P=31) AND D=31)
    PROC_err: UNTIL FALSE
```

This line is useful because we can now consider how to write the full condition without AND or OR operators. Unlike the AND range check which we examined earlier, the AND in

```
((P=4) AND (D>28))
```

is able to take all values from the

Condition A	Condition B	Condition C	A OR B OR C
0	0	0	0
0	0	-1	-1
0	-1	0	-1
0	-1	-1	-1
-1	0	0	-1
-1	0	-1	-1
-1	-1	0	-1
-1	-1	-1	-1

Figure 11. Truth table for three OR operators

Condition A	Condition B	A * B
0	0	0
0	-1	0
-1	0	0
-1	-1	+1

Figure 12. Truth table for A \* B

Condition A	Condition B	A + B
0	0	0
0	-1	-1
-1	0	-1
-1	-1	-2

Figure 13. Truth table for A + B

Condition A	NOT A
0	-1
-1	0

Figure 14. Truth table for NOT A

AND truth table. This means we cannot replace the AND with an = sign as we did before. Look at figure 12, which is the result of multiplying the values of a truth table.

This is so close to the truth table for AND that the BBC micro will actually accept \* in place of AND in numerical logic calculations. Actually, the BBC micro recognises 0 as false and anything else as true. This means our expression can be written:

```
110 IF((P=4)*(D>28)) OR ((P=25
    OR P=10 OR P=16 OR
    P=31)*(D=31)) PROC_err:
    UNTIL FALSE
```

which leaves us looking for an equivalent to the OR operator. Look at figure 13 which is the truth table for addition.

Again, because of the way which the BBC recognises true, this table

is accepted as the equivalent of the OR truth table. Hence we can rewrite line 110 completely:

```
110 IF((P=4)*(D>28))+((P=25)
    +(P=10)+(P=16)+(P=31))*
    (D=31)) PROC_err: UNTIL
    FALSE
```

One word of caution! It is possible for the situation to arise where the arithmetic returns a false OR reading. Imagine that one condition (ANDed with the \* sign) produces +1 while another condition (ORED with a + sign) produces -1. If the results are ORed again with a + sign, they will in fact cancel out, because -1+1=0. Providing readers are aware of this, there is no reason why concise coding of conditionals cannot be achieved.

The NOT operator is different from AND and OR. First, because it only works with one value, and second because it only works with



a numerical value. Try typing:

```
P.NOT("JAN"="JAN")
```

The result should be '0'. What has happened is that ("JAN"="JAN") results in the numerical value -1 (true) and the NOT operator changes that to '0'. Figure 14 shows the short NOT truth table.

Logically, the NOT operator reverses a true state to a false state and vice versa. However the NOT operator works arithmetically too. Look at program 4, which simply NOTs any number which you enter. It seems as though the NOT operator performs the same function as:

```
30 P."NOT value is";-1*no-1
```

One last logical operator for this month is the EOR connector, which stands for 'Exclusive OR' and program 5 simulates this.

On running the program a darkened staircase appears, with a lamp turned off. At top and bottom of the stairs two light switches are marked 'down'. The one which is flashing indicates your position on the staircase. To move upstairs simply press the cursor up key. To move downstairs, press cursor down. The flashing switch position will change as you move up or down. To alter a switch, at your current position, just press 'U' to set that switch into the up position or 'D' to set it down. The light switches on or off depending on the switch positions of both switches. Figure 15 shows a truth table which readers might fill in.

The EOR function is used in line 370 to decide whether the switches are set alike, or whether they are different. The light is only turned on if the switches are set differently.

The most common equivalent of the EOR operator is the not equal sign <>. This would allow us to rewrite line 370 as follows:

```
370 IF SW$(1)<>SW$(0)
    VDU19,0,7;0; VDU19,4,6;0;
    VDU19,5,1;0; ELSE
    VDU19,0,0;0; VDU19,4,4;0;
    VDU19,5,5;0;
```

```
SCLS
10REPEAT
20INPUT "ANY NUMBER > " no
30P."NOT value is:- ";NOTno
40UNTIL FALSE
```

**Program 4. Using the NOT operator**

Upstairs switch up or down	Downstairs switch up or down	Light on or off
UP	UP	
UP	DOWN	
DOWN	UP	
DOWN	DOWN	

**Figure 15. Upstairs/Downstairs Simulation Truth table**

```
100N ERROR GOT0460
20*FX4,1
30level=0:MODE2:COLOUR130
40VDU23;8202;0;0;0;
50GC0L0,132:CLG
60GC0L0,5:PROC_rect(0,0,1280,100,1)
70GC0L 0,0:FOR x= 100 TO 700 STEP 50
80PROC_rect(100+x,x,1180-x,50,1)
90NEXT
100FOR x= 200 TO 800 STEP 100
110MOVE x,x-100:DRAWx,x+100
120NEXT
130FOR x= 900 TO 1200 STEP 100
140MOVE x,700:DRAWx,900:NEXT
150MOVE1380,900: DRAW800,900:
DRAW190,290
160MOVE1280,800: DRAW800,800:
DRAW190,190
170MOVE100,1024: DRAW112,992:
PLOT85,164,1024
180PLOT85,148,992
190MOVE132,992:DRAW132,960
200MOVE50,940:PLOT85,214,940
210MOVE120,940:MOVE120,920
220PLOT85,144,940
230PLOT85,144,920
240MOVE124,916:DRAW140,916
250MOVE128,912:DRAW136,912
260DIMY(1):SW$(1):Y(0)=2:Y(1)=(20)
270SW$(0)="DOWN":SW$(1)="DOWN"
280FOR P= 0 TO 1:PRINTTAB(15,Y(P));
SW$(1):NEXT
290REPEAT:A=INKEY(0)
300IF A=138 level=1
310IF A=139 level=0
320COLOUR3:PRINTTAB(15,Y(1-level));
SW$(1-level):COLOUR 9:PRINT
TAB(15,Y(level)); SW$(level)
330IF (A=85)*level SW$(1)=" UP "
340IF (A=68)*level SW$(1)="DOWN"
350IF (A=85)*(level=0) SW$(0)=" UP "
360IF (A=68)*(level=0) SW$(0)="DOWN"
370IF (SW$(1)=" UP ") EOR (SW$(0)="
UP ") VDU19,0,7;0; VDU19,4,6;0;
VDU19,5,1;0; ELSE VDU19,0,0;0;
VDU19,4,4;0; VDU19,5,5;0;
380UNTIL 0
390END
400DEFPROC_rect(x,y,1,w,f)
410MOVEx,y:DRAWx+1,y
420IFF=0 DRAWx+1,y+w ELSEPLOT85,x,y+w
430IFF=0 DRAWx,y+w ELSEPLOT85,x+1,y+w
440MOVEx,y+w:IFF=0 DRAWx,y ELSE
MOVEx,y
450ENDPROC
460MODE7:PRINT " at ";ERR:*FX4,0
470END
```

**Program 5. Simulation of the EOR operator**



# AMS announce the 3" disk drive

Simply plug in—ready to run



- \* Format and verify utilities on disk or EPROM
- \* Interface cables
- \* Manual
- \* Free disks

- \* 100k—£225
- \* 200k—£399

includes VAT and delivery to your door

NB When used with some computers, both drives and disks have a double density capability. Educational and Institutional orders welcomed.

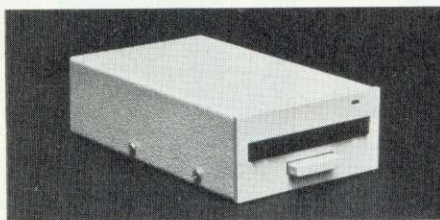


Japan,  
home of the

major disk drive manufacturers, has decided to make the new 3" disks a standard. And no wonder. Not only are they strong and easily stored, they give 100K per side, and you simply flip them over in the same way as a music cassette. The small light on the casing reminds you which side you are using. The disk is totally encased in rigid plastic, with no exposed surfaces, is easily inserted with one hand and simply removed by pressing the eject button. A unique feature of the new disks is a mechanical tab which prevents overwriting of precious data. And of course, you can switch it back when necessary.

## The neatest and best disk option ever

We've taken the brilliantly engineered and proven Hitachi 3" drive and housed it in rigid steel, textured and coloured to match your BBC Micro. And we've added cables, manuals, utilities on disk and EPROM, free disks—everything you need to upgrade your machine.



### Reliable and Robust

The Hitachi drive boasts a brushless direct drive motor, the best possible system for trouble-free use. AMS-3 units simply run off the BBC power supply—they don't need their own supply and there's no need to worry about corrupt data.

The standard interface lets you use the disk drive with most other computers and in tandem with 5¼" drives.

### High Speed Access

The disk drive provides a track-to-track access time of only 3mS, much faster than old-fashioned drives.

### Reliable delivery

You can now order your AMS-3 by mail order direct from Advanced Memory Systems Ltd. The units are delivered by courier service, complete with everything you need to get started. Just plug in the cables, and away you go.

Fill in the coupon below and we will send it to you with our full no-quibble money-back guarantee. Advanced Memory Systems Ltd, Woodside Technology Centre, Green Lane, Appleton, Warrington, Cheshire WA4 5NG.

Ring (0925) 62907 24 hours

TO: Advanced Memory Systems, Ltd, Woodside Technology Centre, Green Lane, Appleton, Warrington, Cheshire WA4 5NG.

Please send me by door-to-door courier:

\_\_\_\_\_ (qty) AMS-3 (S) single disk drive at £225 each with free disk.

\_\_\_\_\_ (qty) AMS-3 (T) twin disk drives at £399 each with two free disks.

(Prices include EPROM, utility disk, cables, manual, VAT and delivery).

Please send me by post, if not with drives:

\_\_\_\_\_ (qty) double sided (100K x 2) disks at £4.95 each.

\_\_\_\_\_ (qty) packs of five at £22.50 per pack.

\_\_\_\_\_ (qty) utility EPROM at £15.

I enclose a cheque for £\_\_\_\_\_

Name \_\_\_\_\_  
Address \_\_\_\_\_

Post Code \_\_\_\_\_ Tel No \_\_\_\_\_

Signature \_\_\_\_\_

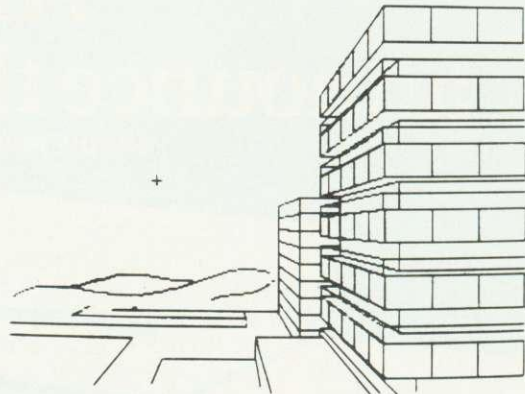
Please allow up to 28 days for delivery. AU7



# Draw with the BBC micro and show the true potential of your machine

Fill shapes in one of 23 colours (Mode I)  
 Draw points, lines, rectangles, ellipses and circles  
 Smooth curves  
 Wire frame diagrams  
 Hidden line removal  
 Draw in perspective  
 Measure scaled distances  
 Ekta sketch lines, Half tone facility  
 Mirror images  
 Repeat images, SS, enlarged, reduced, stretched  
 Actual colour displayed  
 Store up to 10 ellipses or circles in memory  
 Redraw any one of these at cursor position  
 Change any actual colour for one of 8 others  
 Clear screen, load screen, save screen  
 Print characters or numbers at any pixel point  
 Error messages for incorrect input  
 Fully comprehensive manual

356 496 \* □ \*\*\* 3



designs

This programme has been purpose designed by professional Graphic Designers for simplicity and ease of use, and is undoubtedly the most versatile drawing programme on the market at this time. There is no need to input any numerical data, as all judgements are made visually. The BBC Micro is the finest drawing machine in its price range. Find out what it can do.

The A.B. Designs drawing programme costs only £35 for over 70 functions (Model B). When ordering send Cheque/PO and include 50p for P&P. Please include phone no. with all correspondence. For further information send SAE and phone no. to A.B. Designs, 81 Sutton Common Road, Sutton, Surrey. 01-644 6643 (closed all day Thursday).

## BES

# Bourne Educational Software

### HAPPY NUMBERS (Code P22) £7.80+VAT NEW!

Uses full colour graphics to present attractive images to encourage children to learn their numbers and count. No reading skills required for this very easy to use program.

- Children encouraged through attractive flower collection and happy/sad face responses to their entries.
- Full use of sound reactions, but only with correct answers!
- Incorrect entries show equivalent number, then original entry counts to correct number. Records every entry to identify problem figures.

Suitable for 4-6 year olds and BBC Model B.

### WORLD-WISE (Code P19) £7.80+VAT NEW!

Two programs enabling children to build up fascinating information banks on their favourite geography subjects. Covers both UK and World in a series of 10 categories including, e.g. canals, towns, antiquities, etc. Your atlases and reference books well used as they try to find a river that passes through the Equator, or who built the Parthenon! Features:

- Powerful review/edit facilities to correct entries if required.
- Save and load the data at any time.
- Personalised responses with attractive sound.
- Maintains extensive information on individual childrens' entries.

Suitable for ages 7-15 and BBC Model B.

### WORDHANG (Code P20) £7.80 + VAT

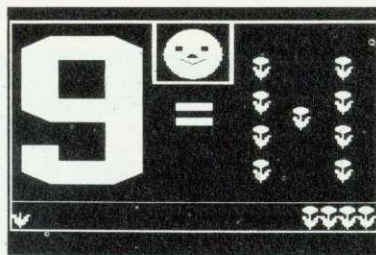
Educational version of 'hangman' word game, with full colour graphics and simple but attractive screen layout. Children no longer find learning to spell a chore as they try to keep him alive! Host of attractive features include:

- Lists totalling 260 words to suit reading age/subject. Facility to create and save own lists - ideal for that weekly spelling list!
- Time limit can be set for each guess.
- Monitors individual childrens' performance - time taken, list used, correct/incorrect attempts, etc.

Suitable for ages 5-13 years and BBC Model B.

### QUALITY EDUCATIONAL PROGRAMS

"... already proving very useful and popular ... envisage being widely used by children."  
 Mr I. Wilson, Headmaster, Weybridge C.E. Middle School.



HAPPY NUMBERS SCREEN

### TIMEMAN ONE (Code P23) £7.80 + VAT JUST RELEASED!

Children will love learning to tell the time and set the clock with TIMEMAN ONE. Right/wrong answers shown by happy/sad faces and figure climbing up (or down!) ladder. On completion of each stage the figure dances a jig to a tune and plants a flag. Choice of any one of progressive stages comprising:

- Telling hours • Telling minutes • Telling hours and minutes
- Setting hours • Setting minutes • Setting hours and minutes
- Attractive use of sound, but level adjustable. • Children shown the correct answer after each wrong entry, and the chance to try again. • Features full BES MONITOR - records individual childrens' separate entries. • Ability and needs easily identified, practice at specific stages can then be chosen.

Ideal for 4-9 year olds and BBC Model B.

### ANIMAL/VEGETABLE/MINERAL (Code P21) £4.95 + VAT

Think of an object and see if the computer can guess it correctly! Children love 'educating' the computer as it fails to get the answer right.

- Stimulates fascinating (and educational!) discussions as to the difference between alligators and crocodiles, and whether oil is vegetable or mineral.
- Encourages use of reference books as children try to find the answers to their own questions.
- Maintains full information on individual childrens' entries.

Suitable for ages 7-13 years and BBC Model A and B.

All programs feature cassette sized explanatory booklet. Postage and packing FREE. For 24-hour despatch by first-class post, send cheque to BES now!

Quantity	Code	Item	Format	Price	Total
_____	19	World-Wise	Cass.	£8.97	£
_____	20	Wordhang	Cass.	£8.97	£
_____	21	Animal/Vegetable/Mineral	Cass.	£5.69	£
_____	22	Happy Numbers	Cass.	£8.97	£
_____	23	Timeman One	Cass.	£8.97	£

I enclose cheque payable to BES

Total: £

Name .....

Address .....

BES, Dept AU5, Bedford Lane, Headbourne Worthy,  
 Winchester, Hants SO23 7SQ. Tel: (0962) 882474

BBC





# THE MAGIC OF RECURSION

BBC Basic is the first dialect of this language to incorporate procedures and allow recursive calls. Recursion always seems a mysterious, inaccessible process only applicable to obscure problems like finding factorials of  $n$ . Not so! Recursive techniques are important and powerful, finding major applications in artificial intelligence (eg game playing and robotic control), language processing (compilers and interpreters) and computer graphics.

Here, we will explain the ubiquitous Towers of Hanoi program that appears in the *User Guide*; show how a program can draw a map of solutions to the Towers of Hanoi, and introduce the intriguing world of recursive graphics. In a later article we will look at practical applications of recursion.

A recursive process is one that is 'described in terms of itself'. How can this be so? One of our students recently remarked that writing a recursive program seemed like an act of faith. Many human problems solving activities are recursive in nature. For example, consider planning a route through London from the *Acorn User* office in Bedford Square to the Cunard Hotel in Hammersmith. One way might be to pick an intermediate landmark such as Marble Arch and break the original problem down into getting from *Acorn User* to Marble Arch and then from Marble Arch to the Cunard. A problem of navigation has been broken down into two easier sub-problems of navigation.

This is the essence of recursion. The solution to a problem is described in terms of solutions to easier or smaller versions of the same problem. We could (rather fancifully) describe how to map our

## Jim McGregor and Alan Watt lift the mystery surrounding recursion with graphics and the Towers of Hanoi

route as follows:

```
10 DEF PROCfind__route__
  between(a, b)
20 IF getting from a to b is
  'easy' (one street say)
  THEN PROCprint__route(a, b):
  ENDPROC
30 m = a point midway between
  a and b
40 PROCfind__route__
  between(a, m)
50 PROCfind__route__
  between(m, b)
60 ENDPROC
```

We shall not expand this into a complete program, but the outline procedure describes a process with which we are all familiar. It also exhibits the essential features of a recursive procedure.

When a procedure is called, the particular problem to be considered is specified by means of its parameters:

```
PROCfind__route__between
  ("ACORN USER", "CUNARD
  HOTEL")
```

The first thing the procedure does is decide whether the problem represented by its parameters can be solved directly without breaking it down further. If this can be done, no recursion takes place. This is essential, otherwise the process would never stop.

Finally, if the problem to be solved by the call of the procedure

is not easy, it is broken down into easier subproblems and the procedure requests a solution to each of these in turn. The solutions to the subproblems are requested by calling the same procedure, but with different parameters. You might find it easier to think of the subproblem being solved by different copies of the procedure, although it does not happen this way inside the computer.

Using recursion successfully means learning to recognise when a problem can be broken down into easier, or smaller, versions of itself and remembering to start a recursive procedure with a test that recognises when a given problem does not need to be further broken down. It is usually easier to write a recursive procedure without worrying in detail about what the exact sequence of operations will be when the procedure is called (an 'act of faith' if you like). Just remember the two ingredients – the stopping condition and the breakdown into easier subproblems.

It is of course interesting to understand what does happen when we call a recursive procedure. In fact, when a program does not work as intended, such understanding is essential. Later, we shall explain in detail how recursive programs work, but first let us write some simple programs that use recursion.

**M**any programs presented in this section could be written without recursion using loops. However, such 'inappropriate' use of recursion provides a useful introduction using familiar problems.

The first example simply prints the positive integers from 1 to  $n$  using a procedure shown in program 1. We can break down the process of printing the numbers up to  $n$  into the problem of printing the numbers up to  $n-1$  followed by the use of a print statement to print  $n$ . If  $n = 0$ , there are no values to be printed and this condition is used to terminate recursion.

An interesting variation on this program is to change it so that it prints the integers up to  $n$ , but in reverse order. In this case, the

```
10 INPUT n
20 PROCprintupto(n)
30 END
100 DEF PROCprintupto(n)
110 IF n = 0 THEN ENDPROC
120 PROCprintupto(n-1)
130 PRINT n
140 ENDPROC
```

**Program 1. Prints positive integers from 1 to  $n$**

```
100 DEF PROCprintupto(n)
110 IF n = 0 THEN ENDPROC
120 PRINT n
130 PROCprintupto(n-1)
140 ENDPROC
```

**Program 2. Prints positive integers from 1 to  $n$  in reverse order**



# OUT NOW! 811 IDEAS FOR YOUR COMPUTER

NEW  
SAME-DAY  
DELIVERY  
IDEAS  
BOOK

In the Inmac catalogue of ideas for your computer check to see what is in the latest issue for you:

**Cables, cables and more cables!** How to order custom-built cables. When to use screened cables. How to choose the right EIA RS-232 extension cables for your VDU's and how to connect your Apple, Commodore, or other micros to Qume, Diablo, NEC printers. Compatible cables for connecting new peripherals to your DEC, Data General, Hewlett Packard, IBM, Osborne, and Tandy computers.

**Lifetime Floppies** Read about Inmac Plus — the floppy with a lifetime guarantee! Choose from our range of 100% error-free disk cartridges, floppy

each with a 3-year replacement guarantee.

**New Ideas!** Dozens of exciting new products — many never seen in Europe before now — and lots of helpful hints on getting more from your computer department.

**Service and Quality — a promise you can rely on!** We promise a next day delivery service of our products, a 30-day risk-FREE trial, and a 12-month trouble-free quality replacement guarantee.

Send today for your FREE catalogue with no obligation to purchase — but be warned: you will want to buy once you have read the Inmac catalogue ideas book!



**FREE!** IF YOU USE A COMPUTER  
☎ 09285-64321/67551

Send this coupon to Dept 164, Inmac (UK) Limited, Davy Road, Astmoor Industrial Estate, Runcorn, Cheshire WA7 1PZ.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

24 hour tel. no.

☎ 09285-64321

164



breakdown into an easier sub-problem gives:

```
PRINT n
print numbers up to n-1 in
reverse order
```

The only change that needs to be made to the previous program is to switch lines 120 and 130 (program 2).

The first two programs are examples of what is sometimes called 'unary recursion' - a problem is broken down into one easier version of itself together with straightforward operations such as PRINT.

A simple example of 'binary recursion', where a problem is broken down into two simpler versions of itself, is provided by an alternative approach to printing the first n integers. We can define a procedure that prints the integers in a given range. For example,

```
PROCprintbetween(3,7)
```

will print 3, 4, 5, 6, 7

```
PROCprintbetween(4,4)
```

will print the single integer 4. This procedure could be used to print the positive integers up to n by calling

```
PROCprintbetween(1,n)
```

PROCprintbetween can be defined using binary recursion if we break down the problem of printing a given sequence as follows:

```
print the first half of the
sequence
print the second half of the
sequence
```

If only one value is to be printed, this breakdown will not be needed (program 3). It is vital when writing recursive programs that variables should be declared local wherever appropriate.

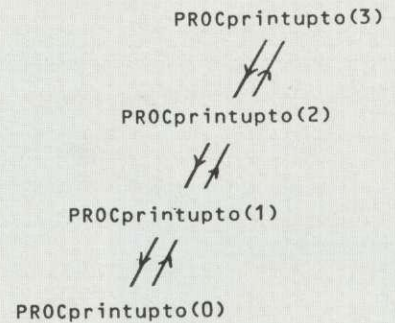
**N**ow return to program 1. We can illustrate the behaviour of this program for a call of PROCprintupto(3) by the 'tree' of procedure calls in figure 1. (The tree has only one branch at each level because we are using unary recursion.) PROCprintupto is called at several points with a different parameter each time. The only difference is that successive calls of PROCprintupto take place *before* the previous call has finished. The easiest way

```
10 INPUT max
20 PROCprintupto(max)
30 END

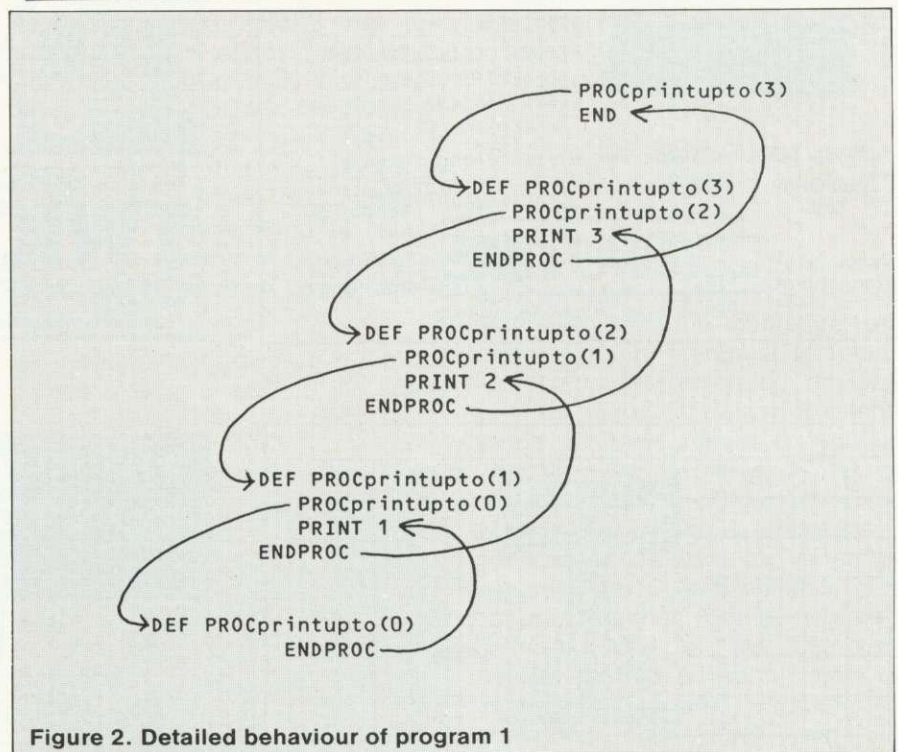
100 DEF PROCprintupto(n)
110 PROCprintbetween(1, n)
120 ENDPROC

130 DEF PROCprintbetween(i, j)
140 LOCAL mid
150 IF i=j THEN PRINT i : ENDPROC
160 mid = (i+j) DIV 2
170 PROCprintbetween(i, mid)
180 PROCprintbetween(mid+1, j)
190 ENDPROC
```

**Program 3. Illustrates binary recursion**



**Figure 1. Tree of procedure calls for program 1**



**Figure 2. Detailed behaviour of program 1**

to understand what is happening is to imagine a separate copy of the procedure being created each time it is called. Of course, copying would be extremely wasteful and recursion is organised much more efficiently behind the scenes. Only the storage space for parameters and local variables need be copied when a procedure is called. However, in appreciating how a recursive procedure works, it is convenient to imagine the whole procedure being copied. We shall refer to these copies of a procedure as 'activations'. We can expand the above tree of procedure calls in more detail (figure 2).

Now consider the behaviour of PROCprintbetween, the procedure that used binary recursion. In this program, a call of PROCprintupto(5)

results in a call of PROCprintbetween(1,5).

This executes the following:

```
mid = (1+5) DIV 2 ie mid = 3
PROCprintbetween(1,3)
PROCprintbetween(4,5)
```

Each of the two recursive calls of PROCprintbetween behave in a similar way and figure 3 is the tree of procedure calls that takes place. Follow the arrows through this tree and see exactly how the sequence of procedure calls results in the numbers being printed as required.

Note the importance of declaring 'mid' to be local to PROCprintbetween. This results in each recursive call of the procedure having its own private variable called 'mid'. Changing the value of this does not effect the current value of 'mid' in



## BBC EXPANDABLE CONSOLE

A professional console to house disc drives/2nd processor/Torch dual drives/teletext, etc. All untidy wiring out of sight in the strong aluminium console in a matching textured colour. Coming soon a bolt on extra module for extra expansions.

Also available a matching printer stand, yes stack your paper under the printer.



### PRINTER/VDU STAND

BBC owners who only need a VDU stand will find the stand slips comfortably over the BBC with adequate ventilation allowed for. After use the micro can be slid UNDER the stand acting as a dust cover when micro not in use

### PRICES :

BASIC CONSOLE as shown only £39.99 + £4.00 p/p  
 PRINTER/VDU STAND only £14.99 + £2.00 p/p

For further information enclose sae or send cheque to,  
 Mail Order Only **Silent** 01-801 3014 27 Wycombe Rd London N17

Viewing by arrangement **COMPUTERS** 24 hour ansaphone  
 Please allow 28 days for delivery

# BUY THE BEST BRITISH COMPUTER

## In stock NOW!

BBC Model A £299 incl VAT  
 BBC Model B £399 incl VAT

- + Wordwise Word Processor (needs 1.0 System)
- + Software—Acorn, Bugbyte, Computer Concepts (Logo 2)
- + Joysticks for the BBC + 100K Single Disk Drives
- + Torch 800K Twin Disk Drives with CPN (Equivalent to CPM\*)

WE DELIVER NATIONWIDE!

\*Reg. trademark of Digital Research

### SPECIAL OFFERS

Whilst stocks last!

For the BBC:  
 Screen Layout Pad,  
 Flow Chart Pad &  
 Symbol Design Pad  
 Kit with ring binder  
 Rec. retail price £15.50  
**OUR PRICE ONLY**  
**£12.50 incl VAT**

VIC-20 Clearance:  
 Arfon Expand Unit £85  
 VIC Games Cartridges:  
 Mission Impossible £20  
 Rat Race £16  
 Road Race £16  
 Mole Attack £16  
 All prices include VAT!

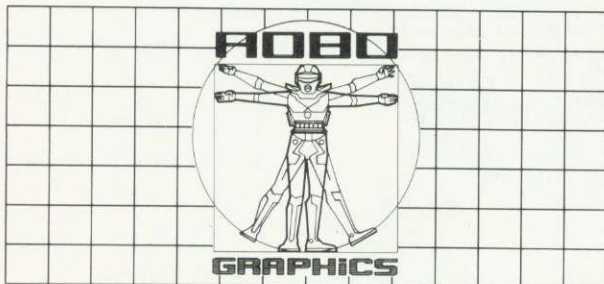
PLUS computers, peripherals, printers, software, games, books and much, much more from leading makers at low prices - always available from your local stockist:

# TWICKENHAM COMPUTER CENTRE LTD

72 Heath Rd Twickenham Middx TW1 4BW (01-892 7896/01-891 1612)



ACORN OFFICIAL STOCKISTS



Robocom Ltd—the UK's leading supplier of microcomputer-based CAD systems is looking for bright enthusiastic programmers to join their innovative development team.

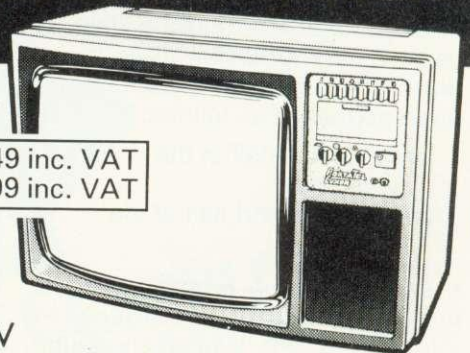
6502 assembler experience an advantage. Applicants will be given the opportunity to develop experience with UNIX and 'C'

Top level remuneration negotiable according to age and experience.

**Please contact Martin Ellis on 01-263 6682**

Robocom Ltd. CIL Building, Goodwin Street London N4 3HQ 01-263 8585

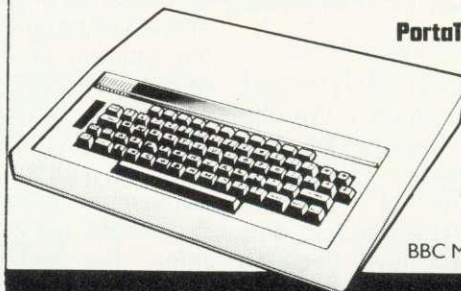
## TIMESHARE YOUR COLOUR MONITOR WITH THE FAMILY



14" £249 inc. VAT  
 16" £299 inc. VAT

COLOUR TV PLUS RGB MONITOR

PortaTel-LUXOR RGB 3711



EXCELLENT RESOLUTION AND GEOMETRY

BBC MICRO LEAD INCLUDED



PORTATEL CONVERSIONS LIMITED,  
 25 SUNBURY CROSS CENTRE,  
 SUNBURY-ON-THAMES,  
 MIDDLESEX TW16 7BB  
 Telephone: Sunbury-on-Thames 88972



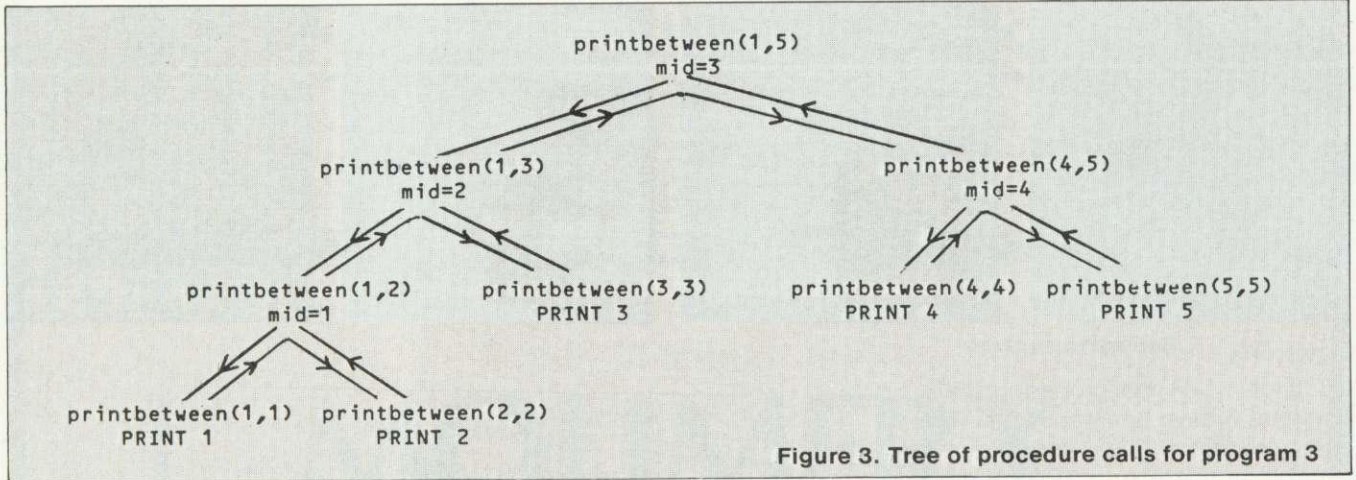


Figure 3. Tree of procedure calls for program 3

other activations or copies of the procedure.

The classic 'Towers of Hanoi' puzzle has been used as an illustration of recursion in the *User Guide*, but without explanation (p329). The puzzle consists of three (or more) pegs mounted on a base together with a number of discs, all of different diameter. The discs have holes which allow them to be slipped on and off the pegs. The initial state is as shown in figure 4. The problem is to find a sequence of moves that transfers the piles of discs from PEG1 to PEG2 subject to the following rules:

- only one disc can be moved at a time;
- no disc can ever rest on a disc smaller than itself.

PEG3 can be used during the transfer as a temporary resting place for discs.

Here is a solution to the three disc problem:

- Move DISC 1 from PEG 2 to PEG 3
- Move DISC 2 from PEG 1 to PEG 3
- Move DISC 1 from PEG 2 to PEG 3
- Move DISC 3 from PEG 1 to PEG 2
- Move DISC 1 from PEG 3 to PEG 1
- Move DISC 2 from PEG 3 to PEG 2
- Move DISC 1 from PEG 1 to PEG 2

To produce a recursive procedure for the problem we can reason as follows. At some stage during the solution, we must move DISC3 (the largest from PEG1 to PEG2. To do this, all other discs must be out of the way on PEG3. Thus, we must first solve the easier problem of transferring two discs to PEG3 (using PEG2 as a spare if

necessary). While this subproblem is being solved, DISC3 can be treated as part of the fixed base. After this subproblem has been solved, and DISC3 has been moved to PEG2, we need to transfer the two discs on PEG 3 to PEG2, DISC3 again being treated as part of the base (figure 5). Hence to transfer a tower of n discs from one peg to another peg given a spare peg:

- first transfer a tower of n-1 discs from the 'from peg' to the spare peg using the 'to peg' as a spare;

- then move disc n to the 'to peg';
- transfer the tower of n-1 discs from the spare peg to the 'to peg' using the 'from peg' as a spare.

This can be implemented directly as a Basic procedure (program 4).

Many complex patterns and curves can easily be drawn recursively and the technique is a useful tool in computer graphics and computer generated art. The simplest recursive pattern is one in which a basic shape is drawn together with recursive copies of smaller versions of the complete pattern. For example, program 5 creates a pattern of recursive squares. The pattern consists of a square, together with a recursive half-size copy of the complete pattern centred on each corner of the main square. Program 5 generates our first set of photographs which show the three stages in the build-up for r=192, together with the complete pattern. For example, the first illustrates the

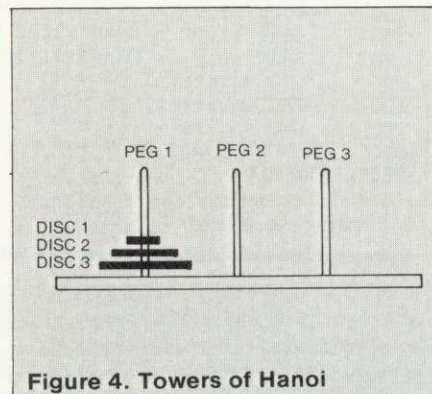


Figure 4. Towers of Hanoi

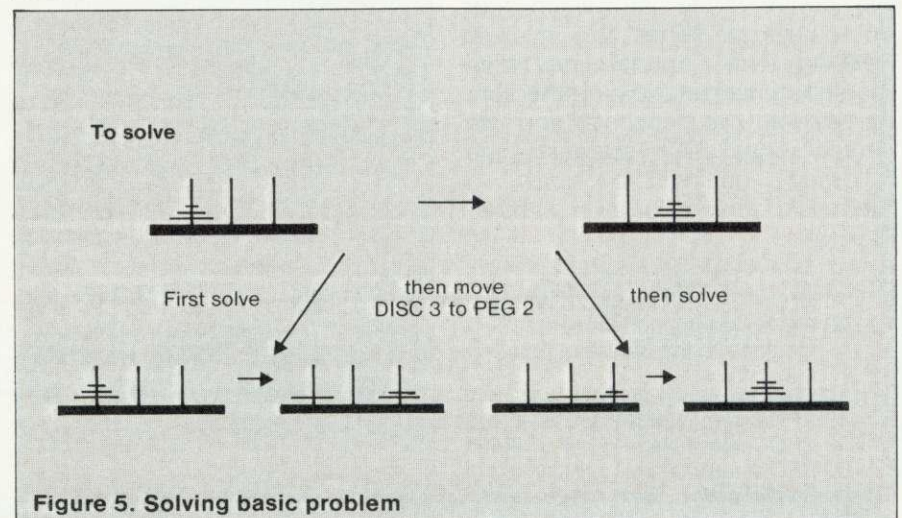
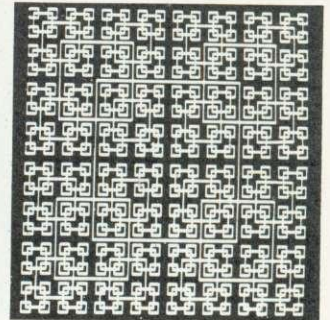
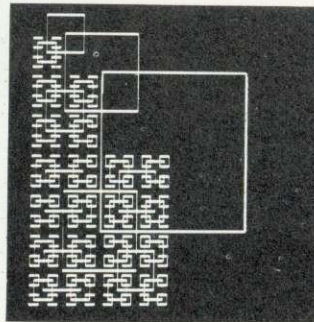
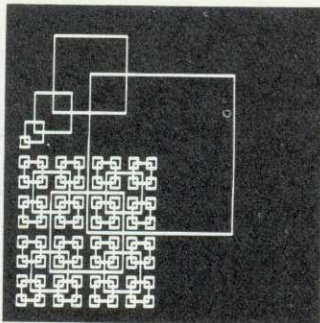
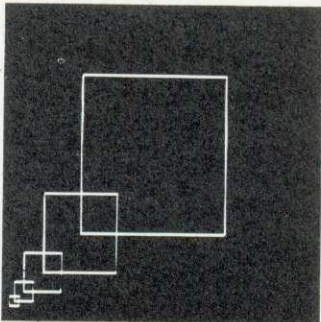


Figure 5. Solving basic problem





◀ page 36

## Recursive squares

situation when the procedure calls in figure 6 have been activated. The last procedure call triggers the stopping condition ( $r < 10$ ) and does not draw a square.

At the stage reached in the second photograph, the tree of procedure calls that has been obeyed and terminated, together with the procedure calls that are still active, has the shape shown in figure 7. (Active calls are down the right.)

A large variety of patterns come into the category of 'space filling curves'. These are such that they can usually be drawn as a single continuous line or curve in some well defined way. We shall illustrate the technique using 'Sierpinski curves'.

The second set of photographs shows the Sierpinski curves of orders 1 to 4. It is convenient to define a Sierpinski curve of order 0 which consists of a diamond (figure 8).

The Sierpinski curve of order 1 consists of four order 0 curves joined at the centre. Similarly, the order 2 curve consists of four order 1 curves joined at the centre. In general, an order  $n$  curve consists of four order  $n-1$  curves joined at the centre. Note that when four sub-curves are joined, this involves deleting four diagonal lines from the sub-curves and joining the sub-curves with two horizontal and two vertical lines. This suggests the following outline to draw a Sierpinski curve of order  $n$ , centred at  $(x, y)$ :

```

100 DEF PROCsierpinski(n,x,y)
110 IF n = 0 THEN draw a diamond
120 k = horizontal and vertical distance to the centre of four sub-curves
130 PROCsierpinski(n-1, x-k, y-k)
140 PROCsierpinski(n-1, x-k, y+k)
150 PROCsierpinski(n-1, x+k, y+k)
160 PROCsierpinski(n-1, x+k, y-k)
170 ENDPROC
    
```

▶ page 55

```

10 INPUT "Number of discs",noofdiscs
20 PROCtransfer(noofdiscs,1,2,3)
30 END
100 DEF PROCtransfer(n,frompeg,topeg,sparepeg)
110 IF n=0 THEN ENDPROC
120 PROCtransfer(n-1,frompeg,sparepeg,topeg)
130 PRINT "Move DISC ";n;" from PEG ";frompeg;
    " to PEG ";topeg
140 PROCtransfer(n-1,sparepeg,topeg,frompeg)
150 ENDPROC
    
```

Program 4. Towers of Hanoi solution

```

10 INPUT "radius",r
20 MODE 1
30 PROCsquare(640,512,r)
40 k=GET:MODE 7
50 END
100 DEF PROCsquare(xc,yc,r)
110 IF r<10 THEN ENDPROC
120 LOCAL x1,x2,y1,y2
130 x1=xc-r:x2=xc+r
140 y1=yc-r:y2=yc+r
150 MOVE x1,y1
160 DRAW x1,y2 : DRAW x2,y2
170 DRAW x2,y1 : DRAW x1,y1
180 PROCsquare(x1,y1,r/2)
190 PROCsquare(x1,y2,r/2)
200 PROCsquare(x2,y2,r/2)
210 PROCsquare(x2,y1,r/2)
220 ENDPROC
    
```

Program 5. Recursive squares

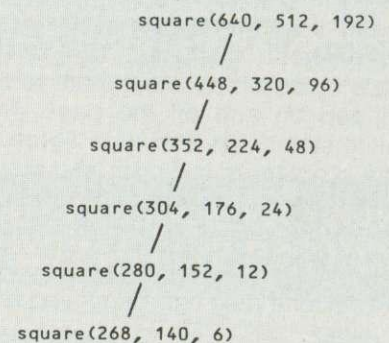


Figure 6. First six procedure activations for program 5

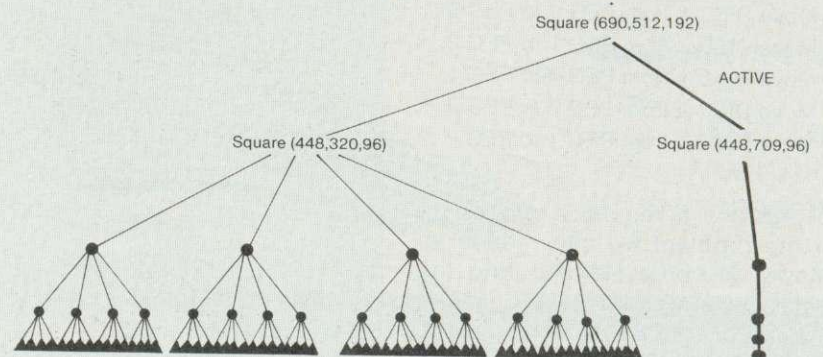


Figure 7. Procedure calls for Sierpinski photographs





# Software News

INNOVATIVE  
BBC SOFTWARE



*from the professionals*

# MOLIMERX EXPANDS INTO THE BBC!

Bexhill — June 1983

TODAY a spokesman for Molimerx Ltd., the TRS-80 Genie Software House of Bexhill, announced that they are entering the BBC Software market.

Until now, Molimerx have been supplying software for all of the Tandy machines plus all of the Genie microcomputers, some dozen machines in all. As they have been doing this for some 5 years, they have accumulated a vast number of programs — in the range of 400-500 in number. Molimerx will be translating all of their best existing programs together with publishing new programs specifically written for the BBC. They are hoping, therefore, to be releasing around six new programs per month for some time to come.

Their spokesman said today that where

programs are going to be translated, the features unique to the BBC will be utilised to the maximum. Specifically Molimerx say that translations will not just be a code adaptation, but will also incorporate BBC features. They gave as an example the recently completed translation of Shuttle. This is a simulation of the Columbia space shuttle. In the TRS-80 version it is displayed in straight text. The BBC version, however, contains a coloured graphic representation of the ship.

The spokesman said that the main thrust will be towards new programs and Molimerx are actively soliciting new software from both their existing stable of 120 authors and are also searching for new qualified authors, experienced on

the BBC machine.

Over the years, Molimerx have built up a catalogue of some 170 pages. The procedure is that an addition containing new software is published every 8 weeks or so. The existing index is discarded and the new addition contains a new up-dated index. The catalogue is punched for a ring binder; hence, customers always have a current and up to date catalogue. Molimerx say that this same procedure will be used for the new BBC software catalogue.

Owners of BBC machines, therefore, should write to Molimerx for a copy of their current catalogue. For at least a while, there will be no charge. Customers should send an A4 size stamped addressed envelope for 17p.

TEL: [0424] 220391/223636

**MOLIMERX™ LTD**  
A J HARDING (MOLIMERX)

TELEX 86736 SOTEX G

1 BUCKHURST ROAD, TOWN HALL SQUARE, BEXHILL-ON-SEA, EAST SUSSEX.



Come to

# MICROAGE ELECTRONICS

NEWSFLASH  
we are now

**ORIC!**  
hardware and  
software dealers

**\* BBC + Disk Interface, 800K  
Disk Drive, Word Processing ROM,  
Epson Printer, Dust covers for all  
units, Basic Programming Book,  
Cassette lead, Paper & Cable.**  
Normal Price £1748.80  
**Our Price £1599.00**  
Saving £149.80 **FREE  
COURIER**

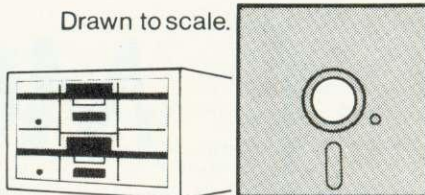
### ACORNSOFT FOR BBC

\*Snapper, \*Planetoid, \*Monsters, \*Rocket Raid,  
\*Meteor \*Super Invaders, Philosophers  
Quest, Sphinx Adventure, Arcadians, Lisp  
Cassette, Peeko Computer, Creative  
Graphics Tape, Graphs and Charts Tape,  
Desk Diary, Arcade Action, View (on ROM)  
and Printer Drive Cassette.  
Available on Disk.

All Acornsoft at £9.95 each, except  
Arcade Action (£11.90), Lisp (£16.85),  
View and Printer Drive (£69.90),  
Wordwise word Processing ROM (£46.00)  
+ £2.00 p+p.

Only a selection of Acornsoft available.

Drawn to scale.



BBC compact, slimline Disk Drive.

### BBC MACHINES

Model A, 32K RAM & 6522 Chip	£329.00
Model B	£399.00
Model B + Disk Interface	£494.00
BBC Dust Covers	£3.95
BBC Compatible Single Disk Drive* (100K)	£235.00
BBC Compatible Dual Disk Drive* (200K)	£389.00
BBC Dual Slimline Disk Drive* (Double Sided & Density 800K)	£799.00
Verbatim Single Sided Diskettes 10 for	£22.50
Verbatim Double Sided Diskettes 10 for	£39.95
Let us fit a disk interface in 24hrs	£95.00
RH Electronics colour light pen	£37.00

### BBC MONITORS

14" RGB Microvitec Colour Monitor (as used in the BBC Computer Prog.) Including lead	£284.00
Microvitec High Res. Colour Monitor	£575.00
12" Zenith High Res. Green screen Monitor	£95.00
BNC Cable for above	£4.95
BBC Compatible Cassette Player price on application	
Blank Data Cassettes 10 for	£3.50
	+ £1.30 p&p
DIN to Jack Lead	£2.00
	+ 75p p&p
Official Joysticks per pair	£13.00
	+ £1.30 p&p

\*All Drives include manual and utility Disk.

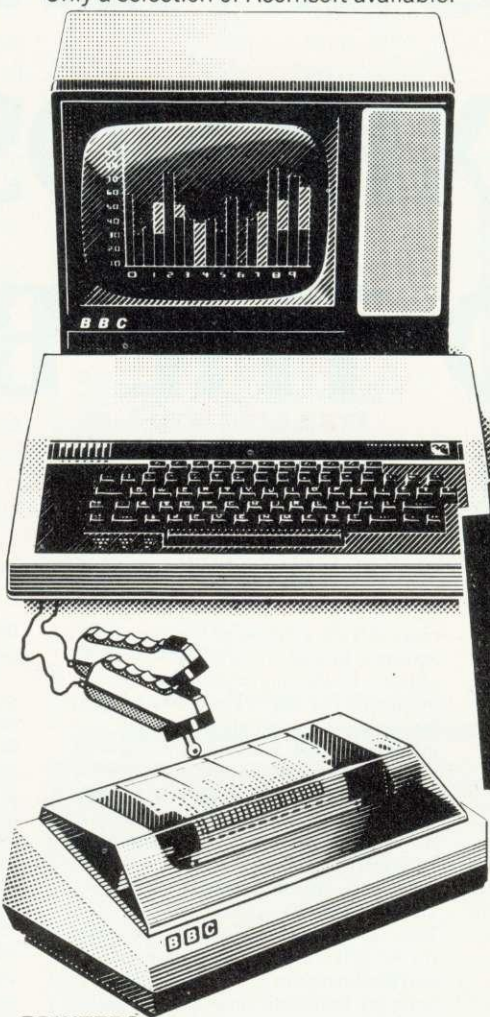
All items subject to availability.

All the products are the official versions,  
beware of imitations, they will invalidate  
your guarantee.

We accept official orders from educational  
establishments.

Credit card holders can phone in for  
express despatch.

Send large S.A.E. for lists and info pack.



### PRINTERS

Acorn AP-80A now down to	£189.00
Acorn AP-100A now down to	£215.00
AP-80A Ribbons	£4.95
AP-100A Ribbons	£5.95
Brand new Epson FX 80	

Contact us for details

All printers include cable & paper	
Epson Dust Cover	£3.95
Parallel printer cable	£15.00

### BOOKS

Practical Programs for BBC & Atom	£5.95
BASIC Programming on the BBC Micro	£5.95
Assembly language programming for BBC	£8.95
BBC Micro Revealed	£7.95
Creative Graphics, Graphs & Charts, LISP	all at £7.50 each
30hr. BASIC	£5.95
Let your BBC Micro teach you to program	£6.45

**\* BBC Model 'B' wordprocessing  
pack at a low price of only £699.  
Save £44. Normal price £743.**  
The Pack consists of: BBC Model  
'B' GP100 Printer Cables, Cassette  
Player Word Processing ROM 1,000  
sheets of paper. Then add the  
GP100A Printer at only £215.  
The lowest price ever.

**FREE  
COURIER**

### POSTAGE RATES

Small items such as Ribbon, books &  
software:— 1 item £1.00, 2 items or more  
All Dust Covers £1.00 p&p 50p per unit

### BY COURIER TO YOUR DOOR

Large items such as Computers, Disk  
Drives & Monitors:— 1 item £7 2 items £10  
3 or more £13

### ATTENTION!!

All Lynx, Oric, BBC, Commodore 64  
owners, we pay top royalties for quality  
software programs. Please write or  
phone for details.



Barclaycard and Access  
welcomed All prices include VAT

**ALL PRICES INCLUDE VAT. FOR FURTHER  
DETAILS AND MAIL ORDER LIST SEND LARGE S.A.E.**  
Open Mon-Sat 9.15am - 6.00pm. Thurs 9.15am - 1.00pm.

**MICROAGE ELECTRONICS**  
135 HALE LANE EDWARE MIDDLESEX HA8 9QP  
TEL: 01 959 7119 TELEX 881 3241





# THE SECRETS OF HANDLING

# ARRAYS ARRAYS ARRAYS

If you live on huge arrays and long strings, you need to know just how they are handled in the memory: but the *User Guide* will not tell you. So here is a guide to BBC variables.

Let's look at the program itself. The address of the first program byte is given by PAGE. This can be changed by the user, but is &0E00 (unless you have discs, etc). Each program line consists of four bytes, followed by the text of the line. The four bytes are: &0D; high byte of line number; low byte of line number; length of line.

The last program line is followed by &0D, &FF. In fact these two bytes are present even when there is no program; thus the value of TOP, which points to the byte after the &FF, is always at least two more than PAGE. LOMEM is normally the same as TOP, and marks the first byte of the variables store. Locations &0002,03 give the low and high bytes of the address, which I'll call VARTOP, of the 'next free byte' in store.

For this article, I've divided variables into three categories: simple variables; arrays; functions and procedures. Figure 1 shows, in a modular fashion, the structure of each category when stored in the memory. The number under the module shows how many bytes it occupies.

Now for a description of each module. NE (Next, two bytes). These

## Ian Copestake explains how the Beeb uses strings and arrays in memory

two locations give the low and high bytes of the address of either (a) the next variable whose name begins with the same character, or (b) the next function or procedure (whatever its name begins with). The high byte is reset to zero if there is no such next variable.

NA (Name, zero or more bytes) is made up of the ASCII code for:

- the first letter of the name, only if it is a function or a procedure, plus
- the rest of the name (if any), plus
- '%' for an integer numeric variable, plus
- '\$', for a string variable, plus
- '(', for an array.

Thus the first letter of the name of a simple variable or array is not stored here: a real (floating point) variable called A will have no NA module at all.

00 (Zero), is a single byte containing the value zero.

VA (Value, four or five bytes) has three forms (figure 2). In the first form, real numeric, the exponent byte is followed by four mantissa

bytes. Bit 7 of the first mantissa byte gives the sign of the number.

Next there is integer numeric. This has four bytes, the first being the least significant.

Finally, the string form. TE gives the low and high bytes of the address where the text of the string is stored. When a simple string variable is first created, the text will follow the VA module; but, as we will see later, it may not stay there for long. RE is the number of bytes reserved for the text of the string. LE is the current length of that text, and may be less than RE.

In an array, the form of the VA module will of course depend on the form of the array. If the array has 50 elements, 50 VA modules will be stored right from the start; but no actual text space is reserved for a string array by the DIM statement (in other words all REs and LEs will be zero). The element numbers of the VA modules in an array run in the order (0,0) (0,1) . . . (1,0) . . . and so on.

HE (header, one byte) indicates the number of bytes in an array header, measured from HE itself to DL, inclusive. Looked at another way, the value of HE is one more than twice the number of dimensions in the array. Since HE is a single byte, you can declare an array with up to 127 dimensions - if you're really keen!

DO to DL (zero to last dimension, two bytes each). There is a pair

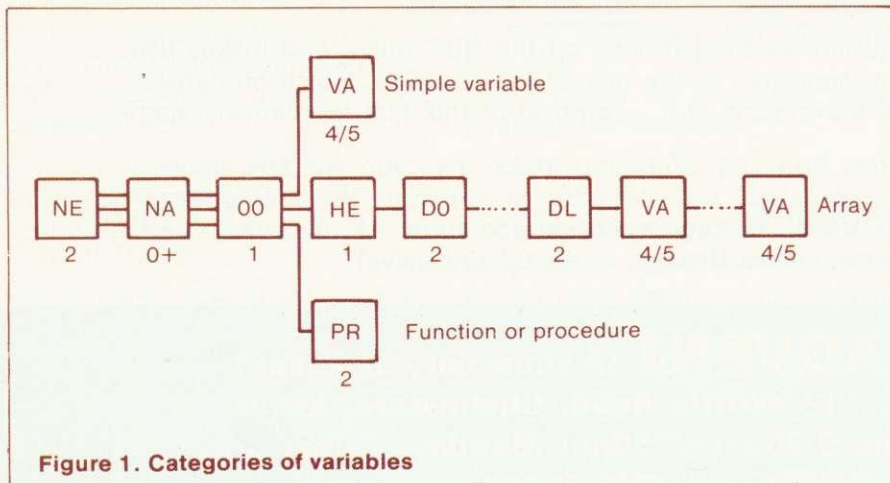


Figure 1. Categories of variables

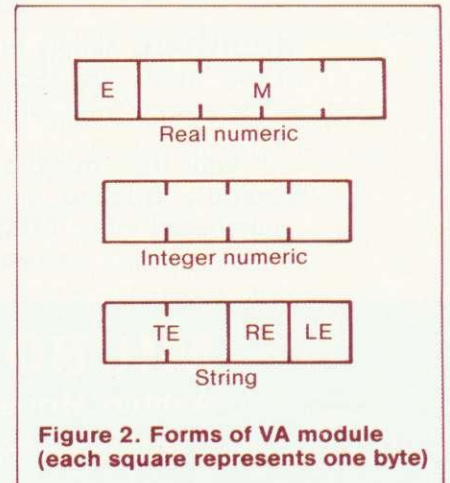


Figure 2. Forms of VA module (each square represents one byte)



Available Now  
Full instructions enclosed

# MICROVOC

Patent applied for.

**Yes it's here!** A complete sound system for the B.B.C. Micro, realistically priced at £21 (Inc. V.A.T.) plus £2.00 post and packaging. (domestic market only).

## MICROVOC – the BBC Sound System

**MICROVOC** is a complete sound system designed specifically for the BBC micro, capable of use with either speech synthesis or computer produced music.

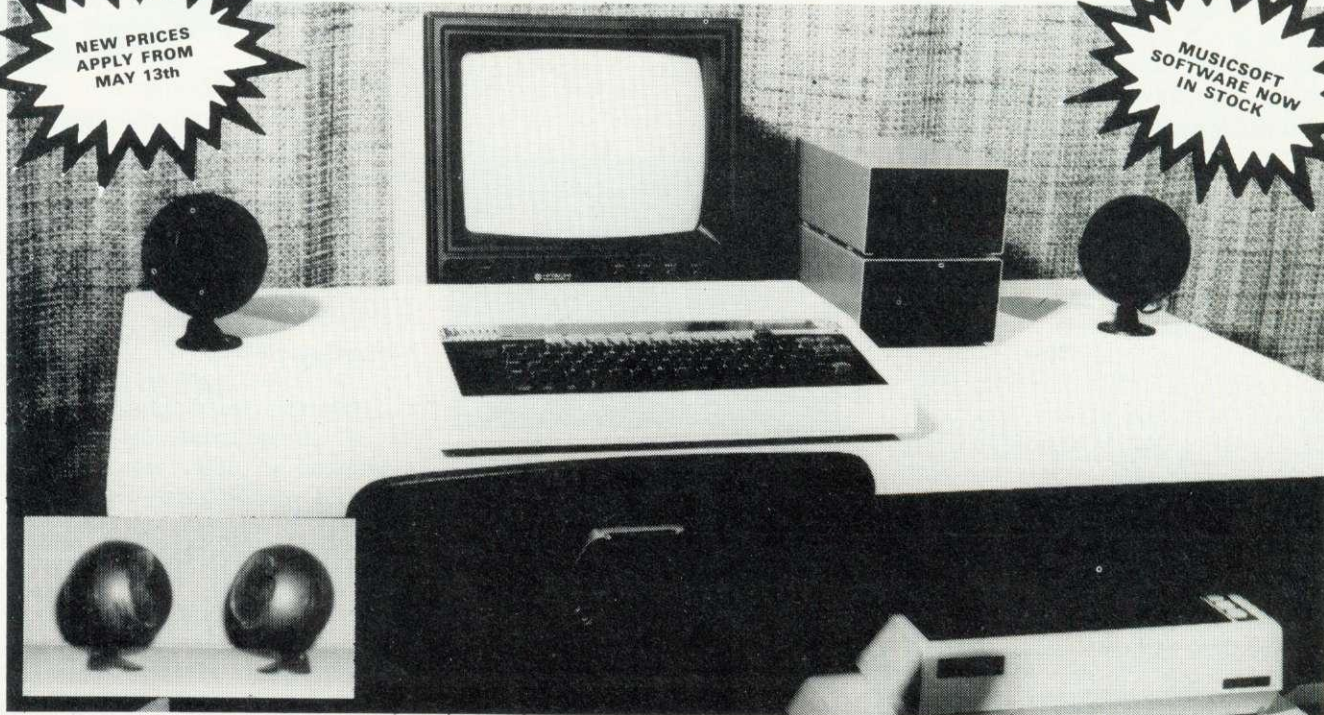
Using the BBC micro's own power, **MICROVOC** can literally fill the average sized room with a quality of sound you may not have believed possible.

Supplied with robust, ultra modern, spherical speakers, which can be free standing, to compliment the BBC machine, or fixed to the wall, or indeed out of sight on the underside of your desk, **MICROVOC** brings out the true quality of the BBC micros sound facilities.

The external speakers can be disconnected at will leaving **MICROVOCs** volume control to operate the internal speaker of the BBC micro.

NEW PRICES  
APPLY FROM  
MAY 13th

MUSICSOFT  
SOFTWARE NOW  
IN STOCK



**OUR GUARANTEE – None of the original components of the BBC micro, including the cabinet need to be modified in any way to install 'MICROVOC'.**

Our prime concern whilst designing '**MICROVOC**' was to ensure that your BBC micro warranty would remain unaffected.

**MICROVOC** can easily be fitted in five minutes and requires no drilling, soldering, or any technical expertise whatsoever. It can just as easily be removed, leaving your BBC micro in its original condition.

**MICROVOC** simply plugs into existing fittings on the BBC micro and makes use of the 'Reset' and 'Econet' apertures at the rear of the machine, which on current models are covered with a thin plastic film – removal of this film is relatively simple.

If your BBC micro suffers from the infuriating 'Buzz' then you will also need '**Buzzgo**'. '**Buzzgo**' simply plugs into the 1Mhz Bus to eliminate the infernal buzz. If purchased with '**MICROVOC**', **Buzzgo** costs an additional £1 (Inc. VAT). For separate purchases **Buzzgo** costs £2 (Inclusive).

**MICRO-ADVENT** (A subsidiary of Advent)

Ashlyn House, 113 Writtle Road, Chelmsford, Essex.

Opening hours 9.30am - 3.00pm Monday - Friday.

Telephone: 0245 59708



of bytes for each dimension in the array: each pair gives the number of elements in the corresponding dimension. The first byte of the pair is less significant. For example, after DIM A\$(1,1): D0 will be &02, &00; D1 will be &02, &00; HE will be &05.

PR (program, two bytes). These two locations contain the low and high bytes of the address within the program itself where the function or procedure is defined. They point to the program byte immediately following the name of the function or procedure.

The PR bytes are followed by the formal parameters, if any, and if their names have not been used earlier in the program (in which case they would already exist in the variables store). These in turn are followed by any local or other variables created within the function or procedure. Each of these parameters or variables is stored with the usual four modules for a simple variable: NE NA 00 VA. As far as the variables store is concerned, the statement LOCAL A has the same effect as LET A=0.

Variables within a function or procedure are not transferred to the store until the function or procedure is actually called.

**A** quick word in passing about data. This is transferred to store when it is read, so from our point of view the program:

```
10 DATA yes
20 READ Y$
```

is, when run, the same as

```
10 Y$="yes"
```

Let's look in more detail at the way the Beeb stores the text of a string, since it has a voracious appetite for RAM when doing this. Run this program:

```
10 LET A$="GLUTTONY"
20 LET A$=A$+A$
30 PRINT LEN A$
40 GOTO 20
```

The program stops when the length of A\$ has doubled to 128, because the maximum length for a string is 255. However, the computer has now consumed no less than 272 bytes of variables storage space! You can check this by looking at TOP and VARTOP, and subtracting

one from the other. Why does it do this? Well, it's like this.

Type CLEAR, then A\$="YES" as direct commands. You have now used 11 bytes: two for NE, one for the \$ in NA, one for 00, two for TE, one each for RE and LE, and three for the text itself. If you now type A\$="NO", the text will be overwritten to produce "NOS". The value of LE is changed from three to two, so the computer ignores the final S. Nothing else changes.

Now type A\$="PERHAPS". This won't fit into the three bytes reserved by RE; so the value of RE is altered to seven. The value of LE also changes to seven. But the computer is not clever enough to

---

## 'The Beeb has a voracious appetite for RAM when storing strings'

---

use the space occupied by 'NOS' (even though A\$ is the only variable in the store). It has to start again at the next free byte, given by VARTOP: the address of the text, as stored in TE, is therefore increased by three. Your seven-character string now uses 18 bytes of memory, of which three are permanently dead. If you had started with A\$="YES□□□□", you would now be using only 15 bytes to store "PERHAPS" (□ represents a space).

But this is not the whole story! Suppose you carry out:

```
CLEAR
A$="YES"
A$="UNLIKELY"
```

How many byte are you using now, for an eight-character string? Not 16, not even 19 . . . but 27! Two for NE, one for NA, one for 00, two for TE, two for RE and LE, three for the dead "YES", eight for "UNLIKELY", and, if you can believe it, eight spare ones – which the machine has thoughtfully set aside in view of

your inept programming. So while the value of LE is eight, that of RE is 16!

Every time you try to assign eight or more bytes of text to a string variable whose RE is insufficient, you get eight bytes more than you asked for. The effect is cumulative, and operates right from the start; so

```
CLEAR
A$="1234567"
```

reserves seven bytes of text space, but

```
CLEAR
A$="12345678"
```

reserves 16.

Moral: when you first assign a string, give it the maximum length it is ever likely to need; and never use eight characters if seven will do.

Careless typing costs bytes, too. If you type A\$=1 when you mean A%=1, you will set up a string variable called A\$. The command DIM A(6000) will produce the error message 'DIM space', because it's too big. But the NE, NA, and 00 modules will have been set up; so that if you follow on with DIM A(1) you will get a 'Bad DIM' message, because you're not allowed to re-dimension an existing array!

**T**he operating system needs to know where it has stored each variable, and keeps a catalogue in page &04 for this purpose. Locations &0482,83 point to the first variable whose name begins with 'A'; &0484,85 indicate the first whose name starts with 'B'; . . . &04C2,C3 point to the first whose name begins with 'a'; and so on.

Locations &04F6,F7 point to the first function; &04F8,F9 to the first procedure.

Now you can see why the first letter of the name of a simple or array variable need not be entered in the variables store.

The catalogue is destroyed when a program listing is modified, even if the length of the program is unchanged. So even the most minor adjustment has the effect of clearing all variables except the system integers.

The system integer variables are stored near the catalogue, taking four bytes each. @% starts at



# THE PROGRAM THAT'S LEAPS AHEAD OF ALL THE REST...

# THE FROG



**STOP PRESS. NOW IN STOCK!** "SHAPE GENERATOR" FOR BBC MICRO. Allows you to design and redesign full colour graphics and shapes in enlarged form then reduced to normal size in programs! Ideal for development of software! Useful utility program for BBC Micro owners! £11.50

FROM

**SOFTWARE FOR ALL**

*"Programs for the people"*

## THE MOST FANTASTIC ACTION GAME FOR THE BBC MICRO!

FAST ARCADE PLAY!  
MODE 2 COLOUR GRAPHICS AT ITS BEST!  
FIVE TUNES!  
INCREDIBLY ADDICTIVE!

AVAILABLE NOW AT YOUR SOFTWARE FOR ALL DEALER

**ONLY £8.95**

### SEE IT NOW AT YOUR NEAREST SOFTWARE FOR ALL DEALER!

- |  |  |  |  |
|--|--|--|--|
| <b>AB &amp; C COMPUTERS</b><br>11 Brockstone Road<br>St Austell<br>Cornwall PL25 3DW   | <b>COMPUTER PLUS</b><br>47 Queens Road<br>Watford, Herts WD1 2LH             | <b>GAMES WORKSHOP</b><br>Unit 37<br>Birmingham Shopping Centre<br>Birmingham B2        | <b>RAM ELECTRONICS (FLEET)</b><br>106 Fleet Road, Fleet<br>Hants GU13 8PA                    |
| <b>ANGLIA COMPUTER CENTRE</b><br>88 St Benedicts Street<br>Norwich, Norfolk NR2 4AB    | <b>COMPUTERS FOR ALL</b><br>72 North Street<br>Romford, Essex RM1 1DA        | <b>GRAVESEND HOME COMPUTERS</b><br>39 The Terrace<br>Gravesend, Kent                   | <b>RDS ELECTRICAL LTD</b><br>157-161 Kingston Road<br>Portsmouth, Hants PO2 7EF              |
| <b>A &amp; D COMPUTERS</b><br>143A Fore Street<br>Exeter, Devon                        | <b>COMPUTERIST</b><br>642 London Road<br>Westcliff-on-Sea, Essex             | <b>KANDYS</b><br>40 High Street<br>Huntingdon<br>Cambridgeshire PE18 6AO               | <b>RITCHIE ELECTRONIC</b><br>31 North Parade<br>Bradford, West Yorkshire                     |
| <b>BLADEN COMPUTER SYSTEMS</b><br>22 Glynne Street, Farnworth<br>Lancashire BL4 7DY    | <b>COMP-LEASE</b><br>121 Queensway, Alsager<br>Cheshire ST7 2SP              | <b>MANSFIELD COMPUTERS</b><br>79 Ratcliffe Gate<br>Mansfield<br>Notts NG18 2JB         | <b>STORKROSE LTD</b><br>44 Shroton Street<br>London NW1                                      |
| <b>BRAINWAVE LTD</b><br>24 Crown Street<br>Ipswich, Suffolk                            | <b>DIGITAL FANTASIA</b><br>24 Norbreck Road<br>Norbreck, Blackpool FY5 1RP   | <b>MICROSTYLE</b><br>29 Belvedere<br>Lansdowne Road, Bath                              | <b>SUPERIOR SYSTEMS LTD</b><br>178 West Street, Sheffield<br>South Yorkshire S1 4ET          |
| <b>BRIDLINGTON COMP CENTRE</b><br>46 Market Place, Old Town<br>Bridlington YO16 4QL    | <b>EMPRISE LTD</b><br>58 East Street<br>Colchester<br>Essex CO1 2TQ          | <b>MICROWARE</b><br>5 St Peters Lane<br>Leicester                                      | <b>SOUND ON SOUND</b><br>64 Lawton Street<br>Congleton, Cheshire CW12 1RS                    |
| <b>J W BAGNALL LTD</b><br>18 Salter Street<br>Stafford ST16 2JU                        | <b>ESSEX COMPUTER CENTRE LTD</b><br>150 Moulsham Street<br>Chelmsford, Essex | <b>MODEL PLUS</b><br>55A West Street, Boston<br>Lincolnshire PE12 8DN                  | <b>STATACOM LTD</b><br>234 High Street<br>Sutton, Surrey                                     |
| <b>BINDERMAN LTD</b><br>12C Manor Road<br>London N16 5SA                               | <b>FALSOFT COMPUTERS</b><br>8 St Georges Arcade<br>Falmouth, Cornwall        | <b>NORTHERN COMPUTERS</b><br>Churchfield Road<br>Frodsham, Cheshire                    | <b>TECHNOMATIC LTD</b><br>17 Burnley Road<br>London NW10                                     |
| <b>CARLTON COMPUTERS LTD</b><br>4 Swanstons Road<br>Great Yarmouth<br>Norfolk NR30 3NQ | <b>FAREHAM COMPUTER CENTRE</b><br>56 High Street, Fareham<br>Hants PO16 7BG  | <b>OFF RECORDS</b><br>Computer House<br>58 Battersea Rise<br>Clapham Junction, London  | <b>TOMORROWS WORLD</b><br>Esplanade, Lerwick<br>Shetland Isles                               |
| <b>CASTLEHURST LTD</b><br>1291 High Road<br>London N20                                 | <b>GALAXY VIDEO LTD</b><br>60 High Street<br>Maidstone, Kent                 | <b>RMK ELECTRONICS LTD</b><br>Hinton House, Station Road<br>New Milton, Hants BH23 6HZ | <b>THE VIDEO PALACE</b><br>62 Kensington High St.<br>London W8                               |
|  | <b>GAMER</b><br>24 Gloucester Road<br>Brighton BN1 4AQ                       |  | <b>WATFORD ELECTRONICS</b><br>33/35 Cardiff Road<br>Watford, Herts WD1 8ED                   |
|  |  |  | <b>YORKSHIRE MICROCOMPUTERS</b><br>28 Ramshill Road, Scarborough<br>North Yorkshire YO11 2QF |









## The versatility of BBC Basic is demonstrated by these two utility programs

# PASSING ARRAY VARIABLES

BASIC does not allow array variables to be passed as parameters to procedures or functions. It is usually necessary, therefore, to copy arrays into global variables which may be used instead. This method has drawbacks as it wastes storage space in duplicating information.

An alternative is illustrated in listing 1, which gives as example a function, FNscalarprod, which returns the scalar product of two (M%+1)-dimensional vector arrays. Names of vectors are passed in the formal string parameters P\$ and Q\$, and the elements of the vectors are found using EVAL. This permits

FNscalarprod to be applied as shown to any compatible pair of vectors without duplication.

This method is unsuitable in the case of a procedure which is intended to return a result which is an array variable instead of a single number. Again, the problem can be solved by duplicating information in globally dimensioned arrays, but a neater solution would be to use array variables as formal parameters to the procedure, and to call the parameters by name instead of by value. Basic permits neither of these techniques, but their effects are easily simulated as illustrated in listing 2.

The example is a procedure, PROCmatrixmult, which multiplies together two (M%+1)x(M%+1) matrix arrays and places the product matrix into a suitable third array, without needing to copy any array. The names only of the three arrays are passed to the procedure as before in the formal string parameters P\$, Q\$ and Z\$. There are restrictions on the allowable names for these arrays, however, and for simplicity, PROCmatrixmult works only with arrays whose names comprise any single upper or lower case letters except x, y and z, such as A(X%) or f(Y%), although some extensions are possible. (Actually, '£' and '\_' are also permissible).

The method relies on the way variables are stored in the BBC micro. Along with the name and value of each variable is stored the address of the next variable encountered (if any) whose name begins with the same letter. Vectors at fixed locations in memory point to the first members of these lists of variables. For example, &4F0 and &4F1 point to the storage location of the first variable whose name begins with 'x'. (Beeb Forum, November 1982)

The function FNaddress (P\$) returns the location of the vector that points to the first member of the list which contains the variable whose name is found in P\$. PROCnewvectors then alters the vectors to the lists that contain

```

10  N%=5
20  DIM VECTOR%(N%),ARRAY(N%),MATRIX(N%)
30
40  REM choose elements
50
60  FOR J%=0 to N%
70  VECTOR%(J%)=J%+1
80  ARRAY(J%)=J%↑2
90  MATRIX(J%)=J%*(J%+1)
100 NEXT
110
120  REM we can now find some scalar
130  REM products.
140
150  CLS:PRINTTAB(8,9)"(VECTOR).(ARRAY)="
    FNscalarprod("VECTOR%","ARRAY",N%)
160
170  PRINTTAB(8,13)"(MATRIX).(VECTOR)="
    FNscalarprod("MATRIX","VECTOR%",N%) ' ' '
180
190  END
200
210
220  DEF FNscalarprod(P$,Q$,M%)
230  LOCAL I%,SUM
240  SUM=0
250  FOR I%=0 to M%
260  SUM=SUM+EVAL(P$+"(I%)")*EVAL(Q$+"(I%)")
270  NEXT
280  =SUM

```



```

10     MODE 7
20     N%=3
30     DIM A(N%,N%),G(N%,N%),W(N%,N%)
40
50     REM choose a matrix, A
60
70     FOR I%=0 TO N%
80     FOR J%=0 to N%
90     A(I%,J%)=(I%+3)* (2*J%+1)
100    NEXT
110    NEXT
120
130    CLS:PRINT "Starting with"
140    PROCprintmatrix("A",N%)
150
160    PROCmatrixmult("A","A","G",N%)
170
180    REM Matrix G now holds
190    REM The square of matrix A.
200
210    CLS:PRINT "we can form the self-product"
220    PROCprintmatrix("G",N%)
230
240    PROCmatrixmult("G","A","W",N%)
250
260    REM Matrix W now holds the
270    REM product of matrices A and G.
280
290    CLS:PRINT "and do other manipulations,"
300    PROCprintmatrix ("W",N%)
310    PRINT ' ' "without copying arrays." ' '
320    END
330
340
350    DEF PROCmatrixmult(P$,Q$,Z$,M%)
360    LOCAL addx%, addy%, addz%,I%,J%,K%,SUM
370    PROCnewvectors
380    FOR I%=0 TO M%
390    FOR J%=0 TO M%
400    SUM=0
410    FOR K%=0 TO M%
420    SUM=SUM+x(I%,K%)*y(K%,J%)
430    NEXT
440    z(I%,J%)=SUM
450    NEXT
460    NEXT
470    PROColdvectors
480    ENDPROC
490
500    DEF PROCnewvectors

```

page 51 ►

variables x, y and z so they now point to the lists containing the variables whose names are given in P\$, Q\$ and Z\$, respectively. The old vectors, meanwhile, are stored in addx%, addy% and addz%. (Of course, no other variables whose name begins with x, y or z may be used within PROCmatrixmult).

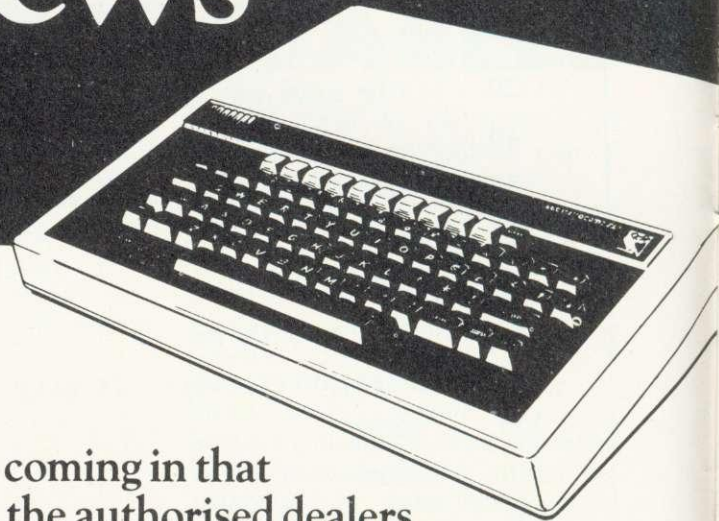
In searching for the variable x, therefore, the computer will examine the list that contains the array whose name was given in P\$. Because variable names are stored stripped of their initial letter, if the names of the array x and of the array indicated by P\$ differ only in their initial letter, the computer will accept the latter array in place of x, thereby effecting a call by name. The contents of the array indicated by P\$ can now be accessed or modified from within the procedure by referring instead to the array. Note that arrays x, y and z do not exist and need not be dimensioned.

At the end of PROCmatrixmult, PROColdvectors restores the original pointers. Finally, PROCprintmatrix prints a matrix on the screen.

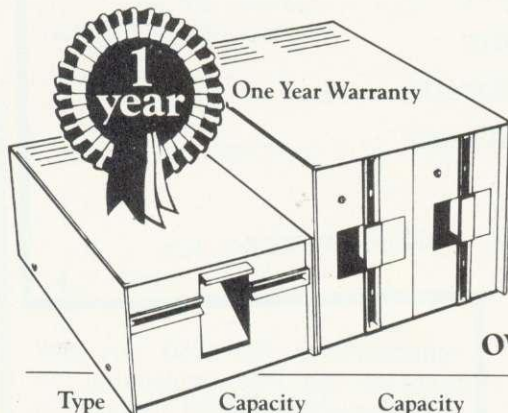
This method of simulating a parameter call by name is clearly capable of handling all types of variables, but it is probably most useful with arrays. The extension to integer and string variables and arrays is straightforward (replace x, y or z by x% or x\$, as appropriate) and makes this a very versatile technique.



# Microware presents the latest news on BBC.



N.B. 40/80 Format Switch – call for information

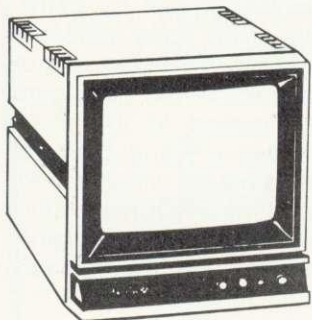


Reports are coming in that Microware, the authorised dealers for BBC and Epson, are being inundated with orders and enquiries from BBC micro owners. It is believed that this unprecedented

activity is the result of the wide range of products on offer and the competitive pricing policy of the company. The most dramatic recent development is the exclusive ZL range of floppy drive sub-systems.

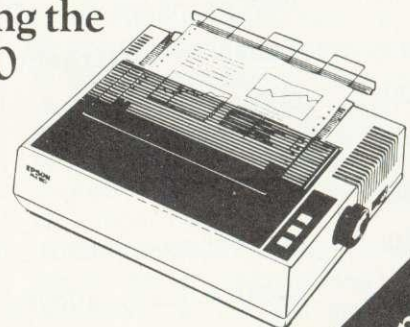
Type	Capacity in MFM	Capacity BBC in FM	No. of files on BBC	Price	Members discount %
ZL141B	250K	100K	31	175.00	10
ZL141	250K	100K	31	225.00	5
ZL142	500K	200K	62	315.00	5
ZL241B	500K	200K	62	220.00	10
ZL241	500K	200K	62	265.00	5
ZL242	1Mb	400K	124	415.00	5
ZL291B	1Mb	400K	62	290.00	10
ZL291	1Mb	400K	62	355.00	5
ZL292	2Mb	800K	124	575.00	5

DFS Manual – Format disk available.



Further news items, of interest to BBC micro users, are the Hantarex monochrome monitors with green or amber screen options. A full range of Epson printers are available from stock, including the RX 80 at £295 and the FX 80 and MX 100. High quality Dysan and Memorex floppy

diskettes start at £1.62 and are always available.



## Microware

Showroom: 637 Holloway Rd London N.19  
Telephone 01-272 6398/6237. Telex 297598

Double density  
controller  
coming soon





PARADOX OF NEW BASIC

ACORN has made it clear that programs written on machines with Basic I should interchange between those with Basic II. As long, of course, as you do not use any of the new keywords! However, some people are experiencing problems with file handling using Basic I keywords.

To be specific, OPENIN doesn't seem to work properly. What happens is that a program is written and saved on a Basic II machine using OPENIN to open files when required. But when the program is loaded onto a Basic I machine, OPENIN will not apparently work.

I will first give the solution, and then the explanation. The solution is to use OPENUP and not

OPENIN when writing programs on a Basic II machine - with cassettes.

The reason is fairly simple. OPENUP has the same token as OPENIN used in Basic I (&AD). OPENIN in Basic II has the token value &8E, not used in Basic I. It follows (as explained in last month's Forum) that OPENIN in Basic I gives the same random access facilities as OPENUP in Basic II.

So, you need to get out of the habit of using OPENIN on the latest machines. And the paradox is: you can only get consistency in file handling if you use a keyword which exists in Basic II but not Basic I! (Acorn did it this way to allow Basic I programs to transfer to Basic II.)

IAN BIRNBAUM sets out to improve your programming techniques on the BBC micro.

He will answer reader's questions in this column and develop their ideas - as well as giving some of his own. But the real aim is for readers to provide the questions and the answers.

At least £5 will be paid for any tip published, with £10 for those which merit a one-star award and £20 for real humdingers!

The idea must be original and be described clearly and fully. It should not have been published before.

Your contribution should be typed or printed, with any substantial listings on cassette, but only included to make a point.

Send your hints or questions to BBC Forum, Acorn User, 53 Bedford Square, London WC1B 3DZ. Please include a self-addressed envelope if your contribution is to be returned. We cannot answer letters individually, but a cross-section of common and interesting points will be covered.



READERS who use the machine code listing to relocate a program in memory on disc machines may have had problems (February, Forum). However, P. Chilvers from Sponne School in Towcester has made several improvements (listing 1). Changes in lines 32080, 32160 and 32000 allow a change of PAGE immediately after \*TAPE. This, with NEW in the keyboard buffer, resets pointers more safely than before.

Most important though is the use of RTS to return to Basic, as the old method corrupts the shifted program and/or doesn't allow the programmed \*KEY10 and break to reload, shift and run the program more than once. This version also works with Basic II.

The changes to the original listing in February's issue are extensive and so we have printed a complete new listing.

See February's Acorn User (page 24, 25) for a more detailed explanation of the program.

```

06GOTO32000
32000BASE=&70:OLDLOC=&
72:NUMBER=&74:
?&76=?&18
32010FORI%=0 TO 2
STEP2:P%=&C00
32020IOPIT%
32030LDA &12
32040SEC
32050SBC #9
32060STA NUMBER
32070LDA &13
32080SBC &76
32090STA NUMBER+1
32100LDA #0
32110STA BASE
32120LDA #&0E
32130STA BASE+1
32140LDA #9
32150STA OLDLOC
32160LDA &76
32170STA OLDLOC+1
32180LDY #0
32190LDX NUMBER+1
32200BEQ LOLOOP
32210.LOOP1
32220LDA (OLDLOC),Y
32230STA (BASE),Y
32240INY
32250BNE LOOP1
32260INC OLDLOC+1
32270INC BASE+1
32280DEX
32290BNE LOOP1
32300.LOLOOP
32310LDX NUMBER
32320BEQ FINISH
32330.LOOP2
32340LDA (OLDLOC),Y
32350STA (BASE),Y
32360INY
32370DEX
32380BNE LOOP2
32390.FINISH
32410RTS:JNEXT
32420*FX138,0,78
32430*FX138,0,69
32440*FX138,0,87
32450*FX138,0,13
32460*FX138,0,79
32470*FX138,0,76
32480*FX138,0,68
32490*FX138,0,13
32500*FX138,0,82
32510*FX138,0,85
32520*FX138,0,78
32530*FX138,0,13
32540*TAPE
32550PAGE=&E00
32560HIGH=TOP-777:
HIGH?-1=&FF
32570CALL&C00

```

Listing 1.



**Style and sophistication  
combined with modern technology  
has produced...**



**A 14" British colour monitor at a price  
you really can afford. £199.50 plus VAT.**

**CABEL**  
electronic

19 High Street, Tewkesbury, Gloucestershire GL20 5AW  
Telephone: 0684 298840 Telex: 339671 ALO FAB





THE following method creates a single program file which can be loaded, run and saved like a normal single program provided \*SAVE is used. The data is poked into memory above the program, and program plus data are saved together using \*SAVE. When the variables are dimensioned normally and the data is read into them from high memory.

Suppose for example we have a 6k program which runs in mode 1 (about 8700 bytes left). Suppose also the program uses 2k of data consisting of 200 strings totalling 1200 bytes and 200 integers totalling 800 bytes.

First write a file-making program using DATA statements (ie, read each item and save it on tape using OPENOUT and PRINT#). Then run this program to create the tape file.

Program \*KEY0 by typing listing 1 in the command mode. When KEY0 is used the data file will be poked into the memory space just above the program.

Alter the main program so the coding of listing 2 is executed first. This copies the data to the space above himem. In mode 2 this is part of the video RAM but it is available in mode 7, where we are for now.

Also in the main program dimension the variables in the normal way. Listing 3 shows this for the example, and also shows the coding which transfers the data back from high memory into the dimensioned variables. These lines should also appear in the main program. After this process mode 1 is called.

When the alterations to the main program are complete, set up the cassette recorder ready to play back the data file. Then press KEY0. When the operation is finished the number of the highest byte poked plus 1 is printed out.

Save the whole thing using:

```
SAVE "Prognam" E00 XXXX
```

where XXXX is the number printed out at the end of the previous step. Thus all bytes from PAGE up to XXXX are saved. The program as saved can be loaded and run in the normal way. To make a copy the program must be loaded and saved straight away using SAVE.

£10

ROBERT WARD AND RICHARD PHILLIPS  
FROM HULL UNIVERSITY CREATE FILES  
WHICH BEHAVE LIKE PROGRAMS

**Listing 1**

```
*KEY0A%=TOP+50:X=OPENIN("filename"):FORI%=1TO200:
INPUT X,j$,J%:$A%=j$:A%=A%+LEN(j$)+1:!A%=J%:A%=A%+4:
NEXT:CLOSE X:PRINTA%
```

**Listing 2**

```
MODE7
HIMEM=HIMEM-2050
A%=HIMEM
FORI%=TOP TO TOP+2050 STEP4
!A%=!I%
A%=A%+4
NEXT
A%=HIMEM+50
```

**Listing 3**

```
DIM strings$(200),integers%(200)
FORI%=1TO200
strings$(I%)=$A%
A%=A%+LEN(strings$(I%))+1
integers%(I%)=!A%
A%=A%+4
NEXT
MODE1
```

## CASSETTE AND DISC BACK-UPS

THERE seems to be some confusion over creating backups for cassette and disc files. It is, in fact, easy to do this using \*LOAD and \*SAVE. Let us suppose we wish to create a tape backup of a file called File which is on tape. Whether it is data, machine code or program is irrelevant. Type:

```
*LOAD "FILE" 0E00
```

and the file will load. Note the message when it has finished. Suppose it reads

```
FILE 05A0
```

Type

```
*SAVE "FILE" 0E00 +5A0 0 0
```

and save the file to the backup tape.

The same technique can be used to transfer a file from tape to disc or vice versa. In this case, use 1900 instead of 0E00.

NOTE that the disc operating system will not differentiate between lower and upper case. Therefore writing SAVE "PROGRAM" followed later by SAVE "program" will result in the first file being erased.

This is a common technique for title pages on cassette, but a different idea needs to be used for disc. The easiest method is to put the main program in a different directory from the title page. Thus SAVE "PROGRAM" for the title page and SAVE "M.PROGRAM" for the main program. Running PROGRAM can then chain M.PROGRAM.





## A J SOFTWARE for BBC

'The Record Changer' 32K £19.95 Cass. £24.95 Disc.  
for indexing, membership lists, directories, inventories, budgeting, etc., etc.

**don't buy a database in the dark —  
check the spec!**

- \* **Visible File** — Scroll around the file UP/DOWN/SIDEWAYS by function keys
- \* **FULL SCREEN UPDATE** — Use cursor to overtype; character INSERT/DELETE within field; ERASE rest of field; TAB from field to field, etc.
- \* **Sort** — on character and numeric fields
- \* **Search** — for a match on field content
- \* **Select** — select records satisfying conditions on one or more fields; or manually
- \* **Total** — total numeric fields of SELECTED records
- \* **Arithmetic** — combine one or more fields of your SELECTED records with any arithmetic expression; put the result in any numeric field
- \* **Print** — print your SELECTED records with pagination
- \* **Up to a 1000** records, (typically 330 at length 40)
- \* **Up to 20** fields, number of decimal places can be specified for numeric fields
- \* **Utility** — to ADD/CHANGE/DELETE fields

'The Wordsmith' 32K for Centronics 737/739  
£19.95 Cass. £24.95 Disc.

For Reports, Essays, Thesis, etc., etc.

**Forget control codes — let 'Wordsmith'  
realise your printer's potential**

- \* Full Screen text editor with wordspill
- \* Unlimited document size
- \* Page numbering, headings, footings, margins, indentation
- \* Full Support for **proportional**, mono, condensed, elongated and underlined printing
- \* Right justification maintained even when mixing proportional, condensed, elongated on same line

**Simple Word Processor 32K**  
£9.95 Cass. £14.95 Disc.

Simple to use; allows you to set margins, justify text, insert and delete lines of text, set page length or force a page, variable TAB, Multiple copies. Save text on cassette or disc. View text formatted before printing. Works with any printer.

**Options Timetable 32K**  
£14.95 Cass. £19.95 Disc.

A must for every secondary school. This programme helps with the timetabling of pupils 3rd year option choices. Try the effect of any changes to your Options Timetable and let the micro do all the donkey work. Has been in use for the last three years in a 6 form entry comprehensive using a CBM 3032 — now runs even faster on the BBC Model B.

**Not only the cheapest, but the best**  
Switchable 14" RGB Monitor/Colour TV  
£250 inc. VAT and cable, £8.00 carr.

Royalties for quality software  
All prices VAT inclusive

**AJ Vision Service Ltd**  
61 Jeddo Road  
London W12 9ED

# Official BBC Programmers Kit

for all BBC Microcomputer users!

De-luxe BBC Programmers Kit consisting of:

- \* 100 sheet flowchart pad with de-luxe BBC grip binder
- \* 100 sheet screen layout pad with de-luxe BBC grip binder
- \* 100 sheet symbol design pad with de-luxe BBC grip binder

**PLUS** super quality BBC ringbinder to store your programmes and notes

**All items finished  
in Official BBC Livery  
and specially boxed.**

Price  
only

# £15

R.R.P.  
(inc.VAT.)



Available from  
your BBC Microcomputer dealer,  
or in cases of difficulty add £1 post and packing  
and order direct from:

**Intastor Micro Aids,  
FREEPOST,  
Stroud,  
Gloucestershire, GL6 1BR.**



Trade Enquiries welcome.



£5

J. DOGGETT  
DELVES INTO  
THE MURKY  
WORLD OF  
\*FX CALLS

## PRINTER DRIVER

THE \*FX5,3 command is used if you wish to provide your only printer drive for a particular machine. It has been suggested to me that it does not work. However, it does, since after executing \*FX5,3, the computer will indirect through address &222,&223. This contains by default the null output address; this is why nothing seems to happen. Change its contents to another address, however, and the effect will be obvious. Of course, to use it properly you will need to write your own routine: put it at &C00 say, and put zero in &222 and 12 in &223.

THE world of \*FX commands seems to be growing daily. The additional list in May's *Acorn User* is definitely not the end of the matters, as shown by the appearance of \*FX209 in the last issue. Mr. J. Doggett of Leicester earns a fiver for delving into \*FX255.

This call reconfigures the start up mode and boot options:

- \*FX255,0 selects mode 0 on a simple break and boots disc
- \*FX255,1 selects mode 1, etc
- \*FX255,7 selects mode 7, etc
- \*FX255,8 selects mode 0, no auto boot
- \*FX255,15 selects mode 7 etc. A 'hard break' (CTRL-break on 1.0 onwards) resets to the default case.

Mr Doggett has spotted \*FX202,32,207 in a listing. What does this do?

DAVID BALL FROM  
SKELMERSDALE  
DISABLE ESCAPE  
KEY IN OS 0.1

£5

I WAS interested to read Ian Copestake's article in April's *Beeb Forum* dealing with the problem of disabling the escape key under operating system 0.1.

Here is my solution which can be placed inside a program to disable the escape key type:

```
?&226 = &FF
```

In fact putting any value other than 0 (zero) into memory location &226 will disable the key completely.

To enable the escape key type:

```
?&226 = &0 (zero)
```

and everything is back to normal.

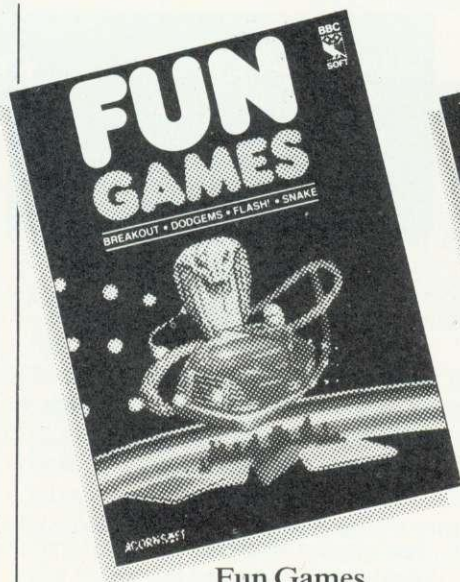
▶page 45

```

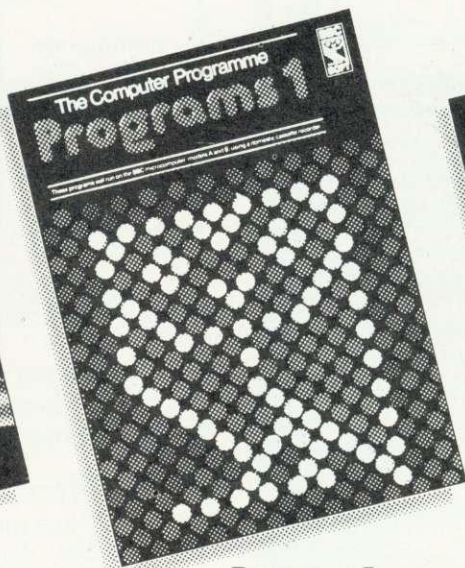
510   addx%=?&4F0 + 256*?&4F1           700   =2*ASC(A$)+1024
520   addy%=?&4F2 + 256*?&4F3           710
530   addz%=?&4F4 + 256*?&4F5           720   DEFPROCprintmatrix(P$,M%)
540   I% = FNaddress (P$)               730   LOCAL I%,J%
550   J%=FNaddress (Q$)                 740   PRINTTAB (4,5) "Matrix "; P$
560   K%=FNaddress (Z$)                 750   P$=P$+"(I%,J%)"
570   ?&4F0=?I% : ?&4F1=I%?1           760   FOR I%=0 TO M%
580   ?&4F2=?J% : ?&4F3=J%?1           770   FOR J%=0 TO M%
590   ?&4F4=?K% : ?&4F5=K%?1           780   PRINTTAB (10*J%,3*I%+8) EVAL(P$)
600   ENDPROC                           790   NEXT
610                                       800   NEXT
620   DEF PROCcoldvectors                810   G$=INKEY$(300)
630   ?&4F0=addx%MOD256 : ?&4F1=addx% DIV 256  820   ENDPROC
640   ?&4F2=addy%MOD256 : ?&4F3=addy% DIV 256
650   ?&4F4=addz%MOD256 : ?&4F5 = addz% DIV 256
660   ENDPROC
670
680   DEF FNaddress (A$)
690   IF ASC(A$)>119 THEN PRINT "Parameters may not start with x, y or z.": END

```

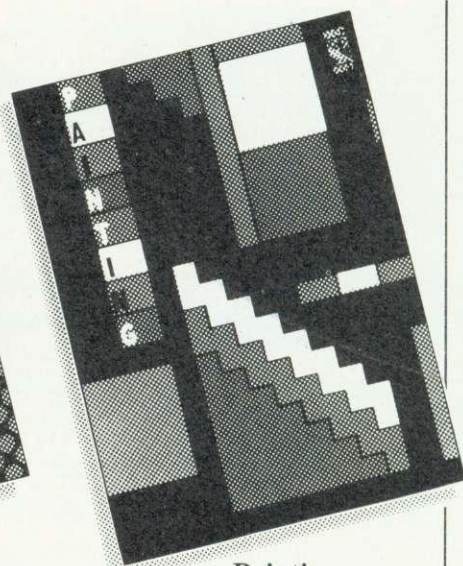




Fun Games  
BBC £9.95



Programs I  
BBC £9.95



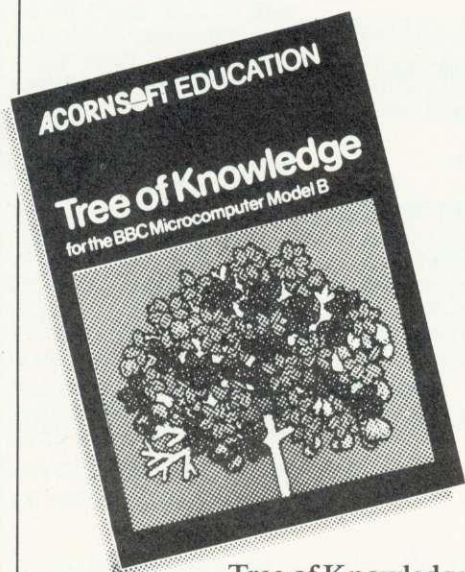
Painting  
BBC £9.95

# NOW BBC SOFTWARE IS EASILY AVAILABLE AT W.H.SMITH.

When it comes to software for the BBC Micro, there's no question who's right up your street. W. H. Smith.

Our range of software, from the leading software houses\* already covers some 40 programs. And it's growing fast.

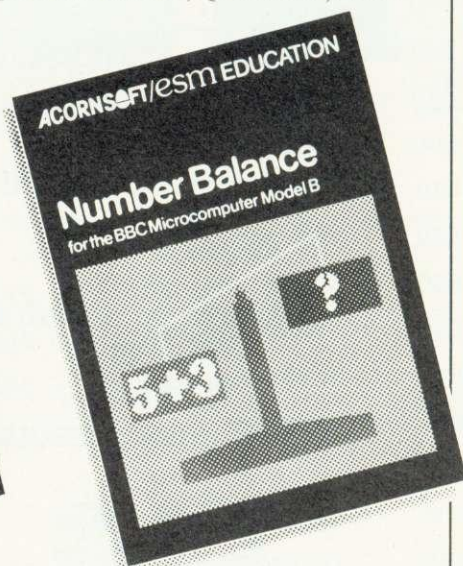
\*Acornsoft, BBC, Bug-Byte, Computer Concepts, Micropower, Superior Software, Quicksilva, A&F.



Tree of Knowledge  
Acornsoft £9.95

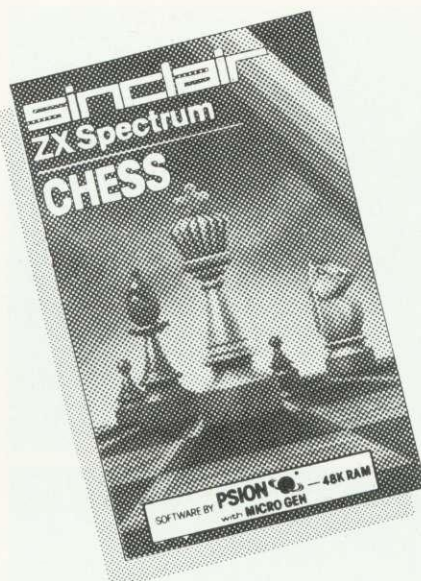


Music Processor  
Quicksilva £14.95



Number Balance  
Acornsoft £11.90





## THE W. H. SMITH SPECTRUM TOP TEN

Chosen from our vast range of software for the Sinclair Spectrum with particular reference to presentation, challenge, excitement and value for money.

Title	Producer	K RAM	Price
Vu-File	Sinclair	16	£8.95
The Hobbit	Sinclair	48	£14.95
Flight Simulation	Sinclair	48	£7.95
Vu-3D	Sinclair	48	£9.95
Hungry Horace	Sinclair	16	£5.95
Horace Goes Skiing	Sinclair	16	£5.95
Chess	Sinclair	48	£7.95
Jet Pac	Ultimate	16	£5.50
Penetrator	Melbourne House	48	£6.95
Sentinel	Abacus	16	£4.95

## COMMODORE 64

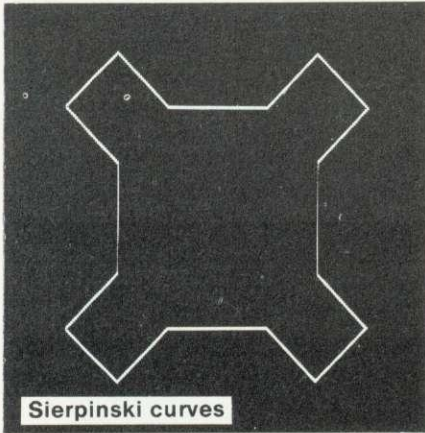
Larger branches of W.H. Smith now also stock the Commodore 64 together with a wide range of the latest software.

# WHSMITH



  Prices correct at the time of going to press. Subject to availability. At selected branches only.





Sierpinski curves

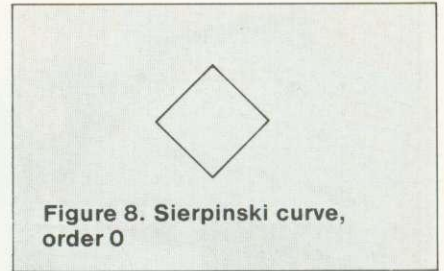
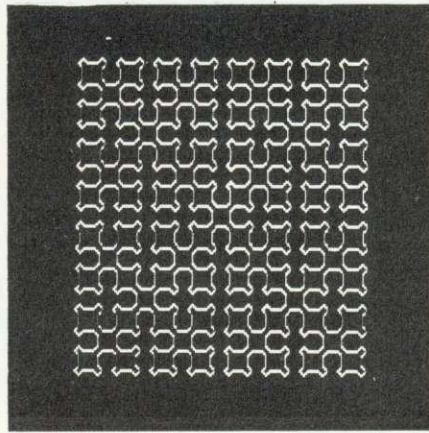
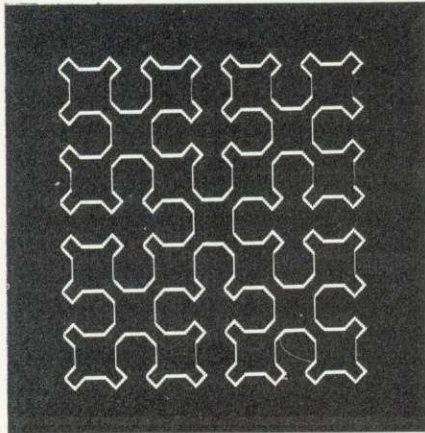
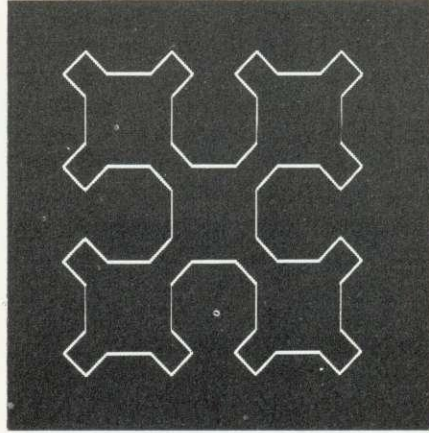


Figure 8. Sierpinski curve, order 0

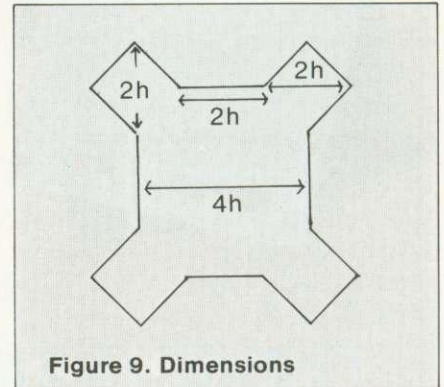


Figure 9. Dimensions

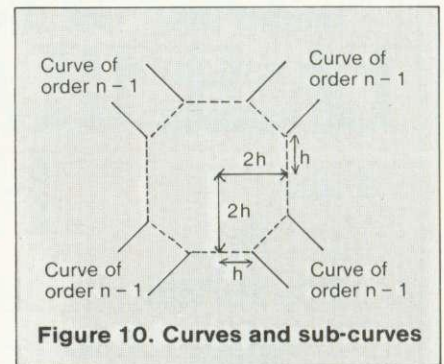


Figure 10. Curves and sub-curves

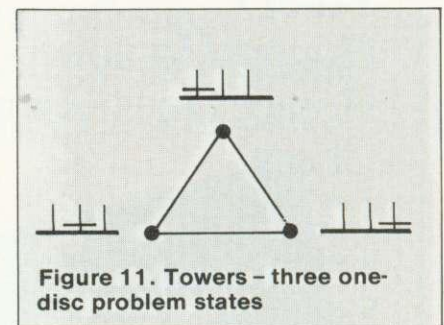


Figure 11. Towers - three one-disc problem states

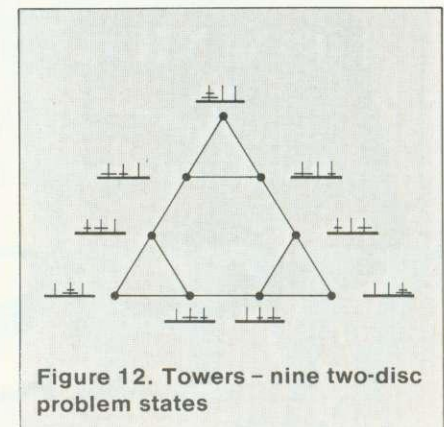


Figure 12. Towers - nine two-disc problem states

```

10 INPUT "Order",order
20 size=(2^order-1)*4+2
30 h=INT(600/size)
40 h2=h*2
50 MODE 0

100 PROCsierpinski(order,640,512)
110 k=GET:MODE 7
120 END

130 DEF PROCsierpinski(n,x,y)
140 LOCAL k
150 IF n=0 THEN MOVE x-h,y:DRAW x,y+h:
DRAW x+h,y: DRAW x,y-h:DRAW x-h,
y:ENDPROC
160 k=2^n*h
170 PROCsierpinski(n-1,x-k,y-k)
180 PROCsierpinski(n-1,x-k,y+k)
190 PROCsierpinski(n-1,x+k,y+k)
200 PROCsierpinski(n-1,x+k,y-k)
210 MOVE x-h2,y-h
220 PLOT 9,0,h2 : PLOT 11,h,h
230 PLOT 9,h2,0 : PLOT 11,h,-h
240 PLOT 9,0,-h2 : PLOT 11,-h,-h
250 PLOT 9,-h2,0 : PLOT 11,-h,h
260 ENDPROC
    
```

Program 6. Sierpinski curves



To fill out this procedure, we need to examine the geometrical details fairly carefully. Any curve of order 1 or more consists of repeated copies of the same basic shape (figure 9). The increment  $h$  is the smallest required in our DRAW or MOVE statements. Thus the statements needed to draw a curve of order 0 (a diamond) centred at  $(x, y)$  are:

```
MOVE x-h, y
DRAW x, y+h : DRAW x+h, y
DRAW x, y-h : DRAW x-h, y
```

The distance from the centre of a curve of order  $n$  to the centre of one of its sub-curves of order  $n-1$  will be  $2^{n-1}h$ .

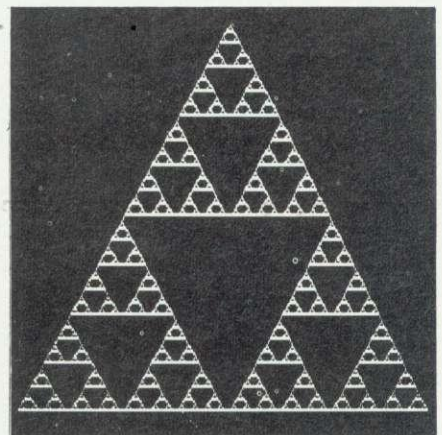
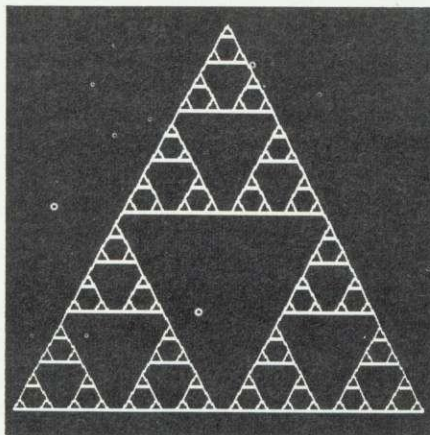
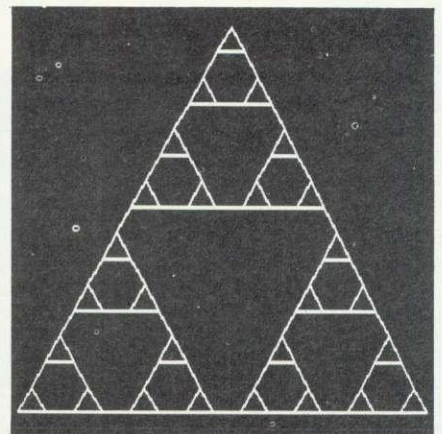
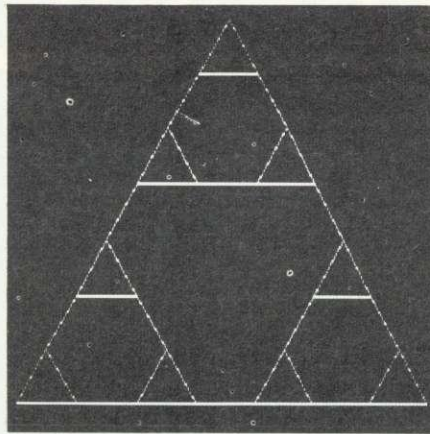
Finally, the situation at the centre of a curve of order  $n$ , when the four sub-curves of order  $n-1$  have been drawn is illustrated in figure 10.

We need to delete the four dotted diagonal lines and draw the vertical and horizontal lines. This can be easily accomplished by drawing round the dotted polygon using alternate PLOT 9 and PLOT 11 commands. These are relative plots, in the foreground and background colour respectively, which do not affect the last point visited on the line. The complete version is program 6.

Many non-numerical problems can be represented by a large (possibly infinite) set of problem states together with a set of moves each of which transforms one state into another. The definition of an operator may include restrictions on the states to which it can be applied.

For example, we could represent the one disc Towers of Hanoi states with a single triangle. There are three states in the one disc problem – the disc can be on one of three pegs. Each vertex of the triangle can represent a state. A line connecting two vertices represents a possible move from one state to the other (figure 11).

In the two disc problem we have three such triangles connected together, one for each possible position of the larger disc (figure 12). Similarly the three disc space diagram contains three two disc state space diagrams. The third block of photographs shows the state space diagrams for the 3, 4, 5 and 6 disc problem. Program 7 generates these diagrams by recursion.



State space diagrams

```
10 base = 800
30 xleft=(1280-base)/2 : xright = 1280-xleft
40 xtop=xleft+base/2
50 root3=SQR(3)
60 height= base*root3/2
65 ybottom = (1024-height)/2
66 ytop = 1024-ybottom
70 INPUT "No. of discs",n
80 arclength=base/(2^n-1)
90 MODE 0
100 PROCdrawgraph(n,xleft,xright,ybottom,
    xtop,ytop)
110 k=GET:MODE 7:END

120 DEF PROCdrawgraph(n,x1,x2,y12,x3,y3)
130 LOCAL subside, subheight
140 IF n=0 THEN ENDPROC
150 subside = (2^(n-1)-1)*arclength
160 subheight = root3*subside/2
170 PROCdrawgraph(n-1,x1,x1+subside,
    y12,x1+subside/2,y12+subheight)
180 PROCdrawgraph(n-1,x2-xsubside,x2,
    y12,x2-subside/2,y12+subheight)
190 PROCdrawgraph(n-1,x3-subside/2,
    x3+subside/2,y3-subheight,x3,y3)
200 MOVE x1+subside,y12
210 DRAW x2-subside,y12
220 MOVE x1+subside/2,y12+subheight
230 DRAW x3-subside/2,y3-subheight
240 MOVE x2-subside/2,y12+subheight
250 DRAW x3+subside/2,y3-subheight
260 ENDPROC
```

Program 7. Draws a map of Towers of Hanoi problem



# CUBE-Universal Control by Eurocomputer

CUBE is **THE** comprehensive Eurocard Computer system. Over the past two years, many of Britain's top industrial companies have been quietly and efficiently using CUBE modules in their small-scale computer control projects.

The range exceeds 30 master Eurocards, extended by almost limitless permutations. Now with the powerful new EURO-CUBE, a single board computer which is a system in itself, the range is complete. All these robust, sensible products are very low-priced—the EURO-CUBE, for example, is just over £100.

The fundamental choice is between 6502 and 6809 microprocessors and the newly-available 68000. Each choice is fully supported with efficient assembly language development tools, and with high-level languages for really quick programming. The range is extended by a continuing programme of industrial computer development, and by compatibility with Acorn Eurocards. Similarly, the CUBE cards can be used as extensions to the BBC computer.

#### The Cube Systems

All CUBE systems are delivered to the customer configured to his exact requirements, and tested in that arrangement. An appropriate text editor, machine code assembler and high level language are included with each system, as our experience has shown that most applications demand these tools, and the CUBE systems offer just about the most cost effective development station available.

#### The Software Products

Each of the three processor options 6502, 6809 and 68000 have associated machine operating systems, disk operating systems, and machine code assemblers.

On 6502, the user has a choice of a 10k version of ROM or disk BASIC with built-in screen graphics commands, or

a 12k version called ICOL which provides real time control of inputs, outputs and timers.

On 6809, the disk operating system offered is FLEX, under which a wide variety of languages may be used, such as Pascal, BASIC, and PL/9. The advantage of PL/9 is that while it is similar to BASIC in ease of use and quickness of implementation, the final program is compiled, and therefore is much faster in operation than interpretive BASIC, and does not require the purchase of an interpreter for each implementation. A 2k version of tiny BASIC on ROM is also available.

BASIC is available on 68000.

#### The Hardware Products

**EURO-CUBE.** The complete system on one small card. Available with either 6809 or 6502, and supplied complete with two channels of serial i/o, 20 channels of digital i/o, four memory sockets, each of which can take up to 32KB of ROM, EPROM or RAM, and a battery back-up circuit which provides non-volatility for CMOS RAM.

**FORCE PROFI II.** 68000 single board computer with 128kb of DRAM, 2 serial and 2 digital ports, and 2 user EPROM sockets.

**CU-MEM.** Universal Memory Carrier board for ROM, EPROM and RAM up to 8KB per device, with 2 banks of four 28 pin memory sockets and battery back-up circuit for CMOS RAM.

**CU-DRAM.** 64kb of DRAM Plus 16kb ROM/EPROM socket.

**CU-KEY.** Standard QWERTY layout keyboard, or non-staggered arrangement of 5x5 or 5x12 keys.

**CU-GRAPH.** High resolution VDU card for programmable text layout of up to 85 columns x 32 rows, mixed with graphics of 512x256 pixels. Uses independent memory from microprocessor, and colour extension allows eight logical colours with no loss of resolution.

**CU-MOT.** 6802 single board computer for study purposes, without machine or disk operating systems, or languages support.

**CU-PROM.** EPROM programming unit for EPROMs up to 32KB (eg 27256)

**CU-CLOCK.** Real time calendar clock, with battery back-up and watchdog circuit.

**CUPS.** Range of power supplies for CUBE system.

**CU-STOR.** Single and double density floppy disk controller.

**INDIO.** Industrial heavy duty input/output system.

**RACKPRINT.** Panel mounted impact printer.

**VIEWLINE.** Single line display module.

**CU-BAN.** Analog interface with choice of 8 bit or 12 bit conversion.

**ROMULATOR.** Development tool for simulating ROM based programs in target systems.

**SERIO.** 2 or 4 channel serial interface.

**BEEBEX.** Allows use of BBC computer with CUBE peripherals.

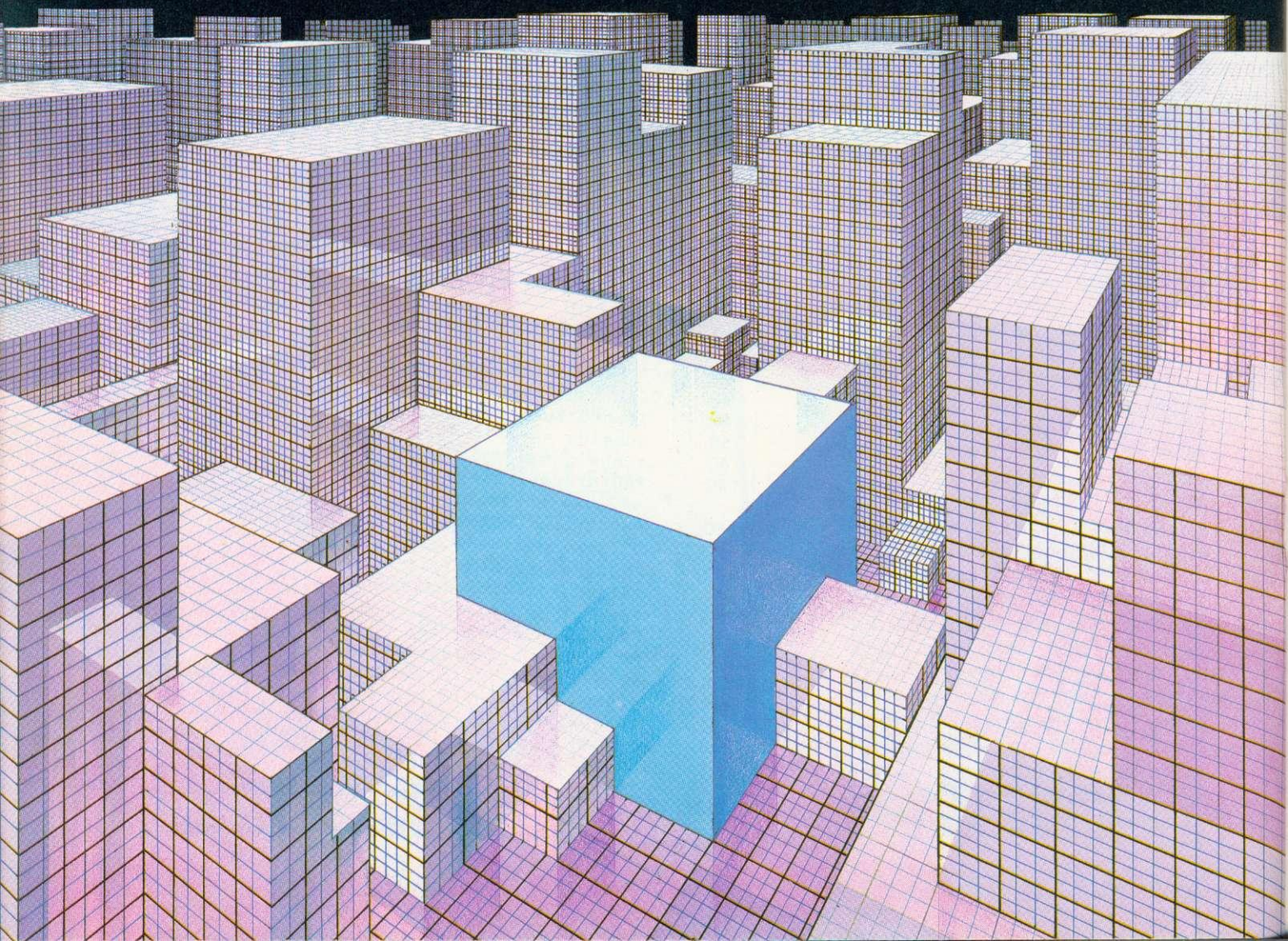
**Compact, superbly-capable and incredibly economical, Control Universal's cards are the best deal around in industrial control intelligence.**

Find out more by ringing one of our engineers or sending for our new catalogue, 150 pages of detailed product information. It's absolutely free!



**Control Universal Ltd**  
**The Hardware House**

Unit 2 Andersons Court,  
Newnham Road, Cambridge CB3 9EZ  
Telephone (0223) 358757





# BEEB, BRAILLE & THE BLIND

**W**ith the introduction of a new micro, there normally follows a range of input/output devices. These may include joysticks, alternative keyboards, speech input and output. Generally, these are aimed at the leisure market, but their adaptation for the disabled has been an interesting development.

In the past, the disabled have been assisted with equipment that is very specialised and, consequently, costly. With micro hardware, adaptations can be achieved through software – important in relation to cost.

The BBC model B has been used with alternative input devices and synthetic speech output to provide a configuration that can be used in schools for the blind and partially sighted. With the exception of the interface for the Perkins braille, the applications described in this article have been achieved

*Dr Thomas Vincent  
has used BBC micros  
at the Open University  
to help teach students  
who are blind or  
visually handicapped*

through software developed for commercially available hardware.

Early in 1982, the MEP and DoI funded a project at the Open University to investigate the use of the BBC micro for the visually handicapped in schools. This followed two successful years of using micro and speech synthesisers in the homes of blind OU undergraduates. The objective of the new project was to develop a range of software that would

provide programming in Basic and computer-assisted learning.

**T**he hardware in current use is shown in figure 1. Interfaced to the BBC micro is a Star Microterminals concept keyboard, a Votrax-Type'N'Talk speech synthesiser, and a Perkins braille. The last is the standard device used by the blind to produce hardcopy braille (combinations of dots produced by pressing the six main keys). It has been adapted by adding micro-switches under each key which transmit signals via an interface to the user port.

The interfacing of the Perkins braille is important as it gives an opportunity to assist in braille teaching. A young person may have difficulty in 'reading' what they have typed because their tactile sensitivity to the raised braille dots may be at an early stage of



BBC micro flanked by Perkins Braille, with Votrax on top of the monitor



# AT LAST, A COMPLEX GRAPHICS SYSTEM, THAT'S SO EASY

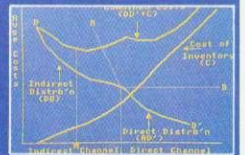
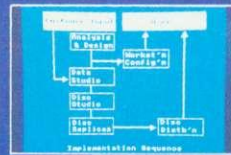
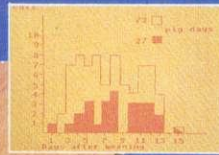
## TO OPERATE

## ....IT' CHILDS PLAY

### P.L. DIGITISER SYSTEM™

The P.L. Digitiser System enables you to reproduce complex pictures and diagrams, or produce original designs, quickly, easily and accurately.

The package consists of the 'Graphics Digitiser' incorporating a tracing pad (mapped out by rectangular grid) 256mm x 205mm and the 'Control Program' (Tape or Disc). This includes such features as automatic parallel, vertical, horizontal or diagonal lines, construction of boxes and circles from two probe positions, free hand draw, fill and outline, move and scale, immediate edit and the ability to save completed screens as files or reproduce by line printer.



## B.S.DOLLAMORE LTD.

U.K. Distributor **LM** Scientific House, Bridge St.,

Sandiacre, Notts. Telephone: (0602) 394000.



£130.39  
+ VAT



Everything for the Acorn and BBC microcomputer user.

# ACORN USER EXHIBITION

## Cunard International Hotel

Hammersmith,  
25-28 August 1983

The Acorn User Exhibition at the Cunard, Hammersmith will house the largest display of Acorn products ever assembled under one roof. It will be four days of non-stop entertainment and education for parents and children alike.

The new Electron, the second processors for the BBC micro, the BBC Buggy, all the new software and hardware will be on show. There'll be competitions, prizes, Acorn experts to answer your technical questions, demonstrations and lots and lots of bargains.

If you are an Acorn owner, or just thinking about being one, you can't afford to miss it.

**Opening hours:** August 25th-27th, 10am-7pm; August 28th, 10am-4pm.

**Admission charges:** Adults £2 per ticket, Children £1 per ticket.

We have arranged for nearly every exhibitor to redeem the cost of your ticket when you buy something from their stand.

**Group rates:** 10% discount for parties of 10 or more.

**Buses:** Frequent services from central London.

**Tubes:** Hammersmith Broadway—Metropolitan, District and Piccadilly lines.

**Car Parking:** Several car parks in the immediate area.

For details of exhibition stands and advance ticket sales contact Computer Marketplace Ltd, 20 Orange Street, London WC2H 7ED. Tel: 01-930 1612.

**ADVANCE BOOKING COUPON** Miss the queue—buy your tickets in advance.  
Computer Marketplace Ltd, 20 Orange Street, London WC2H 7ED.

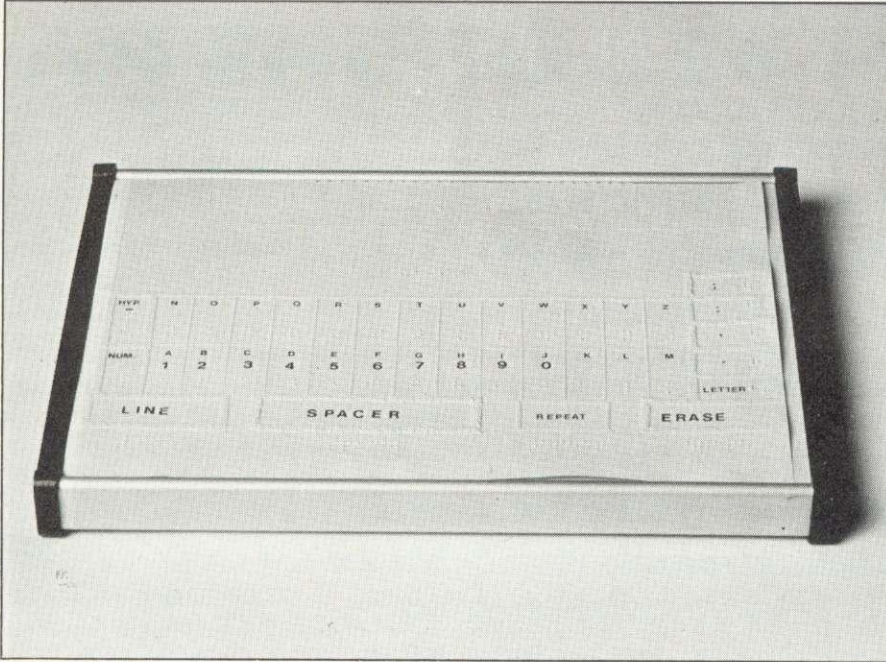
Please send \_\_\_\_\_ Adult tickets at £2 \_\_\_\_\_ Childrens tickets at £1

I enclose a cheque/postal order value £ \_\_\_\_\_ payable to Computer Marketplace Ltd.

Name \_\_\_\_\_  
Address \_\_\_\_\_







Star Microterminals keyboard with braille-embossed overlay

development. Hence, providing a spoken output offers some help.

One of the teaching programs allows a pupil to type in any word which is spoken and can be repeated or corrected. Once the program is loaded by the pupil only needs to use the Perkins brailier. The teacher can access a complete record of the pupil's work from the micro keyboard at any time. For the partially sighted, the words are displayed during typing with double-height characters (mode 7).

Enhancement of tactile sense is achieved with a concept keyboard, which has 128 individual sensitive areas. Overlays are used which have braille-embossed characters (a character occupies one individual area, and is selected by pressing one adjacent area). In this way all of the 63 braille characters can be represented and selected. Programs developed for the Perkins brailier have a procedure which makes the output from the concept keyboard compatible with its output. Hence, the same program can be used with either input device. The program recognises which device is being used by the range of ASCII values: concept keyboard, 128-255; Perkins brailier, 1-127.

The Votrax-Type'N'Talk provides an unlimited vocabulary for various applications. In some cases look-up tables are incorporated. These change the text before it is sent to the speech synthesiser to achieve improved pronunciation. For example the word 'error' is pronounced

better if it is changed to 'airor'. This technique is adopted with a Basic interpreter modification that gives programming facilities with synthetic speech as the output medium. A screen can be used, but the interpreter is designed for a blind person, hence it is assumed that programming can be achieved without visual output. Full editing with the 'copy' and 'cursor' keys is available.

An important feature is that Basic programs written with the standard interpreter will run under the modified interpreter. This helps a teacher writing a program for a visually handicapped person where program development or debugging is more conveniently carried out with a screen display rather than speech. The only restrictions with the modified interpreter are the use of mode 7, and HIMEM must not be changed. All other facilities are available although graphical representations do not have an immediate speech equivalent.

It is hoped that the text-to-allophone speech chip from Acorn will provide higher quality speech at a lower cost and can be incorporated into the configuration already developed. Existing software has been designed with this change in mind.

At least for one section of the disabled community, the exploitation of commercially available hardware through software development has become possible.

## Sold out? It need never happen again

**YOUR LOCAL** newsagent will be pleased to keep by a copy of *Acorn User* each month to make certain you never miss it. Many newsagents even deliver the magazine straight to your door with your morning newspapers - which means you receive it as soon as possible.

To take advantage of these services, complete the coupon below (or a copy) and take it round.



**To my newsagent:**

- Please put by a copy of *Acorn User* magazine for me to collect each month.
- Please deliver a copy of *Acorn User* to my door each month.

Name.....

Address.....

.....

.....

.....

Acorn User is distributed to the News Trade by **Magnum Distribution Ltd.** Tel: 01-583 0961.





# BBC OWNERS

Why not consider the HOBBIT FLOPPY TAPE SYSTEM for your computer?

The HOBBIT gives you all the facilities you would expect from a floppy disc at a fraction of the price.

"The HOBBIT takes the drudgery out of using cassettes and with its excellent performance outshines any cassette recorder I have seen." *Personal Computer News*.

## Brief Specifications

- ☆ Read/Write speed of 750 BYTES per second
- ☆ Capacity: 101K BYTES per CASSETTE
- ☆ Average access time 22 seconds
- ☆ Up to 138 FILES per CASSETTE
- ☆ Completely automatic—no buttons to press
- ☆ Fully built, boxed and tested. Just plug in and go
- ☆ System can support TWO DRIVES

Available from stock **PRICE £135.00 plus VAT**

Also available for NASCOM computers **PRICE £120.00 plus VAT**

£3 p&p. Access and Barclaycard accepted

For more details contact:

## Ikon Computer Products

KILN LAKE, LAUGHARNE, CARMARTHEN, DYFED, SA33 4QE. Tel: Laugharne (099 421) 515

# OFF RECORDS...

The London ACORN-BBC Centre  
Suppliers to Schools and Colleges  
Maintenance Contractors

### Atom:

Full hardware and software support.

### BBC:

Model A £299  
Model B £399  
Memory up-grades £21.99  
Repair service and component supply.

### Printers:

Seikosha 100 £215  
Epson MX80FT/3 £385  
SCM Daisywheel £485

### Cassettes:

Matched Cassette Recorders £26

### Monitors:

12" Green Screen  
(Hitachi/Phoenix) £110  
12" Colour (Kaga) £255  
14" Colour (BMC/Cable) £255

### Discs:

TEAC 40-track £199  
Shugart twin 40-track £299  
TORCH dual disc drive with Z80 processor, 64K RAM, CP/M and FREE software £780

### Eprom programmer:

Specially designed for BBC. Programs 12 different Eproms including 27128. Includes screen software £95 (dealer enquiries invited)  
Add 15% VAT to all prices. Carriage extra.

### Tapes:

Top Tape: see adverts in Radio Times.  
OFF Records beats all published prices.

### Stationery:

Moore Paragon main agents. Large selection of continuous stationery, forms and labels.

### Books:

Browse through the Computer Book Department for educational, scientific and business applications.

### New Showroom:

OFF Records would expect you to buy best value. Spend some time in the relaxed atmosphere of our new showroom to find out exactly what you are getting for your money.

### OFFware:

CHARAID for the design of a block of 4 characters in any graphics mode including mode-7. Outputs VDU23 commands, teletext commands and printer commands to screen or printer together with actual design. Substantial software with more than 20 well-documented commands. Indispensable for graphics work.

£7.50 p.p. & VAT incl.

ATILITY contains seven essential routines for the disc based Atom: \*COPY, \*COPYT, \*COPYD, \*RENAME, \*PURGE, \*BACKUP, \*AUTORUN. £25 p.p. & VAT incl.

### Vacancy:

OFF Records are looking for a bright spark with good knowledge of both software and hardware. Initially a Saturday job with a view to full-time employment.

### COMPUTER HOUSE

58 Battersea Rise  
Clapham Junction  
London SW11 1HH  
Telephone 01-223 7730

BR Clapham Junction	Easy Parking 4 Minutes from BR Clapham Junction Bus: 19, 37, 39, 45, 49, 68, 77, 170, 249 Tube: Clapham Common
SI JOHNS HILL	LAVENDER HILL
	<b>OFF RECORDS...</b>
	58
(A3, SOUTH CIRCULAR)	BATTERSEA RISE, SW11
	Tel: 01-223-7730 Open Daily 9.30am - 6.00pm





# AN END TO KEY POUNDING

THIS month we look at a simple piece of hardware which, with software, produces a useful extra for the BBC micro – a 16-key keyboard which is entirely programmable. Also it has an auto-repeat exactly like the main board and responds to the \*FX commands used to set delay and repeat times. The ease with which we can produce this demonstrates once again how versatile the Beeb really is.

**B**ecause the new keyboard is entirely programmable, it can be used for entirely different applications. The most obvious would be for numeric-entry (provided as standard on micros such as the Commodore Pet). Apart from the 10 number keys, the other six could be used for a decimal point, return key, and four cursor keys (figure 1). This configuration is produced by the keyboard program as it stands.

An alternative would be for hexadecimal entry. There seems to be no standard layout, but as the keyboard is programmable, it can be arranged as desired. The procedure 'hex\_entry\_keys' gives the layout shown in figure 1b.

To produce words or commands the keyboard can double up on the function keys. If you get it to produce codes &80 to &8F, they have the same effect as \*KEY0 to \*KEY9, \*KEY10 (without causing a break), COPY and the four cursor keys (figure 1c).

**W**ith computer games the second keyboard could be

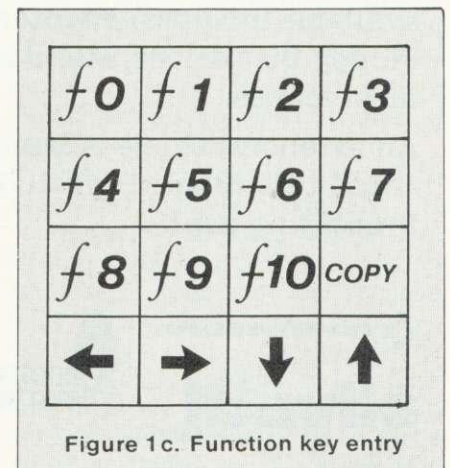
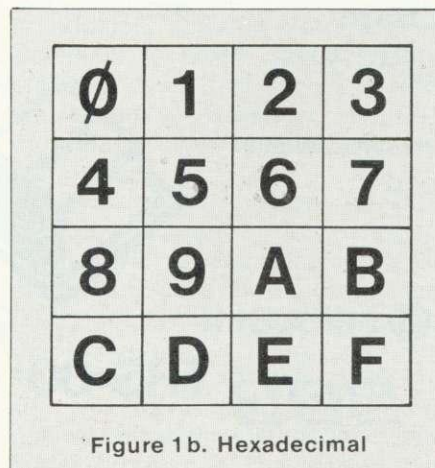
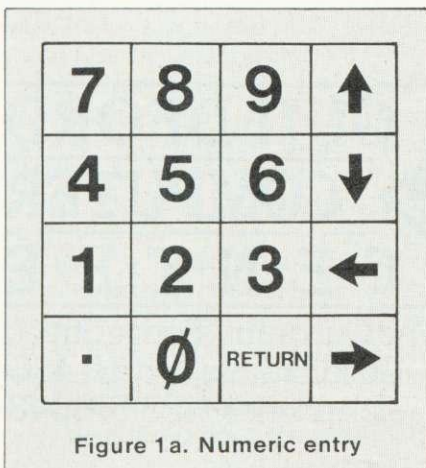
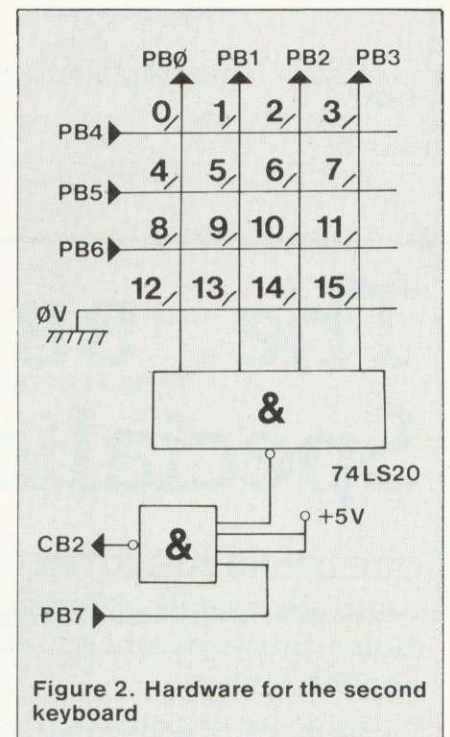
## Paul Beverley explains how to wire up a 16-digit keyboard for numeric entry – or anything else you care to program

programmed for the characters needed and used to save wear on the main keyboard. Also you could provide electrical connections on the keyboard instead of the actual key to control a joystick consisting of switches rather than potentiometers. These switched joysticks are available from most electronic component dealers. If writing games programs you can make them to respond to codes generated by the second keyboard, say codes 150 to 165 or whatever, rather than from the main keyboard.

**A**s you can see from figure 2, which shows the circuit diagram of the second keyboard, the hardware needed is minimal. The keys are set out in a four by four square. The four lines which form the rows are three output lines from the User Port, PB4 to PB6, and the zero volts line. The lines which form the columns are four lines of the User Port as input – PB0 to PB3. To detect when one of the keys has been pressed and generate an interrupt, the four column lines have been gated ready to apply to the CB2 control line. However, before the key-pressed signal goes to CB2 it is gated in with PB7.

The idea of this is that PB7 can be used to control whether an interrupt is actually sent to the processor when a key is pressed. This could be used to disable the second keyboard, but this is not really necessary since it works using interrupts and does not affect the computer itself unless a key is being pressed. The real reason for using PB7 as a control line is to combat key bounce.

**W**hen a key is pressed, there will be a certain amount of making and breaking of the contact for a number of milliseconds. Thus after the first interrupt has been generated, PB7 is used to inhibit





# BBC SOFTWARE FROM LEOsoft

- EASYFILE** A general purpose card index filing system on tape, stores up to 500 files within the program (no messy data tapes to load). Menu prompt driven with user definable field width, file length etc.  
Available for models A or B £6.95
- BANK** Keep track of your bank accounts with this easy-to-use bank statement generator. Automatic insertion of standing orders. Standard Bank statement format Hardcopy (with any printer). Over 500 transactions can be stored with this single loading program on tape.  
Available for models A or B £6.95
- CASHBOOK** A complete cash book ledger system with daily takings register (in three categories), weekly register (in five categories), Petty cash and wages register with VAT totals. Hardcopy options include weekly balance sheet, petty cash summary, VAT period ending summary (in similar format to VAT return). This dual purpose program produces both VAT returns and accounting summaries. Date and keyword search facility allows quick access to files. Eighteen different options, selected by function keys. CASHBOOK is a single loading program storing a complete VAT period cash transactions on tape. Updating service available with this program making it a must for the small businessman.  
Available for model B only £19.95
- INVOICE REGISTER** Stores over 100 invoices for VAT purposes. Entries include Invoice date, Suppliers name, Invoice total, date invoice paid, cheque number, VAT etc. Hardcopy options include VAT summary, aged balance, aged invoices, accounting summaries (produce individual or grouped product lists e.g. utilities list). Produce monthly accounting summaries for your accounts. When used with CASHBOOK this program produces a complete VAT return.  
Available for model B only £19.95
- STOCK** Stock control program (available August). This program complements CASHBOOK and INVOICE REGISTER and provides stock analysis. Stock taking made easy with used stock values and stock in hand values available at the press of a key. Individual product profit margins calculated with computer suggested retail price. Product retail price list Hardcopy printout. Search, display and print individual stock files. You enter the information the computer does the work.  
Available for model B only £19.95
- EDUCATIONAL FUNCTION PLOTTER** Plots sin, cos, tan, log, quadratic, cubic, in fact an almost unlimited range of maths functions can be plotted with this program. Multi-colour overlay allows the comparison of functions. ZOOM facility allows closer inspection of important features (roots of equations can be accurately determined). This program is a must for the study of maths functions to "O" level and beyond.  
Available for model B only £9.95
- AVAILABLE SHORTLY** PYTHAGORAS IN ACTION. A full-colour graphics teaching aid to this basic geometry law.

Please send cheque with order (mentioning this magazine).  
LEOsoft (Devon), 65 New Road, Brixham, Devon. Telephone Brixham 3159

## The BBC Microcomputer Specialists

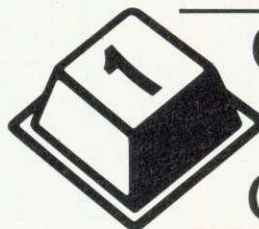
GUILDFORD COMPUTER CENTRE offers a complete range of Computers for Home, Business and Educational applications.

Large stock of additional equipment available includes:- Printers, Hard/Floppy Disc drives, Monitors etc., for most makes.


An extensive range of Business software (Accounts, Stock, Payroll, Word Processing etc.).

Drop in for a frank discussion and expert advice on your requirements or arrange a demonstration. We give a full and expert backup to ALL our sales.

Stockists of:- BBC/Acorn, Torch, Oric, Olivetti, Hitachi, TRS-80, Commodore, Dragon, Sharp, Sirius, Osborne, IBM, Newbrain, Epson, Seikosha, Cumana, etc.



**GUILDFORD  
COMPUTER  
C·E·N·T·R·E**

 **commodore**

**olivetti**

 **ACORN  
COMPUTER**

 **HITACHI**

**BBC**

**TRS-80®**

1 The Quadrant, Bridge Street,  
Guildford, Surrey GU1 4SG  
Telephone (0483) 578848



further interrupts until the key has settled down. This is done automatically by using a timer on the 6522 VIA which uses PB7 as an output. While timer 1 is on, PB7 is low which automatically inhibits the interrupts.

But how long do you wait? Various keys I tested produced bounce times between 800 microseconds (us) and about four milliseconds (ms). Program 1 provides a means of testing your keyboard. If you run this program with the keyboard attached, it will give a measure of key bounce. You can then simply set the delay generated by the VIA so it is just longer than the longest bounce.

If you run program 1, and then press the bottom left hand key, you should get a fairly random looking square-wave on the screen. The time across the screen represents 7 x 256 us. If the plot has not settled down to a steady low level by the time it reaches the other side, you will have to add extra NOP instructions by changing the value of W in line 10. Each NOP adds 256 us to the time scale across the screen. When you know the time taken by the key to settle down, you can set the value of the variable 'bounce\_delay' in program 2. This is actually the number of lots of 256 microseconds of the delay, so if the key settles down well within the length of the display on the screen when W = 0, then bounce\_delay could be set to 5 as in the listing.

One problem that arises in writing software for the second keyboard is which operating system to write for, and whether to make it Tube-compatible. I decided that to try to write it for the 0.1 operating system was futile since the 1.2 version should be well established.

The problem of Tube-compatibility is more difficult, as the software has to be interrupt-driven and therefore in machine code. Initially I tried to stick to the rules and never use LDA or STA to a specific memory location; only LDA and STA immediate, and OSBYTE calls. Flags and counters are needed for the various functions, and so for these, a DIM statement was used to make them Tube-compatible. However, since I did not have a second processor (who has?) I could not

```

10 W = 0:REM The number of NOP's for delay
20 REM Each NOP adds 256 microseconds total
30 DIM CODE% 100, S% 255
40 P% = CODE%
50 PROCassemble
60 G% = 1
70 B% = &FE60
80 MODE 0 : REM or MODE 4
90 VDU19;4;0;
100 PRINT"Press SPACE BAR when ready";
110 FOR J% = 900 TO 0 STEP -100
120   MOVE 0,J%
130   REPEAT UNTIL GET = 32
140   CALL CODE%
150   FOR N% = 0 TO 255
160     A% = S%?N%
170     A% = A% AND 1
180     DRAW N%*4,J%+A%*64
190     NEXT
200   NEXT
210 END
220
230 DEFPROCassemble
240 [OPT 0
250 LDA#1
260 LDX#0
270 .is_it_pressed
280 BIT &FE60
290 BNEis_it_pressed
300 .read
310 LDA &FE60
320 STA S%,X
330 J:IF W=0 GOTO340
340 FOR T=1TOW:[OPT 0:NOP:]:NEXT
350 [OPT 0:INX
360 BNEread
370 RTS
380 J
390 ENDPROC

```

Program 1. Measures keyboard bounce

check this program.

The resulting program had the disadvantage of being longer, more complex and slower than necessary. In addition, since it used a DIM statement to select space for the program, you would have to merge the assembly language program with each applications program that used it.

Although the Tube version worked, I decided to do a stripped down version avoiding the rigmarole of OSBYTE calls for accessing the 6522 VIA, while still maintaining OSBYTE calls for things such as reading repeat and delay times (as set by \*FX11 and \*FX12) and putting characters into the keyboard buffer (program 2). The point is that

no matter which operating system is used, the addresses of the 6522 VIA cannot change as they are determined by the hardware, but for the other routines it is necessary to use OSBYTE calls so when new versions of the operating system come along, you will not have to change this program.

One major problem is where to store the machine code as it is longer than 256 bytes and will not fit into &D00 to &DFF. The placing of these routines is critical because they are interrupt service routines - if they get over-written the whole machine flops. Every few milliseconds interrupts are being generated and all are directed first of all to these routines before being re-directed





```

10 IF PAGE < &1B00 PRINT " PAGE = &1B00":END
20 PROCsetvariables
30 FOR PASS = 0 TO 2 STEP 2
40   PROCassemble
50   NEXT PASS
60 CALL initialise
70 PROCnumeric_keys
80 REM PROCchex_entry_keys
90 REM PROCfunction_keys
100 PRINT " *SAVE NUMKEYS ";~CODE; " ";~P%+16; " ";~CODE
110 END
120
130 DEFPROCnumeric_keys
140 $table = "789x456x123x.0"
150 table?3 = &8F
160 table?7 = &8E
170 table?11 = &8C
180 table?15 = &8D
190 ENDPROC
200
210 DEFPROCchex_entry_keys
220 $table = "0123456789ABCDEF"
230 ENDPROC
240
250 DEFPROCfunction_keys
260 FOR N = 0 TO 15
270   table?N = &80 + N
280 NEXT
290 ENDPROC
300
310 DEFPROCsetvariables
320 CODE = &1902
330 bounce_delay = 5
340 IRQ1V = &204
350 IRQ2V = &206
360 oldIRQ1V = &70
370 flags = &72
380 key_number = flags
390 delaying = flags + 1
400 repeating = flags + 2
410 delay_time = flags + 3
420 repeat_time = flags + 4
430 OSBYTE = &FFF4
440
450 PB = &FE60
460 T1L = PB+4
470 T1H = PB+5
480 ACR = PB+11
490 PCR = PB+12
500 ifr = PB+13
510 IER = PB+14
520 ENDPROC
530
540 DEFPROCassemble
550 P% = CODE
560 [OPT PASS
570
580 .initialise           \ Set PB4 - PB7 as o/p
590 LDA #&F0
600 STA PB+2
610
620 LDA #&80             \ Timer 1 output on PB7
630 STA ACR
640
650 LDA #0               \ Set PCR for CB2 neg. active
660 STA PCR
670
680 LDA #128+64+8       \ Enable interrupts, T1 & CB2
690 STA IER
700
710 .changevectors
720 SEI
730 LDA #newIRQ2V MOD 256
740 STA IRQ2V
750 LDA #newIRQ2V DIV 256
760 STA IRQ2V + 1
770
780 LDA IRQ1V
790 STA oldIRQ1V
800 LDA #newIRQ1V MOD 256
810 STA IRQ1V
820 LDA IRQ1V + 1
830 STA oldIRQ1V + 1
840 LDA #newIRQ1V DIV 256
850 STA IRQ1V + 1
860 CLI
870 RTS
880
890 .newIRQ2V
900 TXA:PHA:TYA:PHA     \ save registers
910 JSR irq2_handle
920 PLA:TAY:PLA:TAX     \ restore registers
930 LDA &FC             \ restore accumulator
940 RTI
950
960 .irq2_handle
970 LDA ifr
980 AND #64
990 BNE clear_interrupt \ If timeout THEN
1000                    \ clear_interrupt
1010 LDA #0             \ ELSE start Timer 1.
1020 STA T1L           \ Low byte first
1030
1040 LDA #bounce_delay
1050 STA T1H           \ then high byte.
1060 JSR inPB         \ Clear interrupt. continued ▶

```

Program 2

```

1070
1080 .return
1090 RTS
1100
1110 .clear_interrupt
1120 LDA T1L
1130
1140 LDA #128
1150 STA delaying
1160 JSR read_delay
1170 JSR readkey
1180 RTS
1190
1200 .newIRQ1V
1210 TXA:PHA:TYA:PHA     \ save registers
1220 JSR irq1_handle
1230 PLA:TAY:PLA:TAX     \ restore registers
1240 JMP (oldIRQ1V)
1250
1260 .irq1_handle
1270 LDA &FE4D
1280 AND #64
1290 BEQ return
1300
1310 LDA repeating
1320 BEQ waiting
1330
1340 DEC repeat_time
1350 BNE return
1360
1370 JMP read_a_key
1380
1390 .waiting
1400 LDA delaying
1410 BEQ return
1420 DEC delay_time
1430 BNE return
1440 LDA #0
1450 STA delaying
1460 LDA #128
1470 STA repeating
1480
1490 .read_a_key
1500 JSR read_repeat
1510
1520 .readkey
1530 JSR inPB
1540 BNE which_row
1550 LDA #0
1560 STA repeating
1570 STA delaying
1580 JMP rts
1590
1600 .which_row
1610 LDA #12
1620 STA key_number
1630 LDY #64+32+16       \ Is it bottom row?
1640 STY PB
1650 JSR inPB
1660 BNE read_column
1670
1680 LDA #0
1690 STA key_number
1700 LDY #32+16         \ or next to bottom row?
1710 STY PB
1720 JSR inPB
1730 BNE read_column
1740
1750 LDA #4
1760 STA key_number
1770 LDY #64+16         \ or next to top row?
1780 STY PB
1790 JSR inPB
1800 BNE read_column
1810
1820 LDA #0
1830 STA key_number
1840 LDY #64+32         \ or top row?
1850 STY PB
1860 JSR inPB
1870 BEQ rts
1880
1890 .read_column
1900 LDY key_number
1910 DEY
1920 .next_column
1930 INY
1940 LSR A
1950 BNE next_column
1960
1970 STY key_number
1980 LDA table,Y
1990 TAY
2000 LDA #&8A           \ character into keyboard buffer
2010 LDX #0
2020 JSR OSBYTE
2030
2040 .rts
2050 LDA #0
2060 STA PB
2070 RTS
2080

```

Program 2,  
continued on page 65 ▶



```

2090 .read_repeat
2100 LDA #197
2110 LDX #0
2120 LDY #&FF
2130 JSR OSBYTE
2140 STX repeat_time
2150 RTS
2160
2170 .read_delay
2180 LDA #196
2190 LDX #0
2200 LDY #&FF
2210 JSR OSBYTE
2220 STX delay_time
2230 RTS
2240
2250 .inPB
2260 LDA PB
2270 AND #15
2280 EOR #15
2290 RTS
2300
2310 .table
2320 J
2330 ENDPROC
    
```

Program 2. Sets up second keyboard

back to the interrupt routines in the operating system ROM. Therefore if these routines were corrupted, the next interrupt would fail to be serviced and the machine would hang up. The only way out then would be to break.

If you are not using any user-programmed characters and are on a cassette system, locations &C00 to &DFF are free, but with disc systems there is no safe area. You could put them between say &1700 and &18FF, but they may be overwritten during certain disc routines such as copying. However, as long as you break before executing these commands and re-load the machine code program, there is no problem in doing that.

The other solution is to move PAGE up to &1B00 and assemble the program at &1900. This is what I have done in program 2. Before you run this you have to ensure the value of PAGE is &1B00.

Once the program has been assembled it can be stored as machine-code and \*RUN from cassette or disc. The command

needed to \*SAVE both routines and the table of characters is printed on the screen by line 100 so you can copy it using the cursor editing to save typing.

If you only want to build and use this keyboard, a detailed explanation of the program is not essential. However, I include it for those who would like to improve their understanding of assembly language programming, or who may want to modify the program.

After initialisation in which the various registers of the 6522 are set up appropriately (lines 580-690), the two interrupt vectors are altered to point to the routines in this program (710-870). While this is being done, interrupts are disabled by setting the interrupt mask (SEI), since if an interrupt occurred before the change was complete, the system would crash.

If an interrupt occurs which is generated by the external 6522 VIA from which the User Port comes, it will not be recognised by the

## 3D COMPUTERS

THE HOME COMPUTER SPECIALISTS

Easy Parking at all branches

See us at the  
**Acorn User Exhibition**  
Cunard Hotel Aug 25-28 STAND No 37

WITH MORE BRANCHES THAN  
ANY OTHER ACORN DEALER  
WE OFFER

**ONE-STOP SHOPPING**  
FOR YOUR  
**BBC MICRO**

CALL IN AT YOUR LOCAL BRANCH  
FOR FRIENDLY ADVICE  
AND SERVICE

SEE A COMPLETE DISPLAY  
OF HARDWARE & SOFTWARE  
TO BUILD UP YOUR  
BBC MICRO SYSTEM

### SOFTWARE

PROGRAM POWER  
BUG-BYTE  
SUPERIOR SOFTWARE  
A & F  
SIMON HESSEL  
MOLIMEX  
PHOTONICS  
ACORNSOFT

### PERIPHERALS

DISCS SINGLE/DUAL  
TORCH Z80 DISCS  
CUMANA DISCS  
PRINTERS  
JOYSTICKS  
MONITORS  
B & W/COLOUR  
LIGHT PENS  
BBC BUGGY

Large range of books,  
diskettes, cassettes &  
printer paper always in  
stock

### TOLWORTH

230 Tolworth Rise South,  
Tolworth, Surbiton  
Surrey KT5 9NB  
Tel: 01-337 4317

### SUTTON

30 Station Road,  
Belmont, Sutton,  
Surrey SM2 6BS  
Tel: 01-642 2534

### EALING

114 Gunnersbury Avenue,  
Ealing, London W5 4HB  
Tel: 01-992 5855

### RICKMANSWORTH

Greystone Works,  
The Green, Croxley Green,  
Rickmansworth,  
Herts. WD3 3AJ  
Tel: (0923) 779250

### MILTON KEYNES

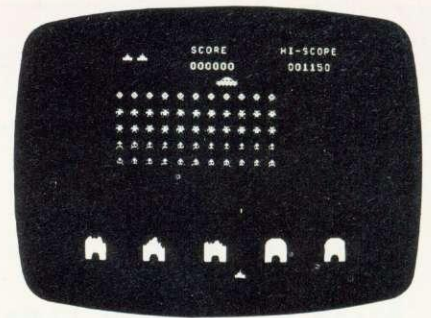
Unit 1, Heathfield,  
Stacey Bushes,  
Milton Keynes MK12 6HP  
Tel: (0908) 317832

### NEWBURY

26 Stanley Road,  
Newbury,  
Berks. RG14 7PB  
Tel: (0635) 30047

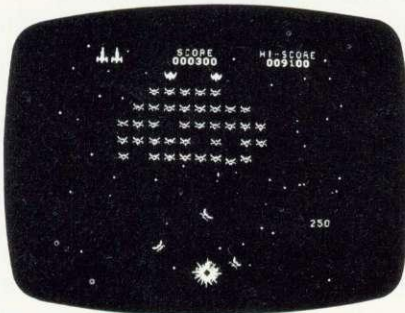


# SOFTWARE INVASION



## 001 INVADERS

Arcade quality full feature Space Invader game, written in machine code using Mode 1 colour graphics. Hi-Score, Mystery Ship, Bonus Base, Advancing, Walking Aliens.  
Runs on a model B for £6.95 inc.



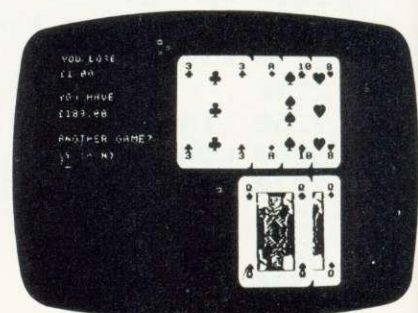
## 002 GALAXIAN

Arcade quality game using machine code, vivid Mode 1 colour, Moving Stars, Hi-Score, Bonus Ship, Flagships, Swooping Aliens and Exciting Sound Effects.  
Runs on a model B for £6.95 inc.



## 003 APOLLO

Lunar Lander with a difference! 4 stage game comprising Orbit, Long Range, Mid Range, Detailed Landings, Limited Fuel, Hall of Fame, Sound, Moon Walk etc.  
Runs on a model B for £6.95 inc.



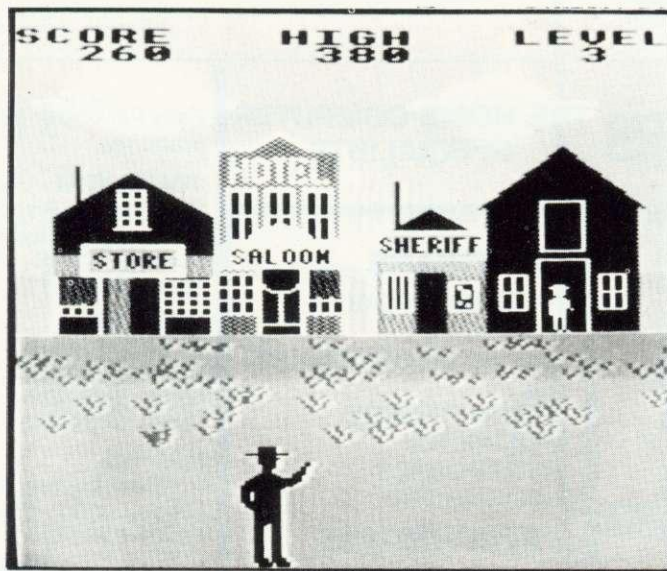
## 004 BLACKJACK, TEXTPRO, DISASSEMBLER

1 tape containing 3 programs representing incredible value for money.

BLACKJACK is like the arcade game, but uses much better graphics - so real you could pick them off the screen!

TEXTPRO is a simple word processor, offering text scrolling, cassette routines, line editing, justification, insertion and deletion, variable line width and page length, data verification, line centralizing and printer commands including page scrolling, large print and variable spacing. Full instructions and function key labels supplied. DISASSEMBLER lists object code and Assembler mnemonics. Includes a pause function, printer option, page mode and only occupies 4.5K of RAM. Full instructions and function key labels supplied.

Runs on a model B for £6.95 inc.



005 GUNSMOKE is the latest release from SOFTWARE INVASION. It's completely different from any game you've played before. Superb realistic sound effects - high speed animation - nail biting action - fantastic highly detailed graphics, mixing colours to produce brown, grey and olive in addition to the normal shades. You play the part of a Wild West Gunslinger, dodging bullets and trying to shoot bandits as they appear in doors, windows, alleys and on the roof. There's sixteen different bandits who need no provocation to fill you full of lead. If you manage to kill them all, it's not over, day turns to night and the nightmare begins again.

If you're quick on the draw, this game's for you!

GUNSMOKE runs on a BBC Micro model B and costs just £7.95 inclusive.

# AND NOW

# GUNSMOKE

50 Elborough St., Southfields,  
London SW18 5DN.





interrupt service routines in the operating system and will therefore be passed on to the second interrupt vector (IRQ2V). This then points to lines 890 to 1180 which first of all save the X and Y registers. Then if the interrupt is from CB2 ie a key has just been pressed, timer T1 is started which inhibits further interrupts generated by bouncing keys. If on the other hand the interrupt was generated by the timer it means the key should have settled down and it is time to find out which key has been pressed.

To produce the automatic delay and repeat facility, it is necessary to intercept the first interrupt vector (IRQ1V) so the 'time-outs' on the internal VIA which occur every 10ms can be detected. The routines check first of all (1270-1290) whether the interrupt is a VIA time-out, and if not, return to the operating system routines. If it is a time-out the routine checks to see if it is in the middle of either the delay after the first press of the key, (waiting, line 1390) or the delay for auto-repeat (1340, 1350). In each case it decrements the appropriate counter which was read by the OSBYTE routines at lines 2090-2230, and if the count has reached zero the key is read again.

To scan the keyboard you first check to see if any key is still pressed and give up if not, ie if the key has been released (1530-1580). You then look at each row in turn (1600-1870). The 'key number' is set in multiples of four according to which row the pressed key is on and then in the 'read column' routine you increment this number until you find in which column the

key is (1900 - 1950). Using 'key number' as an index, the appropriate character is picked out of the table (1980) and transferred into the keyboard buffer (1990-2020). Finally, all output row lines are set back to zero to be ready to detect the next key-press (2050, 2060).

**'D**o-it-yourselfers' will probably want to make up this unit on Veroboard or by making a printed circuit board (PCB). If you do not have much experience, but would like to have a go, Electro Technical Services can supply a PCB to make life very much simpler. All you have to do is solder in the chip, switches and ribbon cable connector and connect it up to the User Port via a piece of ribbon cable. The PCB has been made so it can take either expensive keys for professional applications or cheaper keys for simple home use.

For those who do not want to do any soldering at all, the same company can supply a ready-built and tested unit to professional standards. It is hoped to supply the software in EPROM so it can go into one of the sideways ROM sockets. This means the unit can be set up without loading any software from tape or disc.

**Ready-made  
circuit board  
offer**

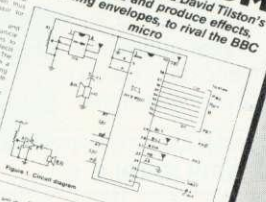
**QUALITY printed boards  
have been commissioned to  
accompany this article.  
These cost £5.83 each,  
including postage and VAT  
(overseas prices on appli-  
cation). Discounts are  
available on bulk orders, and  
delivery will take up to  
28 days.**

**If you would like to take  
advantage of this offer, write  
to: Acorn User Board Offer,  
Electro Technical Services,  
55 Raymond Road, Hellesdon,  
Norwich NR6 6PN.**

ATOM

**PCB for  
Atom  
sound  
generator**

**SOUND OUT  
OF AN ATOM**  
For £20, you can build David Tilston's  
sound board and produce effects  
including envelopes, to rival the BBC  
micro



**ATOM users - upgrade your machine to produce sound effects that will rival those of the BBC micro by adding a sound generator. The May issue of Acorn User explains how to interface a sound board based around the AY38910 programmable sound generator chip.**

**The printed circuit board to accompany the article costs £5.38 (inclusive) and is available from: Electro Technical Services, 55 Raymond Road, Hellesdon, Norwich NR6 6PN.**

INTERFACING

**Interface  
box for  
BBC  
micro**

**INTERFACE your BBC micro with a specially-designed interface box outlined by Paul Beverley in Acorn User (see May's issue for the design and June's for how to test it). For £11.95 we can provide a double-sided printed circuit board with plated through holes, and component overlay.**

**A kit of parts, as well as fully-built and tested boards is also being made available (should cost about £80 for completed interface box). These prices include UK postage and VAT. Please allow 28 days for delivery.**

**Make cheques payable to Electro Technical Services at 55 Raymond Road, Hellesdon, Norwich NR6 6PN.**



# EXTENDED WARRANTIES

**Full parts and labour guarantees for the BBC Microcomputer at a price you can afford from Cambridge Processor Services.**

**Please note we also carry out A to B upgrades and include in the price our full 1 or 2 year guarantees on the whole machine.**



For a model A or B BBC Microcomputer a full 1 year guarantee costs just £18.40 and a full 2 year guarantee just £27.60. If your micro has a disc interface add £5.75 to either price or £6.90 for an econet.

A basic A to B upgrade costs £74.75 including a full 1 year guarantee on the whole machine or £83.95 for an upgrade and full 2 year guarantee. Please telephone for prices on disc, econet and speech upgrades.

If your Micro is still under warranty just fill in the expiry date on the coupon\* and your guarantee will start from that date. Should your machine already have a fault simply return it to us (provided the manufacturers warranty has expired) and we will repair it and issue a full 1 year guarantee for £29.90 or 2 year guarantee for £39.10. Please add £5.75 to either price if it has a disc interface or £6.90 for an econet.

Should your computer malfunction whilst covered by us simply send it to us and our expert staff will repair it within 5 days of receipt and return it to you free of charge.

**For you and your Micro's peace of mind send the coupon today!**

- Please tick service required
- If disc interface fitted add £5.75 to price.
- If Econet fitted add £6.90 to price.
- I enclose £18.40 for a full 1 year guarantee.
- I enclose £27.60 for a full 2 year guarantee.
- I enclose £29.90 for an immediate repair and full 1 year guarantee.

- I enclose £39.10 for an immediate repair and full 2 year guarantee
- I enclose £74.75 for an A to B upgrade and full 1 year guarantee.
- I enclose £83.95 for an A to B upgrade and full 2 year guarantee.

Signature .....

Initials .....

Surname .....

Address .....

..... Postcode.....

Telephone .....

**WARRANTY EXPIRY DATE**  
**IF APPLICABLE \***      /      /

Access card number:

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

Make/Model: .....

Serial Number: .....

Send remittance and micro (if applicable) to:

**Cambridge Processor Services**  
**Dept. A, 25 Parsonage Street,**  
**Cambridge CB5 8DN**

**Telephone Orders and Enquiries:**  
**Madingley (0954) 210212. ACCESS only.**

**This offer applies to mainland UK only and does not apply to major damage caused by abuse.**



## A SIMPLE PROGRAM TO STORE AND EDIT TEXT

THIS month's 'biggie' is for those who haven't got Wordpack. Program 1 provides a simple means of text storage and editing. If you read last month's tip about the way the Atom stores lines, this program should make sense. Text is stored as a program. Lines can be added or deleted. The first line of text must be labelled 'a', for the program to work. When reviewing, the Atom is in page mode. If line 10 has you puzzled, N acts as a logical operator (manual p32). As it stands, the only drawback is that lines may

not be more than 64 characters long on the printer.

On the subject of printers, ever had the machine hang up because the printer wasn't connected? Annoying, isn't it? The following subroutine will test for an active printer and won't allow you to proceed, until connections have been made:

```
1000 IF ?#B801&#80=0 R.
1010 P.$7"PRINTER NOT
      CONNECTED!" "PRESS return
      WHEN READY"; IN.$A; G.1000
```

**Barry Pickles hosts a new cash-for-tips column. Here's a chance to show off your talents – and earn some crinkly green stuff into the bargain. There are reckoned to be some 40,000 of you out there and, bearing in mind that the Atom has been around for more than two years, you must have accumulated a fair amount of expertise.**

**What we're looking for are those little routines, tips and hardware mods you've discovered. Don't worry if your little wrinkle seems too simple – it's probably just what someone else has been looking for. The same rules apply here as in Ian Birnbaum's Beeb Forum. Short, sweet and as original as possible is the name of the game. I'll start you off, but this is your page, so let's hear from you!**

**Send your ideas to Atom Forum, Acorn User, 53 Bedford Square, London WC1B 3DZ. If you want it returned, enclose a SAE. It should be typed or printed, with programs on cassette (with listing if possible).**

## IMPROVE YOUR SECURITY TECHNIQUES

THE simplest way to prevent someone listing a program is to insert a control code at the start of a program line, which turns the screen off. Thus:

```
10REM (CTRL-U)(CR)
20 hidden section of program
...
100(CTRL-F) REM (CR)
```

This will deter casual users, but the real tyros will soon spot something is missing. You can make things harder by hiding all references to lines in the hidden section, but a cleverer way is to start the line with something innocent and turn the screen off afterwards.

A similar idea can be used to

prevent program titles from appearing, if \*CAT is used. However, you will need a 'bootstrap' routine to make loading appear normal – that is, a short program to load the real program. Commercial software houses use this technique a lot. If you really want your program to be secure, insert any innocuous control code into the filename. Only you know the proper name, only you can load it!

Please note that Barry Pickles cannot reply to queries individually.

## SO OBVIOUS WITH

## MACHINE CODE

THIS tip is so obvious you've probably never thought of it. If you look at most commercial games software, it will consist largely of machine code – for the sake of speed. What you won't see is the assembly code, since there is usually not enough room for both code and source in memory. That's my tip. Assemble machine code into the text area, dump the source and save the assembled code along with your Basic. This has the added advantage that users will find it hard to swipe your brainwave!

```
1 REM: SON OF WORDPACK
5 DIMA5,Q64; P.$12'; Q=?18*256
10 IN."rEVIEW OR pRINT"$A; N=(?A=CH"P");
  IFN P.$2; G.30
20 IF ?A<>CH"R" P.$7$7$7;G.10
25 P.$14; ?#E6=10
30 GOS.b; GOS.b;GOS.c
40 IN."PRESS return"$A;RUN
100c DO; P.$Q'; Q=Q+LENQ+3; U.Q>=TOP;
  P.$3$15; R.
110b DO; Q=Q+1; U.?Q=CH"a"; Q=Q+1; R.
119 REM:Text starts on next line
120a TEST STRING 1
130 TEST STRING 2
```

**Program 1. Save yourself £35!**



# FINANCIAL GAMES

## BBC Model B

### THE WORLD TRAVEL GAME



**1 or 2 Players,  
Choice of Game,  
'Exciting, Tense, Competitive and  
even Educational'**



★ ★ ★ ★ ★

Travel the World; Journey by air, rail and road.  
Exchange currencies; Buy souvenirs; Book tickets.  
Cope with hijacks, strikes, robbery and other problems  
inherent with travel.

Visit countries as diverse as Russia & the Falklands.

Your aim is to collect 6 souvenirs and return to  
LONDON intact!

— £6.95 —

### GREAT BRITAIN LTD.



**You are P.M.  
and Chancellor of  
'Great Britain'**

You must select the Party you wish to represent and your aim is to stay in office for as long as possible. You must control inflation and unemployment, maintain the exchange rate, introduce social reforms and stay popular. The game is split into sectors: country profile, shopping basket, budget day, reform opportunities, manifesto, and most important election nights (a telling time).

**A COMPLEX GAME THAT YOU WILL NOT TIRE  
OF IN A HURRY**

— £5.95 —



### INHERITANCE

**Gt. Uncle Arburthnot  
is dead.  
You stand to inherit!!**

A 2 part game. Prove your financial accumen in Part 1 by investing wisely at the stock and metal markets; if desperate try the casino or the horse races. If you are successful you will enter the world of big business in Part 2. Find the secret formula for paradise cola; manufacture and market the drink; cope with strikes, fires, frauds, cash shortages, etc. Your ultimate aim is to become a millionaire! **A MAMMOTH GAME PACKED FULL OF FEATURES**

— £5.95 —

See Reviews in:  
Acorn User Dec '82 — Personal Computer Jan '83

*Trade Enquiries Welcome. Special Deals for Schools.*

**Simon W. Hessel (Dept A)**

**15 Lytham Court, Cardwell Crescent, Sunninghill, Berks.**

**Telephone: Ascot 25179**

**24HR DESPATCH — ONE YEAR GUARANTEE — MONEY-BACK IF NOT SATISFIED**



SCREEN INVERSION FOR PRESENTATION

INVERTING the screen is sometimes a better way of presenting information. The Atom manual explains how to clear the screen to white, but not how to invert a filled screen. In graphics mode, the answer is to OR each location with the value -1.

The exception is mode 0, where you should OR with #3F. In text mode, although the 6847 CRT controller has an inverse capability, the appropriate pin is not connected, so a hardware change would be necessary. However, the same effect can be achieved by

printing normally, then ORing screen locations with #80. If you use the 'byte indirection' operator '!' this is very fast. Turn the cursor off first, though.

In the same vein, dramatic effects can be obtained in games by toggling #B000 to alter the graphics mode. My favourite flashes the screen whenever a hit is made. It goes:

```
F.N=1TO6; ?#B000=RND;
LI.#FB8A; N; ?#B000=#F0
```

This works in mode 4; other modes will need the final value of #B000 to be altered (Atom manual p88).

SOLUTION TO THOSE

BOUNCING KEYBOARDS

LAST month we looked at some inbuilt delay routines in the Atom. The one at #FB83 is user programmable and can be used to 'debounce' the keyboard. Keyboard bounce (double striking) was a common fault on the Atom until Acorn replaced the cheap keyboard used on early models. The following routine alters the ReadCharacter VECTOR (at #20A,20B in block zero) to point to a new routine at #21C, inserting a delay after reading each character. The delay is determined by the value of the X register in line 15. Here it is 4/60ths second, but it can be altered to any convenient value. It is activated by LINK#21C and deactivated by break:

```
5 P=#21C; [
10 LDA@26; STA#20A; LDA@2;
STA#20B
15 JSR#FE94; LDX@4; JSR#FB83;
RTS; ]
20 LI.#21C; E.
```

TEXT PRINTING WITH WORDPACK

PRINTING text in graphics modes is complicated and a general purpose program to do so takes up too much memory. However, with Acorn's Wordpack ROM it is possible to mix text and graphics using a single line:

```
P.$21;]; LDY@3; LDX@96;
JSR#ACDE; RTS; ]; P.$6
```

This can be assembled into any convenient space, where you have eight bytes free and is used by LINK P; CLEAR M, where P is the address of the assembled code and M is the graphics mode. It will not work in mode 0 (but it's not needed there, anyway) and, in modes other than

mode 4, the character set will be progressively larger, as you use a lower mode. Colour modes give strange results, because of the way cells are mapped in colour.

DECIMAL PLACINGS

WHEN using the Atom in financial work, it is often necessary to calculate to four decimal places, but the final answer needs rounding to two decimal places. To do this, add 0.005 before printing out the result. This will perform 5/4 rounding.

STRIP OFF THE

PAINFUL ZEROES

WITH FP ROM

IF YOU use the floating point ROM, you have doubtless found the Atom's insistence on always printing numbers with 10 characters a real pain! The next routine will come as a godsend, since it removes trailing zeroes, by converting the number to a string (\$P) and stripping it. It is written as subroutine z:

```
1000z P=#8200; STR %N,P;
?(P+20)=13; IF?(P+10)
<>CH"E"G.1020
1010 F.Z=(P+10)TO(P+14);
Z?10=?Z;N.
1020 Z=P+10; DO; ?Z=13;
Z=Z-1; U. ?Z<>CH"0"; IF
?Z=CH"="; ?Z=13
1030 P.$P,$(P+20);R.
```

To test it, try this line:

```
20 DO FIN."F.P. NUMBER"%N;
GOS.z; U.0
```

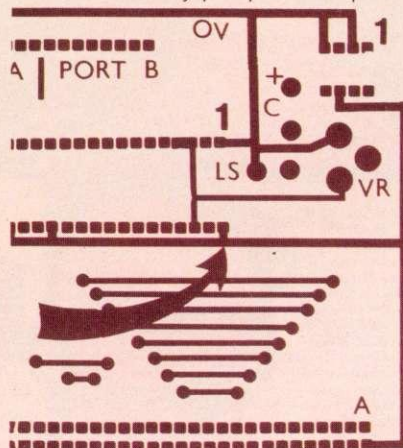
ERRORS IN ATOM ARTICLES

AN ERROR has been spotted in the article 'Sound out of an Atom' in May's *Acorn User*. The PCB foil pattern is incorrect, as pin 40 of the AY38910 should be connected to the 5v supply - but it isn't.

The circuit diagram (figure 1) on page 57 shows it connected correctly. The diagram below shows the section of the pattern as it should be. Our apologies to readers, and thanks to Brian Moulton for pointing this out. Please spread the word.

Now turn to page 57 of June's issue. The graphics fix routine given in the Atom Forum has two errors, Line 10 should begin P.\$21 . . . not S21, and line

9000a should begin !#222=#!#3FE. . . We hope this didn't leave too many people stumped.



A section of the board foil, showing the missing link to pin 40



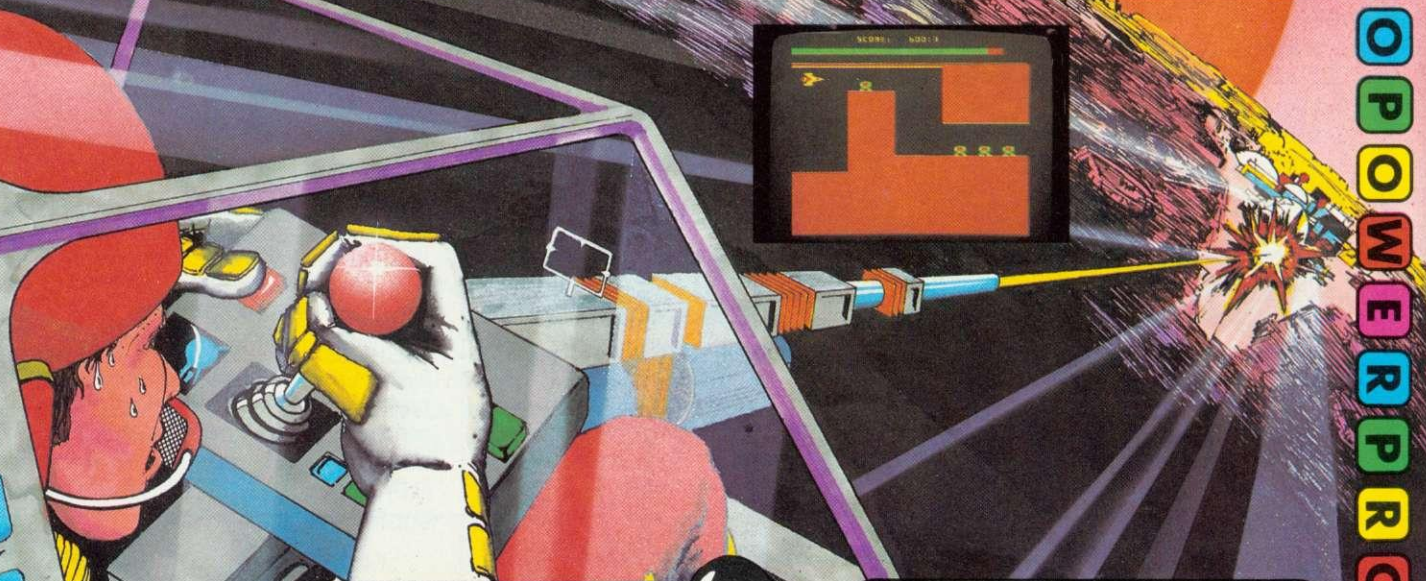
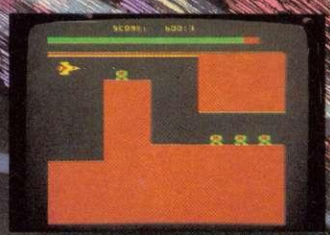
PROGRAM POWER MICRO POWER

# MOONRAIDER

A GREAT NEW BBC MODEL B PROGRAM FROM BRITAIN'S LEADING SOFTWARE HOUSE!

You're flying a highly manoeuvrable 32K Space Fighter armed to the teeth with a rapid-fire laser cannon and the latest Tryxex bombs. Your mission is to penetrate the alien moon defences. Against you are self-firing rockets, nuclear Ack-Ack guns, spacemines, 'fizzers', and meteors, not to mention the network of narrow passageways which must be negotiated. You have only limited fuel which needs to be replenished by either bombing

the enemy fuel dumps or docking with the refuelling station. There are 6 phases to get through and 4 levels of difficulty. The game can be started at any phase and on any level. The controls are either from joysticks or from standard or user-defined keys. This exciting program only £6.95!



PROGRAM POWER MICRO POWER

PROGRAM POWER MICRO POWER

Other B.B.C. programs available: Swoop (B) £6.95/Croaker (B) £6.95/Chess (B) £6.95/Laser Command (B) £6.95/Galactic Commander (B) £6.95/Allen Destroyers (B) £6.95/Adventure £6.95/Cowboy Shoot-Out (B) £5.95/Filer £8.95/Micro Budget £6.95/World Geography (B) £5.95 Timetrek (B) £6.95/Spacemaze (B) £5.95/Martians (B) £5.95/Astro Navigator (B) £4.95/Star Trek £4.95/Munchyman £5.95/Seek £5.95/Eldorado Gold (B) £5.95/Cat and Mouse £4.95/Mastermind £3.95/Reversi 1 £4.95/Reversi 2 (B) £4.95/Roulette (B) £4.95/Gomoku £3.95/Zombies £3.95/Dissassembler £5.95/Constellation (B) £5.95/Junior Maths Pack (B) £5.95/Where? (B) £5.95.

Written any Programs? We pay 20% Royalties for DRAGON, SPECTRUM, B.B.C. PROGRAMS



WE ARE AUTHORISED DEALERS FOR ACORN ATOM, BBC MICRO & DRAGON 32

**SPECIAL OFFER**  
Deduct £1 per cassette when ordering two or more.

MICRO POWER LTD.  
Dept. AU 7  
8/8a REGENT STREET,  
CHAPEL ALLERTON,  
LEEDS LS7 4PE  
Tel: (0532) 683186 or 696343

Please add 55p order P & P + VAT at 15%

Please Note:

All programs are now available at all good dealers or direct from MICRO POWER LTD.



PROGRAM POWER MICRO POWER



# SOUNDS INTERESTING

THE Atom is regarded by many as dated, but although it cannot produce four-part harmony, some interesting and useful sounds can be produced.

A simple bleep generator is given by program 1. To operate this set ?#80 to any number between 1 to 255 inclusive, depending on what frequency of note is required, and set ?#81 again to any number between 1 and 255, depending on the length of note. If LINK VV0 is executed, the computer will issue a bleep using your information. The program works by exclusive OR-ing the speaker location (?#B002) with the number 4 in binary (00000100). This produces a single click; depending on the time between each click (value of ?#80) a different note is produced. ?#81 varies the number of clicks produced.

Different effects can be created by changing parts of the program. If lines 95 and 120 are replaced by:

```
95 DEY;INC#80 (or 95
DEY;DEC#80)
120 ?#80=10;?#81=255
```

and this line is added,

```
130 LINK VV0;GO TO 130
```

two different 'alien mothership' sounds can be produced. This is done by increasing or decreasing the value of ?#80 within the machine code program.

Tunes can be created by using table 1. Values of #80 produce the nearest approximation to the notes indicated.

## Gabriel Gilson outlines some simple sound effects on the Atom with crashing examples

Table 1. Note values

G - 254	G' - 120	A - 57
G' - 239	A - 113	A' - 53
A - 226	A' - 107	B - 50
A' - 213	B - 101	C - 48
B - 201	C - 95	C' - 45
C - 190	C' - 90	D - 42
C' - 179	D - 85	D' - 40
D - 169	D' - 80	E - 38
D' - 160	E - 75	F - 36
E - 151	F - 71	F' - 34
F - 142	F' - 67	G - 32
F' - 134	G - 62	
G - 127	G' - 60	

Lowest note - 254  
Highest note - 32

For example, program 2 produces the old favourite 'Good King Wenceslas'. To change this program, first list all the note codes from the table, and list the note lengths, using 1 for 1/2 beat, 2 for 1 beat, and so on. These lists must then be turned into strings. Lines 40 to 60 give \$A, the note codes, and line 30 gives \$B, the note lengths. Subroutine b (lines 140-170) plays the tune. Line 140 extracts the first three members of \$A (in this case 1, 2, and 7), turns them into the proper numbers from their character values (-48) and

makes them into a single number (127). ?#80 is then set to this value.

Now comes the difficult bit. In line 160, ?#81 is set to the length of the note. It extracts the necessary member of \$B, makes it into its proper number from its character value (-48), multiplies it by 5100 and divides it by the value of ?#80. This is done because on the Atom, the higher a note is, the shorter it is. Line 160 ensures the notes are the correct lengths. The constant 5100 is chosen for a particular tune so that ?#81 never takes a value greater than 255. Clearly the safe default value for this constant is 255 x 32 (highest note on table)/4 (assuming this to be the longest note in string B), which equals 2040. But it is best to set the constant to 255 multiplied by the highest note in your tune (lowest number) divided by the longest note length in your tune. This note is then played by a LINK VV0, and the next numbers are extracted.

The DIM statements in line 10 must be changed to the number of elements in each string. Then the FOR . . . NEXT statements in lines 70-80 must be altered to suit your tune, and to allow for repeats etc.

Sounds can also be produced in a normal Basic program, either by a P.\$7 which produces a bleep like CTRL-G does, or by implementing what the machine code program does in Basic, as in program 3.

The statement ?#B002=?#B002:4 actually produces the single click. The tone on this can be altered by

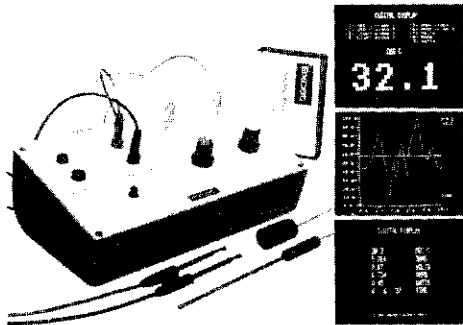
```
5 REM BLEEP
10 DIMVV(4),P(-1)
20 L=#B002
25 P.$21
30 [
40 :VV0 LDA L
50 LDY #81
60 :VV1 LDX#80
70 :VV2 DEX;BNE VV2
80 EOR a4
90 STA L
95 DEY
100 BNE VV1
105 RTS
110 ];P.$6
120 END
```

Program 1. Simple bleep generator (1/2k)

```
5 REM GOOD KING WENCESLAS
10 DIMA119,B40;C=0;P.$12;M=0
20 GOS.a
30 $B="22222242222442222242222442222242222444"
40 $A="127127127113127127169151169151134127127085095101113"
50 $A+LEN(A)="101113127151169151134127127169169151134127127"
60 $A+LEN(A)="113085095101113127095127"
70 F.I=1T02;F.O=0T012;GOS.b;N.O;C=0;M=0;N.I
80 C=39;M=13;F.O=13T039;GOS.b;N.O
90 E.
100 aDIMVV(4),P-1;L=#B002;P.$21
110 [;:VV0LDAL;LDY#81;:VV1LDX#80;:VV2DEX;BNEVV2;EORa4;STAL;DEY
120 BNEVV1;RTS;];P.$6
130 R.
140 bQ=(A?C-48)*100+(A?(C+1)-48)*10+A?(C+2)-48;C=C+3
150 ?#80=Q
160 ?#81=5100*(B?M-48)/?#80;M=M+1
170 LINKVV0;F.Y=1T0200;N.Y;R.
```

Program 2. Good King Wenceslas (1 1/2k)





## Excet Measuring Unit

### SOFTWARE SUPPORTED MONITORING INSTRUMENT—BBC MICRO

Enables the BBC (B) to measure and display accurately:

POSITIVE & NEGATIVE VOLTS \* AMPS \* WATTS  
OHMS \* TEMP \* LIGHT \* TIME

#### FEATURES

Up to 6 simultaneous readings  
Graphical or digital display  
Auto scaling and labelling  
Plots any 2 variables  
Menu driven options  
Full software support  
Unlimited choice of scales  
Event analysis facility  
Teaching display Mode

#### RANGES

Temp - 10 to 110 deg C  
Resistance 0 to 1E6 ohms  
D.C. Volts 40v.p.d.  
D.C. Current 0 to 2000 mAmps  
Power 0 to 80 watts  
Light 0 to 100 (uncalibrated)  
Time 0 to 1E6 secs (hrs mins secs)  
Accuracy: error generally < 1 per cent

**£77.50**

Includes instrument, temperature probe, light sensor, electrical probes (3 sets), leads, connections, software on cassette, full instructions, application notes, p&p

**excet systems**

16a High Street  
Ilfracombe  
North Devon

# DRAFTMATE

© COPYRIGHT (C) P. CROSS 1983

OUR FIRST OFFERING FOR THE B.B.C. MICRO  
... AND WHAT A STUNNER!!



DRAFTMATE allows ANYONE to draw pictures on the B.B.C. without any knowledge whatsoever of B.B.C. Basic. Pictures can be magnified, enabling you to modify any single pixel, they can be dumped directly to a printer, or saved on tape for later modification and use. Optional use of joystick adds a further dimension to a truly amazing piece of software. You really need to see it running to fully appreciate its versatility ... words just cannot do it justice.

Price: £9.95 inc. VAT & P&P.

**COMPUTASOLVE LTD.**

MICRO COMPUTER SYSTEMS FOR THE MODERN BUSINESS

8 Central Parade, St. Marks Hill, Surbiton, Surrey.

Telephone 01-390 5135

Open 9.30 - 18.30 Monday-Saturday

## AUTHORISED ACORN/BBC DEALER & SERVICE CENTRE

	£
* BBC Model B Computer	99.00
BBC Computer Dust Cover	3.99
* BBC/LVL Single 100K Disk Drive	265.00
* BBC/LVL Twin 100K Disk Drive	389.00
Disk Drive Covers	3.99
* Torch 280 Disk Pack	897.00
* 14" Microvitech Colour Monitor	287.50
* 12" Sanyo Green Screen	90.85
* 14" Sanyo Colour Monitor	276.00
* Grundig 14" Colour TV/Monitor	275.00
* Seikosha GP100A Printer	229.94
* Seikosha GP250Z Printer	274.85
* Epsom FX80 Printer	503.70
* Epsom RX80 Printer	332.35
* Epsom MX100 Printer	539.35
* Silver Reed EX44 inc. Interface Typewriter/Printer	516.35
Tape Recorder Leads	
Din to Din + Jack	3.95
Din to 3 Jacks	3.95
Wordwise	39.95
View	59.80
Acorn Soft from..	9.95
BBC Software (all titles)	10.00
Educational Software from..	5.69
Books - hundreds of titles S.A.E. for list	Price including VAT

\* Carriage £8 including VAT.

**VICTOR — TORCH — OSBORNE**

**DAKLEAF COMPUTERS  
LIMITED**



121, Dudley Road, 100, Boughton,  
Grantham, Chester,  
Lincs. Cheshire.  
0476 76994/70281 0244 310099

## PUNC-MAN

Is more than just a game. TWO animated amusing programmes which help children (7-11+) with their punctuation. Noshier gobbles the punctuation marks, then YOU - as Puncman - put them back... BBC 'B' and Spectrum 48k. £7.95.

## STORY'A'

"Spanish Gold" is a picture story-book on the screen. It allows young children (7-11+ according to reading age) to control the direction the story takes. Several endings and full colour graphics. £6.95. BBC 'B' only.

## HANDWRITING

Christopher Jarman's 'Basic Modern Hand' computerised! Two suites each consisting of five programmes and each suite costing £9.95. "LETTERS" draws lower case letters grouped in families; "CAPITALS" draws upper and numerals. Interactive, full-colour, and sound (which can be turned off!) Spectrum versions also available.

Details of these and more (sae please) from:

*chalksoft*  
LTD

Lowmoor Cottage (AU 7)  
Tonedale  
WELLINGTON  
Somerset TA2 10AL  
082 347 7117

TRADE/EXPORT ENQUIRIES WELCOME.





changing the variable T, which increases or decreases the time between clicks. Because Basic is slower than machine code, the highest note obtainable is far lower than before.

The noises from this can be used for tunes although not so easily. Single clicks are useful in all parts of games, to make things more noticeable or just to liven things up. A useful 'rocket motor' noise can be obtained by changing line 30 of program 3 to 30?A=?A:RND.

If you are fed up with the sounds from the Atom internal speaker, sounds can be amplified by attaching one end of a five-pin DIN lead to the cassette port on the Atom, and the other end to an amplifier. Sounds from the computer should now be amplified.

Now almost 'heavy metal' music can be created - try program 4, which sounds excellent when amplified, but not so good through the internal speaker.

Finally, program 5 produces a game using all the sounds mentioned. It is a rather simple version of *Air Attack*. You are on a plane which is attempting to land on a runway (the row of 'equals' signs). But before you can do this all the buildings or X's on top of the runway must be bombed away. If the plane hits one of the buildings, you have crashed, and the game is over. If you manage to get to the far end of the runway without crashing, you have successfully landed. To drop a bomb, press the shift key, and only one bomb can be on the screen at any time. Your score (top left of screen) is incremented every time an X is hit.

The rocket motor sound is used for the plane and the bomb falls using bleeps from the machine code program. If an X is hit, a tone is produced using the Basic method. If you manage to crash, the Royal Air Force instantly rejects you, and a raspberry sound is produced, again the Basic method. If, by some fluke, you actually manage to land, the computer's reward is to play a short tune using Basic and machine code.

So although Toccata and Fugue in E sharp major is still a long way off, many varieties of sounds can be produced to enhance any program.

```

5 REM 'BASIC' CLICK ROUTINE
10 T=5
20 F.B=1T0200
30 ?#B002=?#B002:4
40 F.C=1T0 T;N.C
50 N.B
60 END

```

program 3. Basic clicks (1/2k)

```

5 REM HEAVY METAL
10 A=#B002;P.$12
20 F.B=1T03;F=20;F.E=1T02;F.C=1T020;
  ?A=?A:4;F.D=1T0 F;N.D;N.C
30 F=10;N.E;N.B
40 F.B=1T03;F=10;F.E=1T02;F.C=1T030;
  ?A=?A:4;F.D=1T0 F;N.D;N.C
50 F=5;N.E;N.B
60 F.C=1T020;?A=?A:4;F.B=1T020;
  N.B;N.C;F.C=1T030;?A=?A:4
70 F.B=1T010;N.B;N.C;F.C=1T015;
  ?A=?A:4;F.B=1T050;N.B;N.C
80 C=50;F.B=1T050;?A=?A:4;
  F.D=1T0 C;N.D;C=C-1;N.B
90 F.B=1T025;?A=?A:4;F.C=1T05;N.C;N.B
100 F.B=1T030;?A=?A:4;F.C=1T015;
  N.C;N.B;F.B=1T040;?A=?A:4
110 F.C=1T030;N.C;N.B
120 END

```

Program 4. Heavy metal (1 1/2k)

```

5 REM AIR ATTACK
10 DIMVV4,P-1;L=#B002;P.$21;C;
  :VV0LDAL;LDY#81;:VV1LDX#80
20 :VV2DEX;BNEVV2;EOR04;STAL;
  DEY;BNEVV1;RTS;];P.$6
30 P.$12;F.A=1T010;P.';N.;?#E1=0;
  B=32768;S=0;G=#B002;a=0
40 P."X X X XX X X XX ""
50 P."X X XX X XX XXX XX XXX""
60 P."XXX X XX XX XX XXXXXXXX XXX""
70 P."XXX XX XX XX XX X XXXXXXXX XXX""
80 P."XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX""
90 P."=====
100 ?B=#23;?(B+1)=#30;?(B+2)=#2E
110 IFE=0;IF?#B001<>#FF D=B+32;
  E=1;?#81=100;?#80=150
120 IFE=0G.180
130 ?D=#2A;F.R=1T0 100;N.;?D=32
140 D=D+32;IF?D=#18
  S=S+1;F.P=1T0 50;?G=?G:4;
  F.O=1T0 20;N.;N.
150 IFD>33247 E=0
160 P.$30 S
170 LINK VV0;?#80=?#80-1
175 REM Decrease high value of C
  to speed up game
180 F.C=1T0 75;?G=?G:R;N.
190 ?B=32
200 B=B+1
210 IF?(B+2)=#18 G.240
220 IF (B+2)=33248 G.250
230 G.100
240 @=0;P.$12"YOU HAVE CRASHED"
  ""SCORE:"S;G.280
250 P.$12"YOU HAVE LANDED. CONGRATULATIONS";
  ?#81=255;?#80=120
260 LINKVV0;?#80=100;LINKVV0
270 ?#80=100;LINKVV0;F.D=1T090;
  ?G=?G:4;N.;E.
280 F.L=1T0100;?G=?G:4;
  F.K=1T030;N.K;N.L;E.

```

Program 5. Simple Air Attack (2k)





# BEEBUG FOR THE BBC MICRO

## DEVOTED EXCLUSIVELY TO THE BBC MICRO

### MEMBERSHIP NOW EXCEEDS 18,000 BRITAIN'S LARGEST COMPUTER USER GROUP

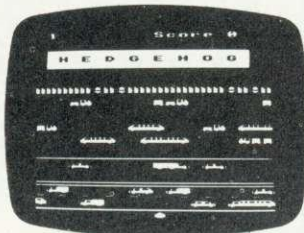
18,000 members can't be wrong — BEEBUG provides the best support for the BBC Micro. BEEBUG Magazine — NOW 64 PAGES devoted exclusively to the BBC Micro.

Programs — Hints & Tips — Major Articles — News — Reviews — Commentary.  
PLUS members discount scheme with National Retailers. PLUS members Software Library.  
10 Magazines a year. First issue April 1982. Reprints of all issues available to members.

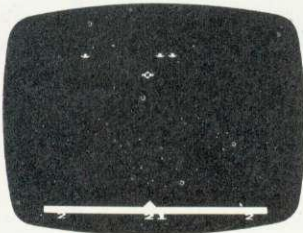
#### SCREEN SHOTS FROM PROGRAMS



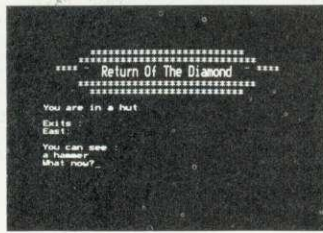
ELLIPTO JUNE 1983



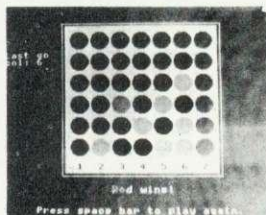
HEDGEHOG JUNE 1983



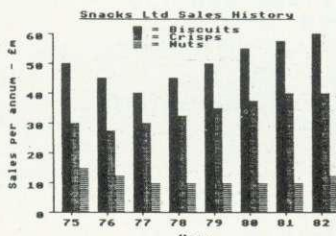
INVASION APRIL/MAY 1983



RETURN OF THE DIAMOND  
JUNE 1983



FOUR IN A ROW APRIL/MAY  
1983



BARChart APRIL/MAY 1983

**Dec/Jan Issue:** Program Features: Space City (invader-type game), Breakout, Artist (Joystick painting program); Rescue (miraculously retrieves programs after bad loading or 'Bad Program' message); and Pack—a program to compact Basic programs. PLUS Disc System Review, Software reviews—including Wordwise, Book reviews, Adding Joystick interface to model A; How to access the video controller chip; and ideas for the newcomer; plus a new crop of Hints and Tips.

**February Issue:** Program Features: BEEBMAZE—Find your way through the random maze, guided by 3D views from inside the maze—an excellent game. FIVE-DICE—A Beeb implementation of YAHTZEE (R), a novel dice game. Also a listing of WINDY FIELD—a creation from Acornsoft, SPIROPLOT screen doodler, and a complete memory display program in a user key. Plus Machine Code Screen Dumps for the Epson and Seikosha Printers; articles on USING FILES, IDEAS ON ANIMATION (Including a Rotating Cube program), an Introduction to the Use of Procedures, a Survey of Books on the BBC Micro, and a Roundup of Disc System Hints. PLUS a variety of HINTS, TIPS AND INFO, including a single VDU command to perform a SIDEWAYS SCROLL.

**March Issue:** Program Features: Life (32K), Artillery Duel (16K/32K), Square Dance, 3D Rotation (will rotate any object), Printers for the BBC micro—Review of Epson, Seikosha, Tandy and Olivetti. What to do with the new Operating System, Disc Formatter Program, and full Disc instruction set, Newcomers article on Text and Graphics Windows. PLUS How to get a new Operating System ROM and a special deal on Wordwise (members only).

**April/May Issue Special Anniversary Issue—Contains index to the whole of BEEBUG Volume 1.** Music Composer—create complex 3 part harmonies with this synthesiser Program. Colour bar chart generator program. Beeb implementation of the Connect-Four Game. Invasion—a 16k. Plus Review of Tape Recorders for the Beeb; a Basic Program Editor, which lists variables and procedures, and executes Find and Replace in a Basic Program; Reviews of Acornsoft Games and the Torch Z80 Disc Pack. Disc Menu Program. Newcomers introduction to Mode 7. How to save the unsavable; and a routine to print Double Height Characters in all modes.

**June Issue:** Program Features: 'Return of the Diamond' A 16k adventure game, 'hedgehog' a well implemented 'frogger' type game, and Ellipto. Create your own off the shelf sound effects with Sound Wizard. Plus articles on Using Files, Rotating and Expanding Characters, Using Printers, and How to multi-program the User Keys. Reviews of The Hobbit Floppy Tape System, Adventure Games, and a Comparative Review of Wordwise and View. Plus FX Call Update, Disc Program Auto-relocator, Wordwise Update, and more BBC Book Reviews.

**BEEBUGSOFT: BEEBUG SOFTWARE LIBRARY**  
offers members a growing range of software from  
£3.50 per cassette.

#### BEEBUG NEW OPERATING SYSTEM OFFER

BEEBUG members can now obtain the new 1-2 OPERATING SYSTEM ROM at around HALF PRICE

See BEEBUG Magazine February, March or April for details.

As a result of BEEBUG negotiations with Acorn the ROM now may also be offered by other user groups to their members.

1. Starfire (32K). 2. Moonlander (16K). 3D Noughts and Crosses (32K). 3. Shape Match (16K). Mindbender (16K). 4. Magic Eel (32K). 5. Cylon Attack (32K). 6. Astro-Tracker (32K).

Utilities: 1. Disassembler (16K). Redefine (16K). Mini Text Ed (32K).

Applications: 1. Superplot (32K). 2. Masterfile (32K).

**13% DISCOUNT TO MEMBERS ON THE EXCELLENT WORDWISE WORD PROCESSING PACKAGE—THIS REPRESENTS A SAVING OF OVER £5.00.**

Magazine programs now available on cassette to members at £3.50 inc: VAT & p&p—see April/May issue for details.

Send £1.00 & SAE for Sample

Membership: UK £5.40 for six months, £9.90 for one year.

Overseas one year only: Europe £16.00, Middle East £19.00, Americas & Africa £21.00, Other Countries £23.00

Make cheque to BEEBUG and send to: BEEBUG Dept 13, 374 Wandsworth Rd, London SW8 4TE

Send editorial material to: The Editor, BEEBUG, PO BOX 50, St. Albans, Herts AL1 2AR



## The faithful Seikosha comes under George Hill's critical eye

### CHEAP HOBBY PRINTER – BUT NOISY

THE Seikosha AP100A (orGP100A) has been on the market for some time. The reason for this review is that it has many of the features described in previous articles, it is cheap (about £215) and deserves serious consideration as a first printer.

First its good points. The Seikosha is neat and attractively packaged. It has a tractor feed mechanism which handles the paper (up to 21.5 cm wide excluding the tear off margins) conveniently and accurately.

It is a conventional dot-matrix printer with seven dot wires, printing its characters on a seven by five matrix. It has a Centronics interface, which can plug into most parallel printer ports with a suitable lead.

Carbon copies can be produced with suitable paper, and the impact strength between wires and paper can be adjusted to vary the

darkness of the print, or to cope with differing paper thicknesses.

The printing style is good, especially for capital letters and numerals, though the limitations of the matrix are evident in the small (lower case) letters. Look closely at the letters g and y for instance in the example printout (figure 1). The typeface is fine for listings and would suit most home-users for word processing, but the business-user would probably require something better.

There is a useful, though non-standard tab facility, and double-width characters can be printed, though not double-height or condensed.

The seven dot wires can be fired individually, giving the ability to produce pictures. Graphics patterns can be repeated automatically, allowing you to underline text. There is also a code to allow you to 'tab' in graphics mode and all the

various styles can be mixed on a single line (figure 1).

As with all hardware, however, you only get what you pay for – and the Seikosha has its limitations. The most obvious one is an appalling din which accompanies any printing. It seems incredible that such a small device should be capable of producing its variety of whirrs, clatters and buzzes. In my house the whispering Olivetti was restored when this test was over!

The printer is unidirectional. The print speed of 30 characters per second is adequate for short program listings, but for long files (for example this article), the printout seems interminable.

You cannot use cut sheet or roll paper, and there was no mention of any modifications or extras being available. Similarly no mention is made in the manual of an optional serial interface. I presume you need the next model in the range (the

```
>This is to illustrate the normal Print style
```

```
THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
```

```
The quick brown fox JUMPS over the lazy dog again in lower case
```

```
This illustrates the TAB function.
```

```
Position 20
```

```
Position 45
```

```
This is in expanded print and this is back to normal.
```

```
Repeated graphics data, and POS used to underline
```

```
Now mix it all on one line !
```

```
NORMAL EXPANDED ██████████ NORMAL ██████████ EXPANDED
```

```
To demonstrate PROCTAB(A)
```

```
0123456789012345678901234567890123456789012345678901234567890123456789
      ^POS10                ^RDS30                                ^POS67
```

```
To demonstrate PROCUL(A$,A)
```

```
UNDERLINING IS EASY
```

```
EVEN WHEN "TABBED"
```

Figure 1. Example output from Seikosha GP100A. Notice the style of 'g' and 'y'.



# Micro-Aid

SOFTWARE - Programs that are guaranteed to run! Save hours of work and worry with these utilities and practical programs on cassette or disc.

102	<b>CASHBOOK</b>	Double entry 4 columns with accounts	£ 5.95	B
103	<b>LEDGER</b>	Complements CASHBOOK with ageing & analysis	£ 5.95	B
104	<b>MAILING</b>	Holds 218 addresses. System with 6 options, 2 Sorts, Labels, 2 Searches & Update	£ 5.95	B
105	<b>PAYROLL (W or M)</b>	In two parts to handle weekly or monthly PAYE & NI for 100 employees Supported.	£13.90	B
105a	<b>Manual</b>	Extra (No VAT)	£ 2.50	
106	<b>MEMO-CALC</b>	Database/Calcsheet with up to 255 columns, string or numeric data, sorts, searches, calculations, with full print facility.	£ 9.95	B
106a	<b>Manual</b>	Extra (No VAT)	£ 2.00	
201	<b>CARDS</b>	Beat Bruce Forsyth at his own game.	£ 2.95	A/B
202	<b>BATTLE</b>	Fast moving game simulation of a minefield.	£ 2.95	B
203	<b>HANGMAN</b>	Word game. French, German, Italian, Spanish.	£ 7.95	B
301	<b>BANNER</b>	Paper printout of large text & graphics.	£ 2.95	A/B
302	<b>DISTANCES</b>	Graphic maps of U.K., EUROPE & WORLD. Calculate distance between any two places.	£ 3.95	B
303	<b>FLAGS</b>	Full colour flags of the world & questions	£ 3.95	B
304	<b>STATPAK</b>	Statistics offering over 30 results.	£ 8.95	B
501	<b>SEARCHBAS</b>	PROC to search a BASIC program & alter it.	£ 1.95	A/B
502	<b>PROCVAR</b>	PROC to list variables used in a program.	£ 1.95	A/B
503	<b>PROCFUSH</b>	PROC to clear Resident Integer Variables.	£ 1.00	A/B
504	<b>PROCAID</b>	A combination of programs 501, 502 & 503.	£ 3.45	A/B
505	<b>DEFCHR</b>	Design, display & store graphic characters.	£ 2.95	A/B
506	<b>SORTM/C</b>	Machine code sort for up to 255 integers.	£ 1.00	A/B
507	<b>SORTBAS</b>	A very fast BASIC sort 1000 items in 42s.	£ 1.00	A/B
508	<b>UTILITY-A</b>	A Combination of 501 to 507 Superb value.	£ 5.95	A/B
600	<b>FORTH</b>	Second language ROM for either OS.	£34.74	B
601	<b>WORDWISE</b>	ROM Superb fast & easy Wordprocessor OS 1.0	£34.74	B
701	<b>BOOKS</b>	Various titles for the BBC Micro from (No VAT)	£ 6.95	
801	<b>CASSETTES</b>	C12 Computer quality boxed in 10's	£ 4.50	
810	<b>DISCS</b>	MEMOREX Soft Sector'd 40 track 5.25"	£19.95	
901	<b>NEW EPSON</b>	FX-80 F/T, 160CPS, 3 FOUNTS, Graphics	£379.00	
905	<b>SEIKOSHA</b>	GP, 100a Printer 50cps, 80 columns, tractor	£195.00	
910	<b>NEW TEAC</b>	Slimline Disc drives suitable for BBC Micro with Power supply, Format disc & Manual.		
	<b>100K</b>	Single Sided, 40 Track. OTHERS AVAILABLE.	£199.00	
920	<b>VDU STAND</b>	Stainless steel support protects your micro	£19.95	

ADD VAT TO ALL PRICES. FOR COPY ON DISC ADD £1.00. NO PACKING CHARGE.

If you want further information before parting with your hard earned cash send for our new brochure to:-

Micro-Aid (AU)

25 Fore Street, Praze, Camborne, Cornwall TR14 0JX.  
Tel: 0209-831274

## Micro-Aid expand to serve you

**NEW TEAC SLIMLINE DISC DRIVES NEW**

(Cased with their own Power Supply, Manual & Format Disc)

100k £199.00 - 200k £265.00

400k £345.00 - 800k £619.00

**NEW EPSON FX-80 PRINTER NEW**

160cps, 40, 80 or 137 columns. Elite, pica, italic, proportional and emphasised text in three sizes and nine languages. Tractor, roll or sheet paper feeds.

RRP £379.00

**SEIKOSHA GP100A Printer**

50 cps, 80 columns. Tractor paper feed.  
£195.00

MEMOREX 5.25" discs - £19.95 for 10  
C12 cassettes - £4.50 for 10

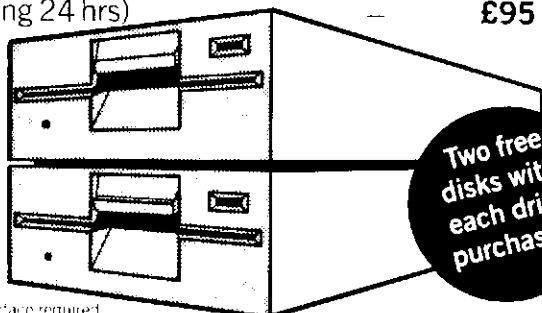
Add VAT to all prices. Packaging included

# MICROAGE ELECTRONICS

## FOR THE BEST DEAL ON BBC MICRO DISK DRIVES

Microage of Edware - Acorn's largest dealer - now bring you the most powerful range of disk drives for your BBC Microsystem B\*.

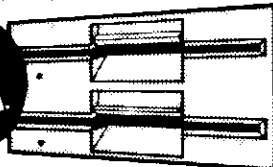
- A BBC Compatible Single drive (100K) - £235
- B BBC Single drive (100K) - £269
- C BBC compatible Dual drives (200K) - £389
- D BBC compatible slimline Single drive (400K) - £399
- E BBC compatible slimline Dual drive (800K) - £799
- F BBC Disk Interface (inc 1.2 ROM & fitting 24 hrs) - £95



Two free disks with each drive purchased.

\*Disk interface required.

Dealer and Institutional Orders Welcomed.



Free courier delivery to your door.

All drives are fully compatible with the BBC Micro and are complete with full manual, utility disk and connecting cables. Remember these are top quality products manufactured by TEAC and Mitsubishi. All prices include VAT.

Open Mon-Sat 9.15-6.00 Thurs 9.15-1.00 Send this coupon in to obtain a 5% discount on all products (excluding B & F).

To: Microage Electronics, 135 Hale Lane, Edware Middlesex HA8 9QP AU7

Please send me qty. A  B  C  D  E  F   
at total cost of £ \_\_\_\_\_ I enclose cheque no: \_\_\_\_\_

Or debit my Access/Barclaycard No. \_\_\_\_\_

Signature \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

Postcode \_\_\_\_\_ Telephone \_\_\_\_\_

**MICROAGE ELECTRONICS**  
135 HALE LANE EDWARE MIDDLESEX HA8 9QP TEL: 01 959 7119 TELEX 881 3241



250) to get this.

The Seiksha is styled as a graphics printer, but a 480-dot line is limiting. Simple dumps are satisfactory, but pattern dumps cause problems, as they need an absolute minimum of 512 dots per line for a full screen from the BBC micro, and 640 dots is more convenient. The seven-dot band requires some tricky programming in pattern dumps. The dot wires are rather coarse, and the quality of the graphics output is not as good as on more expensive printers (figure 2).

There is no form-feed so you cannot advance the printer to the top of the next page from the keyboard (unless you are willing to send multiple linefeeds). I found this one of the most irritating omissions.

The manual is rather like the curate's egg – good in parts. Its contents vary from the ridiculous: 'Power. The lamp is on when power is turned on and off when it is off'; to the cryptic and unhelpful 'The two bytes that follow the POS code are the ASCII code numbers to indicate the absolute address away from the home position (character units)'. That is almost all the help you get on the tab facility!

Sections devoted to the mechanism, loading paper and ribbon and general adjustment are clear and concise. The description of the interface is good, though most people do not need to know the details. There is the usual waste of space, five pages being used for magnified pictures of the dot patterns for the complete character set.

It is in the section on 'input data format' that the manual writer went to pieces! The explanations are far too brief. Details of control codes for tab (called POS), double-width, and both types of graphics, with a full page of examples, take less than three small pages which include diagrams (and the snippet quoted above). There are no example Basic programs, which is odd, as I would think most buyers will be Basic users.

Two different conventions for hexadecimal numbers are used without explanation, and without translation into decimal. In one section (1,4) and in another (14) both mean hexadecimal 14 (ie decimal 20).

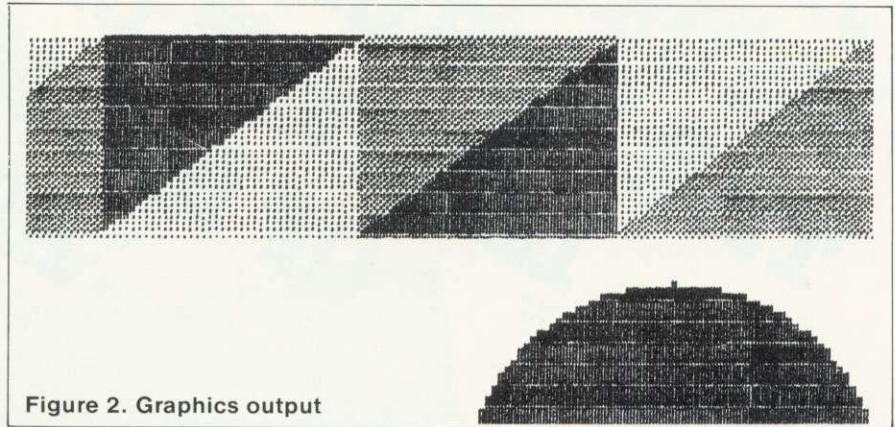


Figure 2. Graphics output

Deciphering the control codes left me with a severe headache! Letters to *Acorn User* indicate that bafflement with printer manuals is a common problem, and many people resort to buying word processors to do all the printing control. This should not be necessary, and for BBC micro owners who would like a bit of help, I have prepared a photostated sheet with a more detailed explanation of the methods of control for this printer. It can be obtained from the *Acorn User* office

for 50p. With the sheet you get listings of two graphics dumps and two procedures, Proctab, which causes the printer to mimic the tab(n) facility on the BBC, and Procul which allows you to underline a string. An assembly language dump was printed in October's *Acorn User*.

In summary, undoubtedly good value for money, if you can stand the noise!

● Our thanks to MicroAge Electronics for the loan of a Seiksha for this review.

## VERSATILE MUSIC SYNTHESISER

### WITH SOME SPEAKERS TO MATCH

QUICKSILVA has marketed a music processor program called *Muproc* which turns your BBC micro into a synthesiser. The first thing to notice is that the keyboard is converted into a 'piano'. My daughters, who are pianists, had no difficulty in playing tunes immediately, though most people would need practice. This, however, is only the start.

*Muproc* gives you a choice of 100,000 built-in combinations of pitch and amplitude envelopes. If these do not suit, all the parameters of envelope can be varied to create new sounds. This gives complete freedom of the BBC sound generator, enables you to play any sound the micro can produce, and build it into a piece of music. The program and its accompanying manual do not explain how the envelope parameters affect sound, so you need to experiment, or know something about envelope in advance.

The display is clearly laid out in mode 7 colour, the areas on the screen representing parts of the keyboard. It does not show musical

## SOFTWARE/HARDWARE

- *Muproc*, music synthesiser from Quicksilva, BBC A & B, £14.95
- *Microvoc*, Micro-Advent, £21

notation, but values of the sound control of parameters currently in use. These values relate to such things as channel number, pitch and amplitude envelopes, volume, tempo, etc. There is an area devoted to the 'record' facility, and one showing the parameters for the notes being played back. Alterations to parameters are made by double depressions of the red function keys. (The addition of an explanatory label to put under the clear plastic trim is imminent says Quicksilva.)

Three pre-recorded music files are provided, although on our early review tape these were too long to load into onto disc without resetting page. However, the music only occupies half the file and wasted

page 82 ►













space can be cut off using \*SAVE. This is being corrected in later copies.

The record/playback function impressed me most. A 'metronome' tick-tock is set to keep you in time (on channel 0). You then 'record' a tune on channel 1, using the chosen sound and volume. Notes to edit can be deleted or changed until the tune sounds exactly as you want it. This includes the ability to change the sound of individual notes in the recording, adding vibrato, or a complete change of tone colour. You now switch to channel 2, and record an accompaniment, in the same or a different sound. Edit the accompaniment, add a third voice on channel 3 and experiment with noise effects on channel 0.

The recording is not acoustic, but kept as values in memory, which can be 'rewound' and 'fast-forwarded' audibly. The speed of record and playback is variable, and you can step through the notes one-by-one. The whole recording can be committed to tape (or disc), and replayed and re-edited through *Muproc* at any time. The amount of music or other sound which can be recorded is stated as 3000 notes,

**'This is a splendid package affording hours of fun'**

though I never managed to approach this limit. The length of time this would occupy on replay depends on the length of each note, and the speed of record and playback. It is several minutes of fast music, though it could be hours of slow notes! To get the maximum number of notes you have to use the 'long play' function, which compacts the notes in

## THE BBC MUSIC PROCESSOR



FROM QUICKSILVA

memory, but stops further editing or alteration.

The program is fully re-locatable, and loaded directly from tape to a disc driven BBC micro, though you necessarily lose some memory, reducing the maximum number of notes you can record. I also split the program into its Basic and machine-code sections, altered the Basic a bit (to remove such lines as 'switch off tape recorder', an irritation to disc users!), and on re-merging and \*SAVEing, the program continued to run perfectly.

The booklet supplied is clear, though perhaps over-concise. It includes a memory map, essential for the alterations just mentioned, and useful summaries. I could have wished for more initial guidance, and a worked example or two. This might be difficult, but the use of the replace-note, and delete-note functions is tricky, and needed a lot of experimentation. The typesetters seem to have had some trouble getting their arrows pointing in the correct directions, but the context normally makes the misprints understandable. (We did, however, appreciate the name of one hymn included: 'Hark the herald angels sin'.)

Overall this is a splendid package, affording hours of fun, and an introduction to synthesiser-type music. It converts your BBC micro into a musical instrument. It is something which will give interesting results immediately, but

for the best results, you have to experiment and practise.

The loudspeaker on the BBC micro is inadequate for the capabilities of its sound generator, and mine produces unpleasant distortion. The capabilities of *Muproc* deserved better, so I obtained a pair of the loudspeakers marketed by Micro-Advent and advertised in the May's *Acorn User*. At a budget price of £21 they improve the sound enormously, getting rid of the bulk of the distortion. The sound chip produces a square wave as its basic 'tone', so the sound always remains spiky, but the improvement is well worthwhile.

The system includes an external volume control, fitted into the Econet hole in the case, and the speakers are plugged in to a jack socket fitted in the reset hole. The volume control is the subject of a modification at present, but is essential, or games such as *Monsters* blast you out of the room! Fitting is straightforward, involving no soldering, but you have to remove the keyboard temporarily. Clear instructions are given.

Don't think you are getting a hi-fi,

**'I recommend such an upgrade for serious sound experiments'**

but I would recommend such an upgrade to anyone who is contemplating serious experimentation with the sound and envelope functions, and to anyone contemplating the use of a system such as *Muproc*.

- Quicksilva, 13 Palmerston Road, Southampton
- Micro-Advent, 113 Writtle Road, Chelmsford, Essex



# Barry Pickles gives his view on the latest, and cheapest, Atom utility ROM ATOM ROM COST CUTTER

THE latest, and cheapest, Atom utility ROM is the Werom, from Watford Electronics. It is a standard 2532 chip and comes in anti-static packing, with a 10-page booklet. Installation is well described, as are the new commands, many of which have example programs given. No conflicting zero-page addresses are used and the ROM generates six new error messages, all explained.

The Werom requires the presence of the floating point ROM, fine if you have one – bad news if not! We asked Watford if there was any way round this – Procyon provide a 'dummy' ROM on request for their Disatom – but they failed to reply.

There are 21 new keywords and a full list is provided in table 1. Nine are picked out as worthy of note. Most of Werom's facilities are standard, but the inclusion of a PROC-like routine makes it a bit special. It's a shame that the F Point requirement has not been dealt with, but, still at only £11.50 (inc VAT), the Werom is a bargain.

We have now looked at all the available 'toolboxes' for the Atom, and can reach some final conclusions. Both the Program Power and Willow ROMs have been surpassed by other, later, offerings and, unless their price is further reduced, cannot be considered as giving value for money.

If you require a shape table compiler, the ROSS utility is the only one for you, and it has some useful additions into the bargain.

Slightly more expensive is A & F's Utilikit, undoubtedly the best general purpose ROM around. Werom is half the price but, if you don't have the F Point ROM, you have to allow for an extra £23.00 outlay, which radically affects its value.

Procyon's Diasatom has a number of valuable, extra features not found elsewhere and should be thought of as complementary to the other ROMs. As 'best buys', therefore I recommend:

ABDO: ABFOR: ABSUB: (POP): AUTO: BREAK: CHAIN: CURSOR: DATA: READ: RESTORE: DELETE: DISASSEMBLE: DUMP: EXIT: FIND: KBD: KEY: MODIFY: ON ERROR: TAPE: REMS%

AUTO x,y	Auto line numbering, with the option of cancelling the current line and issuing (a) the previous line number; (b) same line number; (c) next line number.
BREAK #XXXX	Machine code breakpoint routine, displaying all status registers and flags.
CHAIN	Auto-run for Basic programs.
DISASSEMBLE x,y	Format is the same as the Atom assembler. Adding 'W' causes single-step operation, adding 'P' appends the assembler mnemonics to the end of a Basic program, to ease addition of commonly used chunks of code, without retyping.
DUMP x,y	An ASCII and hex dump. The ROM supplied had a 'bug', in that dumping did not stop at the specified end address, but this did not pose any real problem.
KBD	Selects two-key rollover (for lightning typists) and 'debounces' the keyboard (Acorn take note).
KEY	Has two modes. As an INKEY routine, or as a 'logical operator' which, if the key to be tested is specified, returns 'true' or 'false'. KEY can also be used to detect multiple keypresses, which makes it very useful for real-time applications.
MODIFY	A very basic machine code monitor, allowing you to inspect and/or modify memory contents. It's a drudge to use and I much prefer Procyon's approach.
REMS%	No, it's not a typing error! This is a powerful and exciting routine, allowing users to define their own keywords, as many as memory permits. Also, parameters may be passed at the time of calling. It's almost as powerful as PROC in BBC Basic, the limitations being that parameters may not be local and recursion is not allowed (although other new words may be called from the routine). Routines may be left by EXIT (to return to the point of call) or END. Words may be called in direct mode but, curiously, if Break is pressed, the word is 'forgotten', until OLD is typed. This command has to be used to be really appreciated.

Table 1. Werom keywords

- Utilikit by A & F Software at £19.00
  - Disatom, by Procyon at £22.50
- and, but only if you have the FP ROM:
- Werom, by Watford Electronics
- Finally, if this were the record industry, I would now be anticipating a 'greatest hits' ROM, combining the best features of all the above. Still, now that we have 'TOP 10' software charts, who knows?



# Midwich

COMPUTER COMPANY LIMITED

1st choice for BBC microcomputers

## BBC COMPUTERS

Model B £346.95  
 Model B + Disc Interface £441.95  
 Please phone to check delivery

## BBC MICRO DISC DRIVES

BBC 31 Single 100K Drive £199.00  
 Expandable to 2 x 100K  
 BBC 32 Dual 100K Drives £330.00  
 BBC 33 100K Upgrade for £140.00  
 BBC 31  
 BBC 34 Dual 400K Drives £575.00  
 BBC 35 Utilities Disc (supplied £25.00  
 only with BBC 31, 32, 34)

All Drives except BBC 33 supplied cased with Connecting Leads.

## PRINTERS

NEC 8023 Printer £320.00  
 (Carriage £10)

**NEW**

Shugart Single 100K Disc Drive (Fully compatible with BBC Micro) £199 + VAT  
 Carriage £5 + VAT

Utilities Disc with Word Processor £25 + VAT

Supplied complete with all Connecting Cables

Expansion slot for second Drive £140 + VAT

**Fast ex-stock delivery by Securicor...**

All prices exclude VAT.

## BBC UPGRADE KITS

BBCA2B Complete A to B Upgrade £44.75  
 BBC 1 16K Memory £18.00  
 BBC 2 Printer User 1.0 Kit £ 7.50  
 BBC 3 Disc Interface Kit £95.00  
 only supplied with Disc Drives  
 BBC 4 Analogue Input Kit £ 6.70  
 BBC 5 Serial 1.0 RGB Kit £ 7.30  
 BBC 6 Bus. Expansion Kit £ 6.45  
 All kits are supplied with full fitting instructions.

## BBC CONNECTORS

BBC 21 Printer Cable and Amphenol Plug (not assembled) £13.00  
 BBC 22 User Port Connector and Cable 36" £ 2.46  
 BBC 23 Cassette Lead £ 3.50  
 BBC 24 7 Pin Din Plug £ 0.60  
 BBC 25 6 Pin Din Plug £ 0.60  
 BBC 26 5 Pin Din Plug £ 0.60  
 BBC 35 Disc 1.0 Cable 34W IDC to 2 x 34 way Card Edge £12.00  
 BBC 36 Disc Power Cable £ 6.00  
 BBC 44 Analogue Input Plug & Lever £ 2.25  
 BBC 66 1 M Bus Connector + 36" Cable £ 3.50

## BBC ACCESSORIES

BBC 45 Joysticks (per pair) £11.30  
 BBC 67 Eprom Programmer (assembled) £57.95

## ACORN SOFTWARE FOR THE BBC

SBE03 Business Games £ 8.65  
 SBE04 Tree of Knowledge £ 8.65  
 SBE02 Peeko Computer Inc Manual £ 8.65  
 SBE01 Algebraic Manipulation £ 8.65  
 SBX01 Creative Graphics Cassette £ 8.65  
 SBX02 Graphs & Charts Cassette £ 8.65  
 SBB01 Desk Diary Inc Manual £ 8.65  
 SBL02 Lisp Cassette £14.65  
 SBL01 Forth Cassette £14.65  
 SBG01 Philosophers Quest £ 8.65  
 SBG07 Sphinx Adventure £ 8.65  
 SBG03 Monsters £ 8.65  
 SBG04 Snapper £ 8.65  
 SBG15 Planetoid £ 8.65  
 SBG06 Arcade Action £10.35  
 SBG05 Rocket Raid £ 8.65  
 SBG13 Meteors £ 8.65  
 SBG14 Arcadians £ 8.65  
 SBG10 Chess £ 8.65

## ACORN SOFTWARE BOOKS FOR THE BBC MICRO

SBD01 Creative Graphics £ 7.50  
 SBD02 Graphs - Charts £ 7.50  
 SBD04 Lisp £ 7.50  
 SBD03 Forth £ 7.50

\* Please ring for current delivery on Acornsoft products before ordering.

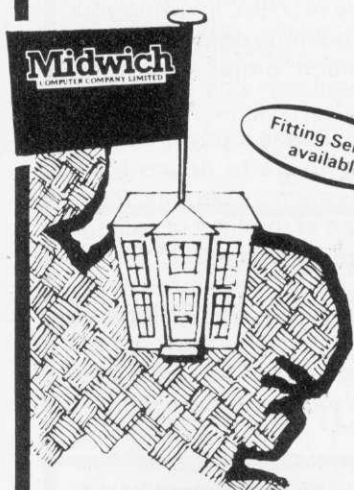
## BBC MICRO COMPONENTS

4516 100NS £ 2.25  
 6522 £ 3.19  
 74LS244 £ 0.59  
 74LS245 £ 0.69  
 74LS163 £ 0.34  
 DS3851N £ 4.50  
 DS98C120N £ 4.50  
 UPD7002 £ 4.50  
 8271 £36.00  
 20 Way Header £ 1.46  
 26 Way Header £ 1.76  
 34 Way Header £ 2.06  
 40 Way Header £ 2.32  
 15 Way D Skt £ 2.15  
 6 Way Din Skt £ 0.90  
 5 Way Din Skt £ 0.90

## BBC SOFTWARE IN ROM.

Wordprocessor "View" £52.00  
 1.2 MOS £10.00

12 month "no quibble" warranty on all products



Fitting Service available

...from East Anglias leading supplier

Delivery charges  
 Computers/Disc Drives £7.50  
 Components/Software £0.50  
 Books/Joysticks £1.00

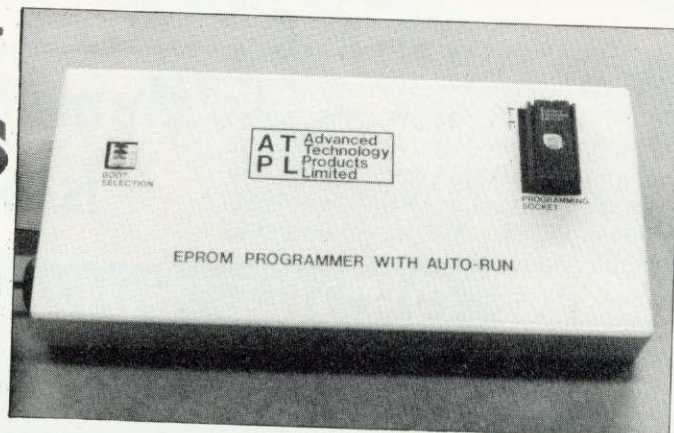
MIDWICH COMPUTER COMPANY LIMITED

RICKINGHALL HOUSE, RICKINGHALL, SUFFOLK IP22 1HH  
 TELEPHONE (0379) DISS 898751



# WORTHY ADD ON DESPITE WARTS

Vincent Fojut takes a look at  
the £140 ATPL Autoprommer and likes  
what he sees



ONE of the more interesting peripherals for the BBC micro is the ATPL Autoprommer, an EPROM programmer with a novel extra. Not only can it permanently store your favourite programs onto EPROM, but an intriguing 'auto-run' feature will automatically download and run them on switch-on.

Many readers will already appreciate EPROMs. They are cheap and hold data permanently, yet can always be erased and reprogrammed. However, to take advantage of them, you really need an EPROM programmer, which brings us to ATPL's offering. How easy to use, and how versatile, is it?

The unit consists of a circuit board housed in a sturdy metal case. Protruding through the top is a 28-pin low-insertion-force (LIF) socket, into which EPROMs to be programmed are placed. In addition, there are four dual-in-line (DIL) switches, labelled 'boot selection' (more later). Two separate cables link the device to the BBC micro. The first is a 34-way ribbon cable, which connects to the 1MHz bus interface (if you use a model A, a suitable socket needs to be fitted). The second cable connects to the BBC's power-out socket. If your micro is an early model with a linear power supply, no such socket will exist, and an alternative source of zero and five volts will need to be found – for example, from the user-port. A cassette is also provided, containing both 'auto-run' and programming software (in source and object form). A slim manual completes the package.

After connecting the device to the Beeb, the first program on the cassette, the 'Prommer object code, is loaded with \*RUN (recorded at 1200 baud, without 300 baud back-ups). If all is well, the program

displays a 'Device?' prompt and the unit is ready for use as a normal EPROM programmer. Let's assume you have a handy utility program – a disassembler for example – that you would like to have in memory every time you switch on. At this point you would load the program, be it in Basic or machine code, into a specific location in memory (the manual suggests a start address of &1800).

Once the chosen program has loaded, the 'Device?' prompt is repeated to allow you to enter a type of EPROM. The Autoprommer will handle 27 series EPROMs, ranging from 2k to 8k. Although not yet generally available, even 16k monsters (27128s) are catered for.

If a program is too large for one EPROM, all is not lost, as the Autoprommer provides two sockets the program can be split between two devices (of the same type). For

**'Robust hardware  
and accessible  
software make this  
an attractive  
proposition'**

example, using 2764 (8k) EPROMs, a program of up to 16k could be stored, and as 27128 (16k) EPROMs become more readily available, 32k. At present, however, I would advise BBC owners to opt for the 2764 device. Not only are they compatible with the Beeb's sideways ROM sockets, but they can be had for around a fiver, which, for 8k, is good value.

Having entered your chosen

EPROM, the Prommer routine allows one of four functions to be selected – Clear, Verify, Read or Blow. The first checks the EPROM is blank and ready for programming. Read copies the contents into RAM (useful for transferring the contents of one EPROM to another). Verify checks the contents of an EPROM against the data used to program it. Lastly, Blow performs the Clear function, followed by programming (or blowing) of the EPROM from data in RAM, and, to finish, carries out a verify.

Providing the EPROM is blank, selecting Blow will copy a program into EPROM at a rate of roughly one kilobyte per minute. A repeat option subsequently allows multiple EPROMS to be copied in succession from the same data.

At this point, the chosen program is permanently stored in EPROM. But how do you get it to automatically load and run on switch-on? To do this, a special 'boot' EPROM is required, which is not supplied with the Autoprommer, but needs to be created by the user. At first, this struck me as a rather mean omission. However, the necessary boot, or auto-run routines are supplied on cassette, and the manual provides step-by-step instructions for creating the boot EPROM. This does, at least, serve as a useful introduction to using the device.

Once the boot EPROM has been blown, and inserted on board, the four boot selection switches on the Autoprommer are configured depending on the EPROM, operating system, and whether the program is in Basic or machine code. You can now automatically download and run your selected program on power-up or by pressing break. 'Dummy' switch settings are





provided, so the auto-run facility can be disabled.

I implied earlier that the Autoprommer could be used to program EPROMS for use in the Beeb's sideways ROM sockets. Whilst this is true, two important assumptions are made. First, you must have the 1.0, or later operating system. Second, you will need some understanding of the way the operating system switches between ROMs. On the other hand, no such knowledge is required to exploit the auto-run.

My major criticism is that the error-trapping is virtually non-existent. For example, enter '273299' as an EPROM type, and the program accepts it. More seriously, an invalid hex character when typing in a buffer address will go unnoticed, and the program will happily fill an EPROM with garbage.

In fairness, the cassette supplied does contain the full assembler source code for the programming software, which is also listed in the

**'My major criticism is that the error-trapping is virtually non-existent'**

manual. Evidently, the manufacturers have tried to simplify the task of modifying (or correcting!) the package.

One feature I found lacking was the ability to program selected areas of an EPROM, at separate times. With the current software, an EPROM is always programmed 'at one sitting', from the start of its memory. However, it should not be too difficult to make such modifications.

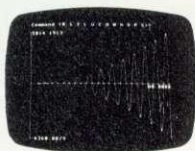
I also would have appreciated LIF sockets on the Autoprommer board itself because changing EPROMs could be a delicate task. The auto-run feature is so attractive, that I can imagine users building up a small library of programs to plug into the Autoprommer.

At £120 plus VAT, the Autoprommer may seem costly, which is a pity, since the auto-run facility, and EPROMs in general, merit a wider audience. Nonetheless, the robust hardware, and easily accessible software (warts and all!), could make the Autoprommer an attractive proposition in industry, education, or any reasonably well-founded club. Its ability to handle a variety of EPROMs, including a couple of future generations, would be a great asset in such environments.

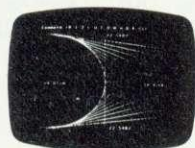
The ATPL Auto Prommer is available from several BBC dealers (see dealer list), or direct from Advanced Technology Products Limited, Station Road, Clowne, Chesterfield S43 4AB.

## BBC MICRO SOFTWARE FROM BEEBUGSOFT THREE PROVEN SOFTWARE PACKAGES

### SUPERPLOT (32k) Screen Plotting Package



Superplot produces tailored screen representations of any function entered. This can be achieved in any of the three major coordinate systems: Cartesian, Polar, or Parametric. SUPERPLOT comes complete with a 7-page instruction booklet. Explore the world of graphic representation.



Reviewed in Electronics & Computing April 1983: "Superplot behaves nicely, responds quickly, produces clear displays, is amazingly clever and is really user friendly... this package is just the sort of software that brings mathematics to life, and should give computers a good name."

### MASTERFILE (32k) Data Filing Package



Thousands of copies of this general purpose file management program have already been sold. It uses are manifold; for example you can file: A magazine index; Names and Addresses of friends; School Class lists; Book Lists; Client/ Customer Lists; Record collection, etc. The program can hold up to 550 records with only one field, but more practically it can hold as many as 100 records with 5 fields. Features incorporated in the program are— Save file on cassette; Load back a previously recorded file; Display individual records on the screen or printer; Search file for a particular match; Sort file on any item or items; Printout of address labels. The program comes complete with a dummy data file on cassette for experimentation purposes, and an extensive manual. (A separate disc version of MASTERFILE will be available in the near future.)

### EXMON (16k/32k) Extended Machine Code Monitor

EXMON is an extremely versatile machine code monitor written specially for the BBC Micro. It adds more than 30 new commands, all achieved in machine code, including the following:

- Disassemble memory giving
- Edit memory
- Search for a given string of bytes or characters
- Fill in a block of memory
- Move a block of memory
- Relocate a block of memory, altering codes so that it will run at the new address

#### ASSEMBLER mnemonics and ASCII codes

Single-step through a machine code program displaying register contents  
Insert and Delete Breakpoints for testing (not on OS 0-1)  
Verify that two blocks of memory are the same  
Self relocate, a special routine that relocates and automatically runs EXMON.

EXMON has a resettable front panel, and will accept all ordinary operating system commands (like \*RUN, \*FX calls etc) without the need to exit. OSBYTE and OSWORD calls can be directly implemented, and there is a facility to enter data for all commands in hex, decimal, or as an expression including variable names used in your assembler program. This is a well written and well thought-out monitor for the Beeb, and a must for anyone using machine code or assembler on the Beeb. Cassette contains a version suitable for cassette or disc use.




MASTERFILE 7.90 inc VAT & p+p  
SUPERPLOT 7.90 inc VAT & p+p  
EXMON 7.90 inc VAT & p+p


Make cheques payable to BEEBUGSOFT, and send to BEEBUGSOFT, Dept 13, PO BOX 109, High Wycombe, Bucks, HP11 4TD





# IF YOU HAVE A BBC MICRO THEN YOU NEED



 is the newsletter of the Independent National BBC Microcomputer Users Group. If you want the best source of information on the BBC Micro you can't do without . No matter what your interest – hardware, software, business, games or education then  has something for you.

Also,  has available many special offers including dust covers (for computer, monitor, printer, disks), cassette leads and 1.2 ROMS FOR ONLY £5.50 INCLUSIVE – THE CHEAPEST PRICE ANYWHERE!  
(Members Only)

 defies description – send off for a sample copy and you'll find that it sells itself to you. See one and you'll be hooked for life!!!

- Please supply me with
- more details about  and your special offers
  - a sample copy for £1.00 and an A4 SAE (17p postage)
  - 1 UK 12 Month Subscription for £12.00
  - 1 UK 6 Month Subscription for £6.00
  - 1 Overseas Surface Mail Subscription for £14.00  
(air mail rates on application)

Please send the goods to:

NAME ..... ADDRESS .....

I enclose a cheque/PO for £ ..... p made payable to LASERBUG.

Please send the form to LASERBUG Dept. A, 10 Dawley Ride, Colnbrook, Slough, Berks., SL3 0QH.





# BOOKS

## THE GOOD, THE BAD & THE PAP

**Paul McGee takes a dozen off the shelves and examines their educational value**

ONE of Dr Rhodes Boyson's tests for a good school is to see if pupils hold their heads at 45 degrees as they listen to teachers. Although this is a definitive advance in measurable behaviourable objectives, it gives little help when assessing pupils' attitudes to microcomputers. And so teachers might like to consider this dozen literary, and other, offerings.

The first book consists of papers from symposia sponsored by the British Educational Research Association in 1980, which aimed to give teachers some idea of the difficulties of introducing micro-electronics. The second book is a collection of papers from CAL 81 in Leeds; the third from a conference at Roehampton in 1979; while the fourth is of papers, on a more limited range of topics, written in 1980. Much of the best material appears in the book by Lewis and Tagg, which also benefits from recorded discussions.

Reading these books is like watching the local repertory company in a series of old favourites. The same people reappear saying different things but still recognisably the same, and unlike repertory companies, there is no reduction for buying the lot. Schools need to know which are worth buying to help keep curriculum and methods up to date, and readers of *Acorn User* - particularly those writing software - will also want to know how relevant the material is to the BBC micro.

Many papers in these volumes describe systems which are more sophisticated than currently used in schools. However, it would be wrong to ignore these contributions because prices of equipment are falling so rapidly that equivalent computer power will be available to British schools in the foreseeable future.

Most of the papers in *Microcomputers in Secondary Education* are too short to do justice to their authors or their

□ **Microcomputers in Secondary Education, edited by J.A.M. Howe & P.M. Ross, Kegan Page, £8.95**

□ **Computer Assisted Learning - Scope, Progress and Limits, edited by R. Lewis & D. Tagg, Heinemann Educational, £4.95**

□ **Computer Assisted Learning - CAL 81 Symposium, edited by P.R. Smith, Pergamon, £12**

□ **Computer Assisted Learning in Physics Education, edited by A. Bork, Pergamon, £10.50**

□ **Computer Software for Schools by Payne, Hutchison and P. Ayre, Pitman, £11.95**

□ **Microcomputers in the classroom, by Alan Maddison, Hodder and Stoughton, £3.95**

□ **An Introduction to Microcomputers in Teaching, by A. Nash & D. Ball, Hutchinson, £6.50**

□ **Microcomputers in Science Teaching, R.A. Sparkes, Hutchinson £7.95**

□ **Elementary BASIC, by H. Ledgard & A. Singer, Collins, £7.95 hardback, Fontana, £4.95 paper**

□ **30 Hour BASIC - School Edition, by C. Prigmore, Longman, £3.95**

□ **Structured Programming with Basic, by R. Atherton, Heinemann Educational, £12.50 hardback, £6.50 paper**

□ **Introduction to Microcomputers, by C.M. Gilmore, McGraw-Hill, £11.50**

subjects. Among the better contributions, Rosemary Fraser deals with evaluation techniques but it is still better to invest in a subscription to the ITMA newsletter than to buy this book. Bob Lewis' excellent account of the pedagogical issues in designing software should tempt many to look again at the Chelsea software, particularly now high resolution graphics

versions are available (although not for the BBC micro).

After the Cockcroft report, heads of maths departments might be interested in the two articles on Logo, now available for the BBC micro, and the one on using programming to help teach algebra.

In case the idea has grown that micros are for teaching maths, Sharples gives a stimulating discussion of their use in language development. He attacks many current teaching packages as inferior teacher substitutes equipped with outmoded and incomplete principles of education. He wonders if any headteacher would welcome a teacher with a didactic and patronising style, confined to one style of learning and unable to meet the demands of pupils. At least one ex-headteacher would say it all depended on the angle of the pupils' heads.

Many authors tend to give straightforward accounts of CAL projects, but the more interesting articles deal with some problems of designing and implementing CAL packages. Much of this good work is in Lewis and Tagg.

In this book Jensen points out that it is important to distinguish between the computer as a medium and the way it is used since CAL often gets a bad name from particular bad examples. This distinction is more important than with other media such as books or films, for which there are no comparable terms such as book based learning or film assisted teaching. Bork, in the best paper in all these books, discusses myths about computer usage and clearly sees that computers will not be used widely in expository class teaching. However, as Moonen shows, sensible use of computers in teaching statistics produces improved attainment and insight.

CAL 81 contains a wide range of papers with notable contributions from the British contingent



including well presented projects from the Open University. Edinburgh's variations on a theme of Logo are disappointing to those whose appetites have been whetted by Papert's book. The ITMA contribution shows that their forthcoming CET publications will be required reading for all CAL designers.

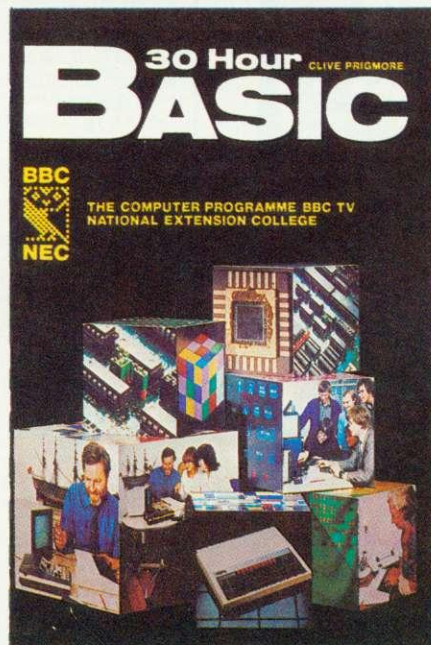
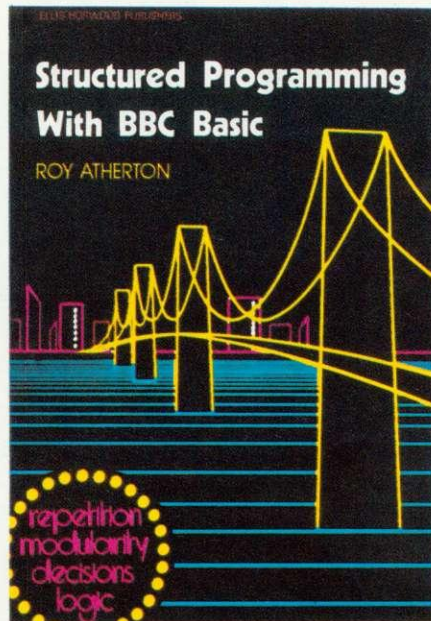
The Howe and Ross book can be only moderately recommended, but the Lewis and Tagg volume should be in every staffroom. The *CAL 81 Symposium* is quite good, but the price is excessive. *CAL in Physics Education* is worth reading to see how good Plato graphics are, and to see Peter's grid for evaluating software, but it is too expensive to be recommended for teacher or departmental use.

*Computer Software for Schools* was good when it first appeared in 1980 but it is now badly dated. All of the programs will run on the BBC micro with minor amendments, although experienced users will sorely miss graphics, sound and colour.

The book is a good attempt to teach elementary Basic programming while developing an understanding and appreciation of the range of applications of computers to education. As a source book of examples in computer aided learning it is sadly deficient, but it could be the basis of valuable in-service work because many of the examples are academically unsophisticated. Its reliance on Basic to perform information retrieval was outdated in 1980 and, although it might get support from the work Frank Gregory is doing on the Isle of Wight, no one can now doubt the fundamental importance of information retrieval and database packages.

In *Microcomputers in the Classroom*, Alan Maddison attempts to provide a brief overview. The book is a useful antidote to much over-optimistic advertising material, but sometimes the caution is overdone. A casual reader could be forgiven for concluding that television screens are a poor medium for text, that pictures are bad at conveying information, and that colour can reduce the effectiveness of a program. It is nevertheless strongly recommended for the staff library.

One weakness of Alan Maddison's book is the lack of examples of



good software. By comparison *An Introduction to Microcomputers in Teaching* contains 20 programs for the Research Machines 380Z.

The book contains an invaluable 10 pages of discussion about the use of computers in *learning*, rather than the more usual emphasis on *teaching*, and should be read by anyone thinking of writing or specifying computer programs for use by children. However, unless the reader has ready access to a 380Z the value of the book is much reduced.

*Microcomputers in Science Teaching* is of little value to a BBC user. The first three pages contain the minimal educational discussion and the rest of the book has a great deal about programming the Pet.

Users who are fortunate enough

to have the advanced facilities of BBC Basic and its excellent graphics are unlikely to want to use a Basic programming book which hardly seems to have left the teletype era.

*Elementary BASIC*, subtitled 'Teach yourself BASIC by solving the mysteries of Sherlock Holmes' is based on minimal ANSI Basic. It attempts to teach the language by developing logical problem solving in the way Sherlock Holmes would have done on Babage's Analytical Engine, if it had used Basic. Much of the approach is designed for a structured language and the program listings often seem uncomfortable after the algorithms have been well developed. BBC micro users might well find the Pascal version better if they want to use structured programming techniques.

*The School Edition of 30 Hour BASIC* seems to have been written at least a decade before the BBC micro. The features which make BBC Basic so valuable are totally ignored and the program test is written in capital letters.

The general level of the book is that of a top junior but the maths section is 'O' level and beyond. Overall, this book is mind rotting pap for indisciplined computer junkies and not even the low price can commend it.

By contrast, *Structured Programming with BBC BASIC* gives a comprehensive and lucid account of problem solving techniques. It is good to see Roy Atherton, who has determinedly fought the cause of structured programming for many years, applying his ideas to such a popular micro. The reader still needs to have the *BBC User Guide* to hand as some of the explanations of BBC Basic are inadequate, but this book is strongly recommended to any serious programmer, teacher or pupil. It is not, however, a book for teaching pupils of all abilities.

Those who want to look inside the micro and gain some general understanding of machine architecture and assembly level programming will find the 310 A4 pages of *Introduction to Microprocessors* good value. The text is not specific to the BBC or even the 6502, and will not therefore be much use for detailed work with the BBC micro.



# BBC MICRO INSTANT MACHINE CODE!

Yes, it's true. Instant machine code from a good subset of BBC BASIC. Type your BASIC program into your model B BBC Micro, trigger the compiler, and your program is changed almost instantaneously into superfast machine code. For £34.95 you get: Cassette version of the complete compiler (along with a version of the compiler for use with discs, ready for when you upgrade, the disc version being dubbed on the cassette after the cassette version); complete compiler listing; extensive documentation and instructions. The compiler was written by Jeremy Ruston.

## THE BBC MICRO REVEALED

By Jeremy Ruston

'...destined to become the bible of all BBC microcomputer users...' (Personal Computing Today). If you've mastered the manual, then this book is for you. Just £7.95

## LET YOUR BBC MICRO TEACH YOU TO PROGRAM

By Tim Hartnell

'...takes you further into the cloudy areas of the BBC machine than anything else I've yet seen...' (Computer and Video Games). If you're just starting out in the world of programming, then this book is the one for you. Forty complete programs, including Othello/Reversi, Piano and a host of dramatic graphic demos. Just £6.45

Interface, Dept. AA

44-46 Earls Court Road, London W8 6EJ

Please send me:

( ) INSTANT BBC MACHINE CODE—tape and book—£34.95

( ) THE BBC MICRO REVEALED—Ruston—£7.95

( ) LET YOUR BBC MICRO TEACH YOU TO PROGRAM—Hartnell—£6.45

I enclose £

Name .....

Address .....

# BIG IN LITTLE COMPUTERS

SOFTWARE NOW IN STOCK  
AT THE VIDEO PALACE

COME AND SEE  
OUR FULL SELECTION



\*\*\*\*\* NOW IN STOCK \*\*\*\*\*

### COMPUTER COMPATIBLE CASSETTE DECK

for use with T199/4A, BBC, Spectrum, ZX81  
and most other computers £37.45

CASSETTE CABLE £1.95

Seven pin DIN to 3x jack-plug

**COWBOY SHOOTOUT** (Micropower) Model B £ 6.85  
Two player gunfighter game. Really good graphics.

**THE CENTIPEDE** (Superior) Model B cassette £ 6.50  
Excellent Centipede game disk £ 9.90

**MODEL B INVADERS** (IJK) £ 5.50  
Superb Invaders game with many options

**GALACTIC COMMANDER** (Micropower) Model B £ 7.79  
High resolution lunar lander game

**SWOOP** (Micropower) Model B £ 7.99  
Galaxian with a difference!

**3D MAZE** (IJK) Model B £ 4.50  
Mindboggling maze game

**CHESS** (Bugbyte) Model B £11.50  
Graphical chess game

**STRATTO BOMBER** (IJK) Model B £ 7.50  
Blast the alien mother ship and save your planet

**ELDORADO GOLD** (Micropower) Model B £ 6.85  
This game will get you started with adventure games

**WORDSWORTH** (Ian Copestake) Model B £13.00  
Excellent word processor. Very good value for money.

**ATLANTIS** (IJK) £ 7.50  
Fast and addictive submarine game

**MOONLANDER** (Software For All) £ 6.45  
Land on the lunar probe without killing yourself. Excellent

**SPACEFIGHTER** (Superior) £ 6.50  
Very fast Scramble/Defender type game.

ALL THE ABOVE PROGRAMMES CAN BE ORDERED BY POST

Add 50p p&p for the first and 15p for each subsequent item. Allow up to 28 days for delivery. Payment by cheque or postal order.



ORDER BY TELEPHONE

Access and Barclaycard holders may order by phone: 01-937 6258

# THE VIDEO PALACE

62 KENSINGTON HIGH ST. LONDON W8.

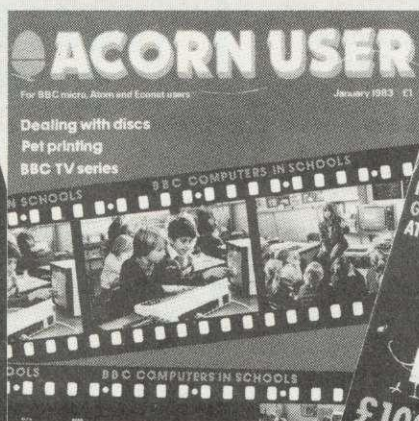


## GAMES PROGRAMMERS

Palace Software, part of a leading film and video company, is looking for games for Atari 400/800, BBC Model B, Spectrum, VIC 20 and CBM 64 for distribution in the UK, Europe and USA. High royalties will be paid for top quality and highly original machine code games. Send cassette samples to: Pete Stone, Palace Software, 62-64 Kensington High Street, London W8 (Tel: 01-937 6258)



# SUBSCRIBE & SAVE



WE HATE to tell you this, but your subscription may well be running out. In fact, if you started with the October 1982 issue there are only two more issues to go! So now is the time to send off.

'But why should I?'

That's a good question and we know it's not easy to part with that extra £3, but here are five very good reasons:

1. If you get your subscription form into us by September 30, the subscription will run for 14 months, whether you are renewing your order or starting up a new subscription.
2. **NOT ONLY** do you get two extra copies of *Acorn User*, but also a complimentary copy of *Programming Hints and Tips for the BBC micro*. This book has been culled from the past year's

issues and will be published in August at £6.95 (Only on orders before September 30.)

3. **NOT ONLY** do you get two free magazines and a free book, but also access to our special subscriber's offers. In the last issue this took the form of £1 discounts on four exciting new books for the BBC micro. In the next issue, subscribers will receive an insert giving them £1 off entry to the *Acorn User* Exhibition in August. These special offers are not retrospective, but there will be others, so don't miss out - subscribe!
4. Not only do you get free magazines, a free book and special discounts, but also your own magazine delivered straight to your door each month.
5. The price of the magazine is bound to go up, but this will not affect subscribers.

We reckon this is pretty good value for your extra £3. In fact, spending an extra £3 could save you £13.95 - beat that for value!

You've seen the competition, and the past year has shown that only *Acorn User* gets the exclusive stories; only *Acorn User* gets the facts; only *Acorn User* gets things right (well, most of the time) - and *Acorn User* gives you the best ideas from the best authors and the real experts.

When you add it all up, there's only one magazine you can choose. And you can't afford to miss this offer. So fill in the form below right now, cut it out and send it off to save yourself time, hassle and money. Remember, September 30 is the date limit for these offers, and you must use the coupon below. Also, we regret that this offer can only apply to the UK.

## SUBSCRIPTION SPECIAL - 2 FREE ISSUES PLUS BOOK

Please open one year's direct subscription to *Acorn User* starting October 1983. I enclose a cheque for **£15** payable to Addison-Wesley Publishers Limited.

Name .....

Position .....

School/College/Company .....

Address .....

.....

.....

**AU12** **NB:** This offer is only valid on this form. So cut it out and send to: *Acorn User*, BKT (Subscription Services) Ltd, Douglas Road, Tonbridge, Kent TN9 2TS.



## HOME STUDY COURSES

### 30 Hour BASIC

A beginner's BASIC programming course.  
Available in 3 editions: Standard, ZX81  
or Spectrum.

### Structured Programming in BASIC

A second stage BASIC programming course.

### Beyond BASIC on the Beeb:

6502 Assembly Language Programming.  
An easy introduction to assembly language.

All 3 courses available now as NEC  
correspondence courses. Write for free  
leaflet/enrolment form. (30 Hour BASIC text  
only is available, price £5.95 post free.)

## MICROTRUST SOFTWARE

### 30 Hour BASIC

2 cassette tapes containing 62 programs from  
30 Hour BASIC, for BBC Micro use only. Boxed  
with instruction booklet.

£11.96 inc. VAT (post free).

### Crossword Puzzler

Programs to create and play puzzles plus  
4 sample crosswords, boxed with instruction  
booklet. Available in BBC Model B and  
Spectrum editions.

£5.00 inc. VAT (post free).

**NATIONAL EXTENSION COLLEGE**  
Dept 45, 18 Brooklands Avenue,  
Cambridge CB2 2HN

## NEWARK VIDEO CENTRE

PRESENTS

# SUPER CLEAR COMPUTER DISPLAY—AND A TV!!!

— AN RGB MONITOR —  
— WITH TV RECEPTION —

14½"	A2102/5/RGB	£275.00	
16"	B3104/RGB	£299.00	
16"	B3404/RGB	£350.00	REMOTE CONTROL
20"	B6100/RGB	£365.00	
22"	B7100/RGB	£399.00	
26"	B8400/RGB	£465.00	REMOTE CONTROL

ALL PRICES INCLUDE 12 MONTH WARRANTY,  
A 6 PIN DIN LEAD AND CARRIAGE.

GRUNDIG TV's - GRUNDIG APPROVED DESIGN  
EDUCATIONAL AND QUANTITY DISCOUNTS  
AVAILABLE

For further details — Mon-Sat:

## NEWARK VIDEO CENTRE LTD

108 London Road, Balderton  
Newark, Notts NG24 3AQ

Tel: 0636 71475

# Electronequip

Authorised BBC Dealer and service centre

### NEW PRODUCTS

Utility Disc for BBC  
Contains VER FORM35  
FORM40 and FORM80  
Cost 9.95

BBC Sparkjet Printer  
New quiet printer  
for BBC. Friction &  
tractor feed 80cps.  
Cost 379.50

Torch Z80 Disc pack  
800K dual disc drive  
plus Z80 processor  
with CMP compatible  
operating system.  
Cost 897.00

TORCH Computer  
800K to 21.4M disc  
drives. High res.  
colour monitor. Plus  
autodial modem.  
From 2795.00+vat

NEW Epson FX80  
FX80 160cps printer  
in stock. Friction  
and tractor feed +  
proportional spacing  
Cost 458.85

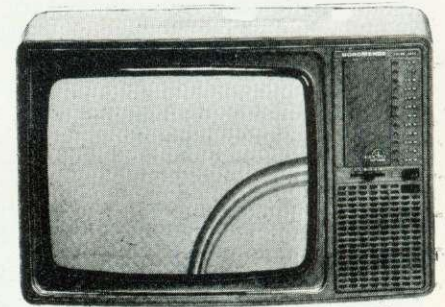
BBC 2	BBC Model B Micro Computer .....	399.00
BBC 3	BBC Model A Micro with 32K .....	333.50
BBC 4	BBC Model A Micro with 32K and VIA .....	339.50
BBC 5	BBC Model B with Disc Interface .....	469.00
BBC 6	BBC Model A with Econet Interface .....	356.00
BBC 7	BBC Model B with Econet Interface .....	456.00
BBC 8	BBC Model B with Disc & Econet Interface .....	526.00
BBC 21	BBC Model A to B Upgrade .....	99.82
BBC 28	Econet Upgrade for BBC .....	92.00
BBC 23	BBC Acorn Memory Upgrade for Model A .....	34.50
BBC 27	Disc Upgrade for BBC B (inc fitting) .....	92.00
BBC 30	BBC 14" Colour Monitor .....	287.50
BBC 33	Sanyo SML2N Green Monitor 15MHz .....	90.85
BBC 34	BMC 12E Green Monitor 18MHz .....	113.85
BBC 35	Karga K12A 12" Orange Monitor .....	129.95
BBC 41	BBC Single 100K 5.25" Disc Drive (AND01) .....	265.00
BBC 43	BBC Dual 800K 5.25 Disc Drive (AND02) ..	803.85
BBC 44	Single Disc Drive (100K) for BBC (Teac) ..	205.85
BBC 45	Single Disc Drive (200K) for BBC (Teac) ..	263.35
BBC 46	Single Disc Drive (400K) for BBC (Teac) ..	343.85
BBC 47	Dual Disc Drive (200K) for BBC (Teac) ..	411.70
BBC 48	Dual Disc Drive (400K) for BBC (Teac) ..	526.70
BBC 49	Dual Disc Drive (800K) for BBC (Teac) ..	687.70
BBC 50	Epson FX80T 160cps Printer .....	458.85

ATM 2	Acorn Atom assembled 12K ram .....	184.00
ATM 26	Atom New Power Supply 1.8A .....	9.66
ATM 21	Floating Point ROM for Atom .....	21.85

Large stocks of software for BBC and Atom, Business,  
Games and Educational. Send for comprehensive lists.

Large stocks. Prices inclusive of VAT  
All prices inclusive of postage except micros 3.00

All Upgrades etc. are fitted free of charge and the computer  
fully re-tested. Access and Barclaycard Welcome.



### 14" Colour portable Monitor/TV

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

Cost 259.90 Trade enquires welcome



# Electronequip

36-38 West Street, Fareham, Hants

(0329) 230670









# WEST OF SCOTLAND

## BBC & ATOM DEALER AND SERVICE CENTRE

### HARDWARE

Model A £299.00 inc.  
 Model B £399.00 inc.  
 Postage & Packing £6.00 inc.

### SOFTWARE

Acornsoft Bug Byte Program Power also  
 30 Golf Fruit Machine Dodgems  
 Send SAE for full list

### MONITORS PRINTERS

A selection on display A

Upgrades carried out  
 Disk and Econet interfaces fitted  
 Also a wide selection of books and magazines

### WEST COAST PERSONAL COMPUTERS

47 Kyle Street  
 AYR  
 Tel 0292 (285082)

# BBC Spectrum nascom

## GIANT ADVENTURE GAMES

- 1) COLOSSAL ADVENTURE:** The classic mainframe game "Adventure" with all the original treasures & creatures + 70 extra rooms.
- 2) ADVENTURE QUEST:** Through forest, desert, mountains, caves, water, fire, moorland and swamp on an epic quest vs Tyranny
- 3) DUNGEON ADVENTURE:** The vast dungeons of the Demon Lord have survived His fall. Can you get to their treasures first?

Every Level 9 adventure has over 200 individually described locations and is packed with puzzles - a game can easily take months to complete. Only sophisticated compression techniques can squeeze so much in! Each game needs 32K and costs £9.90

## BBC FORTH, FORTH TOOLKIT

"r q FORTH" runs on 16K or 32K BBC micros and costs £15. It:

- ★ follows the FORTH-79 STANDARD and has fig-FORTH facilities,
- ★ provides 260 FORTH words,
- ★ is infinitely extensible;
- ★ has a full-screen editor;
- ★ allows full use of the M.O.S.;
- ★ permits use of all graphic modes, even 0 2 (just!);
- ★ provides recursion easily;
- ★ runs faster than BBC BASIC;
- ★ needs no added hardware;
- ★ includes a 70 page technical manual and a summary card;
- ★ has hundreds of users.

Level 9 Computing are pleased to announce a new toolkit for "r q FORTH" on 32K BBC micros. It costs only £10 and adds the following facilities to FORTH:

- ★ a 6502 assembler, providing machine-code within FORTH;
- ★ turtle graphics, giving you easy-to-use colour graphics;
- ★ decompiler routines, allowing the versatile examination of your compiled FORTH Programs,
- ★ the full double-number set;
- ★ an example FORTH program; and demonstrations of graphics;
- ★ other useful routines.

<b>nascom</b>	<b>Asteroids</b> .....	m/c,g	£7.90	
<b>Extension Basic</b> .....	£15/£30 ROM	<b>Galaxy Invaders</b> .....	m/c,g	£5.90
Adds 30 new keywords to BASIC		<b>Missile Defence</b> .....	m/c,g	£7.90
<b>Compression Assembler 2</b> .....	£12	<b>Super Gulp</b> .....	eb,g	£4.90
Small Source + high speed		<b>5-games cassette</b> .....	misc	£5.90
		(FULL RANGE IN CATA LOGUE)		

ALL PRICES INCLUDE P & P AND VAT. All programs are in stock and will be sent within 2 days of receipt. Please send order or SAE for catalogue, describing your micro, to:

### LEVEL 9 COMPUTING

Dept A, 229 Hughenden Road, High Wycombe, Bucks. HP13 5PG

Mole Computer Products Ltd  
offer

## BBC Microcomputer

Compatible  
Disk Drives

### MOLE 100 SUBSYSTEM

Single drive 1 x 100K  
£173 + VAT

### MOLE 200 SUBSYSTEM

Dual drive 2 x 200K  
£346 + VAT

### MOLE 300 SUBSYSTEM

Single drive 1 x 200K  
£193 + VAT

### MOLE 400 SUBSYSTEM

Dual drive 2 x 200K  
£386 + VAT

### MOLE 500 SUBSYSTEM

Single drive 1 x 400K  
£243 + VAT

### MOLE 600 SUBSYSTEM

Dual drive 2 x 400K  
£486 + VAT

Utility disk and start up information £5 + VAT

- Fully compatible with your BBC microcomputer
- Powered from your BBC microcomputer
- Cased in a cream metal case, complete with all necessary cables and connectors.

Please add £6.80 p & p per system, and allow approximately 28 days for delivery.

We do NOT supply the disk interface.  
 For further information send s.a.e. to:-  
 Mole Computer Products Ltd, 1 St. Albans Road  
 Kingston-upon-Thames, Surrey. KT2 5HQ

## Horse in Motion

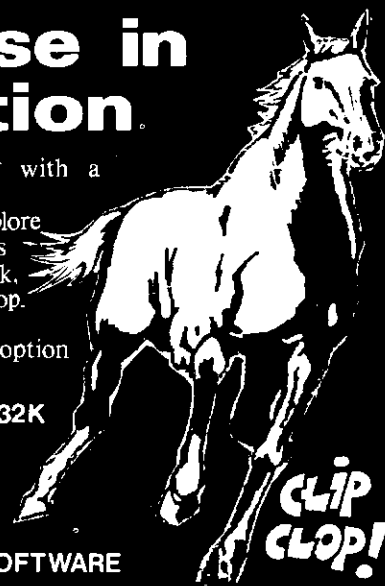
By interacting with a realistic horse animation explore the differences between a walk, trot and gallop.

Slow motion option and sound.

BBC Micro 32K  
EDUCATION  
Cassette



SOFTWARE



CLIP  
CLOP!

To: LIB SOFTWARE,  
20 Wandsworth Bridge Rd., London SW6 2TJ

Please send \_\_\_\_\_ copies of 'Horse in Motion' at £6 each inc. p&p and V.A.T.

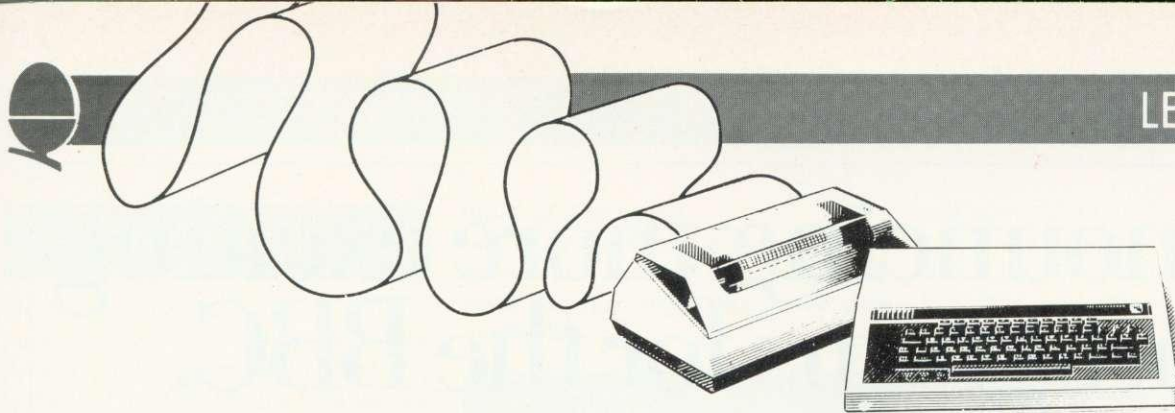
I enclose p.o./cheque payable to 'Lib Software' value £ \_\_\_\_\_

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

V.A.T. No. 227 4253 73





## MINI TO MICRO

Sir, First, may I join the many in thanking you for the excellence of Acorn User? I subscribed from its inception and it provided a stimulating read while waiting for my B with disc/Econet ordered in November 1981. However, the magazine has really proved its worth since the aforesaid machine was delivered this year.

I claim no record for patience, accumulated correspondence or telephone bills, but I may be the only user group of one member, for Acorn do not plan on entering the small Swiss market in the foreseeable future. (A pity, because money is available and Switzerland, in many respects is in the Middle Ages with regards to computing. A product like the Beeb could be in the vanguard of a breakthrough). They have recently opened an office a couple of hundred miles away in Germany, but apart from a small squeak in December, I've not been able to raise any signs of life.

My interest in the Beeb, going back to the very first information of Autumn 1981, rests in the search for a versatile, high-performance micro as the basic laboratory machine for data-acquisition and processing in a research group of about 750 employees.

With its national character and the ensuing software and peripheral support, the Beeb seemed then, and now, ready-made for this. The manner in which it has been, and is being, taken up by institutes of higher education in the UK seems to support this opinion, which was formed in spite of the enormous difficulties encountered by the geographical and mental distance of the band of four (BL/Vector/Acorn/BBC) from customer service/information. It is in this latter aspect that your magazine is such a boon.

Slowly coming to my second reason for writing, an important factor in my

interest is the linking of a Beeb system, either alone or Econetted, to a HP1000 mini. Are you planning any detailed articles about this in the near future? I am really very naive about this, and so will have to start at a very low level. I at least recognise it is not a simple matter of joining B to X with a hair-pin. If you are not planning anything immediately, do you know of anyone who could lend a guiding hand? I would appreciate your recommendations.

Again, thank you for AU.

**T.G. White**

Wander Research Institute  
Switzerland

**Linking the Beeb to a HP1000 is not, unfortunately, on our agenda at the moment. However, if any readers can help, we will pass letters on to Mr White.**

## IRATE IN THE ALPS

Sir, I am writing to you as a last resort in my quest to purchase a BBC model B computer.

I want to order a fully expanded model B complete with disk, Econet, speech synthesis and cartridge ROM pack interfaces (if available). I have written to six companies advertising in your magazine (three of which advertise that they export), since January, but only one bothered to reply, and they were unable to export hardware.

The normal terms for exporting from the UK is the UK price less VAT but plus postage and insurance at cost. I pay the Swiss VAT when it is imported into this country.

I have already enquired from Vector Marketing who will not supply the BBC computer VAT free. They state VAT is used to pay for the extra postage. For a model A this is about £35 and for a fully expanded model B over £60 which seems excessive, when an Atari 400 was exported VAT free and £10 charged for postage.

When the BBC computer was

announced there was a lot of interest shown by my colleagues, who like me are system programmers working for Brown Boveri Cie (the BBC of Switzerland). But trying to get hold of, first information, and now a computer, has been very frustrating, as very few UK companies, including the BBC, bother to reply to either my letters or my other colleagues' letters.

If other people in Europe are receiving the same negative attitude as I have received, I cannot see how UK companies expect to export, which is a pity as they do produce some very good products (if only you get hold of them).

**R.A.Norton**  
Switzerland

**All is not well in Switzerland, judging from these letters, although at least Mr White is not alone.**

**Now, what about it Vector, Acorn and the rest of the UK? When are we going to see a solution to this simple problem?**

**Incidentally, the Swiss BBC is the reason for having to rename the machine the 'British Broadcasting Corporation Microcomputer' overseas.**

## NEW COMMAND?

Sir, Does anybody know what the operating system command \*DEBUG does. It is recognised by the command line interpreter of OS 0.10, but is undocumented. Another recognised command is \*NOTAPE, but this is not very useful as it simply turns the cassette filing system off and gives a 'No filing system' error when any attempt is made to save a file.

**I. Okey**  
Cambridge

**\*DEBUG doesn't do anything at all. It's a remnant from very early versions of the operating system used only by Acorn and it has no effect in any machine issued to the public.**



# Announcing more exciting programs for the BBC.

Acornsoft is the software division of Acorn Computers, the company that designed and built the BBC Microcomputer. Here are four more exciting programs, all designed to get the most from your BBC Micro.

Starship Command (£9.95) is a demanding high-resolution graphics game in which you command a starship against attacking alien ships. You control the forward drive and rotational thrust of your ship, which is equipped with shields, long and short-range scanners and a sector display of the stars and alien ships.

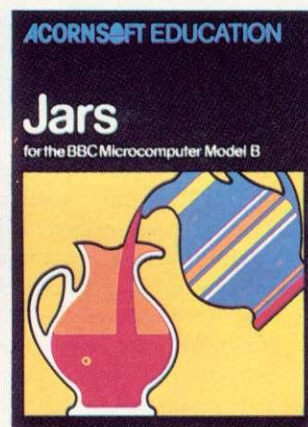
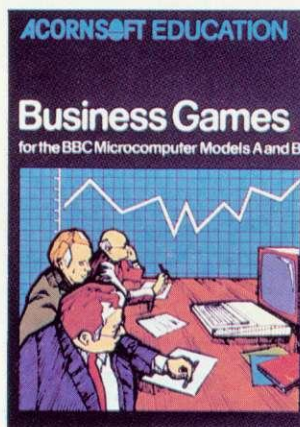
Countdown to Doom (£9.95) is a race against time as you strive to repair your damaged space ship in the corrosive atmosphere on the planet Doomawangara (Doom). Beat the clock or resign yourself to a life in the wilderness of Doom.

Business Games (£9.95) is a cassette containing two games designed for economics, business or general studies teaching.

In Stokmark, up to eight players compete in buying and selling shares aided by a screen display of relevant market information.

In Telemark, players compete to dominate in the manufacture and sale of televisions. The winner is the one who makes the largest profit or controls over half the total market.

Jars (£11.90) is an educational cassette suitable for 7-13 year olds. The objective of the program is to present, what are usually thought of as purely numerical problems, in a visual way. Jars of liquid are used to visualise volume estimation and fraction problems. Success, partial success or failure is noted by a scoring system and suitable comments.



## How to get Acornsoft programs.

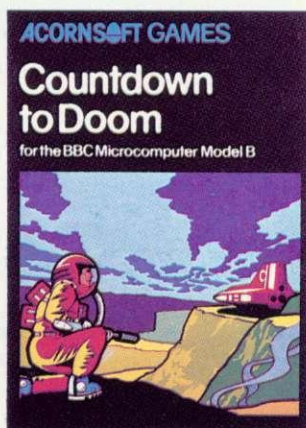
If you're a credit card holder and would like to buy cassettes of the programs shown in this advertisement, or if you would like to know the address of your nearest stockist, just phone 01-200 0200.

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

Also use this form if you would like to receive the current free Acornsoft catalogue.

Please allow 28 days for delivery.

☎ Credit Card Holders. Telephone 01-200 0200.



To: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.

Please send me the following:-

PROGRAM	PRICE	QUANTITY	TOTAL	(Code Acornsoft use only)
Starship Command	£9.95			SBG22
Countdown to Doom	£9.95			SBG19
Business Games	£9.95			SBE03
Jars	£11.90			SBE15
TOTAL				

I enclose PO/cheque payable to Acornsoft Ltd.  
Or charge my credit card.

Card Number \_\_\_\_\_ AU7  
(Amex/Diners/Visa/Access (Delete))

Please send me the Acornsoft brochure

Name \_\_\_\_\_

Address \_\_\_\_\_

Postcode \_\_\_\_\_

Signature \_\_\_\_\_

Registered No. 1524763. VAT No. 215 8123 85

# ACORNSOFT



## DISC PUZZLE

Sir, Several members of our club are puzzled by the following error message: 'Can't extend at line XX'. We suppose it is related to the DFS but we have not been able to find any explanation in the BBC micro or Teac drive manuals.

It happened to us when trying to save a program in ASCII code on top of a previous similar program under the same name or when writing fresh information in a file. There was plenty of room available in the diskettes in both cases.

If that error message is printed by the computer, it seems there is nothing to be done but to delete the previous program or file, in which case the new ones are accepted without further difficulties. Can anyone out there give us an explanation? Many thanks in advance.

I. Beng  
Tenerife

**The message means there isn't room for the whole file as one contiguous**

## block of disc space.

Use \*COMPACT to free all disc space into one block and then re-open the file (using the space now available).

## SLOW ROMS

Sir, Is the 1.2 ROM slower than the EPROMs? The following short program when executed on a model A/B BBC computer fitted with the 0.1 ROM or 1.0 ROM appears to take on average 10.6 seconds, but on computers fitted with EPROMs the time taken is 13.6 seconds.

```
10 TIME=0
20 FOR X=0 TO 1000
30 PRINT X
40 NEXT X
50 PRINT TIME/100
```

Having just been lucky enough to have the 1.2 ROM fitted I discovered that the time on the above program was now increased to 16.6 seconds.

On querying this with the dealer concerned I was told this was normal as the 1.2 ROM was slower because it

had more facilities. I also queried the position of jumper S19 which was still situated to the west or left, and was told this was correct. I then rang Acorn who told me that this jumper should in fact lie to the east.

On repositioning this jumper and running the above program the time taken was now 10.6 seconds. Another dealer was asked the same question on the position of S19 and again said it was correct for it to lie to the west.

S19 lies immediately above IC23, and on all circuit boards fitted with a ROM chip it does lie to the east or right side.

H.A. Leonard  
Berks

**The links should be east (S19) and north (S18). Acorn will supply a complete fitting sheet for the MOS upgrade if you send them a SAE. On the links question the full list of changes are: S18 - north; S19 - east; S20 - north; S21 - (two of) east/west; S22 - north; S32 - west; S33 - west. North is the edge of the board at the back of the case and south is the edge nearest the keyboard. East and west follow on.**

BBC COMPUTER  
DISC DRIVES

- ☆ Latest technology half height drive units
  - ☆ High quality, low noise power supply
  - ☆ Attractive, compact steel enclosure
  - ☆ Fully screened from external interference
  - ☆ Enhanced data integrity
  - ☆ Single and double drive units
  - ☆ Disc formatter utility
  - ☆ Interconnecting cable
  - ☆ Extremely rugged design
  - ☆ Built and supported in the UK
- Prices: Single 40 track

100K £225 + VAT

Double 40 track

200K £425 + VAT

Micro Concepts

8 Skillicorne Mews, Queens Rd, Cheltenham,  
Glos. GL50 2NJ. Tel: (0242) 510525

## The Data Store

6 CHATTERTON ROAD  
BROMLEY  
KENT

for the BBC MICRO

OFFICIAL ACORN DEALERS

WIDE SELECTION OF SOFTWARE  
AND PERIPHERAL EQUIPMENT  
INCLUDING

EPSON, NEC, SEIKOSHA  
PRINTERS

ZENITH, CABEL  
MONITORS

CUMANA  
DISC-DRIVES

BOOKS AND CABLES AVAILABLE  
plus our personal advice service

MACHINES DELIVERED & SET UP  
IN YOUR HOME

PHONE 01 460 8991 (9.30 - 5.30)  
ORPINGTON 26698 (Evenings)  
(CLOSED WEDNESDAY)



**...MORE TO EXPLORE**  
with EE computer "add-on" projects...

**NEW SERIES STARTS THIS MONTH**  
**MICROCOMPUTER**  
**INTERFACING**  
**TECHNIQUES**  
Peripheral Circuits and Software

A series of articles to help the electronics experimenter build and use a range of simple peripheral units, which can be interfaced with 6502 closed microcomputers.

EE knows how to make  
circuit building easy

**\* JULY ISSUE**  
on sale June 17-85p

**EVERYDAY**  
**ELECTRONICS**  
and computer **PROJECTS**

\* Available from your local newsagent. In case of difficulty send £1 to:  
Post Sales Dept., IPC Magazines Ltd., Lavington Street, London, SE1 0PF.



**COMPUTERCAT**  
*Quality Software*  
**BBC MICRO**

**TOUCH TYPIST (32K) — £9.95** *Educational and useful*  
Are you a keyboard pecker? Improve your typing skills. Your computer is your tutor, monitoring and evaluating your progress. Fully documented. Many already sold to educational institutions.

**OTHELLO (32K) — £8.95** *Highly recommended*  
A favourite board game brought up to date with superb graphics and sound.

**SNIG (32K) — £6.95** *Addictive*  
Not just an ordinary snake game but a super-fast arcade type needing exceptional reflexes and co-ordination.

**BOUNCE (16/32K) — £4.95** *A must at the price*  
NEW and FRUSTRATING. Like all ball games it is the timing that's important. Kids love it.

**GRIG BLITZ (32K) — £5.95** *Highly recommended*  
A fast action arcade game with scintillating multicolour graphics and sound. DEFEND your territory by shooting down the GRIG INVADERS. Ten play levels of increasing difficulty. Are you good enough to reach level 10?

**DATABASE (32K) — £12.95** *Good value*  
Organise your records. Add, change, search, delete and display routines. Shell SORT. MENU driven and user friendly.

**COMPENDIUM (32K) — £5.95** *Three for the price of one*  
4 up (Version 1), 4 up (Version 2), Poke the peg. Three board games to test your powers of logic. Four colours and sound. A challenge for 1 or 2 players.

*Professionally written*

*All programs on cassette with instructions/ documentation*

*Price includes P&P • Delivery by return*

*Deduct £1 per cassette for 2 or more cassettes*

Stop press: Star printer DP 510 £270 + VAT + £10 carriage.

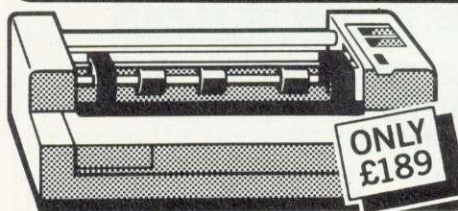
224 Chapel Street, Leigh, Lancs.

(0942) 605730

**MICROAGE**

**ELECTRONICS**

**BIG value in small printers**



**The Incredible Seikoshia AP80**

The AP80 is probably the world's **LOWEST COST**, compact 80-column graphic dot-matrix printer available.

It can produce single and double width characters and has the ability to produce any pattern through its dot-matrix capability.

The AP80's robust construction and its unique "unihammer" make it an extremely cost effective and efficient printer.

**Its features include**

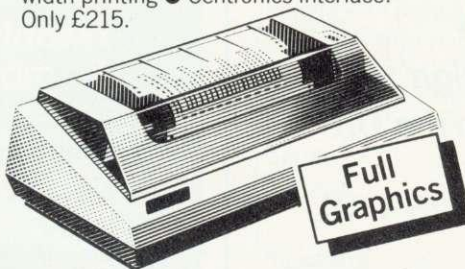
80 Cols 30 cps ● Dot Matrix Unihammer action ● 96 ASCII standard characters ● Up to 8" paper width ● Upper and lower case ● Double width printing ● Standard interface: Centronics

**The Amazing Seikoshia AP100**

Big brother to the AP80 the AP100 is a wider more sophisticated version of the AP80 with a full graphics capability and the ability to take standard width computer stationery, the AP100 is an ideal choice for anyone with a microcomputer.

**Its features include:**

80 cols 30 cps ● Dot Matrix Unihammer action ● 116 ASCII standard characters ● Full graphics capability ● Up to 10" paper width ● Upper and lower case ● Double width printing ● Centronics interface: Only £215.



Official Orders Accepted

At Microage you can now get the very best value in microcomputer printers. We've selected only the best printers available so you can choose confidently, knowing you're getting the best value for money.

Free Cable + paper  
with printers

**Accessories**

Seikoshia GP-80 Ink Ribbon £4.75 (75p p+p)  
Seikoshia GP-100 Ink Ribbon £5.75 (75p p+p)  
Dust and sound Cover £3.95 (75p p+p)

Please Rush me details of all Printers.

Name \_\_\_\_\_

Address \_\_\_\_\_

The computer I shall be using it with is: \_\_\_\_\_

AU7

**MICROAGE ELECTRONICS**

135 HALE LANE EDGWARE MIDDLESEX HA8 9QP TEL: 01-959 7119 TELEX 881 3241

Open Mon - Sat 9.15 am - 6.00 pm. Thurs 9.15 am - 1.00 pm.

**DEALER ENQUIRIES WELCOME**  
**CALL 01-959 7119**  
**FOR TRADE PRICES**





## RADAR ANSWER

Sir, I note with interest Chris Allard's letter about radar pollution. I live nearly under the approach path to RAF Northolt and when I first got my BBC B I was very disappointed with the picture quality. I improved it by using normal TV, UHF co-ax cable instead of the one supplied, but found that the main problem was patterns of black dashes appearing all over the screen. This reminded me of problems encountered even closer to Northolt, with a Video recorder.

I found the frequency of the Beeb could be changed by using the ferrite screw in the RF unit (the little tin box on the right of the Beeb) in the rear right-hand corner of the machine. However, 'turning off' channel 36 produces other problems as the Beeb seems to act as a good aerial and I find the whole of that frequency range is full of faint, but still annoying transmissions. I have at last managed to find a 'Hole' free from radar (if that is the cause of the black lines) and faint TV stations, at around '45' on the dial.

Unfortunately, I am still plagued by random break-ups of the whole picture.

I.S. Mulelly  
Middlesex

## DATE SHEETS

Sir, Last December I bought a BBC model B, it developed a fault in January. At switch-on flickering, vertical lines show and when a games program is run 'sound on vision' symptoms are present. I obtained a replacement from Vector Marketing but after one week it developed the same symptoms. Is this a common fault? I have tried several televisions.

Is it possible to obtain a service Manual for the BBC micro?

R. Pyrah  
Cumbria

**This problem is not common. We've never seen it and so we've passed your letter on to Acorn. Their engineers are looking into it.**

**On your second point, Acorn only distribute service manuals to dealers and educational service centres.**

**Acorn do produce a 1MHz bus Application Note for £2.50 (no VAT) strictly cash with order. This covers interfacing the Acorn Eurocard**

**range and user-designed peripherals to the 1MHz extension bus.**

**They also have data sheets on all the integrated circuits they use, priced at £1 (no VAT) strictly cash with order. These include: 6502; 6809; 6522; 6845; 7002; 6100; 5220; 76489; SAA5050; 6854; 8271; 74 series; 6847; 2114 and 4816.**

**However, please note that no data is available on Acorn ULAs.**

## BBC BLAMED

Sir, I read the correspondence relating to radar interference with interest as it is similar to my own experience with a television transmitter.

After a considerable wait for a BBC cassette recorder I found I could not load or save programs. It only gave statements such as Data? Block? This was strange since I had borrowed a neighbour's recorder which had worked perfectly. After much trial and error I took the recorder to my neighbour's home where it worked perfectly!

We then tried it in another room in my own house where again it worked perfectly.

We are within half a mile of the BBC transmitter at Crystal Palace in London and this was the cause of the problem.

My solution has been to encase the recorder in a metal box to protect it from the interference. Although this is inconvenient it is a relief to be able to use the recorder and computer.

Raymond Cousins  
London SE19

## LINE ERROR

Sir, Do you have any information on the basic keyword 'line' available on the BBC micro? On first receiving my computer only the provisional manual was supplied. To check out what commands were available I looked through the minimum abbreviations list, and line appeared. No description was given. When the *User Guide* arrived there was still no description. When typed into the computer the error message 'Syntax error' is given, showing the interpreter accepts it as a valid Basic word. Is it possible that it's a graphics command?

T. Dinham-Peren  
Surrey

**No, Line isn't a graphics command! It is an optional extension to the**

**Input statement and (as explained on page 278 of the User Guide) it is used to accept every character as valid during the input - usually leading spaces would be removed and the input would terminate at a comma.**

>>>>>'S

Sir, I own a BBC model B with an 0.1 OS, which had developed what seems to be a serious fault.

About every 30 seconds after switching the machine on and not touching the keys, the computer starts printing >'s on every second line at random intervals. On occasions it will print up random key words in full across the screen. While all this is going on the keyboard is totally inoperable with the exception of the break key. Pressing that will reset the computer but within a few seconds, random >'s appear again.

I don't know if the problem lies in the German electricity supply or if it lies in one of the chips.

S. Griffiths  
West Germany

**You do indeed have a problem. Your machine either has a RAM fault or a faulty OS. The dealer to contact for help in Germany is Acorn Overseas Ltd Deutschland, Anzinger Strasse 1, D-8000, Munich 80.**

CR02 = 3T07

Sir, None of the articles and correspondence I have seen in the computer press has said anything about the type of cassette tape to use with the BBC micro, other than to suggest reasonably good quality tapes. I have discovered that if one uses chromium dioxide quality tapes rather than the ferric type one gets one hundred per cent success at 1200 baud for both programs and data files.

When my model B had the 0.1 OS I found that using ferric oxide tape even the patch program would not allow me to use 1200 baud, but with Cr02 I didn't need to patch anyway. Now I have upgraded to the 1.2 the results are just the same, ie ferric oxide is no good for 1200baud, but Cr02 is perfect. I use a Ferguson 3T07 recorder.

I hope that others will find this tip useful.

A.H. Jones  
Berkshire





We've been swamped by messages from new groups this month. It would be impossible to give full details of you all, so here's a quick run-down of who's where and what's what.

**Sutton Library Computer Club**, contact Jennifer Woeller on 01-661 5031 or David Wilkins on 01-642 3102 (evenings); **BBC Micro User Group**, Wakefield, contact Richard Sterry on Wakefield 255515; **Peterborough Personal Computer Club**, contact Andrew

## WHO'S WHERE

## WHAT'S WHAT

Pike on 0733 44342 (after 5pm); **Beebnet, South Australia**, contact Lindsay Thachuk through the address below; **BBC Micro Club, Tenerife**, contact I. Beng at the address below; **Mid-Cheshire Computer Club**, contact Dave

Clare on Winsford 51374; **Kinder Peek Computer Club**, contact John Eary on New Mills 43870; **Iver Computer Society**, contact John Haigh at the address below; **Keighley Computer Club**, contact Colin Price on Keighley 603133; **Wandsworth Computer Club**, contact C. Verrier at the address below; and the **Brighton, Hove & District Computer Club**, contact the secretary at the address below. Keep them coming!

## CLUB CONTACTS

● Rupert Steele  
**Amateur Computer Club**  
St John's College  
Oxford OX1 3JP

● **Beebug**  
374 Wandsworth Road  
London SW8 4TE

● J. Smith, Secretary  
**Brighton, Hove & District Computer Club**  
30 Leicester Villas  
Hove  
E. Sussex BN3 5SQ

● Dr Leo McLaughlin  
**North London BBC Micro Users Group**  
Dept. of Chemistry  
Westfield College  
University of London  
Kidderpore Avenue  
London NW3 7ST  
Tel: 01-435 0109

● **West Midlands Computer Group**  
12 Apsley Road  
Oldbury  
West Midlands B68 0QZ

● Mr J. Price  
Bedford House  
27-28 St George's Road  
Brighton  
Sussex

● Mr P. Beverley  
**Norwich Area Acorn User Group**  
Room 12a, Norwich City  
College  
Ipswich Road  
Norwich NR2 2LJ

● Keith Mitchell  
**Edinburgh ZX Computer Club**  
19 Meadowplace Road  
Edinburgh  
Tel: 031-334 8483

● Steve White  
**Atom/BBC User Group**  
c/o Superior Systems Ltd  
178 West Street  
Sheffield  
Tel: (0742) 755005

● Robin Bradbeer  
**Association of London Computer Clubs**  
Polytechnic of North London  
Holloway  
London N7 8DB

● Nik Kelly  
**Liverpool BBC & Atom Group**  
56 Queens Drive  
Liverpool L4 6SH  
Tel: 051-525 2934

● Andy Purkiss  
**Namebug**  
6 Palm Close,  
Witham, Essex.  
Tel: 0376 515609

● I. Beng  
**BBC Micro Club**  
PO Box 1297  
Santa Cruz de Tenerife  
Tenerife

● Lindsay Thachuk  
**Beebnet**  
PO Box 262  
Kingswood  
South Australia 5062

● Richard Sterry  
**BBC Micro User Group**  
1 Wavell Garth  
Sandal Wakefield  
West Yorkshire WF2 6JP  
Tel: Wakefield 255515

● Colin Price  
**Keighley Computer Club**  
Red Hill  
Hainsworth Wood  
Keighley  
W. York  
Tel: Keighley 603133

● Jennifer Woeller  
**Sutton Library Computer Club**  
Sutton Central Library  
St Nicholas Way  
Sutton  
Surrey  
Tel: 01-661 5031

● Mr C. Rutter  
**Medway Atom Users Club**  
St John Fisher School  
Ordnance Street  
Chatham  
Kent

● Mr J. Ashurst  
**Acorn Computer Users Group**  
Abraham Moss Centre  
Crescent Road  
Manchester 8

● Mr D. L. Evans  
23 Hitchin Road  
Henlow Camp  
Bedfordshire

● N.P. (Bazyle) Butcher  
**Harrow Computer Group**  
16 St Peter's Close  
Bushey Heath  
Watford WD2 3LG

● R. Welch  
**Harpden Microcomputer Group**  
7 Tylers  
Harpenden  
Herts AL5 5RT

● Mr P. Frost  
**Atom Users Group**  
18 Frankwell Drive  
Potters Green  
Coventry CV2 2FB

● Oivind Grenness  
**BBC Norway**  
O-Inform  
PO Box 716  
N3191 Horten  
Norway

● R.V. SOuter  
**TRS/80 Beeb Users Group**  
25 Carr Lane  
Willerby  
Hull HU10 6JP  
Tel: 0482 654117

● E.R. Piper  
**Bognor Computer Group (BUG)**  
2 Ely Gardens  
Aldwick Park  
Bognor Regis  
Sussex PO21 3RY

● Andrew Pike  
**Peterborough Personal Computer Club**  
920 Bourges Boulevard  
Peterborough PE1 2AN  
Tel: 0733 44342 (after 5pm)

● Dave Clare  
**Mid-Cheshire Computer Club**  
'Providence House'  
222 Townfields Road  
Winsford  
Cheshire CW7 4AX  
Tel: Winsford 51374

● **Liverpool BBC Microgroup**  
c/o Fred Shaw  
14 Albany Avenue  
Eccleston Park  
Prescot  
Merseyside L34 2QW

● John Harris  
**Bottisham Acorn User Group**  
1 Rowan Close  
Bottisham  
Cambridge CB5 9BN  
Tel: (0223) 811487

● Peter Smith  
**Fareham and Portchester Amateur Computer Club**  
23 Sandy Close  
Petersfield  
Hants

● Paul Barbour  
**Laserbug**  
10 Dawley Ride  
Colnbrook  
Slough  
Berks. SL3 0QH  
Tel: 02812 3064

● Brian Pain  
**Colour Micro Users Group**  
40a High Street  
Stony Stratford  
Milton Keynes  
Tel: (0908) 564271

● Mr D. Coulter  
**Preston BBC User Group**  
8 Briar Grove  
Ingol  
Preston PR2 3UR

● **Acorn Users Group of Sweden**  
c/o Janne Soderberg  
Frihetsvagen 32  
S-175 33 Jarfalla  
Sweden

● Dilwyn Jones  
**Bangor & District Micro Users Group (BADMUG)**  
Fodol Farm  
Halod Lane  
Bangor  
Gwynedd LL57 4BU

● Peter Wilson  
**Universal Micro Club**  
26 North Cape Walk  
Corby  
Northants NN18 9DQ  
Tel: Great Oakley 742622

● John Haigh  
**Iver Computer Society (IC's)**  
141 Leas Drive  
Iver  
Bucks SL0 9RP

● John Eary  
**Kinder Peek Computer Club**  
36 Parkway  
New Mills  
Tel: New Mills 43870

● C. Verrier  
**Wandsworth Computer Club**  
Earisfield Library  
Magdalen Road  
London SW18

● Mr J. Craig  
**National BBC User Group**  
40 Mount Pleasant Avenue  
Wells  
Somerset BA5 2JQ

● Mr R. Luff  
**Kingbee**  
54 Arlington Close  
Kingswinford  
West Midlands

● **Computer Club**  
Caterham Leisure Centre  
Godstone Road  
Caterham  
Surrey CR3 6RE  
Tel: Caterham 48304/43316

● Ted Ryan  
**Eastwood Town Microcomputer Club**  
15 Queens Square  
Eastwood  
Nottingham NG16 3BJ

● Mr T.A. Kayani  
**SOBAT Computer Club (East London)**  
B25 Berridge House  
Hillfield Road  
West Hampstead  
London NW6

● Mr M.G. Forster  
**Potbug BBC Users Group**  
8 St George's Avenue  
High Lane  
Tunstall  
Stoke-on-Trent  
Tel: 818499

● **Muse (for teachers)**  
Freepost  
Bromsgrove  
Worcs B62 7BR

● Mr B. Carroll  
The Cottage,  
42 Manor Road,  
Aldershot GU11 3DG

● Steve McLeod  
**BBC Users Group of Canberra**  
5 Hatfield Street  
Evatt A.C.T. 2617  
Australia  
Tel: (062) 58 7719



**EXTENDED COLOUR-FILL GRAPHICS  
E.C.F.G. GIVES YOU A CHOICE OF  
!! 4 BILLION + !!**

**SHADES FOR TRIANGLE FILLING  
IN BBC MODES 0,1,2,4 & 5**

- \* PLOT 81 and 85 commands for triangle-filling have been adapted to use the ECFG fill-shade currently selected by new ECFG user-friendly commands. GCOL is still used for line colour.
- \* Easy choice of 17, 289 & 6561 subset colours between those normally available in 2, 4 & 16 colour MODEs. Further options include colours, angles, spacings & widths of cross-hatch etc.
- \* ECFG commands can be used in BASIC, typed from the keyboard, accessed in Assembler, or in future BBC Micro languages. ECFG is MOS-adaptive, and proven with versions 0.1 to 1.2
- \* Bootstrap from cassette rapidly builds an ECFG module at a RAM address pre-defined by PAGE, which is then automatically increased 512 bytes to allow immediate LOADING of programs etc.

**Price : £10 inc : Mail Order only**

**GAELSETT (ECFG)**

44 EXETER CLOSE, STEVENAGE, HERTS. SG1 4PW.  
(Tel. Stevenage 51224)

# CONTEX

**Adult Educational Software  
for the BBC computer**

## TYPING TUTOR 32K

Specifically designed for the BBC micro the 90 smoothly graded lessons teach, train and encourage you to become quickly proficient at touch typing. Keyboard display highlights each lesson. Word scan error checking, times (wpm) and recommends next lesson. Audio key feedback, metronomic pacing beat, many user configurable options. Instruction booklet supplied **£10 inc.**

## SPREADSHEET 32K

A complete and versatile 'calc' program and tutorial. Models containing over 1000 cells can be built using up to 26 columns and 99 rows. Equations, constants or text in any cell. Emphasis on ease of use includes copy, row/col insert, delete, totals, headers, variables, row colours, save and restore. Tutorial, application examples and documentation of the all Basic program for those who wish also to explore the design. **£8 inc.**

**Cassette based. Professional software and service always. Special Offer! Deduct £1.50 if both programs ordered together.**

*Cheque/PO payable to 'Contex Computing'*  
**(A5) 15 Woodlands Close, Cople, Bedford MK44 3UE**

## BBC SOFTWARE

*Quality software produced by professionals and used in hundreds of schools throughout Great Britain present their latest tape:*

### FUN WITH WORDS B £8.05

Start your fun with alphabet puzzles in GUESS A LETTER. Continue your play as you learn about VOWELS, know the difference between THERE and THEIR and have games with SUFFIXES. After working so hard reward yourself with games of HANGMAN. Learning should be fun. The tape includes ALPHA, VOWELS, THERE?, SUFFIXES and HANGMAN.

**EDUCATIONAL-1 A or B £8.05**  
Hours of fun and learning for children aged 5 to 9 years. Animated graphics will encourage children to enjoy maths, spelling and telling the time. The tape includes MATH1, MATH2, CUBECOUNT, SHAPES, MEMORY (Model B only), SPELL and CLOCK.

**EDUCATIONAL-2 A or B £8.05**  
Although similar to Educational-1 this tape is more advanced and aimed at 7 to 12 year olds. The tape includes MATH1, MATH2, AREA, MEMORY (Model B only), CUBECOUNT and SPELL.

**GAMES OF LOGIC AND CUNNING A/B £9.20**  
For children and adults alike. The tape includes AUCTION, FLIP, REVERSE, TELEPATHY and HEXA 15 (Model B only).

**SUPERLIFE B £9.20**  
Fast (machine code) version of a popular 'Game of Life' in a large universe.

**KATAKOMBS B £9.20**  
Are you cunning enough to discover and seize the treasure in the Katakombs AND return alive? What and where are your enemies? Can you outwit them? Yes? Then your adventure will take you through unending forests, besides tumbling streams, over lonely plains to desolate ruins and finally underground to the tortuous Katakombs.

**UTILITIES A/B £8.05**  
Behind the mundane title lies an assortment of useful procedures and functions which can save you hours/days of programming effort: date conversion, input and validation routines, graphic routines (cube, rectangle, etc), sorts, search and many more.

\*\*\* **SPECIAL OFFER** \*\*\*  
Any 3 cassettes for £20.70

**DISCS-TORCH Z80 pack-800K**, second processor with 64K RAM, CP/M\* compatible operating system + system software. **£890 incl of VAT**

Delivery free within 30 mile radius otherwise £10 delivery charge

Add 50p p/p per order. Please state your model

Cheque/PO to: **GOLEM LTD, Dept A**

77 Qualitas, Bracknell, Berks RG12 4QG. Telephone: (0344) 50720

## T Y P E A S Y

E A S I L Y the best typing tutor  
with A M U S I N G musical effects  
BBC models A or B 16 K  
with 139 graded exercises on cassette tape  
K E Y B O A R D D I S P L A Y with pointer  
N E W K E Y S introduced one at a time and practised in one line exercises; tells you which finger to use  
I N C L U D E S upper & lower case, numerals punctuation marks and signs  
optional AUDIO feedback, music while you work  
A D V A N C E D multiline exercises - checks all strokes, spaces, carriage returns at the end of the paragraph  
M E A S U R E S S P E E D in words/minute

\*\*for T E A C H E R S\*\*

- pupil's results are logged for each exercise and can be displayed on the screen
- free and easy routine is included for writing your own exercises and tests onto the tape

all inclusive price £ 10.50  
immediate delivery

**Carswell  
Computers**

Carswell Barn  
Faringdon  
Oxon SN7 8JN









# BBC 32K 747 FLIGHT SIMULATOR & BRIEFING

A full blown, pilot written, simulation (writer of the famous Atom 747) real time instrument and visual display, 3D runway view (Heathrow or Gatwick), large dials, moving pointers plus digital readout. Demonstration approach and landing. Full, separate briefing program. Area chart, notes and flight plan.



A new concept, a new classic . . .

## Wolfpack III BBC MICRO 32K

Combat briefing and program

"Sometimes your first warning is a lancing disruptor beam striking from beyond — sometimes they materialise close at hand. You are either quick or dead!"

True in-space cumulative motion, amazing full colour Starfield graphics & sound. Multiple ship control, each ship has its own mission and destiny, 4 types of enemy, meteor strikes. Good strategy rewarded by energy & promotion. Poor combat rewarded by death! (but rescue/retuel possible). Rotating base station, inter galactic warp.

KREMLIN 3D multi level maze escape with Gremlin Kombat!  
WORD PERFECT friendly and versatile, full facility 80 column word processor (add £4 for disc version).

DEALERS PHONE (0903) 206076 ROYALTIES DOC PAYS THE BEST FOR THE BEST

Orders to: Doctor Soft, 258 Coneygree Rd., Peterborough PE2 8LR

NO extras all prices fully inclusive

..... copies of 747 @ £6.95  
 ..... copies of Wolfpack £7.95  
 ..... copies of Kremlin £6.95  
 ..... copies of Word Perfect £9.95

Name .....

Address .....

TOTAL £



## DOCTOR SOFT ADVANCED SOFTWARE

## WORDSCAN.

FOR ALL BBC MICRO OWNERS - A WORD PROCESSOR ON CASSETTE.  
 Even for those owners with 0.1 Operating System.  
 Even for those owners who do NOT own a printer.

So far, you have used your machine to play games. Now you can really benefit, using it for WORD PROCESSING.

An extremely fast and easy to use program, professionally written caters for over 400 by 40 character lines of text on the BBC Micro Model B.

There are versions to cater for the special facilities of the EPSON MX80 FT3, Seikosha GP100A and Centronics printers, but the program will operate on any 'machine compatible' printer.

Bureau Service available for PRINTING if required.  
 'Edit' your text on your TV monitor.  
 'Save' it on cassette when you have checked it out.  
 'Send' it to me for a fast confidential PRINT service.  
 Epson MX80 FT3 used for Print Service with all features.

For Demonstration cassette just send £2 deposit + £1 to cover p&p. Please state printer to be used.

Otherwise, full details of the Package, priced at £15 and the Bureau Service, minimum charge £2 for 2000 words can be obtained from "Dial Software", 72 Downend Road, Downend, Bristol BS16 5UE.

# AID at last!

Assembler Interactive Debug for your BBC Micro with DUALSCREEN\*\*

- \*Essential for beginners
- \*Invaluable for experts

AID is a unique machine code environment for the BBC micro which brings the user friendliness of BASIC to the world of machine code.

Capable of supporting the development of the most advanced machine code programs it is also the essential companion to the complete beginner.

No more do machine code programs have to 'die' leaving you to hit the Break key and wonder what happened. AID will execute them an instruction at a time if necessary, simultaneously displaying a disassembled program listing together with the changing registers in the processor.

For the experienced programmer AID provides a first class monitor with a host of advanced facilities to cut program development time: Single stepping, breakpoints, register and memory modification and a unique code insertion feature for advanced applications. Plus of course DUALSCREEN - simultaneous support of your program screen and AID's debugging screen.

- \* 28 commands
- \* Integral disassembler and hex/character dump.
- \* Breakpoint and program counter position indications. Automatic disassembly from program counter at AID entry.
- \* Up to 12 simultaneous breakpoints. Breakpoint list facility. Resume (remove break) and Continue (leave break in place) commands.
- \* Previous and current processor status displays, A, X, Y, S and PC registers plus flag bits.
- \* Single stepping of programs with cyclic disassembly from previous current and destination instruction addresses. Automatic illegal instruction stop.
- \* Mode 7 screen with processor status display region, disassembler display region, command line, repeat line and AID message line.
- \* DUALSCREEN - automatic recovery of program screen on program re-entry, and user command.
- \* Alter memory, alter processor registers or invert flag bits.
- \* Entry by CALL from BASIC program or command level. Clean return to BASIC program at machine code program RTS.
- \* Relocatable with AID's relocater/loader.
- \* Tested with OS0.1 and 1.2.
- \* Comprehensive user guide.

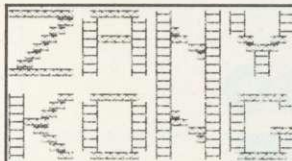


DUALSCREEN is the unique feature of AID which makes it stand out from all other debugging programs. AID recognises that most programs drive graphics displays, and that an essential part of the debugging process is to be able to monitor the screen as the program executes. AID automatically saves and restores your program screen whenever AID is entered either at CALL from BASIC or at a machine code breakpoint, before initialising its own mode 7 screen. Then when you return to your program AID automatically re-establishes your program's current screen whatever the mode. This superb facility, achieved with only 1.5K additional screen data memory makes AID the most powerful monitor available for developing machine code graphics!

The most advanced machine code A.I.D. yet for aspiring machine code programmers or experts!

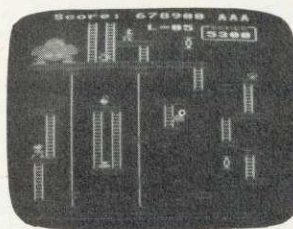
**LINCOLN Microsystems** Dept DP2, 22 Lagan Walk  
 Peel Hall  
 Manchester M22 5WG

**£15** includes VAT and p&p



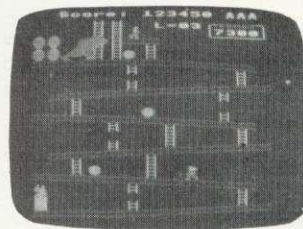
## for the B.B.C. Microcomputer (32k)

Copyright © Christopher Jude and SOLAR SOFT - 1983

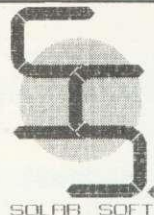


**Full Machine Code  
 4 Screens Of Play  
 Keyboard/Joystick  
 Full Colour/Sound  
 An AMAZING Game**

ZANY KONG is the crazy game in which the player controls a running, barrel-jumping man. In each of the 4 frames of play a girl (captive of Kong) must be rescued by climbing ladders and girders. In later stages conveyor-belts, lifts and fireballs increase the hazards of this task. This version of the classic arcade game includes all of the original's features.



**£6.50** fully inc.



**SOLAR SOFT,  
 5 WESTMORLAND DRIVE,  
 CAMBERLEY,  
 SURREY GU15 1EW**



## SCHOOLSOFT

Quality educational software  
for BBC (32K)

**TRIWORD** - An expansion of the HANGMAN idea which goes much further in the field of reasoning. A piece of text is hidden on the screen and can be found by entering single or groups of letters. The scoring system encourages reasoning by rewarding the grouping of letters. There is a facility to show the position of missing letters and when a word is completed it changes colour. Text can be entered directly from the keyboard or from a previously stored file and the program caters for capitals and lower case. This program can, with imagination be used to supplement a wide range of subjects. **£5.50**

**COMPETITIVE MATHS** - This is a fun type competitive maths program suitable for a wide age range (7-70 yrs). It can be used individually but is most effective when used by groups - with children competing against each other. Addition, Subtraction, Multiplication and Division are covered and varying difficulty levels can be selected. An analogue stop watch is incorporated in the graphics together with the running scores, best score to date etc. Valuable for the development of mental agility, number estimation etc. **£5.50**

**WRITING** - (5-7yrs) demonstrates to young children how to correctly form lower case letters. **£5.50**

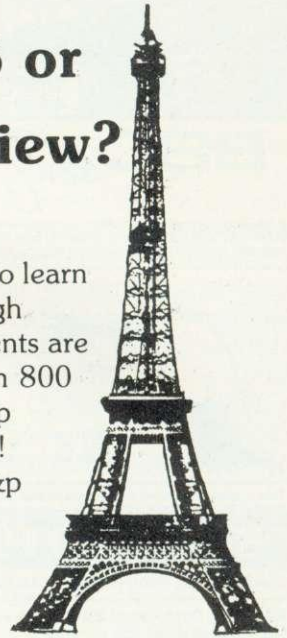
**BRITISH GEOGRAPHY** - (Juniors) - Cities and Ports - guide cursor over the map until location is found: **£8.00**

All programs make use of colour and moving graphics S.A.E. for catalogue.

Add 50p p/p per order  
Schoolsoft 19 Shadwell Grove, Radcliffe-on-Trent,  
Nottingham NG12 2ET.

## FRENCH HOLIDAYS or Exams in View?

This program helps you to learn and revise French through vocabulary quizzes. Accents are catered for. Starting from 800 words (included) build up your vocabulary on tape! Price £6.50 plus 50p p&p from J. Hargreaves, Updown, Pewley Way, Guildford, Surrey GU1 3PY



### VOCABULARY PROGRAM for the BBC Micro (32K)

## TURBO TIMER

has the time of day for you. It will remind you of appointments throughout the day, and chime on the hour. You can enable or disable the display and chimes.

Turbo Timer runs continuously and independently of the BBC Micro's clock, it is also much more accurate. It remembers your appointments while you work with BASIC, VIEW etc. and requires no hardware modification. Suitable for Version 1.0+ operating system.

Price including user guide:

**Cassette** ..... **£4.95 + 50p p&p**

**Disk** ..... **£6.95 + 50p p&p**

**Stable Software,**  
Lodge Cottage, High Street,  
Winterbourne, BRISTOL.

Telephone:

**Winterbourne 772545 (Answering Machine)**

## educational software

Interactive Infant programs for use on the BBC Micro - Model B. A whole new concept of computer based learning, enthusiastically received and recommended for use in the Infant school by teachers and educationalists. Fully tested and evaluated.

Optimum use made of superb sound and bold colour graphics, with score table at end of each programme. Programmes are selected by menu. Facilities for self-correction by child, and computer feedback and correction. Detailed documentation included, and clear on-screen documentation.

### LEARN ADDITION (3 programs)

**BLOCK ADD** gradually develops the concept of addition using unit blocks.

**BLOCK LINE** enables child to add blocks to a number line and complete a number sentence.

**ADDITION TEST** gives practice in addition to 10 with the option of using a displayed number line with moveable arrow.

### LEARN SUBTRACTION (3 programs)

**DIFFERENCE** involves the child in constructing a visual representation of this concept and completion of a difference sentence.

**PICTURE SUBTRACT** involves the child in constructing a story in picture form demonstrating subtraction and completion of related number sentence.

**SUBTRACTION TEST** gives practice to 10 with the option of using a displayed number line with moveable arrow.

**£6.50**  
inc. p&p

**£6.50**  
inc. p&p

Special terms available for Local Education Authorities.

Send cheque/P.O. or Official Order to:  
ABC PRIMARY SOFTWARE, 19 Crumstone Court,  
Killingworth, Newcastle upon Tyne, NE12 0SZ.  
Telephone: (0632) 682627



# MORE OUT OF THIS WORLD SOFTWARE FOR THE BBC MICRO FROM IJK SOFTWARE...



## CASSETTE SEVENTEEN: 5-A-SIDE SOCCA



At last!!! The 2 player m/c game you have all been asking for. Uses joysticks or keyboard. Really exciting - pass, dribble, tackle and shoot.  
£7.50 inc.

## CASSETTE SIXTEEN: PONTOON & PATIENCE



Excellent rendition of the two very popular card games... Post! - red six on black seven!  
£7.50 inc.

## CASSETTE FIFTEEN: LEAP FROG



Superbly written m/c arcade type game. Beautifully presented, features lanes travelling at different speeds, skill levels, tunes, butterflies, parrots. For use with joysticks or keyboard.  
£7.50 inc.

## CASSETTE FOURTEEN: STRATOBOMBER



Excellent graphics on this m/c arcade type game. Can you keep the enemy fleet at bay in order to destroy the rogue star ships nuclear reactor?  
£7.50 inc.

## CASSETTE ELEVEN: ATLANTIS



The superb fast action m/c arcade type game. Guide your submarine Nautilus along the undersea landscape and through the caverns avoiding mines, depth charges, rockets, jelly fish, serpents etc. Features skill levels and user selected keys.  
£7.50 inc.

## OTHER TITLES AVAILABLE...

### MODEL A/B

**CASSETTE 1:** Star Trek/Candy Floss (very popular). £6.50 inc.

**CASSETTE 2:** Family Games (hours of fun). £4.50 inc.

**CASSETTE 3:** Mutant Invaders/Breakout. £6.50 inc.

**CASSETTE 8:** Model A Invaders (M/C). £5.50 inc.

### MODEL B (or A+32K)

**CASSETTE 4:** Beep-Beeb (Super Simon Game). £4.50 inc.

**CASSETTE 5:** Beebmunch (full colour Munchman). £6.50 inc.

**CASSETTE 6:** Super Hangman (animated, educational). £4.50 inc.

**CASSETTE 7:** 3D Maze (fast and intricate). £4.50 inc.

**CASSETTE 9**  
**MODEL B Invaders (or A+32K)**  
(M/C). £7.50 inc.

**CASSETTE 10**  
**WORDPRO.** (Cassette W.P. system). £10.50 inc.

**CASSETTE 12**  
**FLAGS.** (Countries and Capitals). £4.50 inc.

**CASSETTE 13**  
**HYPERDRIVE** (M/C arcade). Destroy the Drone aliens in the caverns with your laser tank. £6.50 inc.

## ALL PRICES FULL INCLUSIVE OF VAT AND P&P - NO MORE TO PAY

All advertised software is in stock NOW and will be despatched within 48 hours of receipt of order.

All Programs will run on ALL current OS versions and basic roms.



**IJK**  
Software  
Limited



24 HOUR ANSAFONE



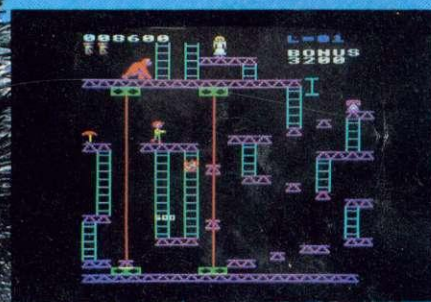
9 King Street, Blackpool, Lancs.  
Telephone (0253) 21555



ANOTHER FABULOUS B.B.C. PROGRAM FROM BRITAIN'S LEADING SOFTWARE HOUSE

# Killer Gorilla

Once again, Killer Gorilla holds captive a young and beautiful heiress. Is the age of CHIVALRY dead? Answer the maiden's cries for help and scale the ironwork tower. Race along Girders, Climb Ladders, Jump Gaps, Leap onto moving Elevators and Career along Conveyors. Dodge or jump the rolling barrels or grab a hammer and smash a few. Watch out for the fireballs and iron beams hurled with animal passion. Sensational, full feature machine code arcade game with four phases, increasing difficulty and speed, bonus points and the highest standard of graphics yet achieved on the BBC micro. Only £6.95.



Other programs available: Swoop (B) £6.95/ Croaker (B) £6.95/Chess (B) £6.95/Laser Command (B) £6.95/Galactic Commander (B) £6.95/Filer £8.95/Timetrek (B) £6.95/Micro Budget £6.95/Moonraider (B) £6.95/Barrage (B) £6.95/Beebmon (B) £6.95/The Labyrinth of La Coshe (B) £6.95/Draw (B) £8.95/World Geography (B) £5.95/ Spacemaze (B) £5.95/Munchyman £5.95/ Seek £5.95/Eldorado Gold (B) £5.95/ Dissassembler £5.95/Constellation (B) £5.95/ Junior Maths Pack (B) £5.95/Where? (B) £5.95/Painter (B) £5.95/Chemistry (B) £5.95/ Physics (B) £5.95/Caveman Adventure (B) £5.95/Astro Navigator (B) £4.95/Starrek £4.95/ Reversi 1 £4.95/Reversi 2 (B) £4.95/Roulette (B) £4.95

Written any Programs? We pay 20% Royalties for B.B.C. & ELECTRON PROGRAMS



WE ARE AUTHORISED DEALERS FOR ACORN ATOM, BBC MICRO & DRAGON 32

**SPECIAL OFFER**  
Deduct £1 per cassette when ordering two or more.

MICRO POWER LTD.  
Dept. AU7  
8/8a REGENT STREET,  
CHAPEL ALLERTON,  
LEEDS LS7 4PE  
Tel: (0532) 683186 or 696343

Please add 55p order P & P + VAT at 15%

**Please Note:**  
All programs are now available at all good dealers or direct from MICRO POWER LTD.