

BBC MICRO USER

Volume 1 No. 3
May 1983 £1

*The independent magazine that helps
you to make the most of your micro*

WIN
a Cumana
disc drive



*in another
challenging
contest!*

More than
30
listings
inside!

JUMPIN' KANGAROOS!

Take your first steps
in Mode 7 animation

Build your own
BBC joystick

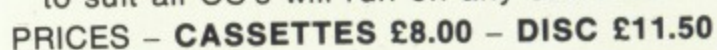
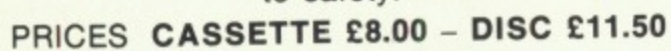
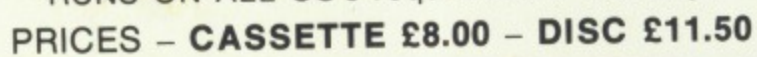
Play Pelmanism
and Anagrams

Inside story of
the BBC ROM

Help with string variables,
editing and function keys

Blast your way
to victory with
AIR STRIKE!

BBC DRAGON ATOM SINCLAIR SIRIUS SPECTRUM BBC DRAGON ATOM SIVA



PRICES CASSETTE £8.00 – DISC £11.50

CLAIR SIRIUS SPECTRUM BBC DRAGON ATOM

Launch your BBC micro with the Torch Z80 disc pack.

If you already have a BBC Model B micro, then you know that it is not a toy. But neither is it suitable for business or for serious programming because it lacks the access speeds and massive storage capacity that only floppy discs can provide.

The answer is a TORCH Z80 DISC PACK. The twin discs store up to 800K of data and programs, while the Z80 processor board provides an extra 63K of user memory and Torch's CP/M* compatible operating system – giving access to the largest range of software currently available.

For the business user, this means sophisticated word processing, financial and stock-control packages. For the programmer who has outgrown BASIC, the TORCH DISC PACK can handle more compact, powerful, and specialised languages – such as PASCAL, C, FORTRAN, LISP and COBOL.

The TORCH Z80 DISC PACK comes complete with a range of useful software, including a full disc function test, a character redefinition program, a music generator, a Z80 monitor and system demonstrations.

TORCH gives you the power and programming space to launch your BBC micro into the world of serious computing.

TORCH
COMPUTERS 

Abberley House, Great Shelford, Cambridge CB2 5LQ.
Telephone: (0223) 841000 Telex: 818841 TORCH G.





Vol. 1 No. 3 May 1983

Managing Editor
Derek Meakin

Features Editor
Mike Bibby

Art Editor
Peter Glover

Advertisement Manager
John Riding

Advertising Sales
John Snowden
Mike Hayes

Marketing Manager
Linda Dobson

Tel: 061-456 8383 (Editorial)
061-456 8500 (Advertising)

Telex: 667664 SHARET G

Published by:
Database Publications Ltd,
Europa House, 68 Chester Road,
Hazel Grove, Stockport SK7 5NY.

**Subscription rates for
12 issues, post free:**
£12 - UK
£13 - Eire (IR £16)
£18 - Europe
£15 - USA (surface)
£25 - USA (airmail)
£15 - Rest of world
(surface)
£30 - Rest of world
(airmail)

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

© 1983 Database Publications Ltd. No material may be reproduced in whole or in part without written permission. While every care is taken, the publishers cannot be held legally responsible for any errors in articles or listings.

BBC Micro User is an independent publication and neither the BBC nor Acorn Computers Ltd are responsible for any of the articles in this issue or for any of the opinions expressed.

Distribution to the news trade in the UK and Ireland is by Wells Gardner, Darton and Co Ltd., Faygate, Horsham, West Sussex RH12 4SU (tel: Faygate 444). Enquiries regarding overseas distribution should be made direct to the publishers.

CONTENTS

NEWS

Keep up to date with all the very latest happenings in the bustling BBC Micro world.

9

PELMANISM

Shuffle the cards and put your memory to the test – but it's much harder than you think!

14

TELETEXT

Another look at the capabilities of Mode 7 – this time for creating fast-moving animation.

18

INTERFACING

Practical programs to start you putting the BBC Micro hard at work in the laboratory.

20

GRAPHICS

Use simple shapes to produce multi-coloured pictures and really bring your screen to life.

28

BITS & BYTES

More about the binary code – to help you understand better how your BBC Micro works.

34

UPGRADE

Part III of our Beeb Body-building Course shows how to construct your own joystick.

37

TAPE OFFER

Save yourself the chore of keying in programs from this issue with our cassette.

41

HOW IT WORKS

More about the operating system in our conducted tour through the BBC Micro.

44

TUTORIAL

Take your first steps into real programming with the use of those vital string variables.

48

FUNCTIONS

There's much, much more to function keys than might be apparent from the User Guide.

50

COMPETITION

Win the latest Cumana disc drive in another challenging test of your programming skill.

51

BOOKSHELF

Our reviewers try out two new books for the BBC Micro user – on Basic and assembler.

55

23

THE GENERATION GAME



How to use the
BBC Micro's
character bit map
to generate vertical
and inverted text.

52

GAME of the MONTH

AIR STRIKE!



Zap four types of
nasties in our fast,
furious and very
colourful arcade
extravaganza.

56

BACK ISSUES

How to find out which articles you missed in
the first two issues of BBC Micro User.

58

ANAGRAMS

Here are 25 anagrams for you to solve – in a
clever games program that simply grows.

60

WORKSHOP

Find your way around the Operating System,
and learn some very useful tricks as you go.

65

SPLURGE

Heard about Splurge II? We reveal the full
lowdown on the latest programming language.

68

STRUCTURE

The gospel of structured programming is
boldly expounded by a leading protagonist.

71

EPROM

An evaluation of one of the latest EPROM
blowers finds points both for and against.

76

COLOURS

Four billion colours can be created with a
new graphics package. We test the results.

78

EDITING

Recover gracefully from those Basic mistakes
with our new, easy-to-follow editing guide.

81

SUBSCRIBE NOW!

A year's subscription to BBC Micro User –
plus a FREE copy-holder and crib sheet.

82

SOFTWARE

Programs galore – but are they all they claim
to be? Our frank reviewers give you the facts.

92

BOOKSHOP

We've chosen 15 of the best books for the
BBC Micro for this month's offer to readers.

97

MICROMAIL

Another deluge of mail from readers saying
what they think of the BBC Micro – and us!

100

SHOWTIME

Meet other readers at the year's top
event – the very first BBC Micro Users Show.

GEMINI PERFORMANCE

It can do a powerful job for you

SPECIAL LIMITED OFFER

Buy just any two programs at £19.95
and take one at £19.95
FREE!



CASH BOOK ACCOUNTS PROGRAM FOR BBC MICRO . . . £95.00

New

One of the most innovative business programs on the market. Most serious accountancy packages are written and coded by professional and competent programmers. The Gemini Cashbook Accounting program was written by practising Chartered Accountants and coded by professional and competent programmers. This is a fundamental difference.

This practical program is simple to use and will replace your manual cash and bank records and by giving you instant management information, it may even put your accountant out of job!

With exceptionally exhaustive user documentation, full technical back up and product update policy this program will increase the efficiency and profitability of your business. Take a look at the information this program will provide.

* summary of VAT information to enable you to complete your VAT returns

* cumulative receipts and payments report analysed over the standard profit and loss and balance sheet heading.

* option for departmental analysis of sales and purchases

* print out of all transactions

* journal routine for entering transfers between accounts and year end adjustment for debtors, creditors etc.

* year end trial balance

* profit and loss account and balance sheet.

These statements can be produced at what ever interval you require e.g. monthly, quarterly or annually.

Coming soon:- Integrated Sales + Purchase Ledgers

"... the systems worked immaculately
when tested ..."

"Mailist is a very professional piece of software ..."
(Which Micro & Software Review Feb 83)

Here's a range of software for the independent businessman that's designed to harness the power of your micro to deliver the vital information you need in all key areas of your business. A breakthrough on both price and performance, each program is fully tested and comes with all the documentation back up you need.

"Gemini's range of software is in the vanguard of the releases for 'serious' micro users ..."

(Which Micro and Software Review)



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.

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
Sinclair Spectrum 16k or 48k	●	●	●					●	●
Dragon 32k or 64k	●				●			●	
VC20 (16k+)	●	●	●	●				●	●
Sinclair ZX81 (16k+)	●								
Grundig Newbrain	●								
Texas T199 4A	●								
Amel 400/800 or Osborne 1	●								
Sharp MZ80A	●	●	●	●				●	●
Sharp MZ80K	●	●	●	●				●	●
Sharp MZ80B	●	●	●	●				●	●
BBC micro model A or B 32K	●	●	●	●	●	●	●	●	●

GEMINI'S NEW SOFTWARE

our business at petty cash prices.



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.



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.

Dealer/Trade enquiries invited — generous trade discounts for quantity
Special ACCESS card instant sales hotline **Tel: 03952-5165**
for GUARANTEED prompt despatch . . .

24 hr Ansaphone Service.

All enquiries other than credit card sales to 03952-5832

Gemini. Functional Software Specialists. 9, Salterton Road, Exmouth, Devon.

Tick the box for Program you require. Prices include V.A.T. and Package and Postage.
 Please supply the following cassette software.

Database	£19.95	<input type="checkbox"/>	ZX81 16K Database	£9.95	<input type="checkbox"/>
Stock Control	£19.95	<input type="checkbox"/>	BBC Cash Book disk or tape	£95.00	<input type="checkbox"/>
Mailing List	£19.95	<input type="checkbox"/>	BBC Disks — other titles	£23.95	<input type="checkbox"/>
Invoices and Statements	£19.95	<input type="checkbox"/>	Osborne Disk Database	£23.95	<input type="checkbox"/>
Commercial Accounts	£19.95	<input type="checkbox"/>	Word processor	£19.95	<input type="checkbox"/>
Home Accounts	£19.95	<input type="checkbox"/>	Beebcalc	£19.95	<input type="checkbox"/>
			Dragoncalc	£19.95	<input type="checkbox"/>

Name

Address

Machine Type Memory Size

I enclose ☐

Make cheques and postal orders payable to Gemini Marketing Ltd.

Diners Card Number Access Number

☐ DIVERS CLUB INTERNATIONAL ☐ Signature

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



Midwich

COMPUTER COMPANY LIMITED

1st

choice for **BBC** microcomputers

BBC COMPUTERS

Model B	£346.95
Model B + Disc Interface	£441.95

BBC MICRO DISC DRIVES

BBC 31	Single 100K Drive	
	Expandable to 2 x 100K	£199.00
BBC 32	Dual 100K Drives	£330.00
BBC 33	100K Upgrade for BBC 31	£122.00
BBC 34	Dual 400K Drives	£649.00

BBC 35 Acorn Utilities Disc/Manual £30.00

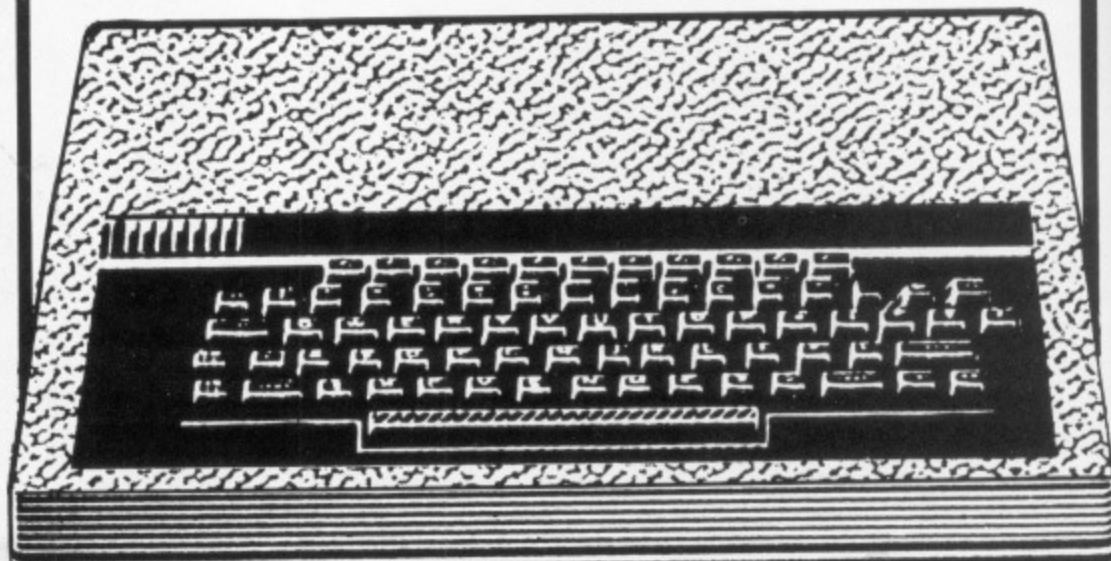
(supplied only with BBC 31, 32, 34)

All Drives except BBC 33 supplied cased with Connecting Leads.

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
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.



Fast ex-stock delivery by Securicor...

Midwich
COMPUTER COMPANY LIMITED



Fitting Service
available

12 month "no quibble"
warranty on all products

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 PK	£ 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	£10.35
SBG06	Arcade Action	£ 8.65
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
DS3691N		£ 4.50
DS88LS120N		£ 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

...from East Anglias leading supplier

Delivery Charges
Computers/Disc Drives £5.00
Components/Software £0.50
Books/Joysticks £1.00

MIDWICH COMPUTER COMPANY LIMITED

RICKINGHALL HOUSE, RICKINGHALL, SUFFOLK IP22 1HH
TELEPHONE (0379) DISS 898751

Down Under drive

ECONETS may be in short supply here, but the Australians have just installed their hundredth system.

The official launch of the BBC Micro in Australia was on St. Valentine's day. Since then, the discerning Australians have been

snapping them up like hot cakes.

Not to be outdone, NBC, New Zealand's version of the BBC, has been showing the Micro program. Unlike the BBC, NBC are actually able to directly advertise the BBC Micro and are pushing it strongly.

MICRO PROGRAM COULD SAVE BBC TV THOUSANDS

A MAJOR breakthrough that could save BBC Television thousands of pounds in equipment costs has been made by BBC TV networks engineer Tim Kennington using a BBC Micro.

Room for 16 ROMs

STEALING a march on Acorn is Watford Electronics which has produced a carrier-board to give the BBC Micro a 16 ROM socket capability.

The board has 13 ROM sockets. It plugs into one of the four sockets currently available on the BBC Micro to give a total of 16.

Watford Electronics is to produce the board itself, and managing director Nazir Jessa says it will be available from the end of this month for £19.95.

Kennington, 31, has written a program that enables the BBC Micro to be used as a terminal to create pages on the Ceefax service.

If current tests with the program are successful BBC TV outside broadcast teams will use micros to transmit Ceefax pages direct from live events. The first major trial is this month at the Sheffield snooker championships.

The BBC newsroom that prepares existing Ceefax pages currently uses Aston intelligent terminals linked to a PDP11 mini computer.

Each terminal costs several thousand pounds,



Tim Kennington . . a breakthrough

but with Kennington's program a BBC Micro, costing only £399, can do the same job.

"We won't replace the existing newsroom terminals," said a BBC spokesman, "but for future developments the price and the portability of the micro has tremendous advantages."

"With it our staff could also work from home if necessary and either send the completed pages by telephone to the Ceefax computer or bring them in to Television Centre on a floppy disc.

"It could also be used in BBC newsrooms and production offices wanting to contribute to Ceefax."

BBC users plump for Micronet

MORE than 1,000 people joined Micronet 800, the Prestel-based information and software database service, in the first month of its operation.

All the subscribers are BBC Micro users.

Managing director Richard Hease said that even though Micronet 800 was a revolutionary service bound to interest micro users, the response was still beyond initial expectations.

The first person to register was Surrey estate agent Jeremy Dredge.

He had heard about the proposed service last December and immediately sold his Vic 20, which he'd been using for three months, and bought the BBC machine.

Hunch

"I felt that because the BBC was so expandable it was likely to be one of the first micros to be connected to Micronet 800. It proved to be a lucky hunch."

He said Micronet 800 was enormous fun to use and easy to follow.

MICRO MARATHON PLANNED

THE most ambitious TV programme on the micro ever attempted is now being planned by the BBC's Computer Literacy team.

Called "Making the Most of Your Micro - Live", it will start at 11am on Sunday, October 2, and last for

two hours. It will be presented by Ian McNaught-Davis, who also hosted the recently-ended TV series.

Invited

Readers of BBC Micro User are being asked to play an active part in helping decide what goes

into the programme, and a number of them will be invited to be in the studio audience.

Anyone who would like to participate is asked to fill in and return the form on Page 11.

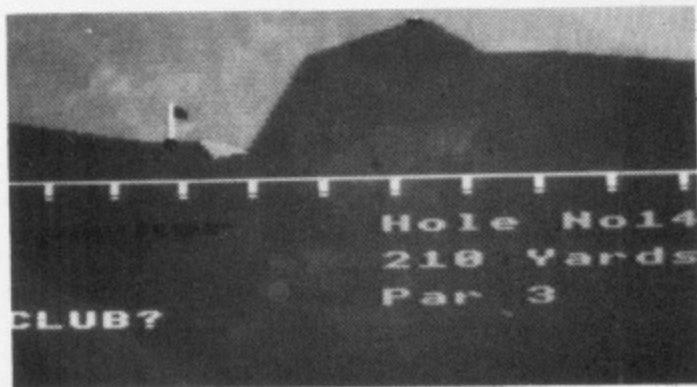
"At this stage we are very flexible about the structure of the

programme", said director Patrick Titley. "The studio audience will consist of both experts and users, and Mac will invite them to join in the discussions and demonstrations.

"There will be filmed

Turn to Page 11

Exit violence, enter golf



A NOVEL approach to the standard violence in arcade games has been taken by Squirrel Software.

"With our games we've deliberately moved away from the murderous aspect of 'zap and kill'," said a spokesman. Their first offering is Supergolf, in which the flight of the golf-ball is faithfully

reproduced depending on which club a player chooses. For example, you can control backspin using a sand-iron.

And with another program, Bunfight, a player's reactions, concentration, timing and rhythm are all severely tested in trying to cope with two jobs at the same time on the icebun production line.

Softly, softly June launch for Electron

ACORN'S new micro, the Electron, will start going out to dealers in June, but only in limited quantities. According to joint managing director Chris Curry: "It's going to be a very shallow start-up, to spot any trouble before the problem gets too big."

"It will not be available in large quantities until October."

One interesting development is that the keyboard features single key entry of Basic keywords – a clear sign that it is aimed at the Spectrum market.

However, keywords can still be spelled out in the usual way. Despite these changes, the Basic and operating system are said to be much the same as in the BBC Micro.

The cost of the micro

is expected to be around £150. For this you get a computer with 32k of RAM which will support all of the BBC Micro's modes except No. 7, the teletext mode.

This basic version can be expanded so as to have all the facilities of the full BBC Micro. Add on units will include

Econet, teletext, games paddles, RS423 and parallel printer interfaces and a disc interface.

The fully expanded version will cost "a fraction more" than its equivalent, the model B.

The pre-production Electron shown to BBC Micro User is very similar in style to the BBC Micro, though somewhat smaller and more elegant.

The full size keyboard lacks specific user-defined keys and features an altered layout.

Function keys can be obtained by "shifting"

the letter keys, which also bear the legends of the Basic keywords for single key entry.

The keyboard can also be fully "exploded", allowing the user to completely redefine each key.

Advanced

The Electron comes with an internal switched mode power supply. The isolating transformer is, however, built into the mains plug.

"I won't open it up," said Curry. "The thing's so advanced there are only a couple of chips in it."

Sackcloth section

The distributors of the Kaga monitor, reviewed last month, have pointed out that the model we reviewed was aligned for the Apple.

Had it been set up for the BBC Micro as it should, there would have been no clipping of the lines at the top and bottom of the screen. We regret the error.

AN old hand on a young machine is Bill Heywood who is probably the oldest, as well as one of the most enthusiastic BBC Micro dealers in the country.

Bill is 68. He's sold about 60 BBC Micros since taking on the machine late last year and is waiting for business to slacken off a bit so that he can start developing some music software for it.

"The problem with

computers," he said, "is there is so much to learn."

"We are going into it properly – not just playing with it – and are learning more each day."

His company, Almaine, is in Colne on the north eastern border of Lancashire. Its name is a spin off from the 1930s. Says Bill: "It was

a bit of a snob effort at the time, with everyone converting their battery powered radios to run on mains supplies."

He has handled TV sales and repairs since 1946 and decided to move into the micro market two years ago, selling the Acorn Atom. Taking on the BBC

Micro was a natural progression.

Bill and his two partners, Noel Finucane, 31, and Mike Speak, 23, also sell BBC Micro software and carry out their own repairs.

Bill has no thoughts of retirement – he says he wouldn't know what to do with his spare time. "I'm younger and fitter than people half my age," he claims, "and haven't had half a day off sick in 54 years."

Now... CALF



60s are a good age to get into micros

P
it
A
stan
is
fact
duc
unit
S
is
mo
cas
driv
itse
she
use
pro
I

...a probe opens into L for training nurses



A THREE year project to investigate the use of micros to train nurses has been launched by the West Lambeth Health Authority's Nightingale School of Nursing in London.

Two BBC Micros are to be used in the project which is funded jointly by the Health Authority and the DHSS.

Project leader is Susan Norman, a senior nursing

tutor, who will be working closely with programmers at the University of Surrey.

Their first aim is to assess the effectiveness of computer aided learning in nursing education for both trained and novice nurses. If that proves successful they will develop software for practical use.

"It will be difficult to assess the actual role

played by CAL because it won't simply replace other methods of learning," said Miss Janice Cackett, director of nursing education at the school.

"We will want to see first whether we can write a program that people will actually use – and obviously we will be drawing on the experience of CAL gained in other teaching fields."

She said a wide range of micros was assessed before choosing the BBC machine for the project.

"We liked it because it was very easily available, robust and easy to use. Other packages being developed on the machine for use in schools could well be adapted for nursing, and we felt that people might have had more contact with the BBC Micro than with other machines."

School micro meet

UNHERALDED amid the proliferation of software and hardware for the BBC Micro is a growth of interesting acronyms.

The latest is NAMEBUG, for the North and Mid-Essex BBC Micro User Group.

The group meets on the second Thursday of each month at a comprehensive school in Witham and membership is open to anyone with an interest in micros, regardless of whether they actually own a machine.

Meetings involve a program of talks and demonstrations by local dealers, followed by a general forum.

Workshop evenings for members interested in modifications, upgrades and interfacing are also planned.

For more information, telephone Dave Watts (0245 358127) or Andy Purkiss (0376 515609) after 7pm.

Two-in-one TV

USERS can upgrade from black and white computing as well as black and white television all in one go with a new monitor/TV from Electronequip.

The 14in colour portable monitor/TV is not a modified television – it has been designed to perform both functions.

The makers claim it has better resolution than normal TVs and many 80 column monitors. The standard model is supplied with an RGB cable which plugs into the back of the BBC Micro and has composite video and sound input capabilities. It costs £244.95.

THE BBC MICRO MARATHON

From Page 9

stories about unusual applications, and during the two hours we will attempt to answer as many questions as we can, both from viewers

who phone in and those sent in writing.

"We won't be able to reply to everyone who writes in, but we will read what they have to say very carefully and this will help us decide what

goes into the programme."

This micro marathon will be followed by weekly repeats of "Making the Most of the Micro".

Also in the BBC

pipeline are two more series – "The Electronic Office", about computers in business, and "Computers and Control", covering their use in industry. They will be shown in 1984.

Packing it in ...

A PURPOSE-designed stand for the BBC Micro is claimed by manufacturers Zygon Products to pack maximum units into minimum area.

Space on the top shelf is provided for TV or monitor and for the cassette recorder or disc drives. The BBC Micro itself sits on the lower shelf which, when not in use, can be slid back to protect it.

It costs £59.

READERS of *BBC Micro User* who would like to be in the studio audience for the transmission of "Make the Most of Your Micro – Live", or who have questions about microcomputing they would like to see answered on the programme, should complete this form and post it to:

Micro Special
BBC
PO Box 7
London W3 6XJ

Name

Address

Daytime phone no

☐ I would like the programme to discuss the following subject/s:

.....
.....
.....

☐ I would like some advice on the following:

.....
.....

☐ I would like to be considered as a member of your studio audience

I own a BBC Micro YES ☐ NO ☐

Americans get full treatment

THE American version of the BBC Micro will be an all-singing, if not quite dancing, fully-expanded model B.

On board as standard will be disc and Econet interfaces, the speech synthesiser and View, the Acornsoft word processor. The ensemble will sell for \$995.

Despite the fact that Acorn has a large – and very expensive – publicity drive currently underway in the States, the machine itself will not go onto the market there until the end of June.

Apparently the BBC Micro has yet to be approved by the appropriate Federal Commission. Also the dealer network has still to be finalised.

Pricing

One thing that is certain is that the "super B" version would not be available in Britain – it's export only.

Acorn is also experiencing pricing problems on the export side. It seems some of its dealers are already rather naughtily exporting BBC Micros at a price that undercuts that of the official export product.

"That, and the falling pound, are giving us some headaches," said an Acorn spokesman.



BBC Micro roadshow takes to the buses

THE BBC Micro has taken to the buses in the North West of England. Eleven micros are installed on a double decker bus as part of Salford University's micro roadshow.

It visits schools and colleges in the region to provide on-the-spot training, demonstrations and

advice, and a second bus is to be commissioned this month.

"In four or five years' time, everyone will be sitting down at computers and using the key-

board," said Roger Ross of CAMPUS, the campaign for the promotion of the university of Salford.

"We want to show everyone, from the early

primary school to the sixth form, what computers can do."

Mr Ross said the roadshow had already been a tremendous benefit to schools.

"One high school was having difficulty keeping abreast of the latest technology.

"However, their headmaster was so impressed with what he saw on the bus that he's now planning to put more money into computer studies to develop the potential."

Dubbed Mobec (for mobile education centre) the bus has exhibition and demonstration space on the lower deck and a study/lecture lounge upstairs.

BUG BYTE'S MAIL MOVE

THE mail order activities of the Liverpool software house Bug Byte have been taken over by a new company, Software Express.

It will sell the company's games for the BBC Micro from a Freepost address, providing post and packaging

free. There are 10 titles at present.

A spokesman for Software Express said the company will measure the response to the Bug Byte games before deciding whether to start developing its own software, or to take on the products of other software developers.

BARRY WOOD'S TAILPIECE

SO "Making the Most of Your Micro" has ended – and I, for one, have managed to control my grief.

The series had all the entertainment value of the Eurovision Song Contest but none of its intellectual depth.

My star moment was when John Coll was asked about a data transfer. The conversation went like this:

"How fast does it go?" enquired straight man McNaught Davis.

"Very fast", came the informative reply.

Making the most of the micro? Blue Peter

could have made more of it!

★ ★ ★

ONE of Acornsoft's mandarins came close to apoplexy the other day. The occasion was the wining and dining of a pair of their potential authors.

One of the duo casually remarked that he'd never seen an original Acornsoft disc or cassette.

"Oh they're very good", the mandarin assured him.

"I know", came the reply. "I've got all the programs. So's every-

one else I know. It's just that I've never seen an original."

★ ★ ★

IT could have been nasty, very nasty indeed. Imagine the red faces at Acorn if the cost of a new Electron plus the cost of its upgrading to full BBC Micro status came to less than that of a brand new model B.

After all, Acorn won't be paying their tithe to the BBC on this one, which allows for some flexibility in the costings.

And, of course, that

terribly clever new technology must make for lower overheads. Pricing must have been an absolute nightmare!

As it is, the cost of the totally upgraded Electron comes to "a fraction more" than that of a new model B. Lucky for Acorn, that.

★ ★ ★

THOSE terribly nice people at Acorn seem to be getting themselves into all sorts of trouble predicting the release dates for their various items of new kit.

So I'm providing them, free of charge, a

computer program that will do the job for them with, I'm certain, the same degree of accuracy:

10 DATA January, February, March, April, May, June

20 DATA July, August, September, October, November, December

30 DIM A\$(12)

40 FOR I = 1 to 12:
READ A\$(I) :
NEXT I

50 INPUT "Item", item

60 P. item "will be available in ";

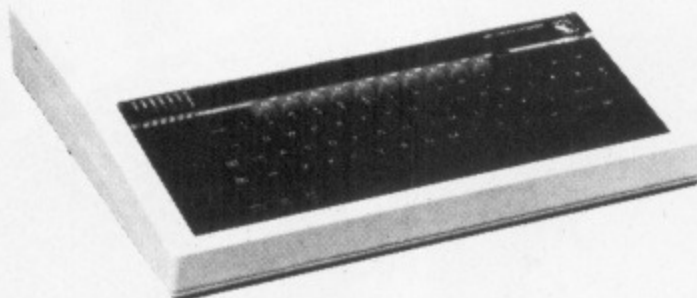
70 P. A\$(RND(12))

Official **BBC** Dealer

BBC Model B £399

(price includes VAT. Carr. extra £8)

Complete Upgrade Kit **£50**
Installation **£15**
Individual Components also
available.
All mating connectors with
cables in stock.



'VIEW' BBC Word Processor ROM
Teletext Adaptor

£52
£196

2nd Processor (6502) + 64K RAM
2nd Processor (Z80) + 64K RAM

£170
£170

Please Phone to Check Delivery Details on New Add-ons

WIDE RANGE OF SOFTWARE HELD IN STOCK

SEND or PHONE FOR OUR BBC LEAFLET

BBC COMPATIBLE 5¼" DISC DRIVES

These are TEAC mechanism fully compatible with BBC. They are
supplied with independent power supply and housed in BBC
matching cabinet.

SINGLE DRIVES: 100K **£190** 200K **£255** 400K **£345**
DUAL DRIVE: 200K **£360** 400K **£480** 800K **£610**

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

PRINTERS

NEC PC8023 BEC

- 80 Cols. 100 CPS • Proportional Spacing • Hi-Res & Block Graphics
- Bi-directional Logic Seeking • Forward & Reverse Line Feed • International & Greek Alphabet • Auto underline
- Super & Sub Scripts • 2K Built-in buffer

£345 + £8 Carr



EPSON PRINTERS

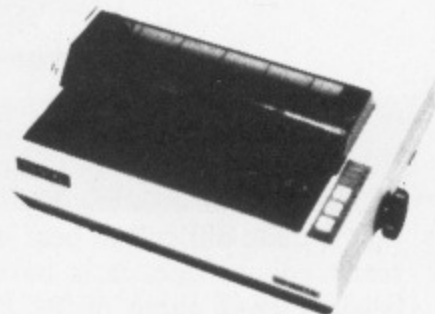
FX80 includes all the facilities of MX80 plus 160 cps plus storage of pre programmed characters plus proportional spacing and italics.
Price: £430 + £8 Carr.
RX80 as MX80 but with 100cps and tractor.
Price £298 + £8 Carr.
MX100 FD3 **£425 + £8 Carr.**

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

SEIKOSHA GP100A

- 80 Cols. 30 CPS • Self Testing • Hi-Res Graphics • Standard & Double width characters only

£185 + £6 Carr.



MONITORS

Microvitec 1431 14" Colour Monitor
£269 + £8 Carr.
Microvitec 2031 20" Colour Monitor
£389 + £8 Carr.

Kaga 12" Colour Monitor RGB
£250 + £8 Carr.
Kaga 12" Antiglare Green Monitor
£107 + £6 Carr.
Hi-Res 12" Green Screen Antiglare Monitor **£99 + £6 Carr.**

Cassette Recorder
£26 + £1.50 Carr.
Cassette Leads
7 pin DIN 3 jacks **£3.50**
7 pin DIN pin DIN + jack **£4.00**

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.
Special pricing for dealers purchasing in quantity.

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.

*A wide range of Software from Acorn,
BBC and others for education and fun
in stock.*

BOOKS

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**
(No VAT on Books — £1 p&p/book)

*For Full Details of Add-ons for BBC
Send for our Leaflet.*

DISKETTES in packs of 10

Disc operating
manual + formatting
diskette **£17.50 +**
£1.50 p&p

Single Sided 40 tracks **£15**
Single Sided 80 tracks **£24**
Double Sided 80 tracks **£32**
p&p £2/pack

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

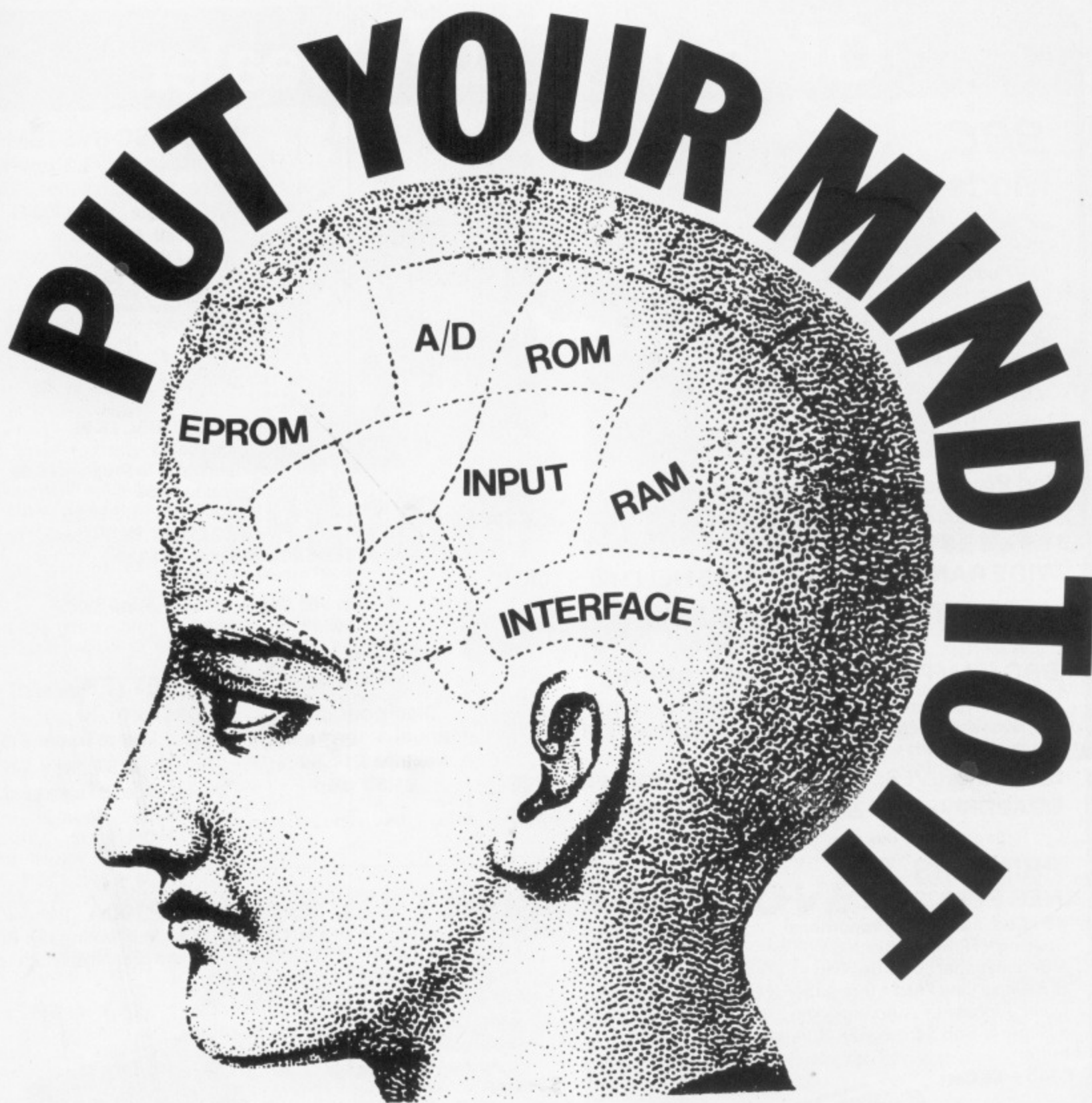
PLEASE ADD 40p p&p & 15% VAT
(Export: no VAT, p&p at Cost)

Orders from Government Depts. & Colleges etc. welcome.



Detailed Price List on request.
Stock items are normally by return of post.





THIS is an interesting little program that is quite difficult to beat unless you really concentrate. It is based on the original card game of Pelmanism or Pairs, the idea being to shuffle the pack and lay the cards face down on the table, then in turn to view any two cards and make pairs.

Where the cards are different they are replaced face down again – and the trick is to remember where they are situated.

The first thing to be done was to decide on a simple uncluttered screen format, then to design the 20 pairs of options to fit the matrix. The VDU23 statement on the BBC Micro is suitable for this purpose.

The game difficulty is ensured by shuffling the pictures into different se-

– and clear the board at Pelmanism!

quences. The array A% is used to hold the card type from one to 20 at each position (one to 40) on the table. The shuffling is performed by exchanging each entry in the A% array with another random entry.

The degree of difficulty has been designed to allow a simple level 1 up to almost unbeatable level 6. This works on the principle that the previous number of moves will be remembered,

by storing them in memory in the array M%. There is, of course no limit to the number of previous moves the computer's opponent may remember! The higher the degree of difficulty, the more previous moves the computer will remember.

The computer's play is straight forward. Where a pair has been displayed but no match found a record of the cards is stored from both the

computer's and the player's go. A search is done to find a pair from the cards stored in memory. When a match is found the cards are removed from the memory store and a point scored.

If there is no match in memory, the computer selects a random card, which it will again try and match with its store of played cards, and only when a match is still not found will it choose a second random card.

The code has been written in a structured manner and a brief description of some of the points of interest follows.

Always set mode at the start to ensure you have control of everything that goes onto the screen (line 40). This can avoid loading into an unsuitable mode after running something else, and presenting unpredictable results on the screen.

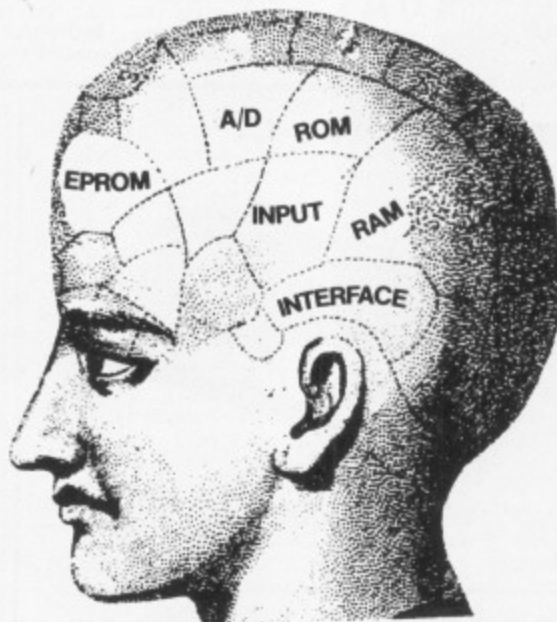
The main procedures are:

PROCVBLE: used only once at the start to set up the DIM statements and initial variables used throughout the game (line 1490).

PROCINIT: contains the initial values required to be set or reset at the start of each game (line 1290).

PROCTITLE: this important procedure is executed first as it does such things as provide a short description and a full list of the control keys and the space bar, required to successfully run and play the program (line 1560).

It is important, even when short of space, to include instructions with the code to avoid loss and wasted effort. There must be many programs lying around on tapes where the writer



By BRIAN and
MARIAN CLARK

cannot remember quite what they were but knows that they work good and should not be overwritten!

PROCENDGAME: deals with displaying the score, establishing who won and who lost. The procedure also includes a loop waiting for the space bar to be depressed to continue with the next game. It is better to wait for a particular key as this traps the inadvertent pressing of any key during play and missing the end game (line 760). The program can then go back through **PROCINIT** for another game.

PROCPLAY: contains the guts of the program. It is advisable to keep the code as high level as possible by calling other procedures that contain the detailed processing. This is to simplify

error trapping (line 80).

It is much neater to switch the cursor off when it is not being used and on again when awaiting input from the keyboard. (**PROCON/PROCOFF** lines 890,900). Line 100 performs a clear the input buffer (*FX15,1) just before accepting an input, to clear any extra key depressions during play.

The control keys are disabled (*FX4,1 line 1500) so that during input the cursor cannot float all over the screen.

It is always worth checking that the replies from the keyboard are valid within the context of the program. If a mistake is made on input the program must be able to cope. In this program the function **VETERR** (line 210) has been used which will return the value true if the input is not acceptable, i.e. outside the range A0 to D9.

If the input is invalid the use of **TAB** in the input statement ensures the question is repeated in the same place on the screen. Failure to do this could end up with the screen scrolling in the middle of the game. After input the cursor is switched off, but the input remains on the screen until the next input is prompted, when the whole input area is cleared.

A standard output routine is often useful, in this case **PROCPRT** (line 290) not only calculates the print position but also generates the graphic character required.

If escape is pressed, whether by accident or design, it presents the title page by using the on error routine (line 40). A nice touch, that.

Pelmanism listing

```

10REM *****
*      PELMANISM      *
* Brian and Marian Clark *
*      Copyright (C) 1983 *
*****
20PROCVBLE
30ON ERROR GOTO1780
40MODE7:PROCTITLE:IF PIC MODE5:PROCP
C
50REPEAT MODE5:PROCINIT
60REPEAT PROCPLAY: UNTIL ENDGAME
70UNTIL0
80DEFPROCPLAY
90FOR IZ=24TO28:PRINTTAB(0,IZ)SPC(20)
;:NEXT
100PROCON:*FX15,1
110INPUTTAB(0,24)*1st Choice e.g.A1?"B

$:IF FNVETERR GOTO90
120AX=254:BZ=253:PROCPRT:P1Z=PZ:X1Z=XZ
:Y1Z=YZ
130PROCON
140INPUTTAB(0,27)*2nd Choice ?"B
$:IF FNVETERR GOTO140
150IF PZ=P1Z GOTO140
160AX=252:BZ=251:PROCPRT:P2Z=PZ:X2Z=XZ
:Y2Z=YZ:TZ=1
170PROCCL:IF CTX(1)+CTX(2)=20 PROCENDG
AME:ENDPROC
180PROCCL:IF CTX(1)+CTX(2)=20 PROCEND
GAME
190ENDPROC
200REM VALIDATE INPUT CARD POSITION
210DEFNVETERR
220IF LEFT$(B$,1)<"A" OR LEFT$(B$,1)>"
D" THEN:=TRUE
230IF MID$(B$,2,1)<"0" OR MID$(B$,2,1)
>"9" THEN:=TRUE
240IZ=VAL(MID$(B$,2,1))
250JZ=ASC(LEFT$(B$,1))-64:PZ=10*(JZ-1)
+1+IZ
260IF AX(PZ)=0 THEN:=TRUE
270=FALSE
280REM DISPLY CARD
290DEFPROCRT
300PROCOFF
310TZ=AX(PZ):YZ=4+JZ*3:XZ=IZ*2+1:PROCC
HAR
320COLOURC1Z(Z):COLOURCZ(Z)
330PRINTTAB(XZ,YZ)CHR$(AX)TAB(XZ,(YZ+1

```

Turn to Page 73

WATFORD ELECTRONICS

DEPT BBC, CARDIFF ROAD, WATFORD, Herts, England
Tel Watford (0923) 40588. Telex: 8956095

MAIL ORDER AND RETAIL SHOP. TRADE AND EXPORT INQUIRIES WELCOME.
GOVERNMENT AND EDUCATIONAL ESTABLISHMENTS OFFICIAL ORDERS ACCEPTED.
Carriage: unless stated otherwise, please add min. 50p to all cash orders.
VAT APPLICABLE TO UK CUSTOMERS ONLY. ALL PRICES EXCLUSIVE OF VAT.
PLEASE ADD 15% VAT TO THE TOTAL COST INCLUDING POSTAGE. SHOP
HOURS: 9.00am TO 5.00pm. MONDAY TO SATURDAY. AMPLE FREE CAR PARKING.
ACCESS ORDERS: Simply telephone through your order on Watford 50234/40588.

BBC MICROCOMPUTER

Model A £299; Model B £399

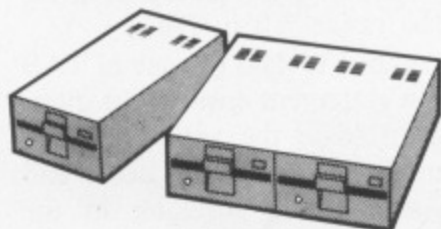
incl. VAT (carr £7)

UPGRADE KITS. Upgrade your Model A to Mod. B with our Upgrade Kits and save yourself £ s s s

- BBC1 16K Memory (8 x 4816AP-3 100nS) £16.00
- BBC2 Printer User I/O Port £6.98
- BBC3 Disk Interface Kit £75.00
- BBC4 Analogue I/O Kit £6.40
- BBC5 Serial I/O Kit £6.70
- BBC6 Expansion Bus Kit £6.10
- Printer Cable Ready made 36" £11.95
- Complete Upgrade Kit Mod. A to Mod. B £43.00

Complete range of Connectors & Cables available for BBC Micro. Send SAE for list.

DISC DRIVES 'TEAC' BBC Compatible



- US50A—Uncased, Single sided, 40 track, 5 1/4", 100K £125
- CL50A—Cased, Single sided, 40 track, 5 1/4", 100K £150
- CS50A—Cased with own Power Supply, S/S 40 track, 5 1/4", 100K £180
- CD50A—Twin Cased with own PSU, Single sided, 40 track, 5 1/4", 200K £350
- CS50E—Single Cased with own PSU, Single Sided, 80 track, 5 1/4", 200K £250
- CD50E—Twin cased with own PSU Double sided 80 track, 5 1/4" 400K £475
- CD50F—Twin Cased with own PSU, Double sided, 80 track, 5 1/4", 800K £599
- Mitsubishi Slim Line—Uncased. Double density, Double track, 5 1/4", One Megabytes, track density 96TPI, track to track access time 3mSec. ONLY £249
- Single Mitsubishi Slimline cased with own PSU. 1 Megabytes £299
- Single Mitsubishi Slimline cased with PSU. 2 Megabytes £575
- Single Drive Cable for BBC Micro £8
- Twin Drive Cable for BBC Micro £12
- 10 Verbatim Diskettes, 5 1/4", S/Sided £18
- 10 Verbatim Diskettes, 5 1/4", D/Sided £30

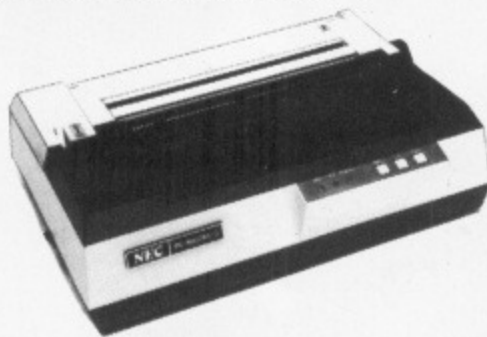
BBC GP100A PRINTER



10 Tractor Feed, 80 Columns, 30 CPS normal & double width Char.
Dot res graphics. Parallel interface std. Our price includes FREE 500 Sheets of paper. ONLY £175 (£7 carr.)

- SEIKOSHA GP250X 10" Tractor Feed, 80 col. 50 CPS, normal & double width & height characters, RS232 & Centronics Interfaces standard. £235 (£7 carr.)
- Printer Cable to interface above printers to BBC Micro £11

NEC PC8023BE-C:



100 CPS, Bidirectional, logic seeking 80 column, Tractor/Friction. 2K Buffer, etc. £320 (£7 carr.)

EPSON NEW FX80

10" Tractor/Friction feed, 160 CPS, 11 x 9 matrix, 137 columns max., Bidirectional, Logic seeking, proportional spacing, Hi-res bit image, Italics & Elite Char, Subscript & Superscript. £399 (£7 carr.)

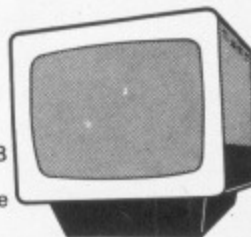
MX100FT/3

15" Carriage, 136 columns, plus all the facilities of MX80FT/3 Only £425 (£7 carr.)

LISTING PAPER

- 8 1/2" x 9 1/2" Fanfold paper plain or ruled (1000 sheets) £7 (150p carr.)
- 15" fanfold paper (1000 sheets) £9 (150p carr.)
- Teleprinter Roll (econo paper) £3 (£1.50 carr.)

MONITORS



MICROVITEC 1431
14" Colour Monitor, RGB Input. (as used in BBC programs) FREE Interface Lead.

£249.95 (carr. £7)
SANYO 3125 14" Colour. RGB & V.H. Sync. Attractive screened metal Cabinet. Value for money. £199 (carr. £7). Interface Lead for Sanyo £8.
ZENITH 12" Green Monitor. Hi-resolution £75 (£7 carr.)

CASSETTE RECORDER & ACC.

Top quality Slim-line, portable Cassette Recorder. Ideal for Computer use. Main/Batt. operated with counter. £28.00
C12 Computer Grade Cassettes in library cases. 40p

BBC FORTH on Cassette

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

BBC FORTH TOOLKIT

Adds following facilities to FORTH. 6502 Assembler, providing machine-code within FORTH — Turtle graphics enables easy to use colour graphics — Decompiler routines enables versatile examination of your compiled FORTH programs — Full double number set — An example FORTH program and graphics demonstration — Other useful routines — 64 page manual. ONLY £10.

READY-MADE LEADS for BBC

- CASSETTE LEADS 7 pin DIN Plug to 5 pin DIN Plug + 1 Jack Plug £2.00
- to 3 pin DIN Plug + 1 Jack Plug £2.00
- to 7 pin DIN Plug £2.50
- to 3 Jack Plugs £2.00
- 6pin DIN to 6 pin DIN Plug (RGB) £2.50

RIBBON CABLE LEADS 36" long

- (Female Plug at one end, other end free)
- SK9 Printer Cable (26 way Female) £2.75
- SK10 I/O Cable (20 way Female) £2.00
- SK11 1MHz Bus Cable (34 way Female) £3.20
- SK12 Tube Cable (40 way Female) £3.70

PRINTER LEAD 36"

Ready Made £11

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
RGB (6 pin DIN)	30p	45p
RS423 (5 pin Domino)	30p	40p
Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	15p	25p
Paddles (15 pin 'D')	£1.10	£2.15

IDC MALE Headers

	to fit BBC PC Board
2 x 10 way (20 pin User Port)	£1.00
2 x 13 way (26 pin Printer Port)	£2.00
2 x 17 way (34 pin DISC Intr)	£2.35
2 x 17 way (34 pin 1MHz Bus)	£2.35
2 x 20 way (40 pin Tube)	£2.50

Official JOYSTICKS £11.50/pr

LIGHT PEN

All parts available for the Acorn User's "SHINE A LIGHT" Light Pen article for £8.50.

BUSINESS SOFTWARE

Written by professional Chartered Accountants and coded by competent Programmers. Ideal for small and medium size companies.

- CASH BOOK ACCOUNTS PACKAGE £82.00
- SPREAD SHEET ANALYSIS. BEEBCALC £17.35

INVOICES & STATEMENTS

Has customer file to produce Invoices & monthly statements. Calculations include automatic VAT. Saves hours of tedious work. £17.35

COMMERCIAL ACCOUNTS

The features include: Daily Journal, Credit Sales, Cash Sales, Credit Purchases, others, Sales Ledger, Purchase Ledger Bank Account. Year to date summary. A fully interactive program suitable for all businesses. Files can be saved and loaded. Useful for Cash flow control with an immediate accessibility to Debtors & Creditors totals. Bank totally supported incl. running balance £17.35

MAILING LIST

A dedicated database to allow manipulation of Names, Addresses and other information. The unique 'searchkey' system gives further 10 user definable parameters for own selections. Facility to find name or detail when only part of the detail is known. Prints labels in variety of user specified formats. £17.35

DATABASE

The program that everybody needs. Facility includes: Sort Search, List print if req., ideal for Card Index application. You can write your own Database to suit your req. with limitless number of entries on separate cassettes. £17.35

STOCK CONTROL

Takes tedious out of stock control and saves time and money. Routines include stock setup, user reference numbers, minimum stock level, financial summary, line print records, quick stock summary, add/delete stock, etc. £17.35

HOME ACCOUNTS

Runs a complete home finance package for you with every facility necessary for keeping track of all expenses like, H.P., Bank, Mortgage, etc. £17.35

WORD PROCESSOR

This program features routines found in much larger and expensive programs. Very easy to use. Allows 1000 words (approx) in memory. Ideal for writing letters. Features incl., block delete, block insert, search and replace, edit text, display text etc. £17.35

SPACE GAMES

- ALIEN DESTROYERS (32K)** £7.95
Sensational, high speed 'Invaders' program with an abundance of features. This program has many unique extras e.g.: 'Battle Analysis' showing the number of each alien type shot down.
- ASTRO NAVIGATOR (32K)** £6.95
Navigate your way through a variety of treacherous caverns, inhabited by killer rockmites. There are 5 skill levels and the top 5 scores are ranked at the end. Excellent colour graphics and sound.
- ASTEROID BELT (16K/32K)** £7.80
A great new space game practically identical to the arcade original. An inspired piece of machine code programming producing one of the most exciting games around.
- CROAKER (32K)** £6.95
People - Huh! Pity us poor Frogs! Trying to hop the logs over the rivers was difficult but now the motorways. Then come the Crocodiles and diving turtles. Survival becomes just impossible. Arcade type, machine code, excellent sound and graphics.
- HITCH-HIKER (32K)** £5.95
A great adventure game. Tests your skill and wits whilst trying to collect 5 objects scattered round the universe. Directions can be found in the clues.
- GALACTIC COMMANDER (32K)** £7.95
Nine phase aptitude test for aspiring space vehicle commanders. The program presents a real challenge and the use of machine code and hi-res graphics makes for beautifully smooth action. Great sound effects.
- LASER COMMAND (32K)** £6.95
Classic Defence of 6 Cities against attack from Alien plus random bombing raids from alien spacecraft. Super fast machine code arcade game with superb sound and graphics.
- MARTIANS** £6.95
Very popular. Defend your plant against the descending Martians with your Force-Field but beware of the Destroyers who can annihilate you.
- SPACEMAZE (32K)** £6.95
You have crash landed in the legendary labyrinth of Titan, inhabited by monsters known as 'FROOGS'. Find your way through to the 'TRANSMAT' before being cornered and eaten. The game has 8 levels of skill and 3D colour graphics.
- SWOOP (32K)** £6.95
The new Galaxians it's here at last! Galaxian style machine code arcade game. 30 screaming, homing, bomb-dropping, explosive egg-laying Birdmen, swooping down in ones and two's to destroy your laser bases. The explosive eggs feature makes a normally difficult game into a challenge 'par excellence'.
- TIMETREK (32K)** £7.50
The ultimate 'real-time' Startrek, where indecision in the battle zone is your major enemy. 20 skill levels. Special features: Panic Button for once only space leap, New Klingon fleet after 30 Stardates and Torpedo sight control.

OTHER GAMES

- ADVENTURE (16K/32K)** £7.50
All the excitement, intrigue and frustration of a mainframe adventure. Explore the tortuous forests, dark caverns and castle dungeons. Great skill and imagination are required to play this game.
- ZOMBIES ISLAND (32K)** £7.95
Fight for survival on an island inhabited by hungry, dangerous cannibals. An excellent Basic and Machine Code program.
- CHARACTERS (16K/32K)** £5.80
Makes redefining of Invaders, Foreign Characters, Technical symbols, etc., character shapes simpler. Clumsy binary and hexadecimal notations are not req. anymore.
- CHESS (32K)** £9.95
An excellent machine code program with superb Mode 1, colour graphics, 6 levels, play black or white, illegal moves rejected, 'en passant' casting, take back of moves and display of player's cumulative move-time.
- COWBOY SHOOTOUT (32K)** £6.50
Full feature, 2 player, cowboy shooting game. Hide behind the cactus plants and moving chuck wagons until they are shot away. Shoot your opponent and avoid getting hit yourself.

ELDORADO GOLD (32K) £6.50
Legend has it that old Bill McCusky, who met a sudden death, had built up a vast treasure somewhere in the nearby territory. Can you end up rich where many have failed?

FOOTER (32K) £6.95
Another high resolution graphics game from the author of our Galactic Commander. A 2 player game in which each player has to use his football skills to try to out run, out dribble and finally score against his opponent. A serious contender to 'Match of the Day'.

LOGO II £9.95
This language is now 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 intro to LOGO language for your and old alike.

MUNCHYMAN (16K/32K) £6.95
Colourful and highly entertaining version of the popular arcade game! Munch your way to high score before the Munchers devour you.

REVERSI (16/32K) £7.80
A sophisticated multi-option game. Play against the computer or another player or even watch the computer play itself. 5 skill levels allows any player to enjoy the game without continually winning (or losing).

ROULETTE (16/32K) £5.95
All the fun of the Casino in your own home. This is a beautifully presented game for up to 6 players. The odds are calculated according to the official rules.

SNAKE (32K) £7.80
An arcade type game. Gives hours of fun. One of the best games available for this machine. Try it for yourself.

NEW ... NEW ... NEW

3 New Adventure games. May be the best yet written. We strongly recommend them. All have over 200 individual locations and packed with puzzles. A game can take easily months to finish. Only sophisticated compression techniques can squeeze so much in.

ADVENTURE QUEST (32K) £8.60
COLOSSAL ADVENTURE (32K) £8.60
DUNGEON ADVENTURE (32K) £8.60

13 ROM SOCKET BOARD

— 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 ROM's may be resident at once).

The circuit has been designed to allow the use of RAM in this area too.

Introductory price for the first 250 orders from BBC Micro User readers
ONLY £19.95 + VAT

APPLICATIONS

- 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 (16/32K)** £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.



WORDWISE Model B
Without doubt the most sophisticated piece of software yet written for the BBC Micro. Wordwise contains all the usual word processing features enabling characters, words, sentences or any defined section of the text to be deleted, moved or copied from one part to any other part of the document. 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 fitting instructions and a spiral bound manual. We believe this word processor compares favourably with those costing many times as much.

Special Offer - ONLY £35.00

EDUCATION

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.

PROGRAMMING MADE EASY ONLY £8
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 Terminology' 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

- 30 Programs - BBC Micro £4.95
30 Hour BASIC (BBC Micro) £6.00
6502 Application Book £10.25
6502 Assembly Lang. Programming £12.50
6502 Assembly Lang. Subroutines £11.80
6502 Software Design £10.50
ACORN ATOM Magic Book £5.50
Advanced 6502 Interfacing £10.95
ALP for the BBC Micro £8.95
BASIC Programming on BBC Micro £6.90
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 & Charts on BBC Micro £7.50
Intro to Micro Beginners Book (3 Ed) £9.90
Let your BBC teach you to program £6.45
Micros in the Classroom £4.90
Practical Prog. for BBC & ATOM £5.95
Programming the 6502 £11.20
Mastering VISICALC (Sybex) £11.95
Structured Prog. with BBC BASIC £9.50
The BBC Micro An expert Guide £7.90

WATFORD ELECTRONICS
CARDIFF ROAD, WATFORD.
Tel: (0923) 40588. Telex: 8956095

The second article
in this series looks
at Mode 7 animation

TELETEXT MODE 7

By PAUL LEMAN and
STEVE SWALLOW

IN keeping with the general ease of access to useful facilities on the BBC Micro, Acorn have made it easy to generate useful teletext control codes by the use of the red function keys at the top of the keyboard. This facility is really only available with OS 1.0 onwards, but those with OS 0.1 can easily define these keys to give single Ascii codes.

The *FX calls in OS 1.0 are detailed on pages 439-440 of the User Guide. There is a small typographic error here, as the second call gives A=&E4 (228). It should be A=&E2 (226).

These *FXs allow you to define the function keys alone as well as SHIFT+function key, CTRL+function key and SHIFT+CTRL+function key. With OS 0.1, however, only the function key alone can be redefined easily. This is briefly mentioned in the User Guide, and also appeared in the first issue of BBC Micro User (see pages 67-68). It takes the form:

*KEY 0 "!!A"

The f0 key will now return the Ascii value 129, the value being made up of two parts. The !! gives 128 and CTRL A gives 1. Having defined this, it is not immediately obvious what use it is. Ascii 129, however, is the red alphanumeric code for use in teletext mode. If we set the keys up as follows then a single key press will give us the colour graphic codes on keys f0 to f6.

```
10 DIM KX 64
20 XZ=KX:YZ=KX DIV 256
30 FOR IX=0 TO 6
40 $KX="KEY "+STR$(IX)+"!!"+CHR$(IX+81)
50 CALL &FFF7
60 NEXT
70 REM Now test the keys.
80 REM Space bar ends.
90 REPEAT
100 AZ=INKEY(0)
110 IF AZ<>-1 THEN PRINT AZ
120 UNTIL AZ=32
```

Program 1

In MODE 7 the characters are hardware generated and so this mode has very fast although obviously limited animation capabilities.

The first example is a simple anima-

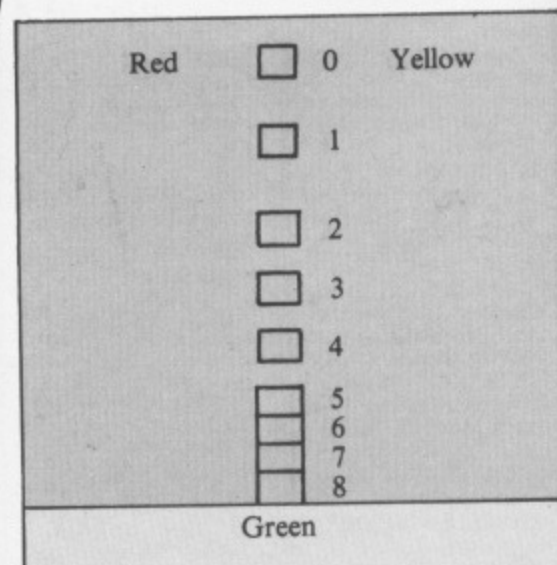
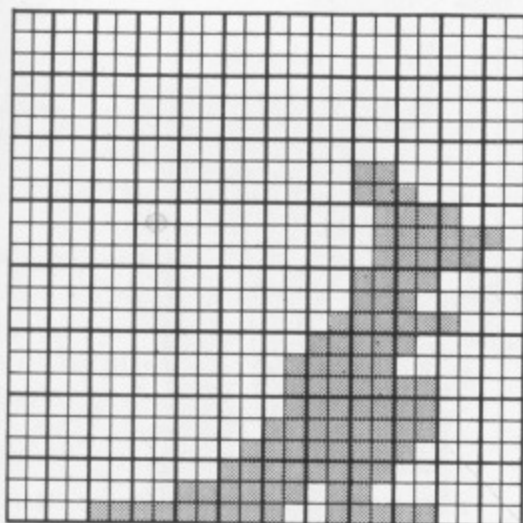
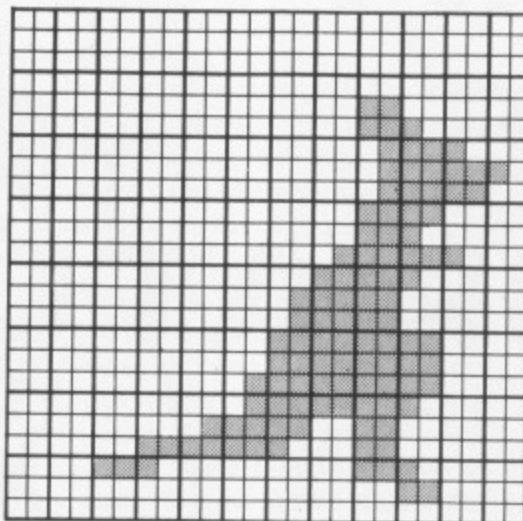


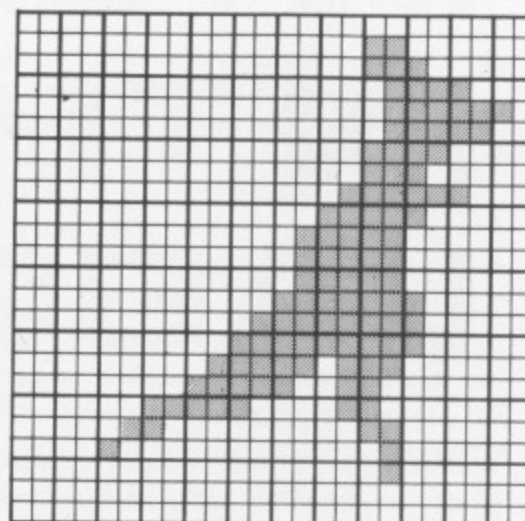
Figure 1



Frame I



Frame II



Frame III

tion displaying a bouncing ball. To do this we display the ball at the positions shown in Figure I. The positions can be held in a look-up table stored in an integer array, and animation achieved by displaying all but one ball in the background colour while cycling through the array. See Program II.

This animation could in fact be done by simply printing and deleting the ball character at the required positions, but more complex repetitive animation effects can be achieved by this very simple method.

The next example is in fact easier to write in one of the normal graphics modes using a redefined character set, but is included here to show another method of animation.

Three frames are constructed using graphics characters to represent a jumping kangaroo. The most difficult part is actually constructing each frame, and I used a small program that converts redefined characters to teletext graphics characters in order to make this easier.

The trick, if there is one, of this type of animation is to let each new frame overwrite the preceding frame. The three frames are shown above on grids. The spaces to the left of the figures are there to delete parts of the preceding picture.

Program III forms the individual pictures from a set of data statements and then displays the animation. The program prompts for a delay time in centiseconds between frames, and finally asks if a repeat is required.

```

10 MODE 7:VDU23;8202;0;0;0;
20 DIM AZ(8)
30 REM
40 REM Read in look-up table.
50 REM Then read in delay(centisecs)
60 REM
70 FOR IZ=0 TO 8: READ AZ(IZ):NEXT
80 INPUT"DELAY(centisecs) ",WT:CLS
90 REM
100 REM Top 19 lines to yellow
110 REM background, yellow foreground
120 REM
130 FOR IZ=0 TO 19
140 PRINTTAB(0,IZ)CHR$147CHR$157CHR$1
47
150 NEXT
160 REM
170 REM Bottom 3 lines green
180 REM
190 FOR IZ=20 TO 2
200 PRINTTAB(0,IZ)CHR$130CHR$157
210 NEXT
220 REM
230 REM Print 'ball', char 255 on
240 REM lines 0 to 19
250 REM
260 FOR IZ=0 TO 19
270 PRINTTAB(20,IZ)CHR$255
280 NEXT
290 REM
300 REM Now animate by moving back &
310 REM forth through look-up table,
320 REM changing graphic foreground
330 REM colour from yellow to red at
340 REM appropriate lines.
350 REM
360 PRINTTAB(2,AZ(0))CHR$145:LZ=AZ(0)
370 REPEAT
380 FOR IZ=0 TO 8
390 PROCdelay
400 PRINTTAB(2,LZ)CHR$147
410 LZ=AZ(IZ)
420 PRINTTAB(2,LZ)CHR$(145)
430 NEXT
440 FOR IZ= 8 TO 1 STEP -1
450 PROCdelay
460 PRINTTAB(2,LZ)CHR$147
470 LZ=AZ(IZ)
480 PRINTTAB(2,LZ)CHR$145
490 NEXT
500 REM
510 REM Repeat forever...
520 REM
530 UNTIL FALSE
540 DATA 1,2,3,4,6,8,10,14,19
550 DEFPROCdelay
560 now=TIME
570 REPEAT
580 UNTIL TIME- now>WT
590 ENDPROC

```

Program II

Turn to Page 84

INTERFACING IN THE LABORATORY

WE saw last month how it was possible to use the BBC Micro to measure temperature and light intensities using two relatively simple circuits that you could build for yourself. In this article I will describe how you can use apparatus that you may have already in your laboratory.

The basic idea is to use the 1 volt chart recorder output that is present on most modern equipment such as pH meters, colorimeters and conductivity meters. On equipment which does not possess this type of output the procedure is a little more difficult and requires extra gadgetry, as I will describe in next month's article.

As you will remember, the BBC Micro has four channels available for A/D conversion, each of which can accept a DC voltage of up to 1.8 volts.

By using the ADVAL command in Basic these voltages are converted into numbers between 0 and 65520 in steps of 16.

By
MIKE SHAW

When an instrument such as a pH meter is used it produces a voltage change at the chart recorder output which is proportional to the meter reading.

Although the maximum output is only about 1 volt, it still will produce a range of numbers between about 0-4000 when connected to the A/D con-

verter. This range is sufficient to incorporate into various programs.

The positive terminal (red) of the chart recorder output should be connected to one of the channel pins, that is, 4, 7, 12 or 15 and the negative terminal (black) to one of the analogue ground pins, 5 or 8 using the screened cable and 15 way D plug.

```
10 REM *pH CURVE*
20 REM *M. SHAW*
30 MODE7
40 PRINT:PRINT
50 PRINTCHR$(141);CHR$131;CHR$157;CHR
$132;SPC(8);"pH CURVE"
60 PRINTCHR$(141);CHR$131;CHR$157;CHR
$132;SPC(8);"pH CURVE"
70 PRINT TAB(1)CHR$131;CHR$157;CHR$13
2;STRING$(34,"@")
80 PRINT:PRINT"This program will prod
uce a pH curve as"
90 PRINT"an acid /alkali titration is
carried out"
100 PRINTTAB(5,20);CHR$131;"PRESS SPAC
E-BAR"
110 IF GET=32 THEN 120 ELSE 110
120 VDU7: DIM RDINGS(100),pH(100),VOLUME(100)
130 REM**ALLOWS UP TO 100 READINGS**
140 CLS:PRINT:PRINT:PRINT"PLACE ELECTR
ODE IN FLASK AND SET pH":PRINT"METER FOR
BUFFER"
```

```
150 PRINT:PRINT:PRINT"PRESS SPACE-BAR
WHEN SET"
160 IF GET=32 THEN 170 ELSE 160
170 VDU7:RDING1=ADVAL(2)
180 PRINT:PRINT:PRINT"WHAT IS THE pH O
F THE BUFFER?"
190 INPUT pH1:VDU7:IF pH1<5THEN SCALE
=200 ELSE SCALE =500
200 PRINT:PRINT:PRINT"HOW MUCH ACID AT
A TIME (IN CM3)?"
210 INPUT ALIQUOT :VDU7
220 PRINT:PRINT:PRINT"HOW MUCH ACID IN
TOTAL (IN CM3)?"
230 INPUT TALACID :VDU7
240 NUMBER=(TALACID)/ALIQUOT
250 IF NUMBER<>TALACID/ALIQUOT THEN NU
MBER=NUMBER+1
260 CLS:PRINT:PRINT:PRINT"PLACE ELECTR
ODE IN ALKALI "
270 PRINT:PRINT"PRESS SPACE-BAR WHEN R
EADY"
280 IF GET =32 THEN 290 ELSE 280
```

```
290 VDU7: RDINGS(0)=ADVAL(2)
300 MODE1:PROCDISPLAY:PROCCHART
310 END
320 DEF PROCDISPLAY
330 VDU 28,0,31,39,28 :BCOL 0,2
340 MOVE 1280,150:DRAW 0,150:DRAW 0,
00
350 V=0
360 FORAX= 0 TO 1200/NUMBER
370 MOVE V,150
380 DRAW V,165
390 V=V+1200/NUMBER
400 NEXTAX
410 MOVE 0,RDINGS(0)/RDING1*SCALE
420 VOLUME(1)=0 :AMOUNT=0
425 V=1200/NUMBER
430 FORX=1 TO NUMBER
440 CLS
450 PRINT"ADD ACID FROM BURETTE IN "
LIQUOT;" cm3 LOTS"
460 PRINT"PRESS SPACE-BAR AFTER EACH
OT"
```

Program 1

In Program I the computer is used to take in readings from a pH meter. The chart recorder outputs from the pH meter should be attached to pins 7 (CH1) and either 5 or 8 (analogue ground) as the program uses ADVAL(2) to accept data.

The initial value of ADVAL(2) is placed into the variable RDING1 (line 170) when the pH meter is calibrated using a buffer solution. The pH of the buffer solution is passed to the variable pH1 (line 190). As the pH meter is used during a titration a graph is plotted to produce a pH curve and then values of pH can be observed in tabular form.

The data being accessed by the ADVAL(2) command is passed into the array RDINGS(X) and the pH values are calculated using the equation (line 640)

$$pH(X) = \frac{RDINGS(X)}{RDING1} * pH1$$

Program II shows how the computer can be used to study the reaction between hydrochloric acid and sodium thiosulphate solution as it takes place within the cell of a colorimeter.

In this reaction a precipitate of sulphur is produced which causes the solution to become cloudy. The increase in cloudiness causes a corresponding drop in the light transmitted through the cell hence a drop in the voltage produced at the chart recorder output of the colorimeter.

The actual end point of the reaction is difficult to detect with the naked eye, but by taking an arbitrary value of transmitted light — for example 80 per

cent transmission — as an end point, it is possible to produce a timing.

The program uses not only the ADVAL function to detect the end point but also the TIME facility to produce a relatively accurate timing of the reaction.

As the program uses ADVAL (2), the colorimeter should be connected to pins 7 (+ve) and 5 or 8 (-ve). The timer is started after the chemicals have been mixed and the space bar pressed.

The test tube containing the reagents is then placed in the colorimeter and the meter adjusted to give 100 per cent transmission. When the transmitted light intensity falls to 80 per cent it is detected using the ADVAL(2) command and the timer is stopped.

The experiment can then be repeated, but using more dilute solutions of sodium thiosulphate. The computer then produces a table showing the concentration of thiosulphate and the time taken for the reaction.

The option is then given to plot two graphs, one of concentration of thiosulphate against time and the other of concentration against the reciprocal of the time taken for the reactions.

Line graphs are not produced, but the individual points are shown corresponding to each reaction so that anomalies, or points of interest, can be clearly spotted and discussed.

By changing the program it should be possible to use the same system with more advanced students so that concepts such as rate of reaction and order can be investigated.

Other sources of inputs which can be monitored using the computer are provided by modules of the Philip Harris Data memory system and of the environmental comparator kits produced by companies such as WPA and Unilab.

These modules provide access to the measurement of, among other things, light, temperature, pH, sound level, oxygen level and conductivity.

As with the pH meter and colorimeter, the chart recorder output is used to pass data to the computer from the sensing device. One of the most interesting devices that can be used is the electronic arm produced by Philip Harris as part of the data memory system.

This device converts rotational movement and hence vertical movement into an electrical voltage output proportional to that movement. It can be used for physics investigations such as the stretching of a spring for physiological experiments in conjunction with items such as a spirometer.

Program III is a short one which shows how the electronic arm can be

used to investigate the stretching of a spring. The computer uses the data from the arm to produce a graphical representation of the oscillations of the spring.

As relatively quick readings are required *FX16,1 is used so that only channel one (CH0) is operating.

The output from the arm should be connected to pins 15 and either 5 or 8. MODE 0 is used to allow high resolution graphics to be implemented.

It is worthwhile remembering that there are four separate channels for A/D conversion and so it is possible to monitor a number of variables as required in some biology experiments, for example investigating the conditions required for plant growth.

Here the electronic arm would be used to measure the growth of a plant and light, and temperature probes outlined in last month's article could be used to monitor conditions.

There are lots of other uses of these devices. If you have any ideas but are not sure what to try, drop me a line.

```

1 *FX15,1
2 ON ERROR GOTO 214
10 DIM thio(10),water(10),finish(10)
20 MODE7
30 @X=&0002020A
40 PROCTITLE
50 water=0
60 volume=10
70 CLS
80 PRINT TAB(0,3);CHR$131;CHR$157;CHR$132;"HOW MANY SERIES OF REACTIONS?"
90 INPUTseries
100 FORS= 1 TO series
110 thio(S)=volume
120 water(S)=water
130 PROCINSTRUCT
140 volume=volume-2
150 water=water+2
160 IF volume<0 THEN volume=0
170 IF water>10 THEN water=10
180 NEXTS
190 PROCRESULTS
200 MODE1
210 PROCOPTION
214 IF ERR=17 THEN 215 ELSE REPORT
215 CLS:VDU 19,2,7,0,0,0
220 END
230 DEF PROCINSTRUCT
240 CLS
250 PRINT:PRINT:PRINT
260 PRINT"Carefully measure out 1ml. of 4M Hydro -";

```

Program II

Turn to Page 87

BBC MICRO OFFERS FROM OPUS

TEAC DISC DRIVES

TEAC 55F 5¼" D/S 80 Track
Formatted Single Density 400K. ONLY £229.00
CASE to hold 2 drives with power supply ONLY £29.95

- Ideal for use with BBC Micro
- Low power consumption
- Slimline – latest technology ● Full warranty.
- Cables available to connect Drives to BBC – Ring for details.

CANON DISC DRIVES

MDD 6106
5¼" S/S 40 Track formatted single density 100k ONLY
Case to hold one Drive £9.95 £129.00

- Ideal for use with BBC Micro
- Full warranty ● Slim design
- Cables available to connect Drive to BBC – Ring for details.

A DAISY WHEEL PRINTER ONLY £499

TEC STARWRITER FP 1500-25
25 CPS – Friction Feed – Serial Interface
Interface Lead to connect to your BBC £9.00

GAMES

We are authorised dealers for A&F Software and can offer the following top quality cassettes for the BBC Model B.

● LUNAR LANDING	£6.00	● PHARAOH'S TOMB	£6.95
● PLANES	£6.95	● NEW PAINTER	£6.95
● FROGGER	£6.95	● TOWER OF ALTOS	£6.00

FLOPPY DISCS

Mini Discs in FREE Plastic Library Case

	ATHANA	NASHUA
S/S 40 Track	£19.95	£16.95
D/S 40 Track	£24.94	£22.95
S/S 80 Track	£26.95	£25.95
D/S 80 Track	£29.95	£26.95

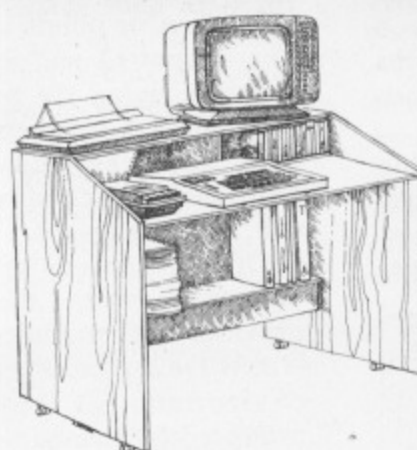
Prices per 10 discs.

22 INCH RGB COLOUR MONITOR ONLY £99.95

We have available a limited quantity of VMC 22 Colour Monitors with free isolating transformers. The Monitor has a 22" Mullard 110°C CRT and for shipping purposes the CRT and scan coil assembly are separate from the chassis. The lugs of the CRT allow it to be mounted in a standard 22" colour TV cabinet or a unit of your own design. The unit is assembled by plugging the wires from the chassis to the tube and soldering the power connector, input connector and isolating transformers. A comprehensive instruction sheet and circuit diagrams are included.

RGB Lead to connect the monitor to your BBC – ONLY £4.50

THE "ORGANIZER" DESK



ONLY
£49.50

- Teak finish
- On castors
- Self assembly
- Full instructions provided
- Top shelf for monitor/printer
- Large desk top area

- Lower shelf for paper/book storage – ample room in front of the shelf for you to sit comfortably.

THE MAGIC BOARD

A Memory Board for your BBC!

Gives up to 64K of Eprom storage/16K of additional RAM. Takes the following:

2716/2732/2764/6116/5516.

Plugs into an Eprom socket and fits inside your BBC!
Easy to use – supplied with full software instructions.
ONLY £29.95

How to order:- Add carriage at the following rates –
Discs 85p, Games & Magic Board, Free. Monitor
£10.00. Other goods £7.00. Add VAT at 15% to the
total.

Govt, Educational & Official orders welcome.

And send your order to:-
OPUS SUPPLIES

10 Beckenham Grove,
Shortlands, Kent BR2 0JO.
Tel: 01-464 5040 or 01-464 1598



Character

By JIM NOTMAN

MODE 7 uses only 1k of memory to store screen information. To display a character on a screen the machine looks at each memory location in turn and passes its value to a character generator (5050 teletext chip) which translates this into the pattern required on the screen.

All the other modes are different. Instead of being a value which represents the whole character, each byte represents only a small part of a character. It is for this reason that the BBC gobbles up memory at an alarming rate.

This system, however, allows us to define our own characters using the VDU23 command. The operating system already reserves a section of memory from &C00 to &CFF so that character numbers 224 to 255 may be defined. Each VDU 23 command is

followed by the character number and *EIGHT* bytes of data.

For instance, if we want to define the Greek character alpha first draw the character you want on a 8 x 8 grid (see Figure 1). On the grid, marked along the top, is a bit value if that bit was switched on. The first byte corresponds to the first row, in this case 0. On the second row the bits with values 32, 16 and 1 are to be "switched on". These values added together make 49, the byte value for the second byte.

This must be done for each of the bytes in turn, so that to assign the alpha character to character number 240 we would use the statement VDU 23, 240, 0, 49, 74, 132, 132, 74, 49, 0.

That's how we can define a character, but what happens when the

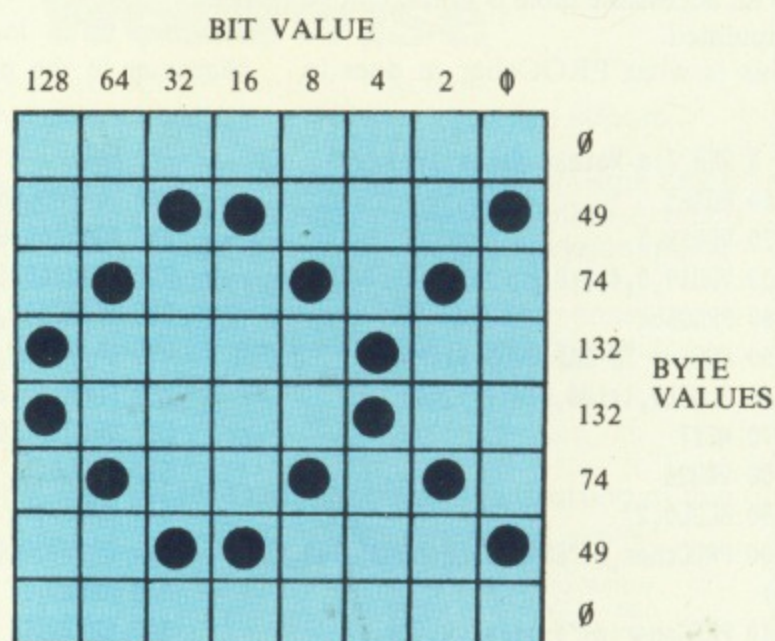
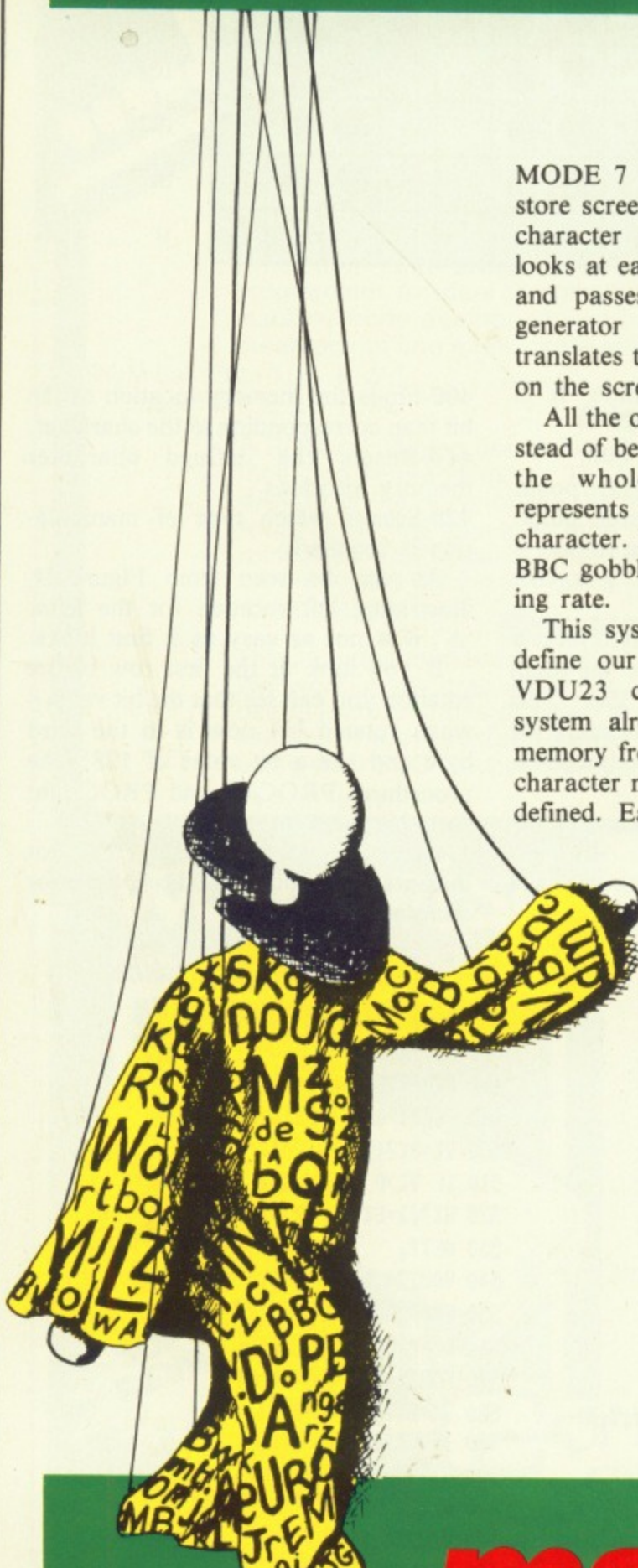


Figure 1

manipulation

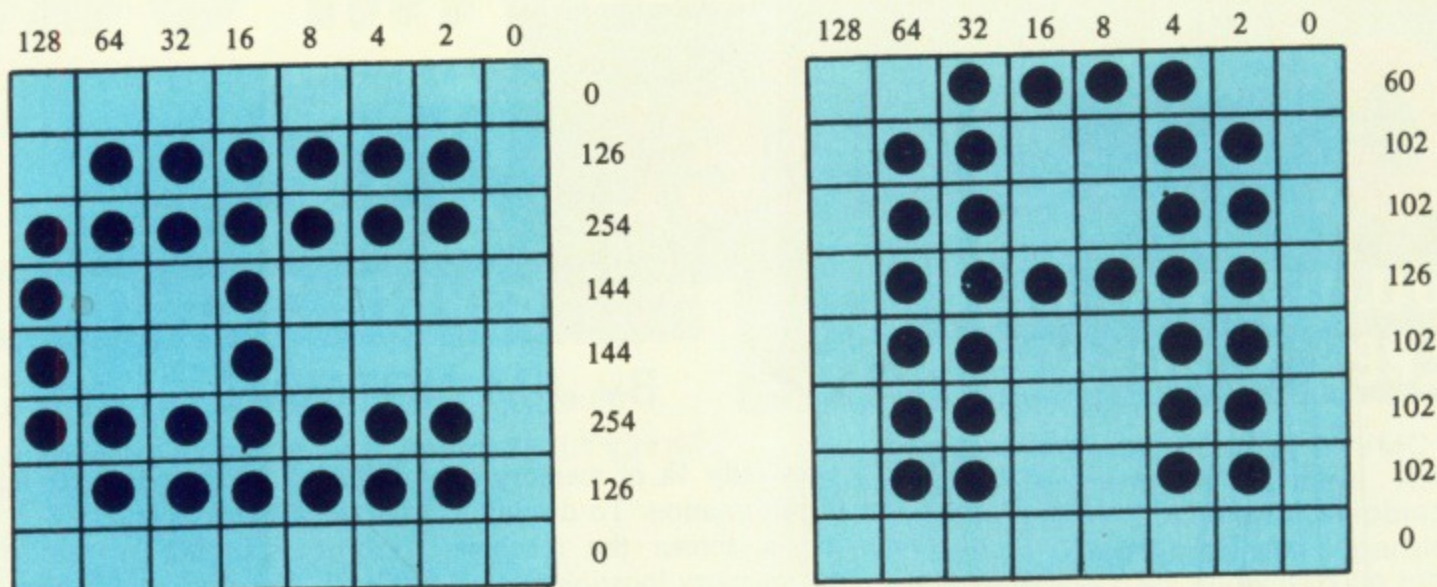


Figure II

From Page 23

machine wants to print out standard text characters? If there is no character generator for Modes 0 to 6, how does the micro know what to print out?

The answer is that there is a bit map at the start of the operating system ROM from addresses &C000 to &C2FF. Each of the Ascii character from &20 (space) to &7F in groups of eight bytes. This means that when the BBC Micro wants to print out a character it will look up the bit map for that character before transferring it to the screen. The advantage of having such an accessible table is that it can be manipulated.

This is what PROCchar_m does in

the accompanying programme. It is called with four parameters:

- The string to be printed out.
- The x-co-ordinate of its start point.
- The Y-co-ordinate of its start point.
- A number which selects a routine – 1 Rotate left; 2 rotate right; 3 reverse video.

The first part of the program plots a sine wave graph to annotate the main routine starting at line 350. This routine in turn will call a procedure for each type of character manipulation.

Line:

360-Defined character memory location.

380-Sets up a loop to look at each character in the print out string.

400-Finds the memory location of the bit map corresponding to the character.

410-Resets the defined character memory locations.

420-Selects which type of manipulation is required.

As can be seen from Figure II, illustrating left rotation for the letter 'A', it is not as easy as it first looks.

If you look at the first row before rotation you can see that the bit value 4 when rotated left now is in the third byte and has a bit value of 128! The procedures PROCleft and PROCright sort this problem out.

As it is all in Basic, it's not instantaneous, but quite acceptable for annotating graphs.

```

5 REM Jim Notman March 1983
10 MODE5
20 VDU12,5
30 VDU19,0,4;0;0;
40 PROCbox
50 FORI=0 TO RAD(540) STEP .02
60 PLOT69,I=100,SIN(I)*200
70 NEXT
80 VDU26
90 GCOL0,2
100 PROCchar_m("CHARACTER DEMO",180,96
0,3)
110 PROCchar_m("Y-axis",0,450,1)
120 PROCchar_m("-1",100,300,1)
130 PROCchar_m("0",100,512,1)
140 PROCchar_m("1",100,724,1)
150 PROCchar_m("X=SINE(X)",1200,640,2)
160 MOVE160,100:PRINT"0"
170 MOVE400,100:PRINT"180"
180 MOVE700,100:PRINT"360"
190 MOVE1000,100:PRINT"540"
200 MOVE150,32:PRINT"X-axis (degrees)"
210 VDU4

```

```

220 END
230 DEFPROCbox
240 MOVE160,896
250 DRAW160,128
260 DRAW1120,128
270 DRAW1120,896
280 DRAW160,896
290 VDU29,170;512;
300 GCOL0,1
310 MOVE0,0
320 DRAW950,0
330 MOVE0,0
340 ENDPROC
350 DEFPROCchar_m(A$,X,Y,M)
360 SZ=&C00
370 MOVE X,Y
380 FORJZ=1 TO LEN(A$)
390 C$=MID$(A$,JZ,1)
400 BZ=&C000+(ASC(C$)-32)*8
410 VZ=0:VDU23,224,0;0;0;0;
420 ON M GOTO430,440,450
430 PROCleft(C$):GOTO460
440 PROCright(C$):GOTO460

```

```

450 PROCreverse(C$):GOTO460
460 NEXT
470 ENDPROC
480 DEFPROCleft(C$)
490 FORJZ=0 TO 7:FORJY=0 TO 7
500 VZ=BZ?JZ AND 2^JZ
510 IF VZ>0 THEN VZ=1
520 SZ?JZ=SZ?JZ OR VZ*2^(7-JZ)
530 NEXT,
540 VDU224,11,8
550 ENDPROC
560 DEFPROCright(C$)
570 FORJZ=0 TO 7:FORJY=0 TO 7
580 VZ=BZ?JZ AND 2^JZ
590 IF VZ>0 THEN VZ=1
600 SZ?(7-JZ)=SZ?(7-JZ) OR VZ*2^JZ
610 NEXT,
620 VDU224,10,8
630 ENDPROC
640 DEFPROCreverse(C$)
650 FORJZ=0 TO 7:SZ?JZ=BZ?JZ EOR &FF:NEXT
660 VDU224
670 ENDPROC

```


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.

Computer Concepts

Dept BMU4

16, Wayside, Chipperfield,

Herts, WD4 9JJ. tel(09277) 69727



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



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 **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.

NEW **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.

NEW **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 inc. require 32K RAM

Each adventure comes attractively packaged for just £10.29 inc.

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



SEND CHEQUE OR P.O. TO:

**DIGITAL
FANTASIA**

24 NORBRECK ROAD, NORBRECK, BLACKPOOL, LANCASHIRE.
Tel: (0253) 591402



UPON REFLECTION

things
couldn't
be better



LOW-COST COLOUR MONITORS

Advanced design and manufacturing techniques put the new colour monitor from DIGIVISION at the top of its class. Produced specifically to compliment the latest generation of micros. In the office, in the home, in the design studio, at college, wherever a micro is at work this new monitor will work happily with it. A 14" screen

gives exceptional display clarity and high-quality colour resolution presented in a two-tone case at optimum cost. At a price of £300 it must be THE monitor for anybody requiring high quality colour communication in its simplest, most effective form.

DIGIVISION with your micro will prove to be a more exciting and rewarding investment.

Cash with order (cheques will not be presented until despatch of goods) or send for further details.

Dealer enquiries welcome

Digivision

**DIGIVISION LTD · PARKER DRIVE ·
LEICESTER LE4 0JP · TEL: 351224 · TELEX 341382**

SCREENS

LAST month we saw how to draw coloured lines on the graphics screen and use them to outline various shapes. Now we shall see how to fill those shapes with colour so as to really bring the screen to life.

Firstly, let's recap. We learned these new commands:

GCOL0, which sets the graphics colours.

MOVE, which moves the (imaginary) graphics cursor to the point specified.

DRAW which draws a line, in the current foreground colour, from the last point visited by the graphics cursor to the point specified.

Program I illustrates the use of these commands to draw a red triangle similar to that of Figure I.

We can cause the triangle to be filled in with colour by using a new statement, **PLOT 85**. Before we go into it in detail, I suggest that you run Program II to get a feel of what happens – it draws the same triangle as Program I, this time completely filled with red, the graphics foreground colour.

When you think about it, you can specify a triangle on the screen by giving the co-ordinates of its three corners. Now **PLOT 85** is the BBC Micro's triangle-filling command. When the machine receives this command it needs to know those three sets of co-ordinates.

You always follow **PLOT 85** with the co-ordinates of one of the points.

For example, in Program II, line 70 uses **PLOT 85,640,1020**, since the co-ordinates of the top of the triangle are (640,1020). But how does the BBC Micro know where to get the other two points to complete the triangle?

Well, it takes it for granted that the other two points are the last two points the graphics cursor has visited before it meets the **PLOT 85** statement.

So when you are programming you have to keep track of the last two posi-

```
10 REM *** PROGRAM ONE ***
20 MODE 5
30 GCOL0,1
40 GCOL0,130:CLG
50 MOVE 10,10
60 DRAW 1270,10
70 DRAW 640,1020
80 DRAW 10,10
```

Program I

```
10 REM *** PROGRAM TWO ***
20 MODE 5
30 GCOL0,1
40 GCOL0,130:CLG
50 MOVE 10,10
60 MOVE 1270,10
70 PLOT 85,640,1020
```

Program II

tions the graphics cursor has visited – remembering that both **MOVE** and **DRAW** affect this.

If the last two points are unsuitable for the triangle you want to draw you have to fix this by using **MOVE** to visit the appropriate points.

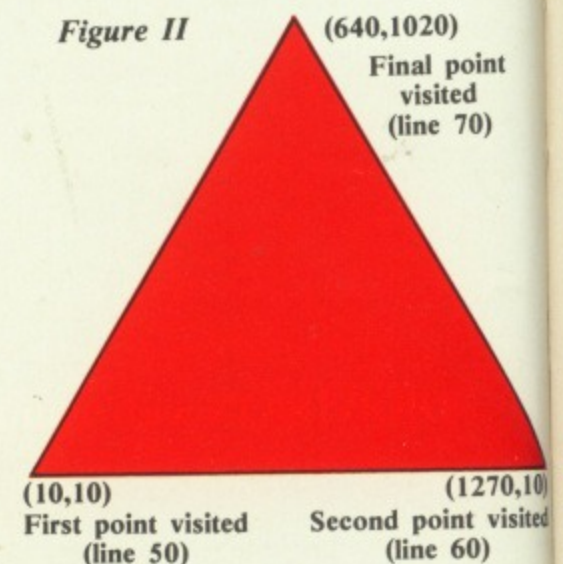
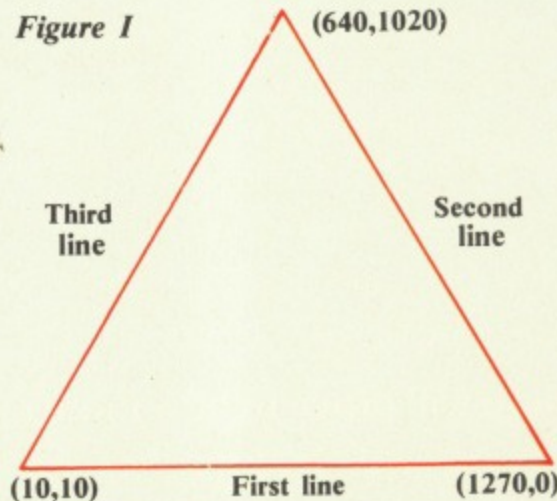
In Program II lines 50 and 60 use **MOVE** to visit the first two points of the triangle. Line 70 then uses **PLOT 85** to specify the last point and fill in the triangle defined with the current foreground colour. Figure II should make this clear.

This ability to fill triangles is the key to the whole business of graphics.

All the other shapes you see in BBC Micro programs are constructed from triangles – even the circles!

It is worth spending some time now playing with variations of Program II. It's easy to read and understand what we've been doing so far – but it is another thing to put the ideas to use.

So please, before you continue, have a go at writing programs, based on Program II, to draw your own triangles




```

10 REM *** PROGRAM THREE ***
20 MODE 5
30 VDU 19,3,4,0,0,0
40 VDU 19,0,7,0,0,0
50 GCOL 0,128 : CLG
60 REPEAT
70 firstx=RND(1200)
80 firsty=RND(1000)
90 secondx=RND(1200)
100 secondy=RND(1000)
110 thirdx=RND(1200)
120 thirdy=RND(1000)
130 colour=RND(3)
140 GCOL 0,colour
150 MOVE firstx,firsty
160 MOVE secondx,secondy
170 PLOT 85,thirdx,thirdy
180 FOR I=1 TO 1000:NEXT I
190 UNTIL FALSE

```

Program III

on the screen. Try changing their size and colour.

Then write a program to put two on the screen at once. Can you make them different colours? What happens if they overlap? And what happens if you change MOVE in lines 50 and 60 to DRAW? (Putting in a line 75 to change the graphics colour might help here.)

Program III uses the ideas of Program II to generate a random sequence of triangles.

Line 20 sets the mode.

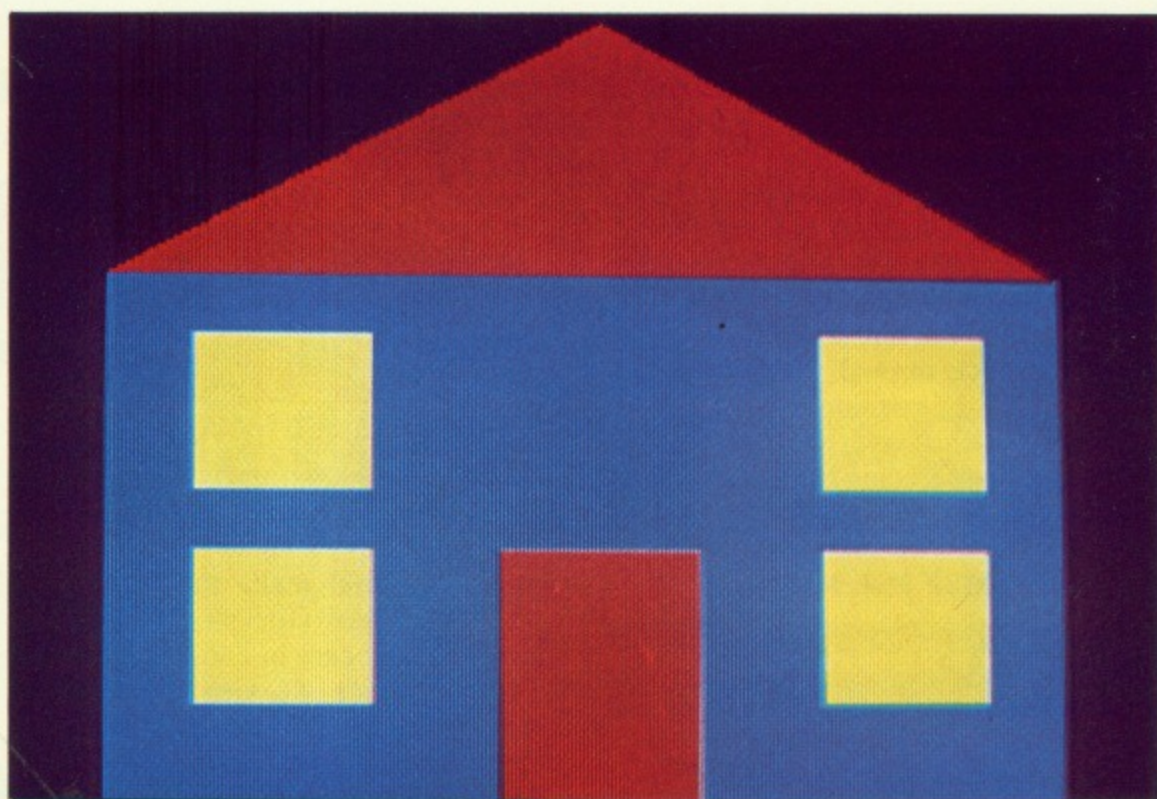
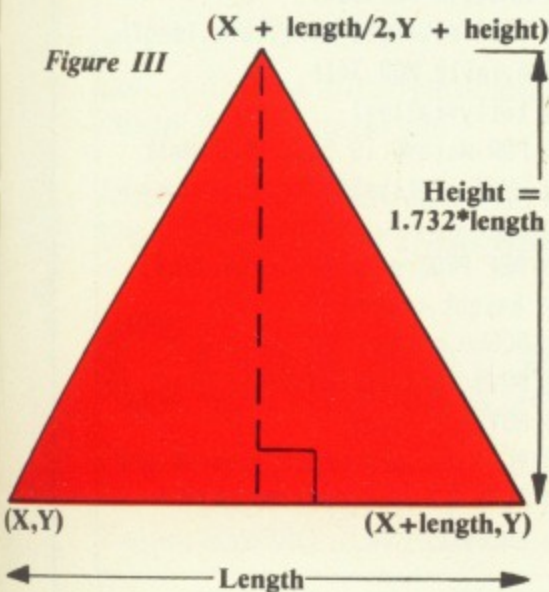
Lines 30 and 40 alter the colour assignments of logical colours 3 and 0 respectively.

Lines 60 and 190 make up the REPEAT UNTIL LOOP which generates the triangles.

Lines 70 to 130 pick out at random the three points (firstx,firsty), etc. and choose the colour.

Lines 150 to 170 do the actual work of plotting the triangles.

150 and 160 MOVE the cursor to the first and second points respectively.



**Let colour
bring the
screen
to life..**

By PAUL JONES

Line 170 fills the triangle between these and the third point with a PLOT 85.

If the program were any more complex it would have been better to put the triangle-drawing part of it in a procedure. This is the strategy we adopt in Program IV, which prints out 50 random equilateral triangles on the screen by repeatedly calling PROCtriangle.

If you experience a feeling of déjà vu when you look at PROCtriangle, don't worry – it is virtually identical to the procedure of that name in last month's Program IX, save that we use PLOT 85 since we are filling in triangles rather than drawing outlines. There's a lot to be gained from comparing both procedures.

Figure III should also help make PROCtriangle clearer. Line 60 randomly chooses the position of the left hand corner of the triangle (xpos,ypos). Line 70 fixes the size of the triangle. Tally counts the number of

times the REPEAT UNTIL loop (lines 50 to 110) is repeated.

A little thought should show you that tally MOD 3 + 1 returns the values 1,2,3,1,2,3,1,2,3 cyclically.

We use this to cycle through the colours for the triangle by passing tally MOD 3 + 1 to the variable colour in the procedure call (lines 80 to 130).

Last month we not only used PROCtriangle to draw the random triangle outlines, we also used it in Program X to draw the nested triangles that featured in Page 33's colour photo.

This month I have followed in the

```

10 REM *** PROGRAM FOUR ***
20 MODE 5
30 VDU 19,3,4,0,0,0
40 tally=0
50 REPEAT
60 xpos=RND(1000):ypos=RND(800)
70 size=RND(500)
80 PROCtriangle(xpos,ypos,size,
tally MOD 3+1)
90 tally=tally+1
100 FOR wait=0 TO 500: NEXT wait
110 UNTIL tally=50
120 END
130 DEFPROCtriangle(x,y,length,col
our)
140 LOCAL height
150 GCOL 0,colour
160 height=length*1.732/2
170 MOVE x,y
180 MOVE x+length,y
190 PLOT 85,x+length/2,y+height
200 ENDPROC

```

Program IV

From Page 29

same vein by using PROCtriangle from Program IV to produce a series of colour-filled triangles, as you will see if you run Program V.

In Program V we not only use tally to once more cycle through the colours, but also to alter the position and size of the triangle, so that each successfully nests within the preceding one (lines 80 to 110).

```
10 REM *** PROGRAM FIVE ***
20 MODE 5
30 VDU 19,3,4,0,0,0
40 tally=0
50 size=1000
60 height=1.732*size/2
70 REPEAT
80 base=size - tally*250
90 up=height*tally/4
100 xpos=100 + 250 * tally/2
110 ypos=up/2 + 100
120 PROCtriangle(xpos,ypos,base,tally
MOD 3+1)
130 tally=tally+1
140 UNTIL tally > 3
150 END
160 DEFPROCtriangle(x,y,length,colour)
170 LOCAL height
180 GCOL0,colour
190 height=length*1.732/2
200 MOVE x,y
210 MOVE x+length,y
220 PLOT 85,x+length/2,y+height
230 ENDPROC
```

Program V

Program VI uses two different coloured triangles positioned to give a multicoloured rectangle. It does this by repeating our triangle drawing formula:

1. MOVE to first point
2. MOVE to second point
3. PLOT 85 to third point.

```
10 REM *** PROGRAM SIX ***
20 MODE 5
30 VDU 19,3,4,0,0,0
40 REM First triangle
50 GCOL0,1
60 MOVE 0,0
70 MOVE 1279,0
80 PLOT 85,1279,1023
90 REM Second Triangle
100 GCOL0,3
110 MOVE 0,0
120 MOVE 0,1023
130 PLOT 85,1279,1023
```

Program VI

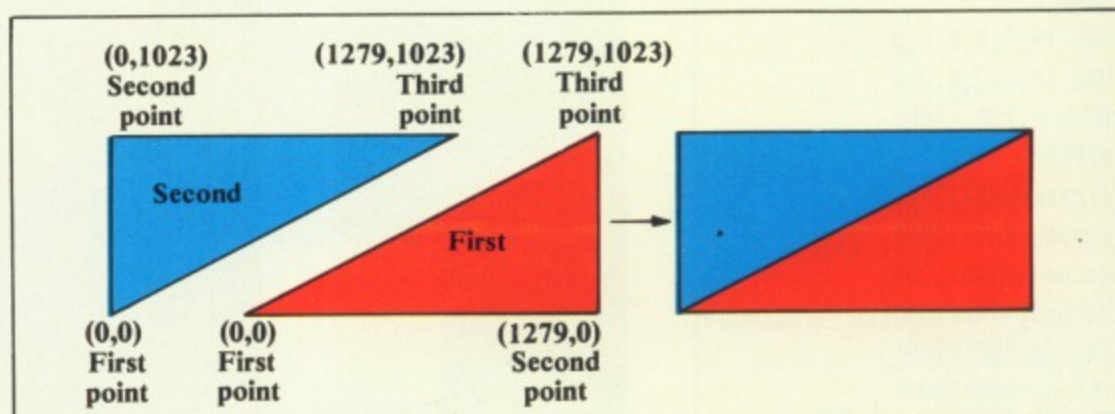


Figure IV

Figure IV should make this clear. This is not the most efficient method, though. If we take care in choosing the order of the points we visit we can arrange that the last two points visited in order to draw the first triangle become the first two points of the second.

That is, having drawn the first triangle, we can then draw the second with just another PLOT 85 to supply the final point.

Program VII uses this method to produce the same output as Program VI. Figure V should illustrate the idea.

```
10 REM *** PROGRAM SEVEN ***
20 MODE 5
30 VDU 19,3,4,0,0,0
40 REM First triangle
50 GCOL0,1
60 MOVE 1279,0
70 MOVE 1279,1023
80 PLOT 85,0,0
90 REM Second Triangle
100 GCOL0,3
110 PLOT 85,0,1023
```

Program VII

To show how important the order of visiting the points is when you're using this method, try swapping lines 60 and 70, then run the program.

If you think about it, we can use this technique in a procedure to draw rectangles – though we'd probably have both triangles the same colour!

In fact, we use this in PROCrectangle in Program VIII. The procedure assumes that the sides of the rectangle are parallel to the axes, that is that the rectangle does not slope. Figure VI should help make the procedure's variables clear.

The program simply computes random values for those variables (once more using tally MOD 3 + 1 to pick colours) and calls PROCrectangle 50 times to produce random rectangles in much the same manner as

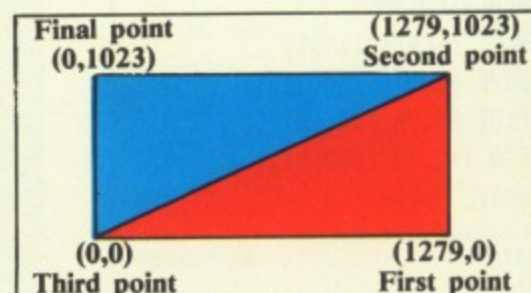


Figure V

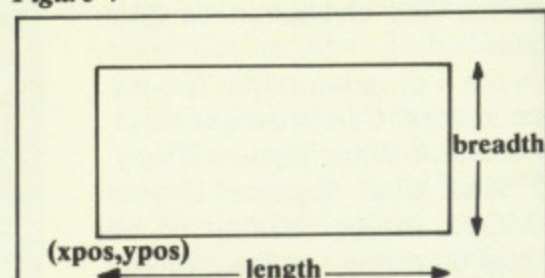


Figure VI

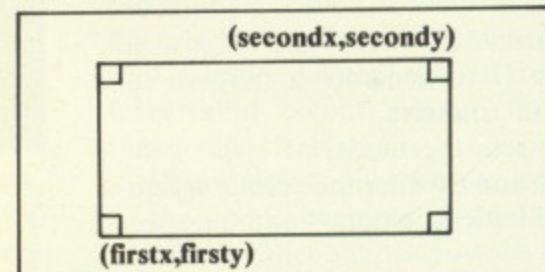
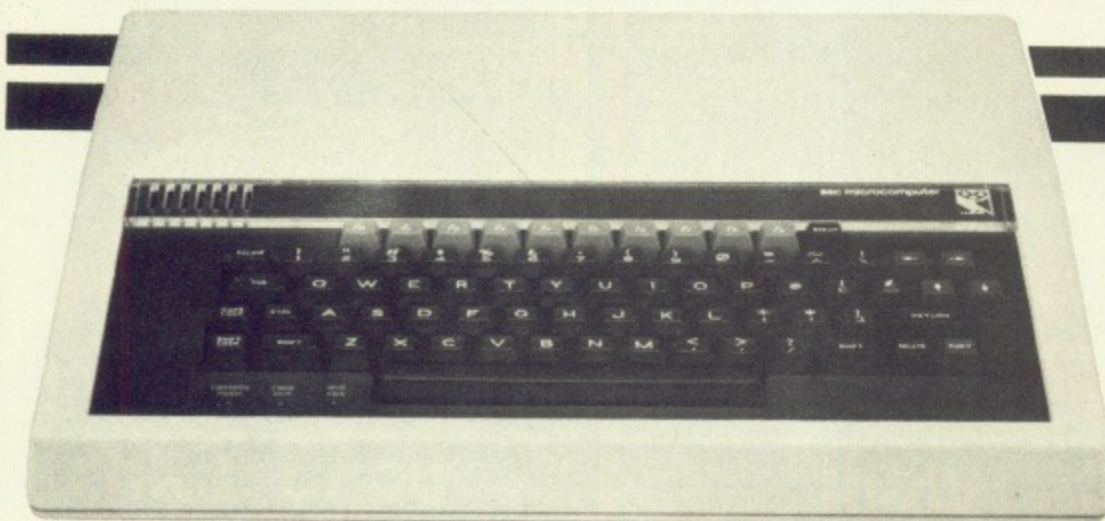


Figure VII

```
10 REM *** PROGRAM EIGHT ***
20 MODE 5
30 VDU 19,3,4,0,0,0
40 tally=0
50 REPEAT
60 xpos=RND(1000):ypos=RND(800)
70 length=RND(500)
80 breadth=RND(500)
90 PROCrectangle(xpos,ypos,length,
breadth,tally MOD 3+1)
100 tally=tally+1
110 FOR wait=0 TO 500: NEXT wait
120 UNTIL tally=50
130 END
140 DEF PROCrectangle(xpos,ypos,
width,height,colour)
150 GCOL0,colour
160 MOVE xpos+width,ypos
170 MOVE xpos,ypos
180 PLOT 85,xpos+width,ypos+height
190 PLOT 85,xpos,ypos+height
200 ENDPROC
```

Program VIII

Cumana drives BBC Micro best!



**CUMANA DRIVES +
OWN POWER SUPPLY
=BIG PLUS FOR
BBC MICRO USERS
... JUST FOR
STARTERS**

The 'ice on the cake' is that because the Cumana Drive has its own power supply, it can be used with many other Micros when connected via the appropriate cable. Cumana supply a Drive connecting cable which has a standard 34 way edge connector plus 34 way BBC connector in the same cable length. This allows the Cumana Drive to be connected to numerous makes of micro without the need to change connecting cable. And the Japanese manufactured disk drives are quiet and utterly dependable.

**12 MONTH
FULL WARRANTY**

**£199
100K**

**£619
800K**

- | | |
|--|-------------|
| CS50A Single 40 track drive 100K | £199 |
| CD50F 2 double sided 80 Track TEAC Drives
with cabinet and power supply 800K | £619 |
| Disk formatter and instructional manual | £15 |
| Model A-B upgrade kits | £65 |

**Many other Disk Modes available for BBC.
Call or write for Data Sheet.**

CUMANA LTD

Unit 1, The Pines Trading Estate, Broad Street,
GUILDFORD, Surrey GU3 3BH (0483) 503121
Telex: 859380 CUMANA

Please add VAT to all prices

**DEALER & EDUCATIONAL ENQUIRIES WELCOME -
GENEROUS DISCOUNTS AVAILABLE**

From Page 30

we produced random triangles in Program IV.

Continuing with this theme of adapting previous programs, Program IX uses PROCrectangle to produce a series of nested rectangles in a manner strictly analogous to the way that Program V produced nested triangles. Lines 70 to 100 ensure that successive rectangles nest by altering the side lengths and the corner positions.

Although I normally use the above procedure for rectangles, there is another way of defining a rectangle (again assuming it doesn't slope). This is by simply giving the procedure the co-ordinates of two diagonally opposite corners of the rectangle.

Figure VII shows the method. Program X uses it in PROCrectangle to produce a "staircase" of six rectangles. Each successive rectangle is drawn ystep graphical units taller than the preceding one and xstep graphical units to the right.

Although the output may seem rather trivial, it is by using much the same techniques that we are able to draw bar charts and graphs, as we shall

```
10 REM *** PROGRAM NINE ***
20 MODE 5
30 VDU 19,3,4,0,0,0
40 tally=0
50 length=1000:breath=800
60 REPEAT
70 width=length*(4-tally)/4
80 height=breath*(4-tally)/4
90 xpos=100 + 500*tally/4
100 ypos=100 + 400*tally/4
110 PROCrectangle(xpos,ypos,width,
height,tally MOD 3+1)
120 tally=tally+1
130 UNTIL tally > 3
140 END
150 DEF PROCrectangle(xpos,ypos,
width,height,colour)
160 GCOL0,colour
170 MOVE xpos+width,ypos
180 MOVE xpos,ypos
190 PLOT 85,xpos+width,ypos+height
200 PLOT 85,xpos,ypos+height
210 ENDPROC
```

Program IX

see in later issues.

In the meantime, why not practice your graphic techniques by writing programs to draw simple, multi-

```
10 REM *** PROGRAM TEN ***
20 MODE 5
30 VDU 19,3,4,0,0,0
40 VDU 19,0,5,0,0,0
50 bottomx=0:bottomy=0
60 topx=0:topy=0
70 xstep=213:ystep=170
80 counter=0
90 REPEAT
100 colour= counter MOD 3+1
110 topy=topy+ystep
120 topx=bottomx+xstep
130 PROCrectangle(bottomx,bottomy,
topx,topy,colour)
140 bottomx=topx
150 counter=counter+1
160 UNTIL counter=6
170 END
180 DEF PROCrectangle(firstx,firsty,
secondx,secondy,colour)
190 GCOL0,colour
200 MOVE secondx,firsty
210 MOVE firstx,firsty
220 PLOT 85,secondx,secondy
230 PLOT 85,firstx,secondy
240 ENDPROC
```

Program X

coloured pictures constructed from triangles and rectangles? Houses, rockets and boats seem to be favourite subjects.

Useful things to know

ROM insurance can save your program

IF you're the type of person who always has to go back three times to check that his front door is locked, you probably share my sense of insecurity when it comes to saving programs. The BBC Micro might well be indicating that saving is complete, but how do you know that you will be able to reload the program from tape?

*CAT might show you what's on the tape, but that's no guarantee that it will load. And, of course, you can't try a simple LOAD command because, in the process of trying to load the version on tape, you overwrite your original - so, if the loading fails for any reason, you're in a real mess.

The answer is to use the command

***LOAD""8000**

which will load the first program it encounters on tape, not to the place it normally loads Basic programs, but to memory locations &8000 onwards.

Now these memory locations are ROM, which means that their contents are fixed. The computer can try as much as it wants to try to change the values of these locations (say, by loading a program into them, as in this case), but it won't succeed.

The micro is blithely unaware of this fact though, and will continue to load into the ROM until it reaches the end of the

program on tape.

Once there, if the program was properly saved in the first place, it will return to Basic, considering that it has completed its task successfully.

We can now breathe sighs of relief, since we then know that the program on tape is capable of being loaded by the system.

If, however, the program on tape fails to load, or an error message is generated, all is not lost. By using *LOAD""8000 and thus loading to an area of ROM, the memory which our original program occupied remains untouched. That is, the program we have attempted to save remains intact, so we can now try to save it again - hopefully with more success.

BBC programs by post

ALL TIME FAVOURITE

FOR THE BBC MICRO

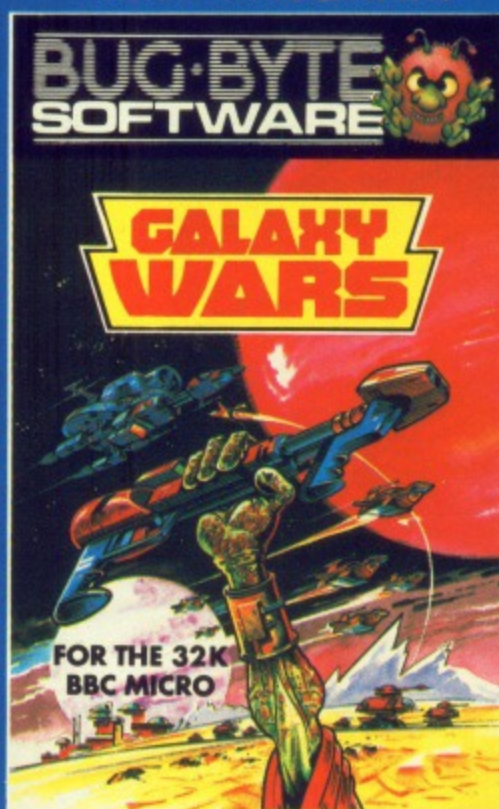


FOR THE BBC MICRO

PRICE £7.50

NEW PROGRAM

FOR THE BBC MICRO



FOR THE BBC MICRO

PRICE £7.50

NEW PROGRAM

FOR THE BBC MICRO



FOR THE BBC MICRO

PRICE £7.50

NEW PROGRAM

FOR THE BBC MICRO



FOR THE BBC MICRO

PRICE £9.50

THE SOFTWARE EXPRESS EASY-REPLY COUPON

Please mail me the following Software Cassettes.

(All prices include VAT and postage)

PROGRAM	PRICE	INSERT QUANTITY
---------	-------	-----------------

FOR BBC MODEL B OR EXPANDED MODEL A (compatible with all current BBC ROMS)

SPACE INVADERS	£7.50
GALAXY WARS	£7.50
CITY DEFENCE	£7.50
MUSIC SYNTHESIZER + AUTO COMPOSER	£9.50

OTHER BBC PROGRAMS

SPACE PIRATES (16K)	£8
SPACE WARP (32K 0.1 ROM only)	£9
BBC CHESS (32K 0.1 ROM only)	£8

TOTAL PRICE £

I enclose cheque/P.O. ☐
Payable to Software Express.

Or please charge my Access/Barclaycard No.

24 HOUR
ANSAPHONE FOR
CREDIT CARD ORDERS

051-548 2020

Name: _____

Address: _____

Tel: _____

Mail to:
SOFTWARE EXPRESS
FREEPOST
(No Stamp Required)
Liverpool L33 3AB



SOFTWARE EXPRESS

SOFTWARE EXPRESS, FREEPOST (No Stamp Required), Liverpool L33 3AB
Software Express is a trading name of DAMS Office Equipment Limited.

BITS & BYTES

MIKE BIBBY continues his explanation of the fundamentals of the BBC Micro workings

So
how
are
you
at

decomposing?

WE have seen that we can code our numbers in ways other than our usual denary, or decimal, system. We also looked last month at a way of coding known as the binary system, which uses the digits 0 to 1 to represent any number – unlike the denary system which uses the digits 0 to 9. To distinguish the two systems, we decided to prefix binary numbers with the symbol “%”.

The number “one hundred and sixty – two” is encoded in each system as follows:

In denary,

162 i.e. $100+60+2$

In binary,

128 64 32 16 8 4 2 1
% 1 0 1 0 0 0 1 0
i.e. $128+32+2$

Each column in the binary system, known as a “bit”, contains either a one or a zero. Although the binary representation of a number is rather cumbersome to write, this simple two-state system is easily represented by electrical circuits – which are either *on* or *off*.

We saw that the computer handles bits in groups of eight at a time. Such a group is called a byte. Thus a byte contains eight bits labelled, somewhat perversely, bits 0 to 7. See Figure 1.

Bit 0, as you can see, is the “1” column. As this is the smallest value bit we say that bit 0 is the least significant bit (LSB). Bit 7, the “128” column, is called the most significant bit (MSB). The reason for using the numbers 0 to 7 to label the bits instead of the more logical 1 to 8 has to do with powers, a

subject you almost certainly covered at school.

“2 to the power 2” is $2*2 = 4$

“2 to the power 3” is $2*2*2 = 8$

“2 to the power 4” is $2*2*2*2 = 16$ and so on. “2 to the power 8” would be eight twos all multiplied together.

Notice as the powers of two increase – that is, as we multiply more twos together – the answers are doubling, just as our column or bit values do.

Also, 2 to the power of 2 is 4, the value of bit 2, while 2 to the power of 3 is 8, the value of bit 3. It shouldn’t come as any surprise to you to find that 2 to the power of 7 is 128, the value of bit 7.

You can verify this on the BBC Micro by using the symbol “^” (“^” in Mode 7) which stands for “to the power of”.

Try:

PRINT 2^4

PRINT 2^7

Be sure to try 2^1 , which will show you why bit 1 has the value 2. Also try 2^0 . The answer may surprise you. The fact is that any number to the power 0

Bit number	7	6	5	4	3	2	1	0
	1	0	0	0	1	1	0	1
Bit value	128	64	32	16	8	4	2	1

Figure I: The bit pattern for 141

Bit number	7	6	5	4	3	2	1	0
Bit value	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
	128	64	32	16	8	4	2	1
	1	1	0	0	1	1	0	0

Figure II: The bit pattern for 204

is 1! Hence bit zero has the column value of one. Figure II illustrates this.

Look at this sum:

$$\begin{array}{r} \% 1 \\ + \% 1 \\ \hline \% 10 \end{array}$$

If you think about it, that is correct, since the sum adds one and one, and the answer %10 is binary for two. One way of relating this to our usual way of doing sums is to say that we carry when we get to two, instead of ten as we do in our normal, decimal, sums.

Another way to look at it is that we have to carry when we get to two because we aren't allowed to use the digit '2'. If you remember, last month we had a rule forbidding two "coins" of the same value.

Try this sum:

$$\begin{array}{r} 4 \ 2 \ 1 \\ \% \ 1 \ 1 \text{ in } 3 \\ + \% \ 1 \ 0 \text{ denary } + 2 \\ \hline \% 1 \ 0 \ 1 \qquad \qquad 5 \end{array}$$

Here we carry from the second column to the third.

Addition is not very hard at all – just make sure that you always "put 0 down and carry 1" when you get a two. If you get a three then "carry one for two and put one down".

For example:

$$\begin{array}{r} 8 \ 4 \ 2 \ 1 \\ \% \ 1 \ 1 \ 1 \text{ in } 7 \\ + \% \ 1 \ 1 \text{ decimal } + 3 \\ \hline \% \ 1 \ 0 \ 1 \ 0 \qquad \qquad 10 \end{array}$$

Subtraction is a little more complicated, and depends on whether you borrow or decompose! That latter phrase doesn't describe the current

economic climate, it's just that there are two schools of thought on the way subtraction should be taught – the borrowers and the decomposers.

Fortunately, we can ignore binary subtraction since we can manage without it – as does the microprocessor inside your machine. If you want to do some binary subtraction it is straightforward enough provided that you remember that it is two you're borrowing or taking, not ten. Figure III illustrates the process – without any attempt to explain it.

Before we leave the realm of simple sums, look what happens if we shift everything in a binary number over to the left, putting a zero into bit 0, which would be left vacant otherwise. For example:

$$\begin{array}{r} 8 \ 4 \ 2 \ 1 \\ \% \ 1 \ 0 \ 1 \text{ which is } 5 \\ \text{becomes} \\ 8 \ 4 \ 2 \ 1 \\ \% \ 1 \ 0 \ 1 \ 0 \text{ which is } 10 \end{array}$$

This shifting to the left doubles the number automatically. This isn't too hard to visualise, because the value of

each bit is transferred to the next higher bit, which is of course double in value – so the end result is that the whole number is doubled in value.

Similarly, we can do the binary equivalent of DIV 2 by shifting to the right. For example:

$$\begin{array}{r} 8 \ 4 \ 2 \ 1 \\ \% \ 1 \ 1 \ 0 \ 1 \text{ which is } 13 \\ \text{becomes} \\ 8 \ 4 \ 2 \ 1 \\ \% \ 1 \ 1 \ 0 \text{ which is } 6 \end{array}$$

and, of course, 13 DIV 2 gives you 6. (The DIV command, in case you aren't familiar, deals with integer division, that is, it does division but only tells you the "wholes" and ignores the remainders.)

As each bit is moved to the right, it occupies a column exactly one half lower in value, thus the sum total of all the bits is one half lower, save for the original bit 0 which has disappeared altogether (hence the ignored remainder).

Well, that's enough binary for one month. Hexadecimal blooms in June!

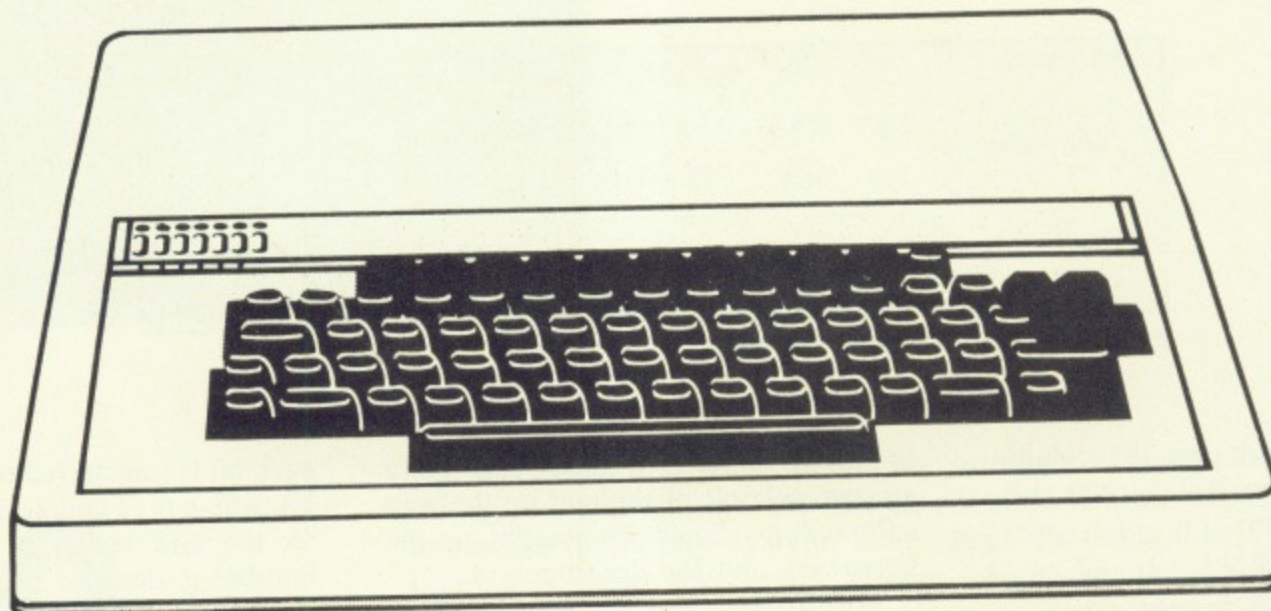
$\begin{array}{r} \% \ 1 \ 1 \ 1 \ 1 \\ - \% \ 1 \ 1 \ 1 \ 1 \\ \hline \% \ 1 \ 1 \ 1 \ 1 \end{array}$	OR	$\begin{array}{r} \% \ 1 \ 1 \ 1 \ 1 \\ - \% \ 1 \ 1 \ 1 \ 1 \\ \hline \% \ 1 \ 1 \ 1 \ 1 \end{array}$	In decimal	$\begin{array}{r} 6 \\ - 3 \\ \hline 3 \end{array}$
Decomposition		Borrowing		

Figure III: Binary subtraction

The B.B.C. Microcomputer Model B

available today, but designed for the future...

Are you looking for a home computer that is **flexible** - that can cover education, entertainment or business; **powerful** - that offers 32K of memory; and is above all **great value**?



Then look no further! Come and see us at **Microstyle** and we'll show you the **B.B.C. Micro**.

A home computer system designed to grow hand-in-hand with the abilities of its user, and that is capable of keeping pace with advances in modern technology.

We stock a wide range of exciting games and systems packages, quality add-on facilities and a comprehensive selection of accessories designed to expand your B.B.C. system.

Games & Educational Software:	Our range is growing daily, and we deal direct with independent, specialist software suppliers to bring you one of the widest choices available in the South-West.
Screens & Monitors:	Green Screen, 12" Monitors. £90.00 Colour Monitors, 14" screen. Make the most of hi-resolution graphics in colour. £285.00
Cassette Decks:	Great value <i>WITH COUNTER</i> . £33.65
Joysticks:	Add a new dimension to your games B.B.C. joysticks. £13.00
Accessories:	Our stock covers just about everything you could ever need. For example, B.B.C. PARALLEL PRINTER CABLE. £19.95

Printers:

One of the most valuable aids to the programmer or business user.

Our range includes:

Epson MX80 FT III.	£385.00
GP100A	£224.25
GP250X	£299.00

FOUR COLOUR PRINTER/PLOTTER.
4½" roll fed paper. £149.00

Discom BYTEWRITER. Great value, low-cost daisy wheel printer/type-writer. £557.75

Books:

Keep up to date with developments, our stock of books and publications is changing all the time. There's always something new!

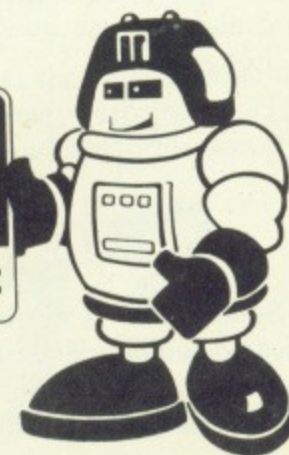
ALL PRICES ADVERTISED INCLUDE VAT

Contact us now for your B.B.C. Microcomputer.
available ex-stock at £399.00

Don't forget, we also stock a wide selection of other systems
COMMODORE, SPECTRUM, ZX81 and COLOUR GENIE
Talk to **Microstyle** the people who make computing understandable

The Newbury Computer Centre, and
47 Cheap Street, Newbury.
Telephone: Newbury (0635) 41929

The Bath Computer Centre
29 Belvedere,
Lansdown Road, Bath.
Telephone: Bath (0225) 334659



**You really can't manage
without a lever device for
inputting information as a
two-dimensional vector?**

So build a joystick!

IN the previous two articles of this course we saw how a model A could be upgraded to a model B. This month I'd like to explore the topic of joysticks.

The joystick sold by Acorn is quite reasonably priced, but it is possible to undercut it by building it yourself. You can then mount it in the sort of housing that suits you best. If you already have the joystick for the Atari games computer we shall be seeing how to interface it to the BBC computer.

Part of the rationale behind including the A/D converter in the BBC Micro is to allow the connection of a joystick. It is possible to connect one to the user port, but as this is not the way Acorn planned it there will be no supporting software for that type of configuration. So I will only talk about fitting a joystick to the A/D connector.

To make the connection you will need a 15-way D-type plug with solder cup connections. If you look very carefully on the wiring side you will see the pin numbers printed on that side of the plug. The BBC Micro is capable of supporting two joysticks, and the connections for the second one are shown on all the diagrams *in brackets*.

A joystick is a lever device for inputting information as a two dimensional vector. Sounds impressive doesn't it? You can rehearse the phrase

and slip it quietly into the conversation when boasting about your latest score on Snapper!

Despite what has been said elsewhere, using a joystick for Snapper improved my score fourfold at a stroke. As far as I know, Snapper is the only

THE BEEB BODY BUILDING COURSE

By MIKE COOK

Acorn game to support a joystick at the moment, but I'm sure there will be more before long.

There are basically two types of joystick, and both will work with Snapper. The simpler is the switch type, where moving the joystick in any one of four directions will close one of four switches. This is the type found on

many arcade games and can be fitted to the user port as well as the A/D socket.

The second sort is the proportional type, which inputs a value that is proportional to how far over the stick is moved. This type can only be fitted to the A/D input, and this is the one we'll look at first.

If you cast your mind back to the first issue of BBC Micro User you will remember an article by Mike Shaw about adding a paddle to the computer. In essence the addition of a joystick can be achieved in a similar way by using one potentiometer, variable resistor or volume control – they are all the same thing with different names – for each axis of movement.

However, you will need to convert the rotational movement of each pot (potentiometer) into the lateral movement required. This can be achieved quite simply as follows. One pot is fixed to a bracket and the other pot is attached to it by bolting the shafts together at right angles. A lever is then connected to the body of the second pot – and there you have your joystick! If you study photo No. 1 you will see the construction clearly.

You must arrange that the travel of the pots covers the mechanical range

From Page 37

you are interested in. This can be achieved simply by rotating them in their fixings. For the more mechanically able, you might like to put a kink in the lever so that it is in line with the centre of movement. This will improve the feel of the joystick, but is not essential.

The circuit in Figure I shows how this can be wired up for one joystick. If you want a second, repeat the circuit using the connections shown in brackets.

Although this is the first circuit diagram we have seen in this series, I am not going to delve into the relationship between the physical appearance of a component and its circuit symbol. To do so would be a little tedious to those already familiar with it and many books are available on simple electronics which show it more clearly than I could in this article. Such books are available at most libraries and are sometimes found in the children's section, so don't be put off looking in there.

The value of the pots you use is not critical and any value between 1,000 ohms and 1 megohm can be used, but they must be of the linear type, not logarithmic. You will also see in Figure I that a "push to make" switch is needed. This is the "fire" button and can be used for several things. In Snapper it tells the program to look at the A/D port for movement instructions instead of at the keyboard.

The only snag with this type of construction is that as the pot is not being

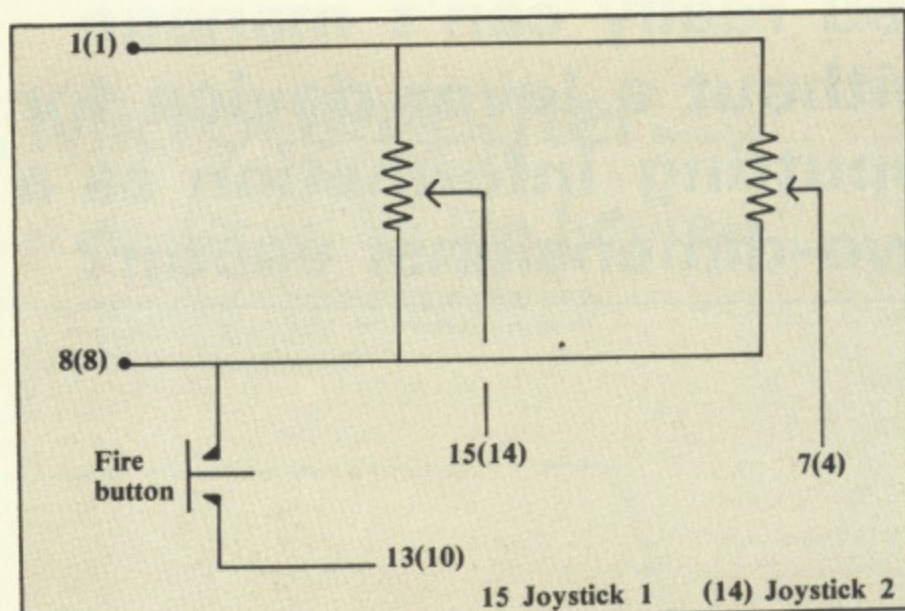


Figure I: Resistor Joystick

moved over the whole of its range you will not get the maximum range of numbers of which the A/D converter is capable.

This situation can be improved by connecting one end of the pots, not to

THE BEEB BODY BUILDING COURSE

the reference voltage, as was the case with the games paddles, but to a higher voltage. As there is a 5V output from the A/D socket it is convenient to use this as shown in Figure I.

For the less adventurous, it is

possible to purchase joystick assemblies of this type. A low cost one is available for under £3 from Tandy stores. Also Radio Spares supply a joystick assembly (stock No. 162-732) which is shown in photo No. 2. You will also see that I have mounted it in a small plastic box. I took the sharp edges off with a file and it is quite comfortable to hold.

This assembly enjoys the luxury of a spring which returns the lever to its centre position and also a grub screw adjustment on the position of the pots. On mine I had to adjust this to get Snapper to work properly. To do so, simply run the game and adjust the rotation of the pot until the Snapper can be steered in both directions. Then tighten up the grub screw and adjust the up and down in the same way.

If you get control in the wrong direction and pressing the lever left turns Snapper right just swap over the two outside connectors of the pot. This applies to all the types of joystick I have described so far.

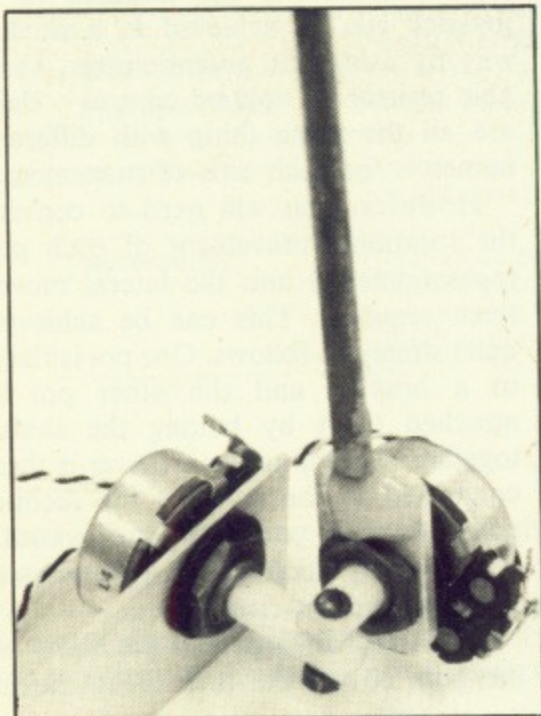


Photo I: A two-potentiometer joystick

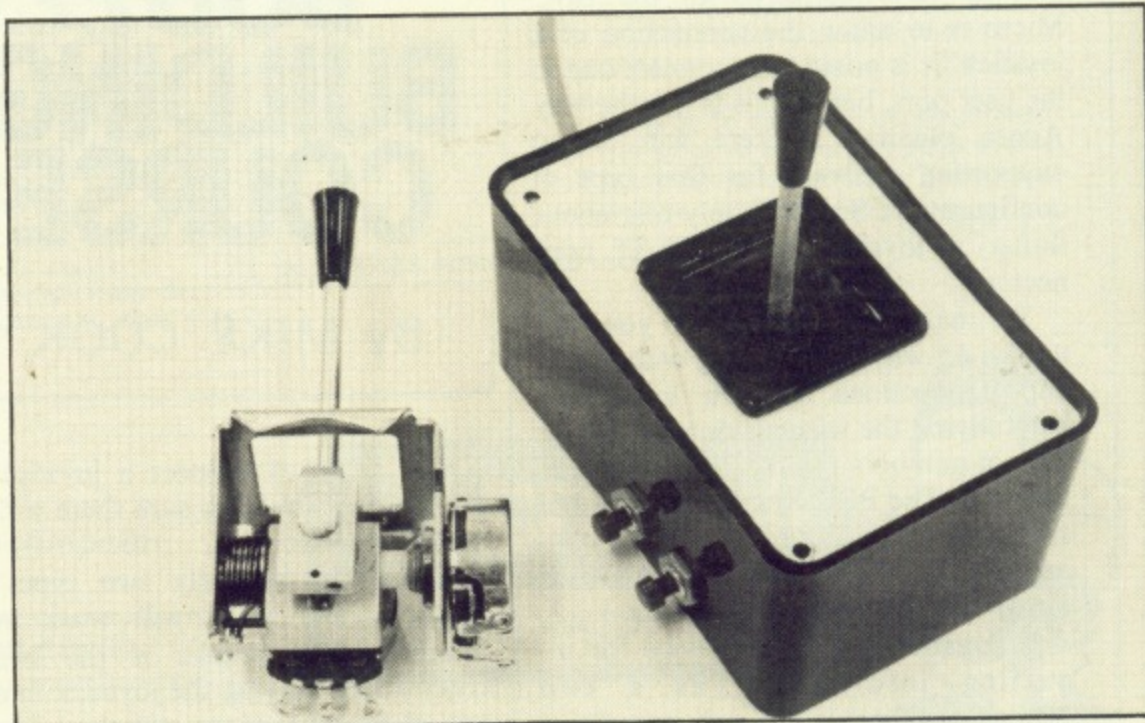


Photo II: Radio Spares joystick assembly

If you do not have Snapper, and are itching to have a go with your joystick, listing No. I shows a simple program which allows you to draw on the screen using the joystick. Lines 50 and 60 input the values from the joystick. The DIV 64 part should always be added, as the A/D converter has only 10 bits resolution, and this returns numbers in the range 0 to 1023.

According to the User Guide the A/D converter is capable of 12 bits resolution (0 to 4095), but this is not the case. I have seen an internal technical memo from NEC (the company who made the chip) saying that the two least significant bits do change but they represent only internal noise, and that this chip should be described

```

10 CLS
20 PRINT "JOYSTICK DOODLE"
30 INPUT "INPUT MODE ",M
40 MODE M
50 X=ADVAL(1) DIV 64
60 Y=ADVAL(2) DIV 64
70 DRAW X,Y
80 TIME=0
90 REPEAT : UNTIL TIME > 5
100 GOTO 50

```

Listing I

in future as a 10 bit chip and not 12 bit. So when looking at the values from the A/D port you should always use

ADVAL(N) DIV 64

to avoid any unnecessary fluctuations in the number returned. In the program, lines 80 and 90 waste time until a new value has been taken for both channels. This happens automatically, and each channel is updated every 40 ms.

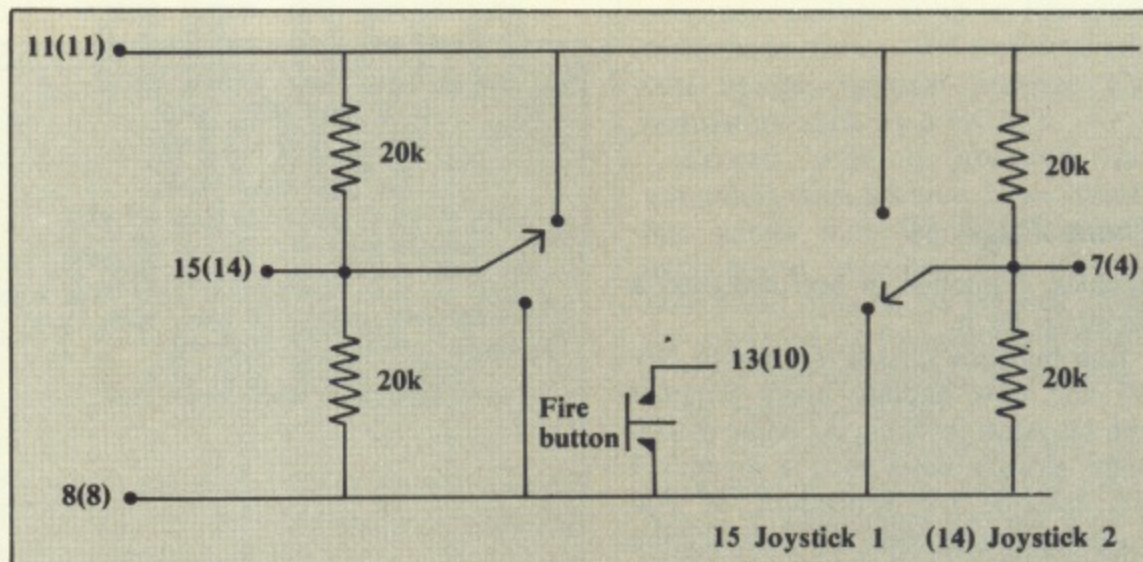


Figure II: Switch joystick

If there are other program lines in the loop which will take up time these lines will not be needed. So try taking those lines out and watch the results carefully. You will see that the points plotted are displaced, as a new position is used for one axis and the old value for the other. This program can be used as the nucleus of a more complicated one.

Try using the INKEY\$ function to look at the keyboard each time round the loop and use any key presses for extra functions, like wiping out the screen and changing the colour. You could also scale the numbers by multiplying them by some number so that you cover more of the screen.

You may want to use the X and Y values, not to draw, but to move the gun sights of a space ship or track enemy planes as they appear over the horizon.

You could also make a joystick using switches, which would be sufficient for playing games like Snapper. Again, Radio Spares have a joystick switch assembly (stock No. 337 352)

which is shown in photo No. III. It consists of two rotary switches connected together mechanically just as we connected the pots.

As we need to know when the switch is in the centre position as well as when it is pushed to one side, we have to arrange two resistors so that half the

```

10 X=512
20 Y=512
30 INPUT " INPUT MODE ",M
40 MODE M
50 MOVE X,Y
60 A=ADVAL(1) DIV 64
70 B=ADVAL(2) DIV 64
80 IF A > 800 THEN X=X+2
90 IF A < 300 THEN X=X-2
100 IF B > 800 THEN Y=Y+2
110 IF B < 300 THEN Y=Y-2
120 DRAW X,Y
130 TIME=0
140 REPEAT : UNTIL TIME > 5
150 GOTO 60

```

Listing II

voltage is fed to the input (giving a value of about 512) when the joystick is in the centre position, and full voltage, or no voltage, in the other positions (1023 or 0).

Again the connections for a second joystick are shown in brackets on the diagram in Figure II. Listing II shows how this arrangement could be used to draw pictures. Improvements could be made by making the delay loop speed up when the joystick had been held in the same direction for some time.

Now that would have been the end of the story but for one incident. A friend of mine, Bob Cliff, had been given an Atari joystick and wanted to know how he could connect it up to the BBC Micro to play Snapper. I told him that it was impossible because of the way the joystick was made. Unfortunately I overheard myself saying this and, as my ability to resist a challenge is one of my least developed

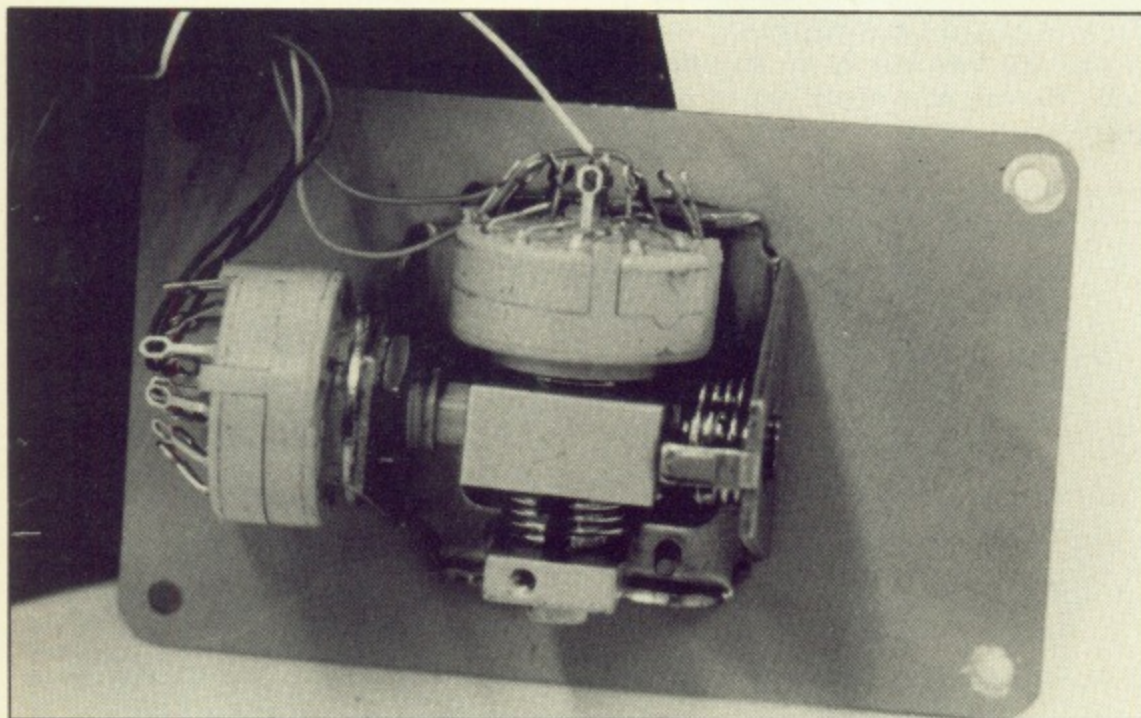


Photo III: Detail of the Radio Spares switch joystick assembly

From Page 39

faculties, I pitched in and designed a circuit to do it.

Bob built the circuit (see photo No. IV) and now happily plays Snapper with his Atari joystick. As some of you might already have such a joystick I will describe the procedure. If you haven't got one then the next section will still be of interest as it includes some simple transistor theory.

The Atari stick is a series of contacts arranged in a circle. The lever makes a connection with any one of these contacts at a time. Also included is a fire button and the whole thing terminates in a 9-way D-type socket. The wiring diagram is shown in Figure III. This is not a configuration that can be wired up like Figure 2 because the lever consists of only one contact and not two.

In order to see how this problem can be solved we need to see how a transistor can work as a switch. In

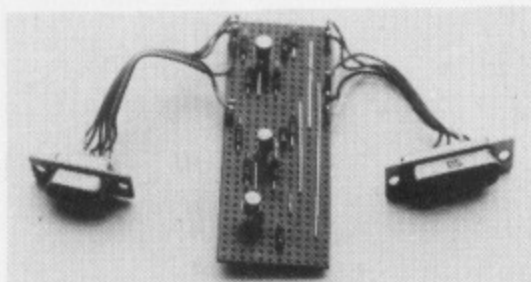


Photo IV: The Atari-to-BBC interface. It could be mounted in a box by the DIY inclined.

Figure IVa a transistor is shown with current flowing down the base (I_b), this causes a larger current to flow down the collector (I_c). The amount that I_c is larger than I_b is known as the gain (G) such that:

$$I_c = I_b * G$$

If I_b is large enough then the value of the resistor R_L will limit the

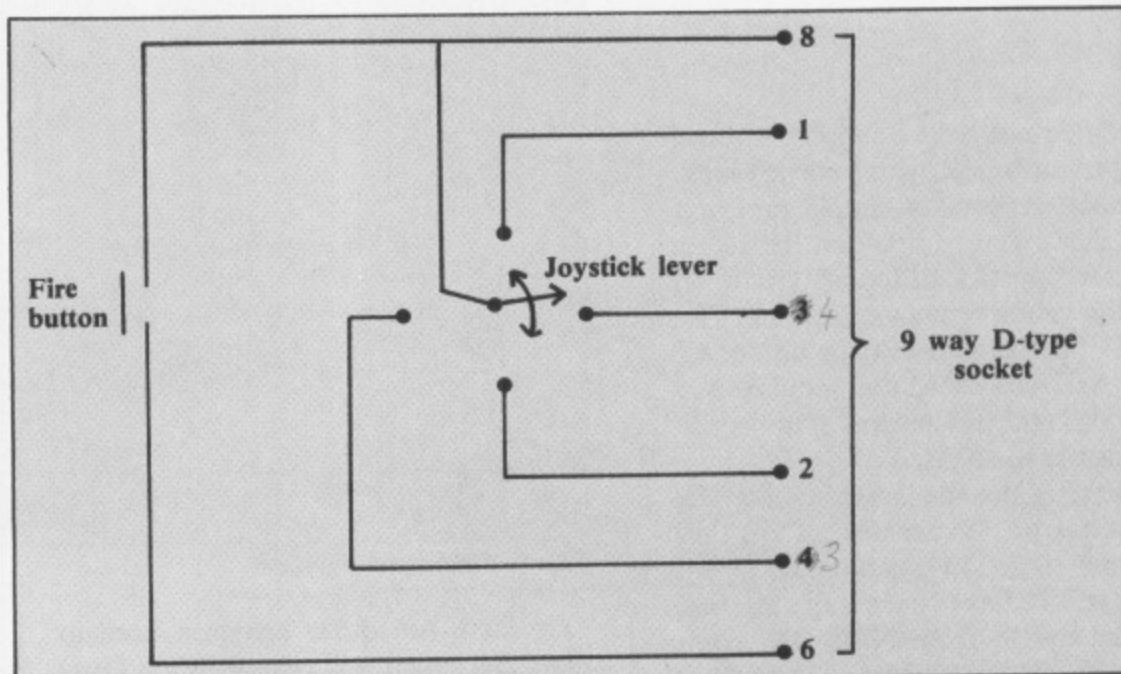


Figure III: Diagram of Atari joystick

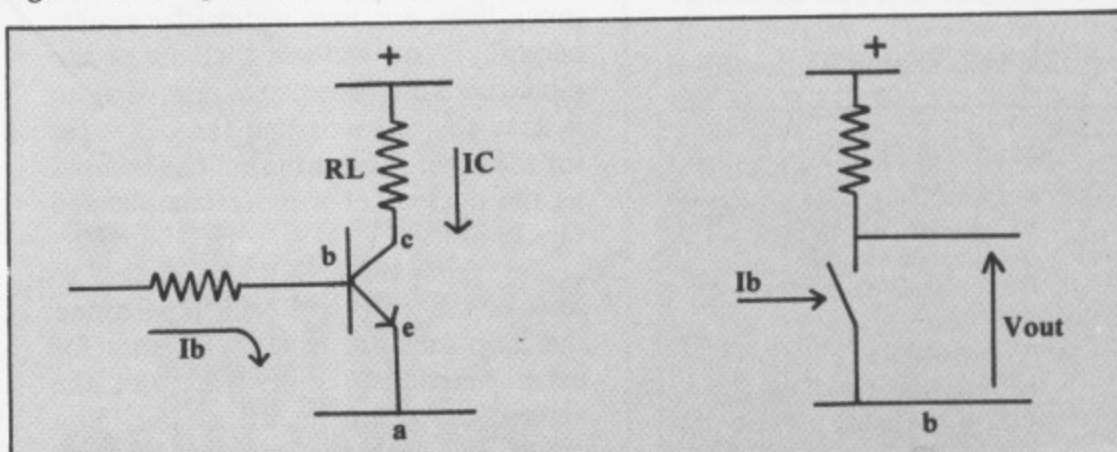


Figure IV: The transistor as a switch

maximum size of the current I_c . When this happens the transistor is said to be saturated. It stands to reason that when this happens there is no voltage across the collector and emitter of the transistor, and the transistor is said to be "turned on".

Looked at another way (in Figure IVb), base current causes a switch to be closed. When no base current is flowing the switch will be open, thus you get a voltage at the point V_{out} . You can see that this is an inverting action. We can now apply this to our problem.

The circuit shown in Figure V consists of three parts, the first two of which (T_1 and T_2) are identical and condition the up/down and left/right outputs of the joystick. The final transistor (T_3) deals with the fire button.

The joystick's central lever is connected to the full scale voltage of the A/D converter called V_{ref} (short for reference voltage). When in its central position it does not make contact with either connectors 1 or 2 and so T_1 is

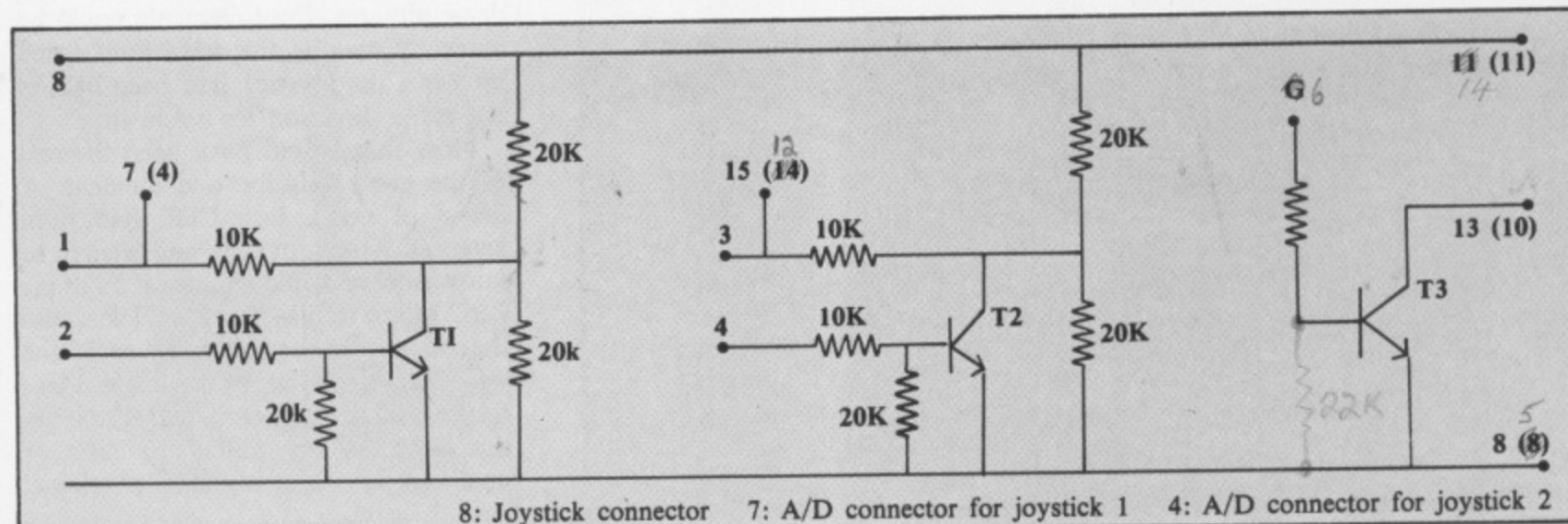


Figure V: Atari joystick to BBC Micro interface

off. This means that the voltage at pin 7, the input of the A/D converter, is at half the Vref value due to the potential divider action of the two 20k resistors. This gives a mid-range number with no movement of the joystick.

If the joystick lever is pushed forward it makes a connection with contact 1 and, as this is wired directly to the A/D input, we get the full range number.

If the joystick is pulled back, then Vref is connected to contact 2. This drives current into the base of transistor T1 and turns it on. In turn this shorts out the lower 20k resistor and so puts zero volts on the A/D input, thus giving a low number – actually zero. The circuit is the same for the left/right connections using transistor T2. Finally, transistor T3 in-

THE BEEB BODY BUILDING COURSE

verts the high voltage on connector 6 when the fire button is pressed by acting as a switch.

You may have to read that a few times and follow Figure V closely before you understand it. Sorry, but it don't come any simpler. Again, the resistor values are not very critical and

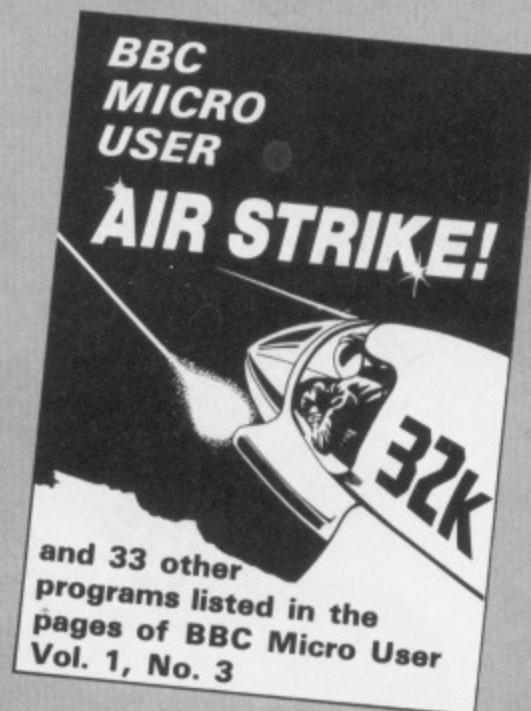
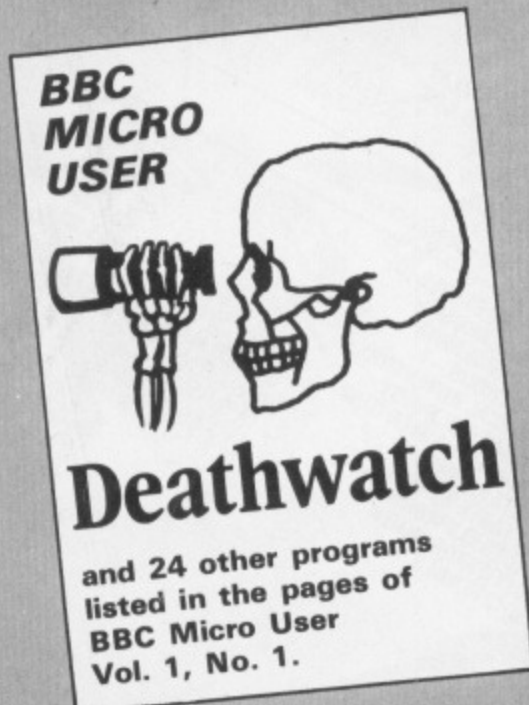
you may use values up to 10k greater than those shown. The transistors also can be any general purpose NPN transistors such as a BC107.

Armed with a joystick, programming can become more interesting, games more exciting and other applications possible. For example, how about making the joystick control the envelope or frequency parameters of the sound synthesiser so you can interact with the noise?

Or you could use a joystick to point to options in a menu and use the fire button to select them. Do not think the applications of a joystick are limited to games. Have a good old joystick joggle.

● Next month the misers' graphics digitiser will exercise your arms as well as your imagination.

We've got it all taped!



Top-quality cassettes of programs listed in BBC Micro User

March Issue

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

April Issue

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

May issue

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

Save wear on your fingers – and ensure your programs are error-free!

£3.75 each

(incl. p&p)

ORDER FORM ON PAGE 81

Prices include VAT

- # HARDWARE
- | | | | |
|-------|------------------------------|----------------|--------|
| MMB01 | BBC MODEL B | ECONET (ACORN) | 803.85 |
| MMB02 | BBC MODEL B + ECON/DISK INT | (ACORN) | 109.50 |
| MMB03 | BBC MODEL B + ECON/DISK INT | (ACORN) | 195.50 |
| MMB04 | BBC MODEL B + DISK INTERFACE | (ACORN) | 310.50 |
| MMB05 | BBC MODEL A | (ACORN) | 225.00 |
| MMB06 | BBC MODEL A + ECONET | (ACORN) | 103.00 |
| MMB07 | BBC DISK DRIVE 100K | (ACORN) | 20.00 |
| MMB08 | BBC DISK DRIVE 800K | (ACORN) | 20.00 |
| MMB09 | BBC DISK INTERFACE | (ACORN) | 20.00 |
| MMB10 | BBC 8502 2nd PROCESSOR | (ACORN) | 20.00 |
| MMB11 | BBC 8502 2nd PROCESSOR | (ACORN) | 20.00 |
| MMB12 | TELETEXT RECEIVER | (MICROVITEC) | 20.00 |
| MMB13 | JOYSTICKS (PAIR) | (MICRO MAN) | 20.00 |
| MMB14 | RGB COLOUR MONITOR S/RES | (PRINCE) | 20.00 |
| MMB15 | RGB COLOUR MONITOR H/RES | (MICROVITEC) | 20.00 |
| MMB16 | RGB CABLE | (ACORN) | 20.00 |
| MMB17 | 12" GREEN MONITOR | (ACORN) | 20.00 |
| MMB18 | 12" AMBER MONITOR | (ACORN) | 20.00 |
| MMB19 | PLINTH FOR RGB MONITOR | (ACORN) | 20.00 |
| MMB20 | 12" AMBER MONITOR | (ACORN) | 20.00 |
| MMB21 | PLINTH FOR RGB MONITOR | (ACORN) | 20.00 |
| MMB22 | A TO B UPGRADE (KIT) | (ACORN) | 20.00 |
| MMB23 | A TO B UPGRADE (KIT) | (ACORN) | 20.00 |
| MMB24 | MEMORY I/O (KIT) | (ACORN) | 20.00 |
| MMB25 | ANALOGUE (KIT) | (ACORN) | 20.00 |
| MMB26 | SERIAL I/O & BUS (KIT) | (ACORN) | 20.00 |
| MMB27 | EXPANSION BUS (KIT) | (ACORN) | 20.00 |
| MMB28 | PARALLEL CABLE ASSEMBLED | (ACORN) | 20.00 |
| MMB29 | USER PORT CABLE ASSEMBLED | (ACORN) | 20.00 |
| MMB30 | ANALOGUE PLUG & CABLE | (ACORN) | 20.00 |
| MMB31 | 5 PIN DIN | (ACORN) | 20.00 |
| MMB32 | 6 PIN DIN | (ACORN) | 20.00 |
| MMB33 | 7 PIN DIN | (ACORN) | 20.00 |
| MMB34 | BUS CONNECTOR | (ACORN) | 20.00 |
| | SEIKOSHA 6P2 | | |
| | EPSON 8P2 | | |

- | | | |
|--|-------|------------------------|
| | MMB44 | DISK DRIVE DUST COVER |
| | MMB46 | CASSETTE RECORDER |
| | MMB47 | FLOWCHART STENCIL |
| | MMB48 | DISK LIBRARY CASE |
| | MMB49 | PAPER LISTING BINDER |
| | MMB50 | PAPER 9½"×11" (2000) |
| | MMB51 | GRAPHICS TABLET (DISK) |
| | MMB52 | LIGHT PEN |
| | MMB53 | A/D CONVERTOR |
| | MMB54 | 128 K RAM PACK |
| | MMB55 | COOLING FAN |
| | MMB56 | DISK DRIVE S.S. 40 T |
| | MMB57 | DISK DRIVE D.S. 80 |
| | MMB58 | DISK DRIVE 2"D.S. |
| | MMB59 | DISK DRIVE CABLE |
| | MMB60 | 2 DRIVE BBC C |
| | MMB61 | 30 PROGS FOR |
| | MMB62 | APL FOR THE 6 |
| | MMB63 | 6502 APPL |
| | MMB64 | BBC MICRO |
| | MMB65 | LET BBC |
| | MMB66 | 30 HOUR |
| | MMB67 | Z80 D |
| | MMB68 | 6502 |
| | MMB69 | INT |
| | MMB70 | D |
| | MMB71 | D |
| | MMB72 | D |
| | MMB73 | D |
| | MMB74 | D |
| | MMB75 | D |
| | MMB76 | D |
| | MMB77 | D |
| | MMB78 | D |
| | MMB79 | D |
| | MMB80 | D |
| | MMB81 | D |
| | MMB82 | D |
| | MMB83 | D |
| | MMB84 | D |
| | MMB85 | D |
| | MMB86 | D |
| | MMB87 | D |
| | MMB88 | D |
| | MMB89 | D |
| | MMB90 | D |
| | MMB91 | D |
| | MMB92 | D |
| | MMB93 | D |
| | MMB94 | D |
| | MMB95 | D |
| | MMB96 | D |
| | MMB97 | D |
| | MMB98 | D |
| | MMB99 | D |
| | MMB00 | D |

- (MICRO MAN) \$
(ACCO)

**ECONET?
ASK US**

- | ECONET?
ASK US | | PARADOX TOMB (A & F SOFTWARE) £7.99 | | £7.99 | | £6.99 | |
|-------------------|--------|-------------------------------------|--------|-------|-----------------|--------|--------|
| 5.74 | MMS013 | PHARAOHS TOMB (A & F SOFTWARE) | £7.99 | 5.69 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 29.00 | MMS014 | FROGGER | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 4.02 | MMS015 | LUNAR LANDER | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 2.87 | MMS016 | MAZE INVADERS | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 2.87 | MMS017 | FOOTER | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 14.95 | MMS018 | GOMOKO | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 86.25 | MMS019 | BOMOCYAN | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 143.75 | MMS020 | MASTERMIND | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 34.50 | MMS021 | SPACE MAZE | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 36.23 | MMS022 | COWBOY SHOOTOUT | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 343.85 | MMS023 | ALIEN DESTROYER | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 38.24 | MMS024 | MARTIANS | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 228.85 | MMS025 | SWOOP | £7.99 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 396.75 | MMS026 | SEEK (PROGRAM POWER) | £ 6.84 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 711.85 | MMS027 | GALACTIC COMMANDER | £ 6.84 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 17.25 | MMS028 | CAT & MOUSE | £ 6.84 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 8.95 | MMS029 | ZOMBIES | £ 6.84 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 4.95 | MMS030 | STARTREK | £ 6.84 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 10.75 | MMS031 | REVERSI 1 | £ 6.84 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |
| 75 | MMS032 | CHES | £ 6.84 | 7.99 | (PROGRAM POWER) | £ 4.54 | £ 6.84 |

- | | | |
|---------------------|---|--------|
| (R. ZAKS) | £ | 6.45 |
| (R. ZAKS) | £ | 5.95 |
| (J. RUSTON) | £ | 780.00 |
| (T. HARTNELL) | £ | 10.25 |
| (C. PRIGMORE) | £ | 8.25 |
| (TORCH) | £ | 10.25 |
| (L. J. SCANLON) | £ | 14.95 |
| (K. NECHT) | £ | |
| (T. HOGAN) | £ | |
| (W. J. WELLER) | £ | |
| (D. JOHNSTON-DAVIS) | £ | 5.95 |
| (BBC) | £ | 6.75 |
| (E. DEESON) | £ | 5.95 |
| (T. HARTNELL) | £ | 5.95 |
| (N. & P. CRYER) | £ | 5.95 |
| (SAMS) | £ | 12.50 |
| (ACORN) | £ | 11.50 |

Prices include VAT (A.J.)

- SOFTWARE** (All prices include postage)
- | | |
|--------|-----------------------|
| MMS001 | OPTIONS TIMETABLE (C) |
| MMS002 | RECORD CHANGER |
| MMS003 | WORD PROCESSOR - I |
| MMS004 | EDUCATIONAL ADVENTURE |
| MMS005 | COLOSSAL ADVENTURE |
| MMS006 | ADVENTURE ADVENTURE |
| MMS007 | DUNGEON SPELL |
| MMS008 | STARSPELL |
| MMS009 | TABLE STAR |
| MMS010 | EARLY WARNING |
| MMS011 | ROADRUNNER |
| MMS012 | PLANES |

- | | |
|-------------------|--------|
| (A.J. VISION) | £18.75 |
| (A.J. VISION) | £ 9.25 |
| (A.J. VISION) | £11.38 |
| (GOLEM) | £11.38 |
| (LEVEL 9) | £11.38 |
| (LEVEL 9) | £11.50 |
| (FISHER MARRIOTT) | £11.50 |
| (FISHER MARRIOTT) | £ 6.90 |
| (FISHER SOFTWARE) | £ 6.90 |
| (A & F SOFTWARE) | £ 7.99 |

CODE	ITEM	QTY	£	p	£	p
CREDIT CARD No		SUB TOTAL				
NAME		BARCLAY/ACCESS	POST & PACKING			
ADDRESS		TOTAL				

F BBC MICROS ACCESSORIES

Market
your own
software through us
Write with
details

MMS060 ALGEBRAIC MANIPULATION (ACORN/ST)
MMS061 MONSTERS (ACORN/ST)
MMS062 PLANETOID (ACORN/ST)
MMS063 ARCADE ACTION (ACORN/ST)
MMS064 DESK DIARY (ACORN/ST)
MMS065 PHILOSOPHERS QUEST (ACORN/ST)
MMS066 LISP (ACORN/ST)
MMS067 GRAPHS & CHARTS (ACORN/ST)
MMS068 CREATIVE GRAPHICS (BOOK) (ACORN/ST)

MMS069 LOGO II (COMPUTER CONCEPTS) £ 9.95
MMS070 FRUIT MACHINE (BUG-BYTE) £ 9.95
MMS071 FORTH-HIKER (BUG-BYTE) £ 9.95
MMS072 HITCHHIKERS (COMPUTER CONCEPTS) £ 9.95
MMS073 SPACEHAWKS (COMPUTER CONCEPTS) £ 9.95
MMS074 ASTEROID BELT (COMPUTER CONCEPTS) £ 9.95
MMS075 CHESS (COMPUTER CONCEPTS) £ 9.95
MMS076 ANGLEZUP (GEM SOFTWARE) £ 9.95
MMS077 L TRAP (GEM SOFTWARE) £ 9.95
MMS078 TAKE OFF (GEM SOFTWARE) £ 9.95
MMS079 GRAPH CAPERS (BUG-BYTE) £ 9.95
MMS080 MONTE CARLO (BUG-BYTE) £ 9.95
MMS081 SPACE WARP (BUG-BYTE) £ 9.95
MMS082 GOLF (BUG-BYTE) £ 9.95
MMS083 DRAGON QUEST (BUG-BYTE) £ 9.95
MMS084 AIRLIFT (BUG-BYTE) £ 9.95
MMS085 POLARIS (ACORN/ST) £ 9.95
MMS086 CUBE MASTER (ACORN/ST) £ 9.95
MMS089 GRAPHS & CHARTS (ACORN/ST) £ 9.95
MMS091 HOME FINANCE (BBC) £ 9.95
MMS092 EARLY LEARNING (BBC) £ 9.95
MMS093 MUSIC (BBC) £ 9.95
MMS094 THE COMPUTER PROG VOL 1 (BBC) £ 9.95
MMS095 THE COMPUTER PROG VOL 2 (BBC) £ 9.95
MMS096 PAINTING (BBC) £ 9.95
MMS097 DRAWING (BBC) £ 9.95
MMS098 GAMES OF STRATEGY (BBC) £ 9.95
MMS099 FUN GAMES (BBC) £ 9.95
MMS100 SALES LEDGER DISK (BBC) £ 9.95
MMS101 PURCHASE LEDGER DISK (BBC) £ 9.95
MMS102 FILE IT DISK (BBC) £ 9.95
MMS103 MAILING LIST DISK (BBC) £ 9.95
MMS104 MISSING SIGNS (BBC) £ 9.95
MMS105 WORD SEQUENCING (BBC) £ 9.95
MMS106 SENTENCE SEQUENCING (BBC) £ 9.95
MMS107 MONSTERS (BBC) £ 9.95
MMS108 SNAPPER (BBC) £ 9.95
MMS109 PLANETOID (BBC) £ 9.95
MMS110 INVADERS (BBC) £ 9.95
MMS111 MUTANT BREAKOUT (BBC) £ 9.95
MMS112 3-D MAZE (BBC) £ 9.95
MMS113 BEEB BEEP (BBC) £ 9.95
MMS114 SUPER HANGMAN (BBC) £ 9.95
MMS115 FLAGS (BBC) £ 9.95
MMS116 STRATOBOMBER (BBC) £ 9.95
MMS117 FAMILY GAMES (BBC) £ 9.95
MMS118 BEEB MUNCH (BBC) £ 9.95
MMS119 STARTREK/CANDYLOSS (BBC) £ 9.95
MMS120 POLAR BEAR (BBC) £ 9.95
MMS121 DATABASE FOR 16/32K (BBC) £ 9.95
MMS122 J.R. (BBC) £ 9.95

MMS123 SPACE KINGDOM (SOFTWARE FOR ALL) £ 7.95
MMS130 CAR WARS/ALIEN PLANET (SOFTWARE FOR ALL) £ 6.95
MMS131 TIME TRAVELLER (SOFTWARE FOR ALL) £ 6.95
MMS132 UTILITY PACK 1 (SOFTWARE FOR ALL) £ 7.45
MMS133 ZOMBIE ISLAND (SOFTWARE FOR ALL) £ 6.95
MMS134 ROW OF FOUR (SOFTWARE FOR ALL) £ 6.95
MMS135 BEEB TREK (SOFTWARE FOR ALL) £ 6.95
MMS136 GALACTIC INTRUDER (SOFTWARE FOR ALL) £ 6.95
MMS137 INHERITANCE (SOFTWARE FOR ALL) £ 6.95
MMS138 GREAT BRITAIN LTD. (SOFTWARE FOR ALL) £ 6.95
MMS139 WORLD TRAVEL GAME (SOFTWARE FOR ALL) £ 6.95
MMS140 PASCAL (SOFTWARE FOR ALL) £ 6.95
MMS141 ANGLE (SOFTWARE FOR ALL) £ 6.95
MMS142 INKOSI (SOFTWARE FOR ALL) £ 6.95
MMS143 INVISIBLE MAN (SOFTWARE FOR ALL) £ 6.95
MMS144 LETTERS (SOFTWARE FOR ALL) £ 6.95
MMS145 METRICS (SOFTWARE FOR ALL) £ 6.95
MMS146 SEQUENCES (SOFTWARE FOR ALL) £ 6.95
MMS147 CASTLE OF RIDDLES (SOFTWARE FOR ALL) £ 6.95
MMS148 BBC BASIC COMPILER (SOFTWARE FOR ALL) £ 6.95
MMS149 ROCKET RAIDER (SOFTWARE FOR ALL) £ 6.95
MMS150 SPINX ADVENTURER (SOFTWARE FOR ALL) £ 6.95
MMS151 SLIDING BLOCK PUZZLER (SOFTWARE FOR ALL) £ 6.95
MMS152 MUSIC TUTOR 1 (SOFTWARE FOR ALL) £ 6.95
MMS153 MORSE TUTOR (SOFTWARE FOR ALL) £ 6.95
MMS154 MORSE TUTOR 2 (SOFTWARE FOR ALL) £ 6.95
MMS155 30+ PROGS FOR THE BBC (C.J.E.) (SOFTWARE FOR ALL) £ 6.95

MMS156 WAR & PEACE NUMBERS (FISHER MARRIOTT) £ 11.50
MMS157 WAR & PEACE TABLES (FISHER MARRIOTT) £ 11.50
MMS158 WORDWISE (COMPUTER CONCEPTS) £ 44.85
MMS159 EDUCATIONAL 2 (GOLEM) £ 9.25
MMS160 SUPERLIFE (GOLEM) £ 10.58
MMS161 KATAKOMBS (GOLEM) £ 9.25
MMS162 UTILITIES (GOLEM) £ 9.25



MMS034 WORLD GEOGRAPHY (PROGRAM POWER) £ 6.84
MMS035 JUNIOR MATHS (PROGRAM POWER) £ 6.84
MMS036 DISASSEMBLER (PROGRAM POWER) £ 6.84
MMS037 TIMETREK (PROGRAM POWER) £ 6.84
MMS038 ADVENTURE (PROGRAM POWER) £ 6.84
MMS039 EL DORADO GOLD (PROGRAM POWER) £ 6.84
MMS040 LASER COMMAND (PROGRAM POWER) £ 6.84
MMS041 ASTRO NAVIGATOR (PROGRAM POWER) £ 6.84
MMS042 MICRO BUDGET (PROGRAM POWER) £ 6.84
MMS043 FILER (PROGRAM POWER) £ 6.84
MMS044 CONSTELLATION (PROGRAM POWER) £ 6.84
MMS045 BEEB TAPE (PROGRAM POWER) £ 6.84
MMS046 MICROPIRATES (PROGRAM POWER) £ 6.84
MMS047 CHESS (PROGRAM POWER) £ 6.84
MMS048 ARCADIAN (PROGRAM POWER) £ 6.84
MMS049 SNAPPER (PROGRAM POWER) £ 6.84
MMS050 METEORS (PROGRAM POWER) £ 6.84
MMS051 CREATIVE GRAPHICS (PROGRAM POWER) £ 6.84
MMS052 TREE OF KNOWLEDGE (PROGRAM POWER) £ 6.84
MMS053 BUSINESS GAMES (PROGRAM POWER) £ 6.84
MMS054 PEEKO-COMPUTER (PROGRAM POWER) £ 6.84

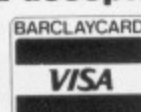
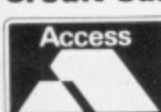
MMS055 AIRLIFT (BUG-BYTE) £ 6.84
MMS056 POLARIS (ACORN/ST) £ 6.84
MMS057 CUBE MASTER (ACORN/ST) £ 6.84
MMS058 GRAPHS & CHARTS (ACORN/ST) £ 6.84
MMS059 HOME FINANCE (BBC) £ 6.84
MMS060 EARLY LEARNING (BBC) £ 6.84
MMS061 MUSIC (BBC) £ 6.84
MMS062 THE COMPUTER PROG VOL 1 (BBC) £ 6.84
MMS063 THE COMPUTER PROG VOL 2 (BBC) £ 6.84
MMS064 PAINTING (BBC) £ 6.84
MMS065 DRAWING (BBC) £ 6.84
MMS066 GAMES OF STRATEGY (BBC) £ 6.84
MMS067 FUN GAMES (BBC) £ 6.84
MMS068 SALES LEDGER DISK (BBC) £ 6.84
MMS069 PURCHASE LEDGER DISK (BBC) £ 6.84
MMS070 FILE IT DISK (BBC) £ 6.84
MMS071 MISSING SIGNS (BBC) £ 6.84
MMS072 WORD SEQUENCING (BBC) £ 6.84
MMS073 SENTENCE SEQUENCING (BBC) £ 6.84
MMS074 MONSTERS (BBC) £ 6.84
MMS075 SNAPPER (BBC) £ 6.84
MMS076 PLANETOID (BBC) £ 6.84
MMS077 INVADERS (BBC) £ 6.84
MMS078 MUTANT BREAKOUT (BBC) £ 6.84
MMS079 3-D MAZE (BBC) £ 6.84
MMS080 BEEB BEEP (BBC) £ 6.84
MMS081 SUPER HANGMAN (BBC) £ 6.84
MMS082 FLAGS (BBC) £ 6.84
MMS083 STRATOBOMBER (BBC) £ 6.84
MMS084 FAMILY GAMES (BBC) £ 6.84
MMS085 BEEB MUNCH (BBC) £ 6.84
MMS086 STARTREK/CANDYLOSS (BBC) £ 6.84
MMS087 POLAR BEAR (BBC) £ 6.84
MMS088 DATABASE FOR 16/32K (BBC) £ 6.84
MMS089 J.R. (BBC) £ 6.84

MMS090 WAR & PEACE NUMBERS (FISHER MARRIOTT) £ 11.50
MMS091 WAR & PEACE TABLES (FISHER MARRIOTT) £ 11.50
MMS092 WORDWISE (COMPUTER CONCEPTS) £ 44.85
MMS093 EDUCATIONAL 2 (GOLEM) £ 9.25
MMS094 SUPERLIFE (GOLEM) £ 10.58
MMS095 KATAKOMBS (GOLEM) £ 9.25
MMS096 UTILITIES (GOLEM) £ 9.25

Overseas
dealers
and distributors
enquiries welcomed.
Exports a
speciality

Local
Authorities and
Government Departments.
Orders welcomed.
Educational Seminars
given.

Mail or telephone order
Barclaycard or Access
Credit Card accepted



Only defective or faulty goods
may be returned.



MICRO MANAGEMENT

POST and
PACKING

IS STILL ONLY
£1 PER ITEM

Micro Management 32 Princes Street, Ipswich, Suffolk. Telephone: (0473) 59181

OSBYTE

WE will be looking this month at the two sets of operating system routines which go under the names of OSBYTE and OSWORD. I shall try to explain how they are organised and how to use them from within Basic and from assembly language.

The OSBYTE routines are those which only deal with a single byte of data at a time, such as reading or writing to the user port or putting characters into or taking them out of the various input and output buffers.

The OSWORD routines, on the other hand, are those which either need to use several bytes to specify how the particular routine is to operate, or which need to pass or return several bytes of data. The idea of this should become clearer once we have looked at the OSBYTE routines and seen how they work.

IN order to see how the OSBYTE routines are arranged, here is a hypothetical case involving Basic in which it is probably easier to see what is happening than it would be if we were dealing with machine code.

Suppose you wanted to supply a user with a set of subroutines which he could call from simple Basic programs, and you wanted to be able to correct if necessary and to improve the routines at a later date.

You would want to do it in such a way that the user could simply replace the old routines with the new ones

Paul Beverley is lecturer in electronics at Norwich City College.

without having to change any of the programs which use them.

How then would you present the routines, and how would you make it easy for the user to use them and for you to update them?

One way would be to say that such and such a routine was called by "GOSUB 10000", the next one by "GOSUB 11000", the next by "GOSUB 12000", and so on.

That would be easy enough in Basic, since there is no shortage of line numbers, so that if you wanted to update the routines you could fit in the extra lines without having to change the line numbers from which they were called.

But remember that what

routines provided consist of lines 10000 onwards, and they are called from the program which the user has written in the first six lines.

This program does actually work. Although it doesn't do anything very spectacular, hopefully it illustrates the point.

The way in which the routines work is that no matter which is being called, the same statement is used namely "GOSUB 10000". Which actual subroutine is executed depends on the value of A% when the routine at line 10000 is called.

The ON GOTO statement determines the actual line number to which the Basic interpreter is directed.

The user of these routines

10 routine number 5 is called, and in this case no data is needed – it simply produces a buzz.

At line 20 the mode change routine is called (routine number 4). This just requires a single piece of data – the number of the mode required – and X% is used to carry this data.

Routine number 3, which is called from line 30, uses two parameters and these are transferred using the variables X% and Y%. The action of this routine is to change the logical colour number, X%, to the actual colour, Y%. In other words it is the VDU 19 command.

The final command which is called in this small program is routine number 1, and it is called from line 40.

As you can see, data is not only passed into this routine, but is also returned from it. Y% is used to carry the answer of the calculation, which comes as a result of raising one number to the power of the other, back into the program which called it.

How then does this relate to the OSBYTE routines? It is no coincidence that we have used A%, X% and Y%, because A, X and Y are the letters used to represent the three registers in the 6502 microprocessor.

A is the accumulator, and X and Y are known as the index registers. When you jump from Basic into a machine code program by using the CALL command, Basic takes the lowest byte of each of the integer variables A%, X% and Y% and puts them into the A, X and Y registers respectively before jumping to the address specified in the

we are trying to do is to see how the machine code routines in the operating system are arranged.

In machine code, if you add any extra instructions in the middle you have to move all the rest down a bit, which changes their addresses.

Let us look therefore at another way of arranging these Basic routines.

Program I illustrates an alternative method. The

has no need to know what these actual line numbers are, and it does not matter if you change the numbering of the routines when you supply an up-dated version.

All you have to do is to reserve a particular value of A% for each particular routine.

By looking at Program I we can get some idea of how data is transferred to the OSBYTE routines. At line



PAUL BEVERLEY explains the intricacies of the BBC Micro's two operating system routines

CALL.

Programs II, III and IV show one way in which you could CALL some of the OSBYTE routines.

Programs II calls OSBYTE

```
10 OSBYTE=&FFF4
20 AZ=0
30 CALL OSBYTE
```

Program II

routine 0 which interrupts the processor and produces the operating system title before returning you to Basic.

Program III is an example of passing a variable into the X register. The value given for X% in this case is the time in centiseconds of the auto-repeat on the keys.

In the third example

```
10 OSBYTE=&FFF4
20 AZ=11
30 X%=1
40 CALL OSBYTE
```

Program III

(Program IV), two variables are passed. Unfortunately, the routine it uses is only available in operating systems 1.0 onwards, so if you still only have the 0.1 version you will not be able to try it out.

There are various buffers on the BBC machine, such as the keyboard, the speech

```
10 AZ=5:GOSUB 10000
20 AZ=4 : X%=6 : GOSUB 10000
30 AZ=3 : X%=0 : Y%=4 : GOSUB 10000
40 AZ=1 : X%=2 : Y%=3 : GOSUB 10000
50 PRINT "The cube of ";X% " is ";Y%
60 END
70
10000 ON AZ GOTO 10200, 10600, 11000, 11400, 11800, 12200
10100
10200 REM Routine 1 - Power calculation
10300 Y%=X%^Y%
10400 RETURN
10500
10600 REM Routine 2 - This routine is not available
10700 REM before version 1.0!!!!
10800 RETURN
10900
11000 REM Routine 3 - Colour change
11100 VDU19,X%,Y%,0,0,0
11200 RETURN
11300
11400 REM Routine 4 - Mode change
11500 MODE X%
11600 RETURN
11700
11800 REM Routine 5 - Buzz!
11900 VDU7
12000 RETURN
12100
12200 REM Routine 6 - For future expansion
12300 RETURN
```

Program I

input, the sound input, or the RS423, where characters can be stored until the processing software is ready to deal with them. The purpose of this routine then is to add extra bytes into these buffers.

The particular buffer is selected by the value of X% and in this case we have chosen the keyboard buffer by setting X%=0.

The value of Y% is the Ascii code of the character which is to be inserted. Any characters which are thus inserted will be dealt with as if they had been typed in from the keyboard.

Thus as soon as the program itself has finished running, the Basic monitor looks in the keyboard buffer to see if any characters have

```
10 OSBYTE=&FFF4
20 AZ=138
30 X%=0
40 Y%=78
50 CALL OSBYTE
60 Y%=69
70 CALL OSBYTE
80 Y%=87
90 CALL OSBYTE
100 Y%=13
110 CALL OSBYTE
```

Program IV

been typed in during the running of the program.

It finds the characters which you have put in and prints them out on the screen, and since the last character is a carriage return (13), it acts on them.

If you run this you will see that it is an auto-destruct program! However you can, of course, regain it by typing OLD.

```
10 *FX138,0,78
20 *FX138,0,69
30 *FX138,0,87
40 *FX138,0,13
```

Program V

If you want to use some of the OSBYTE routines without going into machine code, then provided the routines do not expect data to be returned you can use the *FX command.

If we translate Programs II, III and IV using the *FX command, they become very simple. For example, Program II becomes simply *FX 0, and Program III reduces to *FX 11,1.

Program V is the equivalent of Program IV when turned into *FX form. As you should be able to see by comparing Programs IV and V, the first parameter after the FX is the routine

OSWORD

From Page 45

number, that is the contents of the accumulator. The next two are the X and Y registers respectively.

If no parameter is specified in the FX call it is assumed to be zero, so if you want, for example, to use *FX 12,0 to restore the auto-repeat time to its default value you could just say *FX12, since the X value is then assumed to be zero.

If you are wanting to use

```
10 DIM CODE 100
20 OSBYTE = &FFF4
30 P%=CODE
40 [
50 LDA # 138
55 LDX # 0
60 LDY # 78
70 JSR OSBYTE
80 LDA # 138
85 LDX # 0
90 LDY # 69
100 JSR OSBYTE
110 LDA # 138
115 LDX # 0
120 LDY # 87
130 JSR OSBYTE
140 LDA # 138
145 LDX # 0
150 LDY # 13
160 JSR OSBYTE
170 RTS
180 ]
190 CALL CODE
```

Program VI

OSBYTE CALLS from within machine code you have to use the load immediate (LDA#) command as shown in the example in Program VI. Once again, this program produces exactly the same effect as Programs IV and V.

Exactly what each of the OSBYTE calls does is too complex to describe here, but I have tried to give at least some idea of the way in which they can be called. These commands are summarised in the User Guide pages 418 and 419, and they are explained in detail in the rest of that chapter.

The OSWORD routines are similar to the OSBYTE

ones in that they are selected by the number placed in the accumulator.

They are different in that they transfer more than the two bytes of data that can be held in the X and Y registers. For the OSWORD routines, the X and Y registers are used to carry the address of an area of memory which is used to store the data which is being transferred into or out of the routine.

This area of memory is known as the parameter block, and X carries the low byte of the address, and Y the high byte.

The example given in Program VII shows how this works. It involves OSWORD routines 4 and 5, which are to do with writing and reading the interval timer.

```
*DISK
*NET
*TELESOFT
*TERMINAL
```

TABLE II – These commands are mentioned in the User Guide but are not found in the OS ROM since they refer to software which will have to be put in the sideways ROM sockets.

```
*FX Call one of the write-only operating system routines.
*BASIC Switch back to Basic.
*CATT Do a catalogue of the current file system.
*CODE Does anyone know what this one does?
*EXEC Take a file into the input stream as if it came from the keyboard.
*HELP Give information on what is in the sideways ROM sockets.
*KEY Program a function key.
*LOAD Load data straight into memory.
*LINE Does anyone know what this one does?
*MOTOR Switch cassette motor on or off.
*OPT Set up various options to do with the filing systems.
*RUN Load and run a machine code program.
*ROM Switch to the ROM file system.
*SAVE Save an area of memory to the file system.
*SPOOL Send to the file a copy of all that goes to the output channel.
*TAPE Select the tape file system.
```

TABLE I – List of operating system commands. These were read directly out of the OS 1.2 ROM using a machine code monitor. Two of the command names are not mentioned in the User Guide, but presumably must do something.

You may be familiar with the TIME command in Basic, which uses a centisecond clock, and can be either written or read from Basic. The value of TIME is referred to as the elapsed time clock, and can be accessed by using OSWORD routines 1 and 2.

The interval timer, however, is not affected by, and does not affect, the value of TIME, as this program illustrates. The idea is that the routine labelled "write" from lines 50 to 100 is called in order to write zero into the interval timer.

The address of the parameter block is &D00, and at line 90 at the number 0 is written into that area of memory.

When the operating system starts into this routine it looks in the X and Y registers to find where the data is stored.

It then takes that data and puts it into the interval timer memory locations.

At line 210 the value of TIME is recorded and then printed out, and after an arbitrary waiting time produced by asking the user for an input at line 230, the value of the interval timer is read at line 240 by using the

"read" routine.

The TIME is again recorded and the difference between the first value of TIME and the second is printed out. This can be

```
10 DIM CODE 100
20 OSWORD=&FFF1
30 P%=CODE
40 [
50 .write
60 LDX#0
70 LDY#&0D
80 LDA#4
90 JSR OSWORD
100 RTS
110
120 .read
130 LDX#0
140 LDY#&0D
150 LDA#3
160 JSR OSWORD
170 RTS
180 ]
190 !&D00=0
200 CALL write
210 T%=TIME
220 PRINT T%
230 INPUT WAIT
240 CALL read
250 T1%=TIME
260 PRINT T1%
270 PRINT T1%-T%
280 PRINT !&D00
```

Program VII

compared with the value of the number recorded in memory location &D00 which had been read from the interval timer.

These two should, of course, be the same, though there is occasionally a difference of one centisecond.

As you will have gathered, there are various levels at which the operating system software can be used. DRAW, PLOT, SAVE and LOAD, for example, all use the operating system routines, and yet they are keywords specific to Basic.

Any function which deals with input or output such as the keyboard, vdu, filing systems, printers etc uses the operating system routines. From within Basic, or any other language, you need to be able to set the operating system to do various jobs and so instead of adding extra commands to the language, the common ones

are made available as what are called command lines.

In Basic these are commands such as *CAT which all begin with an asterisk. *LOAD and *SAVE are the two which you may well have used.

Again, they are not Basic commands, that is they are not the same as SAVE and LOAD.

The difference is that they allow you to load and save data to and from specific memory locations, and the commands have to be followed by data about the particular command – *SAVE "DATA" 3000 4000, saves the block of 4k of data from &3000 to &4000 under the file name "DATA".

Other such commands include *SPOOL and *EXEC, which are concerned with transferring text to and from the filing system (tape, disc or Econet).

Whenever a command line

is encountered – that is, from Basic, any line starting with an * – it is first passed to the operating system to see if it is one of the commands which it is supposed to recognise. A list of these is given in Table I.

If the operating system itself does not recognise it it compares it with all the commands available in each of the service ROMs in the sideways ROM sockets.

If it cannot find it there it looks in the serial ROMs on the cartridge input (that is the funny looking hole on the left hand side of the keyboard).

Then finally, if you are on disc or Econet, it looks to see if there is a file of that name, and if there is, it loads and executes it before returning to Basic at the line following the one from which it was called.

Most of the operating system commands given in Table I are discussed in more

detail in the User Guide on pages 416 and 417. Some of them, such as *TV and *OPT, are simply OSBYTE routines but with a name attached to them rather than with just a number – to make them easier to use.

The same effect, for example, as *TV 255 can be obtained by using OSBYTE CALL number 244 followed by the number 255, that is you would say *FX244, 255.

(Two routines have been discovered by digging around in the operating system ROM, but so far we have no idea what they do, if anything!)

As you can see, the operating system of the BBC Micro is very complex. But when you consider that there must be around 13-14k of machine code routines in the operating system ROM, it's hardly surprising that it takes quite a while to sort out how it all works.

CABEL

electronic

MONITOR MANUFACTURER



The case has been designed with safety utmost in our minds. This advanced model cuts the component count and incorporates the most sophisticated parts on the market today. Using the MULLARD AX tube, which gives perfect colour registration with reliable and stable operation. Automatic drift (Black level) compensation adjusts automatically with the ageing of the tube. All this and many other features, including years of experience in the data display industry and backed up by our 2 year guarantee. **We guarantee long service and reliability.**

- Quality.
- Reliability.
- Manufactured in Britain 100%.
- A moulded case with carrying handle.
- Meets British standard safety regulations (BS415).
- Automatic black level compensation for tube ageing.
- Mullard AX37-590x Tube.
- Power consumption 60w.

CABEL offers you a new high quality 14" colour monitor.

CE 370 A

R.G.B.
Includes Lead

£199.50 + VAT

CE 370 B

R.G.B. Composite
Video and Audio

£250 + VAT

Dealer enquiries and Education enquiries welcome.
Cheque/Postal Order, or for fast delivery, ring us with your credit card number.

CABEL

electronic

Administration:
Mount Road, Burntwood,
Walsall WS7 0AX.
Telex: 339671 ALD FAB.

Factory:
Unit 15, Whitegate Industrial Estate,
Whitegate Road, Wrexham LL11 1AY.
Tel: 0978 350345

Sales Office:
Lloyds Bank Chambers,
The High Street,
Tewkesbury, Gloucestershire.
Tel: 0684 298840

Part Three of MIKE BIBBY'S introduction to programming

String along

.. and pick up some

WE saw last month how to write our own programs, however primitive. Now we'll look at some ways of improving them. I don't guarantee that you'll be able to produce spectacular programs by the end of this article, but you will certainly be well on the way to an understanding of Basic.

First, though, let's recap a little: We saw last month that a Basic program consists of a numbered sequence of instructions to the computer.

To enter one of these instructions we simply type the correct line number, followed by the appropriate Basic keyword, then press Return.

As we discovered, because of the line number, the BBC Micro doesn't do what you tell it immediately, but remembers it as part of the program.

To see all the instructions in a program, we type:

```
LIST [Return]
```

To actually get the BBC Micro to carry out the sequence of instructions we type:

```
RUN [Return]
```

To clear a program from memory (and we should do this before entering a new program), we use:

```
NEW [Return]
```

We saw that we tended to enter line numbers in steps of 10 to allow us to fit in other instructions between them if necessary. Also we found that we could replace a line with a better version by simply giving the new version the line number of the old one.

Finally, to delete a line completely, we simply type the line number and press Return.

Program I is the one we started with last month. Before we continue, type it in and run it, to make sure you know what's going on:

```
10 PRINT "PROGRAMMING"  
20 PRINT "IS"  
30 PRINT "EASY"
```

Program II is another way of achiev-

ing exactly the same output. Type it in and try it:

```
10 A$ = "PROGRAMMING"  
20 B$ = "IS"  
30 C$ = "EASY"  
40 PRINT A$  
50 PRINT B$  
60 PRINT C$
```

Apart from its being an incredibly long-winded way of doing things, what else is going on?

Well, as you will recall from the first article in this series, the words inside quotes are known as strings – because the computer simply remembers them as strings. That is, it considers HAMSTER as H, followed by A, followed by M and so on, with no idea of the word's meaning.

I don't think that it takes all that much imagination to see that when your computer is printing a lot of output, you might be using the same string rather a lot.

For example, in a business letter you might use the name of the company fairly frequently – for example, BBC for British Broadcasting Corporation. The BBC Micro's Basic allows us to use much the same idea, but more as labels than abbreviations.

For instance, in line 10 of the above program we have labelled the string "PROGRAMMING" with the label A\$.

In computer terms, we have assigned to A\$ the value "PROGRAMMING".

All this means is that from now on wherever I want to use "PROGRAMMING" in my program, I can replace it with A\$. So line 40, which is

```
40 PRINT A$
```

causes the micro to print out "PROGRAMMING".

Admittedly in this example this technique of labelling doesn't save much space or effort, but if the program uses the word "PROGRAMMING" 100 times, there would be a substantial saving in using A\$ instead of the string itself.

Similarly, line 20 causes B\$ to label "IS" and line 30 labels "EASY" with

C\$, so that lines 50 and 60 give the appropriate printout.

Notice the following points:

- We have chosen our labels so that they consist of a letter of the alphabet followed by the "\$" sign. Actually, we don't have to restrict ourselves to just one letter, as we shall see, but our label must end with the "\$" sign, since this warns the computer that we are labelling a string. (We'll see later how to label other things.)

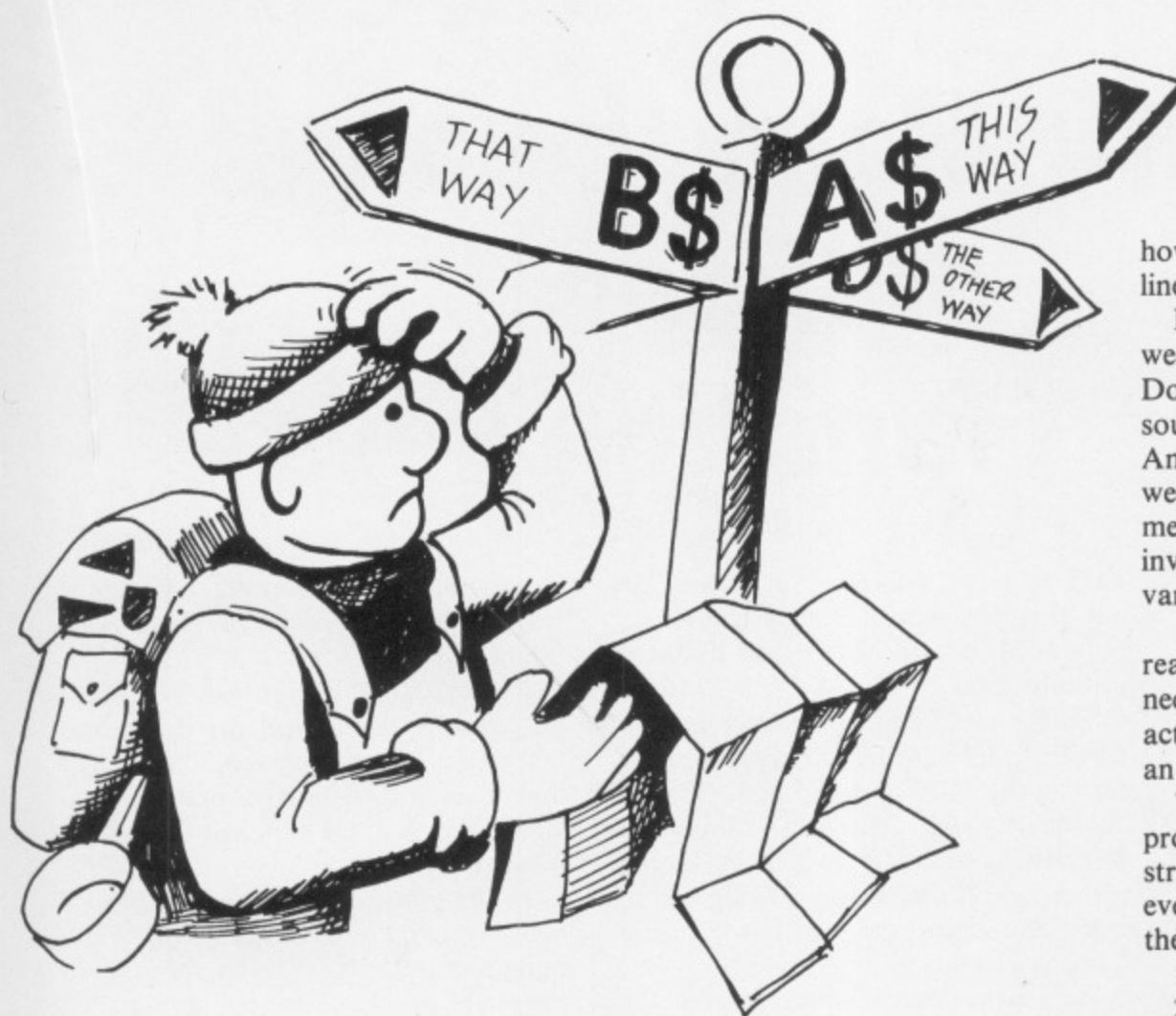
- While I used A\$ for the first label, B\$ for the second and C\$ for the third, this was totally arbitrary on my part – labels don't have to follow alphabetic or any other kind of order.

- Although we use an equals sign ("=") to connect the label with what it is labelling, it is safer, as we shall see, not to think of it as an equals sign – think in terms of A\$ becomes "PROGRAMMING" rather than A\$ equals "PROGRAMMING".

- We must have the label on the left and what is labelled on the right of the equals sign. A line such as:

```
10 "PROGRAMMING" = A$
```

just does not make sense to the BBC



e handy jargon

Micro. Try it for yourself!

● When labelling we put the string inside quotes, as we did previously when using the PRINT statement to print out strings. So line 10 reads:

```
10 A$ = "PROGRAMMING"
```

From now on A\$ completely replaces "PROGRAMMING", quotes and all, so that when we say

```
PRINT A$
```

we don't have to use any quotes – they're already there, implicit in the label A\$.

Now when we label a string the label refers to whatever is inside the quotes, including spaces, as you will see if you run Program III:

```
10 REM *** PROGRAM III ***
20 MODE 6
30 A$ = "TEST"
40 B$ = " TEST"
50 C$ = " TEST"
60 D$ = " TEST"
70 PRINT A$B$C$D$
80 PRINT A$;B$;C$;D$
90 PRINT "01234567890123456789
    0123456789"
```

Notice that our punctuation, semicolons and apostrophes, works for

labelled strings just as it worked on its own.

Notice also that we have introduced a new Basic keyword in line 10 – REM. We use REM for REMark, which is short to add comments or headings to our programs.

When the BBC Micro encounters REM in a line it ignores everything else after it on the same line. This means we can write whatever we want after REM (providing it is on the same line) without fear of the micro giving us an error message – the BBC Micro doesn't "read" the line beyond the REM.

If we use REM to prefix our comments on the program we can annotate our program. Certainly each main subdivision should have one or more REM statements explaining what is going on.

Since the BBC Micro ignores the contents of REM statements, you could leave them out of your program entirely and it will work as effectively. However it is good programming practice to include them.

In the example below I have used a single REM at the beginning of the program, as it is so short. Bear in mind

however, that REM can appear on any line in a program.

Now for some jargon. From now on we shall refer to our labels as variables. Don't be put off by the mathematical sound of that – they are still just labels! And instead of saying we are labelling, we say we are assigning, as we have mentioned previously. The actual string involved is known as the value of the variable. So

```
A$ = "TEST"
```

reads "the string variable A\$ has assigned to it the value 'TEST'". The actual act of giving a variable a value is called an assignment.

To return to the world of actual programs, you can mix and match string variables and actual strings however you want. Program IV illustrates the point:

```
10 REM ***PROGRAM IV***
20 MODE 6
30 A$ = "MY NAME IS"
40 B$ = " MIKE"
50 PRINT A$; B$
60 PRINT "MY NAME IS"; B$
70 PRINT A$; " MIKE"
```

Notice the space of the beginning of the string assigned to B\$ – you need this otherwise the output looks rather odd. Leave it out if you don't believe me!

As we saw last month, a semi-colon at the end of a line causes the next output to start immediately after the last and not on a new line – as it would do in the absence of the semi-colon. That is, it "glues" the strings together.

The internal semi-colons of lines 50, 60 and 70 do much of the same, "gluing" variables to strings, etc.

While this is grammatically correct Basic, the BBC Micro assumes (unless you tell it otherwise) that variables and strings mentioned in the same PRINT statement are meant to be output continuously on the same line. To prove this run Program IV omitting all the semi-colons.

Also, while we're on the subject of grammatical propriety, when we're assigning variables we should use the LET statement. So line 40 should read

```
40 LET B$ = "MIKE"
```

As you're already discovered, we can omit LET altogether.

● Next month, more on variables and INPUT – which opens the door to effective programming. ☺

THE User Guide contains some suggestions for using the function keys. What they amount to is to set up keys to change to MODE7 and LIST the program, to enter OLD and then RUN, and finally, to print the contents of part of memory (Page 411).

Now many other features spring to mind as being suitable for the function keys. Clearly not much advantage is gained from using them as shorthand for keywords, since there are already comprehensive abbreviation facilities, such as P. and N. So here is a brief description of some areas that seem "functionable", starting with two useful BBC functions, EVAL and ("Hex").

Designed with the object of allowing a user to enter a whole expression while a program is running, that is, to show different graphical representations of various functions, EVAL can be used in a function key to convert the computer into a simple calculator.

The key is set up to accept input of a string expression from the user, which is then EVALuated and printed. Instead of having to type a PRINT command, the user merely types, for example:

34*PI*2.3^2

or

SIN(RAD(57.3))

Further, since the EVAL function also understands hex input, the facility provides a means of converting hex to decimal. All the user does is to type:

&300

which will be evaluated to its decimal equivalent.

The reverse process, that of obtaining hex from decimal, is readily achieved by use of the ~ command, which appears to be wholly undocumented in the User Guide, although it is used without explanation in the assembler section. Thus, if a function key is set up to PRINT~N, where N is input by the user, the dec to hex facility is instantly available.

The memory map is set out on Pages 500 and 501 of the Guide. To find the length of your program, subtract PAGE from LOMEM. The space left is the gap between LOMEM and HIMEM. The function keys can readily be set up to show all or part of the memory usage, at the touch of a key.

One of the poorly documented features of the Guide is how to get your printer to function properly. It is common knowledge that some printers

need to have auto-feed set, others do not. Further, special control characters may need to be sent to select different printing fonts.

So far as the Epson printer is concerned, the auto-feed requirement is met by the *FX6,0 command. Control characters can be sent using the VDU1,n command (where n is the Ascii control character). Multiple control characters can be sent using VDU1,n,1,m.

It seems logical then to include printer set-up commands in the function keys.

In order to get paged listing, rather than scrolled listing, the control character N has to be sent before the LIST (and after any MODE change). The two different commands can be included in the function keys.

The short set-up program shows examples of the above. The key sequence is as follows:

KEY 0: Turn printer off.

KEY 1: Turn printer on.

KEY 2: Printer width 75, normal font.

KEY 3: Printer width 135, condensed font.

KEY 4: Calculator (including hex to dec).

KEY 5: Dec to hex

KEY 6: Prog size.

KEY 7:

KEY 8: Paged LIST

KEY 9: Scrolled LIST

Although it doesn't say so in the Guide (it appears that BBC hitchhikers are expected to fall into the occasional dark hole as they progress through the galaxy), there is a memory limit to the function keys.

If you try and cram too much into the key definitions you will get a mysterious BAD KEY error message. This may have nothing to do with your lack of programming skill, but simply mean that you have gone over the memory allocation for the keys.

The sample program is about the

maximum length allowed. By getting rid of spaces you could get more in, no doubt.

Further, depression of the key prints out the key definition on the screen before the key is executed. This means that a lengthy definition may have to start with a CLS to clear away unwanted printout.

In the end it is all a matter of your own ingenuity and particular programming requirements. You might want to program the keys to call pre-loaded machine code routines, or print out the time and date, or provide extensive renumbering facilities. Over to you!

```

10 *KEY0:IM
20 *KEY1:IM
30 *KEY2:IM
40 *KEY3:IM
50 *KEY4:IM
60 *KEY5:IM
70 *KEY6:IM
80 *KEY7:IM
90 *KEY8:IM
100 *KEY9:IM
110 REM PRINTER KEYS 0=OFF 1=ON
2=NORMAL/75 3=CONDENSED/135
120 *KEY0 :C
130 *KEY1 :B
140 *KEY2 WIDTH 75: VDU1,18:
*FX6,0 :M
150 *KEY3 WIDTH 135: VDU1,15:
*FX6,0 :M
160 REM SIMPLE CALCULATOR FACILITY
170 *KEY4 CLS:P.'':REPEAT INPUT
"EXPRESSION "F$:P.;EVAL(F$):UNTIL
FALSE :M
180 REM DEC TO HEX
190 *KEY5 CLS:P.'':REPEAT INPUT "DE
CIMAL "F$:P.;~VAL(F$):UNTIL FALSE :M
200 REM PROGRAM SIZE
210 *KEY6 CLS:P.'':LOMEM-PAGE :M
220 REM PAGED MODE 7 LIST
230 *KEY8 MODE 7 :M :M LIST :M
240 REM MODE 7 LIST
250 *KEY9 MODE 7 :M LIST :M

```


WIN!



THIS month's contest should prove a worthy test of your programming abilities. And we've a prize that should certainly speed up your future programming – a high quality Cumana disc drive with its own independent power supply.

With it comes a book that strips the mystery off how drives work, and takes you on a complete guided tour of the BBC's Disk Filing System (DFS).

Now for the competition itself . . .

Sean Overend's article on the opposite page tells

- ★ **One 40-track 100k Cumana disc drive, value £199.**
- ★ **One connecting cable to link the drive to your BBC Micro.**
- ★ **One copy of "Using Floppy Disks with the BBC Microcomputer."**

– They all go to the winner of this challenging contest.

you what we mean by a program that sets up the User Defined Function Keys. Every programmer seems to have his personal way of setting up the keys – Paul Leman details his in the Mode 7 article on Page 18.

All you have to do is to present us with your program to set up the function keys – the most original and creative program wins!

Send us your entries on cassette, accompanied by a listing – with your name and address clearly marked on both – before June 30. (If you want your cassette returning please enclose a stamped addressed envelope, otherwise we shall donate it to a school.)

Each entry must include the entry form printed below – or a copy of it.

★★★★★★★★★★★★★★★★

Leeds reader wins colour monitor

WE had many hundreds of entries for our first competition in the March issue of BBC Micro User, and while only a handful managed to recreate the original photograph, most entries were very close indeed – close enough to give Percival a headache sorting them out!

Programming was to an extremely high standard, and it was obvious that many of you had gone to a great deal of trouble.

Perhaps the most remarkable aspect was the large variety of execution times – the longest took just under an hour!

Eventual winner was Stuart Stoney of Leeds, and the superb Microvitec monitor presented by Silicon Express is on its way to him.

Those who didn't manage to

crack the program will be glad to know that Percival has found his original. (He actually tried to sneak it into the competition but the editor spotted it.) We present it here with no explanation, as he's forgotten how it works.

```

10 RZ=300
20 DIMX(100),Y(100)
30 MODE1:VDU19,0,4;0;
40 VDU 29,640;512;:MOVE
   RZ,0
50 FOR IZ=0 TO 100
60 Z=2*PI*IZ/100
70 X(IZ)=RZ*COSZ:Y(IZ)=
   RZ*SIN Z
80 NEXT
90 FOR A=0 TO PI STEP 0.1
100 ANGLE=COS A
110 FOR IZ=1 TO 100
120 DRAW X(IZ),Y(IZ)*ANGLE
130 GCOL0,IZMOD3+1
140 NEXT
150 NEXT
  
```



Your FREE entry form

My cassette and listing for the BBC disc drive competition is enclosed, plus a stamped addressed envelope for its return.

Name

Address

Tel: No.

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

★★★★★★★★★★★★★★★★

**A fast and furious
arcade game by
Jonathan McFarlane**

HOVERING over the mountains of the enemy planet, a ship appears on the horizon. Move in, line up your sights and fire ...

Air Strike is an arcade-style game for the 32k BBC machine. The aim of the game is to shoot as many aliens as possible before they get you.

There are four different types of nasties, two on the ground firing up at you and two airborne. A description of them and how they attack is given in the instructions along with directions for movement of your craft.

There are three levels of play (1 being the hardest and 3 the easiest) to

choo
playe
level
diffic
appr
accu
ship
score

Th
you
enou
top
game
the
upda
incom
grap

A
need
□ S
cont

AIR STRIKE!

***Fly low and fast
to zap the aliens***

choose from, after which a short tune is played and the screen is set up. On level one your spaceship is more difficult to control and the aliens approach more rapidly, firing more accurately and more often. A bonus ship is awarded for every 1000 points scored.

The game ends when you lose all your lives, but if your score is high enough you can enter your name in the top five high score table. During the game your score, ships remaining and the high score are displayed and updated whenever necessary. The game incorporates realistic sound effects, graphics, colour and explosions.

A few hints and believe us, you'll need them:

□ Stick to level 3 until you master the controls, because level 1 requires the

quickest of reflexes and a lot of skill.

□ Try to keep low, in order to dodge flak and missiles fired at you from ground bases.

□ Don't get too near the top or bottom, as you might explode.

□ Don't go too fast as you could lose control of the craft and crash.

□ On level 1, avoid the mother ship, which is deadly.

The program calls two main routines, one to move your ship and one to move the alien, which in their turn call other procedures to do such things as check for crashes and update scores.

The program uses integer variables – the ones followed by a % sign – to speed up the program. For the same reason multi-statement lines and procedures are used.

Note that BBC owners with the disc interface might find that they do not have enough memory to type in the program. This should be remedied by leaving out all unnecessary spaces.

```

0 REM AIR STRIKE MK VII
1 REM Jon McFarlane 1983
2 ONERRORPROCCL(2):CLS:VDU4:GOTO7
3 DIMN$(5),HHZ(5):FORNZ=1TO5:N$(NZ)=
  "Beeb 3":HHZ(NZ)=100:NEXT
4 VDU23,230,0,64,96,112,127,63,31,0,
  23,231,0,0,96,144,248,255,248,0,23,232,0,
  ,7,63,114,114,63,7,0,23,233,0,224,252,78,
  ,78,252,224,0,23,234,129,66,36,24,24,36,
  66,129,23,236,0,16,16,16,248,172,252,252,
  ,23,237,0,0,0,49,25,13,7,3
5 MODE1:VDU23,238,0,0,0,140,152,176,
  224,192,23,239,219,219,126,126,60,60,60,
  24,23,235,0,0,64,64,67,66,67,67,23,226,8
  5,170,85,170,85,170,85,170:ENVELOPE1,1,1,
  ,1,1,1,1,126,0,0,-5,100,0
6 A$=CHR$230+CHR$231:B$=CHR$232+CHR$
  233:C$=CHR$234:ENVELOPE2,10,0,0,0,10,10,
  10,126,-5,-5,-5,110,0:ENVELOPE3,7,-10,20,
  ,-10,1,1,1,0,0,0,-127,100,0:BBX=-10:AAZ=
  0
7 VDU23,8202;0;0;0;:PROCINST
8 BSZ=0:ASZ=0:SZ=0:AZ=50:BZ=500:TX=0
9 LIVZ=3:VDU4:PROCCL(7):COLOUR130:C
  OLOUR0:CLS:INPUT "Which level (1
  -3) ",LEVZ:CLS:IFLEVZ<1ORLEVZ>3THEN9
10 PROCTUNE:VDU5:ONLEVZGOSUB96,97,98
11 VDU23,8202;0;0;0;:PROCTERR
12 R=RND(4):ONR GOSUB27,28,29,30
13 BONZ=RND(10):IFBONZ=1PRINTTAB(0,3)
  "Double points!":BONZ=2 ELSEIFBONZ=3
  PRINTTAB(0,3)"Mystery points!":BONZ=
  RND(4)ELSE BONZ=1
14 GCOL4,3:MOVEAZ,BZ:PRINTA$:IFR<3
  MOVECZ,DZ
15 IFR=2PRINTB$:SOUND3,1,20,255ELSEIF
  R=1PRINTC$:SOUND3,3,100,255
16 GOTO19
17 IF AL=0GOTO36
18 GOTO16
19 GCOL4,0:MOVEAZ,BZ:PRINTA$:IFINKEY
  (-66)BSZ=BSZ+1ELSEIFINKEY(-98)BSZ=BSZ-1
  ELSEIFINKEY(-1)ASZ=ASZ+6
20 IFASZ>90 ASZ=90 ELSEIFASZ<MSZ ASZ=
  MSZ
21 IFBSZ>10 BSZ=10 ELSEIFBSZ<-20 BSZ=
  -20
22 BZ=BZ+BSZ:AZ=AZ+ASZ:ASZ=ASZ-1
23 IFAX>1250THEN11ELSEIFBZ<0ORBZ>1
  000 THEN60 ELSEIFAX>1250THENNZ=31:GOTO17
24 GCOL4,3:MOVEAZ,BZ:PRINTA$:IFINKEY
  (-74)GOTO32
25 IFAX<CX+32ANDAZ>CX ANDBZ-16<DZ AND
  BZ-16>DZ-32 THEN60
26 GOTO17
27 CX=1200:DZ=RND(500)+100:RETURN
28 CZ=1200:DZ=RND(500)+100:RETURN
29 GOSUB31:MOVECZ,DZ:PRINTCHR$235;
  CHR$236:RETURN

```


AIR STRIKE!

```

30 GOSUB 31:MOVECZ,DZ:PRINTCHR$237;
CHR$238:RETURN
31 CX=1110:DZ=X+33:GCOL0,1:RETURN
32 MOVEAZ+64,BZ-16:GCOL4,3:DRAW1280,
BZ-16:SOUND1,-15,200,1:SOUND2,-15,205,1:
GCOL4,0:DRAWAZ+64,BZ-16:IFBZ-16<DZ AND
BZ-16>DZ-32 ANDAZ<=CX THEN33ELSEGOTO17
33 IFAL=1ENDPROC
34 *FX15
35 PROCSC:PROCEXP:GOTO17
36 ON R GOTO40,37,46,44
37 GCOL4,0:MOVECZ,DZ:PRINTB$:CX=CZ-
CRZ:IFDZ<BZ DZ=DZ+CRZ ELSE DZ=DZ-CRZ
38 GCOL4,3:MOVECZ,DZ:PRINTB$:IFRND(FR
Z)=1 AND CX>AZ THENPROCAIRE
39 GOTO16
40 GCOL4,0:MOVECZ,DZ:PRINTC$:IFCX<AZ
THENCX=CZ+CRZ ELSEIFCX>AZTHENCX=CZ-CRZ
41 IFDZ>BZ DZ=DZ-CRZ ELSEIFDZ<BZ DZ=
DZ+CRZ
42 GCOL4,3:MOVECZ,DZ:PRINTC$:IFCX<AZ
+100 AND CX>AZ-100 AND DZ<BZ+100 AND DZ>
BZ-100 THEN 94
43 GOTO16
44 IFBZ<DZTHEN6GOTO16
45 MOVEAAX,BBZ:VDU226:AAX=RND(1280):
MOVEAAX,BZ:VDU226:BBZ=BZ:IFAAX-16<AZ AND
AAX-16>AZ-32 THEN60ELSEGOTO16
46 IFDZ<BZ ANDRND(5)=1THEN48
47 GOTO16
48 RSZ=RND(140):MOVECZ,DZ:GCOL4,3:
DRAWAZ+RSZ,BZ:SOUND1,-15,255,1:SOUND2,
-15,250,1:GCOL4,0:DRAWCZ,DZ:IFRSZ<65THEN
60
49 GOTO16
50 DEFPROCTERR
51 VDU19,2,2,0,0,0:*FX15
52 AAX=0:BBZ=-10
53 IFTX>995PROCNM
54 VDU4:PROCCOL(2):CLS:COLOUR3:PRINTT
AB(0,1);"Score=";SZ;" ";
55 IFLIVZ>3PROCSL ELSEPRINTSTRING$(LI
VZ-1,CHR$230+CHR$231+" ");
56 PRINT " "; "Hi-score=";HHZ(1);" ";N
$(1):VDU5:MOVE0,0:GCOL0,2:FORMZ=0T01100S
TEP100:X=RND(10)*32-2:DRAWMX,X:NEXT:DRAW
1200,X
57 DRAW1300,RND(10)*32-2:AL=0:IFAZ>10
00THENAZ=10 ELSEIFAZ<10AZ=1200
58 ENDPROC
59 IFBZ<=0BZ=10 ELSEIFBZ>=1000 BZ=990
60 *FX15,0
61 SOUND0,2,4,50
62 VDU19,0,8,0,0,0,19,3,0,0,0,0:GCOL0
,1:FORNZ=1T050:MOVEAZ+32,BZ-16:DRAWNRD(1
280),RND(1024):NEXT

```

```

63 VDU4,19,0,7,0,0,0,19,3,0,0,0,0
64 LIVZ=LIVZ-1:IFLIVZ>0THEN110ELSELZ=
0
65 COLOUR0:PROCCOL(8):CLS:COLOUR1:PRI
NT""TAB(9);"Air Strike Hi-scores.":COLO
UR3:PRINT":FORNZ=1T05:IFNZ=LZCOLOUR2ELS
ECOLOUR3
66 PRINTNZ;" ";N$(NZ);"....";HHZ(NZ)'
:NEXT
67 IFSZ>=HHZ(5)GOTO84
68 COLOUR1:PRINT""TAB(9)"Press S to s
tart.":REPEATUNTILGET$="S":GOTO8
69 DEFPROCEXP
70 MOVECZ,DZ:GCOL0,1:AL=1
71 IFR=1PRINTC$ELSEIFR=2PRINTB$ELSEIF
R=3VDU235,236ELSEVDU237,238
72 SOUND0,2,5,50:FORMZ=1T03:VDU19,1,
MZX;0;0;0;0:TIME=0:REPEATUNTILTIME>2:NEXT
:MOVECZ,DZ:GCOL0,0:IFR=1PRINTC$ELSEIFR=2
PRINTB$ELSEIFR=3VDU235,236ELSEVDU237,238
73 GCOL0,1:VDU19,1,1,0,0,0
74 FORNZ=3T00STEP-1:GCOL0,NZ:MOVECZ-5
0,DZ:DRAWCZ+50,DZ:MOVEDZ-50,CZ:DRAWDZ+50
,CZ:MOVECZ-50,DZ-50:DRAWCZ+50,DZ+50:MOVE
CZ-50,DZ+50:DRAWCZ+50,DZ-50:MOVECZ,DZ+5
0:DRAWCZ,DZ-50:NEXT
75 CX=0:DZ=0:ENDPROC
76 DEFPROCAIRE
77 MOVECZ,DZ-16:GCOL4,3:DRAW0,DZ-16:
SOUND1,-15,255,1:SOUND2,-15,250,1:GCOL4,
0:DRAWCZ,DZ-16:IFDZ-16<BZ ANDDZ-16>BZ-32
THEN78ELSEENDPROC
78 GOTO60
79 DEFPROCSC
80 PZ=SZ
81 IFR=1SZ=SZ+PTZ*BONZ ELSEIFR=2 SZ=
SZ+PTZ*2*BONZ ELSEIFR=3 SZ=SZ+40*BONZ
ELSESZ=SZ+30*BONZ
82 TZ=TZ+SZ-PZ
83 VDU4:PRINTTAB(6,1);SZ:VDU5:ENDPROC
84 *FX15,0
85 PRINT""TAB(15);"Hi-score!!"
86 PRINT""TAB(3);:INPUT"Please enter
your name ",AA$:IFLEN(AA$)>4THENAAS=LEFT
$(AA$,4)ELSEIFLENAAS<4REPEAT:AA$=AA$+" "
:UNTILLENAAS=4
87 AA$=AA$+" "+STR$(LEVZ)
88 LZ=0:REPEAT:LZ=LZ+1:UNTILHHZ(LZ)<=
SZORLZ=5
89 IFLZ=6GOTO93
90 HZ=6:REPEAT:HZ=HZ-1:HHZ(HZ)=HHZ(HZ
-1):N$(HZ)=N$(HZ-1):UNTILHZ=LZ
91 N$(LZ)=AA$:HHZ(LZ)=SZ:SZ=0:GOTO65
92 IFMID$(AA$,6,1)<MID$(N$(5),6,1)LZ=
4:GOTO90
93 SZ=0:GOTO65

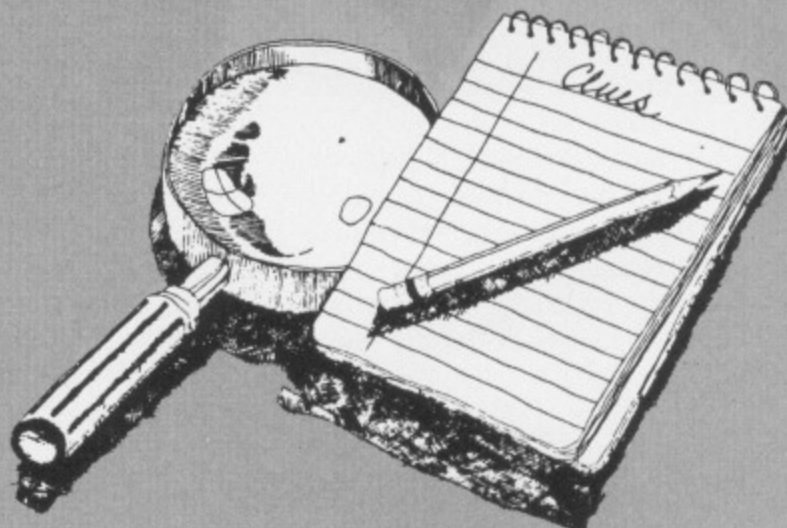
```

```

94 *FX15,0
95 SOUND0,2,4,50:FORNZ=1T050:MOVECZ+
16,BZ-16:DRAWNRD(1280),RND(1024):NEXT:
GOTO63
96 MSZ=40:CRZ=25:FRZ=3:PTZ=20:RETURN
97 MSZ=15:CRZ=15:FRZ=8:PTZ=10:RETURN
98 MSZ=10:CRZ=10:FRZ=10:PTZ=5:RETURN
99 TIME=0:REPEATUNTILTIME=100:AZ=50:
BZ=500:PRINTTAB(6+LIVZ*2,1);" ":VDU5:
GOTO11
100 DEFPROCCOL(ZZ):VDU20,19,2,ZZ,0,0,0
:ENDPROC
101 DEFPROCNM:PROCCOL(9):COLOUR2:VDU4:
TZ=TZ-1000:PRINTTAB(10,12)"EXTRA SHIP BO
NUS":LIVZ=LIVZ+1:FORNZ=1T03:SOUND3,-15,2
50,10:TIME=0:REPEATUNTILTIME=100:NEXT:EN
DPROC
102 DEFPROCSTL:PRINTA$;" ";LIVZ-2;:ENDP
ROC
103 DEFPROCINST:PROCCOL(6):COLOUR130:C
OLOUR0:CLS
104 PRINT""TAB(15);"AIR STRIKE":PRINT""
You have three ships.2 moves you down,""
"A moves you up,press SHIFT to accelera
te":PRINT"and RETURN to fire.""You can
move through the mountains""without e
xploding,but do not go too far"
105 PRINT""up or down.Level 3 is the e
asiest,"""level 1 the hardest.There are
more""points to be gained in level 1
than in""the other levels.""Press 'S
' to continue.""Press <ESCAPE> to ret
urn to this page."
106 REPEATUNTILGET$="S"
107 CLS:PRINT""A$;" Your ship.""B$;"
Alien ship.Moves about and fires""at
you.""C$;" Death satellite.Moves in c
lose and""explodes.""CHR$235;CHR$236"
Radar base.Fires accurate missiles""
at overhead ships.""CHR$237;CHR$238;
108 PRINT;" AA gun.Fires flak at over
head ships.":PRINT"Press S to start.":R
EPEATUNTILGET$="S"
109 ENDPROC
110 REPEATUNTILADVAL(-5)=15:AZ=50:IFBZ
<100 BZ=200
111 GOTO11
112 DEFPROCTUNE:PRINTTAB(15,15);" READ
Y !!"
113 LOCALNZ,AZ:RESTORE115:FORNZ=1T013:
READAZ:SOUND1,-15,AZ,3:SOUND2,-15,AZ-48,
3:NEXT:SOUND1,-15,101,7:SOUND2,-15,53,7
114 PRINT""TAB(15);"Here we go....":TI
ME=0:REPEATUNTILTIME>100:ENDPROC
115 DATA101,117,129,117,109,121,137,12
1,101,117,129,117,101

```


Nice line in deduction, Mr Holmes



AS a Sherlock Holmes fan of long standing I have been amazed at the number of trunks that have turned up recently containing previously unpublished memoirs of the great detective.

Dr Watson must have had a full time job in his declining years just hiding the things! And how he arranged for them to be discovered after the copyright expired baffles me.

Most of the trunks would have been better off undiscovered, but here, to my joy, is a book that pleases me both as a Holmes

afficionado and as a micro nut.

Elementary Basic is really two books in one. At one level it is a collection of some of Holmes' less remarkable cases, the only points of interest being supplied by his ingenious use of Mr Babbage's analytical engine in the science of detection.

Additional to these accounts are short essays on how Holmes communicated with the engine by means of

a language called — you've guessed it — Basic.

Both parts of the book work remarkably well. The efforts of Holmes to explain algorithms and Basic to the brilliantly obtuse Watson are supplemented by short, lucid essays on the aspects of Basic Holmes has raised.

To me these essays are the best part of a very good book.

They are concise, clear and thought-provoking,

Elementary Basic — Teach yourself Basic by solving the mysteries of Sherlock Holmes. Henry Ledgard and Andrew Singer.

giving an insight into the structure and purpose of Basic without being specific to any one machine.

The example algorithms and programs are at times almost beautifully logical.

All in all a book that was a joy to read. Not just another "Basic, how to" book, but a lively and entertaining introduction to Basic in particular and good programming in general.

So good, in fact, that I will forgive it one basic elementary error. Holmes never actually said "Elementary, my dear Watson".

Assembling from the ground up

BBC Microcomputer Basic includes many powerful features, not least of which is a fully integrated assembly language system for use in developing 6502 machine code.

For those familiar with other more conventional assemblers, note that "fully integrated" means that the Basic interpreter is used during assembly to evaluate instructions such as $LDA\ 100 * SIN(Angle * PI / 180)$.

Unfortunately the User Guide from Acorn provides little guidance on the use of assembler, being aimed at the user with prior experience of 6502 machine code, and a book to fill this gap was much needed.

Ian Birnbaum says his book is written for those familiar with Basic but new to assembler, and is a suitable basis for use in a structured course on

Assembly Language Programming for the BBC Microcomputer by Ian Birnbaum, 305 pages, £8.95. Macmillan Press, 1982.

the subject.

Chapter 1 outlines how a computer interprets machine code commands, and introduces the concept of an assembly language using mnemonics (such as keywords). It then discusses the role of assembler v high level compiled or interpreted languages.

Chapters 2 to 9 are in the form of a series of tasks to be addressed in assembler, with each statement type explained as the need arises.

Useful routines are developed, and there are exercises for the reader at the end of each chapter, with a full set of

solutions at the back.

Chapter 10 comprises the listings and documentation for six utility programs, including a very useful machine code monitor program to assist debugging of machine code programs, and a very fast program which searches memory and reports where a given Ascii, machine code or numeric sequence is in memory.

Appendices are used to provide a quick reference to the 6502 instruction set, a discussion of indexed indirect addressing (for which no application arose in the main text), linking BBC computer programs, user port applications, the zero page and operating system differences.

All supported features of the BBC assembler are covered, except the new

BOOKS

From Page 55

facilities (such as Macros) which are present in the Basic II chip, revealed too late for this book.

The programs developed in the book are also available on two cassettes priced at £9 each or £16 the pair, a nice marketing touch being that each cassette contains two further interesting routines which are not in the book, so why bother typing?

I believe that Ian Birnbaum's book will prove to be of great value to those who wish to teach or learn assembler

for use on the BBC Micro "from the ground up".

The book is organised in application-oriented format and therefore more likely to hold the attention of a student.

Unfortunately there is no detailed subject index, a great drawback to the experienced 6502 programmer in that it is difficult to glean the niceties specific to the BBC Micro except by reading the whole book.

In summary, if you have a BBC Micro and are a complete novice wishing to learn assembler, then this is the book for you.

When you have worked through it you will join those more experienced programmers who hope for the publication of a good BBC Micro reference book – indexed!

Two further books on assembler for the BBC Micro are to be published later this year, one of which I understand will be from the BBC itself (or herself?). Watch this space for news of these.

P.S. If you are writing a book called "The BBC Micro REALLY Revealed", please publish it soon!

David Reader

Make sure your collection is complete!

Articles in the March issue included:



- ☐ Part 1 of our series on computing for beginners.
- ☐ How to build your own games paddle.
- ☐ Review of the Alphabeta word processor.
- ☐ Part 1 of our easy to-understand guide to text colours and graphics.
- ☐ Part 1 of our introduction to the BBC operating system.
- ☐ How to avoid cassette loading problems.
- ☐ DEATHWATCH! Complete listing of this arcade game.
- ☐ How to upgrade a Model A to B at half the shop price.
- ☐ Create your own micro portrait gallery with our "Shapes" program.
- ☐ Play Bingo and learn about random numbers.
- ☐ Part 1 of our evaluation of colour monitors for the BBC Micro.
- ☐ Speed up your processing time with our sorting routines.
- ☐ Programmers' Workshop shows how to test for function keys in machine code routines.

Articles in the April issue included:



- ☐ How to produce impressive graphics using Teletext Mode 7.
- ☐ Having listing trouble? We review common copying errors.
- ☐ Part 2 of our series on computing for beginners.
- ☐ Our graphics course teaches how to draw multi-coloured lines.
- ☐ KING KONG! Fly your helicopter and rescue maidens.
- ☐ Part 2 of our guide to the BBC's operating system.
- ☐ Part 2 of our review of BBC colour monitors.
- ☐ 8-PAGE PULLOUT: Essential reference guide for Basic programmers.
- ☐ Final part of how to upgrade a Model A into a Model B.
- ☐ Programmers' Workshop helps you find the ROM's action addresses.
- ☐ Binary code: what is it and how to use it.
- ☐ Disc formatter: The essential program you need to run discs.

Back numbers still available at £1.25

- incl. p&p

ORDER FORM
ON PAGE 81

THE NEW AND UNIQUE C.A.D.* PROGRAM FOR THE BBC MICRO (32K)

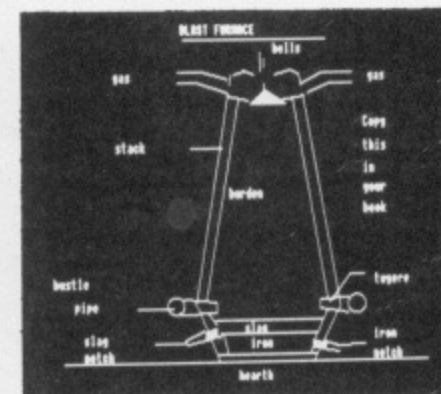
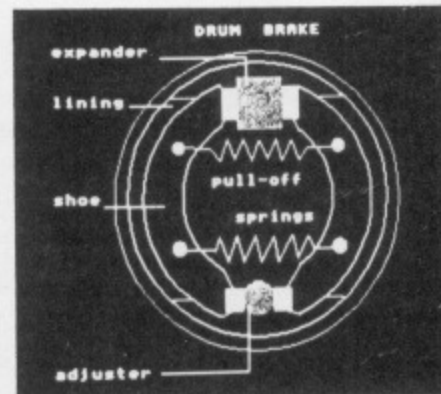
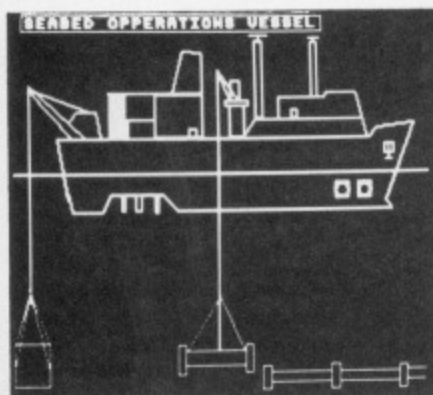
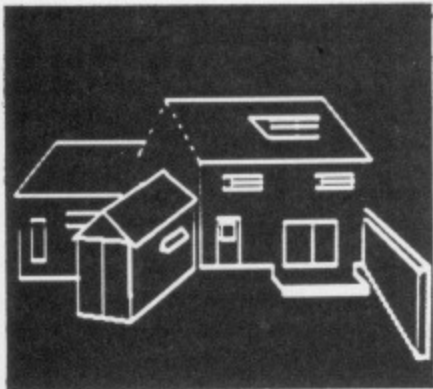
* COMPUTER AIDED DESIGN (Available on Cassette or Disc)

AT A VERY AFFORDABLE PRICE

Ideal for teachers, designers, artists, technical drawing and numerous other applications including your own form and stationery design etc.

This program must be seen to be appreciated – your imagination is the only factor to limit its individual applications.

- Modes 0,1,2,4,5 (can be changed when program is running).
 - Multiple display of arrays enables infinite complexity.
 - **FUNCTIONS:** Line, rectangle, triangle, circle, text (upper and lower case) and colour pallet (8 colours and flashing).
 - **DRAWING AIDS:** Alignment grid, circle copy, delete, free memory, purge memory, variable cursor speed, clear screen and redraw.
 - Shapes can be filled or outlined (no need for Fill Routines).
 - Save and load to tape in about 20 seconds, or to disc in 2 seconds.
 - **SPECIAL FACILITY** – Rubber band mode – A very flexible and variable line drawing facility – must be seen.
 - Free "redraw" routine to enable the pictures created to be displayed in your own programs.
 - The disc version allows screen saves, which take approx. 3 seconds.
 - **Recommended by BBC Micro User.**
 - Future developments will include processing packs which will provide additional features such as arcs, ellipses, air-brush, printer dump and many more. Cassette users may purchase an additional cassette containing these features, but disc users will be able to return their disc which will be upgraded to the latest specification, and the user will only be charged the difference between the two versions.
 - GRAFSTIK (joystick cassette version) **£7.95**
 - GRAFKEY (keyboard cassette version) **£7.95**
 - GRAFDISC (combines both on one disc) **£12.95**
- (the examples shown are all unretouched off-screen photographs of some of the program's capabilities).



SYNTHESISER PACKAGE


PART 1:-

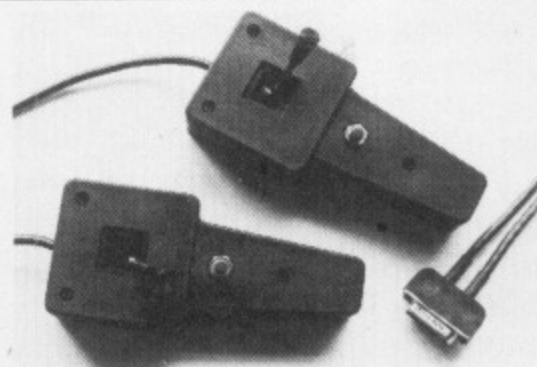
Allows up to 16 envelopes to be defined and saved using a very sophisticated, yet easy to use defining program. Alter the values and hear the effect instantly. Then use the envelopes in Part 2.

PART 2:-

Turns your keyboard into a musical instrument. Lets you play 3-note chords (not just single notes). Use cursor keys to change octaves etc, etc.

Become the Rick Wakeman of the Computer Age.

THIS SUPER PACKAGE COSTS
JUST  Cassette **£7.95**
Disc **£10.95**



JOYSTICKS
Pair of fully
proportional
joysticks
of compact and
handy size
£17.95

"THE KEY"

Copies most protected programs on disc and allows you to keep a back-up of your treasured programs.
It is a condition of sale that this program is not used for piracy.
Price: £12.95

CASSETTE LEADS (with Motor Control)

7 pin DIN – 3 pin DIN £2.95
+ REMOTE £2.95
7 pin DIN – 2 x 3.5mm Jacks
+ 1 x 2.5mm JACK £2.95

MONITOR LEADS

6 pin DIN 6 pin DIN £2.95
BNC – PHONO £2.95

PRINTER LEADS

SERIAL (5 pin DOMINO – 25 way
"D") £7.50
PARALLEL (Centronics) £13.95

PROGRAMMERS

We are constantly seeking new and interesting programs. Why not send yours for appraisal? Do not worry if the presentation is not to professional standards – we are looking for new ideas and we will advise and assist in bringing your program to the required standard. You have got nothing to lose but much to gain – So why not send your program today? 40 Track disc if possible or two copies on cassette. In some cases we will even provide disc drives against future royalties.

CLARES MICRO SUPPLIES



Dept. BMU5, Providence House,
222 Townfield Road, Winsford,
Cheshire CW7 4AX.
Tel: 06065 51374

All prices inclusive of
VAT + Carriage – No Extras.

ANAGRAMS is a program that demonstrates how a simple idea can be developed into a sophisticated program which can then be used in a variety of educational contexts or as a game in its own right.

The idea is to solve a series of 25 anagrams. The program sets a time limit for each attempt, which you may exceed if you wish.

However, the computer uses the time you take and the difficulty of the word, determined by its length, to calculate your skill level.

As your skill increases throughout the game, so the anagrams presented to you become longer.

At the end, the program displays your skill level as well as your total and average score.

There is also a facility for

ARAM SNAC?

logging the name of the highest scorer, as in all good arcade games.

As it stands, the game describes objects that would be found in the kitchen. You may wish to change, or add to, the data, particularly the longer words so as to give more available anagrams.

Also, it would not be too hard to add a procedure to input the data from cassette instead of having the data embedded in DATA statements.

It would then be simple to prepare a whole series of tapes on different subjects.

The following details should give sufficient understanding

of the program to allow conversion work to be undertaken:

PROCSTART (called at line 60) turns off the cursor with VDU23;8202;0;0;0;.

If you have ROM 1.0 or above, this should be changed to VDU 23,1,0;0;0;0; — the cursor is re-enabled with VDU

If you don't get it, this program by CHRIS TURNBULL will sort it out

```
10 REM Anagrams '83
20 REM
30 REM C.Turnbull.
40 REM
50 MODE7
60 PROCSTART
70 REPEAT
80 PROCSetvars
90 PROCInstructions
100 CLS
110 FORTryZ=1 TO 25
120 REPEAT
130 FZ=RND(50)
140 UNTIL LEN(Data$(FZ))=SkillZ AND Data$(FZ)<>Last$
150 Right$=Data$(FZ)
160 REPEAT:Word$=Right$:PROCJUMBLE: UNTIL Right$<>Word$
170 PRINT "THE JUMBLED WORD IS:";
180 FORTZ=0 TO 1:PRINTTAB(7,TZ+2);CHR$(130);CHR$(141);WORD$:NEXT TZ
190 TrytimeZ=INT(1.8*LEN(Word$))
200 PRINT "YOU HAVE ";TrytimeZ;" SECONDS."
210 TIME=0
220 PRINT
230 INPUT Answer$
240 TimetakenZ=INT(TIME/100)
250 PRINT "YOU TOOK ";TimetakenZ;" SECONDS,";
260 PROCMarks
270 PRINT "YOUR CURRENT SCORE IS.....";CHR$(130);ScoreZ
280 PRINT "YOUR CURRENT SKILL LEVEL IS
```

```
....";CHR$(130);SkillZ
290 PRINT "CHR$(131);CHR$(8);CHR$(157);CHR$(134);
300 PRINT "PRESS ANY KEY.";CHR$(8);:PROCGet:CLS
310 Last$=Right$
320 NEXTTryZ
330 CLS
340 PROCaverages
350 UNTIL Finish
360 #FX12,0
370 END
380 REM*****
390 DEFPROCJUMBLE
400 LengthZ=LEN(Word$)
410 FORTZ=1 TO LengthZ:Word$(TZ)="":CheckZ(TZ)=0
420 NEXTTZ
430 FORTZ=1 TO LengthZ
440 REPEAT
450 DX=RND(LengthZ)
460 UNTIL CheckZ(DX)<>1
470 CheckZ(DX)=1:Word$(DX)=MID$(Word$,TZ,1)
480 NEXTTZ
490 Word$="":WORD$=""
500 FORTZ=1 TO LengthZ
510 Word$=Word$+Word$(TZ)
520 WORD$=WORD$+Word$(TZ)+" "
530 NEXTTZ
540 ENDPROC
550 REM*****
560 DEFPROCInitdies
570 DIMCheckZ(15),Word$(15),Data$(50)
```

```
580 FORTZ=1 TO 50:READData$(TZ):NEXTTZ
590 RESTORE
600 ENDPROC
610 CLS
620 REM*****
630 DEFPROCInstructions
640 CLS
650 FORTZ=0 TO 1:PRINTTAB(0,TZ);CHR$(132);CHR$(157);TAB(14);CHR$(131);CHR$(141)"Anagrams":NEXTTZ
660 PRINTTAB(0,4);CHR$(130);"Instructions."
670 PRINTTAB(2,6);"The computer will display a word, this word is an anagram of something found in a kitchen, ranging from cutlery and appliances to food and drinks."
680 PRINTTAB(2);"It will also display a time, this time is your limit. If you take longer, then you will lose points, more points lost for the more time used, but if you put in your word before the time runs out ";
690 PRINT "you will gain points, of course, if you get the word wrong you lose even more."
700 PRINT";CHR$(131);CHR$(157);TAB(6);CHR$(136);CHR$(130);"PRESS ANY KEY.":PROCGet
710 CLS
720 FORT=0 TO 1:PRINTTAB(0,T);CHR$(132);CHR$(157);TAB(8);CHR$(131);CHR$(141)"More instructions.":NEXT
730 PRINTTAB(2,4)"To put in your word,
```


23,1,1;0;0;0;

The auto-repeat is disabled with *FX11,0 — it is re-enabled at the end of the program with *FX12,0.

This procedure also sets the Boolean variable FINISH which tests for the end of the program and calls PROCInitdms which initialises the arrays (line 570) and reads the data into Data\$().

It also sets the high score, High%, to zero and the name of the scorer, High\$, to nobody.

Lines 120-140 pick a number F% in the range 1 to 50 and use it to index Data\$(), i.e. Data\$(F%) picks out a word for the next anagram.

Last\$ holds the word last chosen and Skill% is the skill level involved, which is the

length of the word.

Thus, line 140 checks that the word chosen is of the right length and has not just been picked.

Line 150 stores the word chosen in Right\$. Line 160 is a loop that stores Right\$ in Word\$.

The latter is then "anagrammed" in PROCJumble and checked to ensure that Right\$ <> Word\$, i.e. that it has not emerged still in the correct order — "butter" is not a very good anagram for "butter"!

PROCJumble works by using array WORD\$() to store randomly picked letters from Word\$.

Each time a letter is picked, the element of Check%() corresponding to the position of that letter in Word\$ is set to 1. This "flag" is used to ensure that an individual letter is not

picked twice (line 460).

Finally, the elements of array Word\$() are concatenated and stored in Word\$ — so that this now contains an anagram of its original self (which is still stored in Right\$).

Also WORD\$ is built up. This is identical to the newly jumbled Word\$ except that its letters are separated by spaces.

PROCMarks alters the skill level (Skill%) as necessary depending on the values of Trytime%, which is the time allowed for a word, and Timetaken% which is the time actually taken for an answer.

PROCAverages gives the average score, calling either PROCNewhigh or PROC-Save, depending on whether a new high score has been achieved. Given all these

details, it should be fairly easy to determine the workings of the program, particularly as descriptive variable names have been used throughout, single letter variables being reserved for loop parameters, etc.

Those of us used to restricted length variable names will readily appreciate how readable the BBC Micro's approach to variable names makes programs. Of course, you could shorten these if you wish to save memory for more data.

This program was written with 50 words as data. To add more data, simply add extra DATA statements and increase the references to 50 appropriately in lines 130, 570 and 580.

sort things out

NEXTTZ

type it in, using the keyboard, then press";CHR\$(134);"RETURN"

740 PRINT"TAB(2)"If you press a wrong key, press";CHR\$(133);"DELETE"

750 PRINTTAB(2)"The offending letter will be removed."

760 PRINT"TAB(2);"Press 'RETURN' to start";:PROCGet

770 ENDPROC

780 REM#####

790 DEFPROCSetvars

800 Last\$=""

810 Right\$=""

820 SkillZ=4

830 ScoreZ=0

840 ENDPROC

850 REM#####

860 DEFPROCMarks

870 IFTimetaken<TrytimeXTHENPRINT"WIT
HIN THE TIME LIMIT"

880 IFTimetaken>TrytimeXTHENPRINT"OUT
SIDE THE LIMIT"

890 IFRight\$=Answer\$ THEN PRINT"YOU GOT
IT RIGHT, IT WAS ";Right\$

900 IFRight\$<>Answer\$ THEN PRINT"YOU GOT
IT WRONG, IT WAS ";Right\$

910 IFAAnswer\$=Right\$ AND TimetakenZ<Try
timeXTHEN ScoreZ=ScoreZ+(LEN(Word\$))+2*
TrytimeX

920 IFAAnswer\$=Right\$ AND TimetakenZ<(
2*LEN(Word\$)) THEN SkillZ=SkillZ+1:IFSkil
lZ=9 THENSkillZ=9 ELSE SkillZ=SkillZ-(
RND(2)-1)

930 IFSkillZ<3 THEN SkillZ=3

940 IFAAnswer\$<>Right\$ THEN ScoreZ=ScoreZ-(20-LEN(Word\$))

950 IFAAnswer\$=Right\$ AND TimetakenZ>Try
timeXTHEN ScoreZ=ScoreZ+(LEN(Word\$))-5*
((TimetakenZ-TrytimeX))

960 ENDPROC

970 #####

980 DEFPROCAverages

990 CLS:PRINT"YOUR TOTAL SCORE AFTER 2
5 WORDS ";ScoreZ

1000 PRINT"YOUR SKILL LEVEL AFTER 25 WO
RDS ";SkillZ

1010 PRINT"YOUR AVERAGE SCORE FOR 25 WO
RDS ";ScoreZ/25

1020 AVSCZ=ScoreZ/25

1030 IFAVSCZ>HighZTHEN PROCNewhigh ELSE
PROCSame

1040 PRINTTAB(0,22);CHR\$(132);CHR\$(157
);CHR\$(131);

1050 PRINT"DO YOU WISH TO PLAY AGAIN?(Y
/N)"

1060 REPEAT:PROCGet:UNTIL A\$="Y" OR A\$=
"N"

1070 IF A\$="N" THEN Finish=TRUE

1080 ENDPROC

1090 REM#####

1100 DATABUTTER,MARGARINE,LARD,VEGETABL
E,CHEESE,BACON,SUGAR,NUTS,CAKES,BISCUITS
,BREAD,CHIPS,CEREALS,WHEAT,BARLEY,OATS,R
ICE,MAIZE,POTATOES,EGG,FISH,EGGS,MILK,PE
AS,BEANS,LENTILS,BREAD,HAZELNUTS,ORANGES
,LEMONS,HAM,LETTUCE,CARROTS

1110 DATABANANAS,POTATOES,CABBAGES,BREA
D,BACON,TOMATOES,CHEESE,BISCUITS,FORKS,S

POONS,KETTLE,TOASTER,SAUCEPAN,PEAS,COFFE
E,TEA,SUGAR

1120 REM#####

1130 DEF PROCSame

1140 PRINT"THE CURRENT HIGHEST AVERAGE
IS ";HighZ

1150 PRINT"IT WAS SET BY ";High\$

1160 PRINT"THANK YOU FOR PLAYING"

1170 ENDPROC

1180 REM#####

1190 DEF PROCNewhigh

1200 PRINT"YOU HAVE BEATEN THE HIGHEST
AVERAGE"

1210 PRINT"WHICH WAS ";HighZ;" SET BY "
;High\$

1220 PRINT"PLEASE ENTER YOUR NAME (ONLY
15 LETTERS)"

1230 INPUTHigh\$:High\$=LEFT\$(High\$,15)

1240 HighZ=AVSCZ

1250 ENDPROC

1260 REM#####

1270 DEFPROCSTART

1280 VDU23;8202;0;0;0;

1290 *FX11,0

1300 Finish=FALSE

1310 HighZ=0

1320 PROCInitdms

1330 High\$="Nobody"

1340 ENDPROC

1350 REM#####

1360 DEF PROCGet

1370 *FX 15,1

1380 A\$=GET\$

1390 ENDPROC

**What a tangled web
the OS weaves,
poor mortals
to confuse..**



By JIM NOTMAN

ONE difficulty with looking at the operating system is that at the moment there are still a number of different versions around, from the infamous 0.1, with its well known Cassette Filing System problems, to the (for the present) definitive 1.20, capable of supporting paged ROMs, the disc system, Econet, Teletext and numerous other goodies.

I'll be looking mainly at the 1.20 version, which is now becoming widely available according to Acorn and should be around for a while. Many of the routines in the 1.0 version are very similar in what they do and in memory locations.

The main problem with having a closer look at the operating system in the BBC Micro is knowing where to start, as it is long – not much less than 16k – and because of the way the operating system is structured, with routines being called within routines and some of those being vectored. The system weaves a very tangled web.

The command line interpreter (&DF89)

This is responsible for recognising instructions and jumping to the appropriate action address. It has some features which are noted below.

Like the Basic keyword table (&806D-&8359) the operating system has a command table located from about &DF00. The command table program (Program I) will print out the commands, the action addresses and an extra byte which is loaded into the

```
10 REM OSBYTE action addresses
20 REM for OS 1.20
25 REM Jim Notman (c) 1983
30 VDU14
40 OSBYTE=0:offset=0
50 REPEAT
60 PRINT"OSBYTE ";OSBYTE"
  &";*!(&E5B3+(OSBYTE-offset)*2) AND
  &FFFF
70 IF OSBYTE=21 THEN OSBYTE=116
  :offset=&5F
80 OSBYTE=OSBYTE+1
90 UNTIL OSBYTE>160
100 PRINT"OSBYTE calls>166 &E99C"
```

For OS 1.00 the following changes need to be made :-

line 60 the address needs to be &E56E
line 70 IF OSBYTE=22 THEN OSBYTE=115:
offset=&5D
line 90 UNTIL OSBYTE>161
line 100 PRINT"OSBYTE calls>166 &E9AF

Program II

```
10REM Jim Notman (c) 1983
20ADDRESS=&DF10
30REM 1.0=&DF04 : 0.1=&DFEB
40FINISH=&DF84
50REM 1.0=&DF79 : 0.1=&E060
60PRINT"Command action extra"
70PRINT"      address byte"
80REPEAT
90REPEAT
100PRINTCHR$(?ADDRESS);
110ADDRESS=ADDRESS+1
120UNTIL?ADDRESS>&7F
130PRINTTAB(10);*(!?ADDRESS*256)
+ADDRESS?1;
140PRINTTAB(18);*ADDRESS?2
150ADDRESS=ADDRESS+3
160UNTILADDRESS>FINISH
```

Program I

accumulator before jumping to the action address.

It is interesting to note that:

- The commands no longer appear to be preceded by an *, as this is not passed to the operating system, or as can happen (if you type in two or more *'s together), they are stripped off by the command line interpreter.
- The command is immediately followed by its action address, unlike Basic where there were separate tables for the high byte and low bytes. Like Basic there is an "extra" byte. This is placed in the accumulator before being directed to the action address.
- The action address is in the form high byte then low byte. This is opposite to the way that you would expect for a 6502 system. The reason for it here is that since the high byte will be greater than &80 it can be used to separate the command from the address. The command line interpreter manipulates the address so that it is in the form required by the 6502.
- The first command is '.' so you can see that it is not just an abbreviation for



*CAT, but a command in its own right.

● There appear to be two new commands not documented in the User Guide – *CODE and *LINE.

● Some of the commands share common action addresses, but have different values placed in the accumulator. This is especially true for the action address &E348, where MOTOR, OPT, TAPE, ROM, TAPE and CODE are all directed.

● The action address of FX closely precedes them. This is because all these commands are converted to OSBYTE calls by this routine (Table II).

● The commands you type in *do not have to be in upper case!* Before checking whether a word is present in its command table it does a Boolean AND with &DF with each letter. This effectively changes a lower case letter into an upper case letter.

This sort of trick is very useful to know, especially for inputs in a Basic program where inexperienced users may not realise the difference and programmers have forgotten to take it into account.

OSBYTE setup routine (&E342)

Before a call can be made to OSBYTE the accumulator, X register and Y register must be 'primed' with values. FX has the earlier entry because it must gather up three bytes of information, whereas the other commands already have a correct value for the accumulator and only need to have their X and Y registers loaded with appropriate values. A disassembly of the routine is given in Program III.

The main purpose of the subroutines that leave this OSBYTE setup routine is not only to get values for the registers but also to check that they do not contain any non-numeric characters or any numbers greater than

PROGRAMMERS' WORKSHOP

From Page 61

255, the maximum value that can be placed in an 8 bit register.

If it finds anything wrong it will clear the carry flag so that, on return to the register load routine, the operating system will branch to an error - "Bad command".

Even after OSBYTE has been called, there is still an error check. The overflow flag will be set if there has been an error, for example an incorrect FX number was selected, so that the "Bad command" error message can be issued.

OSBYTE (&E772)

One of the most powerful features of the BBC Micro is that many of the functions that the machine can perform are not controlled by PEEKing and POKEing memory locations, but by specific calls to the operating system. This gets around the constant problem which manufacturers have of updating hardware and operating systems without making you rewrite all of your software.

OSBYTE allows a large number of functions to be made available to the programmer without the need for a very long command table. However the machine must have some way of deciding where all the calls should go.

When OSBYTE is called (as can be seen from Program IV) it uses the value it has in the accumulator to calculate the action address from a table starting

at &E5B3.

The routine checks for legal values of the accumulator. With all calls numbered 21 (&15) or under, this value is

E342	20	4E	E0	JSR &E04E	\ FX entry point.
E345	90	C9		BCC Bad command	
E347	8A			TXA	
E348	48			PHA	\ Other commands entry point.
E349	A9	0		LDA #0	
E34B	85	E5		STA &E5	
E34D	85	E4		STA &E4	
E34F	20	43	E0	JSR &E043	
E352	F0	18		BEQ &E36C	
E354	20	4E	E0	JSR &E04E	
E357	90	B7		BCC Bad command	
E359	86	E5		STX &E5	
E35B	20	45	E0	JSR &E045	
E35E	F0	C		BEQ &E36C	
E360	20	4E	E0	JSR &E04E	
E363	90	AB		BCC Bad command	
E365	86	E4		STX &E4	
E367	20	3A	E0	JSR &E03A	
E36A	D0	A4		BNE Bad command	
E36C	A4	E4		LDY &E4	
E36E	A6	E5		LDX &E5	
E370	68			PLA	
E371	20	F4	FF	JSR OSBYTE	
E374	70	9A		BVS Bad command	
E376	60			RTS	

Program III: OSBYTE setup routine

E772	48			PHA	
E773	8			PHP	
E774	78			SEI	
E775	85	EF		STA &EF	
E777	86	F0		STX &F0	
E779	84	F1		STY &F1	
E77B	A2	7		LDX #7	
E77D	C9	75		CMP #75	
E77F	90	41		BCC &E7C2 \ values < 117 (&75)	
E781	C9	A1		CMP #A1	
E783	90	9		BCC &E78E \ values < 161 (&A1)	
E785	C9	A6		CMP #A6	
E787	90	3F		BCC &E7C8 \ values < 166 (&A6) - Discard	
E789	18			CLC	
E78A	A9	A1		LDA #A1 \ all values 161 or more	
E78C	69	0		ADC #0	
E78E	38			SEC	
E78F	E9	5F		SBC #5F \ subtract from values > 117 (&75)	
E791	A			ASL A \ *2 for offset	
E792	38			SEC	
E793	84	F1		STY &F1	
E795	AB			TAY	
E796	2C	5E	2	BIT &25E	
E799	10	7		BPL &E7A2	
E79B	8A			TXA	
E79C	BB			CLV	
E79D	20	7E	E5	JSR &E57E	\ no action unless (&224) changed
E7A0	70	1A		BVS &E7BC	
E7A2	B9	B4	E5	LDA &E5B4,Y \ high byte	
E7A5	85	FB		STA &FB	
E7A7	B9	B3	E5	LDA &E5B3,Y \ low byte	
E7AA	85	FA		STA &FA	
E7AC	A5	EF		LDA &EF \ acc. on routine entry	
E7AE	A4	F1		LDY &F1 \ store for Y register	
E7B0	B0	4		BCS &E7B6	
E7B2	A0	0		LDY #0	
E7B4	B1	F0		LDA (&F0),Y	
E7B6	38			SEC	
E7B7	A6	F0		LDX &F0 \ store for X	
E7B9	20	58	F0	JSR &F058 \ see below	
E7BC	6A			ROR A	
E7BD	28			PLP	
E7BE	2A			ROL A	
E7BF	68			PLA	
E7C0	B8			CLV	
E7C1	60			RTS	
E7C2	A0	0		LDY #0	
E7C4	C9	16		CMP #16	
E7C6	90	C9		BCC &E791 \ values < 22 (&16) rejoin OSBYTE	
F058	6C	FA	00	JMP (&FA) \ action address	

Program IV: Disassembled OSBYTE routine

OSBYTE 0	&E821	OSBYTE 17	&DE8C	OSBYTE 129	&E713	OSBYTE 146	&FFAA
OSBYTE 1	&E988	OSBYTE 18	&E9C8	OSBYTE 130	&E729	OSBYTE 147	&EAF4
OSBYTE 2	&E6D3	OSBYTE 19	&E9B6	OSBYTE 131	&F085	OSBYTE 148	&FFAE
OSBYTE 3	&E997	OSBYTE 20	&CD07	OSBYTE 132	&D923	OSBYTE 149	&EAF9
OSBYTE 4	&E997	OSBYTE 21	&F0B4	OSBYTE 133	&D926	OSBYTE 150	&FFB2
OSBYTE 5	&E976	OSBYTE 117	&E86C	OSBYTE 134	&D647	OSBYTE 151	&EAFE
OSBYTE 6	&E988	OSBYTE 118	&E9D9	OSBYTE 135	&D7C2	OSBYTE 152	&E45B
OSBYTE 7	&E68B	OSBYTE 119	&E275	OSBYTE 136	&E657	OSBYTE 153	&E4F3
OSBYTE 8	&E689	OSBYTE 120	&F045	OSBYTE 137	&E67F	OSBYTE 154	&E9FF
OSBYTE 9	&E6B0	OSBYTE 121	&F0CF	OSBYTE 138	&E4AF	OSBYTE 155	&EA10
OSBYTE 10	&E6B2	OSBYTE 122	&F0CD	OSBYTE 139	&E034	OSBYTE 156	&E17C
OSBYTE 11	&E995	OSBYTE 123	&E197	OSBYTE 140	&F135	OSBYTE 157	&FFA7
OSBYTE 12	&E98C	OSBYTE 124	&E673	OSBYTE 141	&F135	OSBYTE 158	&EE6D
OSBYTE 13	&E6F9	OSBYTE 125	&E674	OSBYTE 142	&DBE7	OSBYTE 159	&EE7F
OSBYTE 14	&E6FA	OSBYTE 126	&E65C	OSBYTE 143	&F168	OSBYTE 160	&E9C0
OSBYTE 15	&F0A8	OSBYTE 127	&E035	OSBYTE 144	&EAE3	OSBYTE calls >166	
OSBYTE 16	&E706	OSBYTE 128	&E74F	OSBYTE 145	&E460	&E99C	

Table I: OSBYTE action addresses

used directly to compute the offset. Values between 22 (&16) and 116 (&74) inclusive are discarded, and values between 117 (&75) and 160 (&A0) have 95 (&5F) subtracted from this value before calculating the offset. Values between 161 (&A1) and 165 (&A5) inclusive are again discarded. All values 166 (&A6) and over are treated the same, having the same action address.

The offset is calculated by doing an arithmetic shift left (&E791) on the value remaining in the accumulator and using this to access the necessary bytes from the action address table.

The OSBYTE action addresses program will produce a list of the action addresses for OSBYTE OS 1.2.

For example, if we have a look at the

Command	action address	extra byte	CODE	E348	88	OPT	E348	88
			EXEC	F68D	0	RUN	E031	4
			HELP	F0B9	FF	ROM	E348	8D
.	E031	5	KEY	E327	FF	SAVE	E23E	0
FX	E342	FF	LOAD	E23C	0	SPOOL	E281	0
BASIC	E018	0	LINE	E659	1	TAPE	E348	8C
CAT	E031	5	MOTOR	E348	89	TV	E348	90

Table II: Command action addresses

OSBYTE call of 0 we can see it has the action address of &E821.

E821 D0 FB BNE &E81E

After that instruction (it doesn't branch) it "falls through" onto a BRK instruction which the BBC Micro handles by going into an error routine. The number after the BRK becomes the error code, with the bytes following

being the error message, the message printed being "OS 1.20".

In the operating system 0.1 the error number was 0. Now with OS 1.00 and OS 1.20 the error number is 245 (&F7). So if you have written a program which requires the facilities of the newer systems all you need is to *FX0 and check the error number.

**More
crib
cards
to stick
on your
BBC
Micro**

BBC MICRO USER		Programmer's guide 4	
		Two Colour Modes: 0,4	
Logical colour number		Colour	
Foreground	Background		
0	128	Black	
1	129	white	
Four Colour Modes: 1,5			
Logical colour number		Colour	
Foreground	Background		
0	128	Black	
1	129	Red	
2	130	Yellow	
3	131	White	

BBC MICRO USER		Programmer's guide 5	
		Sixteen Colours: Mode 2	
Logical No.		Colour	
Fore ground	Back ground	Colour	Colour*
0	128	Black	White*
1	129	Red	Cyan*
2	130	Green	Magenta*
3	131	Yellow	Blue*
4	132	Blue	Yellow*
5	133	Magenta	Green*
6	134	Cyan	Red*
7	135	White	Black*
* = Flashing			
N.B. The foreground logical colour numbers on entry to Mode 2 are also the actual colour numbers of the BBC Micro's palette.			

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 £1.50 post and packaging.

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.



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.

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 £2 (Inc. VAT). For separate purchases **Buzzgo** costs £3.50 (Inclusive).

MICRO-ADVENT (A subsidiary of Advent)

Ashlyn House, 113 Writtle Road, Chelmsford, Essex.

Opening hours 9.30am - 3.30pm Monday - Friday.

Telephone: 0245 59708

**More of a revue
than a review..**

SPLURGE

- the thinking man's Pascal

STRUCTURE is all important in computer programming, so much so that a language should be selected entirely on the basis of its structured properties. The majority of computer experts consider that it is more important that a language should be well structured than that it should be useful.

The new language about to be released on ROM is the most highly structured language so far available. This language, Splurge II, supports all the structures offered by Pascal and Algol, and in addition several novel structures which make Splurge particularly suitable for artificial intelligence, simulation and NP-complete problems.

Splurge offers all the usual structures, FOR, WHILE, REPEAT and IF, by enclosing the statements in the structure in the usual begin .. end compound statement, but in Splurge II the begin is replaced by the word DO and the end by the word DONT. An ELSE implies DONT ELSE DO, thus giving rise to statements such as:
IF A=B THEN DO B=C; A=D
ELSE DONT

The existence of DO and DONT allow reverse structures to be set up, in which an action is performed only if some condition is not true. This is done by putting the 'DONT' statement before the DO:
IF A=B THEN DONT PRINT "A is not equal to B" DO

Splurge stands for Structured Programming Language with User Restricted Goto Environment, and one of the features is the ability of the user to completely eliminate all GOTO statements. This is one of the main aims of structured programming, and can be achieved at a stroke by the use of the GOTO OFF statement, which causes all subsequent GOTOs to become illegal. GOTO OFF can be cancelled by GOTO ON.

The most exciting statements in Splurge II are the stochastic statements, which cause random effects. The most basic of these is the

stochastic GOTO (SGOTO) which causes the program to jump to a random statement.

SGOTO does not normally consider all statements as candidates for the jumps; instead the COME FROM statement is used to mark the lines to which the SGOTO can jump.

For example, the statement 300 COME FROM 200 allows a SGOTO statement at line 200 to cause a jump to line 300, or to any other line with COME FROM 200; SGOTO selects between them at random. SGOTO ANY ignores COME FROM and jumps to a random line.

Stochastic statements are also a feature of procedure calls in Splurge II. The SCALL statement calls a random procedure, and the SRETURN statement RETURNS to a random part of the program. There is also an inverse return statement, IRETURN, which allows return to any statement in the program except the one after the procedure call.

The SHUFFLE statement is another flexible example of Splurge II's versatility. The statement SHUFFLE

A, where A is an array, shuffles the array elements, and can be considered to be the opposite of a sort. On its own, the command SHUFFLE shuffles the stack, thus giving rise to a great variety of random events. SHUFFLE PROC shuffles the names of all the procedures. The equivalent statement with strings is A\$ = ANAGRAM\$(A\$), which causes a random rearrangement of the string.

Two more statements of tremendous potential usefulness are the REVERSE and GO BACKWARDS statements. The latter causes the program to go from each statement to the statement with the next lowest line number (the opposite direction to normal) starting with the current statement. The REVERSE statement reverses the direction of program flow. Direction of program flow can be evaluated using the two functions FORWARDS and BACKWARDS. If the flow is in the conventional direction, FORWARDS is true and BACKWARDS is false. The reverse is true after a GO

Exclusive!

**Ron H.J. POETH and SAM MACRAB
delve into the unbelievable, and we do
mean unbelievable, depths of
SPLURGE II, the latest language ROM
for the BBC Micro**

From Page 65

BACKWARDS statement.

No review of Splurge II would be complete without a description of the splendid Ferret graphics system. Ferret graphics are in many ways similar to Turtle graphics, but there are significant differences. The most important is that, unlike the Turtle which must stay on the flat surface, the Ferret can vanish down holes and reappear elsewhere on the screen. This provides a limited 3D capability. The Ferret is also much faster than the turtle, but not nearly as user friendly.

Normally Splurge II runs under an interpreter which is invoked by typing *SPLURGE. This enters SUE, the Splurge User Environment. SUE also offers a compiler, which allows the program to be executed using the many compiler options designed for rapid debugging.

These options include BOTTOM, which causes the program to be executed from the last statement upwards, and IGNORE, which causes the compiler to ignore all occurrences of

a specified kind of statement (eg. IGNORE IF).

The SHUFFLE option shuffles all the statements, thus simulating the effect of dropping a deck of cards, a frequent manoeuvre in the days of mainframe batch systems (the same effect can be achieved in Basic by typing REN. 30000), and the CONVERT option changes all occurrences of WHILE into REPEAT UNTIL, and vice versa.

The compiler is not exactly compatible with the interpreter, but the program can be converted from the compiler form to the interpreter form by typing the command CFORM and the reverse can be achieved by the command IFORM.

The most powerful feature of the compiler is an improvement of the PL1 defaults system. When PL1 detects an error it guesses a correction and continues. This can cause problems if PL1 guessed wrongly, so Splurge II guesses a correction and enters it as a comment. The command IMPLEMENT COMMENTS, given after a syntax error, causes the guessed corrections to be put into effect.

The Splurge II compiler does not produce machine code directly. Instead, the source code is converted into P-code via an intermediate step called S-code. The P-code is then translated into L-code, U-code, R-code and G-code, which is finally interpreted into E-code or machine code. The Splurge II compiler is unusual in that execution times are in general longer than the times produced by the interpreter.

At the moment Splurge II is suffering minor production problems. The copy presented to us for review is in five EPROMs mounted piggyback, and will only run under operating system 0.1 EPROM.

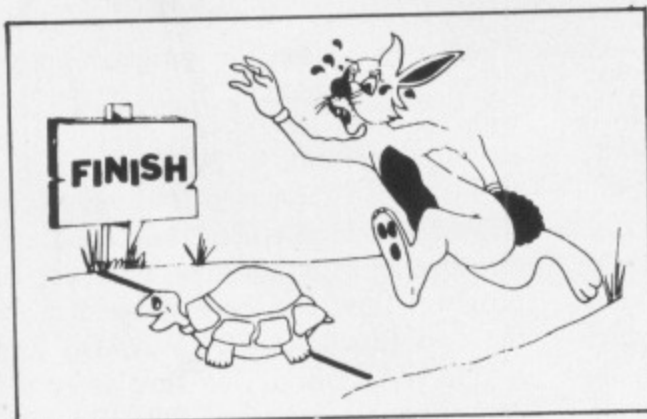
Despite this, it is only a matter of time before the bugs are ironed out and Splurge II is released on ROM. The language is a worthy successor to BBC Basic, offering facilities that only occur elsewhere in ADA (which is less efficient and needs a much larger machine to run on). It should put someone light years ahead of their competitors.

Oswaltdwistle
1 April, 1983

H

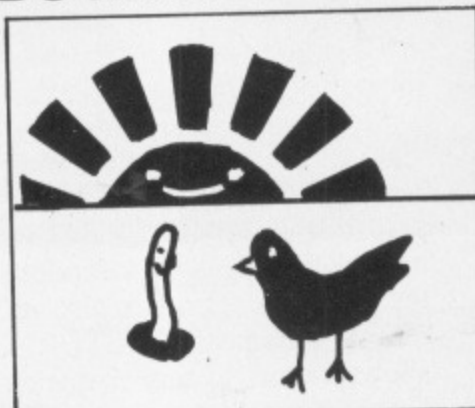
H & H SOFTWARE FOR THE BBC MICRO COMPUTER

H



No prizes for guessing who the race is between in SHAPE and RACE

£5.50



EARLY SERIES - ONE, TWO & THREE. Educational games for young readers.

£6.50



TESS. Do you want a completely different type of Program? TESS is for you.

£8.50

ALPHABETA, our Word Processing Package, now has extra facilities including Print emphasis and underlining, it's compatible with most popular printers and ... there's a **Price reduction.** £14.50 for tape and £16.00 for disc version.

For further details of all our Programs please send S.A.E.

Prices include cased cassette, instructions, postage, etc. Please send orders and cheques/PO/Transcash (No. 61 413 1707).

H & H SOFTWARE, Dept. A. 53 Holloway, Runcorn, Cheshire.

Computerama-

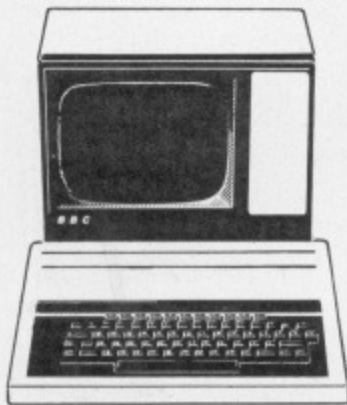
The Midlands

Home Computer Specialists

**WALK IN.
TRY ANY
COMPUTER
ANYTIME.**

**SYSTEMS
FOR EDUCATION
BUSINESS & LEISURE**
Yes. We cater for the educationalist.
SPECIAL OFFER!!
£3.00 discount on 3 or more cassettes
**SAME DAY DESPATCH
ON STOCK ITEMS!**
NEW! ACORN ELECTRON
Telephone for latest
price and delivery

BBC	Inc. VAT.
BBC Model A	£299.00
BBC Model B	£399.00
BBC Model B plus disk/int.	£499.00
BBC Model A+32K	£338.00



DISK DRIVES	Inc. VAT.
Including utilities, disc and manual	
LVL single 100K drive	
expandable to 2 x 100K	£265.00
LVL double 100K drive	£389.00
Acorn 2 x 400K 80 track	£804.00
Torch 2 x 400K Z80	
disk pack	£895.00
Cannon 1 x 100K drive	£212.75
Cannon 2 x 100K drive	£388.00

MONITORS	Inc. VAT.
Microvitec 14"	
colour monitor	£287.50
Sanyo colour monitor	£229.00
Sanyo green monitor	£89.00

ACORN SOFTWARE	Inc. VAT.
Algebraic Manipulation	£9.95
Arcade Action	£11.90
Arcadians	£9.95
Business Games	£9.95
Chess	£9.95
Creative Graphics	£9.95
Cube Master	£9.95
Desk Diary	£9.95
Forth	£16.85
Graphs and Charts	£9.95
Lisp	£16.85
Meteors	£9.95
Monsters	£9.95
Peeko Computer	£9.95
Philosophers Quest	£9.95
Planetoid	£9.95
Rocket Raid	£9.95
Sliding Block Puzzles	£9.95
Snapper	£9.95
Sphinx Adventure	£9.95
Super Invaders	£9.95
Tree of Knowledge	£9.95

BUG BYTE	Inc. VAT.
Airlift	£5.50
Backgammon (A/B)	£8.00
Dragon Quest	£11.50
Fruit Machine	£5.50
Golf	£5.50

Multifile (A/B)	£15.00
Polaris	£5.50
Space Pirates (A/B)	£8.00
Space Warp	£9.00

MICRO POWER	Inc. VAT.
Adventure	£7.99
Alien Destroyers	£7.99
Astro Navigator	£5.70
Cat and Mouse	£5.70
Chess A	£5.70
Chess B	£7.99
Cowboy Shoot Out	£6.85
Croaker	£7.99
Eldorado Gold	£6.85
Footer	£7.99
Galactic Commander	£7.99
Junior Maths	£6.85
Laser Command	£7.99
Martians	£6.85
Maze Invaders	£5.70
Munching Man	£6.85
Reversi A and B	£5.70
Roulette	£5.70
Seek A	£6.85
Space Maze	£6.85
Swoop	£7.99
Time Trek	£7.99
World Geography	£6.85

I.J.K.	Inc. VAT.
Atlantis	£7.50
Beeb Beep	£4.50
Beeb Munch	£6.50
Flags	£4.50
Hangman	£4.50
Hyperdrive	£6.50
Invaders Model A (A/B)	£5.50
Invaders Model B (B)	£7.50
Mutant Breakout (A/B)	£6.50
Super Hangman	£4.50
Strato Bomber	£7.50
3D Maze (B)	£4.50
Word Pro (B)	£10.50
Startrek/Candy	
Floss (A/B)	£6.50
Family Game (A/B)	£4.50

A and F	Inc. VAT.
Frogger	£8.00
Lunar Lander	£6.95
Painter	£8.00
Pharaohs Tomb	£8.00
Planes	£8.00
Tower of Alos	£6.95

DIGITAL FANTASIA	Inc. VAT.
Adventures 1 to 10	
Note: 5 to 10 require 32K all at	£8.95

PRINTERS	Inc. VAT.
Acorn Spark Jet Printer	£419.00
Seikosha GP 100A	£238.00
Seikosha GP 250X	£274.85
Epson FX 80	£504.85
Epson MX 100 FT III	£539.00
Smiths Corona TP/1	
(Daisywheel)	£557.00
NEC PC 8023	£458.00



ACCESSORIES	Inc. VAT.
Cassette Deck for BBC	£29.90
5 1/4 Diskettes (Box 10)	£20.00
Cassette Lead For BBC	£2.80
Printer Cable (Parallel)	£14.95
C15 Data Cassettes	£0.65
BBC Joysticks	£13.00

BOOKS	Inc. VAT.
30 hour Basic	£5.95
ALP for BBC Micro	£8.95
BBC Revealed	£7.95
Let your BBC Micro teach you to program	£6.45
Basic Programming on the BBC MICRO	£5.95
Creative Graphics	£7.50
Graphs and Charts	£7.50
LISP Manual	£7.50
Forth Manual	£7.50

BUSINESS SOFTWARE	Inc. VAT.
Database	£19.95
Commercial Accounts	£19.95
Invoices and Statements	£19.95
Stock Control	£19.95
Home Accounts	£19.95
Mailing List	£19.95
Wordwise	£45.00
View	£59.00

CLARE	Inc. VAT.
Graph Key	£7.95
Graph Stick	£7.95
Graph Key/Stick/Disk	£12.95

ORDER: please indicate method (✓)

- ☐ Access/Mastercharge/Eurocard Card No.
- ☐ Barclaycard/Visa
- ☐ Cheques/PO made payable to SATCOM Expiry Date

Name.....

Address

Post Code.....

Send to: Computerama, 1 Sash Street, Stafford ST16 2PS.

computerama
The Midland's Home Computer Specialists.

STAFFORD
59 Foregate Street, Stafford,
ST16 2PR. Tel: (0785) 41899

STOKE-ON-TRENT
11 Market Square Arcade, Hanley,
Stoke-on-Trent, ST1 1PD.
Tel: (0782) 268620

BBC
SERVICE
INFORMATION
CENTRE

ACORN
COMPUTER
DEALER



WHY



"Habit is habit, and not to be flung out of the window by any man, but coaxed downstairs a step at a time."

Pudd'nhead Wilson — Mark Twain.

IN a recent review of books about programming John Laski observed that "Flowcharts still hang around in syllabuses and codes of practice just because the computing pioneers used them."

Old habits die hard and it would be hard to explain if some people did not still use flowcharts. In view of the persistence of old habits, it is remarkable that most computing professionals and experienced academics find them of little value.

But even if one accepts that structured programming is appropriate

** Roy Atherton is with Bulmarsh Computer Education Centre.*

for professionals doing large or complex tasks, it may be argued that beginners or amateurs — schoolchildren or the personal computing fraternity — may find the older methods easier and adequate.

These articles will explain the fallacy of this view and show how we can all make the best of our abilities, whether they be high or moderate, by using structured methods. Further, it is important for the intellectual and educational health of the nation that we should do so.

In saying this one agrees with the paragraph about schools in the recent Alvey Report:

"Action must start in the schools. We support the moves which are now putting computing on the curriculum. But, it is no good just providing schools with microcomputers. This will merely produce a generation of poor Basic programmers. Universities in fact are having to give remedial educa-

**By ROY
ATHERTON**

tion to entrants with "A" level computer science.

"Teachers must be properly trained, and the languages chosen with an eye to the future. Uncorrected, the explosion in home computing with its 1950s and 1960s programming style will make the problem even worse."

If Alvey and the other opponents of what might be called traditional Basic programming are wrong, then it doesn't matter. A million microcomputers have been sold. We're all learning fast. What is the problem? Why make a fuss?

The problem is that if something is wrong, it is not wrong on a trivial scale. In these circumstances it is worth examining the situation very carefully. If there is a problem and it is a big one, then the rewards for putting it right are correspondingly great.

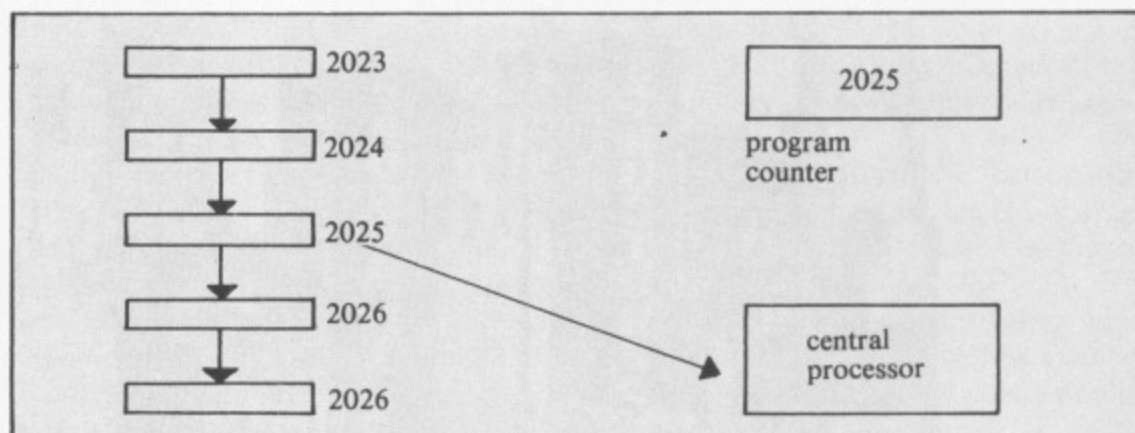


Figure III. Forward jump (decision)

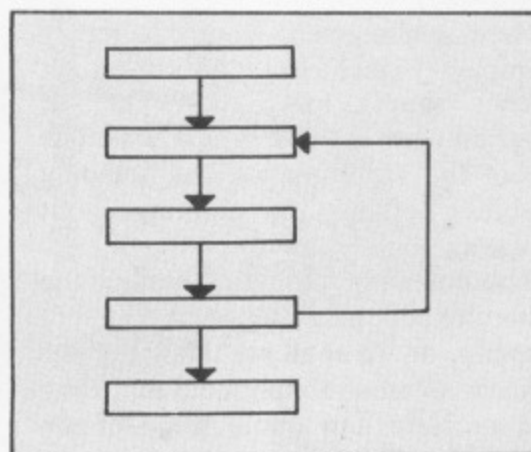


Figure II. Backward jump (repetition)

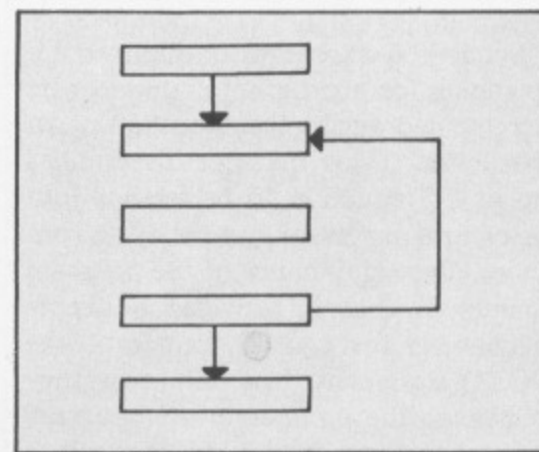


Figure I: A stored program segment

What is not so obvious is that the rewards at a personal level can be great as well. The writer now knows dozens of non-specialist beginners who, after the initial extra effort of learning the structures, "took off" like young birds suddenly able to fly.

The only real proof of that phenomenon is experiencing it or talking to those who have. These articles will take Pudd'n'head Wilson's advice and try to show, a step at a time, how structured programming came about, what it is and why it is so good — for any programmer at any level.

Mark Twain's homespun philoso-

pher also observed that "Few things are harder to put up with than the annoyance of a good example".

In the leisurely days of the mid-19th century amid the abundant natural wealth of the Southern States of America, Samuel Langhorne Clemens took his pen name from the old Mississippi riverboats. It means "Two fathoms deep", and few would dispute the depth of his wisdom, but we have to move faster than riverboats now.

Having encountered pearls among the dross of outmoded practices, it is no more possible to keep silent than it is to conceal the name of a good

restaurant. The message is hard and radical, technically just a few extra words added to Basic, but in reality a new philosophy and conceptual framework for problem-solving.

It will be easier to follow and accept in a historical context so we will start with first ideas, a 1950s view of computing.

In those days of glass valve computers, the pioneers used machine code or something close to it. A machine code program is physically a sequence of instructions, and it sits in sequential

```

210 INPUT TAB(13,10) "Enter y or N" A$
220 IF A$="YES" OR A$="Y" THEN GOTO20000
230 If A$="N" OR A$="NO" THEN GOTO 300
240 PRINT CHR$(7)
250 GOTO 162
300 CLS
310 PRINT TAB(5,5) "LESSON IDENTIFICATION ROUTINE"

```

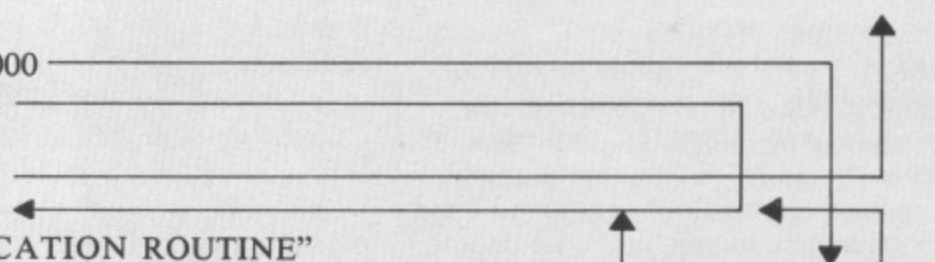
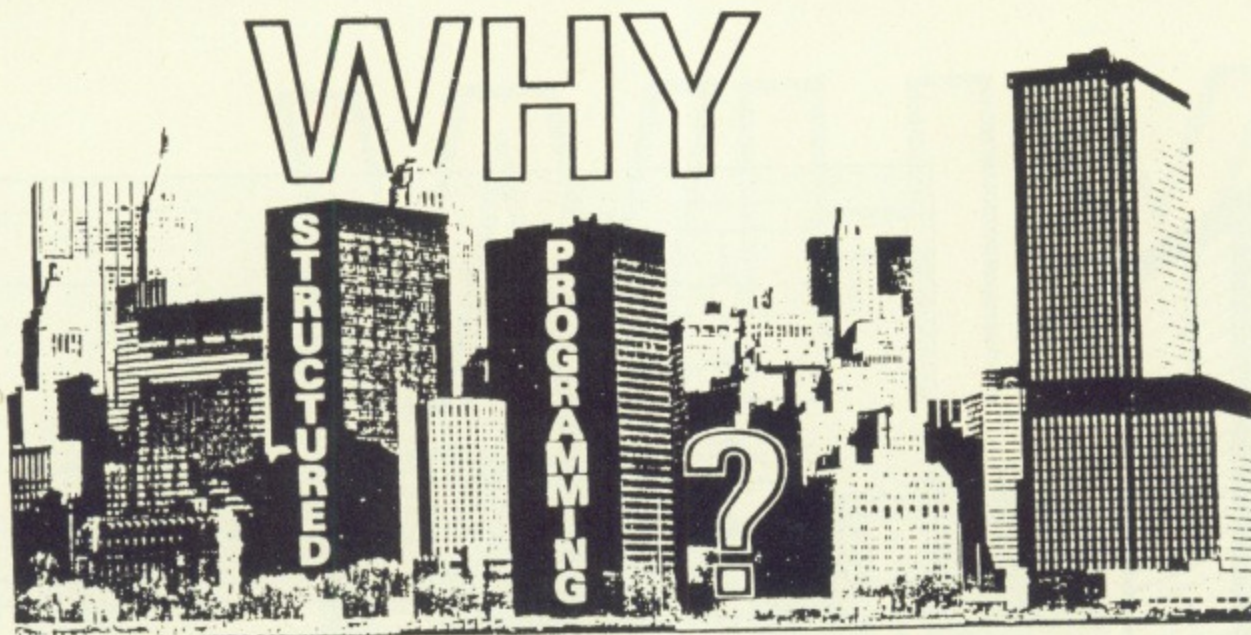


Figure IV: Segment from badly structured program



From Page 69

memory locations, of which a few are shown in Figure I.

Sequential execution is obtained by arranging for a program counter to be incremented during the execution of an instruction. This number determines the next instruction to be fetched into the central processor and the cycle continues. The significance of the program counter is that it provides a simple mechanism for control transfer – the GOTO statement. It is only necessary to change the number in the program counter to cause backward, forward or with a little extra organising, sub-routine jumps.

The 1960s brought the so-called high level languages like Fortran, Cobol, Algol and, a little later, Basic. These languages enabled more programmers to write more programs more easily. One of the most significant advances was the FOR loop which enabled repetition with exit on a count. In BBC Basic this might read:

```
FOR record = 1 TO 100
  Action on
  record
NEXT record
```

This achieves repetition without the explicit use of GOTO. Without a FOR structure one could write:

```
100 record = 0
110 Action on
    record
200 record=record+1
210 IF record 10 THEN GOTO 110
```

The FOR loop is a structure which reflects the thinking behind the program. It is about repetition. The alternative method required the programmer to set up the counter explicitly and use what is essentially a binary decision concept to cause the

repetition. This does not seem particularly difficult or damaging but we have all seen what using GOTO can, and usually does, lead to.

Here is a segment from one recent example (Figure IV). A self-taught teacher simply lost control of the program when it reached 110 lines. The use of the proper structures not only enables better programming – it encourages it.

This could not happen so easily if the structures of BBC Basic were used properly, as we shall see later. For the moment we shall simply note that there is a problem and quote some of the world's leading computer scientists on the subject.

One of the most famous learned articles of all time must be Edsger Dijkstra's "GOTO Statement Considered Harmful".

It has produced a spate of jokey references by commentators and writers, such as "The Else Must Go" and "Programming Considered Harmful". Dijkstra suggests that:

"... our intellectual powers are rather geared to master static relations ... our powers to visualise processes evolving in time are relatively poorly developed. For that reason we should do ... our utmost to shorten the conceptual gap between the static program and the dynamic process."

"The GOTO statement ... is too much an invitation to make a mess of one's program."

There is no doubt where Dijkstra stands, but it is interesting that in the final paragraphs of his paper he refers to a remark by Heinz Zemanek in Copenhagen, in 1959. Zemanek expressed doubts, even then, as to *"... whether the GOTO statement should be traced on an equal syntactic footing with the assignment statement."*

The ideas had clearly been brewing

in Dijkstra's mind for some time. In 1965 he wrote: *"... two programming departmental managers from different countries and different backgrounds – the one scientific, the other mainly commercial – have communicated to me, independently of each other and on their own initiative, their observation that the quality of their programmers was inversely proportional to the density of GOTO statements in their programs. This has been the incentive to try to do away with the GOTO statement."*

Despite the strength of the case the view seemed to persist, in the UK and elsewhere, that structured programming was too hard or not necessary for non-professionals. The BBC's first computer literacy series, "The Computer Programme", was based on the old methods. Many people urged them to change, including 11 lecturers from the Polytechnic of North London:

"In view of the future importance of computer literacy to the UK, it would be nothing less than a national tragedy if thousands upon thousands of eager young minds were introduced to the technology of the 1980s through the modes of thought of the 1960s. It is not too late to reconsider: we urge you to reassess your software policy."

Reconsider they did. Apart from one small lapse, the second series, "Making the Most of the Micro", did not mention the GOTO statement and paid proper regard to structured methods. It is a very good series of programs, certainly good enough to make one feel optimistic about the future.

The BBC joins the Open University, another major institution with an interest in schools, teacher training and general continuing education, in having "gone structured". In the next article we shall begin to see in practical details what this means.

REVIEW

AN EPROM is an erasable read-only memory that can be used to store programs permanently. They do not lose their memory when the power is removed and can only be erased by exposing them to strong ultra-violet light for about 20 minutes. This wipes them clean ready for them to be reprogrammed.

To program a memory location, the address of that location is placed on the address pins and the contents required are placed on the pins which are normally outputs.

Then one pin, which is called the program input, is raised to about 25 volts and another pin is subjected to a 5 volt pulse for 50 ms. This procedure must be repeated for each memory location, so it can take some time if

several thousand locations are to be programmed.

It is obvious that to do this some special hardware is needed as well as software to control it. As to who might need one, it is almost certainly the case that if you have to ask you don't! However, they can be used for making dedicated computer systems, a plug-in cartridge of your favourite software to sell or to save time loading.

One such package is supplied by Microtrol Engineering Design. It is known as the MEDPROM S3P1 EPROM Programmer and sells for £79. It plugs into the user port of the BBC Micro and also requires connection to the mains.

The unit is professionally built in a sloping front grey plastic box with a screen printed aluminium front panel. The multi-way cable to attach it to the computer is just about adequate in length.

This model is suitable for connection to other computers and software is available for the Pet and UK101, with others in the pipeline. One of the design features is that it only takes up one memory port and so can be connected to the user port. Many others need two or more connections.

The EPROM types that can be programmed are of the 2k variety, 2516 & 2716 and the 4k types, 2532 & 2732. The latter are the ones that hold the EPROM version of operating system 0.1 on the early BBC machines.

The MEDPROM cannot cope with the new 8k type EPROMs that hold Wordwise and other such programs as they are in a 28 pin package. The front panel has an EPROM type-selector switch, a power switch labelled "Remove EPROM", and three red LEDs. These indicate "Mains connected", "Power on the EPROM" and "Programming in operation". There is also a zero force insertion socket of the dual-lever type to accommodate the EPROMs.

The documentation consists of three single sheets of operating instructions and a double-sided publicity handout. These give an adequate indication of the procedure to be followed.

The software comes on cassette and was rather difficult to load. This should not surprise anyone, but there were no instructions about how to make a backup copy using your own recorder, as this often works better than a duplicated tape. The program has been supplied at speeds of 300 baud and 1200 baud to ease this problem. To load and run the program you type:

***RUN "MEDPROM"**

The program automatically loads into the correct location if you only have 16k of memory. Once running you are asked to specify the EPROM type and you can then enter any command.

Commands are available to read a section of the EPROM into memory, display the contents of the EPROM or memory, check that a section has been erased, write a section of memory to EPROM, and finally, to check a section of memory against the contents of the EPROM. All the above require a five letter command (which can be shortened to two), as well as address information in hexadecimal.

When the EPROM is being



**Let's cast
some light
(but not ultra violet)
on EPROMs**

REVIEW

programmed it is automatically tested to see whether it is blank and checked afterwards to see if it has been correctly programmed.

During programming, which can take up to four minutes depending upon the length, a constantly moving number is displayed in the lower left hand corner of the screen. This is a particularly nice feature and gives you something to look at while twiddling your thumbs. It also assures you that the thing is still working as four minutes can seem a long time.

As the programming procedure is written in machine code, very little time is wasted and the EPROMs are programmed in the minimum recommended time.

In operation the MEDPROM performed well. I programmed all the types it is capable of and confirmed the contents by testing them against my own system. I have been using EPROMs of one type or another for about eight years and have come across many programming systems. I found this one had a few niggling faults that would not be expected at the price.

First, the zero force socket is not of

particularly high quality. It required the EPROM to have its legs straightened before insertion and even then it required some force to push it home. At times the EPROM did not seat properly in the socket and had to be re-programmed. This is not a fault of the specific socket in the machine I had for review but a general one with that design of socket. With better quality ones available it seems a shame to spoil the ship for a ha'p'eth of tar.

In operation the software was not very user friendly, forcing you to constantly juggle hexadecimal addresses in your head. This is in some respects necessary if you are going to be able to program separate sections of EPROM, but in my experience the whole EPROM is usually programmed at one time.

It would have been quite easy to make a virtual system with a little thought, that is, one where you need not bother about addresses. There is also no means of modifying the contents of the memory, so the MEDPROM would be better described as an EPROM copier. To be fair, this software can link up to a monitor

program, MEDMON, supplied by the same firm, but the EPROM programmer is of little serious use without it.

Another criticism is that there is no indication of how the EPROM programmer is squeezed onto one input/output port, and so writing your own software to overcome these shortcomings is made even harder. It was not made clear in the instructions, but it is possible to re-specify the EPROM type and so move the contents of one type of EPROM to another. No re-entry address is given, so the program has to be loaded again once it has been exited.

I found the MEDPROM well-made and sensibly priced. I would have liked to see a better zero force socket and friendlier software, but overall it did perform adequately. You should note that you cannot change any locations unless you have the extra MEDMON monitor program.

BBC Micro User's ratings

- *** Value for money
- ***** Quality of construction
- ** Ease of use
- ***** Performance

BBC MICRO OWNERS! KEEP **PACE** WITH LATEST TECHNOLOGY!

ACQUIRE THE COMPLIMENTARY DISC DRIVE

This superb precision disc drive has been specifically designed to give increased versatility to the BBC microcomputer. It is made by the world-famous camera manufacturers, Canon. Compact and colour matched, it measures a mere 217mm x 303mm x 63mm. The entire design concept is notably advanced and practical e.g. improved head seek accuracy has been achieved by positioning the read/write heads with a four phase DC stepper motor actuator. A wheel provides precise location of the head track. The solenoid connected via hardware jumper automatically locks the front door when in use, ensuring data security. Utilities Disc and Operating Manual available.



PACE
SOFTWARE SUPPLIES

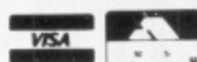
QUITE REMARKABLE VALUE AT

£338 plus VAT

130 CLAYTON ROAD
BRADFORD BD7 2LY

Single version available at

£185 plus VAT
INCLUDING ALL CABLES
POSTAGE AND PACKING FREE



TELEPHONE: 0274 575973

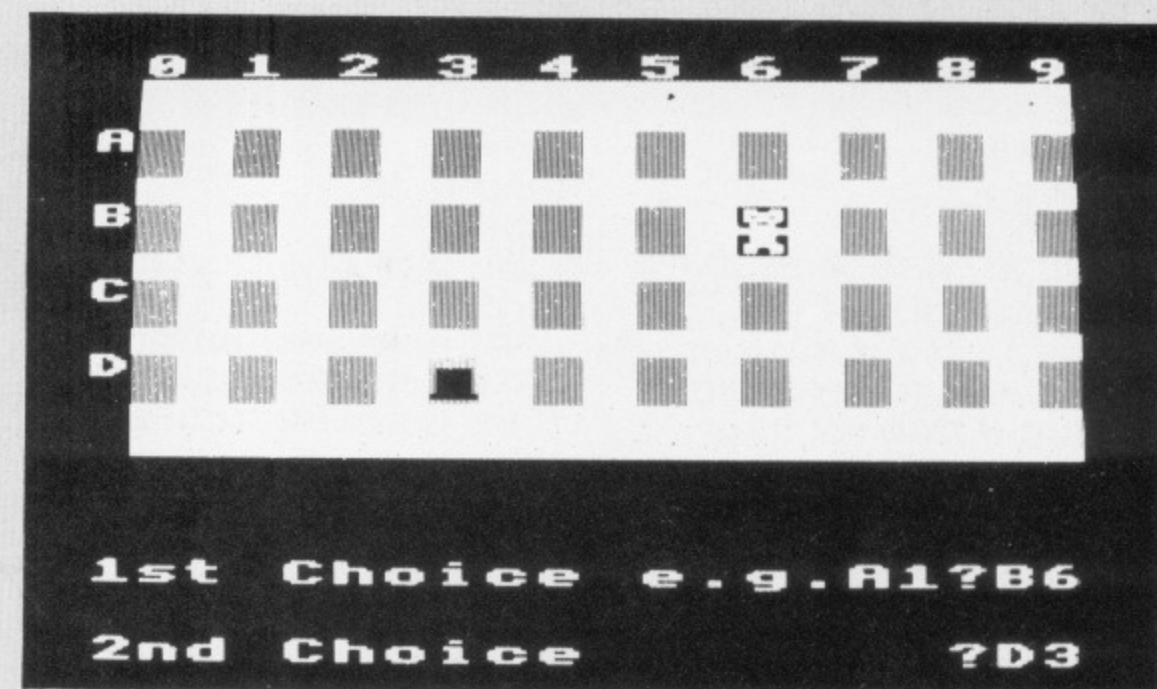
Pelmanism listing

From Page 15

```

1)CHR$(BZ)
340COLOUR2:COLOUR128:ENDPROC
350REM CLEAR PRINT AND COUNT GOES
360DEFPROCCL:TMZ=TIME+200
370IF AZ(P1Z)<>AZ(P2Z) COLOUR1:PROCSND
1:PROCME:GOTO390
380CTZ(TZ)=CTZ(TZ)+1:AZ(P1Z)=0:AZ(P2Z)
=0:COLOUR2:PROCSND2
390REPEAT UNTILTMZ<TIME
400PRINTTAB(X1Z,Y1Z)C$TAB(X1Z,(Y1Z+1))
C$TAB(X2Z,Y2Z)C$TAB(X2Z,(Y2Z+1))C$
410COLOUR2:ENDPROC
420REM COMPUTERS TURN
430DEFPROCCMP:TZ=2
440FOR IZ=1 TO TTZ-1:BZ=MZ(IZ):IF BZ=0
GOTO510
450IF AZ(BZ)=0 GOTO510
460FOR JZ=IZ+1 TO TTZ:CZ=MZ(JZ):IF CZ=
0 GOTO500
470IF BZ=CZ GOTO500
480IF AZ(CZ)=0 GOTO500
490IF AZ(BZ)=AZ(CZ) JZ=TTZ:NEXT:IZ=TTZ
-1:NEXT:GOTO610
500NEXT
510NEXT
520BZ=RND(40):IF AZ(BZ)=0 GOTO520
530FOR IZ=1 TO TTZ:IF MZ(IZ)=BZ:IZ=TTZ
:NEXT:GOTO520
540NEXT:FOR IZ=1 TO TTZ:CZ=MZ(IZ)
550IF AZ(BZ)=AZ(CZ) IZ=TTZ:NEXT:GOTO61
0
560NEXT
570CZ=RND(40):IF AZ(CZ)=0 GOTO570
580IF BZ=CZ GOTO570
590FOR IZ=1 TO TTZ:IF MZ(IZ)=CZ:IZ=TTZ
:NEXT:GOTO570
600NEXT
610PZ=BZ:JZ=(PZ-1)/10:IZ=PZ-1-JZ*10:JZ
=JZ+1
620AZ=254:BZ=253:PROCPRT:P1Z=PZ:X1Z=XZ
:Y1Z=YZ
630PZ=CZ:JZ=(CZ-1)/10:IZ=CZ-1-JZ*10:JZ
=JZ+1
640AZ=252:BZ=251:PROCPRT:P2Z=PZ:X2Z=XZ
:Y2Z=YZ
650PROCCL:ENDPROC
660DEFPROCSND1
670FOR IZ=180TO60STEP-1:SOUND1,-10,IZ,
0:NEXT
680SOUND1,-10,60,2:ENDPROC
690DEFPROCSND2
700FOR IZ=80TO160:SOUND1,-10,IZ,0:NEXT
710SOUND1,-10,155,2:ENDPROC
720DEFPROCME
730IF TTZ>2 FOR IZ=3 TO TTZ:MZ(IZ-2)=M
Z(IZ):NEXT

```



```

740MZ(TTZ-1)=P1Z:MZ(TTZ)=P2Z
750ENDPROC
760DEFPROCENDGAME:COLOUR130:COLOUR0
770PRINTTAB(5,8)"END OF GAME"TAB(6,12)
;
780IF CTZ(1)=CTZ(2) PRINT" A DRAW!!"
790IF CTZ(1)>CTZ(2) PRINT" YOU WIN"
800IF CTZ(1)<CTZ(2) PRINT" I WIN"
810EZ=2:PRINTTAB(4,15)"I Score : "CTZ
(2)
820PRINTTAB(4,17)"You score : "CTZ(1);
830CTZ(1)=0:CTZ(2)=0:COLOUR128:COLOUR2
840PRINTTAB(0,24)SPC(80)TAB(1,27)"SPAC
E to restart:";
850PROCON
860IZ=6ET:IF IZ<>32 GOTO860
870ENDGAME=1
880ENDPROC
890DEFPROCOFF:VDU23;10,32;0;0;0;:ENDPR
OC
900DEFPROCON:VDU23;10,67;0;0;0;:ENDPR
OC
910DEFPROCCHAR:LZ=DZ(ZZ)*20
920GOTO (910+LZ)
930VDU23,AZ,60,90,60,24,62,93,93,93
940VDU23,BZ,221,181,84,84,84,148,20,54
:ENDPROC
950VDU23,AZ,0,24,60,60,126,126,255,60
960VDU23,BZ,126,126,255,60,126,255,24,
24:ENDPROC
970VDU23,AZ,0,0,0,0,124,127,125,125
980VDU23,BZ,125,125,127,124,124,124,0,
0:ENDPROC
990VDU23,AZ,0,8,20,54,65,119,54,54
1000VDU23,BZ,20,20,8,8,16,32,32,64:ENDP
ROC
1010VDU23,AZ,0,0,0,0,126,126,126,126
1020VDU23,BZ,126,126,126,126,255,255,0,
0:ENDPROC

```

```

1030VDU23,AZ,36,36,60,36,36,36,60,36
1040VDU23,BZ,36,36,60,36,36,36,60,36:EN
DPROC
1050VDU23,AZ,0,0,127,119,119,65,119,119
1060VDU23,BZ,127,64,64,64,64,64,0:EN
DPROC
1070VDU23,AZ,0,60,66,66,193,161,159,129
1080VDU23,BZ,129,129,66,66,60,255,255,0
:ENDPROC
1090VDU23,AZ,0,0,0,24,60,126,126,126
1100VDU23,BZ,126,126,60,24,0,0,0,0:ENDP
ROC
1110VDU23,AZ,0,0,0,124,124,124,124,124
1120VDU23,BZ,124,56,16,16,16,56,0,0:END
PROC
1130VDU23,AZ,0,0,124,126,126,9,8,8
1140VDU23,BZ,8,8,8,8,8,8,0,0:ENDPROC
1150VDU23,AZ,0,0,8,8,28,62,127,73
1160VDU23,BZ,8,8,8,8,28,28,0,0:ENDPROC
1170VDU23,AZ,0,20,62,42,62,28,28,62
1180VDU23,BZ,126,122,122,122,250,128,24
0,12:ENDPROC
1190VDU23,AZ,0,0,16,84,124,254,108,254
1200VDU23,BZ,124,84,16,16,16,8,4,0:ENDP
ROC
1210VDU23,AZ,0,102,126,90,126,36,60,255
1220VDU23,BZ,255,60,60,60,126,102,102,0
:ENDPROC
1230VDU23,AZ,0,0,0,112,112,112,112,112
1240VDU23,BZ,112,112,112,124,126,126,92
,0:ENDPROC
1250VDU23,AZ,0,0,0,56,68,56,16,16
1260VDU23,BZ,16,16,16,16,28,24,28,0:END
PROC
1270VDU23,AZ,0,24,16,16,24,52,84,82

```


Pelmanism listing

From Page 73

```

1280VDU23,BZ,146,145,145,255,255,127,0,
0:ENDPROC
1290DEFPROCINIT
1300ENDGAME=0
1310PROCOFF
1320VDU23,255,255,255,255,255,255,255,2
55,255:C$=CHR$(255)
1330VDU19,3,2,0,0,0,19,131,2,0,0,0
1340TZ=1:FOR JZ=1TO DZ:TZ=TZ*2:NEXT
1350TTZ=TZ:IF TTZ>40 THEN TTZ=40
1360VDU12:COLOUR2:PRINT"" 0 1 2 3 4
5 6 7 8 9";
1370FORIZ=1TO15:PRINT" "STRING$(19,CHR$(
255));NEXT
1380PRINTTAB(0,7)"A"TAB(0,10)"B"
1390PRINTTAB(0,13)"C"TAB(0,16)"D";
1400FOR JZ=1TO4
1410FOR IZ=0TO9
1420YZ=4+JZ*3:XZ=IZ*2+1
1430COLOUR1:PRINTTAB(XZ,YZ)C$TAB(XZ,(YZ
+1))C$:COLOUR2
1440NEXT:NEXT
1450FOR IZ=1TO40:AZ(IZ)=IZ/2+.5:MX(IZ)=

```

```

0:NEXT
1460REM SHUFFLE THE CARDS
1470FOR IZ=1TO40:ZZ=AZ(IZ):Z1Z=RND(40):
AZ(IZ)=AZ(Z1Z):AZ(Z1Z)=ZZ:NEXT
1480ENDPROC
1490DEFPROCVBLE
1500*FX4,1
1510DIM AZ(40),MZ(40),CZ(20),DZ(20),C1Z
(20),CTZ(2)
1520FOR IZ=1TO20:READDZ(IZ):NEXT
1530FOR IZ=1TO20:READCZ(IZ):NEXT
1540FOR IZ=1TO20:READC1Z(IZ):NEXT
1550ENDPROC
1560DEFPROCTITLE
1570PRINTTAB(7,5)CHR$141CHR$130"**** PE
LMANISM ****"
1580PRINTTAB(7,6)CHR$141CHR$130"**** PE
LMANISM ****"
1590PRINTTAB(4,10)CHR$131" Can you re
member more"
1600PRINTTAB(4,11)CHR$131" Pairs than I
can ?"
1610PRINTTAB(3,15)CHR$134;
1620INPUTTAB(4,15)"Choose degree of dif
ficulty(1-6)?"DZ

```

```

1630IF DZ<1 OR DZ>6 GOTO1620
1640PRINTTAB(3,20)CHR$133;PIC=0
1650INPUTTAB(4,20)"Do you wish to see t
he cards(Y/N)?"I$
1660IF I$="Y" OR I$="YES" PIC=1
1670ENDPROC
1680DEFPROCPIC
1690PROCINIT:AZ=254:BZ=253
1700FORIZ=1TO40:AZ(IZ)=IZ/2+.5:NEXT
1710FORIZ=0TO9:FOR JZ=1TO4
1720PZ=10*(JZ-1)+1+IZ:PROCPRT:
1730NEXT:NEXT
1740PRINTTAB(0,24)SPC(80)TAB(1,27)"SPAC
E to restart:";
1750PROCON
1760IZ=GET:IF IZ<>32 GOTO860
1770ENDPROC
1780IF ERR=17 GOTO40
1790REPORT:PRINT" at line "ERL:END
1800DATA 1,2,3,4,5,6,7,8,9,10,11,12,13,
14,15,16,17,18,4,18
1810DATA 1,3,3,1,0,0,1,0,3,1,1,2,0,1,2,
1,1,3,2,1
1820DATA 0,0,0,0,131,131,0,131,0,0,0,13
1,131,131,0,0,0,0,131,0

```

SIR COMPUTERS LTD — CARDIFF

Agents for Acorn, BBC and TORCH Computers

BBC Microcomputers

Model B £399.00
 Model B with disc interface £509.00
 Single 100K disc drive £249.00
 Dual 2 x 100K disc drive £389.00
 The disc manual and utilities disc are both included.
 Disc interface for the BBC Micro
 Kit £95.00
 Fitted £110.00
 Upgrade of BBC Model A to B £90.00
 Please telephone for up to date information on Prestel, Teletext, speech synthesis, second processors, etc.



TORCH Computers

Z-80 Disc Pack for the BBC Microcomputer £897.00
 This unit connects to the BBC Micro in the same way as a normal disc drive, but as well as offering a dual 2 x 400K disc drive for use under BBC BASIC or other languages it provides the option of using the wide range of CP/M software available for business and data processing applications. The firmware supplied with the machine allows switching between BASIC and CPN, a powerful operating system developed from CP/M 2.2.

In addition to the disc pack a second processor is supplied. This is a Z-80A with its own 64K RAM card, communicating with the 6502A in the BBC computer through the 'Tube'. Typically the speed of execution of programs under the twin-processor system is increased by up to 50% compared with a conventional single-processor computer. A third processor, the 16 bit 68000, will shortly be available.

**SIR Computers Ltd., 91 Whitchurch Road,
 Cardiff. Telephone: (0222) 21341**

TORCH CF240 £2795.00 (ex VAT)

This is an extension of the BBC microcomputer/Torch disc pack system, available in a single unit. The computer contains a BBC-based peripheral processor connected to the main Z-80 computer, a dual 2 x 400K disc drive as described above, a high resolution (80 character) colour monitor and a complete British Telecom approved 1200 baud modem. It is the only microcomputer which has been granted permission for direct connection to the Public Switched Telephone Network both in the U.K. and the United States.

The TORCH can communicate either directly with another TORCH or with virtually any other type of computer via Prestel. Using the Gateway facility of Prestel it is possible for the TORCH to access vast amounts of information stored by private organisations on public database systems. The Mailbox facility of Prestel also allows the use of electronic mail.

TORCH CH240/10 As above but with a 10 MB hard disc drive.
 TORCH CH240/21 As above but with a 21 MB hard disc drive.

PERIPHERALS

Seikosha GP 100A Printer £229.00
 NEC PC 8023 Printer £389.00
 Kaga 12" RGB Monitor £280.00
 Sanyo 14" RGB Monitor £270.00
 High resolution 12" black/green monitor £85.00

Please send for details of New Epson Printer Range.

SOFTWARE

We currently hold in stock programs from the following suppliers. Acornsoft, A&F Software, Bug Byte, Computer Concepts, Digital Fantasia, Golem, IJK Software, Level 9 Software, Molimerx, MP Software, Program Power, Salamander Software, Software for All, Superior Software, Database Software, Gemini Software.

Unfortunately we are unable to supply software by mail except as part of a large order. Delivery by Interlink of any of the above items £10.00 Unless otherwise stated all prices include VAT.

A NEW BOOK FOR FIRST TIME USERS

"Learning to Use the BBC Micro" is in a new series of books which introduces newcomers to the most widely used micros in the marketplace.

The books assume absolutely no knowledge about computers and the reader is shown even the most fundamental operations such as "switching on" and "loading a program". The books lead the reader through simple programming and then on to graphics, with several programs which show how to achieve pictures and even animation!

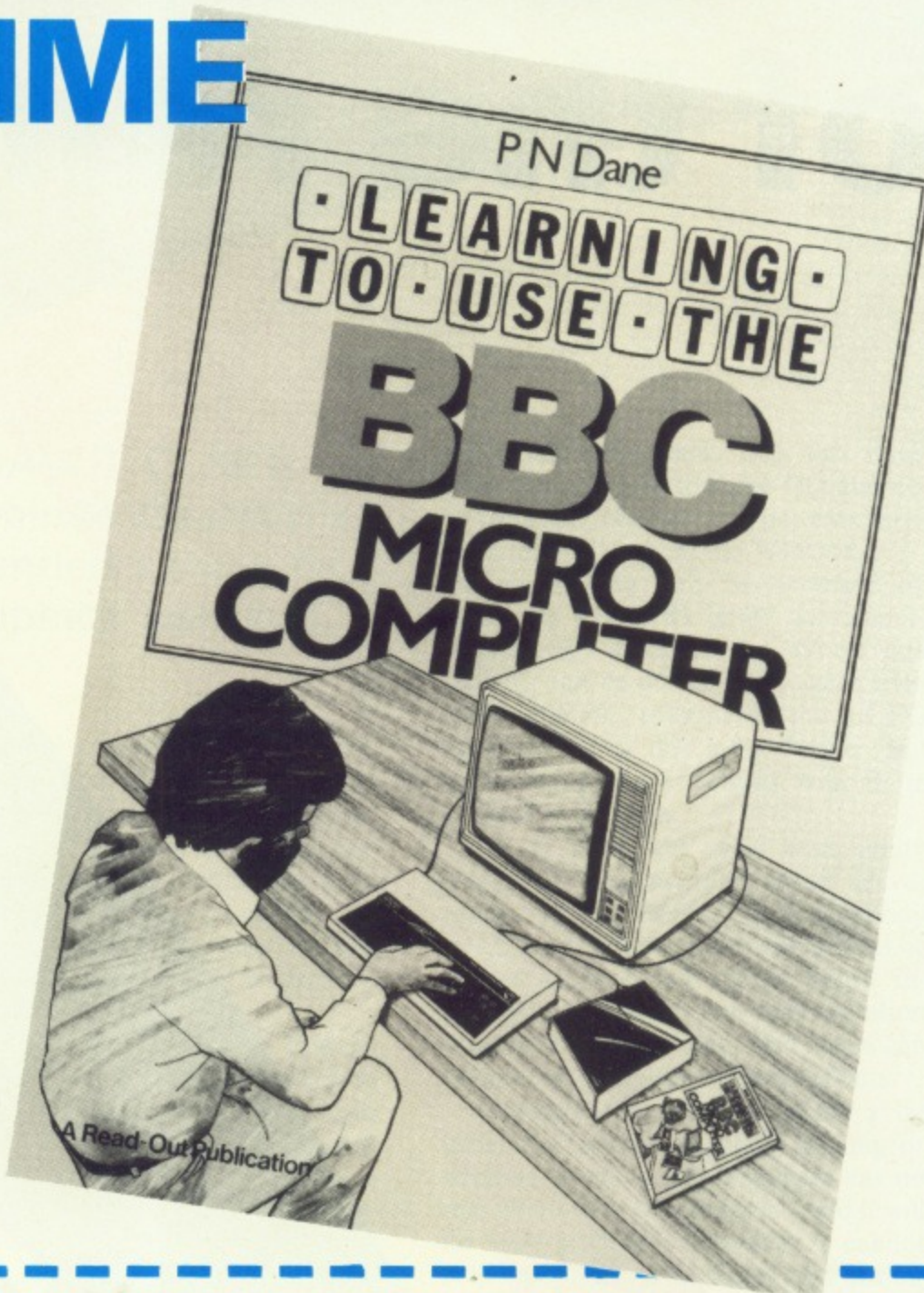
The user-friendly approach is consistent throughout the text – not only are program listings clearly shown, but in many cases, a photograph is included to show what the program looks like when actually loaded and run!

All books in the series are £5.95 (incl. postage).

Gower

"The Learning to Use" series will bring comfort and help to many first time microcomputer users. The books represent the first genuine approach to assisting the beginner to get to grips with the best selling personal microcomputers . . ."

Communicate



Order Form to: **READ-OUT BOOKS AND SOFTWARE**

8 CAMP ROAD, FARNBOROUGH, HANTS, GU24 6EW.
24 Hour Answering Service. Telephone 0252 510331/2

Name

Address

Please send mecopy/ies of

☐ Learning to Use the BBC Microcomputer

@ £5.95 including postage and packing. (Allow 14 days for delivery.)

Make cheques payable to Read-Out Publishing Company Ltd.

I enclose my cheque for £.....

Please debit my Access ☐

Number

Signed

Date

BBMU5

All the colours of the rainbow

THE Gaelsett ECFG (extended colour fill graphics) program gives the BBC Micro an extended area colour facility. It operates when the PLOT 81 or 85 commands are executed.

In MODE 2 this gives a claimed choice of 6561 different colours when using the friendly option and a theoretical four billion plus when using the more complex second option.

I am afraid that the latter must remain a theoretical number as I have no intention of verifying each possibility! The program requires only 512 bytes to run but needs another 2048 bytes when loading.

If programs are written to run on all systems with or without the ECFG then tests must be included to establish whether ECFG is present or not.

The large number of colours available means that many cannot be discriminated by the human eye, but in practice a very wide selection of colours is available and in addition to the colours it is possible to create patterns and textures, which can be very useful when drawing complex bar charts or diagrams.

The effect is created by using a much larger colour mask than normally used by the BBC Micro. This allows the user to choose the colour of each individual pixel when using the more complex of the two options, or if the user friendly option is used the user can control the amount of each of the primary colours within an area.

It is the mixing of the various colours within this small area that provides the additional colours. So 50 per cent red pixels and 50 per cent yellow will give orange, or 60 per cent red and 40 per cent yellow will give a deeper orange and so on.

The colours are accessed using the PLOT 81 or 85 commands, which are those used for triangle drawing.

**-plus or
minus
the odd
billion!**



colour
BBC
ility.
or 85

aimed
when
nd a
using

t.
must
I have
possi-
y 512
2048

on all
ECFG
ablish
t.
avail-
be dis-
but in
on of
ion to
create
an be
ex bar

much
y used
ne user
ividual
plex of
riendly
rol the
colours

arious
a that
So 50
r cent
er cent
give a

ng the
ch are
awing.

Triangles are the most useful shape available, as almost any other shape can be made from them.

In the standard BBC Micro the colours for line and area are controlled by a 1 byte (8 bit) line mask that is 1 pixel high by 8, 4 or 2 pixels wide in the 2, 4 or 16 colour graphics modes respectively. So in MODE 2 the line mask is 1 pixel high by 2 pixels wide.

When using the ECFG the PLOT 81 or 85 commands are controlled by an area mask that is 4 pixels high by the normal 8, 4 or 2 pixels wide. Thus the colour mask is made up of 32 bits as opposed to 8, which can each be set to its own individual value giving 2^{32} (four billion) possible combinations.

The problem with such a vast number of possible combinations is in being able to predict the results so that they can be made use of. This will become easier as the user gets to know the program better.

Two extra commands are provided to control the effects of ECFG:

VDU18,L,32,C1,C2,C4,C8
and

VDU18,L,64,R1,R2,R3,R4

where L is the logical colour to be defined, C is the amount of colour 1,2,4,8 to be used and R is the range of 1,2,3,4.

The first statement is the user friendly one and is identified by the 32 following L. This instructs the computer to expect and use the values of C1,C2,C4,C8. C1 is red, C2 is green, C4 is blue and C8 is flash, and the values given to them are the proportion of each colour to be used to construct the new colour L.

Red, green and blue are the primary colours that make up all others and flash can be used to introduce grey tones.

For instance, the statement **VDU18,0,32,32,32,0,0** will assign

DAVID CLARE examines Gaelsett's extended colour fill graphics package

logical colour 0 (normally black) to be yellow. The value 32 gives the full intensity of a colour and the above statement tells the computer to use 50 per cent full intensity red plus 50 per cent full intensity green to give yellow.

The intensity and number of the colours used can be altered to provide the 6561 possible colours.

Further investigation shows that in MODE 2 colour 1 is red, colour 2 is green, colour 4 is blue and colour 8 is flash (see page 223 of the User Guide). Colour 3 is yellow. Red(1) + green(2) = yellow(3). It is this type of logic that makes the BBC Micro special and although the logic is not always apparent it is usually there if looked for.

The 64 in the second statement instructs the computer to expect and use values for R1 to R4. The values can be in the range of 0 to &FF(255) and allow binary on/off control of the 4

pixel high area mask. It is this statement that controls the area fill patterns.

Once the colours and patterns have been defined using the VDU18 . . . statement they can be accessed by using the PLOT 81 or 85 commands.


Although some of the effects and colours can be produced by using over range GCOL statements the ECFG program takes this a lot further and gives many more options with more control over them.

As is often the case with utility programs, the documentation leaves much to be desired and anybody purchasing this program will have to be prepared to spend many hours investigating its use. Some demonstration programs are provided, and these can be altered to obtain various effects.

Although the program seems a bit expensive at £10 anybody needing or wanting to use a larger palette has no real alternative to buying it – and it will do what it claims. However, I cannot help wondering why Acorn did not include these facilities in the ROM along with user friendly methods of using them.

To get an idea of the effects possible enter the following short program which gives some colours not normally available on the BBC Micro:

```
10 MODE 5 (Any graphics mode can be used)
20 X%=0
30 PRINT TAB(2,2)"X%=";X%
40 GCOL X%,1 (Try changing the 1 for other
   numbers)
50 PLOT 85,RND(1000),RND(1000)
60 *FX15,0
70 wait=GET
80 X%=X%+1
90 GOTO 30
```

Each time a key is pressed X% is increased and a new triangle is drawn – try it now. 

tri has I may I carn't spel four tofee, but lukily

I SHOULD know by now not to look up when the editor comes in. I did. And he pounced. "You're not doing anything. Earn your keep and write me an article on editing." I say my opening: "Then you admit I know more about editing than you. Why not let me have your job?"

"Editing on the BBC Micro, idiot," came the stuffy reply. He went back into his office to "review software" – his term for playing games on the Beeb.

HAPPILY, unlike me, the BBC Micro has a very good editor. With it you can alter programs already in the machine, enter lines or delete them at will and, if you think about what you're doing, you can save yourself a lot of typing.

The whole point of this editing facility is that you can use it to change things. On one level you are just changing the display on the screen but on another the editing facility changes the program in the machine itself – it actually alters the software. This ability gives the BBC Micro a great deal of its versatility, so it's worth knowing well.

Being human we all make mistakes and, unless you are quite exceptional, you will find yourself making all sorts of typing errors. If you are lucky enough to catch yourself before you press the RETURN key and enter your mistake there is an easy method of correction.

The incorrect line will be the last on the screen, say:

10PIRNT "A SILLY ERROR" –
with the flashing cursor at the right hand end. All you have to do to rub out an unwanted character is to press the DELETE key which you'll find on the right of the keyboard. The character next to the cursor will disappear to be replaced by the cursor itself. In the example if you press DELETE once this is what you see at the bottom of your screen:

10PIRNT "A SILLY ERROR"

You can carry on deleting right the way up to the command prompt ">", the cursor moving to the left each time. You'll probably have noticed that keeping the delete key pressed makes it repeat its function, rubbing out the line from right to left. Once you have erased the error you just type in the correct characters. When satisfied with the corrected line press RETURN as usual.

This is quite simple, but if you have a long line with the mistake at the beginning you may feel that deleting it all takes too long. Once again the BBC Micro comes to the rescue. If you want to get rid of the bottom line entirely just

press the CTRL key (on the left of the keyboard) and the letter U at the same time. The bottom line with all its characters will disappear and you can retype the whole line.

Sadly, all of this is no good to you if you have already entered an incorrect

**By NIGEL
PETERS**

line. Suppose you had something like:

50 PIRNT "A SILLY MISTAKE"
actually in a listing. Obviously it will have to be corrected. "PIRNT" should be "PRINT". How do you go about changing what is already in the machine? The delete button won't work once you have pressed RETURN and the line is part of a listing.

You have two alternatives. The straightforward one is to get rid of the incorrect line 50 by typing in the

correct line 50, that is, you type in:

50PRINT "A SILLY MISTAKE"
press RETURN, and the machine accepts the new line.

This is easy, but can be a bit laborious. Imagine a line of some 200 characters, only one of which was wrong! It would be far too time consuming to have to re-type the whole 200 characters for one mistake, so now is the time to make use of the second alternative.

If you look to the right of the keyboard you will notice some light brown keys. Four have arrows on them and one is marked "COPY". The keys with arrows are the cursor controls and, with the "COPY" key, you can use them to alter program lines quickly and easily.

Type in the following program, which will be used for examples throughout the article. I know it doesn't look very neat but bear with me for now, I'll be doing something about it later. Since this article is about correct-



I have a friend to put me right

ing mistakes, it might help if you made a few errors, deliberate or otherwise!

```
10 REM EXAMPLE
20 Y = 1
30 REPEAT
40 FOR X = 1 to 5
50 PRINT "BBC MICRO USER
  RULES, O.K.?"
60 NEXT X
70 Y = Y + 1
80 UNTIL Y = 3
```

Suppose we had typed in and entered
60 NXET X

and we want to correct it. In this case it would be easy to type in a new, correct line 60, but let's try using the cursor keys and "COPY".

Start with the four cursor keys, "↑", "↓", "←", "→". Press them a few times and you'll notice that the flashing cursor moves round the screen (leaving a white block at the bottom of the screen which we'll ignore for the moment).

The cursor moves in the direction indicated on the key you press. If you press the "↑" key the cursor moves up one line. If you press the "→" key the cursor moves one space to the right. I leave it to you to find out what the "↓" and "←" keys do to the flashing cursor. You will notice that if you keep a key depressed it repeats its function and the cursor can shoot off one side of the screen to reappear at the other.

Normally the flashing cursor stays on the bottom line showing where the next character you type in will appear. When it goes on its travels about the screen under the influence of the cursor keys it loses its ability to show where the typing goes. It becomes what is known as the "read" cursor and I'll explain what it reads in a moment.

Meanwhile, what about the white square that stayed stubbornly on the bottom line while the cursor wandered? It appeared in the place where the flashing cursor was before we sent it off on its travels and it's called the "write" cursor.

Ignoring the flashing "read" cursor, try typing in a few characters. You will see that they appear on the bottom line of the screen, the "write" cursor moving to the right along the line showing where the next character will appear. In fact the "write" cursor behaves just like the flashing cursor did when it was on the bottom line. You can even use the "DELETE" key to erase the bottom line, the "write" cursor moving to the left.

So, I've got a flashing 'read' cursor

that I can move around the screen using the cursor keys and I've got a square 'write' cursor on the bottom line which allows me to type in characters in the usual way. "How can I use these to correct my mistakes?" you might ask.

This is where the "COPY" key comes in. When, under the influence of the arrowed keys, the flashing cursor leaves the bottom line the BBC Micro enters what is known as the editing mode. In this state if you press the "COPY" key whatever is under the flashing cursor (the "read" cursor) will magically appear on the bottom line of the screen, written by the "write" cursor. It will have been copied!

Like most things on the BBC Micro, it is a lot easier to do than to read about, so let's have a bit of practice. Suppose we want to correct a line in a listing that looks like this:

```
60 NXET X
```

Use the cursor keys to position the "read" cursor under the "6" of the "60". Now press the "COPY" key and two things happen. The flashing "read" cursor moves one character to the right and at the same time the 6 appears on the last line of the screen, the "write" cursor moving to the right as well. For example:

	Before pressing "COPY"	After
"Read" cursor (anywhere on the screen)	60 NXET X	60 NXET X
"Write" cursor (last line)	□	6□

Press "COPY" again and the same thing happens with the 0. Using the "COPY" key you can copy the whole line to the bottom of the screen, but this would be a little silly, as all you would be doing would be to duplicate your original mistake!

What you do is use the "COPY" key to read the incorrect line and copy it to the bottom line up to where the mistake occurred. Then you can type in the correct characters which appear on the bottom of the screen. You'll notice that when you type in characters the "write" cursor moves to the right as normal. The "read" cursor stays put.

In the example you would COPY up to where the "read" cursor was below the "X"

```
"Read" cursor line: 60 NXET X
"Write" cursor line: 60 N□
```

Then you would type in the correct

characters, for example:

```
"Read" cursor line: 60 NXET X
"Write" cursor line: 60 NEX□
```

You can then move the "read" cursor to wherever you want it to be on the screen, that is, past the mistake onto the correct bit and when you press "COPY" whatever is above the "read" cursor will be copied to the last line, appearing after what you typed in.

In the example you would move the "read" cursor to below the T, that is:

```
"Read" cursor line: 60 NXET X
"Write" cursor line: 60 NEX□
```

Then you would press "COPY" and transfer the rest of the line, which is correct, to the bottom. Press "COPY" and you get:

```
"Read" cursor line: 60 NXET X
"Write" cursor line: 60 NEXT□
```

and so on until the bottom line is correct. Then all you do is press RETURN in the normal way, the new correct line is entered and the flashing cursor appears next to the command prompt as usual. Editing mode has ended.

Although the example was fairly trivial, you can imagine that with a long line with only one error, using "COPY" is a lot easier than retyping the whole line. Also, by paying attention when typing in listings, using

"COPY" can save you a lot of typing.

Imagine a program like:

```
200 PRINT "ABCDEFGF"
210 PRINT "ABCDEFGFH"
220 PRINT "ABCDEFGFHI"
```

You could type in each line separately, but wouldn't it be easier just to copy line 200 with a few modifications to produce 210 and 220? A little practice and forethought can save a lot of typing.

Anyway, enough of cursor keys and "COPY". If you want practice try putting all the words and numbers that formed the example program on one line using cursor keys and "COPY". Then from that one line try recreating the original program with no typing in allowed. I guarantee that you'll be an expert by the time you have finished that!

Which is more than can be said for my editor... ☺

BBC MICRO USER

A subscription
will ensure you
get your own
personal copy
**HOT OFF THE
PRESSES** month
after month for
the next year.

Be one of the first to get each issue!

Every owner of a BBC Micro – and everyone thinking of buying one – needs to get BBC Micro User every month. It's the biggest, brightest, most authoritative yet completely independent guide to a machine that has so much potential you will never tire of reading about its remarkable capabilities.

You can buy BBC Micro User from your local newsagent or station bookstall. Or you can take out a 12 months subscription and have it delivered by post.



Copies of
these back
issues are
still available
at £1.25

**Cassette
tapes of
programs
from BBC
Micro User
— £3.75**



Or take out a year's subscription and have your cassette posted to you each month. You can start your subscription from any issue to take advantage of this offer.

FREE



**COMPLETE THIS
COUPON TODAY**

If you take out a subscription to **BBC Micro User** you will receive completely free the sturdy copy-holder illustrated above, together with a large crib card containing essential information and charts that will save you continually referring to the User Guide. This free gift is for a limited period, so subscribe now!



**Sweat
Shirts**

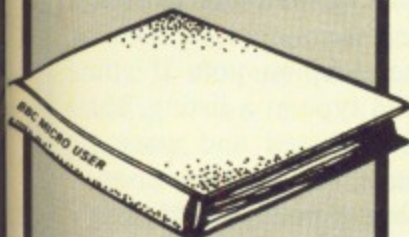
£6.29

**T
Shirts**

£3.29

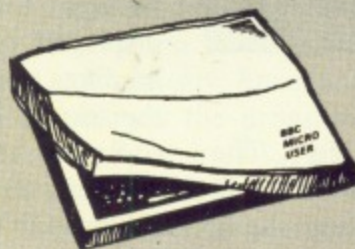
Blue printing on either light blue or white backgrounds

Keep your collection of BBC Micro User complete with these handsome binders



£3.95
(UK)

**Your BBC Micro
needs
protecting!**



£3.25

Top quality pale blue P.V.C. dust covers

ORDER FORM

All prices include postage, packing and VAT, and are valid to 30 June 1983.

Please enter number required in box

£ p

BBC Micro User annual subscription

UK £12 ☐
EIRE £13 ☐
EUROPE £18 ☐
Surface* mail - USA £15 ☐
Air mail - USA £25 ☐
Surface mail - Rest of world £15 ☐
Air mail - Rest of world £30 ☐

Commence with issue TOTAL

BBC Micro User back issues

☐ £1.25 UK
Rest of world: March 1983 ☐
☐ £1.50 - Surface April 1983 ☐
☐ £2.50 - Air mail TOTAL

Cassette tape annual subscription

£40 (UK & Overseas) TOTAL

Cassette tape single copies

£3.75
(UK & Overseas) March 1983 ☐
April 1983 ☐
May 1983 ☐
TOTAL

Dust Covers

£3.25 ☐
(UK & Overseas) TOTAL

Binders

£3.95 - UK ☐
£5.00 - Overseas TOTAL

T-Shirts **£3.29** (UK & Overseas)

Sweat Shirts **£6.29** (UK & Overseas)

		T-Shirt		Sweat Shirt	
		Blue	White	Blue	White
Age 6-8	28"				
Age 10-12	30"-32"				
Small	34"-36"				
Medium	36"-38"				
Large	38"-40"				
Extra Large	40"-42"				
		TOTAL			

Payment: please indicate method (✓)

TOTAL

☐ Access/Mastercharge/Eurocard
☐ Barclaycard/Visa
☐ American Express

Card No.

Expiry Date

☐ Cheque/PO made payable to Database Publications Ltd.

Name

Address

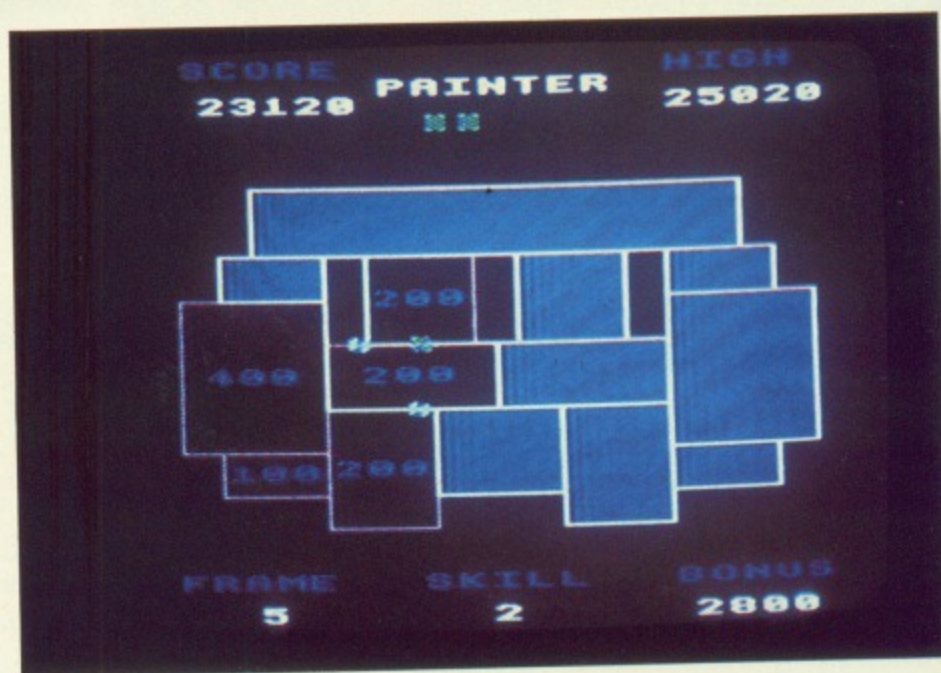
Signed

Send to: **BBC Micro User, FREEPOST, Europa House,
68 Chester Road, Hazel Grove, Stockport SK7 5NY.**
(No stamp needed if posted in UK)

Or you can order by phone
quoting credit card number
and expiry date.

061-456 4157
9am - 5pm

***Go down that
painted trail
to pleasure***



Painter (A&F)

PAINTER is a sheer delight to play – a compulsive, fast-action game and far more refined than the usual “bang ‘em, shoot ‘em” arcade type.

It is hard to convey the excitement of the game in words. You simply move your man round a grid composed of rectangles, leaving a trail behind you. When your trail surrounds a rectangle it is "painted in", and you score a varying number of points.

However, while you're doing this you are pursued by a creature intent on destroying you. Your aim, of course, is to avoid that fate while achieving as high a score as you can.

On the lower levels, the beastie is relatively unintelligent and scoring is rather easy. However, once you've filled in all the scoring rectangles, you

move onto a new, more complex grid, and the creature's IQ increases.

Worse still, as you ascend the skill levels, more creatures appear in pursuit. I am sure whoever thought of this game had the DTs at the time. To counter this, you can "break" the grid line to prevent them following you. While the respite gained is only

temporary, there's an immense satisfaction from using two such breaks to bottle one of the enemy up – it goes wild with frustration!

The game is beautifully designed from every angle. It is visually appealing, simple to learn and exceptional fun to play. One for all the family. A & F are onto yet another winner.

Invasion . . . of invaders

Invaders (Software Invasion)

fine version of the arcade game, quite fast but not too difficult. The colours are nice and the instructions adequate. No, I can't see what has upset him at all.

Now let's have a look at those next cassettes. Oh no, surely they can't all be, not all of them . . .

I'M sorry if this review isn't up to the usual BBC Micro User standard, but I'm not one of the regular reviewers. In fact this is the first review I've ever done. You see the person who should be doing it was last seen running away from the office screaming "No, not another Space Invaders game, I can't take it any more."

I don't understand what has upset him. Software Invasion has produced a

Basic, but busy, moonlander

"WHY?", I asked myself, as I loaded Software Invasion's Apollo, "should anyone bother producing a moonlander game when there are lots of listings available?"

The graphics didn't help my doubts. They were adequate but hardly made full use of the BBC Micro's facilities. No, there didn't seem much point in the exercise.

But having said that I kept on trying

Apollo (Software Invasion)

to land the lunar module safely. The game may be an old idea but it's still fun, and Software Invasion have produced a competent easy-to-play version.

You take the Apollo craft from orbit

round the moon to a, hopefully, safe landing, four different screens being displayed on the way, and the more landings you achieve the more difficult the terrain becomes.

So the choice is up to you. If you wanted you could type in a listing, but if you can't be bothered and want a basic but adequate version of a moon-landing game then Apollo would meet your needs.

Not the best banner bearer

HOME Finance, marketed by BBC Soft and created by the Consumers' Association (the publishers of Which?) is a colourful, presentable package, containing a booklet and cassette.

The booklet is clearly written and gives you fair warning of all the facts you need to amass before running any of the programs. It also indicates some of the limitations involved.

The cassette contains four programs, all recorded once on one side at 1200 (standard rate) baud. There were no loading problems encountered in loading via three different cassette decks.

From a software point of view I was very disappointed. None of the programs initialised the computer in any way, presuming the machine to have just been switched on, so problems could be and were encountered by the machine being in the wrong MODE/screen-scroll set/ the effects of cursor-control keys etc.

The only BBC micro facilities utilised were occasional double-height characters, a little background colour and the acceptance of numbers (say 1.5) to be input with a comma (such as 1,5), although the latter facility was not in all programs.

Each program did contain a good REM list at the start, defining the intended use of all variables, but the code overall was ponderous, in-

Home Finance (BBC Soft)

efficient in many places (in Basic terms) and, would you believe, not a PROC in sight!

I found all four programs very poor examples to carry the BBC banner to the public in general – particularly to those whom on acquisition will list them and try and use them as a programming guideline.

Program I: Heating

Purpose is to estimate the cost of heating your home. It takes into consideration eight different types of heating system, the temperature and time duration required, and a fairly detailed definition of the house.

Before running it you need to arm yourself with a large number of facts (detailed in the accompanying book) such as the cost of various fuels, the area of your floors, windows, roof and construction.

As most households are heated by more than one source, and the program only offers a single option system, the results obtained are bound to be inaccurate.

From my household calculations the program overestimated by £12 a month.

After the initial result has been attained you can alter the fuel/hours/temperature and quickly see what the net effect would be.

It would have been nice if single/double glazing and

draughty/not draughty options had also been included in this list.

I found the initial question and answer system very off-putting in that there was a constant screen full of text as the program scrolled forever onwards. (And why should Yes or No be answered by typing 1 or 2?)

Program II: Rent/buy

This enables you to compare the costs involved in renting an item as opposed to an outright purchase, over a period of five years. It does not facilitate credit purchases, or items where tax relief may be gained.

Within the calculation it does take into consideration such things as the rate of inflation, rate of lost interest, annual service contracts and the secondhand resale value.

The initial questions were asked in a scrolling screen mode and the results table was reasonably presentable after jumping its way to the top of the screen.

However my copy of the program contained a mathematical error within the rental calculation (a TV rented at £180 per year for five years would have cost £2,470!)

Program III: Borrowing

The intention of this program is to help you select a suitable source from which

to borrow money.

You can borrow up to £999,999 with repayments at any one of five methods per year (weekly, monthly, etc). Repayment period, rate of interest and tax relief are all taken into consideration.

The results are tabled, showing how much it will really cost you and the effective interest rate after tax relief, if applicable.

Not an inspiring program, the maths is pretty basic, but no doubt included in the package for completeness.

Program IV: Saving

This program attempts to show the interest you will acquire when saving either a lump sum of money or by regular payments.

It shows a fairly wide cross-section of options and takes into account tax and inflation rates.

You will have to keep changing the interest rates to keep up to date, as the program starts with a set from last year.

Again the screen scrolled on, but for a brief moment you do get a second colour.

Summary

My initial enthusiasm when presented with this impressive package rapidly evaporated due to the unimpressive screen usage and program discrepancies.

I feel, as both a householder and home economics teacher (covering these subjects), that the package falls somewhat short of value for money.

From Page 19

Program III

```

10 MODE 7: VDU23;8202;0;0;0;
20 DIM A$(14),RZ(3,7)
30 REM
40 REM Use FNget to read data and
50 REM form string array.
60 REM
70 FOR LZ=0 TO 14
80 A$(LZ)=FNget
90 NEXT
100 REM
110 REM Read in each frame's formation
120 REM
130 FOR IZ=1 TO 3
140 FOR JZ=0 TO 7
150 READ RZ(IZ,JZ)
160 NEXT JZ
170 NEXT IZ
180 INPUT"DELAY",WT
190 REM
200 REM Yellow background, then window
210 REM
220 FOR IZ=0 TO 23:PRINT CHR$147:NEXT
230 VDU 28,1,23,39,0
240 FOR XZ=0 TO 24 STEP 6

```

```

250 PROCput(XZ,1):PROCdelay
260 IF XZ=24 THEN 290
270 PROCput(XZ+2,2):PROCdelay
280 PROCput(XZ+4,3):PROCdelay
290 NEXT
300 INPUTTAB(0,2)"REPEAT "AN$
310 IF LEFT$(AN$,1)="Y" THEN VDU 26,12
60TO180
320 END
330
340 DEF PROCput(PZ,FZ)
350 FOR JZ=0 TO 7
360 PRINTTAB(PZ,JZ+10)A$(RZ(FZ,JZ))
370 NEXT
380 ENDPROC
390 DEFPROCdelay
400 now=TIME
410 REPEAT UNTIL TIME-now>WT
420 ENDPROC
430 DEFFNget
440 Z$=""
450 READ Q$
460 FOR IZ=1 TO 23 STEP 2
470 Z$=Z$+CHR$(EVAL("&" + MID$(Q$,IZ,2
)))
480 NEXT
490 =Z$

```

TELETEXT MODE 7

```

500 DATA A0A0A0A0A0A0A0A0FCB0A0A0
510 DATA A0A0A0A0A0A0A0A0EAFFFDA4
520 DATA A0A0A0A0A0A0A0A0E0FFF7B0A0
530 DATA A0A0A0A0A0A0A0A0E8FFFFA1A0A0
540 DATA A0A0A0A0A0E0FEFFFFB4A0A0
550 DATA A0A0A0E0F8FFBFEBBFA1A0A0
560 DATA A0A0BBA7A3A1A0A2EDA0A0A0
570 DATA A0A0A0A0A0A0A0A0A2A0A0A0
580 DATA A0A0A0A0A0A0A0A0A0A0A0A0
590 DATA A0A0A0A0A0E0FEFFFFFA0A0
600 DATA A0A0A0F0F8FFBFA3FFA1A0A0
610 DATA A0A0A3A1A0A0A0A0A3ADA0A0
620 DATA A0A0A0A0A0A0E8FFFFF1A0A0
630 DATA A0A0A0A0A0E0FEFFFFBFA0A0
640 DATA A0A0F0F0FCFFBFEBF7F0A0A0
650 DATA 8,8,0,1,2,12,13,14
660 DATA 8,0,1,2,3,9,10,11
670 DATA 0,1,2,3,4,5,6,7

```

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.

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**

Access and Barclaycard accepted

For more details contact:

Ikon Computer Products

KILN LAKE, LAUGHARNE, CARMARTHEN, DYFED, SA33 4QE. Tel: Laugharne (099 421) 515

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
IN STOCK
(as long as you're quick!)

BBC MICROCOMPUTERS

WITH THE LATEST 1.2 OPERATING SYSTEM

Model A **£299**

Model B **£399**

Latest Slim Line TEAC Drives with
Utilities & Manual from
£195.00

Microvitec "Cub" Monitor.
True 80 Column Definition
at a new low cost.

Revolutionary "Spark-jet" Printer
from ACORN
50 lines per minute and no noise!

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.

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

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.

PROTECTIVE COVERS AND CARRYING CASES

Polyester Cotton Cover 3.97
Soft PVC Cover 4.45
Hard Carrying Case for Computer, Cables,
Cass/Disc Drive 55.20
Soft Carrying Case for Computer, Cables,
Cass/Disc Drive 23.00

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 5.75

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 & CARRIAGE.

For full price lists or further details of any products send s.a.e.

ELTEC COMPUTERS

217 Manningham Lane, Bradford,
BD8 7HH.

Telephone: (0274) 722512



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 and 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

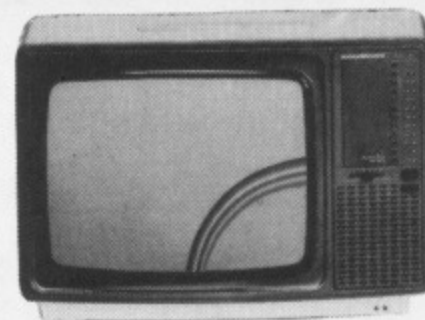
800K to 21.4M disc drives. High res. colour monitor. Plus autodial modem. From £2,795.00 + VAT

NEW Epson FX80

FX80 160cps printer in stock. Friction and tractor feed + proportional spacing. Cost £458.85

Large stocks of software for BBC and Atom, Business, Games and Educational. Send for comprehensive list.

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 SM12N 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



14" Colour Portable Monitor/TV

This Monitor/TV is not a modified television 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 enquiries welcome

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.



**ACORN
COMPUTER**

Electronequip

BBC

36-38 West Street, Fareham, Hants

(0329) 230670

The BBC Microcomputer Specialists

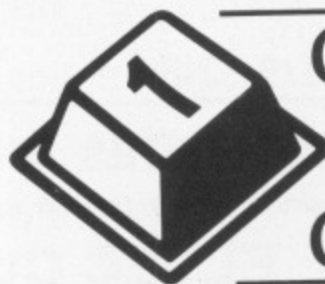
GUILDFORD COMPUTER CENTRE offers a complete range of Computers for Home, Business and Educational applications.

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**

1 The Quadrant, Bridge Street,
Guildford, Surrey GU1 4SG
Telephone (0483) 578848

 **commodore**

olivetti

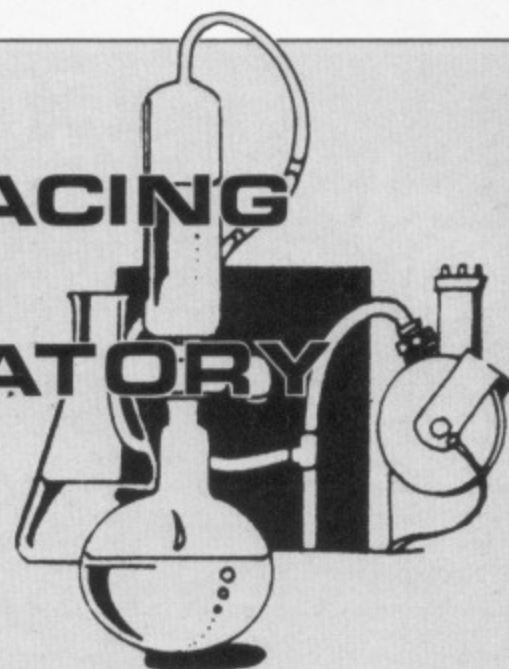
 **ACORN
COMPUTER**

 **HITACHI**

BBC

TRS-80®

INTERFACING IN THE LABORATORY



From Page 21

```

270 PRINT "chloric acid into a test-tube"
280 PRINT "Into another test-tube measure out"; thio(S); " ml. of Sodium";
290 PRINT "thiosulphate and "; water(S); " ml. of water "
300 PRINT:PRINT:PRINT
310 PRINT "Pour the acid CAREFULLY into the sodium ";
315 PRINT "thiosulphate solution "
316 PRINT CHR$(131);CHR$(157);CHR$(132);SPC(5)
) "PRESS SPACE-BAR QUICKLY"
320 IF GET =32 THEN 330 ELSE 320
330 SOUND1,-15,150,2:*FX15,1
340 TIME=0
350 Now=TIME /100
360 PRINT "START TIME= "; Now; " SECOND S"
370 PRINT:PRINT "Place reagents into colorimeter and set to 100% transmission"
380 PRINT CHR$(131);CHR$(157);CHR$(132); "PRESS SPACE-BAR QUICKLY WHEN READY"
390 IF GET =32 THEN 400 ELSE 390
400 VDU7: *FX15,1
420 REPEAT UNTIL ADVAL(2)<30000
430
440 finish(S)=TIME/100
450 PRINT "FINISH TIME= "; finish(S); " SECONDS"
460 PRINTTAB(2,22); "PRESS SPACE-BAR TO CONTINUE"
470 IF GET=32 THEN 480 ELSE 470
480 SOUND1,-15,150,2:*FX15,1
490 ENDPROC
500 DEF PROCRESULTS
510 CLS
520 PRINTTAB(0,3)CHR$(141);CHR$(131);CHR$(157);CHR$(132);SPC(8)"TABLE OF RESULTS"
530 PRINTTAB(0,4)CHR$(141);CHR$(131);CHR$(157);CHR$(132);SPC(8)"TABLE OF RESULTS"
540 PRINTCHR$(141);CHR$(131);CHR$(157);CHR$(132);STRING$(28,"=")
550 PRINT:PRINT:PRINT "VOL. OF THIO. TIME (SECS) 1/TIME (SECS) "
555 PRINT STRING$(40,"=")
560 @%=&0002020A
570 FOR S=1 TO series
580 PRINT thio(S),finish(S),1/finish(S)
590 NEXTS

```

```

600 PRINTTAB(2,22);CHR$(131);CHR$(157);CHR$(132);SPC(4)"PRESS SPACE-BAR TO CONTINUE"
610 IF GET =32 THEN 630 ELSE 610
620 *FX15,1
630 ENDPROC
640 DEF PROCGRAPHICAL_2
650 @%=&10
660 LOCAL SCALE
670 SCALE=2000
680 VDU5 :CLS
690 MOVE 0,1000
700 DRAW 0,0:DRAW 1280,0
710 FORS=1 TO series
720 MOVE thio(S)*100,1/finish(S)*SCALE+40:PRINT"*";S
730 NEXTS
740 VDU 4
750 PRINTTAB(2,3); "PRESS SPACE-BAR"
760 IF GET =32 THEN 770 ELSE 760
770 PROCPTION
780 ENDPROC
790 DEF PROCGRAPHICAL_1
800 @%=&10
810 LOCAL SCALE
820 SCALE=10
830 VDU5 :CLS
840 MOVE 0,1000
850 DRAW 0,0:DRAW 1280,0
860 FORS=1 TO series
870 MOVE thio(S)*100,SCALE*finish(S)+40:PRINT"*";S
880 NEXTS
890 VDU 4
900 PRINTTAB(4,30); "PRESS SPACE-BAR"
910 IF GET =32 THEN 920 ELSE 910
920 PROCPTION
930 ENDPROC
940 DEF PROCTITLE
950 *FX15,1
960 PRINT:PRINT :PRINT
970 PRINTCHR$(141);CHR$(131);CHR$(157);CHR$(132); "A PROGRAM FOR A COLORIMETER"
980 PRINTCHR$(141);CHR$(131);CHR$(157);CHR$(132); "A PROGRAM FOR A COLORIMETER"
990 PRINTCHR$(141);CHR$(131);CHR$(157);CHR$(132);STRING$(28,"=")
995 PRINTCHR$(141);CHR$(131);CHR$(157);CHR$(132);STRING$(28,"=")
1000 PRINT:PRINT "This program will allow you to"

```

```

1010 PRINT "use the computer to accept AND"
1020 PRINT "process data from a colorimeter"
1021 PRINT "used to investigate the rate of"
1022 PRINT "reaction between hydrochloric acid"
1023 PRINT "and sodium thiosulphate."
1030 PRINTTAB(5,20);CHR$(136);CHR$(131);CHR$(157);CHR$(132);SPC(5); "PRESS SPACE-BAR"
1040 IF GET=32 THEN 1050 ELSE 1040
1050 SOUND1,-15,100,2:*FX15,1
1060 ENDPROC
1070 DEF PROCPTION
1080 CLS :COLOUR3
1090 PRINT TAB(0,2); "THIS COMPUTER PLOTS TWO TYPES OF GRAPH"
1100 PRINT "EITHER "
1110 PRINT "(1) CONCENTRATION AGAINST TIME"
1120 PRINT "OR"
1130 PRINT "(2) CONCENTRATION AGAINST 1/TIME"
1135 VDU19,2,11,0,0,0
1140 PRINT:COLOUR2:PRINT "SELECT 1,2 FOR GRAPH OR 3 TO STOP"
1160 INPUT Answer
1165 VDU23 ;8202;0;0;0;
1170 IF Answer=1 THEN PROCGRAPHICAL_1
1180 IF Answer=2 THEN PROCGRAPHICAL_2
1190 IF Answer=3 THEN ENDPROC
1200 IF Answer <>1 AND Answer <>2 AND Answer <>3 THEN PRINT "PRESS 1 OR 2 OR 3":GOTO 1160
1210 ENDPROC

```

Program III

```

10 MODE0
20 *FX16,1
30 FOR XX=0 TO 1200
40 DRAW XX,ADVAL(1)DIV55
50 NEXTXX

```


COMPUTER AMPLA

THE
COMPUTER
CENTRE
OF THE
NORTH



THE
showroom
for all the
leading
micros

easy parking off the M56 (junc 12) • VIC 20 • VIC 64
• BBC micros • Newbrain • Acorn Atom • Books
• Apple 11e, 111 • Dragon • Electron • Games
• Sinclair Spectrum, * IBM P.C.

Secondhand computers • EASY PAYMENTS
ALL ACCESSORIES SALES AND SERVICE •

northern computers Churchfield Road,
FRODSHAM
Cheshire WA6 6RD

• **TEL: FRODSHAM (0928) 35110**
• **UNBEATABLE PRICES** •

WE WILL PURCHASE AND PUBLISH YOUR PROGRAMS: Call Steve Rhodes for details

OWL SOFTWARE BBC MICRO

CHEQUE BOOK 16K. Computerise your current account with our complete cheque book management program. £3.75

MUSIC 16K. Compose on your micro, plays notes and chords and presents colour display of score in hi-res graphics. £6.50

GHOST CHASE 32K. Best of the PACMAN type arcade games with exciting hi-res graphics and sound. £6.00

CASSETTE DECK Guaranteed to work with BBC Micro, we have used this deck daily for six months without a single failure on LOAD or SAVE. Facilities include remote, tape counter and monitoring. £35.00

ALL PRICES INCLUDE POST & PACKING

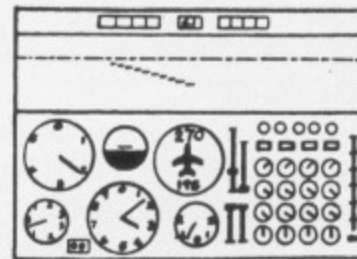
Cheques/P.O.:
OWL SOFTWARE,
46 The Plain, Epping, Essex.

DRAGON/32

TRS 80 C/C 32K

BBC MODEL/B 747 FLIGHT SIMULATOR

Superbly realistic instrumentation and pilots view in Hi-Res graphics. Lifelike simulation including emergencies such as engine fires and hydraulic failures. This program uses high resolution graphics to the full to produce the most realistic instrument display yet seen on a home computer. There are 21 real dials and over 20 other indicators (see diagram). You control throttle, ailerons, elevators, elevator trim, flaps, slats, spoilers, landing gear, brakes, reverse thrust and see the runway in true perspective. Uses joysticks and includes options to start with take-off or random landing approach and restart. "A real simulation, not just another game." (Your Computer).



CASSETTE £9.95 (pp + VAT inc.)

D.A.C.C. LTD., Dept BMU,
23 Waverley Road, Hindley, Gtr. Manchester WN2 3BN.

GAMES WANTED

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

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

If so, get in touch with us right away – we're only too willing to hear from you. And we've got our team of experts ready to help evaluate your work and add any necessary finishing touches.

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

The Editor,
BBC Micro User,
Europa House,
68 Chester Road,
Hazel Grove,
Stockport.
SK7 5NY.

And please mark your envelope clearly
"GAME".

EDUCATIONAL SOFTWARE FOR ECONOMICS BBC 32K

'AN INTRODUCTION TO NATIONAL INCOME MODELS'

Five programs on cassette (consumption, equilibrium income, multiplier, influence of government, foreign trade, etc.). Extensive use of graphics. Suitable for all introductory courses in economics, e.g. A level. Ideal for class or individual use.

£15.95 inclusive of manual and postage.

BEECON EDUCATIONAL SOFTWARE

(Dept BU), 16 Kingrove Avenue, Beeston,
Nottingham, NG9 4DQ.

FRENCH ON THE BEEB

Educational Software on the Model 'B'

Test yourself, browse at random, use as reference.

All Tenses of over 150 French irregular verbs.

For all ability levels.

On Cassette for £19.30

A unique practical program to challenge beginners, O, A, Level Students and even French Graduates.

- ★ Menu driven ★ Test with time limit ★ English meanings
 - ★ Choice of tenses ★ Vetted by native speakers ★ Fully accented ★ Attractive colour format ★ 3 levels.
- Russian verbs available soon. S.A.E. for details.

CARSONDALE ENTERPRISES LTD.

44, Kingsway, Stoke on Trent,
Staffs, ST4 1JH.

BBC SOFTWARE

Quality Software produced by Professionals

Present their latest tape

FUN WITH WORDS

Start your fun with alphabet puzzles in GUESS A LETTER. Continue your play as you learn about VOWELS, know the difference between THERE & THEIR and have games with SUFFIXES. After working so hard reward yourself with games of HANGMAN. Learning should be fun. The tape includes GUESS A LETTER, VOWELS, THERE/THEIR, SUFFIXES & 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 & CUNNING A/B £9.20

For children and adults alike. The tape includes AUCTION, FLIP, REVERSE, TELEPATHY and HEXA15 (Model B only).

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. Be prepared for anything!

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

Add 50p p/p per order.

Please state your model,

Also available from reputable dealers.

Also on Micronet

Cheque/P.O. to:

GOLEM LTD., DEPT B,

77 Qualitas, Bracknell, Berks. RG12 4QC.

Telephone: (0344) 50720

Simonsoft

Specialists in High Quality Software for
the BBC Microcomputer

DISASSEMBLER (A/B) - a 'smart' disassembler that will generate fully labelled assembly listings of any machine code program - data is automatically differentiated from code and displayed together with its ASCII equivalent - the assembly listing can be saved in *EXEC format and subsequently incorporated into user programs - supplied with full instructions.

Without doubt the most powerful and flexible disassembler available
Disassembler £6.95

EMULATOR (B) - a new concept in machine code programming tools! Emulator is a machine code INTERPRETER which allows you to write and debug machine code as easily as BASIC - fully compatible with disassembler so that disassembled programs can be altered and 'emulated' - features single step, breakpoints register display, edit modes, data display mode etc etc - since the machine code is interpreted there is full protection from errors. Probably the most useful machine code programming tool.

Emulator £6.95

BASIC GOODIES (A/B) - a set of useful BASIC debugging routines saved in *EXEC format and fully documented - includes PROC/FN LISTER which lists the lines where procedures and functions are defined together with name, parameters etc - VARIABLE LISTER displays the current values of all or selected variables; very useful for debugging and demonstrations - SUPER REPORT intercepts BASIC errors and returns the message in a string variable so that error messages can be more flexibly reported - and more besides.

Basic Goodies £5.95

Prices are fully inclusive (for disc version add £3.00 and state single or double density)

All programs are fully guaranteed and OS 0.1 to 1.2 compatible.

DEALER ENQUIRIES WELCOME

Simonsoft

Front Street, Topcliffe, North Yorkshire, YO7 3RJ.

TWO WAYS TO ENSURE YOU GET

BBC MICRO USER

EVERY MONTH

1. Complete and mail subscription form on Page 81
2. Hand this form to your newsagent.

Please reserve me a copy of **BBC Micro User** magazine every month until further notice.

☐ I will collect

☐ I would like it delivered to my home.

Name _____

Address _____

Note to newsagent: BBC Micro User should be obtainable from your local wholesaler, or contact the distributor - Wells, Gardner, Darton & Co Ltd Tel: Faygate 444

EXTRAS FOR THE BBC Unique Hardware & Software

Guaranteed Available Now

HARDWARE

"MEDPROM-B" EPROM programmer

With Machine Code software, User Port Connection, Programs 2516/2716/2532/2732, Software EPROM Safety Features. £79.00

Also available for 2764/27128 using EX1 Adaptor Unit £19.75

"MEDCLOCK" real time calendar/clock, battery operated user port connection

NEW £29.50

SOFTWARE

"MEDITOR-B" free format text file gen/editor

including: "MEDMAIL-B" mailshot label printer Professional Word Processor. Features enable Edit, Save, Compose and Append Text with Single Key Letter Commands. £ 9.50

"MEDMON-B" machine code monitor

20 Commands: Disassemble, Memchange, Breakpoints, Search, Relocate, Offset, etc. Invaluable for Program Development and to reveal the Machine Operating System. £ 9.95

"MEDMON" also available in EPROM for use with all versions of O.S. £17.00

All prices include p & p. Please add VAT.

Microtrol Engineering Design Ltd.,
Dept. Z, 640 Melton Road, Thurmaston,
Leicester LE4 8BB. Tel: 0533 704492.



...MORE TO EXPLORE
with EE computer "add-on" projects...

REAL-TIME CLOCK for APPLE II and BBC micro

Full constructional details in May issue.
Software available.

Hardware designs for all popular microcomputers
will be featured regularly.

EE knows how to
make circuit building
easy.

MAY ISSUE
ON SALE NOW—85p

**EVERYDAY
ELECTRONICS**
and computer PROJECTS

ALL IN
STOCK

**S.P.
ELECTRONICS**

BBC
SPECIALISTS

BBC Model B 1.2 O.S.	£399
Upgrade Kits A to B	£60
Disc Operating System	£95
Disc Drives	from £199
Cassette Recorders	£18.90
Top quality EMI computer cassettes	from 55p
G3WHO RTTY PROGRAM	£7.50
Circuit boards for RTTY decoder (inc. instructions)	£6.30

Wide selection of software, books, leads, plugs, etc.

Mail Order

48 Linby Road, Hucknall,
Notts. NG15 7TS.
Tel: 0602 640377



(all prices include VAT)

UP TO 30% ROYALTIES

paid for high quality original software
BBC, SPECTRUM, DRAGON 32, PET,
RML380Z

Games and Educational programs

WANTED URGENTLY

SILVERLIND LTD.,
156 Newton Road, Burton on Trent,
Staffs. DE15 0TR.

BBC 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	CASHBOOK	Double entry 4 columns with accounts	£ 5.95	B
103	LEDGER	Complements CASHBOOK with ageing & analysis	£ 5.95	B
104	MAILING	Holds 218 addresses. System with 6 options, 2 Sorts, Labels, 2 Searches & Update	£ 5.95	B
105	PAYROLL (W or M)	In two parts to handle weekly or monthly PAYE & NI for 100 employees. Supported.	£13.90	B
105a	Manual	Extra (No VAT)	£ 2.50	B
106	MEMO-CALC	Database/Calcsheet with up to 255 columns, string or numeric data, sorts, searches, calculations, with full print facility.	£ 9.95	B
106a	Manual	Extra (No VAT)	£ 2.00	
201	CARDS	Beat Bruce Forsyth at his own game.	£ 2.95	A/B
202	BATTLE	Fast moving game simulation of a minefield.	£ 2.95	B
203	HANGMAN	Word game. French, German, Italian, Spanish.	£ 7.95	B
301	BANNER	Paper printout of large text & graphics.	£ 2.95	A/B
302	DISTANCES	Graphic maps of U.K., EUROPE & WORLD. Calculate distance between any two places.	£ 3.95	B
303	FLAGS	Full colour flags of the world & questions.	£ 3.95	B
304	STATPAK	Statistics offering over 30 results.	£ 8.95	B
501	SEARCHBAS	PROC to search a BASIC program & alter it.	£ 1.95	A/B
502	PROCVAR	PROC to list variables used in a program.	£ 1.95	A/B
503	PROCFLUSH	PROC to clear Resident Integer Variables.	£ 1.00	A/B
504	PROCAID	A combination of programs 501, 502 & 503.	£ 3.45	A/B
505	DEFCHR	Design, display & store graphic characters.	£ 2.95	A/B
506	SORTM/C	Machine code sort for up to 255 integers.	£ 1.00	A/B
507	SORBAS	A very fast BASIC sort. 1000 items in 42s.	£ 1.00	A/B
508	UTILITY-A	Combination of 501 to 507. Superb value.	£ 5.95	A/B
600	FORTH	Second language ROM for either OS.	£34.74	B
601	WORDWISE	ROM Superb fast & easy wordprocessor OS 1.0	£34.74	B
701	BOOKS	Various titles for the BBC Micro from (No VAT)	£ 6.95	
801	CASSETTES	C12 Computer quality boxed in 10's.	£ 4.50	
810	DISCS	MEMOREX Soft Sector 40 track 5.25"	£19.95	
901	NEW EPSON	FX-80 F/T, 160CPS, 3 FOUNTS, Graphics.	£379.00	
905	SEIKOSHA	GP-100a Printer 50cps, 80 columns, tractor	£195.00	
910	NEW TEAC	Slimline Disc drives suitable for BBC Micro with Power supply. Format disc & Manual.		
100K		Single Sided, 40 Track. OTHERS AVAILABLE.	£199.00	
920	VDU STAND	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 (BU)
25 Fore Street, Praze, Camborne, Cornwall TR14 0JX.
Tel: 0209-831274

Group 70

208 Maybank Road, South Woodford, London E18
Telephone: 01-505 7724/5

MICROCOMPUTERS
Official BBC Acorn Dealers

Hardware:

Disc Drives · Printers · Monitors

Software:

Acornsoft · BBC Soft · Word Processors
Small Business Software

Small Business Systems:

Exidy Sorcerer Systems Dealer

**FAIRHURST
INSTRUMENTS LTD**

BBC

**SERVICE & INFORMATION
CENTRE**

Dean Court, Dean Row, Cheshire
(Nr. Deanwater Hotel)
Telephone: (0625) 533741

BBC MICRO CONSOLES

Not just a monitor/tv stand but an expansion console which gives your micro the professional look. Protects and encloses your micro with room for disc drives and 2nd. processor or teletext adapter etc., all untidy connecting wires safely out of sight within the console. Made of light yet strong aluminium with a textured finish in matching BBC colour. Coming soon a bolt on extra module to the console for further expansion options. YES this console will grow with your needs. Basic BBC console as shown **£39.99** MAIL ORDER ONLY Viewing by appointment only.

For further information or send cheque for **£43.99** incl. post/pack to:

Silent
COMPUTERS

* The console will house the Torch Disc Pack



Matching Printer Stand, can double for VDU Stand over the micro - only **£14.99** + £2 p&p
27 WYCOMBE ROAD, LONDON N17 9XN.
TEL: 01-801 3014 (24 Hr Ansaphone)



MICRO SHOP

ZX81·ZX SPECTRUM· DRAGON 32·VIC-20·BBC

The very best mail order items "over the counter"

Games, Keyboards, Serious Programs, Rams, Books, Peripherals and much, much more!

FAST MAIL ORDER SERVICE PHONE **01-769 2887** WITH ACCESS/VISA (24hr Ansafone)
or send large S.A.E. for catalogue (state which computer)

310 STREATHAM HIGH ROAD, LONDON SW16 Open 10.30 - 5.30 Tues. to Sat. (closed Mondays)

FOR SCHOOLS

"Scrambler" a program to help teach spelling in the classroom situation. Any BBC or Spectrum.

Over 100 examples and your own, includes manual.

For details:-



MENTOR SOFTWARE

Freepost Sheffield S6 2NT.

SQUIRREL SOFTWARE

4 Bindloss Avenue, Eccles, Manchester M30 0DV.
Telephone: 061-789 4120

SUPERGOLF - BBC B 32K £7.50
The ball speeds into the air, slows, curves down and rolls. Bunkers, water and O.O.B. to avoid. This will **HOOK** not only golfers but the whole family for hours. Up to 4 players - 18 different holes.
BUNFUN - BBC B 32K £6.50
Icing and nuts have to be squirted on as the buns go past at all levels you will need good rhythm, timing and reactions to avoid wrecking the factory!
TOOLKIT - BBC for model A or B
1. 'Disassembler'. Extremely powerful. Lists mnemonics, binary, decimal, Hex. Finds masks, overlays and messages.
2. 'Variables list'. Lists non-resident variables and arrays.
3. 'Graphics Design Pad'. Graphic character design station on a 24 x 24 grid!
All on one cassette £6.50
SPACE WALK - Multi levels - needs dexterity and strategy to prevent an early death from contact with 'unearthly things'!
Also
CODEBREAKER - Our version of the classic 'Mastermind' type peg game but with up to '26 colours' and holes.
On one cassette BBC B 32K only £5.50
All cassettes in M code/basic. All cassettes compatible with 0.1, 1.0 & 1.2 O.S. All prices include VAT & P&P.
Trade enquiries welcome. Special deals for Schools.
Cheques, P.O.'s etc to: **Squirrel Software, 4 Bindloss Av., Eccles, Manchester M30 0DV.** 24 Hr Answering Service 061-789 4120

OAKLEAF COMPUTERS LTD

Education Hobbyist & Small Business Computers

BBC

Model B . £399.00*
100K Single Disk £265.00*
100K Twin Disk £389.00*

OAKTREE WORKSTATION
Teak £24.95 white £22.95
ELECTRON — PHONE FOR DETAILS

Acorn Atom & BBC Twin User
Joystick Interfaces £13.95

(Free Carriage — Please state model)
All Prices include V.A.T. *£8.00 Carriage

BBC
SOFTWARE &
ASSESSORIES

ALL
IN
STOCK
NETWORKING
& EDUCATION
SPECIALISTS



ACORN

Please send your
remittance to:-

121 DUDLEY ROAD, GRANTHAM,
LINCS NG31 9AD Tel: (0476) 76994

SPECIALISTS

**BBC MICRO USERS
COMMUNICATE WITH
ACOUSTIC COUPLERS
BRITISH MADE**

By
**K & N
ELECTRONICS**



**K & N Electronics Ltd.,
Cordwallis Street, Maidenhead, Berks
SL6 7BH.**

Tel: 0628 22447. Telex: 847692

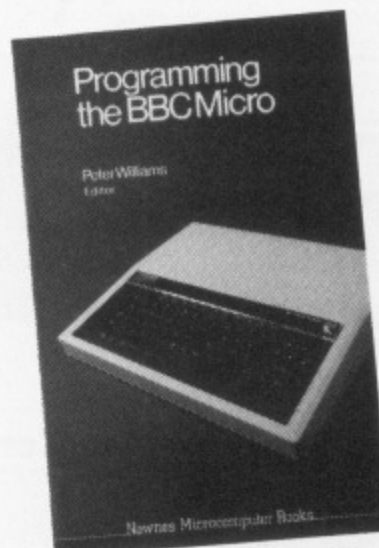
As supplied to Acorn and
selected Acorn Dealers.

BBC MICRO



Forty quality games. A varied selection ensures something for everyone.

£7.95



A thorough, thoughtful, though high-paced review of elementary BBC lore. Includes topics such as the disc system and interfacing.

£7.50

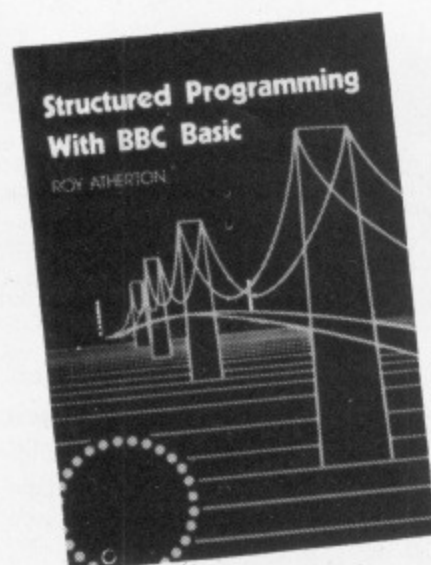
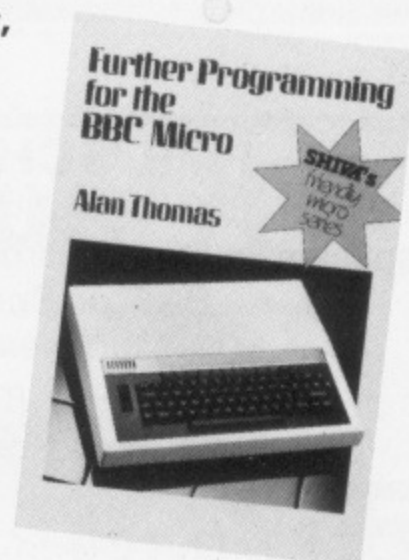
Probably the best elementary BBC Basic text. An exceptionally readable book which more than lives up to its title.

£6.95



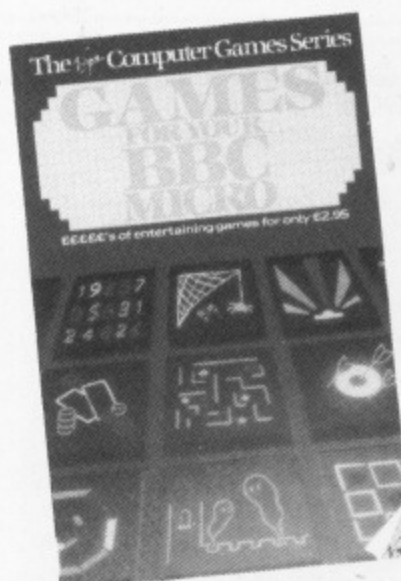
An easy-to-follow, step-by-step guide to more advanced BBC Basic, following on from Easy Programming for the BBC Micro.

£6.95



A clearly written manual on good Basic programming and problem solving. This book could become the standard work.

£7.50



Twenty good games listings plus hints on better programming and a comprehensive glossary. Excellent value.

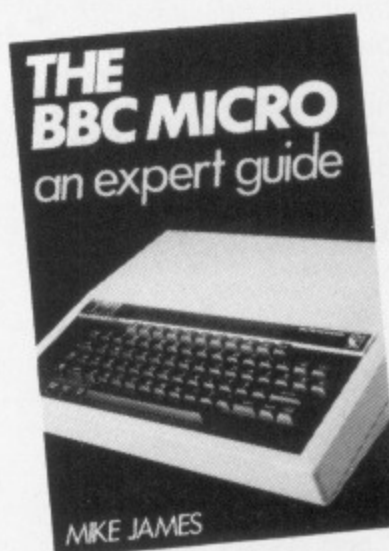
£3.55

BOOKSHOP



One of the best assembly language books ever written. Comprehensive, and specially compiled for the BBC Micro.

£9.95

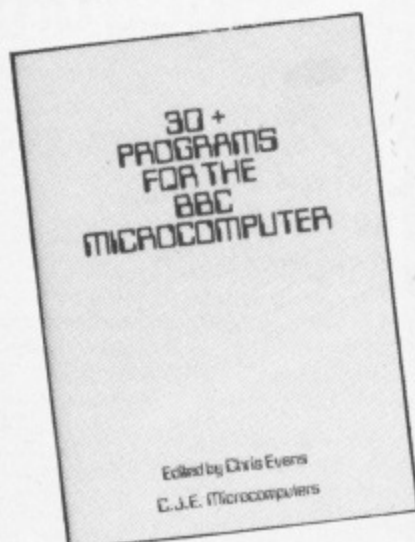


An intelligent, information manual on the workings of the BBC Micro. Recommended reading for anyone beyond the beginner's stage.

£7.95

With 36 fun programs for the BBC Micro, this is exceptional value for money. It also gives many ideas for future projects.

£4.75



A useful assortment of programming ideas for the less-experienced programmer. It's also a useful source of enjoyable programs.

£5.95

ORDER FORM

All prices include postage and packing

Please supply the following book(s)

Please enter number required in box

£

- | | | |
|--|-------|-------|
| <input type="checkbox"/> Let Your BBC Micro Teach You to Program | £7.45 | ..... |
| <input type="checkbox"/> Programming the BBC Micro | £7.50 | ..... |
| <input type="checkbox"/> Easy Programming for the BBC Micro | £6.95 | ..... |
| <input type="checkbox"/> Basic Programming on the BBC Micro | £6.95 | ..... |
| <input type="checkbox"/> 30 Hour Basic | £6.50 | ..... |
| <input type="checkbox"/> Practical Programs | £6.95 | ..... |
| <input type="checkbox"/> Assembly Language Programming for the BBC Microcomputer | £9.95 | ..... |
| <input type="checkbox"/> The BBC Micro Revealed | £8.95 | ..... |
| <input type="checkbox"/> The Book of Listings | £4.75 | ..... |
| <input type="checkbox"/> 30+ Programs for the BBC Microcomputer | £5.95 | ..... |
| <input type="checkbox"/> Further Programming for the BBC Micro | £6.95 | ..... |
| <input type="checkbox"/> Games for your BBC Micro | £3.55 | ..... |
| <input type="checkbox"/> Games BBC Computers Play | £7.95 | ..... |
| <input type="checkbox"/> Structured Programming with BBC Basic | £7.50 | ..... |
| <input type="checkbox"/> The BBC Micro: An expert guide | £7.95 | ..... |

I enclose my cheque/P.O. for

Cheques payable to Database Publications

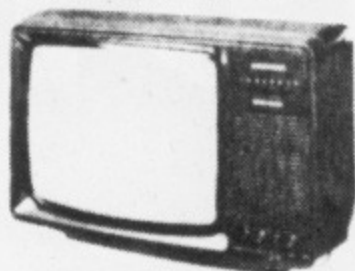
Name

Address

Post to: Database Publications,
Europa House, 68 Chester Road,
Hazel Grove, Stockport SK7 5NY.

These special prices apply to UK readers only.
Prices to overseas readers are available on request.

GRUNDIG KINGSLEY



R.G.B. MONITOR/TV (GRUNDIG APPROVED)

As supplied to Education Authorities Specification
R.G.B. inputs (Analogue and Digital Levels) all models
1 Volt P.P. composite video (remote model only)
Teletext decoder available to plug into chassis. (remote
model only). Remote control of computer via monitor
(remote model only). Sound input gives access to audio
amp all models. Instantly switches back to TV.

12" MONOCHROME MONITOR/TV	£95 + VAT
14" COLOUR MONITOR/TV	£227 + VAT
16" COLOUR MONITOR/TV	£255 + VAT
16" COLOUR MONITOR/TV REMOTE	£295 + VAT
20" COLOUR MONITOR/TV REMOTE	£315 + VAT
22" COLOUR MONITOR/TV REMOTE	£340 + VAT
26" COLOUR MONITOR/TV REMOTE	£380 + VAT
PLUG IN TELETEXT MODULE	£75 + VAT
CONNECTING LEAD	£5 + VAT
CARRIAGE AND INSURANCE	£9.50
4 YEAR GUARANTEE	£29.60

KINGSLEY

40-42, Shields Road, Newcastle-upon-Tyne,
NE6 1DR. Tel: (0632) 650653

BUY THE BEST TWILLSTAR COMPUTERS



BBC MOD A £299.80
BBC MOD B £399.00

DISC DRIVES
Business Software
Educational Software
Entertainment Software
ONLY £195



ORIC-1
THE REAL COMPUTER SYSTEM
FROM £99.95 INCL. VAT

COMPUTERS
LYNX

Dragon 32 £195

**SINCLAIR
SPECTRUM**
16K £125.00
48K £175.00

PRINTERS
Dot Matrix
Epson MX 100 FT III Acorn AP 100 A
Epson RX 80 Seikosha GP100 A
Epson FX 80 BEST PRICES EVER

commodore
Printer Cables, Leads, Discs, Stationery,
Cassettes, Ribbons, Dust Covers and wide
range of Software for all Computers.

COMPUTERS
COLOUR MONITORS
14" Microvitek £250
GREEN MONITORS
Sanyo £99.00 Hitachi £99.00

COMPUTER BOOKS & ELECTRONIC MAGAZINES
SOFTWARE, HARDWARE
SUPPORT/SERVICES/RENTALS

CALL IN FOR FURTHER DETAILS
TWILLSTAR COMPUTERS LTD.
17 REGINA ROAD, SOUTHALL, MIDDX.
TEL: 574 5271 (24 hours)
OPEN 10am-8pm SIX DAYS A WEEK



Silicon Centre Edinburgh

7 ANTIGUA STREET, EDINBURGH EH1 3NH
TEL: 031-557 4546
BUSINESS AND PERSONAL COMPUTERS

BBC



BBC COMPUTERS IN SCOTLAND

BBC Computers, Disc Drives, Printers, Software, Colour
Monitors, Modifications, Upgrades A-B, Repairs etc.

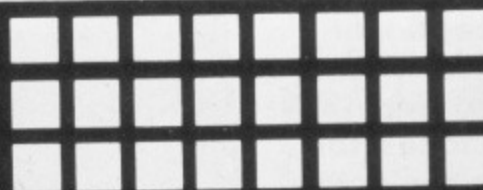
WE SPECIALISE IN "TORCH Z80" DISC PACS

Turn your BBC Microcomputer into a full business
system running CP/M and BBC Basic. The Torch Disc
Pac adds a second Z80 microprocessor, 64K of RAM
and 800K of disc storage for ONLY £780.00 + VAT.

1.20.5.
NOW IN
STOCK

MICRONET 800
COMING SOON

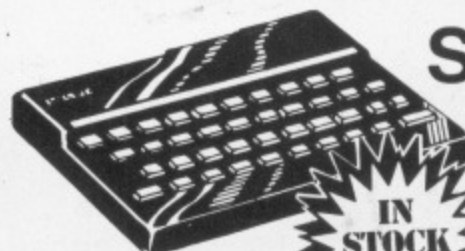
PHONE: 557 4546 or call in for a demonstration.



Cambridge Computer Store

Two Great Micros — from Cambridge!

**sinclair
Spectrum**



**BBC
Computer**



Cambridge Computer Store

1 Emmanuel Street, Cambridge CB1 1NE
Phone (0223) 358264/65334

Also in our 'Budget Micros' Dept: ZX81: Lynx: Commodore 64

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 Software

44 EXETER CLOSE, STEVENAGE, HERTS. SG1 4PW.
(Tel. Stevenage 51224)

MP

B.B.C. MICRO SOFTWARE

"SURVIVOR"
(NEW)
£6.50 + VAT

You are shipwrecked on a tropical island in this unusual adventure game. Can you survive and escape back to civilization, or will you end up in someones cooking pot. Try it if you dare!!! Written in machine code.

"SPACEGUARD"
(NEW)
£6.50 + VAT

Your ship is trapped by aliens in this great space game. Your only chance is to destroy them whilst avoiding the mines they are laying. Can be played with or without joysticks, Mode 2 graphics and sound. (Model B or 32K Model A + User Port).

"INVADERS"
£6.50 + VAT
"FIRIENWOOD"
£6.50 + VAT

A fast moving space game, compiled in machine code. It utilises Mode 2 colour graphics and sound.

Journey on a quest for the Golden Bird of Paradise in this adventure game. Travel through caverns and a forest in a land of monsters and magic where death waits around every corner.

"SWAMP MONSTERS"
£6.50 + VAT

A fantastic high speed game in machine code with full colour and sound. Can be played with or without joysticks. Guide your robot through an alien swamp and try to destroy the monsters that inhabit it. (Model B or 32K Model A + User Port).

"GENERAL"

All programs require 32K and run on all operating systems. Send S.A.E. for full range of programs and price list or ask your local dealer. Trade enquiries welcome.

ALL PRICES INCLUDE POSTAGE. CHEQUES
AND POSTAL ORDERS PAYABLE TO: M.P. SOFTWARE.

MP

SOFTWARE & SERVICES

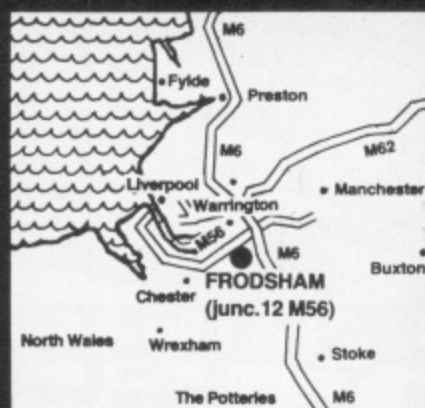
DEPT. BM, 165 Spital Road,
Bromborough, Merseyside L62 2AE.
Telephone: 051-334 3472

**northern
computers**

micro computer systems for all applications

education and training division

location



For Educational and
Training Institutions
only:

Apple II, III
BBC (Free Econet
Interface).
Newbrain
Green Monitors £79
Colour Monitors £199
Seikosha Printers £207
Epson Printers £349
NETWORKS
Coming soon:
Acorn Electron

we supply everything to meet the requirements of
secondary schools, colleges and universities, whether
it be small B.B.C. computers, Apple IIe computers, or
Apple III school administration and accounting
systems.

please contact: Gareth Littler or David Horsfall
EDUCATION & TRAINING DIVISION

Northern Computers, Churchfield Road,
FRODSHAM, CHESHIRE WA6 6RD Tel: (0928) 35110

BES

Bourne Educational Software

makes learning fun **BBC**

WORLD-WISE (Code P19) £7.95

Constructive geography programs allowing children to build databases covering both the UK and the World.

- Choice of 10 categories in each program eg. rivers, antiquities, towns, mountains etc.
- Powerful review and edit facilities to correct entries if necessary.
- Save or load the database at any time.
- Sound adds interest - and level is adjustable!
- Motivates children as computer tries to guess what they're thinking of.
- Encourages use of atlas and reference books as children create the database.
- Maintains extensive information on individual children's entries.
- Suitable for ages 7-15 and for Model B.

WORDHANG (Code P20) £7.95

Educational version of 'hangman' word game, with limited allowance of wrongly guessed letters.

- Learning to spell no longer a chore as children try to keep him alive.
- Full colour graphics and simple screens appeal.
- Includes lists totalling 260 words. Your own word lists easily created and saved too.
- Adjustable time limit for each guess.
- Monitors details of individual childrens performance, list used etc.
- Suitable for ages 5-13 and Model B.

ANIMAL/VEGETABLE/MINERAL (Code P21) £4.95

Think of an object and see if the computer can guess it correctly. The computer asks a series of questions as it tries to guess the answer. The program either guesses correctly or asks for a question to distinguish the object from the incorrect guess.

- Stimulates fascinating and educational discussions as to eg. the difference between an alligator and crocodile.
- Encourages use of reference books.
- Monitors details of childrens entries.
- Suitable for ages 7-13 and Models A&B.

For 24 hour despatch send cheque/PO to:

BES, Dept BU2, Bedfield Lane, Headbourne Worthy,
Winchester, Hants, SO23 7SQ.
Telephone: (0962) 882474

B.B.C. or ATOM USERS

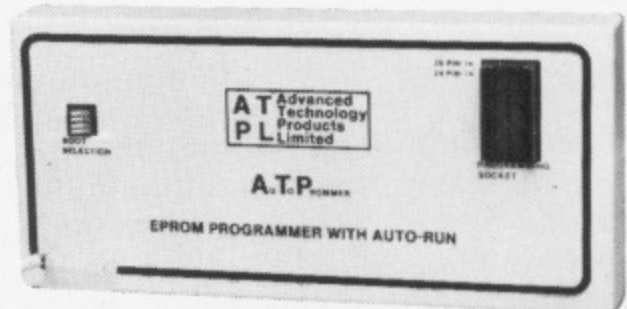
the ATPL EPROM PROGRAMMER WITH AUTO RUN FEATURE

- * Ideal for use in Education, or by Development Engineers, Software Houses, Computer Clubs etc.
- * Program, read and check for blank the following 24 & 28 pin single rail EPROMS:- 2516, 2716, 2532, 2732, 2564, 2764, 27128 & 27256.
- * Fully automatic configuration and verification.
- * Automatically runs user program.
- * Load or dump Data files or programs (Basic or machine code) from/to cassette.
- * Complete with all software, cables and fully comprehensive instructions.

Used regionally by Microelectronics Education Programme

Stockists:

Basingstoke Computer Centre, 5 New Market Sq., Basingstoke, Hants. (0256) 52203.
 Cambridge Computer Store, 1 Emanuel St., Cambridge, CB1 1ME. (0223) 65334.
 Customised Electronics Ltd., 155 Marton Rd., Middlesbrough, Cleveland. (0642) 247727.
 Datron Micro Centre, Abbeydale Rd., Sheffield, Sth Yorks. (0742) 585490.
 Electronequip, 36 West St., Fareham, Hants (0329) 230670.
 Eltec Services Ltd., 271 Manningham Lane, Bradford, West Yorks. (0274) 722512.
 HCCS Associates, 533 Durham Rd., Low Fell, Gateshead, Tyne & Wear (0632) 821924.
 Leasalink Viewdata Ltd., 230 Derby Rd., Stapleford, Nottingham (0602) 396976.
 S.P. Electronics, 48 Linby Rd., Hucknall, Notts. NG15 7TS. Phone 640377.
 Micro Power Ltd., 8/8A Regent St., Chapel Allerton, Leeds, West Yorks. (0532) 683186.
 Northern Computers, Churchfield Rd., Frodsham, Cheshire, WA6 6RD. (0928) 35110.
 Somerset Business Computers, 25 East Reach, Somerset. (0823) 52149.
 Silicon Centre, 7 Antigua St., Edinburgh. (031-557 4546).
 SIR Computers Ltd., 91 Whitechurch Rd., Cardiff, Sth Wales. (0222) 21341.
 Twickenham Computer Centre Ltd., 72 Heath Rd., Twickenham, Middx., TW1 4BW. (01) 892 7896.
 Other areas and in case of difficulties, please contact us direct.



Guildford Computer Centre, Bridge St.,
 Guildford, Surrey (0483) 578848
 Com Tec, 6 Eastgate, Barnsley,
 S. Yorks (0226 46972

**£120.00
 CARRIAGE
 PAID + VAT**

ELECTRO & GRAPHIC PRODUCTS

70 Summer Lane, Barnsley, South Yorks. S70 2NN.
 Telephone: (0226) 790609.

BBC MICRO IN MANCHESTER

**YES WE'VE PROBABLY GOT IT IN STOCK
 - NOW WHAT WAS IT YOU WANTED?**

We stock all the following:

BBC MICRO Model B £399 incl.
DISC I/F KIT £95 incl.

**All Teac Disc Drives including Utilities Disc
 and DFS Manual.**

100K single sided £230 incl.
 200K single sided £265 + VAT
 400K double sided 80 track £345 + VAT

PRINTERS
 AP 100 A £199 + VAT
 Spark Jet £365 + VAT

Please phone for latest prices on above.

SOFTWARE

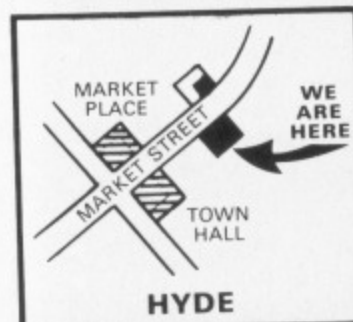
The North's best stockist of Acornsoft. We
 always have in stock:
**Snapper, Planetoid, Rocket Raid, Arcadians,
 Meteors and Monsters, Castle of Riddles,
 plus Program Power selected lines.**

We also supply Professional Standard Business
 Software including Integrated Accounts, Pub
 Stock Control and Video Shop System.
Plus TAILORMADE SOFTWARE TO ORDER.



**NEW SLIMLINE
 100K DISC DRIVES
 £205 incl.**

(includes Formatting Disc,
 Cables & Manual) - These
 drives are the most
 advanced available.



C★TECH
 COMPUTERS

**184 Market Street, Hyde,
 Cheshire SK14 1EX.
 Tel: 061-366 8223**



EDUCATIONAL & BULK
 DISCOUNTS AVAILABLE

MICROMAIL

Schools need all the help they can get

I AM reading the first issue of the BBC Micro User, and so far, for a newcomer to the micro like myself, it would appear to provide a refreshing easy to read and understand text for someone like myself and my family who want to make practical use of the computer as well as exploit its entertainment value.

I hope the magazine will provide information hitherto difficult to find under one cover without hours of research and study.

I note from your editorial that you are looking for views regarding the future contents of the magazine.

If possible could you please include a series on producing educational programs similar to those used in primary and middle schools and which are apparently not readily available at the moment.

As yet many schools have not been able to buy computers, and even those lucky enough to have one also generally have very restricted use by individual pupils.

I feel this would be particularly useful and would provide youngsters like mine,

who are unlucky enough to go to a school without a computer, with a valuable stepping stone into the world of computer technology.

Another article which could be included is one on adapting programs to enable the games paddles to be used. Many programs, including Deathwatch, use the keyboard keys for control. On the face of it most programs would appear suitable for use with paddles.

A feature dealing with the basic steps and method required to amend the listing to cater for this would, I believe, be well received as well as save much wear and tear on the keyboard.

Other ideas: features presenting useful ideas for making use of the computer in the home as an aid to time saving and also to enhance traditional systems of information storage.

Articles on the presentation of this information to improve interest and make it easy to

read and understand, would also be worth considering.

I look forward to receiving future issues of the magazine and hope that some of my suggestions can be incorporated. — M.A. Godfrey, Gravesend.

● Thanks for your suggestions. The use of the computer in education is a subject that we are deeply interested in, and we shall be regularly providing listings of educational programs for the pre-school child upwards. We've already got plenty in stock, but are always willing to accept more. So if any teachers or interested parents want to submit their programs or ideas to us we'd be only too pleased.

As for the topic of educational program design, articles on the subject tend to be rather woolly and not of much practical use. However, we shall be featuring a series on this subject which, we hope, will

provide plenty of definite advice for the educational programmer.

The point about the games paddle is well made. I think it would be impossible to write a comprehensive article on adapting programs already written (though I'm willing to be proved wrong). However, we do try to make sure that our contributors do bear in mind the great advantages the joystick has in many applications.

Greedy interfaces

I HAVE today purchased, read and enjoyed your magazine BBC Micro User. My main problem with my BBC machine has been loading cassettes, so I found the relevant article helpful.

My next problem is that, to



I READ with interest your article on Cassette Capers in your March issue.

As I am a computer engineer I was tempted to investigate further when my BBC micro suddenly failed to read in programs off cassette.

The problem turned out to be a faulty LM324N Quad operational amplifier, pin 10 (input from cassette) of which had incorrect DC bias on it. Replacing the chip cured the problem.

During the investigation I found that if I increased the level fed in far above the normal level required some programs

would load, but my main concern was as to why the fault had occurred at all.

I can only guess as to what caused it but from my experience of interfaces I suggest the following as a probable cause: We share the tape recorder with our hi-fi and it is plugged and unplugged at regular intervals. I suspect doing this with the power ON both machines caused our fault to occur, there being no earth (which is normal) on the recorder.

Needless to say we have now ceased this practice.

More interesting was why some programs still loaded, and this investigation led me to discover a modification to the cassette input circuitry which is a 220nf capacitor between pin 14 and R90.

This blocks any small changes in the DC bias which may occur, and allows the final stage of the Op. Amp. to sit at the correct level for clipping the signal sent to the ULA. I do not know if you are aware of this modification, but from my experience it may be the answer to some cassette loading problems.

Obviously the leg nearest pin 14 of R90 should be lifted or the track cut to insert the capacitor. I spotted the modification on an Acorn drawing, so I am not aware of the official fitting instructions. Perhaps you could obtain them from Acorn.

I hope this information is useful to other BBC Micro users — W.B.A., Ecclestone, Staffs.

● Many thanks for your advice. It's always nice to be able to pass on readers' discoveries, particularly when they are as practical as yours.

MICROMAIL

From Page 97

overcome my first problem, I have invested in a disc drive system, but certain items of commercially produced software that did work on a BBC without disc interface will not now run, including some from Acorn! Can you help?

Finally, I would like to master graphics in Mode 7, including drawing lines. How about an article on this subject? — R.Y. McNulty, Kettering, Northants.

● Mode 7 articles are coming in a-plenty. As for the interface, unfortunately many dealers are fitting them without warning unsuspecting purchasers that they use up so much RAM as to leave programs that previously ran well short of space.

The answer is to set up one of the function keys as a downloader — we gave such a program in April's issue. You then LOAD (not CHAIN) the recalcitrant program from disc and press the appropriate function key to activate the downloader. This moves the program down in memory from where the disc loads it to the position it would have been in had the interface not been fitted, thus giving you more space. You can then run your program.

Not off the micro map

OUR school now has five BBC Micros and I bought (with my own money!) a copy of your magazine from a bookstall.

I was, therefore, quite disappointed to see that your article "Spreading the Micro Gospel in Education" made no mention of Scotland, either in the text or on the map.

It is supposed to be a national circulation magazine is it not? — Hector MacSween, Glasgow.

● Feminism last month, nationalism this! Apologies for omitting Scotland, but as the article was about the MEP,

which doesn't function there, it would have been rather out of context.

Still, BBC Micro User aims to cover developments nationwide, and this will involve a look at the Scottish educational scene in the near future.

Cassette bug fix

I have a Model B BBC Micro version 0.1 and wish to use the cassette bug fix listed on page 39 of the March issue of BBC Micro User.

I am new to this type of program and wish to know whether, having run the program, I am then free to program normally, ie to use line numbers 10-180.

Initially, I assumed this program fix would only be run prior to saving or loading but Mike Cook suggests running it whenever the computer is powered up. — R.G. Loveday, Woking, Surrey.

● The idea of the program is to fix an error in the cassette filing system, to enable you to save and load programs or files reliably. All you have to do is to load the program and run it.

Nothing spectacular appears on the screen, but from then on you can enter programs as normal (using NEW between each, of course), with the certainty that you will be able to save them.

The fix only has to be run once, at switch-on. If, however, you switch off at any time, the BBC Micro will "forget" it and you will have to load it again.

Calling Mr Cooper

I AGREE with most of the letters in the last issue. Most of the magazine is easy to understand and provides basic knowledge of how the computer works.

There is one aspect of the magazine, however, which I feel is badly organised. This is the advertising. It would be a great

help to the software buyer if:

1. All advertisers had to show a picture of their programs.

2. Any advertisers found to be untrustworthy would immediately be stopped from advertising.

I am sure these measures would give people more faith in mail order software.

Another idea would be to ask people to send in a list of the programs they think are good and then you could maybe compile a top ten so that we would know what was good and what was trash. — Barry Cooper.

● Mr Cooper also sent in an order for a cassette, but failed to include his address. Could he please write to us again?

Breezy beginning

YOUR first issue was definitely a spring breeze in the winter of BBC publications. It was refreshing and gave me lungfuls of joy!

I do have a quick but difficult query: Is there any way of passing different numeric arrays through the PROCEDURE call from the main routine to a certain procedure?

If this cannot be done in Basic could it be done in assembly language?

Is there any book which gives information about transferring and manipulating arrays for the BBC model B?

I thoroughly enjoyed your magazine, and was pleased with your exposition of available books. Keep advancing to a better spring for the BBC user.

— Fsa Al-Ramadhani, Ely, Cardiff.

● Unfortunately there is no simple way of passing arrays in the fashion you describe. You'll have to stick to global variables, unless one of our readers has some devious ways of doing it.

That 6521

FIRST, my congratulations on your first issue — it is most encouraging.

However you have managed

to confuse me on page 54. You talk about 6521 VIA; Acorn refer to 6522 VIA and someone else to 6522 PIA for this duty.

Can you possibly clarify this?

— R.L. Maltby, Farnham.

● Sorry about that — it should have been 6522 VIA — Mike Cook.

Satisfied

I FOUND edition 1 of BBC Micro User absolutely superb. The format and content were exactly right. I have learnt and understood more from your edition than I have from six months of reading the other dross on the market.

As I have always believed in putting my money where my mouth is, I enclose my subscription for the next 12 months. Keep up the good work — Tom Morrison, Liverpool.

Digital dangers

CONGRATULATIONS on what looks a very promising magazine for the 'Beeb'. I admire your temerity in setting up a contest asking for listings. Presumably many can be weeded out by eye, but I wouldn't like to be the one to type in the remainder!

With respect to the tape reading article, one occasionally sees "digital" tape recommended for micros. This is magnetically very "hard" and requires a high-power bias to magnetise it — beyond the capacity of many domestic recorders.

When I received my recorder from Acorn I couldn't get a satisfactory load using the tape supplied.

I was about to return the recorder as faulty when I decided to check the recorded level on a machine with a VU meter. It was almost non-existent!

Substituting ordinary good quality audio tape has made tape operations so reliable that I often don't check-read smaller programs nowadays (provided

the 0.1 OS bug-fix is in). I can't remember the last time I had a bad load.

I have noticed one or two complaints about space bar action. My machine was very sticky when I first received it, but investigations showed that one of the plastic pedestals which link the ends of the bar to the bent wire "switcher" had succumbed to the GPO.

Replacement of this part has resulted in an action as good as, if not better than, the commercial electric typewriter on which I am writing this letter. (How about a competition for a printer?) — K. Withey, Crowthorne, Berkshire.

● The one who typed in the remainder didn't like it much either! But as it was Percival who started all the trouble, Percival it was who had to sort it out! He's stopped speaking to us. As for the printer competition, there's one on the way.

Matter of style

VISITING our newsagents recently, I was glad to find a new magazine devoted to the Beeb: You seem to have found a nice slot between the slightly snooty Acorn User and the ever so intense Beebug.

However, I would like to complain about the programming style of Deathwatch.

The program is fine once it is up and running and my son Ben (aged 11) has had every penny of the £1 I paid for your magazine back in enjoyment. But what a mess to de-bug and what arguments my son and I had when we were typing in the listing (he reads, I type).

Why not use the DEF PROC statements to divide up the text (or REMs even) instead of putting extra statements on the line?

Why not use real, meaningful names for the procedures (in lower case maybe)?

How about a few spaces and, although it isn't strictly necessary, a few THENs would have helped. Why use a colon before ELSE? And don't use 'I

as a variable, it's too like 'I'.

I've seen worse examples but why not set a higher standard? Shapes, which I haven't tried yet, looks much more attractive and controlled. Let that be the standard.

Sorry to be so critical but you did ask.

Good luck! I'll be watching the newsagents for your next issue. — J.R. Todd, Chester.

● Programming style is the sort of subject that causes broken homes. Unfortunately, to program a fast-action Basic game of the high calibre of Deathwatch, which still fits into a 32k machine, style has in many cases to be sacrificed.

Shapes, a more sedate program, could afford to be somewhat extravagant in terms of execution time and memory — though I agree it's a pity that all programs can't be as nicely laid out (and as free from GOTOs).

Use of joysticks

I HAVE just purchased your first issue of BBC Micro User and was absolutely delighted with it.

Up to now, apart from club magazines, Acorn User was the only other BBC specialist

publication and, as the saying goes, "Two heads are better than one."

I found the articles on software, monitors and particularly "Programming is easier than you think" very interesting and helpful, the programming article being especially easy to follow.

I feel this is very important as no doubt many people have purchased their first micro due to rave reviews but like myself are complete novices as regards how to use it.

I feel it would be helpful to advise in the software reviews when joysticks can be used as in Frogger and also whether using them is realistic.

To qualify my statement, Frogger allows joystick usage but, as you can move the frog East, North, West and South, you have to restore the stick to the exact central position to leave the Frog motionless.

You should try this. Unfortunately because the official BBC joystick is not spring-loaded, to automatically restore it to the central position the use of the joystick is virtually a non-starter as you can't watch screen and stick at the same time.

Unfortunately, several other games over-respond to joysticks in a similar way.

I look forward to all your

coming issues and, if the standard is as high as that of the first, there is no doubt that I will buy them all. — David Glew, Beckenham, Kent.

● Odd you should mention Frogger — I've just tried with joysticks and watched my score plummet for much the same reasons. Mike Cook reckons he plays better with joysticks, though he's made his own. He describes how to do it in this month's instalment of the Beeb Bodybuilding Course.

Accent on business

WE are one of probably several thousand small businesses who have purchased the BBC Micro as a means of entering the world of the micro and with the intention of building up to useful and value-for-money hardware and systems.

We should, therefore, like to see in your publications as much guidance and business information material as you can cram into it. — P.E. Hitchcock, Brighouse.

● We see the BBC Micro, particularly with the advent of the second processor, as a serious proposition for the small businessman and intend to cover the subject in the pages of BBC Micro User. We have already commissioned a series of reviews of current business software.

Right approach

MANY thanks for BBC Micro User. To one fairly new to the BBC Micro and others to whom I have spoken, your "starting from scratch" approach is most helpful.

As drawing office manager of Wireless World I also find most of the contents extremely good — I would have puzzled over Fig. II Page 21 had the text not explained it. Congratulations again — R.J. Goodman, Wandsworth.

King Kong Klanger

APOLOGIES to all those who suffered from the errors in the King Kong listing — and congratulations to the many who worked them out. What is particularly galling is that we list directly from a working program to printer. King Kong, however, was listed on a new printer which produced the odd hiccup in the most well-hidden places — and on only one of our listings. Of course, that had to be the one that went through...

The two lines that contain errors should read:

```
180 VDU23,230,254,50,133,153,123,183,255,
    255,23,231,255,255,255,255,255,255,
    255,23,232,255,207,135,3,1,0,0,0,23,233,
    1,1,1,0,0,0,0,23,234,0,0,0,128,96,120,
    252,23,235,252,252,252,248,248,248,240,240
```

```
450 DEFPROCchitcheek:IFY% < 651AN
    DY% > 599THENGOTO460ELSEIFY%
    < 695ANDY% > 650THEN480ELSEENDPROC
```

The errors do not occur, of course, on our cassette tape of programs from that issue.



EXHIBITORS! For details of remaining stand space contact Linda Dobson on 061-456 8383

SPECIAL LOW RATES FOR HOTEL ACCOMMODATION

BBC Micro User has been able to negotiate exceptionally favourable rates for bed and breakfast at hotels within easy reach of the Show. Single bed prices per night are:

FIVE STAR HOTEL: £21
FOUR STAR HOTEL: £19

In addition, UMIST are making available student accommodation in single studies for £17 a night (this includes bed, breakfast AND an evening meal). Applications can only be made on the form alongside, and full payment must be enclosed.

Please reserve me
..... rooms at

- ☐ Five Star Hotel
- ☐ Four Star Hotel
- ☐ UMIST accommodation

I enclose remittance
for £

(Cheques must be payable to UMIST)

Name

Address

Phone number

Post to: Business Manager, UMIST,
PO Box 88, Sackville Street,
Manchester M60 1QD

There's never been a show like it!

INSPECT the latest hardware devices that add greater power and more versatility to the BBC Micro.

TRY OUT the yet-to-be released summer crop of games – a unique opportunity to test them out in advance.

WATCH demonstrations by some of Britain's leading experts in BBC computing.

AT LAST – a national show exclusively for users of the BBC Micro! An action-packed, three-day event that has one main aim ... to ensure users from all over the country are brought fully up to date with all the exciting developments in this most remarkable machine.

The BBC Micro User Show is primarily designed for people who already own a BBC Micro, and they will find it a veritable Aladdin's cave, packed with goodies that will help them make their computing even more rewarding.

But there will also be much to interest anyone about to buy their first machine. They will be able to discover for themselves what computing is all about – and how easy it really is.

Visitors will be able to ask all the questions they want about the vast range of accessories on show, from tiny program chips and memory expansion devices to disc drives, monitors, modems and the many other ways of linking the BBC Micro to the outside world.

This is an event no user of the BBC Micro will want to miss. So make a note of the date in your diary now. More details of our plans will be given in next month's BBC Micro User.

Meet BBC Micro experts at our WALK-IN FORUM

LECTURE theatres adjoining the two exhibition halls will be in use throughout the three days of the Show, with leading authorities on the BBC Micro explaining in easy-to-understand language the latest developments in BBC computing.

On Friday there will be special sessions on practical applications of the micro in education and business.

On Saturday and Sunday more well-informed speakers will be discussing subjects ranging from Basic for beginners, the use of discs and exploring the BBC's ROM to tackling assembler language and demonstrating advanced techniques in BBC graphics.

When it's open, and what it costs

EXHIBITION

Friday, June 24 – 9.30am-7pm
Saturday, June 25 – 9.30am-5pm
Sunday, June 26 – 9.30am-4pm
Adults: £1.50 Under-12: £1

(50p reduction with voucher from this page)

WALK-IN FORUM

Two-hour sessions each morning and afternoon
10.30am-12.30pm
2pm-4pm

Admission per session: £1

Why Manchester?

IT was at Manchester University that computing as we know it today was born. So it is only just that the first national show devoted exclusively to the all-British BBC Micro should make its debut in the city that spearheaded the computer revolution.

UMIST is in the city centre, only minutes away from main-line rail and coach stations. And there are NO parking problems!

Cut-price travel by British Rail

British Rail is offering special discount fares for visitors to the BBC Micro User Show – in some cases as much as one third off the normal fare. These are Second Class fares on any train, and the return journey can be made on any day within one month. (For First Class travel add on half to the prices given.) These are the fares from BR stations in the following counties:

ENGLAND: Avon, £18.90; Beds, £16.40; Berks, £20.40; Bucks, £17.60; Cambs, £18.90; Cheshire, £4.00; Cleveland, £12.30; Cornwall, £35.30; Cumbria, £9.40; Derbys, £6.90; Devon, £27.30; Dorset, £27.30; Durham, £13.60; Essex via London, £29.80*; Gloucs, £14.90; Hants, £25.80; Hants via London, £35.30*; Hereford & Wors, £12.30; Herts, £20.40; Herts via London, £27.30*; Humberside, £9.40; Isle of Wight, £29.80; Isle of Wight via London, £38.20*; Kent via London, £32.80*; Lancs, £4.00; Leics, £13.60; Lincs, £9.40; London (Greater), £24.60; Merseyside, £4.00; Norfolk, £23.10; Northants, £16.40; Northumberland, £21.60; Notts, £9.40; Oxon, £17.60; Shrop, £8.20; Somerset, £23.10; Staffs, £6.90; Suffolk, £23.10; Surrey, £24.60; Surrey via London, £29.80*; Sussex (East) via London, £32.80*; Sussex (West) via London, £32.80*; Tyne & Wear, £16.40; Warwicks, £12.30; West Midlands, £9.40; Wilts, £21.60; Yorks (North), £9.40; Yorks (South), £8.20; Yorks (West), £4.00.
WALES: Clwyd, £8.20; Dyfed, £20.40; Glamorgan (Mid), £21.60; Glamorgan (South), £18.90; Glamorgan (West), £24.60; Gwent, £18.90; Gwynedd, £10.90; Powys, £12.30.
SCOTLAND: Central, £25.80; Dumfries & Galloway, £16.40; Fife, £27.30; Grampian, £35.30; Highland, £40.70; Lothian, £24.60; Strathclyde, £25.80; Tayside, £29.80.

* Valid via London. Does not include travel between London Termini.

For an application form for these special fares, send a stamped addressed envelop to: BBC Micro User Show, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.



50p off
exhibition admission price

**BBC
MICRO
USER
SHOW**

Name

Address

Phone number

THIS VOUCHER NOT VALID WITHOUT ABOVE DETAILS

Renold Building, UMIST, Manchester

June 24-26, 1983

Hand this voucher in at the door

COMPUTER CITY

BBC

BBC Model B	£399.00
BBC Model A	£299.00
BBC Model A + 16K	£338.30
BBC Model A + 16K & VIA	£345.00

DISC DRIVES

(Including Disc Utilities and Manual)

Canon Single 100K Drive	£221.50
Canon Twin 100K Drive	£399.95
Acorn Twin 400K Drive (80 Track)	£804.00
Torch Twin 400K + Z80 & 64K	£897.00

MONITORS

Microvitec 14" Colour Monitor	£287.50
Sanyo Green Monitor	£90.85
Sanyo 14" Colour Monitor (Composite)	£228.85

PRINTERS

Seikosha GP100A (including free 'Screen Dump' Program)	£229.94
Seikosha GP250X	£274.85
Epson RX80	£343.00
Epson FX80	£488.00
Smith Corona TP/1 (Daisywheel)	£557.75

ACCESSORIES

Binatone Cassette Recorder/Counter	£29.95
Cassette Lead	£3.75
C12 Cassettes	£0.55
Printer Cable for Seikosha	£18.40
Printer Cable for Epson	£23.00
BBC Joysticks (pair)	£13.00
Listing Paper	£13.05
Computer Dust Covers	£3.95
Wabash Discs S/S S/D	£19.00
Wabash Discs S/S D/D	£25.00
Wabash Discs D/S D/D	£28.00 (40 track)
Wabash Discs D/S D/D	£33.00 (80 track)

Computer City Service and Repair Department

Let Computer City offer you their extensive computer maintenance service. We deal with all aspects of home computer servicing at very competitive rates. Computer City invite you to come and talk to us about any problems that you may have with your computer; our experienced staff will be pleased to help. For technical advice our service staff can offer their wide computing and electronic knowledge. Most servicing and modification work can be done while-you-wait. (By appointment only). We can service most types of home computers, from Sinclair to Apple. We can provide custom built cables for printers etc., and our design and development team is available for production of custom built interfaces and peripherals. Why not give us a ring or write for more information? Ask for Tony Coyne (Service Manager), who will be pleased to assist.

ADVERTISERS INDEX

A & F Software	I/F/C	K & N Electronics Ltd	91
Beecon Educational	88	Kingsley T.V. Services	94
Buffer Micro Shop	91	MED	89
Bourne Educational Software	95	Microadvent	64
BBC Micro User Show	100-101	Micromanagement	43
C-Tech	96	Microstyle	36
Cambridge Computer Store	94	Midwich Computer Co.	8
Carsondale Enterprises	88	Microaid	90
Cabel Electronics	47	Mentor Software	91
Computer Concepts	25	M.P. Software	95
Cumana Ltd	31	Micropower	O/B/C
Clare Micro Supplies	57	Newtech Publishing	75
Computerama	67	Northern Computers	88, 95
Computer City	102, 103	Opus Supplies	22
Dace Ltd	88	Owl Software	88
Digital Fantasia	26	Oakleaf Computers	91
Digivision Ltd	27	Pace	72
Electro & Graphic Products	96	Simonsoft	89
Electronequip	86	Sir Computers Ltd	74
Eltec Computers	85	Software Express	33
Everyday Electronics	90	SP Electronics	90
Fairhurst Instruments	90	Silverlind	90
Gaelsett Software	95	Silent Computers	91
Gemini	6, 7	Squirrel Software	91
Golem Ltd	89	Silicon Centre	94
Guildford Computer Centre	86	Torch Computers	3
Group 70	90	Technomatic Ltd	13
H & H Software	66	Twilstar Computers Ltd	94
Ikon	84	Watford Electronics	16, 17

BBC UPGRADE PRICES (All prices inc. VAT and fitting)

Full A To B Upgrade	£99.00
Disc Interface	£105.50
16K + VIA	£35.50
Cassette matching service	£7.50

Delivery charge subject to distance.
Please phone for quotation.

COMPUTER CITY EDUCATIONAL SERVICES DEPARTMENT

The educational uses of the BBC Microcomputer are fully supported by Computer City's Educational Services Department. We can provide all hardware and software requirements for schools, colleges and institutes of further education.

An ever-growing range of software for all levels of teaching and instruction, from pre-school to A level, is available off the shelf from our Widnes branch.

We can supply all the peripherals necessary for efficient use of the computer. These include a large range of printers, plotters, monitors (Monochrome and Colour), joysticks, disc drives etc., and also a range of special interfaces for technical experimentation.

For multiple computer installations, the ECONET network system (Both level 1 and 2) will be available shortly to enable up to 254 BBC's to link together.

We also supply the Apple IIe and III computers and software. Educational catalogue available on request.

CREDIT FACILITIES

Ask about instant credit up to £1,000. Choose the credit to suit you. The deposit is only 10% of the cost of your purchase.

We are credit brokers for Lombard Tricity Finance Ltd. Interest is just 2.25% per month, equivalent to an annual percentage rate of 30.6%. Ask for a written quotation today!

COMPUTER CITY

78 VICTORIA ROAD, WIDNES, CHESHIRE

051-420 3333

MICROPOWER

Swoop (B)	£7.99
Alien Destroyers (B)	£7.99
Galactic Commander (B)	£7.99
Time Trek (B)	£7.99
Laser Command (B)	£7.99
Space Haze (B)	£6.85
Martians (B)	£6.85
Astro Navigator (B)	£5.70
Maze Invaders	£5.70
Chess (32K)	£7.99
Chess (16K)	£5.70
Footer (B)	£7.99
Adventure (B)	£7.99
Cowboy Shoot Out (B)	£6.85
Munchy Man (B)	£6.85
Seek (A)	£6.85
Eldorado Gold (B)	£6.85
Roulette (B)	£5.70
Reversi (A/B)	£5.70
Cat & Mouse (A)	£5.70
Croaker (B)	£7.99
World Geography (B)	£6.85
Junior Maths Pk 1	£6.85



Star Trek/Candy Floss	£6.50
Hangman	£4.50
Super Hangman	£4.50
Beep Beep	£4.50
Beebmunch	£6.50
Mutant Invaders	£6.50
3D Maze	£4.50
Model A Invaders	£5.50
Model B Invaders	£7.50
Word Pro	£10.50
Atlantis	£7.50
Flags	£4.50
Hyper Drive	£6.50
Strato Bomber	£7.50
Leap Frog	£7.50



ADVENTURE GAMES FOR THE BBC

The Golden Baton (A/B)	£8.95
The Time Machine (A/B)	£8.95
Arrow of Death (Pt 1) (A/B)	£8.95
Arrow of Death (Pt 2) (A/B)	£8.95
Escape from Pulsar 7 (B)	£8.95
Circus (B)	£8.95
Feasibility Experiment (B)	£8.95
The Wizard of Akryz (A/B)	£8.95
Perseus and Andromeda (A/B)	£8.95
Ten Little Indians (A/B)	£8.95



BUSINESS SOFTWARE

Cash Book Acc.	£95.00
Beeb Calc	£19.95
Inv. & Statements	£19.95
Commercial Accts	£19.95
Mailing List	£19.95
Database	£19.95
Stock Control	£19.95
Home Accounts	£19.95
Word Processor	£19.95



Space Pirates	£8.00
Space Warp	£9.00
BBC Dragon Quest	£11.50
BBC Fruit Machine	£5.50
BBC Airlift	£5.50
BBC Chess	£8.00
BBC Backgammon	£8.00
BBC Multifile	£15.00
Golf	£5.50
Polaris	£5.50
NEW!! - Action packed games, all tape and disc compatible.	
Space Invaders	£7.50
Galaxy Wars	£7.50
City Defence	£7.50
Also compose your own tunes with BBC Music Synthesizer	£9.50



SOFTWARE	
Home Finance	£10.00
Early Learning	£10.00
Music	£10.00
The Computer Prog. (Vol. 1)	£10.00
The Computer Prog. (Vol. 2)	£10.00
Painting	£10.00
Drawing	£10.00
Games of Strategy	£10.00
Fun Games	£10.00



Lunar Lander	£6.95
Planes	£8.00
Tower of Alos	£6.95
Frogger	£8.00
Pharaohs Tomb	£8.00
Painter	£8.00



Business Games	£9.95
Tree of Knowledge	£9.95
Peeko - Computer/Manual	£9.95
Algebraic Manipulation Pack	£9.95
Creative Graphics Cassette*	£9.95
Graphs & Charts Cassette*	£9.95
Desk Diary/Manual	£9.95
Lisp Cassette*	£16.85
Forth Cassette*	£16.85
Philosophers Quest	£9.95
Sphinx Adventure	£9.95
Castle of Riddles	£9.95
Monsters	£9.95
Snapper	£9.95
Planetoid	£9.95
Arcade Action	£11.90
Rocket Raid*	£9.95
Meteors	£9.95
Arcadians	£9.95
Sliding Block Puzzles	£9.95
Cube Master	£9.95
Super Invaders	£9.95

* Please ring for availability before ordering.

LEVEL 9 COMPUTING ULTIMATE ADVENTURES

Colossal Adventure	£10.00
Adventure Quest	£10.00
Dungeon Adventure	£10.00

BBC Forth	£15.00
BBC Forth Tool Kit	£15.00

SPECIAL OFFER

ORDER 2 CASSETTES - DEDUCT £1
ORDER 3 CASSETTES - DEDUCT £2 etc.

BOOKS FOR THE BBC MICROCOMPUTER

1 30 Hour Basic (NEC)	£5.50
2 Programming the BBC (Newnes)	£6.50
3 Easy Programming for the BBC Micro (Shivas)	£5.95
4 Let Your BBC Micro Teach You To Program (Interface)	£6.45
5 Assembly Language Programming for BBC (MacMillan)	£8.95
6 BBC: An Expert Guide (Granada)	£6.95
7 The BBC Micro Revealed (Interface)	£7.95
8 Programming the 6502 (Sybex)	£10.75
9 Advanced 6502 Programming (Sybex)	£10.25
10 Machine Code for Beginners (Sybex)	£5.95
11 Practical Programs for BBC and Atom (Wiley)	£5.95
12 30 Programs for the BBC Micro (Evans)	£4.95
13 Games BBC Computers Play (Addison Wesley)	£6.95
14 The Book of Listings (BBC Publications)	£6.75
15 The Computer Book (BBC Publications)	£6.75
16 Creative Graphics (Acornsoft)	£7.50
17 Graphs and Charts (Acornsoft)	£7.50
18 Forth Manual (Acornsoft)	£7.50
19 Lisp Manual (Acornsoft)	£7.50

P & P on Books £1.

Please send me
Postage and packing on software 50p. Telephone for hardware delivery rates.
I enclose cheque/P.O. for

OR Please debit my Access/Barclaycard/Visa*
* delete as applicable

Card no Expiry date

Name

Address

Code

Telephone number

Dealers Discount Available

ACCESS, BARCLAYCARD VISA ORDERS
WELCOME ON 24HR 051-420 3333

TRADE ENQUIRIES WELCOME.
SPECIAL DEALS FOR SCHOOLS.

COMPUTER CITY Dept F. FREEPOST (No Stamp Required)
78 VICTORIA ROAD, WIDNES, CHESHIRE WA8 7RA.



BBC MICROCOMPUTERS NATIONWIDE FOR EDUCATION, BUSINESS AND LEISURE

Croaker

CROAKER (B) £6.95

People—HUH!! Pity us poor Frogs!! It was tough before, just trying to hop logs over the river. Now you've built multi-lane motorways, packed with fast-moving traffic. And if we get the family safely over that little lot, you drive faster and faster and breed ever increasing numbers of crocodiles and diving turtles to make things impossible. How long will we survive the ravages of Human Expansionism?

Full feature, arcade-standard, machine code program, with excellent sound and graphics. The faster you complete each level, the more you score. One for the Connoisseur!!

SWOOP (B) £6.95 — the NEW GALAXIANS
Galaxian-style, machine-code arcade game. THIRTY screaming, homing, bomb-dropping, explosive egg-laying BIRDMEN, swooping down to destroy your laser bases. Bonus bases, score & high-score, hall of fame etc.

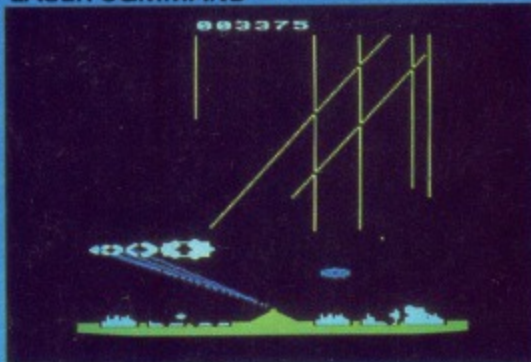
CHESS (B) £6.95

Our excellent machine code program—now with superb MODE 1, colour graphics. Six skill levels, play black or white, illegal moves rejected, 'en passant', castling, take-back of moves, and display of player's cumulative move-time. Options include Blitz Chess where you must move in 10 seconds, set-up of positions for analysis, replay of a game just played and saving of part completed games on tape. On loading, a 1972 Spassky/Fischer game can be replayed.

LASER COMMAND (B) £6.95

Classic 'Defence of 6 Cities'. Detonate single mines or patterns to counter laser fire from alien planets. Store and recall mine patterns. Super fast, machine-code arcade game with superb graphics, sound effects, many skill levels, bonus points. etc.

LASER COMMAND



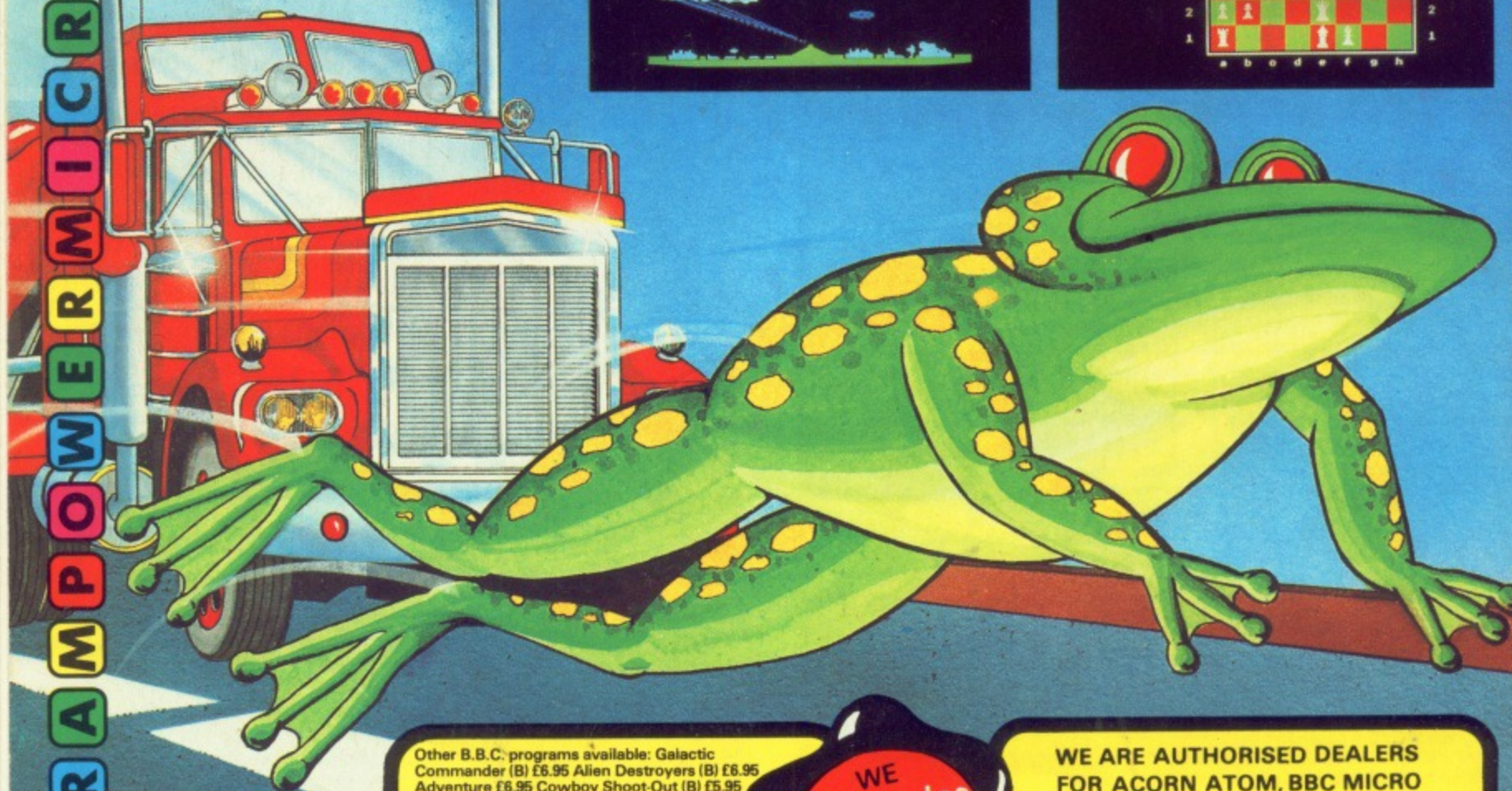
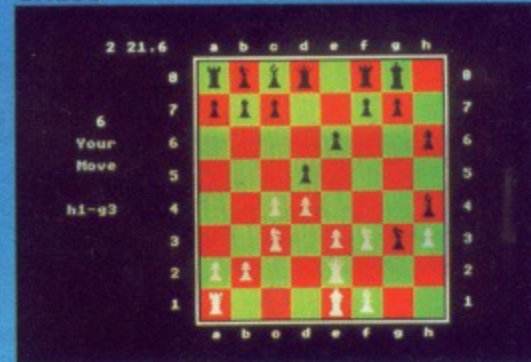
CROAKER



SWOOP



CHESS



Other B.B.C. programs available: Galactic Commander (B) £6.95 Alien Destroyers (B) £6.95 Adventure £6.95 Cowboy Shoot-Out (B) £5.95 Flier £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 & 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 Guarantee
THAT ALL OUR ADVERTISED
PROGRAMS HAVE BEEN
COMPLETED AND ARE
READILY AVAILABLE

**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. BMU5
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.



FREE!



This practical copy-holder to make it easier for you to key in programs, together with a specially designed crib sheet of essential information...

FREE WHEN YOU ORDER A YEAR'S SUBSCRIPTION TO BBC MICRO USER ON THE FORM OVERLEAF

You can also order...

Back numbers



Cassette tapes



T-shirts and Sweat shirts



Binders and dust covers



ORDER FORM OVERLEAF

Down Under

ECONETS may be in short supply here, but the Australians have just installed their hundredth system.

The official launch of the BBC Micro in Australia was on St. Valentine's day. Since then, the discerning Australians have been

snapp cakes. No NBC version been progr BBC able the B pushi

GRAM COU THOUSAN



Kennington... a breakthrough

Kennington's BBC Micro, £399, can do b.

It replace the wsroom ter-aid a BBC, "but for lopments the e portability micro has is advan-

"With it our staff could also work from home if necessary and either send the completed pages by telephone to the Ceefax computer or bring them in to Television Centre on a floppy disc.

"It could also be used in BBC newsrooms and production offices wanting to contribute to Ceefax."

I PLANNED

gramme, and them will be in the studio

who would rticipate is in and return Page 11.

stage we are e about the of the

programme", said director Patrick Titley. "The studio audience will consist of both experts and users, and Mac will invite them to join in the discussions and demonstrations.

"There will be filmed Turn to Page 11

MO people 800, inform datab first tion.

Al BBC M Rich even 800 service micro was expec Th regist agent He the p Dec medi which three the E

"I BBC it wa the fi necte It pr hunc He was and

Mid

COMPUTER CO

oice for BBC

£346.95
£441.95

S
BOOK £199.00
£330.00

£122.00
£649.00

Manual £30.00
(2, 34)
plied cased

grade £44.75
£18.00
£ 7.50
£95.00
£ 6.70
£ 7.30
£ 6.45

fitting

Fast

ry by S

Fitting Service
available

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

East A

ading s

VICH COMPUTE

RICKINGHALL HOUSE, RICKI
TELEPHONE (02

ORDER FORM

All prices include postage, packing and VAT,
and are valid to 30 June 1983.

Please enter number
required in box £ p

BBC Micro User annual subscription

UK £12 ☐
EIRE £13 ☐
EUROPE £18 ☐
Surface mail - USA £15 ☐
Air mail - USA £25 ☐
Surface mail - Rest of world £15 ☐
Air mail - Rest of world £30 ☐

Starting with month: 1983 TOTAL

BBC Micro User back issues

☐ £1.25 UK
Rest of world: March 1983 ☐
☐ £1.50 - Surface April 1983 ☐
☐ £2.50 - Air mail TOTAL

Cassette tape annual subscription

£40 (UK & Overseas) ☐
Starting with Vol 1, No. TOTAL

Cassette tape single copies

£3.75
(UK & Overseas) March 1983 ☐
April 1983 ☐
May 1983 ☐
TOTAL

Dust Covers

£3.25 ☐
(UK & Overseas) TOTAL

Binders

£3.95 - UK ☐
£5.00 - Overseas TOTAL

T-Shirts £3.29 (UK & Overseas)

Sweat Shirts £6.29 (UK & Overseas)

		T-Shirt		Sweat Shirt	
		Blue	White	Blue	White
Age 6-8	28"				
Age 10-12	30"-32"				
Small	34"-36"				
Medium	36"-38"				
Large	38"-40"				
Extra Large	40"-42"				

TOTAL

Payment: please indicate method (✓)

☐ Access/Mastercharge/Eurocard
☐ Barclaycard/Visa
☐ American Express

Card No.
Expiry Date

☐ Cheque/PO made payable to Database Publications Ltd.

Name
Address

Signed

Send to: BBC Micro User, FREEPOST, Europa House,
68 Chester Road, Hazel Grove, Stockport SK7 5NY.
(No stamp needed if posted in UK)

Or you can order by phone
quoting credit card number
and expiry date.

061-456 4157

9am - 5pm

BBC MICRO USER

NEW

MICRO SAVE BB

A MAJOR breakthrough that co
BBC Television thousands of p
equipment costs has been made by
networks engineer Tim Kennington

Room for 16 ROMs

STEALING a march on
Acorn is Watford
Electronics which has
produced a carrier-board
to give the BBC Micro a
16 ROM socket
capability.

The board has 13
ROM sockets. It plugs
into one of the four
sockets currently avail-
able on the BBC Micro to
give a total of 16.

Watford Electronics is
to produce the board
itself, and managing
director Nazir Jessa says
it will be available from
the end of this month for
£19.95.

BBC Micro

Kennington
written a pr
enables the
to be used
minal to cr
on the Ceef

If current t
program are
BBC TV
broadcast tea
micros to
Ceefax pages
live events.
major trial is
at the Sheffi
championship

The BBC
that prepara
Ceefax page
uses Aston in
minals linked
mini compute
Each term
several thous

MICRO MA

THE most ambitious TV
programme on the micro
ever attempted is now
being planned by the
BBC's Computer
Literacy team.

Called "Making the
Most of Your Micro -
Live", it will start at
11am on Sunday,
October 2, and last for

two hours. It
sent by Ian
Davis, who
the recently
series.

Invi

Readers of
User are bei
play an act
helping decid

ATURE

516,

**£120.00
CARRIAGE
PAID + VAT**



rd Computer Centre, Bridge St.,
rd, Surrey (0483) 578848
ec, 6 Eastgate, Barnsley,
ks (0226 46972

PRODUCTS
2NN.

MESTER



**NEW SLIMLINE
100K DISC DRIVES
£205 incl.**

(includes Formatting Disc,
Cables & Manual) - These
drives are the most
advanced available.

C ★ TECH
COMPUTERS

184 Market Street, Hyde,
Cheshire SK14 1EX.
Tel: 061-366 8223



EDUCATIONAL & BULK
DISCOUNTS AVAILABLE

FREE!



This practical copy-holder to make it
easier for you to key in programs,
together with a specially designed crib
sheet of essential information...

**FREE WHEN YOU ORDER A
YEAR'S SUBSCRIPTION TO
BBC MICRO USER ON THE
FORM OVERLEAF**

You can also order...

Back numbers



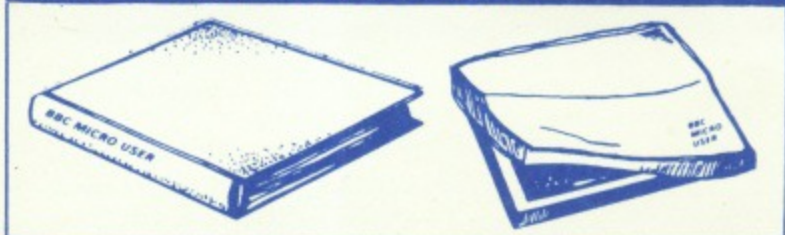
Cassette tapes



T-shirts and Sweat shirts



Binders and dust covers



ORDER FORM OVERLEAF

MA

**need all
they ca**

and understand, would
be worth considering.

I look forward to receiving
future issues of the magazine
and hope that some of my
suggestions can be in-
corporated. - M.A. Godfrey,
avesend.

Thanks for your suggestions.
The use of the computer in
education is a subject that we
are deeply interested in, and we
will be regularly providing lists
of educational programs
for the pre-school child
wards. We've already got
many in stock, but are always
willing to accept more. So if any
teachers or interested parents
want to submit their programs
ideas to us we'd be only too
glad to accept them.

As for the topic of
educational program design,
articles on the subject tend to be
rather woolly and not of much
practical use. However, we shall
be featuring a series on this sub-
ject which, we hope, will



More interesting was why
the programs still loaded, and
the investigation led me to
discover a modification to the
cassette input circuitry which is
a 20nf capacitor between pin
and R90.

This blocks any small
spikes in the DC bias which
may occur, and allows the final
stage of the Op. Amp. to sit at
the correct level for clipping the
signal sent to the ULA. I do
not know if you are aware of
this modification, but from my
experience it may be the answer
to some cassette loading
problems.

C. or A
GRAMMER
ment Engineer
Following 24 & 2
& 27256.
ation.
asic or machine
ully comprehen
cs Education
singstoke, Hants. (0
e, CB1 1ME. (022
borough, Cleveland.
orks. (0742) 58549
30670.
West Yorks. (0274
ead, Tyne & Wear
ottingham (0602)
7TS. Phone 6403
Leeds, West Yorks.
shire, WA6 6RD. (C
rset. (0823) 52149
546).
Wales. (0222) 213
vickham, Middx.,
us direct.

GRI
Lane, Barnsl
Telephone:

CRO
IT IN STOC
WANTED?

399 incl.
£95 incl.

ities Disc

£230 incl.
£65 + VAT
£45 + VAT

99 + VAT
65 + VAT

We

arcadians,
iddles,

Business
s, Pub

ORDER.

ORDER FORM

All prices include postage, packing and VAT, and are valid to 30 June 1983.

Please enter number required in box £ p

BBC Micro User annual subscription

UK	£12	<input type="checkbox"/>
EIRE	£13	<input type="checkbox"/>
EUROPE	£18	<input type="checkbox"/>
Surface mail - USA	£15	<input type="checkbox"/>
Air mail - USA	£25	<input type="checkbox"/>
Surface mail - Rest of world	£15	<input type="checkbox"/>
Air mail - Rest of world	£30	<input type="checkbox"/>

Starting with month: 1983 TOTAL

BBC Micro User back issues

<input type="checkbox"/> £1.25 UK	March 1983	<input type="checkbox"/>
Rest of world:	April 1983	<input type="checkbox"/>
<input type="checkbox"/> £1.50 - Surface		
<input type="checkbox"/> £2.50 - Air mail		

TOTAL

Cassette tape annual subscription

£40 (UK & Overseas) ☐ TOTAL

Starting with Vol 1, No.

Cassette tape single copies

£3.75 (UK & Overseas)

March 1983	<input type="checkbox"/>
April 1983	<input type="checkbox"/>
May 1983	<input type="checkbox"/>

TOTAL

Dust Covers

£3.25 (UK & Overseas) ☐ TOTAL

Binders

£3.95 - UK ☐
£5.00 - Overseas

TOTAL

T-Shirts £3.29 (UK & Overseas)
Sweat Shirts £6.29 (UK & Overseas)

	T-Shirt		Sweat Shirt	
	Blue	White	Blue	White
Age 6-8	28"			
Age 10-12	30"-32"			
Small	34"-36"			
Medium	36"-38"			
Large	38"-40"			
Extra Large	40"-42"			

TOTAL

Payment: please indicate method (✓) TOTAL

<input type="checkbox"/>	Access/Mastercharge/Eurocard
<input type="checkbox"/>	Barclaycard/Visa
<input type="checkbox"/>	American Express
<input type="checkbox"/>	Card No.
<input type="checkbox"/>	Expiry Date
<input type="checkbox"/>	Cheque/PO made payable to Database Publications Ltd.

Name

Address

Signed

Send to: BBC Micro User, FREEPOST, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.
(No stamp needed if posted in UK)

Or you can order by phone quoting credit card number and expiry date. **061-456 4157**
9am - 5pm

MICRO

Sch the

I AM reading the first issue of the BBC Micro User, and so far, for a newcomer to the micro like myself, it would appear to provide a refreshing easy to read and understand text for someone like myself and my family who want to make practical use of the computer as well as exploit its entertainment value.

I hope the magazine will provide information hitherto difficult to find under one cover without hours of research and study.

I note from your editorial that you are looking for views regarding the future contents of the magazine.

If possible could you please include a series on producing educational programs similar to those used in primary and middle schools and which are apparently not readily available at the moment.

As yet many schools have not been able to buy computers, and even those lucky enough to have one also generally have very restricted use by individual pupils.

I feel this would be particularly useful and would provide youngsters like mine,

who are unlucky enough to go to a school without a computer, into the world of micro technology.

Another article which should be included is one on how to write programs to enable the user to use the paddles to be used in programs, Deathwatch, use the keys for control. Could it most programs be made suitable for use with a keyboard?

A feature dealing with the basic steps and methods to amend the listing of a program, this would, I believe, be received as well as the wear and tear on the keyboard.

Other ideas: featuring useful ideas for the use of the computer in the home as an aid to time saving, to enhance traditional methods of information storage.

Articles on the use of this information to interest and make



I READ with interest your article on Cassette Capers in your March issue.

As I am a computer engineer I was tempted to investigate further when my BBC micro suddenly failed to read in programs off cassette.

The problem turned out to be a faulty LM324N Quad operational amplifier, pin 10 (input from cassette) of which had incorrect DC bias on it. Replacing the chip cured the problem.

During the investigation I found that if I increased the level fed in far above the normal level required some programs

would load, but I was concerned as to why this occurred at all.

I can only guess that it was caused by my experience of using a cassette recorder to suggest the following cause: We used a cassette recorder with our BBC micro plugged and used at regular intervals. When doing this with the BBC micro both machines caused to occur, there was a problem (which is normal for a cassette recorder).

Needless to say I ceased this practice.