

**Independent  
guide to the  
BBC MICRO!**

# **THE MICRO USER**

Volume 3  
Number 2  
April 1985  
£1.25

**The making of  
the gold micro**



**Full story inside**

**How to teach the AMX  
mouse to do its sums**



**Visit Mornington Crescent  
or fly alien skies with this  
month's games specials**

**Dither your pixels  
for 27 new colours**

**Build your own  
A/D converter**

# SERIOUS SOFTWARE

FOR THE B.B.C. MICRO AND ELECTRON

# From BEEBUGSOFT

B.B.C. only

## MUROM



The BBC Micro sound facilities have a lot of potential, MUROM will help you exploit this to the full.

Create your own tunes and sound sequences with ease, either with MUROM'S editor and a musical score or by using the Beeb to simulate a piano keyboard. Edit your creations with the full screen music editor. Then

switch to the envelope editor to tailor the tonal quality and select instrument type. Alternatively select one of the predefined instrument envelopes.

Incorporate your music and sound sequences into any program of your own, to play back with or without MUROM plugged in. Playback is interrupt driven and may continue even while you run other programs.

Predefined instrument envelopes may be set up, e.g. \*FLUTE, \*SYNTH etc.

Instant sound effects may be called from Basic, e.g. \*ZAP, \*SIREN, \*EXPLODE etc.

MUROM is accompanied by a full instruction manual and repertoire of music data on cassette.

MUROM CHANNEL EDITOR

NOTE	CHAN 0	CHAN 1	CHAN 2	CHAN 3
TEL	NOEL	NOEL	NOEL	NOEL
0008	CH1	1 0	F#0	5 4
0009	D#1	1 0	www	sss
0010	E 1	1 1	www	sss
0011	www	- -	www	sss
0012	A#1	1 0	www	sss
0013	B 1	1 0	www	sss
0014	D#1	1 0	D#3	5 1
0015	D#2	1 0	www	sss
0016	F 2	1 1	sss	sss
0017	sss	- -	sss	sss
0018	sss	- -	sss	sss
0019	sss	- -	sss	sss
0020	sss	- -	sss	sss
0021	sss	- -	sss	sss
0022	sss	- -	sss	sss
0023	sss	- -	sss	sss
0024	sss	- -	sss	sss
0025	sss	- -	sss	sss

B.B.C. & Electron

## EXMON II

EXTENDED MACHINE CODE MONITOR NOW WITH DUAL SCREENS



EXMON II by Beebugsoft

A	X	Y	S	P	flags	PC	stack
00	00	00	FF	30	B	0000	
8009	42	41	53	49	43	00	28 43
8011	29	31	39	38	32	20	41 63
8019	6F	72	6E	0A	0D	00	00 80
8021	00	00	A9	84	20	F4	FF 86
8029	06	84	07	A9	83	20	F4 FF
8031	84	18	A2	00	86	1F	8E 02
8039	04	8E	03	04	CA	86	23 A2
8041	0A	8E	00	04	CA	8E	01 04
8049	A9	01	25	11	05	0D	05 0E
8051	05	0F	05	10	D0	0C	A9 41
8059	85	0D	A9	52	85	0E	A9 57
8061	85	0F	A9	62	8D	02	02 A9
8069	B4	8D	03	62	58	4C	DD 8A
8071	41	4E	44	80	00	41	42 53

7P 8000  
7SS 8000+9000 "BASIC"  
Found at 8009

## 60 New Commands for debugging and developing machine code

Our very popular machine code monitor has been enhanced by the addition of a number of new facilities, including Dual Screen Operation and full screen memory editor.

Now if you are debugging a game, or any other program with a visual display, you can single step through it instruction by instruction and actually watch the effect on the screen.

You can also revert to the monitor screen at the press of a key to examine registers, edit code, read variables, alter a memory etc., and then switch back to your display screen and continue running (or single stepping), without losing your display.

### Exmon II features include

- 60 machine code commands.
- Full dual screen operation.
- Full screen memory editor, input in hex, Ascii or as assembler instructions.
- Search for hex, or Ascii string, including wildcards.
- Move memory block.
- Verify that two blocks are the same.
- Relocate code to run at another location.
- Fill memory with series of hex bytes or Ascii string.
- Execute all \* commands.
- Single step with skip option.
- Up to 10 breakpoints which may even be set in Rom.
- Conditional breakpoints ... e.g. Break if register X=5.
- User definable work area.

Note: The Electron version does not feature dual screens.

## COMMAND SUMMARY

- \*PLAY Calls the variable speed, interrupt driven playback routine.
  - \*DISP Mode 7 display of tune playing.
  - \*TEMPO Alter tempo.
  - \*KEYB Use BBC keyboard as a piano keyboard.
  - \*SCORE Call up full screen music editor.
- EDITOR SUB-COMMANDS:
- MODE Change from editing a single channel to editing all channels consecutively.
  - GO Move editor to any note in score.
  - PLAY Enable single stepping of music.
  - OCTV Change octave of any channel.
  - ENVL Change envelope of any channel.
  - LOAD Load previously created music.
  - SAVE Save edited score to disc or cassette.
  - KEY Toggle note entry between note name and keyboard position.
  - \*ENVLP Sound envelope editor.
  - \*FLUTE, \*SYNTH ... etc. ten predefined envelopes.
  - \*EXPLODE, \*ZAP ... etc. ten predefined effects.
  - \*TRANS Transpose up or down by a number of semitones.
  - \*MONOC Disable colour output for monochrome screens.

# BEEBUG SOFT

MUROM £29.00 EXMON II £29.00

Available from your local dealer and selected branches of BOOTS  
Prices include VAT

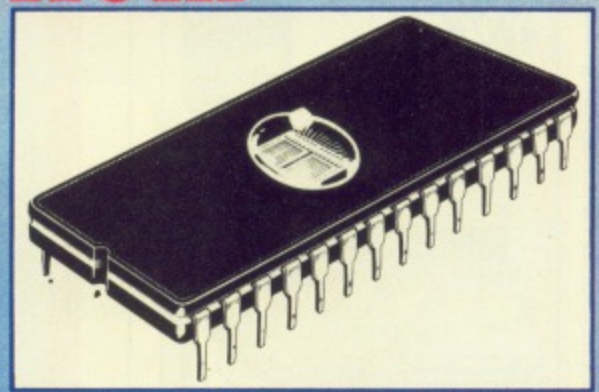


ACCESS & BARCLAYCARD ORDERS & ENQUIRIES:  
TEL ST. ALBANS (0727) 60263

MAIL ORDER (POST FREE) TO: BEEBUGSOFT, Mailing Dept 16, P.O. Box 109, High Wycombe Bucks.

# TOOLKIT ROM from BEEBUGSOFT

BASIC Programmer's Aid for the BBC micro



```

>HELP INFO
TOOLKIT 1.30
FX 4 0
FX 6 4
FX 8 10
FX 10 25
FX 12 8
0%=&0000090A
LISTO 0 WIDTH 0
ERR 26 ERL 0
REPORT: No such variable
Free memory = 20262 bytes
Program size = 5082 bytes
Next free location = &2CDA
PAGE = &1900 LOMEM = &2CDA
TOP = &2CDA HIMEH = &7C00
OS 1.20
  
```

- 27 new commands to make life easier
- Saves hours in program development and debugging
- Supports both cassette and disc systems

- No command name conflict with other Roms
- Ideal for expert and novice alike
- Fitting instructions and a 32 page manual supplied
- You'll wonder how you ever managed without it

## SPECIAL FEATURES INCLUDE

**SCREEN EDITOR** An extremely powerful editor, allowing the use of cursor keys to list a program line-by-line in either

direction and move to any part of a program to overwrite or insert new code and corrections.

```

Editing lines 5 to 1470
1 String search
2 Search and replace
3 Move lines
4 List procedures and functions
5 List A% to Z%
6 List numeric variables
7 List string variables
8 List arrays
9 Change edit range
0 Edit program
ESCAPE to exit
Enter option: 1
Search string: X%
640 DEFPROCEVAL (U%, V%, W%, X%, Y%)
670 IFB%< X% A%=&UR+2:ENDPROC
1450 LOCAL X%, Y%
1460 Sbuf%=&cbandB: X% =buf%: Y%=&buf%DIV2
56
Enter option: _
  
```

**ERROR DETECTION** Powerful facility to trap an error in a Basic program as it runs. It will then automatically enter the Screen Editor, display the line in error and position the cursor close to the statement at fault.

"TOOLKIT is an essential utility for all Basic programmers using the BBC Micro. . . an indispensable aid packed full of powerful utilities."

EDUCATIONAL COMPUTING MARCH 1984

"... highly recommended,"  
PCN MARCH 17 1984

"The Beebugsoft Toolkit costs £27 and in my opinion is worth every penny. Since it has been installed in my BBC it has been used extensively and I can find no fault with it. Highly recommended to lazy programmers!"

COMPUTING TODAY JUNE 1984

## COMMANDS

- \*CHECK Verify a program or data in memory with disc/cassette.
- \*CLEAR Clear all variables including integers.
- \*EDIT Enter full screen editor.
- \*FREE Display free memory and pseudo variables.
- \*HELP INFO Display a screenful of useful system information.
- \*MEMORY Display memory contents.
- \*MERGE Merge a program in memory with one on disc/cassette.
- \*MOVE Move program to run at specified address.
- \*NEW As NEW, but can be issued from within a program.
- \*OFF Cancel enhanced error handling.
- \*OLD As OLD, but can be issued from within a program.
- \*ON Auto error handling - enters editor at line in error.
- \*PACK Efficient program compactor.
- \*RECOVER Intelligently recover bad programs.
- \*RENUMBER Allow partial renumbering.
- \*REPORT Extended error reporting facility.
- \*SCREEN Screen dump to cassette or disc.
- \*UTIL Display utilities menu.
- \*UTIL 1 String search.
- \*UTIL 2 String search and replace.
- \*UTIL 3 Move Basic program lines.
- \*UTIL 4 List procedures and functions.
- \*UTIL 5 List values of A% to Z%.
- \*UTIL 6 List numeric variables.
- \*UTIL 7 List string variables.
- \*UTIL 8 List names of arrays.
- \*UTIL 9 Set up range for utilities 1 and 2.

# BEEBUG SOFT

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Available from your local dealer and selected branches of W.H. SMITH'S



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**THE MICRO USER**

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Visit Managers' Circuit or fly along discs with this month's games update

Order your push for 27 new colours

Build your own A/D converter

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

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## NEWS

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Read all about it! All the latest events in the ever changing world of your BBC Micro.

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The story behind the making of our unique gold-plated version of the BBC Micro.

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Our fearless reviewers present their in-depth evaluation of all the recent releases.

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Interweave pixels with this clever program. You can create 27 unique shades of colour.

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The Acorn DNFS, a Source Library Manager, machine code monitor and NLQ ROM.

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Landscapes and alien ships are the hazards in this sideways-scrolling arcade spectacular.

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Your micro's musical potential explored in our review of the Island Logic Music System.

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Once again our frank columnist takes her critical look at the world of Adventures.

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All about our next great BBC Micro Show at the Horticultural Halls from May 6 to 9.

**92 BEGINNERS**

Use string handling and program organisation to get more out of a database than you put in.

**99 CHATTERBOX**

Exploit the potential of your Acorn Speech Synthesiser with these useful procedures.

**103 FREEBIE**

A-maze yourself this Easter with this lively machine code extra to our tape/disc offer.

**104 6502 GAMES**

Smooth animation techniques in the third part of our machine code games series.

**121 MORNINGTON CRES.**

The oldest and most fascinating board game is brought to life – specially for this month!

**127 PAGING ELITE**

Acornsoft's best seller has prompted a varied assortment of mail. Here is a small selection.

**131 CALCULATOR**

This superb program teaches the AMX mouse how to do its sums.

**140 BODY BUILDING**

Obtain greater accuracy over a wider range with our slow A/D converter.

**151 MICROMAIL**

The part of the magazine you write yourself – your news, views, ideas, praise and moans.

**167 ORDER FORM**

From back issues to binders, cassettes to cases, discs to disc covers – they're all here.

*Another first from*  
**THE MICRO USER**

Over the last two years *The Micro User* has built up an enviable reputation for giving its readers the first news of new products to enhance the BBC Micro, and in many cases giving them the chance to be the first to buy them – often at specially low prices.

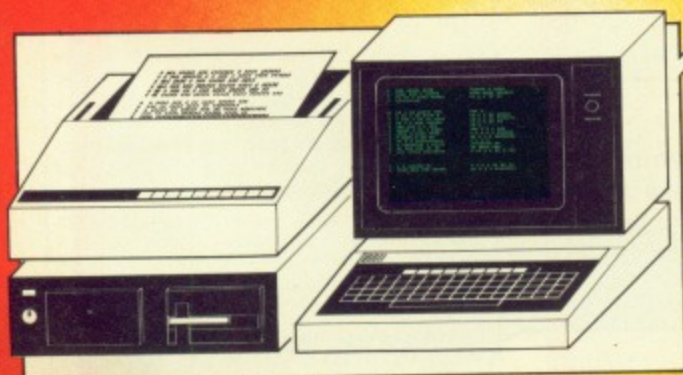
This month is no exception. We've been testing a new teletext adapter from OEL, and we have been so impressed with the facilities it provides that we are making it the subject of our latest special offer.

There is ever-growing interest in downloading software from the TV screen. The BBC's own Telesoftware Service is expanding, and now Channel 4 is starting doing the same through 4-Tel.

With the new teletext adapter, now's the chance for you to join in this latest communications revolution.

Full details on Page 119

*It's another*  
**MICRO USER**  
*special offer!*



And now we have E-NET series 5, still economic for five BBC's ... or more.

It's a cut above any other educational network available.

Even faster than standard E-NET. Introduces extended fileserver features; "Superclients" control workareas within the system; "Hyperclients" use Acorn Z-80 second processor to run CP/M programs.

These are some of the improvements over standard E-NET. Find out all about this most advanced hard disc network, designed specifically for education.

Contact us for full facility details, educational discounts & hands-on demos.



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Kiln Farm  
Milton Keynes  
MK11 3ET  
(0908) 569212

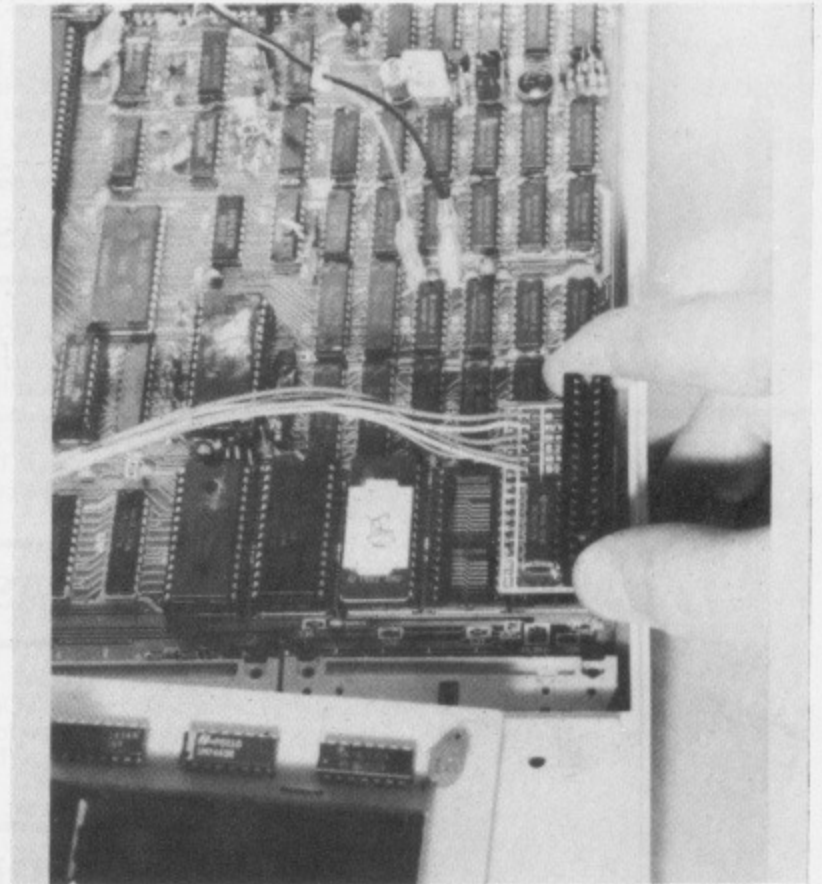
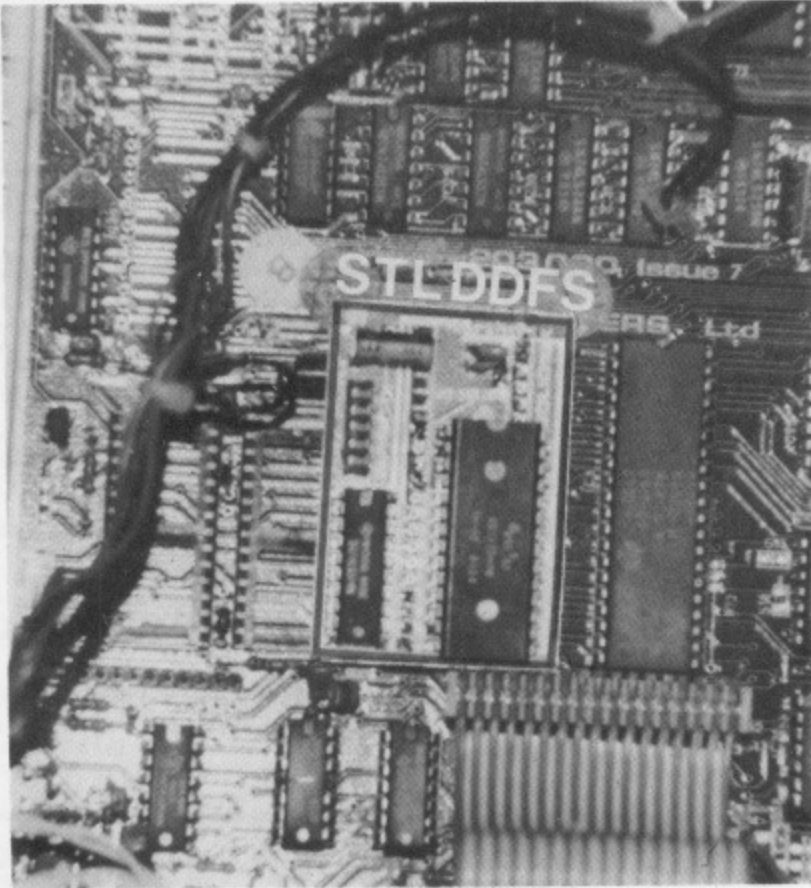
# FROM SMALL ACORNS, SOLIDISK GROWS.

IN JULY 1983, we released the Sideways RAM for the BBC computer. We sold 5 in the first week, 10 in the second week, 20 in the third and one year later, we sell more than 500 in the UK and well more than 100 a week abroad.

By the time you read this, more than 30,000 Solidisk Sideways RAM boards will be beavering away in hundreds of schools and thousands of homes.

They are being joined by thousands of Solidisk DDFS each month. Soon, we hope, they will all be linked together by Solidisk Single Chip MODEM.

To support the users, a network of Solidisk Local Experts, covering the UK, Holland, France, Australia and Israel has been set up and expanding. Providing fitting and software for free.



#### **SOLIDISK DOUBLE DENSITY DFS 1.5:**

Single and Double Density.  
Automatic Density Selection.  
1 or Twin Drives, 40 and 80 Tracks, Single and Double Sided.  
Automatic 40 and 80 Track Selection.  
31 Filenames.  
Low Cost.

#### **SOLIDISK DOUBLE DENSITY DFS 2.0:**

Virtually Unlimited Number of Filenames.  
Automatic Tape to Disk.  
Built-in Disk Fix and Disk Sector Editor.  
Built-in Wordprocessor.  
Does not Require DNFS With Z80 and 6502 Second Processors.

#### **SOLIDISK SIDEWAYS RAM:**

Add from 16k to 256k bytes of RAM to the BBC 32k RAM.

Useable for running Sideways ROM Software.  
Useable in Networks or on BBC with Disk Drive(s).  
Compatible With All Acorn Existing Products.  
Including Econet, Teletext, 6502 and Z80 Second Processors.

Compatible With Most Sideways ROM Software.  
Available Multi User Licencing Agreement from Leading Software Houses.

Easily Expandable as Your Needs Grow.

Low Cost.

Free Installation if Required.

Very large User Base, Extensive Free Software.

Local Help by Solidisk Local Expert Network.

Free Membership to receive Periodic Newsletters.

#### **COMING SOON:**

SOLIDISK is at present developing a state of the art MODEM. This will be compatible with the CCITT V23 and BELL 202 transmission standards at speeds from 5 to 1200 Bauds and will be based on the TMS 3105 single chip FSK MODEM manufactured by TEXAS Instruments.

The price is expected to be £39.95 inclusive of VAT.

We need you and your help. To make Solidisk Users the largest BBC Users Group. To share good ideas and good ways to use them.

SOLIDISK TECHNOLOGY, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX

TEL. (0702) 354674 (10 lines).





## BENCHMARK OUTSTANDING PERFORMANCE:

The table below shows the benchmark timing for STL DDFS 1.4. The benchmark consists of disk operations such as save and load a 16k program, open and close files, BPUT, BGET strings and numbers, format and verify a disk etc., and is available upon request, otherwise listed in Solidisk DDFS User Manual.

The benchmark tests B1 to B9 are the same as used by many reviewers. The time is expressed in seconds and parts of 100th of a second. The disk drives are twin 40/80 track double sided MITSUBISHI M4853, the diskettes are Verbatim Datalife MD 557 series, 96 TPI, double density, double sided, pre-verified to ensure that the media is free of all error and mechanical defects and containing solely the benchmark program. The test is loaded into memory, the drive motors are allowed to stop completely 2 seconds between tests, 10 timing samples are taken and the mean time is calculated automatically.

For example:

100 DEFFN1:REM Save a 16k program.

110T% + TIME

120 \*SAVE A 8000 +4000

130 + TIME - T%

Full listings are included in the User Manual.

This FN is called 10 times with 3 sec. interval, the mean result is printed as 'B1'.

BENCHMARK DESCRIPTION	S/D TIME	D/D TIME
B1 Save 16k	2.62	1.43
B2 Load 16k	2.45	1.23
B3 Openin and close 100 times	20.70	20.16
B4 Openout and print 1000 numbers (255)	5.84	4.66
B5 Openin and input 1000 numbers (255)	4.72	4.14
B6 Openout and print 100 80 bytes strings	6.18	4.91
B7 Openin and input 100 80 bytes strings	4.90	4.31
B8 BPUT 100 bytes (255)	3.01	2.06
B9 BGET 1000 bytes (255)	1.88	1.52

Note 1: Whenever a file is to be opened, STL DDFS automatically refreshes the disk directory, thus preventing erroneous disk change. Many other DFS's do not take the same care, although yielding a much shorter time, and this could accidentally stop the program.

OPERATIONS	S/D TIME	D/D TIME
FORMAT 40 TRACKS:	17.74	17.74
FORMAT 80 TRACKS:	33.22	33.22
VERIFY 40 TRACKS:	9.30	9.30
VERIFY 80 TRACKS:	17.84	17.84
BACKUP 01 80 TRACKS:	37.69	37.69
BACKUP 02 80 TRACKS:	39.46	39.46
COMPACT 100K 10 FILES	22.42	18.82

With Wordwise:

Load 2000 words (17811 bytes) 16.80 sec. (41.40 sec. with AC).

With Scribe:

Count 2000 words (17811 bytes) 4.20 sec. (9.80 sec. with AC.90 DFS)

With Beebug's Masterfile:

Sort records 1 to 20 in PEOPLE sample database, the database is presorted on field 2 then the program is asked to sort on field 1, the time is then taken:

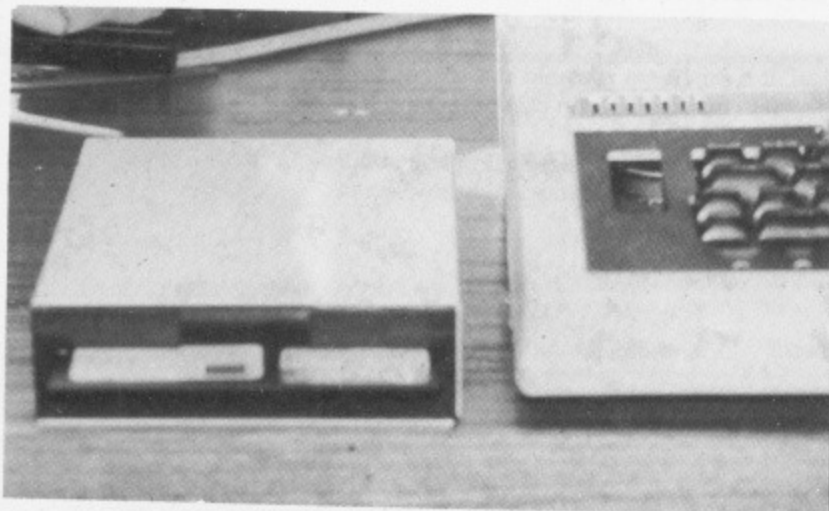
56.23 sec. (127.86 sec. with AC.90 DFS).

These timings are improved even further in double density mode.

The figures speak for themselves.

STL DDFS dramatically increases the operating speed of your software, including wordprocessors like Wordwise, View, Scribe, databases like Masterfile, Starbase etc.

Solidisk engineers won't stop there.



### MITSUBISHI DISK DRIVE:

From the new VLSI ultra quiet auto spin-up series comes the MITSUBISHI M4853. We have chosen it for its speed, quiet performance, low power consumption and state of the art design — look at the following features:  
— new developments by Motorola and Mitsubishi largely reduce the area taken up by electronics, leaving more room for the diskette. This in turn implies lower noise levels and reduced friction on diskettes.

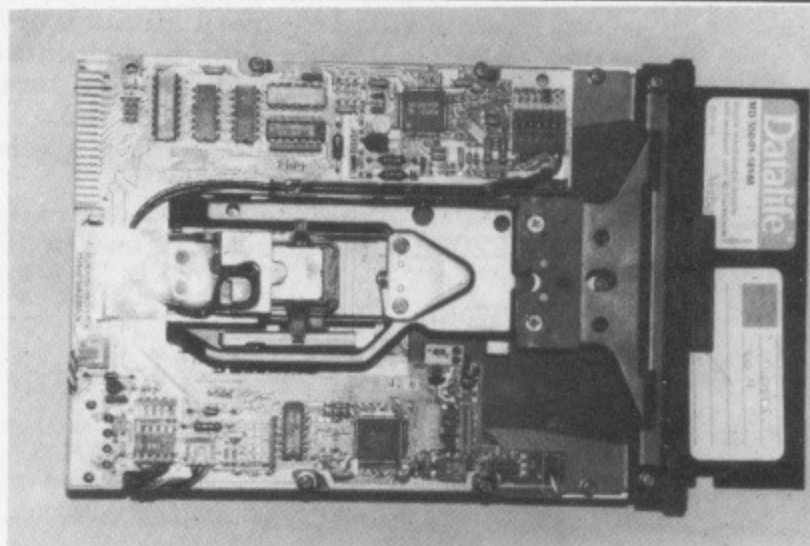
8 Slim 5.25" half height model attractively cased in BBC micro beige

— Reliability: we find that Mitsubishi compares most favourably with other makes

— Use your BBC own power supply —

— Single and double density available, plus ability to read 40 track diskettes formatted elsewhere when used with our DFS.

Of course, we don't need to mention that all drives come complete with Dual leads letting you add instantly a second disk drive and manual together with full guarantee on parts and labour.



## EXTRA FEATURES OF SOLIDISK DDFS 2.0

With the production of the SOLIDISK DDFS 2.0 ROM we raise the already high standard of the previous DDFS 1.5 ROM.

The larger memory capacity of the DDFS 2.0 has allowed inclusion of a Wordprocessor and complete Disk Toolkit as well as a totally new concept in the working of the Disk Directory.

This will, we feel, make the SOLIDISK DDFS 2.0 ROM the most powerful Disk System currently available.

### 1) EXTENDED NUMBER OF FILENAMES

The standard number of filenames on the BBC micro-computer is limited to 31 on most Single Density DFS's. This usually presents no problem on a system using 40 track drives but when using either 80 track drives and/or a Double Density Filing System this number will quite often be reached with a lot of the disk space still unused.

The SOLIDISK DDFS 2.0 ROM uses a unique and novel way to circumvent this shortcoming as every time a catalogue becomes full a new one is created. This gives the possibility of having up to 1502 filenames on a normal 80 Track Double Sided disk. Even with this large number of filenames worst case access taking only just over 2 seconds. Obviously with large files and a lesser number of filenames the access time decreases dramatically.

The way that the DDFS 2.0 ROM operates means that ordinary single catalogue discs are completely compatible with our system and, indeed, will be upgraded to multi catalogue once the number of filenames exceeds 31. This means no special formatting is necessary and that the disc remains compatible with other Single Density DFS's.

### 2) DISK TOOLKIT

Included on the SOLIDISK DDFS 2.0 ROM is a powerful disk repair facility. It is possible to read a complete track into memory and to repair or modify the data before restoring the track to the disk. If only one sector needs to be worked on then this too is possible with the Disk Sector Editor contained in the DDFS 2.0.

A powerful Disk Copy routine is also included to allow most non-standard format disks to be duplicated. This routine will also display the Sector I.D. Fields so that it is possible to see the makeup of the track being copied.

### 3) WORDPROCESSOR:

SOLIDISK DDFS 2.0 ROM contains a Word Processor with many excellent features such as 80 column screen, automatic on screen justification, Search and Replace, Block Move and Copy etc.

# SOLIDISK+MITSUBISHI BIG DEAL:

**This is exactly what you would receive:**

- one double sided 80 track Mitsubishi M4853 disk drive, cased in beige.
- one Solidisk Double density disk interface (complete with STL DDFS 1.5 ROM) as described overleaf, giving a total capacity of 640K.
- Dual leads and instruction manual.
- 5 Software Diskettes containing a selection of the most prestigious programs written for the BBC.
- full one year guarantee.
- all for £209.95 including VAT and post and packing.

## **THE HARDWARE:**

As described earlier and opposite.

## **THE SOFTWARE:**

A selection of 6 programs based on ease of use, and popularity. All efforts are made so that you would not have to read the manual twice.

All programs feature on screen help (word processor) or option menus throughout. Mode 3 is used throughout whenever possible for good visual representation.

### — Solicalc —

A Disc Based electronic spreadsheet made only possible with the speed of Solidisk DDFS. The sheet size can be as big as 170 kbytes. Written in modules, it is easily upgradable. Mode 3 screen. Goto, Calculate, Replicate, Automatic Header etc.

### — Solidisk Datafile —

A fast, efficient and random access Database. Solidisk Datafile features:

- Compact size.
- 80 column screen throughout.
- 15 fields of 60 characters per card.
- Unlimited number of cards.
- Powerful Screen Editing allowing VERY FAST data entry on new cards or data correction on old cards.
- All Maths functions on ALL fields admitting Symbolic Variables (like A, B, C, D etc) for entering formulae.
- Special SORT program making use of any free disk space to avoid swapping cards.
- Standard options include View, Print using Tabulation, Print Labels, Search on any number of criteria and repeat on count, Amend, Create, Spool to disk, Append and Mailmerge with Solidisk Word Processor (requires EPSON compatible printer).
- Ability to read BEEBUG's Masterfile and possibly other systems later on.

### — Solidisk wordprocessor —

On screen help, Wordstar style cursor editing and control keys, on screen justification while you type, Block commands, Quick commands and dot commands for mailmerge. Future development will allow reading Wordstar text from the Z80 second processor. Solidisk can offer Laser Typesetting and Page Planning service: it costs you only £1.00 for typesetting 1×A4 page (around 4,000 characters) from disk received by MODEM.

### — Stock control —

useful for small businesses. Features include menu driven, easy to follow instructions, easy categorising. Stock evaluation reports and inventories, together with price lists and reorder forms can be printed automatically as requested.

— Silexicon — the most successful spelling checker with English, French and German dictionaries, together with self generating capability.

### — Macrobasic —

a BASIC program generator capable of using bits of old programs to create new ones. Clever ideas — clever ideas of making them work!

Please note that this software is only free as part of the package deal. It is otherwise available at a cost of £14. Customers who would prefer the DFDC version of our disk filing system (see earlier) can purchase the package deal with this option for an extra £10.

What we may need to tell you is that the price is also agreeably low — check what we offer against any of our competitors — which all adds up to a high degree of sophistication affordable to students and businessmen alike.

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*We shall endeavour to dispatch Disk Offer orders by credit card within 48 hours.*

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We have local people able to fit your equipment **FREE OF CHARGE** in all of the following towns. If your area is not mentioned ring the office!

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## INTRODUCING THE DFDC!

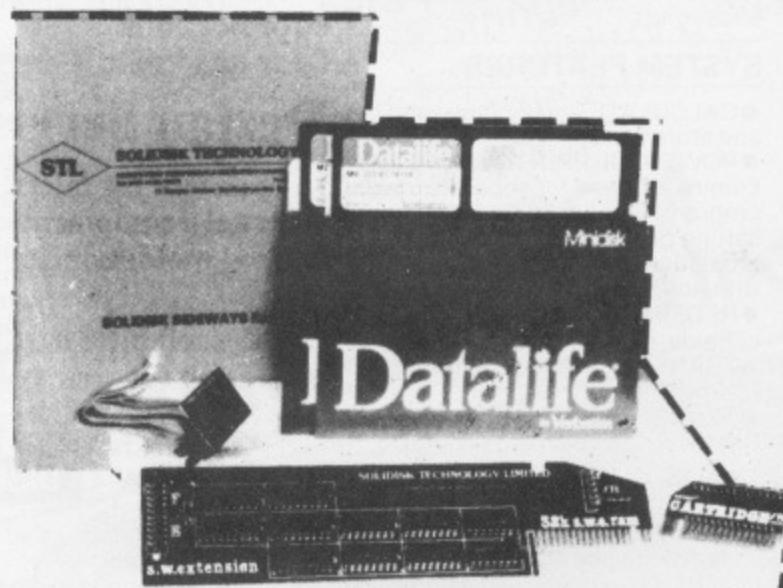
For those who already have the Acorn DDFS installed in their computer and would like the advantages of increased speed and storage capacity that Double Density systems offer SOLIDISK have introduced a totally new concept in the shape of the DFDC!

The DFDC board simply sits in place of the 8271 FDC, this being reinstalled in the DFDC board. Now all that needs to be done is to install the DDFS ROM into a Rom Socket, to the right of the existing Acorn DFS, and two other minor connections.

Great Value at £49.95 inc.

## HAS YOUR BBC COMPUTER GOT ITS SIDEWAYS RAM BOARD YET?

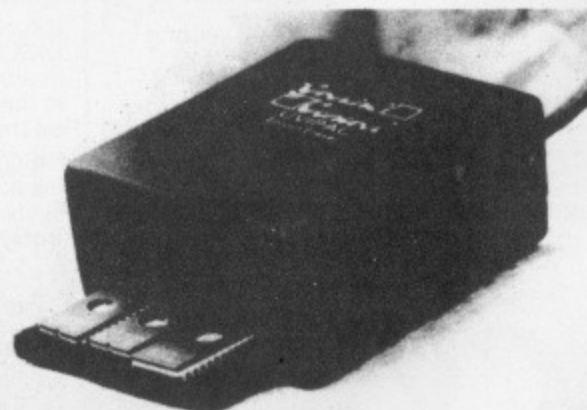
"Break the Ram Barrier" (A&B)



### HOW TO ORDER?

You can order any item using the coupon. Prices are inclusive of VAT, post and packing. Access and Barclay card holders can place their order by phone. Educational authorities, Acorn dealers and OEMs can obtain quantity discounts.

### OTHER PRODUCTS FROM SOLIDISK: UVIPAC EPROM ERASER:



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**BETA-BASE £25 DISC**  
**8 GREAT FEATURES**

## WHAT IS A DATABASE?

It is a FILE which contains RECORDS. Records consist of a number of FIELDS containing the information—an analogy can be drawn with a card index in which a box of cards is the file. Each card is a record and each line on the card is a field.

## SPECIFICATION

- 1) Random Access—disc based, single or dual drives
- 2) File Size—99K (40 track), 199K (80 track)—65,000 + records
- 3) Record Size—up to 2048 characters and 200 fields
- 4) Field Size—up to 254 characters with complete line scanning
- 5) Access any record using Primary Key in 2 seconds
- 6) Holds—1200 NAMES AND ADDRESS records on 100K disk
- 7) Search—500 records on 5 fields in 60 seconds
- 8) Sort—500 records on 3 fields in 60 seconds

## SYSTEM FEATURES

- CALCULATE—using any valid expression and store results
- POWERFUL PRINTOUT OPTION—Eliminates need for separate mailing program, Parallel/Serial Printout allows setting of printer control codes, line spacing, tabulation, Headings etc, plus label printing with horizontal and vertical tab control.
- REDEFINE—Titles, field widths, number of fields, number of records etc.
- TRANSFER—Records from one file to another.
- SEARCH LISTS—Allow creation of sub-Databases within main Database.

## NEW \*

- \* GLOBALENTRY enables repetitive data to be typed in once and placed in as many records as required. Can also be used with a search list to provide a powerful global edit/update facility that will save hours of typing.
- \* SPOOLER enables you to create spooled files that are compatible with Wordwise, View and other word processors. You can therefore present your data within a document or in varying formats etc. The spooler program will allow to format your spooled file in the same way as the print out option. You can therefore have headings, columns, titles, numbers etc.
- \* INPUT is a routine included on the disc which will allow you to write utilities for accessing your data and tailored specifically to your needs.
- \* TUBE compatible with the 6502 second processor.
- \* Comprehensive manual and tutorial. All timings and sizes are relative to ACORN DFS. Compatible with ACORN DFS, WATFORD 1.3 and latest AMCOM DFS SERIES B.
- \* ORIGINAL USERS send your disc plus £3 for up grade.

**REPLICA II: £12.00.**

**DISC**

The original REPLICA set a very high standard so the specification we set our chief programmer included some impossible features. In fact ACORN state that some of the things that we have done are impossible. It just took us longer that's all. REPLICA II transfers most cassette based programs to disk, even more than REPLICA. When you buy disk drives you do not have to throw away expensive cassette based programs.

REPLICA II transfers 'LOCKED' programs, programs loading as files, programs that load below &EOO, those with up to 6 sections and those up to &6E in length eg adventure programs. No waiting for 6 minutes whilst adventure programs load.

REPLICA II is very easy to use. The user enters a name, how many sections and whether CHAIN, RUN or \*LOAD to load the first section. Press play and let the program do the rest, even a menu. Think how much it will cost you to buy just 1 disk version of your favourite program—REPLICA II which will hold up to 16 programs, limited only by the disk capacity.

**FX 80 PRINTER DRIVER £12.00**

**PRINTER DRIVER FOR EPSON FX80 AND VIEW**

Multi-page driver with print menu allowing the setting of global (document wide) printer functions at printer initialisation.

The print menu program contains a sophisticated character generator which allows the construction of 95 user defined characters which are then accessible from VIEW via a highlight option.

Supplied on disc with comprehensive user manual.

NEW

**DISCDEX: £15.00 DISC**

- Catalogues all your discs quickly and easily.
- Room to store four thousand titles.
- Quick search and load option.
- Compatible with single or dual drives.
- Extensive print options for catalogue and disc labels.
- Update and delete options.
- Supplied with stick on labels to number your discs and a supply of labels for printing your own disc labels.

DISCDEX is the answer to a disc users nightmare. How many times have you had to wade through your discs looking for the file that you know is there somewhere? Now with DISCDEX those days are gone.

DISCDEX will catalogue all your discs and store them in alphabetic order. In addition to the very useful search and load facility DISCDEX will also print out a full catalogue in alphabetic or disc order. Even more useful is the ability to print disc labels for sticking on the disc or the jacket.

DISCDEX is only suitable for discs with 31 file names as in the standard ACORN system. It is not suitable for double density interfaces.

NEW

**ONESHOT: £12.00 DISC**

- Full feature trace utility.
- Single step through BASIC program or halt at user determined interval.
- Print line number prior to execution.
- Obey fixed instructions before executing a line.
- Trace window allows screen to be seen whilst tracing execution.
- "Printer only" will force trace output to a printer allowing full screen display.
- Ability to dynamically alter control of ONESHOT.
- ONESHOT can be configured to run in any area of memory.

ONESHOT is a 1.25kb machine code program which gives the user several powerful aids in debugging BASIC programs. These include the ability to SINGLE STEP through the BASIC code of the target program, stopping the processing at specified points and comprehensive trace functions of the variables used by the target program.

A very powerful option allows the user to enter a command string into function key 0 and instruct ONESHOT to obey this command BEFORE each line is executed e.g. \*KEY0 PRINT X%; M will print the value of X% before executing each line. This is a very simple example and it is possible to do much more complex things including printing the value of a variable only when it changes or when it reaches a certain value or falls within a certain range. This option can also be used to dynamically alter ONESHOT as it is working. The power of this option is only limited by the users ingenuity.

In addition to ONESHOT the disc also contains 3 very useful function key routines. The first will search for any DEFPROC or DEFFN and print the line numbers in which they appear together with the name of the procedure or function. The second will search for a specific procedure or function and print the line numbers containing it. The third routine will print out every active variable together with its present value. ONESHOT is not compatible with double density interfaces.

NEW

**FUN HOUSE: £10.00 DISC**

FUN HOUSE is a highly original suite of educational programs suitable for ages 3 to 13. The program is designed to encourage children to spell words which relate to objects found around the home. Animation and music are used to good effect and some highly original ideas are incorporated. Each room exercise is terminated with a warning item e.g. the lounge finishes with 'FIRE' which goes on to engulf the whole lounge. Tests with a newly hired 4 year old resulted in us having to prise him away from the keyboard after 2 hours. In that time he had gone from never having used a keyboard to finding the location of all the keys very quickly and entering the correct answer. He had thus started on the path to learning spelling and familiarised himself with the keyboard including the use of DELETE to correct his mistakes. Can you afford not to give your children the same start?

FUN HOUSE is not compatible with double density interfaces.

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# **BROM— ANOTHER FIRST FROM CLARES!**

The first Toolkit ROM to give you full screen editing with insert and overwrite. Works just like WORDWISE but on a Basic Program instead of text.

You can enter \*Err On which will trap errors within the program and drop you into the screen editor at the statement which caused your problems.

**YOU CANNOT SURVIVE WITHOUT BROM  
BROM AVAILABLE NOW FOR JUST £34.50 inc.**

**22 Extra Functions Available** including  
\*ROM OFF allows you to disable sideways ROMS and have them stay off even on CTRL/BREAK even the DFS.  
A real must for users of Second Processors  
\*FIND and \*CHANGE strings  
or BASIC keywords—selectively or globally  
\*COMPARE provides a true verify of programs saved to tape or disc



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UTILITY SOFTWARE



FREE WITH EVERY DISC DRIVE  
A DISC SECTOR EDITOR  
PROGRAM WORTH £10

# UPGRADE TO A DISC SYSTEM THAT'S DOWN TO £200.

For the incredibly low price of £199.95, Opus are giving you the opportunity to own a 5401 250K\* 5¼" disc drive and double density disc interface – bought separately they would cost £249.90.

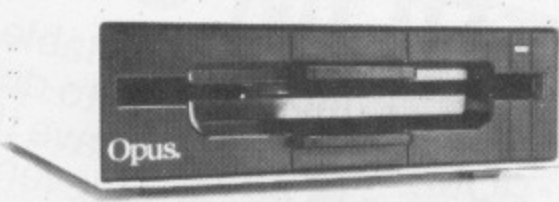
We're also extending the offer to our other high quality drives by reducing the

price on our disc interface from £99.95 to £79.95 when bought with any 5¼" drive from the Opus range. This bargain also includes VAT, all necessary leads along with a two year guarantee.

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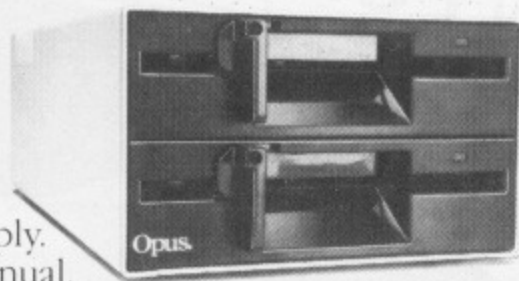


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## 5¼" DUAL DISC DRIVES. WITH POWER SUPPLY

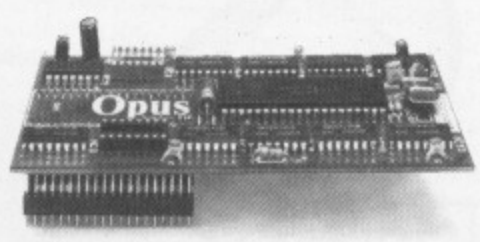
- Metal cased and all necessary leads.
  - Separate power supply.
  - Utilities disc and manual.
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## DOUBLE DENSITY DISC INTERFACE.

The ultimate double density disc interface for your BBC Micro Z-80 and 6502 2nd Processor compatible.

- Utilities on ROM including: Format and verify, tape to disc transfer, automatic 40/80 Track selection, automatic density selection, unique mass copy routine, powerful machine code operating system giving up to 248 files, 80% faster than single density. Easy to install. Free user manual supplied. \_\_\_\_\_ **£99.95**  
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## FLOPPY DISCS.

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\*Unformatted capacity.

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# QUALITY NEVER LOOKED SO GOOD—

Now everyone with a BBC or IBM PC will want to get their paws on CUB's sleek new D series plastic cabinet — a triumph of ergonomics and up to the minute design. Within it is the CUB 653 MEDIUM RESOLUTION colour monitor — the perfect mate for computer users who wish to combine the advantages of brilliant, low cost colour graphics with 80 column processing software.

CUB 653's remarkable depth of colour is enhanced by minimal screen glare, thanks to a super high contrast CRT. Even in well lit environments the 653 (H) x 585 (V) resolution and 0.43mm dot pitch produces 80 column text which is pin-sharp and easy to read. Owners of SHARP, RML 480Z, APPLE Series, WANG and other leading computers needn't feel left out, because CUB 653's compatibility extends to these models and many more.



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Standard Resolution version also available in new cabinet. Both Standard and Medium resolution models produced in metal cabinets if required.



**MICROVITEC 653 CUB COLOUR DISPLAYS**

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Tel: (0274) 390011 Telex: 517717

Available from High Street Computer Retailers and selected branches of W. H. Smith, Harrods, John Lewis Partnership, John Menzies with selected models available from larger branches of Boots.

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# AMX ART

## AMX MOUSE

The AMX MOUSE is an advanced opto-mechanical device which brings to the B.B.C. micro facilities hitherto only available on more expensive machines. It enables you to use advanced features such as ICONS, WINDOWS, and POINTERS in your own programs.

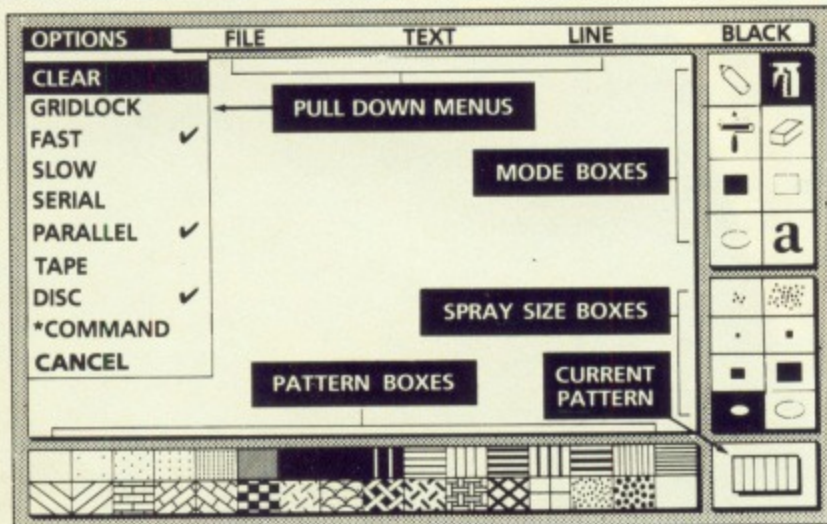
The AMX MOUSE can be used with ordinary programs to replace the cursor keys and with the AMX software it turns the B.B.C. micro into a far more user-friendly device, enabling beginners to quickly learn to use the computer for a wide range of purposes, including COMPUTER AIDED DESIGN, Word Processing, and a host of business uses – to say nothing of its inclusion in games software.

A further range of software will be released in 1985. Starting with "DESK TOP MANAGER".

## THE AMX MOUSE PACKAGE

The AMX MOUSE – an advanced three buttoned mouse which simply plugs into the B.B.C. user port drawing its power from the computer.

### AMX ART GRAPHICS PROGRAM



The AMX ROM – contains fast machine code routines for creating on screen windows, icons, and pointers and enables the MOUSE button to be programmed for use with commercial software such as Wordwise and VIEW.

Please send No. \_\_\_\_\_ **AMX MOUSE** package/s (including **AMX ART** and EPROM) at **£89.95** inc. VAT and P&P. I enclose a cheque/PO for £ \_\_\_\_\_ or debit my credit card.

Card No.   Visa  Access

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(Please tick choice of media for AMX ART)  Cassette  3" Disc  5 1/4" Disc

To: Advanced Memory Systems Ltd., Woodside Technology Centre, Green Lane, Appleton, Warrington, WA4 5NG, England. MU 4/85

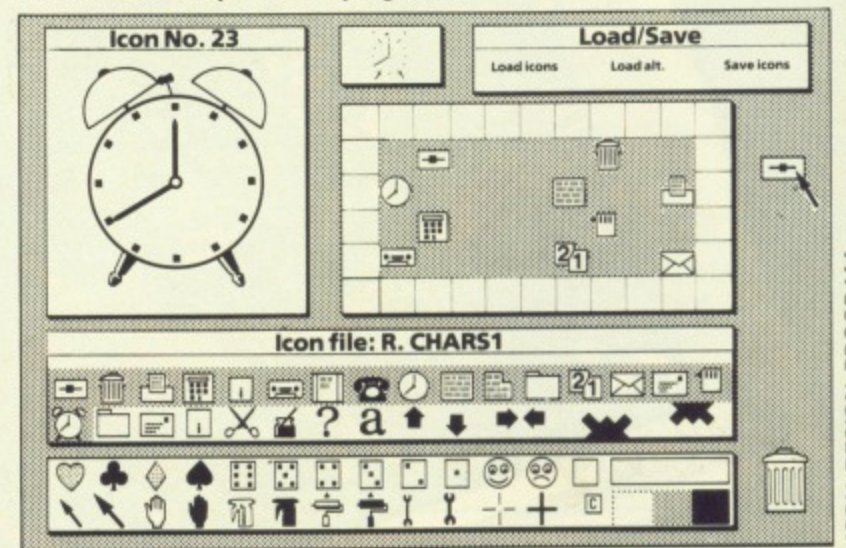
If not available from one of our main dealers, fill in the coupon and we will send you an AMX MOUSE with AMX ART with our full no quibble money back guarantee. OR phone 0925 602690/62907 for instant Access or Visa orders.

A MANUAL describing how to operate the MOUSE and the ROM routines which are available in both basic and machine code programs.

AMX ART – a superb computer aided drawing program on both tape cassette and a 5 1/4" floppy disc with its own manual. It is suitable for a wide range of uses including preparation of illustrations, architectural and engineering detail drawings, teachers' worksheets, and just creating your own pictures. It soon becomes addictive.

AMX ART includes full use of on screen menu boxes, icons, and pull down menus so that beginners find it very easy to learn and gain confidence in the use of the B.B.C. Micro.

An ICON DESIGNER program which enables you to create and store icons for use in your own programs.



## TECHNICAL REQUIREMENTS

The AMX MOUSE can be used with any B.B.C. Model B computer fitted with the Operation System 1.2 and is compatible with the second processor and disc or tape filing systems.

The AMX MOUSE is adjustable for sensitivity via software control and three buttons can be programmed to simulate 24 different key codes.

The AMX MOUSE may be disabled by a simple software command and will then not interfere with normal operation of the computer.

The AMX ART programme enables users to print out screen displays using any Epsom compatible dot-matrix printer. Owners of non-standard printers may use their own screen dump routines.

\*Wordwise' is a wordprocessing program by Computer Concepts.

\*View' is a word,processing program by Acornsoft Ltd.

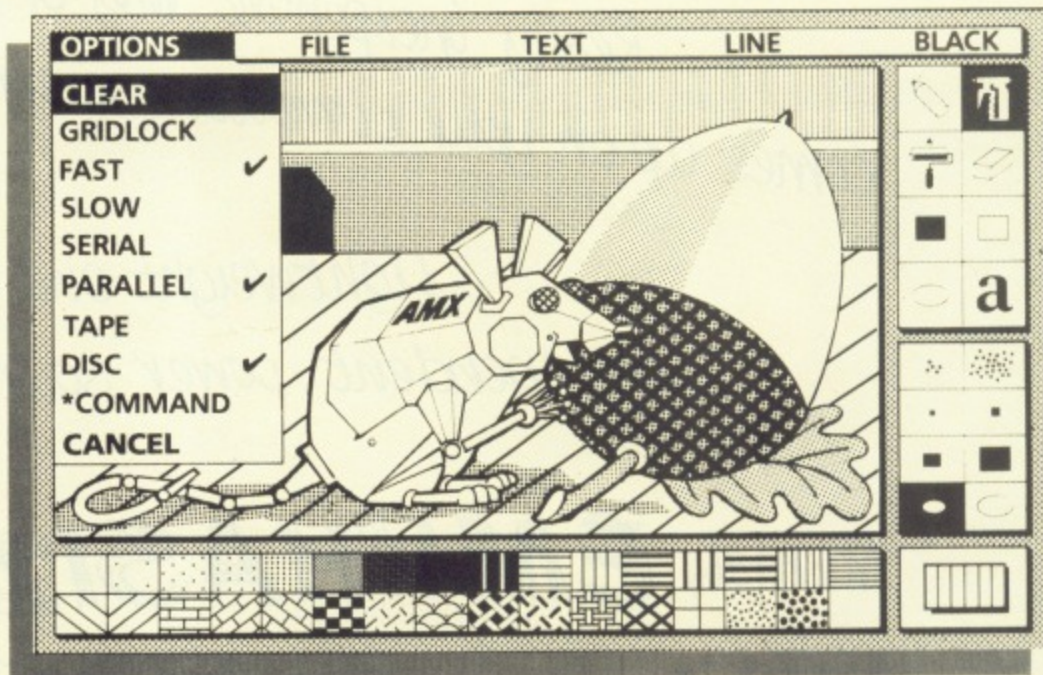




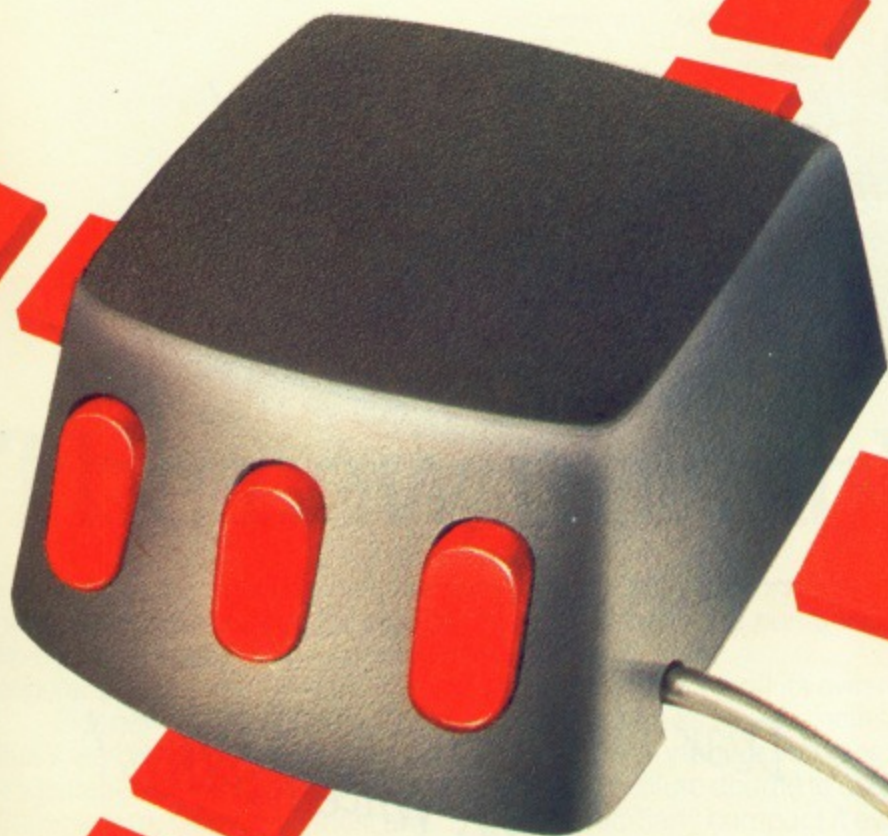
# AMX MOUSE

**POINTS THE WAY**

**FOR THE  
BBC MICRO  
MODEL B**



**with AMX ART GRAPHICS PROGRAM**




**ICON SOFTWARE**

**CREATIVE GRAPHICS**

**FASTER INTERACTION**

ICON DESIGN PROGRAM



Really inexpensive way of writing down whatever comes up on your computer screen.

Lightweight and totally portable — independent power source!

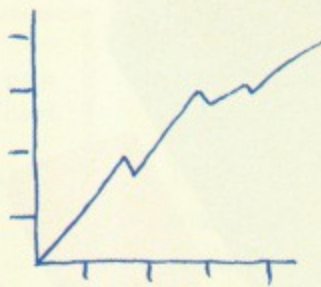
Normal, **EMPHASIZED**, CONDENSED and ENLARGED print.

WORKS perfectly in the dark even during a power cut!

45 characters per second (only in optional "totally-illegible-squiggly-line" mode).



DO



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Dear Me,

Even writes letters!



# The new, portable Epson P40.

Now the home computer user can have a true business quality printer, from Epson – maker of the world's most popular printers.

Our new P40 is only £99.95 – that's including VAT and recharger. It's suitable for BBC, Sinclair, Commodore, Oric and almost any

other popular home computer, as well as virtually any portable or desk top micro.

Running off its own rechargeable batteries as well as mains, your P40 is totally portable and being Epson, an absolute doddle to use. And though particularly compact it even gives

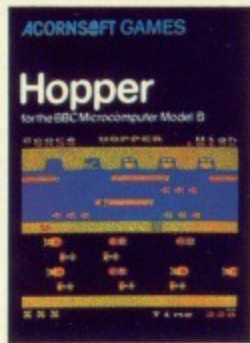
you 80-column width printing in condensed mode.

So wherever and whenever you want to print, now you can – with the new, portable Epson P40. In fact, anything a ball-point does, it can do – better. See it at selected branches of Boots, or ring 01-200 0200 for details.

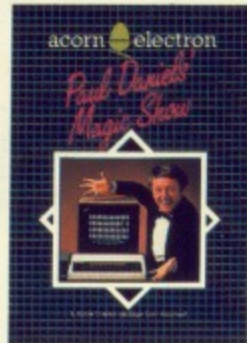
## EPSON



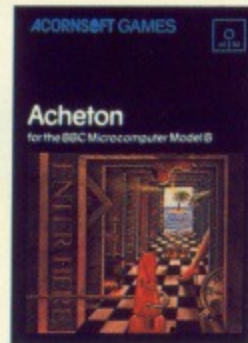
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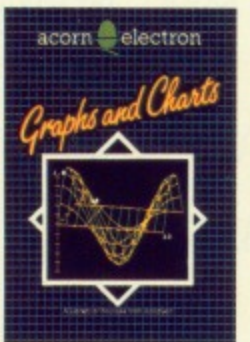
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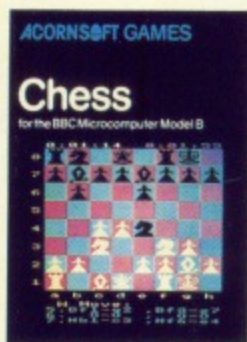
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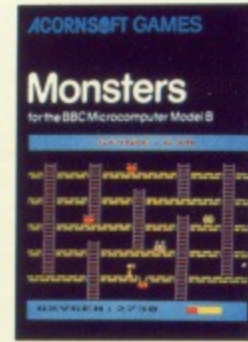
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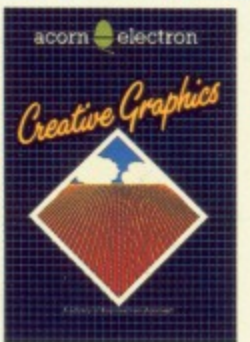
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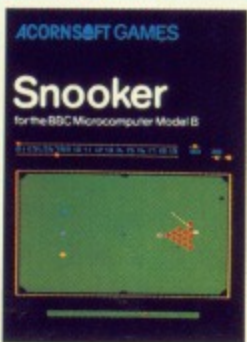
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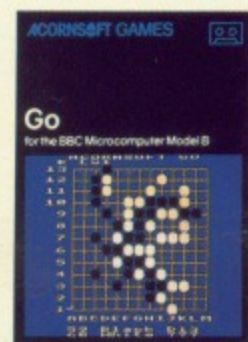
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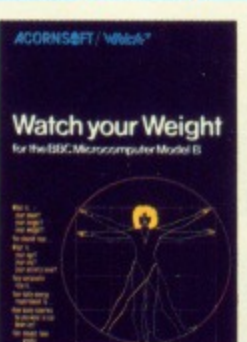
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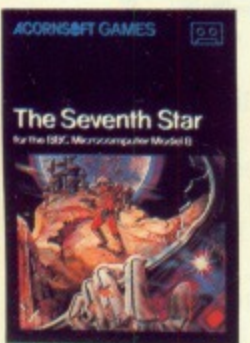
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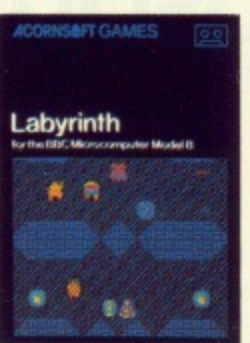


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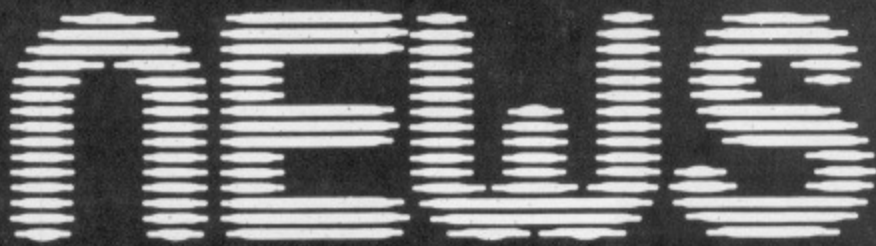
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## Reid is new chairman

A FORMER British Telecom senior executive, Dr Alexander Reid, is Acorn's new chairman.

A non-executive director of the Acorn group since January 1984, Dr Reid, 43, was educated at Trinity College, Cambridge,

and at University College, London, where he took his MSc and his PhD in telecommunications studies.

His most recent post at British Telecom — from 1981 to 1983 — was as chief executive of British Telecom Spectrum.

# Acorn's deal gets warm reception

A SURVEY of leading companies in the BBC Micro market has revealed that 90 per cent actively welcome the Acorn/Olivetti deal.

Only four per cent expressed disapproval while the remaining six per cent adopted a wait and see attitude.

The survey was conducted by *The Micro User* within days of the restructuring package being announced.

In all, 50 companies were contacted for their views, ranging from peripheral manufacturers to

major dealers.

Of those positively in favour of Olivetti taking the largest single stake in Acorn, most hoped to see this as opening the BBC Micro up to more world markets. And, as a result,

creating substantially more business for their own companies.

No one had any real reservations about Olivetti itself, preferring to accept the view from the City that the multinational's track record suggests it will ensure that Acorn will flourish.

### Independence

However some of those contacted would have preferred to see Acorn

maintain its independence had it been possible.

Typical of those firmly supporting the Acorn/Olivetti arrangement was John Rowland, merchandise controller of W.H. Smith.

"It's a terrific move. There is a lot of synergy between the two companies, for their ranges are complementary", he told *The Micro User*.

"It will help Acorn achieve its research and

development potential and encourage the firm's innovative aspects".

*Other comments from companies in agreement with what has taken place were:*

"It may have been something of a shotgun wedding but we have little doubt that a long and successful marriage will result. For if, as it seems, Olivetti will enable the BBC Micro to be marketed world wide — then that's great for us" — David Hood, Pace Software.

### Uncertainty

"I'm very, very pleased this has happened to settle the dust. The uncertainty was not helping anybody in the industry. Now professionals will run the company which has needed this type of management for years". — Nazir Jessa, Watford Electronics.

"I'm pleased Acorn has brought somebody in who will get their marketing sorted out. There is plenty of life left if they get their fingers out". — Dave Clare, Clares Micro Supplies.

"I'm very pleased about it. This solves Acorn's cash flow problems and opens up marketing opportunities in Europe. Their business

## Olivetti to the rescue

OLIVETTI, the Italian computer and office equipment group, has acquired a 49.3 per cent share of Acorn as part of the £18 million rescue package.

The deal sees Olivetti paying £10.39 million to become Acorn's largest single shareholder, with an option of further shares to increase its holding to a controlling 50.1 per cent majority.

Co-founders Dr Hermann Hauser and Chris Curry have now seen their combined equity in the company slashed from 85.7 to 36.5 per cent.

The top level package

was agreed soon after dealings in Acorn's shares had been suspended at the company's own request.

This followed a dramatic slump in the price of Acorn shares on the Unlisted Securities Market.

At the time Olivetti stepped onto centre stage it was revealed that Acorn in fact had lost some £10.9 million during the last six months of trading in 1984.

In the main these losses were put down to the failure of Acorn to penetrate the American and German markets.

A new look Acorn will

result from the company being divided into four divisions, each with its own managing director.

These are education and training, headed by Jim Merriman; scientific and industrial, Jeffrey Tansley; business, John Horton; and consumer, Peter O'Keefe.

As part of the top level shuffle, Hermann Hauser and Chris Curry become deputy chairmen, with special responsibility for overall group strategy and external relations. In addition, they will also have line responsibility for specific product developments.

Two representatives of Olivetti are to join the board along with a new group managing director.

Olivetti executive vice-president, strategy and development, Elserino Piol, acted as the official spokesman for the Italian company when news of the deal was announced.

"We believe Acorn is a company with outstanding technical expertise", he said.

"With our backing, it will be in a strong position to consolidate its position in the UK, and to establish an effective presence in worldwide markets".

# Comal for BBC Micro

COMAL, the high level language chosen for secondary school computing in Scotland, Ireland and Sweden, is now available for the BBC Micro.

Acornsoft has released a 16K sideways ROM

based version of the language – similar to Basic and Pascal, but drawing on the better features of both – for £49.85.

The company says Comal is user friendly and minimises bugs by drawing attention to syntax errors as lines are entered. It also checks structure before the program is run.

Comal promotes structured programming, provides extensive parameter passing facilities for procedures and functions, supports strings and multi-dimensional arrays and facilitates file I/O through file handling.



## To Russia with profit

THE persistence of Acorn Computers in sending its products to Russian computer shows has paid off with a £20,000 order for a 20 station BBC Micro network from the Moscow Education Institute.

The order, first of several expected to follow soon from other Soviet educational establishments, was clinched at the recent Moscow Computer Exhibition – the third occasion Acorn has shown its technology in the USSR.

The company has been working with UK distributor 3SL Overseas to win orders in the USSR.

A Russian version of the BBC Micro with Cyrillic as well as Roman alphabet has been developed jointly by the two firms.

Acorn International sales manager Owen Maddock said: "We are particularly confident of winning big orders from technical colleges and secondary schools who have recently been instructed by the Politburo to improve the level of their computer teaching facilities".

## On the ball

NEW for the BBC Micro is a tracker ball graphics input device from Marconi, which comes with utility software and a free drawing package, Microdraw.

It plugs directly into the user port and costs £59.50.

## DTI NEWSLETTER TAKEN OVER

TELELINK, a sister magazine to *The Micro User*, has been asked by the Department of Trade and Industry to take over the publication of the world's first newsletter devoted to teletext and viewdata.

Now Talk Teletext and Viewdata will be given a new look and appear as a supplement to *TeleLink*, which was launched last November to cater for the growing public interest in telecommunications.

The newsletter was originally started by the DTI's Information Technology division in May, 1981, to help promote the British teletext industry.

Since then it has expan-

ded to cover the events in the viewdata industry. But recently the DTI decided it was time to pass responsibility for the publication to the private sector.

This decision coincided with the launch of *TeleLink* and, after discussions with a number of other publishers, the DTI asked the owners of *TeleLink* – Database Publications – to take over Talk Teletext and Viewdata.

"We are delighted that the DTI should express its confidence in *TeleLink* by

asking us to take this pioneering publication under our wing", says managing editor Derek Meakin.

"It has helped break new ground before and we'll be giving it a new look to ensure it maintains its impact within the teletext and viewdata communities, which are now well established in this country.

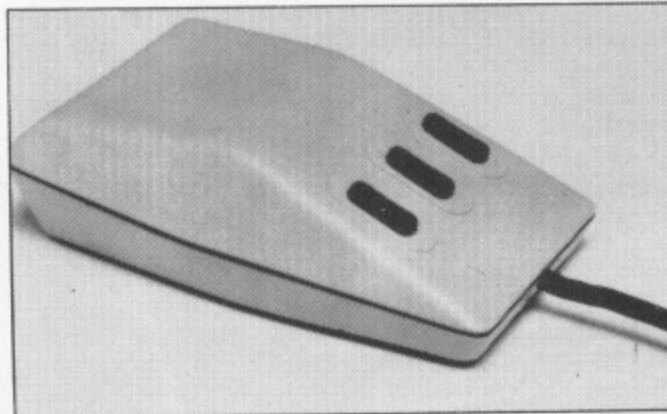
"As a supplement to *TeleLink*, Talk Teletext and Viewdata will enjoy a much wider distribution, both in Britain and overseas".

## Quiet mouse..

TRACKBALL manufacturer Wigmore has brought out a BBC Micro mouse called Megamouse which incorporates a quiet, slip-free rubber ball.

The company says this is more accurate than imported metal ball versions.

Megamouse comes with a graphics package Mousepaint which operates in Mode 1, providing a choice of four from eight colours. Its



main functions include rubber banding, painting with variable brush sizes, standard design shapes, save, load and print. Options are selected by picking off icon symbols. No additional hard-

ware or modifications are required since the software can be either cassette or disc.

Megamouse with Mousepaint costs £77. The optional Cadmouse package costs £24.

A 2D draughting software package for schools and colleges that runs on the BBC Micro has been produced by Denford Machine Tools.

Easicaad incorporates features associated with larger CAD systems including dimensions, symbols, text, hatching, plotting and four colours.

The system, price £495, runs on a BBC Micro with no additional hardware required.

## Acorn deal From Page 23

machines in particular should benefit". – Nick Pearson, AMS.

"It's good news. This has removed the uncertainty about the future that was affecting us all". – Hamayun Mughal, Akhter Computers.

"We feel very confident Acorn will make a recovery with the help of Olivetti which will bring mature and responsible direction to the company's activities". – Charles Forsyth, Micro-world Computer Group.

Companies adopting a wait and see stance told *The Micro User*:

"I'm pleased Acorn has been bailed out and is not going down but I've reservations about it being rescued by such a big international concern". – Keith Manning, Care Electronics.

"The end result of this could be good, but it's a little early to come up with any firm conclusions as yet". – Victor Hinton, P & H Electronics.



# Micro monitors heart transplant

A BBC Micro is part of a new technique for assessing and monitoring candidates for transplant operations at the National Heart Hospital in London.

Patients who suffer from heart failure and are awaiting cardiac transplantation periodically have their fitness tested during treadmill exercises.

Measurement of oxygen consumption during these tests helps

## patients

determine function of the heart and response to drug therapy, and is an alternative to the often painful methods involving needles and tubes.

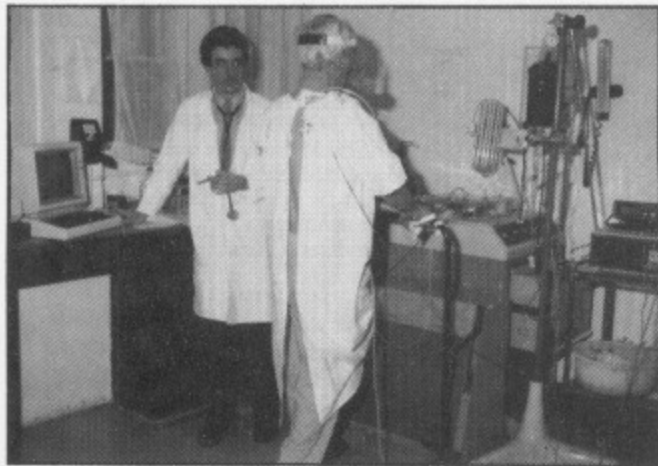
Expired air from the patient is analysed with a machine called a spectro-

photometer. The output from this machine is linked to the BBC Micro via an analogue to digital converter within the computer.

Oxygen consumption, carbon dioxide production and the volume of air being breathed each minute are calculated by the computer and averaged so that a printout of the results is available every 30 seconds.

At the end of each exercise test the computer prints graphs of change in oxygen consumption and the amount of air consumed with time on the treadmill.

Each patient's data is stored on floppy disc for future referral. Transplant candidates undergo the test every two or three months until their operation.



Research registrar Dr David Lipkin puts a transplant candidate through his paces on the treadmill at the National Heart Hospital.

## BBC SPEEDS ANSWERS TO DRUGS QUERIES

MORE than 100 sales representatives employed by Ciba-Geigy Pharmaceuticals have been equipped with BBC Micros to speed up their response to queries from doctors and hospitals.

The national network, linked to the company's headquarters in Sussex, went live in March and will reduce from one week to 48 hours the time it takes to reply to requests for drug information from the medical profession.

And the increased efficiency will save Ciba-Geigy money. The entire network will be run for two-thirds the cost of the previous area office system for the Ciba branch alone, says general sales manager Paul Harrod.

Ciba-Geigy already has experience of using

BBC Micros to present case studies to doctors and in hospitals, where the machine proved a successful training aid with interactive programs.

Before the new network went live, the sales force was able to get hands on experience of up to four weeks.

Says Harrod: "This is not a means of increasing drug sales. The major role of representatives in the pharmaceutical industry is imparting information and helping members of the medical profession in the application of drugs."

Many queries concern the effectiveness of a particular drug in a cer-

tain clinical condition and prompt answers are necessary in the interests of patients.

"Actual times to respond depend very much on the complexity of the question but anything we can do to speed the process is welcome."

"One of the things we have noticed about being on a viewdata system is that people use far fewer words to get their message across."

The firm's network is based on a private viewdata system on British Telecom. It involves 110 sales representatives, 16 area managers and a team of specialists concerned with teaching hospitals.



## Sysops are getting younger

OUR story on Viewfax 258 Tubelink editor Benjamin Rietti (*The Micro User*, January issue) prompted another youthful IP, Matthew Lemmings of Staines, to tell us about his own BBC Micro users' service on Miconet.

At 14½ Matthew is six months younger than Benjamin, which makes him a candidate for the title of Prestel's youngest information provider.

Coincidentally, the boys are close friends and often meet at shows.

Matthew, a pupil at

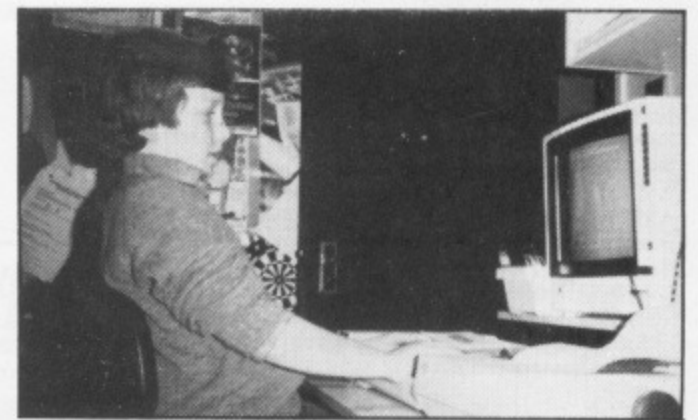
Churchmead School, Datchet, near Slough, started with the Viewfax Hotline when he was only 13 years old.

He moved to Miconet last September.

His InfoBeeb database on Prestel Page \*8001127 carries a tube users' section, news pages, reviews of software, hardware and computer books, hints and tips, a RAM users' directory, technical help and competition pages.

There is also a Top Scores section for games players.

## ... and younger



PROVING you're never too young to be a sysop, 11-year-old London schoolboy Marcus Anselm has started a bulletin board for fellow BBC Micro users.

Marcus has written all the software himself and says he is improving his board - called Marctel - all the time.

Latterly that includes adding electronic mail and a new special interest groups menu in which users can deselect Sigs.

Marcus says his only problem is that his times

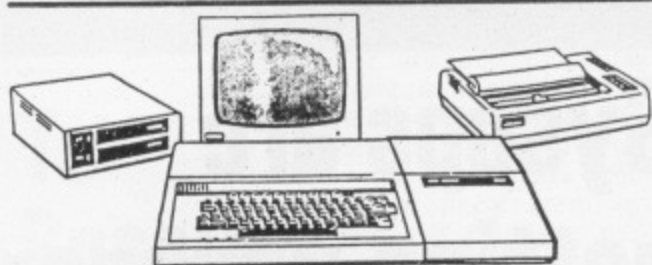
are very restricted as he doesn't have an auto answer for his Pace modem.

This means - homework permitting - he can only man his telephone - 01-346 7150 - between 8 and 9pm during the week and for five hours on weekends.

However, good news for Marcus and other sysops like him is that Pace has promised its auto dial/auto answer add-on cartridge should be in the shops this month, priced £45.

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# D Boost for Mini Office

MINI Office, the chart topping business package for the BBC Micro from Database Software, has been officially endorsed as an aid for the handicapped.

The software is specifically recommended in "Micros for Handicapped Users", a book published by Helena Press of Whitby, Yorkshire. It carries a foreword by Baroness Masham of Ilton.

Revolutionarily priced at £5.95 - business packages can cost up to several hundred pounds - Mini Office is a suite of four programs.

All professionally written, they are made up of a word processor, database, spreadsheet and graphics.

The software package is singled out in the book in the chapter "Jobs for housebound people", which deals with the handicapped contemplating setting up their own businesses.

"We found Mini Office very useful", Peter Saunders of Helena Press told *The Micro User*.

## WORDS FROM THE WISE

THERE'S help on the horizon for the 40,000 users of Wordwise, the first ROM-based word processor to be produced for the BBC Micro.

Paul Beverley, of Norwich Computer Services - a Wordwise user for the last two years - has written up his accumulated wisdom on the use and applications of this firmware.

The Wordwise Applications Guide costs £6.50 and gives help for beginners, offers solutions to all the most common problems and demonstrates a wide range of new applications which extend the value of the Wordwise chip.

# Bulletin board software to be released soon

THE first commercial bulletin board software for the BBC Micro is currently undergoing trials ready for release shortly, and it is in teletext Mode 7.

The package is coming out of the Pace stable, already well known for its Commstar communications package for the BBC and the Nightingale multi-standard modem.

It has been written by Robert O'Donnell who has been operating his own bulletin board in Manchester for some months.

David Hood of Pace said: "We have a number of exciting new products coming out and this is one

of them. It is undergoing trials at the moment to see how it operates with our auto/answer auto/dial board for the Nightingale".

The new card for the Nightingale mounts into three existing sockets. "It is very simple to insert and soldering is unnecessary", said David Hood. Price is expected to be around £45.

Pace plans to sell the bulletin board package - some sources suggest for as little as £15 in a

pre-configured form - and a more powerful version at a higher price.

The software will require a minimum of 100k disc storage and even that will be tight for much additional special interest group material and messages.

"It will work with that basic capacity, but really it could need either a double sided 40 track drive or 80 track drive for maximum message storage", said David Hood.



YOUNG children and the disabled are two important groups who will benefit from the new Microvitec Touchtech 501 touch screen for the BBC Micro.

It works by projecting a network of harmless infra-red beams across the face of the screen.

## HELPFUL BEAMS

Once the sensors detect that the network has been broken the coordinates are fed to the host computer which is programmed to interpret a

signal from that part of the screen in a certain way.

The technique enables any stylus or a finger to be used. It costs £210.

## Cleaner power all round

A POWER distribution unit has been developed by Total Business Services that has seven power outlets, of which six are mains interference filtered, leaving the printer outlet independently wired.

The mains interference filter has approximately 30 db attenuation over the range 1600 KHz to 100 MHz.

The front panel contains eight individual neon light switches. A hinged flap at the rear allows access to the sockets which accept 13 amp plugs.

The power unit is supplied with two metres of inlet cable and costs £119.50.

# German recorder on its way

THIS German data recorder, already the undisputed leader in its home market, is poised to invade the BBC Micro scene in the UK.

Whereas most recorders used with micros are modified music cassette machines, the MC 3810 from Waltham Electronics of Munich is specially designed for data processing.

Priced at £26, it is supplied with an interface cable (£3.95) to make it compatible with the BBC Micro.

It has a precision tape



drive, data transfer rate of 1200 baud, motor control via CPU, as well as automatic level and shut

off controls.

All sockets for interface cables and power are on the back panel of the

casing, with the monitor plug on the front.

A series of lamps display the "Ready", "Save", "Load" and "Control" functions, while the 3810 also boasts an oil damped cassette eject and tape counter.

The read/write head is easily adjustable from the outside - "this is a most important feature", said Waltham's Roman Hummelt.

The German company has signed an agreement with Twillstar Computers to act as distributors for the MC 3810 in the UK.

# SOFTWARE, FIRMWARE AND HARDWARE FOR YOUR BBC

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## MICRO

Most programs available on Micronet

105	MAILING	Holds 218 addresses. Alpha & Post code sorts, searches, any label format, delete, add and amend	£11.95	B
201	GAMES 1	5 Card, Minefield, Darts, Pontoon & Mr midon	£5.95	B/E
202	STOCKMARKET	Exciting world of Stocks and shares, 1-4 players	£5.95	B/E
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303	FLAGS	98 full colour flags of the world with questions	£4.95	B/E
304	STATPACK	Statistics package giving over 30 results	£11.95	B
305	GRAPH	Produce varied graphs & charts of functions	£7.95	B
306	FRENCH	A New audio visual computer way to learn a language	£7.95	B
307	SPELL-CHECK	Add to WORDWISE. 15000 words in 12 dictionaries, ideal in education	£17.95	B
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602	PASCAL-T	Structured language ROM with compiler- interpreter	£57.50	R
603	XCAL	Computer Assisted Learning ROM for presentations	£65.00	B
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607	GDUMP	Screen dump ROM, 8 shades, 8 sizes and windows	£17.95	B
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901	EPSON RX-80T/F	Superb, 100cps with Tractor & Friction feed	£275.00	
902	EPSON FX-80	Magnificent, 160cps, 6 fonts, graphics, F/T Roll	£365.00	
910	DISC DRIVES	Slimline 3" or 5 1/4" 100K-800K Japanese Format disc, cable and excellent manual. Plus £50 of FREE Software	£189.00	
915	DISC UPGRADE	Double or Single Density available in one system	£89.00	
920	VDU STAND	Stainless Support protects your micro	£19.95	
930	GREEN VDU	12" Green Monitor, cream sloping front case	£79.95	
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ADD VAT TO ALL PRICES EXCEPT BOOKS

Add £1.75 for programs on 40 or 80 Track Disc. No post charge in UK. Send for our free brochure for more information before parting with your money.

## memo-calc

107 MEMO-CALC £12.95 B C/D  
"IT MUST BE AMONG THE LEAST EXPENSIVE PIECES OF USEFUL SOFTWARE YOU WILL EVER BUY" Revue by Practical Computing July 1983.

Database/calcsheet program which allows up to 255 columns. The number of rows is automatically set from 5 to over 1000 depending on the columns declared. Both numeric and alphanumeric data can be stored in any cell and can be of any length up to 255 characters.

There are a multitude of uses for this program from accounts to diaries, club or personnel records etc. and is probably the one program that we all need. MODE7

107a Manual for MEMO-CALC included free otherwise £2.00 (0% VAT)

## PAYROLL

Part 1 is a BASIC program running in MODE7 which accepts new data on employees, allows additions, deletions and alterations, listing of P35 & automatic alterations to the codes as required by tax notice P7X. Fully 'user friendly' with colour and graphics to make life simple for the operator.

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## PERSONALISED SOFTWARE

We are happy to quote for writing programs to suit your own specific purpose. Please telephone for details in first instance.



## CASHBOOK

102 CASHBOOK £11.95 B C/D

FIRST CHOICE This is a double entry cashbook program showing cash and bank credits and debits, i.e. 4 columns. Any number of individual accounts can be used and analysed or totalled individually or cumulatively by associated group. A friendly but very practical, and reliable program which despite its low cost is used by many people in a range of situations from domestic and clubs to schools and businesses.

MODE7

102d CASHBOOKd £19.95 B D

SECOND CHOICE This version of the above program uses random access disc files and can hold up to 1250 entries on 100K discs and up to 2500 on 200k discs. There is sophisticated protection against unauthorised use built in. MODE 7

102f ACCOUNT £29.95 B D

THIRD CHOICE This version of the above program uses random access disc files and can hold up to 1100 entries on 100K discs, and up to 2250 on 200K discs. Included is a choice of CASH/BANK or VAT/BANK headings. Over 830000 possible accounts combinations. Ledger sheets and summaries can be printed as well as full accounts. The latest balance is available at any time. This program is only available on disc. MODE 7

## Special Interest Items

### NEW EXTENDED PAYROLL

Disc only version of our very popular PAYROLL with extensions to include three O/T rates, SSP, contracted in and out, pensions, personnel records and many other features - £49.95 + VAT.

### ACCOUNT and CASHBOOK d PROGRAM OWNERS

Please note we can now offer monthly analysis feature. Return your disc with £10.00 for upgrade.

## Top Spring Program



RANDOM MAILING up to 1850 addresses, names, phone numbers & codes on one disc. Selective printing any number of labels, repeat, stationery or fan fold. Automatic WORDWISE letters produced repeatedly with personalised names many other features such as automatic sorting by company or personal names. By far the best and most comprehensive program of its type for the BBC Micro. Price £29.95 + VAT

# Micro-Aid

25 Fore St. Praze, Camborne  
Cornwall. TR14 0JX tel: 0209 831274

## Three more major shows

DATABASE Publications is to organise three Electron & BBC Micro User Shows this year.

Two are to be held in London, with the third in Manchester. All will be returning to previous venues.

"Whereas some computer show organisers have been experiencing problems of late - IPC has even cancelled events - we expect once again to break previous attendance records", says Derek Meakin, head of Database.

Dates and venues are:

May 9 to 12: New Horticultural Hall, London SW1.

September 27 to 29: UMIST, Manchester.

November 14 to 17: New Horticultural Hall, London SW1.

Show contacts: Christine Lees/Pam Goodwin, Database Publications. Tel: 061-429 8157.

## Slavish service

THE slave market beckons for BBC Micro owners. A & F Software has moved into the world of firmware with the introduction of a 16k eeprom called The Slave.

The firm says its research has shown that the programmers' ideal eeprom would encompass all the good points of ROMs already on the market.

And it claims The Slave fulfills this ideal and provides more routines the programmer will find indispensable.

"It has extensive routines to cover all requirements and comes with a 64-page operational manual, The Slave Drivers Guide", a spokesman said.

The Slave is initially available by mail order only from A & F Software and costs £49.95.

# New network brings in £6 million orders

ACORN'S new "streamlined" distribution network has already brought in orders worth more than £6 million for BBC Micros and Electrons.

## TV review

ANGLIA Television plans to launch a regular review of computer software for the BBC Micro.

The series will concentrate on games programs, but will include educational, strategy and adventure gaming as well as arcade action.

The number of distributors was recently cut from 17 to six in a move which the company maintains will introduce stability into the marketplace.

Acorn's distributor network for England and Wales now comprises 3SL, Eltec, Hugh Symons, Lightning, LVL and Micro Management.

Computerworld remains Acorn's distributor for Scotland, while CEM

and Lendac will continue in Ireland.

Nearly all of Acorn's 2,000 independent dealers will now be serviced entirely by the new distributor network.

Chris Hall, Acorn's UK sales manager, said: "Independent dealers account for over half our sales, particularly in the business and education sectors.

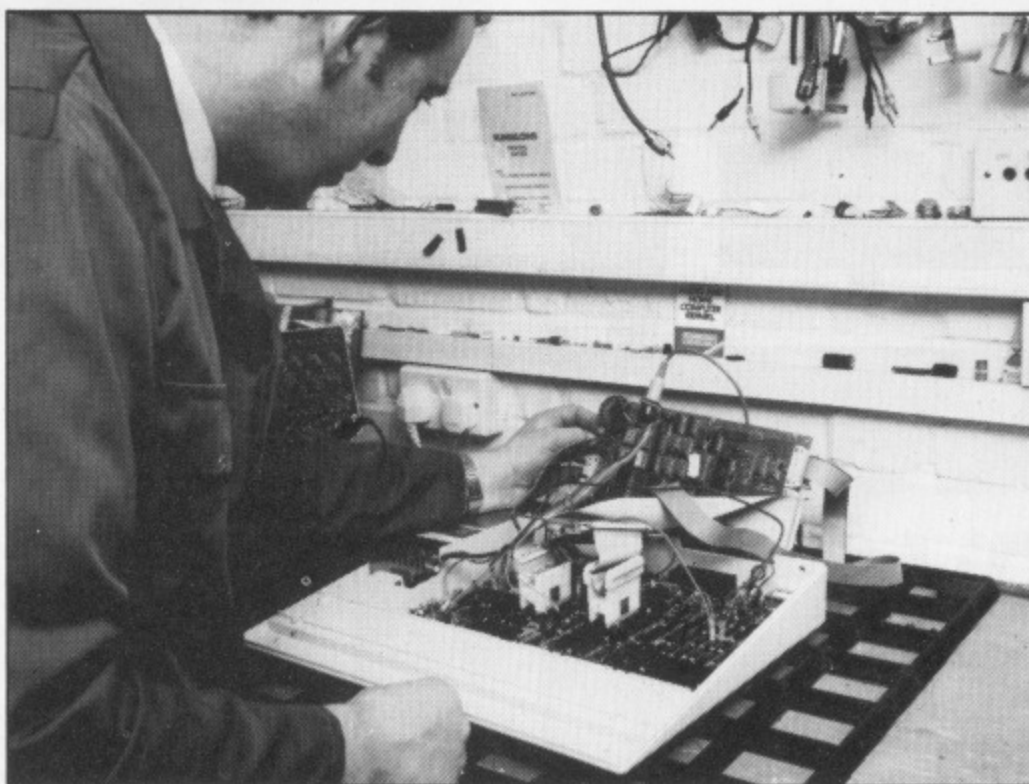
"This new strengthened network, with its increased emphasis on support, will not only help independent outlets to compete on an equal footing with the multiples,

but ensure that they can successfully handle the evolving product lines of Acorn's 1985 marketing strategy".

Acorn claims that improved margins will enable the remaining distributors to offer dealers "better support and in turn help them to improve customers service".

However not all dealers appear to be entirely happy with the new arrangements, with at least one claiming his profit margin had been effectively slashed to £6 for every Electron sold.

"This just isn't true", insisted an Acorn spokesman.



## MICRO MENUS

STUDENTS at catering colleges all over the country are learning to cook with the help of the BBC Micro.

Shumwari Associates has produced a set of programs called Menu Master based on Practical Cookery, the book that has been the bible of catering colleges for years.

The programs, which cover more than 400 ingredients and 750 recipes, were designed with the help of a leading catering college

## Sorting out your circuits

THE BBC Micro has proved to be one of the most reliable home computers on the market.

However, should something go wrong you may find your dealer doesn't offer a repair service or, if he does, you're in for a long wait.

Fortunately a number of firms offer repair services. One of them is Rumbelows, which has 40 service clinics across the

country staffed by BBC maintenance experts.

Rumbelows' computer engineers undergo an intensive training period to develop their skills and are also qualified to install peripherals such as disc drives, Econet, word processors and printers.

They use a range of equipment to locate the problem, including an oscilloscope which checks the signals present on

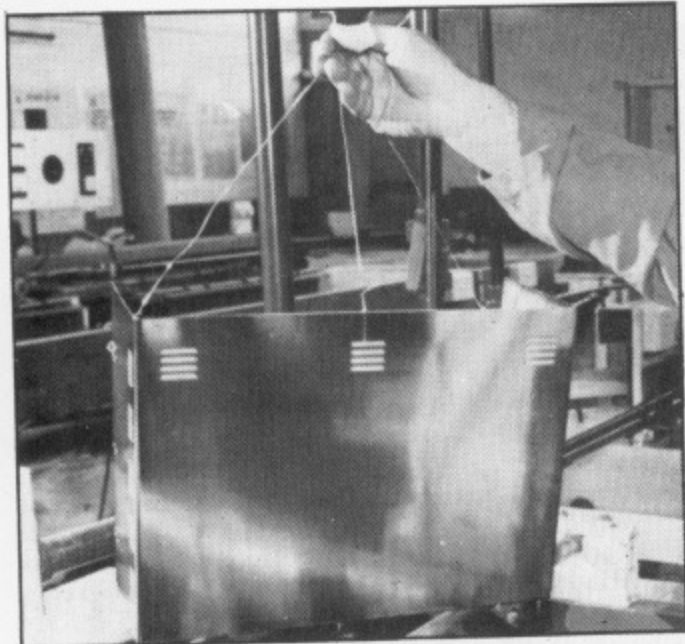
each of the integrated circuits.

However, as any service engineer will tell you, the hardest part of his job is repairing a computer with which it is impossible to communicate.

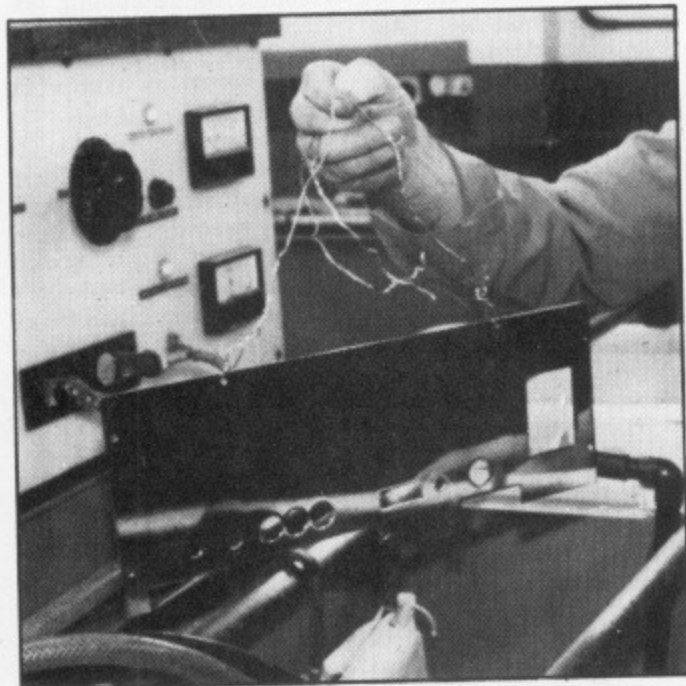
This is what the PET - progressive establishment testing system - is designed to handle. By connecting the PET to the main board of your micro (see picture) the engineer

is able to run a sequence of tests which starts from the central core of the computer and progressively establishes the operation or malfunction of the components.

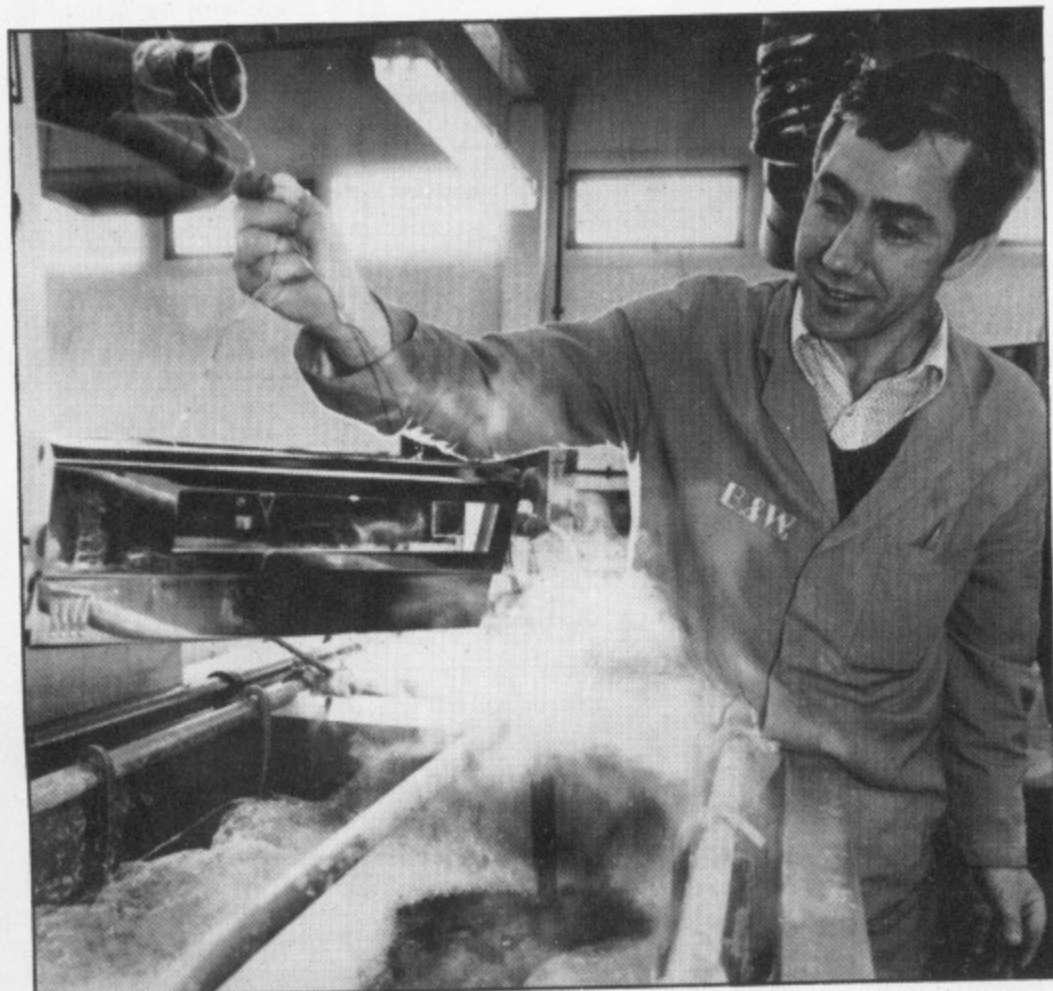
After the fault is located it is usually a straightforward job to put right and when the repair has been carried out the machine gets a final check before being returned to its owner.



From copper



... to nickel



... to gold

# The making of a golden micro

A GOLD BBC Micro! Since it was announced that *The Micro User* was giving one away to celebrate its second birthday, the idea has captured the imagination of the computer world... and far beyond.

News of the fabulous prize – valued at £5,000 but considered priceless in that it is unique – has even reached those most discriminating of people at London's top store, Harrods.

Now consideration is being given to making more gold micros to sell to oil-rich Arabs out in the Middle East.

"I'm sure that many of our wealthier customers would be pleased to own something like this", a spokesman told *The Micro User*. "This really is the gift for someone with everything".

All of this is not really surprising in the light of the fact that *The Micro User's* gold micro has been made to the most exacting standards.

It was commissioned from the Universal Communications Company, based in Bradford, West Yorkshire. Now No. 1 in the field of customised casings for the BBC Micro, UCC markets its products under the Oak label.

In all, David Atkins and his UCC team lovingly lavished attention on the making of the gold micro for one whole month.

The base units were

## Now top store may sell them to Arabs

painstakingly hand made out of soft steel to ensure the perfect finish needed to guarantee that the gold dipping would be a success.

For hour after hour the casings were then spindle polished by a craftsman ready for the birthday micro to be clad in its golden coat.

Both parts were then shipped at high speed – to alleviate the problem of them becoming contaminated during the journey – to a specialist company, B. & W. Plating, near Crawley, Sussex.

Time served craftsmen



## BRIGHT IDEA THAT PAID OFF

*BEHIND the Oak computer range are a husband and wife team and a brilliantly simple idea.*

*Ann and David Atkins had a wealth of business experience behind them when they started Oak ten months ago, she in commercial management and he in sales.*

*What brought their previously separate career courses together was a high-tech application of an old adage: "It a man builds a better mousetrap the world will beat a path to his door..."*

*In this case the "mousetrap" was the BBC Micro - a first rate machine with great potential for business applications.*

*Only one problem - when you added the peripherals and wiring*

*necessary to turn the BBC into a sophisticated business tool the end result looked anything but businesslike.*

*Ann and David Atkins came up with the simple solution - make the BBC Micro look as sophisticated and efficient as its working parts and a whole new market of serious applications would open up.*

*In other words, package BBC Micro systems in smart custom designed housings that gave the machines an attractive new image in the eyes of potential customers.*

*The idea has proved a tremendous success. Orders for Oak systems are increasing at the rate*

*of 50 per cent a month for packages ranging in price from £200 to £2,000.*

*Whitehall ministries, educational establishments, multinational companies, local government authorities and medical institutions have bought Oak systems.*

*Medicine, science, mechanics, accountancy and retailing are being serviced by bespoke systems incorporating specific software for vertical markets.*

*Remarkably, the Oak success story has been achieved by Ann and David Atkins in the humble surroundings of their Bradford home and without the backing of City financiers.*

there then subjected the now celebrated micro to 20 separate processes.

Working round the clock, they began by dipping the casings in tricoethylin in order to remove any grease that may have been picked up during the trip from Yorkshire.

A limed rag was then used to eliminate any surplus dust or grit.

The next critical stage saw copper wires attached to the casings so that dipping could begin.

Lowered in turn into cyanide and sulphuric acid solutions, the casings were then ready to be flashed in copper cyanide for their essential copper undercoatings.

Without this and the subsequent bright nickel coating, the gold plating process would not be lasting.

Finally, it was time for the casings to take the world's most expensive bath in a vat of 22 ct gold.

Within the gold stream-

lined processor and keyboard casings can now be found the BBC keyboard and motherboard, a disc interface, two 1mbyte disc drives and an 85 watt power supply unit.

"One thing you can say for certain is that whichever Arab sheikh eventually buys a gold micro, he will be second in line to the winner of *The Micro User* contest", says David Atkins of UCC.

"This is the first and, as such, will remain the most valuable in the world..."



*Polishing the casing before plating began*

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# TAKE A TEST FROM THE RANGE



So now you have got your home computer, you're ready to talk to Cumana – the best name in memory. Already a market leader throughout Europe for their range of disk drives, Cumana now have other products on offer, all to the same exacting standards that have made their disk drives the number one choice in the home and in education.

### The Touch Pad

The Touch Pad is a low-cost graphic plotting aid for the BBC micro. This compact display cursor moving device simplifies programming with the touch of the stylus.

The product comes complete with an instruction booklet, basic software, stylus and connecting cable. Its uses are in graphics, computer aided design, education and games.

**£69.95**  
including VAT.

## BE SAFE NOT SORRY

Cumana's CS range of single disk drives have been subjected to the strict safety demands of the BEAB.

They have now been awarded BS415 approval, so if you value safety do not trust it to anything less than Cumana.

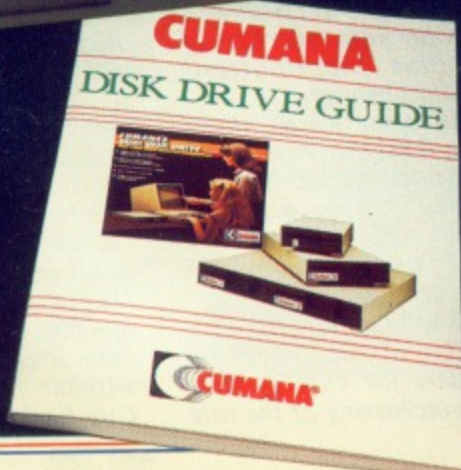
Cumana's dual range of disk drives have also been submitted for approval.



### Disk Drives

Cumana have spent years on research, development and marketing a range of drives second to none. Their drives are compatible with BBC, Spectrum, Dragon, Oric, Tandy Models III and 4 and Video Genie. They are fully guaranteed for 12 months and approved for electrical

safety by the D.M.E.E. and are extensively used in GLC and ILEA establishments. Cumana were the first independent disk drive supplier and are now Europe's market leader. Their products have been proven in the schools, universities and homes throughout Europe. Let us drive you in the right direction, send now for further details of the Cumana range, or see them at our distributors and at selected branches of W.H. Smith, Lasky's, Greens, Currys, and Spectrum UK.





# T DRIVE E CUMANA

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## The Acorn Electron Computer

A microcomputer with a proven track record. Using BBC Basic, the Electron was developed out of the Micro that has been chosen for over 80% of schools participating in the Government's current Micros In Schools project. It connects into almost any TV set and cassette player and is supplied with a comprehensive User Guide which runs through, in a simple to follow manner, the basic principles of programming. A wide range of software is available, including games, educational packages and home accounts.

Disk interface now available for the Acorn Electron, Spectrum and Spectrum + and Dragon 32/64. details from Cumana

**£149.95**  
including VAT.

## Diskettes

Only when Cumana found a double density diskette up to their stringent quality control requirements, and at a price that made sense to the end user, were Cumana ready to put their name to it.

The result was a top quality diskette, complete with a plastic protective case for the ten-pack (they are also sold in two-packs!) together with index stickers.

Cumana diskettes are available now in both 5¼ inch and 3½ inch as single or double-sided, 40 or 80 track, from your local computer dealer. Don't trust it to chance, go for the best name on record.

Cumana BBC Microcomputer compatible disk drives:  
Cumana disk drives supplied with formatting diskette, drive connecting cable and Cumana user guide. Independent power supply, mains lead and moulded plug included.

CS100 40 Track single sided (100K)	£164.95
CS200D 40 Track double sided (200K)	£169.95
CS200 80 Track single sided (200K)	£192.95
CS400 80 Track double sided (400K)	£219.95
CD200 2 x 40 Track single sided (200K)	£294.95
CD400D 2 x 40 Track double sided (400K)	£325.95
CD400/S 2 x 80 Track single sided (400K)	£359.95
CD800/S 2 x 80 Track double sided (800K)	£414.95

Cumana disk drives with independent power supply, mains lead and plug. Excluding other accessories.

CS100E 40 Track single sided (100K)	£149.95
CS200ED 40 Track double sided (200K)	£192.95
CS200E 80 Track single sided (200K)	£180.95
CS400E 80 Track double sided (400K)	£208.95

Cumana disk drives supplied with formatting diskette and Cumana user guide. Power supply taken from BBC Microcomputer, with lead supplied.

CSXL100 40 Track single sided (100K)	£115.95
CSX100 40 Track single sided (100K)	£124.95
CSX200D 40 Track double sided (200K)	£134.95
CSX200 80 Track single sided (200K)	£159.95
CSX400 80 Track Double sided (400K)	£189.95

## 3½ INCH DRIVES

CSX351 40 Track single sided (100K)	£139.95
CSX354 80 Track double sided (400K)	£199.95
CDX352 2 x 40 Track single sided (200K)	£256.95
CDX358 2 x 80 Double sided (800K)	£383.95

The 'X' range takes its power from your microcomputer.

CS351 40 Track single sided (100K)	£169.95
CS354 80 Track double sided (400K)	£229.95
CD352 Dual 40 Track single sided (200K)	£299.95
CD358 Dual 80 Track double sided (800K)	£429.95

The 'CS' range comes complete with power supply.

## DISTRIBUTORS/RETAIL

Available from the following retail outlets:  
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0534 74000. Eltec Home & Business  
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**All 80 Track 5¼" Drives are**  
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# ...Let your BBC play the game...



## **KEMPSTON BBC PRO JOYSTICK**

This new joystick has been designed to complement the BBC Computer in both style and performance.

Based on the best selling Competition Pro 5000 series, the BBC Pro Joystick contains micro switches allowing movement in a total of eight directions together with twin fire buttons for left and right handed play.

The joystick is moulded in cream and brown and plugs directly into the analogue port ensuring compatibility with a wide range of existing BBC software without the need for expensive interfaces.

**ALSO AVAILABLE PRINTER CABLE**

Available directly from Kempston Micro Electronics Ltd · Singer Way · Woburn Road Industrial Estate ·  
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BBC Pro Joystick ..... £17.95  Printer Cable ..... £13.50

I enclose a cheque/P.O. for £ .....

Name/Address .....

Signature ..... P/code .....

All prices include  
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Overseas add  
£4.00 P&P

# TECHNOMATIC

BBC Computer & Econet Referral Centre  
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 305 Edgware Road, London W2 Tel: 01-723 0233

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and 15% VAT to order value

APRIL '85

## ACORN COMPUTER SYSTEMS

BBC Model B.....	£300(a)
BBC Model B + DFS.....	£346(a)
BBC Model B + Econet.....	£335(a)
BBC Model B + Econet + DFS.....	£399(a)
ACORN 10Mbyte Hard Disc.....	£1300(a)
BBC Dust Cover.....	£4(d)
BBC Carrying Case.....	£12.50(b)

## UPGRADE KITS

A to B.....	£65 (d)	Installation.....	£20
ACORN DFS Kit.....	£95 (d)	Installation.....	£15
Econet Kit.....	£55 (d)	Installation.....	£25
Speech Kit.....	£47 (d)	Installation.....	£15
BASIC II Rom with user guide.....	£22.50		
1.2 O/S Rom.....	£7.50	DNFS Rom.....	£17.50
4816AP Memory upgrade RAM (each).....	£2.00		

## ECONET ACCESSORIES

Terminator (Two reqd per installation).....	£31 (c)	File Server Level II.....	£216(c)
Clock with psu.....	£39 (c)	File Server Level III.....	£300(c)
Printer Server Rom.....	£41 (c)	10 Station Lead Set.....	£26 (c)
File Server Level I.....	£86 (c)	Extra Econet cable.....	£1.50/m (d)
		Econet User Guide.....	£10 (d)

## ACORN BITSTICK

The renowned 'BITSTICK' graphic CAD package. Using the on-screen menu and colour palette, it can draw freehand as well as lines and shapes with great accuracy. Any part of a drawing may be magnified many times, and up to 48 drawings may be saved on a disc. In total, a friendly yet sophisticated CAD system offering tremendous value. **£325(a)**

FX80 dump routine available. **£35**

Multi-Plotter Driver (Plotters include H.P., Epson HI-80, Watanabe, etc) **£79(c)**

## ACORN Z80 2nd Processor

This processor converts your BBC into a complete business micro with all the computing power a professional would need. The system is CP/M based and is supplied with free software package. The package includes three office productivity programs, (memoplan, fileplan and graphplan), Systems generator program, three programming languages plus the ACCOUNTANT business program. Software is accompanied by extensive manuals that not only get you started but also answers your whys and hows. **All for only £348 (a)**

See our section on CP/M software for other packages available for use with this processor.

## ACORN 6502 2nd Processor

This processor is designed for the serious computer user who wants to get even more out of his computer. This processor provides increased memory — allowing up to 44K for Basic programs and up to 60K for assembly language programs, regardless of screen mode in use. (ideal for VIEW). An increase in speed means that programs run up to 50% faster. The second processor/BBC combination offer computing power comparable to systems costing twice as much. **£175 (a)**

## ACORN P-SYSTEM



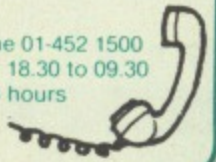
The long-awaited-for portable operating system has arrived. Intended for use with the 6502 Second processor, this portable operating system is a complete implementation and comes complete with a Filer, Editor, and compilers for two languages, USCD PASCAL and FORTRAN-77. Widely used in universities and colleges, as well as being popular with business software authors, P-System is user-friendly, offering ease of program development as well as portability. **£263(b)**



We are pleased to announce the launch of our on-line information system. Pages available will include:

- \*New Products \*Comment Box
- \*Technical Pages \*Comments on Stock and availability of Products
- \*Placing of Orders and many others...

Techno-Line 01-452 1500  
 Weekdays. 18.30 to 09.30  
 Sunday: 24 hours



Technical Information: Automatic V21/V23 for both 300/300 and 1200/75 Baud. Standard Viewdata/Prestel Protocols.

## ACORN WINCHESTER DRIVES

Acorn Hard discs are now available in 10 Mbyte and 30 Mbyte versions. The drive plugs into the 1 MHz bus. The ADFS filing system with its hierarchial filing structure provides an excellent file management facilities. Data is transferred at a rate of 1 Mbit/sec and the 'seek time' is 85 ms. Full details on request.

10 Mbyte Winchester Drive **£1300(a)**

30 Mbyte Winchester Drive **£1999(a)**

Acorn File Server Level 3: This enhanced file server allows more users on the network with better user access. **£300(b)**

If purchased with a Winchester Drive **£200(b)**

## TORCH UNICORN PRODUCTS

The TORCH Unicorn system has been in the field for over two years and is now a proven Z80 system for the BBC. It gives you the potential to expand which no other system can currently offer. You can expand a single system with a 20Mb Hard Disc, have the processing power of a 32bit 68000 cpu with up to 1Mbyte of RAM and a Single/Multi-user UNIX operating System or set up a network. All these capabilities are available now. Probably the most popular upgrade is the TORCH Z80 PACK, offering an attractive 2 x 400K disc drive, a Z80 second processor with 64K RAM, and a CP/M compatible operating system. A free bonus is the easy-to-use, yet advanced PERFECT range of software including a word-processor, speller, spreadsheet and database. Z80 BBC BASIC is also included. **£650(a)**



## TORCH GRADUATE SYSTEM

The ultimate upgrade — converts your BBC into a powerful 16 Bit business computer and makes it disc and hardware compatible with the IBM PC. With 256K RAM and single/dual drives, it simply connects through the 1MHz bus. (The disc drives can be used in both BBC and IBM mode, without requiring a disc interface.) The top-of-the-range Model G800/2 comes complete with the free Xchange range of software, and includes a full-feature word processor, a financial planner, a database and a business graphics package — all 'linkable'.

(This highly acclaimed software is now available for the IBM PC at a cost of over £400!)

G800/2: **£945(a)**

Z80 Card ZEP100 with PERFECT Software Packages

+ Z80 Basic..... **£275 (a)**

Z80 Disc Pack ZDP240 with software as above..... **£650 (a)**

20Mb Hard Disc + 1 x 400K Floppy Drive..... **£1,950 (a)**

Unicorn 68000, Unix OS/Z80B/512K, 20MB Hard Disc, 400K Floppy..... **£3495 (a)**

# PRINTERS

ALL PRINTERS HAVE A 12 MONTH GUARANTEE

## DOT MATRIX

### KAGA TAXAN:

- \* Epson Compatible Control codes \* 80 or 156 Column
- \* NEAR LETTER QUALITY Print using 23 x 18 matrix
- \* Text Modes include Normal, Italic, Enlarged, Condensed, Super/Sub Script, Proportional
- \* Dot Addressable graphics in various modes
- \* 3K buffer which can also hold user defined characters
- \* Extra ROM/RAM socket for custom print fonts
- \* Friction & Tractor feed with built in paper roll holder

KP810 (80 column) £255 (a)

KP910 (156 column) £359 (a)

### EPSON:

The industry standard printer offering the quality, reliability and versatility.

RX80T £215 (a) RX80FT £225 (a)

RX100 £345 (a) FX80 £315 (a) FX100 £435 (a)

## DAISY WHEEL

**BROTHER HR15:** • 14 cps • 3K Buffer • Two colour printing • Proportional spacing • Underline • Bold • Shadow print • Super/Sub script + many other features.

**BROTHER HR15 £325(a)**

• 15 cps • 2K Buffer • Switchable 10/12/15 cpi • Proportional printing • Linear Motor for max reliability.

**JUKI 6100 £325(a)**

## ACORN VIEW PRINTER DRIVER GENERATOR

As well as coming with pre-defined drivers for printers including EPSON FX80, JUKI6100 etc, this generator enables you, by answering a few simple questions, to generate your own dedicated driver for almost any printer. The days of having to buy individual dedicated printer drivers are gone! £10(d)

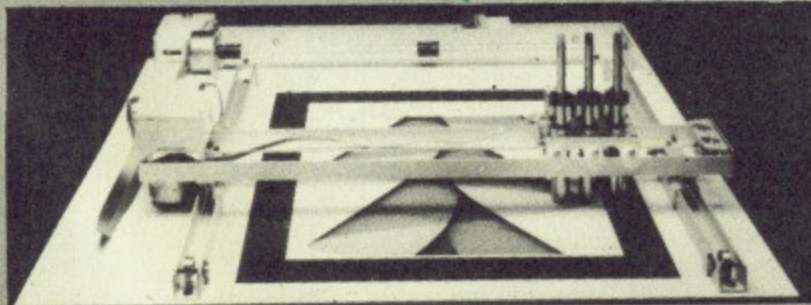
## EPSON HI-80 PLOTTER

This new A4 size Epson plotter has many features and commands not present on plotters costing far more. Features include: 4 pens at same time — up to 10 colours, various types of pens, high plotting speed, can produce text in normal way as well as user defined characters, text can combine with graphics etc., £399(a) ROMs available to make H1-80 operate with HP control codes.

## GRAPHICS PLOTTER/WORK STATION

Equally at home in the artists studio, hobbyists workshop, science lab or a classroom, this system has something to offer for everyone. The 3 colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025cm over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic plotter carries 3 colour pens each of which is software selectable. Additional accessories greatly enhance the versatility of the unit without losing the accuracy. The servo controlled drill/router, and scribe can be used on various materials. A unique Opto Sensor (using a Hewlett Packard device) turns the plotter into a high-res scanning digitiser to read & store whole diagrams and photographs. Workstation comes complete all accessories.

**Workstation Complete £490(a)**



**Basic Plotter £270(a)**

Opto Sensor £72(c) Drill/Router Attachment £79(c)  
Power Supply: PS12V £42(c) PS24V £78(c)  
Scandump Utility Disc £14.95 (d)

# TECHNOMATIC

All prices exclude VAT

## PRINTER ACCESSORIES

### EPSON

32K Internal Buffer Parallel £99(b)

Paper Roll Holder £17(d) FX80 Tractor Attachment £37(c).

Interfaces: 8143 RS232 £28(c); 8148 RS232 + 2K £57(c);

8132 Apple II £60(c); 8165 IEEE + Cable £65(c).

Serial & Parallel Interfaces with larger buffers available.

Ribbons: RX/FX/MX80 £5.00(d); RX/FX/MX 100 £10(d);

FX80 Dustcover £4.50(d)

**KAGA TAXAN:** RS 232 Interface + 2K buffer £78(c); Ribbon KP810/910 £6(d)

**JUKI:** RS232 Interface £65(c); Spare Daisy Wheel £14(d); Ribbon £2.50(d);

Sheet Feeder £129(a) Tractor Feed Attach £129(a)

**BROTHER HR15:** Sheet Feeder £189(a) Ribbons Carbon or Nylon £4.50(a)

**BBC Printer Lead:** Parallel (42") £7(d); Serial £7(d)

Printer Leads can be supplied to any other length.

Plain Fanfold Paper with extra fine perforation (Clean Edge):

2000 sheets 9.5" x 11" £13(b) 2000 sheets 14.5" x 11" £18.50(b)

Labels per 1000s: Single Row 3 1/2" x 1 7/16" £5.25(d)

Triple Row 2-7/16" x 1 7/16" £5.00(d)

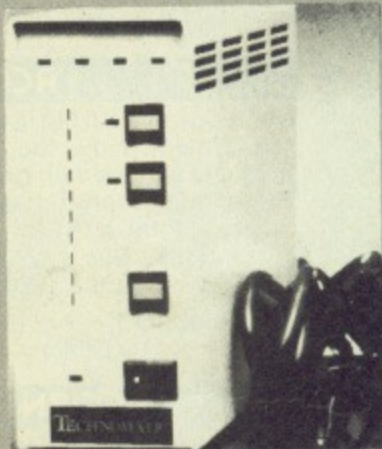
## PRINTER SHARER/BUFFER

A unique sharer/buffer that provides a simple solution to improve system utilisation. It can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. In networked systems it can eliminate the printer server unit. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.

**TSB 64 Buffer/Sharer £245(a)**

**Cable Set £30**



## PERIPHERAL & COMPUTER SHARERS

We now offer an extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No power required.

Three Computers to one centronics printer (all 36 lines switched) £65(b)

Four Computers to one centronics printer (all 36 lines switched) £79(b)

Three Computers to one serial printer/modem (all 25 lines switched) £59(b)

Four Computers to one serial printer/modem £69(b)

BBC Cable Sets 3 way £22(c) 4 way £27.50(c)

### Computer Sharer:

Allows one computer to be connected to two parallel printers fitted with cable for the BBC computer £19.50(b).

## GRAFPAD

A low cost graphic tablet offering the performance & durability required by industrial and educational users. It is compact, accurate & reliable; working area 240 x 192mm + menu area. Comes complete with a CAD package. £110(b).

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Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and VAT at 15% to order. Carriage (a) sent by Datapost

## MONITORS

All monitors supplied with BBC lead

### MICROVITEC

All 14" monitors now available in plastic or metal cases, please specify your requirement.

#### 14" RGB

1431 Std Res	£165(a)	1431 AP Std Res	£210(a)
1451 Med Res	£240(a)	1451 AP Med Res	£280(a)
1441 Hi Res	£399(a)	These monitors can receive TV programs thru a Video Recorder	

#### with PAL & Audio

#### 20" RGB with PAL & Audio

2030CS Std Res	£380(a)	2040CS Hi Res	£685(a)
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#### KAGA TAXAN 12" RGB

VISION II Hi Res	£235(a)	VISION III Super Hi Res	£340(a)
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SANYO CD3125NB 14" RGB Std Res £179(a)

### MONOCHROME MONITORS:

SANYO DM8112CX Hi Res 12" Green Screen	£90(a)
KAGA KX1201G Hi Res 12" Etched Green Screen	£99(a)
KAGA KX1202A Hi Res 12" Etched Amber Screen	£105(a)
ZENITH 123 Hi Res 12" Green Screen	£68(a)
ZENITH 122 Hi Res 12" Amber Screen	£68(a)
Swivel Base for Kaga Monochrome fitted with Digital Clock	£21(c)
Monitor Plinth for the BBC	£13.50(b)
Double Tier Plinth for BBC and flat pack dual drive	£19.50(b)
BBC Leads Kaga RGB £5(d) Microvitec £3.50(d) Monochrome £3.50(d)	

### RB2 TRACKER BALL



Marconi with its years of experience making tracker balls for use in Military and Air Traffic Control have developed a quality device for the serious hobbyist, for educational uses, and for low cost CAD/CAM applications. RB2 is a compact, ergonomically designed tracker ball that provides precise positional control and rapid direction changing using a freely rotating resin ball in any direction without the limiting stops or the zero point drift of joystick controls. Three switch

buttons enable easy software manipulation to incorporate the use of the tracker ball. Appropriate software will enable the RB2 to take over the functions of cursor keys in word processing, CAD/CAM applications and two dimensional positional controls of robots, drillheads etc. RB2 which plugs into the user port is supplied with utility programme to use it as a joystick with other software, a comprehensive graphics/CAD program and a program demonstrating its editing capabilities. User guide includes instructions on writing your own programs for the RB2. £52(b)

### AMX MOUSE - As seen on the BBC TV Micro program

In conjunction with a controlling ROM this sophisticated mouse has many advanced features such as Icons, Windows etc., these can be used in ordinary programs as well as sophisticated CAD Design. The supplied 'AMX ART' is a superb, yet simple-to-use CAD package allowing the creation of amazing graphical designs. A screendump for drawings is included. It can also be used with Wordwise/View to replace the cursor keys. Supplied complete with CAD Package, ROM and full instruction manual. £75(b)

## DISC DRIVES



TECHNOMATIC disc drives come fitted with high quality slimline Japanese mechanisms and represent the state of art in disc drive technology. They are built to highest standards and are all tested to their full performance capability before packaging. Single drives are offered with or without integral power supply whilst the dual drives are supplied with generously rated switch mode power supply. Attractively designed steel casings are painted in hard wearing BBC matching paint. All drives can operate in single and double density modes. Drives are supplied with cables, manual and formatting disc and are ready to be fitted to the computer.

#### Single Drives

1 x 100K 40T SS	: TS55A £100(b);	CS55A with psu	£125(b)
1 x 200K 40/80TSS		CS55E with psu	£150(b)
1 x 200K 40TDS	£115(a)		
1 x 400K 40/80TDS	: TS55F £125(a);	CS55F with psu	£169(b)

#### Dual Drives

2 x 100K 40T SS:	TD55A with psu	£250(a)
2 x 400K 40/80T DS:	TD55M with psu	£310(a)
2 x 400K 40/80T DS:	TD55MP in flat pack with built-in plinth	£325(a)

### DISC DRIVE MULTIPLEXER

A simple device that enables up to four computers to be connected to one single or dual drive. Ideal unit for installing in classrooms where networking is not planned or necessary or the costs have to be kept low or where software information is shared. Several of these units can be installed in series to connect more computers to access the same discs. Units supplied with 5' of cable per outlet as standard. Mains powered.

TDM 4 Quad Unit (upto 4 computers) £135(a)

TDM 2 Dual Unit (2 computers) £75(b)

Note: All computers must be fitted with a DFS

## 3M FLOPPY DISCS

Authorised Distributor  
Data Recording Products

Industry standard high quality discs with guaranteed error free performance for life.

Discs in packs of 10:

40T SSDD £15(c)	40 T DSDD £18(c)
80 T SSDD £22(c)	80 T DSDD £24(c)

### DISC ACCESSORIES

Single Disc Cable £6(d)	Dual Disc Cable £8.50(d)
10 Disc Library Case £1.80(d)	30 Disc Case £6.00(c)
Lockable Storage Boxes 40 Discs	£14(c) 100 Discs £19(c)

The FLOPPICLENE disc head cleaning kit is the ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminate the risk of recontamination and abrasion of the sensitive disc heads and ensure continuously reliable data capture and transmission.

Floppiclene with 20 disposable cleaning discs. £14.50(b).

# COMMUNICATIONS

## MODEMS

**ACORN PRESTEL:** The official Acorn add-on — an advanced BT Approved. Auto-Dial, Prestel Terminal ideal for British Telecom Gold. Comprehensive software includes 'tagged' frames, downloading of Telesoftware, saving of frames, printing, sophisticated 'Mailbox' handling c/w editor. A built-in speaker allows line monitoring. A simple !BOOT file allows automatic operation **£99(b)**

**BUZZ BOX** A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as intercomputer communications. It conforms to CCITT V21 300/300 Baud Standard. Battery/mains powered **£62(c)** BBC Lead **£6** External PSU **£9(c)**

**MINOR MIRACLES WS2000** A world standard modem, having BT approval, covering V21, V23, BELL 103/113/108 and including 75,300,600,1200 Baud ratings. (It even includes 'reverse Prestel!'). This is the modem that will cover 'Prestel' type systems as well as Bulletin Boards both in the UK and abroad. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible



computer controlled auto-dial/auto-answer makes this modem unique. WS2000 **£129(c)** BBC Serial Cable **£7**

**WS2000 Auto-Dial card:** includes an integral loudspeaker for monitoring of the phone line **£30(d)**. BBC User Port cable (for modem control) **£7**.

**SKI KIT** (Allowing total control of the modem by your computer) **£10**.

**DS1 Disc (for Commstar):** When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers for autodialling **£10**.

**WS2000 Auto-Answer Card** **£30(d)**.

(Please note that the A/D & A/A Cards are still awaiting BAPT Approval.)

**UNICOM** A High Performance, yet low-cost Modem. Features include: Auto-dial & auto-answer, Auto baud rate scan, 75,300,1200 Baud rates with V21, V23 and Bell standards. Sophisticated software in ROM allow many features like: Auto-Dial, Redial, Remote facilities etc. An Auto-Dial disc allows storage of commonly dialled numbers. UNICOM **£49.95(b)** Unicom ROM **£20** Unicom Disc **£9.95** Unicom Cable **£6(d)** Not BT approved

**TELEMOD-2** A BT approved modem complying with CCITT V23 1200/75 Duplex & 1200/1200 Half-Duplex standard, that allows communication with Viewdata services e.g. Prestel, Micronet etc., as well as using 1200 Baud for communicating with other computer users. Mains powered. TELEMOD 2 **£65(b)** BBC Lead **£7.00**

**COMMSTAR** An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. All input may be copied into a buffer in memory over which full control is available. Controls of protocols are very simple and any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time-clock. **£29(d)**

**TERMI-II** A good all round package for communicating with notice boards, electronic mail services etc. Termi is a semi-intelligent terminal emulator allowing the BBC to act as a dumb terminal, slave BBC graphics terminal, or VT52 terminal. The rates at which data is sent or received is easily set up with rates of up to 4800 Baud with 40/80 col. selectable. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Termi is not suitable for PRESTEL). **£28(d)**

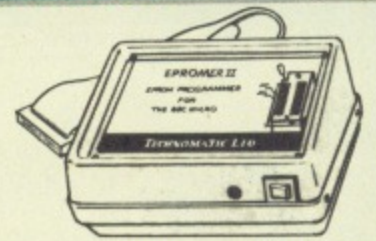
**COMMUNICATOR** This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). **£59(d)**.

# TECHNOMATIC

All prices exclude VAT

## EPROMER II

This enhanced eprom programmer will handle the full range of popular single rail eproms. Its sophisticated menu driven software makes the programming of eproms simple and efficient. Features included in this programmer are normally found in industrial grade programmers costing many times more.



- \* Interfaces with the BBC through 1 Mhz bus. Fully buffered and complies with the ACORN protocols. Integral power supply ensures no power drain from the computer.
  - \* All eproms up to 16K programmable in single pass.
  - \* User friendly software driven menu provides total control from the keyboard — no knobs to fiddle with.
  - \* Selectable programming voltage — 25/21/12.5V.
  - \* Defaults to normal programming — high speed algorithmic programming selectable.
  - \* READ/BLANK CHECK/PROGRAM/VERIFY at any address or addresses.
  - \* Constant display of all options selected.
  - \* Full screen editor with HEX/ASCII input — Full TAPE/DISC filing facility.
  - \* Data entry from the keyboard, disc/tape or another eprom.
  - \* Several BBC BASIC programs can be entered on one eprom.
- EPROMER II with manual & cassette **£99(b)** Software on: Disc **£3** ROM Based software **£12.50** extra

## UV ERASERS

**UVT1T** Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59(b)**.

**UV1T** as above but without the timer. **£47(b)**.

For Industrial Users, we offer UV140 and UV141 erasers with handling capacity of 14 eproms. UV141 has a built in timer. Both offer full built in safety features UV140 **£61**; UV141 **£79(b)**.

## SMARTMOUTH

The original 'Infinite Speech' Synthesiser — Still the best around!! A ready built, self contained speech synthesiser unit, attractively packaged with built in speaker. Tailored frequency response audio stages for optimum sound quality. Any word can be easily created — very economical with memory. Plugs into the user port — no roms required. Demo and development programs supplied on cassette (easily transferred to disc) **£31(c)**

## 'TIME-WARP' REAL-TIME CLOCK CALENDER

We have broken the price barrier! A low cost unit, allowing the facilities of units costing far more. Built to professional standards, it opens up the total spectrum of Real-Time applications. Possibilities include desk diary/planner, calendar, continuous display of on-screen time and date information, automatic document dating, precise timing and control in scientific applications — its uses are endless. Simply plugs into the user port — battery backup is supplied as standard. A full manual as well as Extensive software on cassette (easily transferred to disc) — no ROMs needed. **£29(c)**



## RAMROM-15

The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. (Allows other units to be fitted inside the BBC). Absolutely no soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. All the hardware to take the RAM is already fitted e.g. battery backup. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual. **£112(b)**

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Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and VAT at 15% to order. Carriage (a) sent by Datapost

## ATPL SIDEWISE ROM EXPANSION BOARD

This is a well constructed expansion board, that does not require soldering in its installation. All buses are buffered. It allows full sideways Rom expansion to a total of 16 ROMs. One socket has been split into two 8K sockets to allow the use of 8K byte CMOS RAM chips, giving a total of 16K sideways RAM. This is ideal for sideways rom development, and will also allow downloading of software from cassette or disc. The battery backup option will allow retention of data in the RAM, when power to the computer is removed. Several link-selectable options include the choice of type of Eprom, and a 'write-protect' for the RAM option. £39(d) Back-up Kit £18.

## ACORN IEEE INTERFACE

This interface enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 separate IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. £282(a)

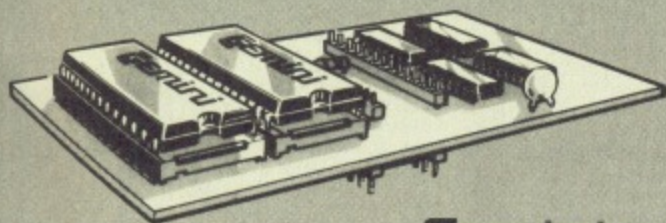
## ACORN TELETEXT INTERFACE

This interface allows the retrieval and storage of data transmitted by both BBC and IBA. There are currently many educational and other programs being transmitted, and this unit will allow their retrieval absolutely free. In 'Terminal' mode, the system receives and decodes pages from both Ceefax and Oracle. (These pages can be stored). In 'Telesoftware' mode, the system can load, run and execute programs that are transmitted. This unit gives you a professional teletext terminal at a cost effective price. £180(b)

## ACORN MUSIC 500

Convert your BBC micro into a sophisticated music composition aid and sound effects generator. Custom made software will provide you with the flexibility to compose, experiment, perform and teach music. Stereo output can be connected to a sound system including your home stereo unit. Full specification on request. £174(a)

## DATABASE MANAGEMENT SYSTEM



**GEMINI DATAGEM**

### The Definitive Random Access, 24K ROM Based DATABASE MANAGEMENT SYSTEM.

Datagem is the first truly flexible database for the BBC Micro that can make your system really useful and efficient, saving you money in the long run. The system includes a carrier board containing two Eproms, demonstration applications disc in both 40/80T, professional documentation with quick reference card, and 'Trans' utility program. Features include: \*almost unlimited file size (max 10MByte) \*supports up to 4 drives \*Max of 5000 records per file \*max 6K record size \*max of 62 fields \*9 level hierarchical search system with facilities to store results of searches. Searches can be any one of the following: Search, Include, Exclude, Combine, Common or Difference \*user defined variables \*generates form letters from records. Please ask for leaflet. £112(c).

**STARdataBASE** A fast machine code, true random access database program in a 16K Eprom. Up to 4096 records in a file, up to 69 fields in a record. The record layout is totally user defined. Entirely menu driven — thus very user friendly. Extremely fast searches are possible using the Keysearch facility. Mailmerging from View and Wordwise, and address labelling. Its printer configuration suits any BBC compatible printer. £75(d)

## ROMs/SOFTWARE

**VIEW** Acorn's new version V2.1 word processor rom. Advantages include printing straight from memory and editing in any mode. £48(c)

**HI VIEW** Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory. £52(c)

**VIEW INDEX** Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books. £13(d)

**WORDWISE** One of the most popular word processors for general use £34(d). Wordwise SpellCheck Disc — A must for any serious word processor user. Normal price £16.50(d). If bought with Wordwise: No p&p and only £14.

**WORDWISE PLUS** The new advanced Wordwise on a 16K eprom, for the more specialised users who require added features and flexibility. New facilities include: 2nd Processor compatible allowing 80 column previewing in all cases, a new Basic-like language, new editing features and embedded commands etc etc. Four new programs are also supplied allowing mail-merging, index generating, two-column text printout and continuous processing. A new 56 page introductory manual and a 180 page reference manual complete this rather special package. Finally, it is able to use existing Wordwise files without any modification. £49(d).

**SPELLCHECK II:** A rom based fast machine code program that works with both VIEW and WORDWISE. Vocabulary disc supplied with 6000 words can be expanded to well over 17000 words on 100K drive. Fully compatible with 6502 second processor. £26(d)

**ISO-PASCAL:** Acorn's full implementation of International Standard Pascal on two 16K ROMs. Disc Version for use on 6502 2nd Processor also supplied. Comprehensive manual. £60(c)

**ACORN LOGO** A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with a tutorial course and technical manual. £60(b)

**ULTRACALC 2** This enhanced version of the original BBC Publications popular spreadsheet rom includes many new features including full compatibility with the 6502 2nd processor running as HiCalc allowing 44K of user memory, operate in any mode, greater flexibility in printer control, spooling as ASCII file etc. All these features are in addition to the existing powerful features such as handling of labels and numbers as values. Column width control and features normality found in well designed spreadsheets. £69(d)

**VIEWSHEET** Acorn's spreadsheet provides 255 columns and 255 rows and will operate in any mode. Windows can be created which can then be rearranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor. £52(d)

**BCPL** A full implementation of the BCPL compiler language consisting of the language rom, disc containing the BCPL compiler, a screen editor, a 6502 assembler, other utilities and programming aids and examples of BCPL code and a 450 page manual. BCPL can be used to develop games programs, commercial packages, system software, to write control systems and to produce programs which otherwise would need to be written in assembler. £52(b)

**BCPL STAND ALONE GENERATOR** Utilities in this package enable the programs developed using the BCPL rom to be converted so that they can be run on any BBC micro whether it has a BCPL rom or not. Stand alone programs for other 6502 based systems can also be developed. £43(d)

**BCPL CALCULATIONS PACKAGE:** supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calculation files, example files and a comprehensive user guide. £17.30(b)

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# Painting by numbers

I LOADED **Number Painter** from ASK Software and let my two boys, aged 10 and 12, play with it – they were still playing it two hours later at bedtime.

Then my daughter, 17, and her boyfriend took over and I did not get a chance to play until the next day, and even then I had to get in quick before the boys came home from school. I give it thumbs up for interest and playability.

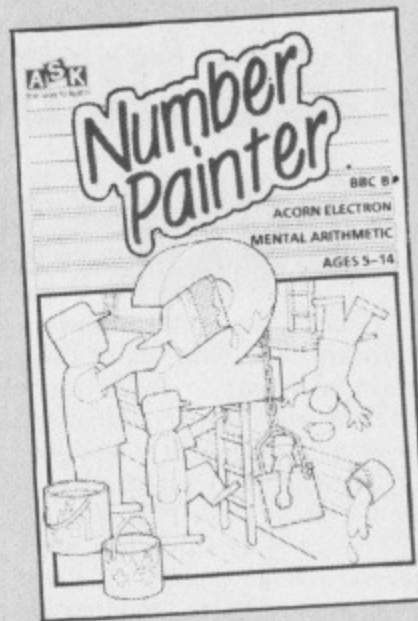
This is a girders and ladders program, another new twist to an old theme. The painter, who is beautifully animated, has to collect numbers to match a target figure using familiar keys

or joystick.

Each number has a +, -, x, ÷ sign and it gradually gets more difficult through 12 different levels. Success is rewarded with more difficult brain teasers and vice-versa.

The little man has four incarnations called Mr Plod, Mr Walker, Mr Speedy and Mr Swift. You choose the starting level and speed.

If the player tries to get a number which is too large – above 999 – or below zero, or if the painter falls through a hole in a girder, the game is frozen and there is time to work out the sum. However, once the man is



moving, time is limited by a rising bucket that floods the screen with red paint when it reaches the top of its chain and the man is lost.

The age range is supposed to be from five to 14. A five year old would have great fun on level one, but even when I cheated on

my calculator, I couldn't do level 12.

The instructions are in big, clear type and easy for an eight year old to read. The graphics and colour are very good.

Sound effects are used in a realistic way and they can be made louder or softer by a Ctrl-S command – very useful.

The one big fault with this program is that the authors have not disabled the Break key and if it is pressed the program is lost and has to be reloaded. This takes 2.4 minutes from tape.

A second section to this program is a self test which puts a series of sums on the screen at the level you choose and times the response.

Buy your child this game and he will gain a better understanding of numbers. But if you are a teacher, be prepared for each child to want the micro all day.

Alison Cernyw Hughes

# Out on the battlefield

EVER fancied leading your own army into battle? There are people all over the country who indulge in such fantasies every weekend. They are wargamers, and their hobby covers everything from skirmishes to full campaigns, from several centuries BC to several centuries AD.

**English Civil War** by Red Shift, is another offering to bring wargaming to the BBC Micro. The battlefield is the screen divided into a grid – which can be viewed at any time – with varying amounts of impenetrable wood scattered about.

Each side has units of pike, musket, artillery and cavalry, and a sconce or fort to defend. The various units have different fire power, movement and close quarter fighting abilities which each player has to use to defeat the other.

In reviewing this game I was looking for two things. Firstly, a game that is different from the usual run of Space Invaders/Pac-Man/Frogger/Donkey Kong types, and secondly, a genuine wargame on a micro.

It succeeds with the former, but as to the latter, I was



somewhat disappointed. If it is meant to appeal to wargamers rather than computer games freaks then it will fall short of a lot of their demands.

The sound effects are distracting and inconsistent. The graphics quite acceptable, except the sconce, though I wish more colours could have been used.

The response times of the keys are somewhat annoying, and there is no reason why the

same key has been used for moving and firing.

Also, it could have made playing easier the first few times if the values for ranges, close quarter combat and so on were in the instructions, rather than finding them out only during the game.

While playing the game, several incidents left me doubting the comprehensiveness of the program. The size of the battlefield limits manoeuvring. The composition of the armies is fixed, which most wargamers will not like.

Further – and I apologise if non-wargamers may not understand what I am getting at – the rules have several oversights. For example, musket units can fire at full effect while in hand-to-hand combat; attacking the side of a unit, particularly pike units, gives only a tiny advantage; units can back out of hand-to-hand combat without any problems; there is no morale system.

In the words of a nineteenth century French general: "C'est différent, mais ce n'est pas le wargaming".

Roberta Wood



# Pitched at right level

**RHYTHM and Pitch**, a suite of musical dictation tests, is rather unambitious in its scope, and certainly not the real breakthrough claimed by publishers Chalksoft.

But it undeniably has one major virtue which sets it apart from some of its competitors – it does what it sets out to do, and does it effectively.

In the refreshingly literate

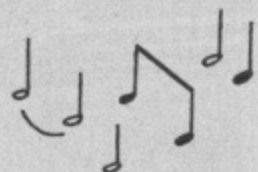
## From Page 41

documentation, the author rightly claims that his brainchild is for music students of all ages. His prime aim, however, has been to supply teachers with graded aural exercises extending to about CSE level.

The dictation tests are presented in groups of 10. Answers are entered with the function keys or, for some low notes, the appropriate letter keys (the program comes complete with a key-card inlay). Scores are displayed and, in the disc version, stored in a file which can be called from the menu.

Within the constraints of three metronome settings, five note values, four major scales, 3/4 or 4/4 time, and a choice of rhythm only, pitch only, or rhythm and pitch combined, various levels of difficulty can be selected.

But left to its own devices, the program will choose suitable test grades, based on a student's previous results.



In the more advanced melody tests, the student is required to use pen and manuscript paper. This steam-age approach clashes with high technology, but the method is practical if only because it simulates current exam procedures.

For checking, the correct answer is displayed on the screen.

Nothing is more obviously suited to a micro than ear-training tests, an area in which the micro's often-vaunted patience and anonymity can for once be of unquestionable benefit.

Students can practice these most nerve-racking of trials without standing in the well of a piano, under the gaze of a teacher who, by causing anxiety, may unwittingly slow down or even reverse the learning process.

And the teacher can be freed from the time-consuming business of individual tuition.

I can therefore recommend Rhythm and Pitch as a functional educational aid, and a real labour-saving device.

Gabriel Jacobs

# Has business potential - but examine with care

IN essence Acornsoft's *Business Software* series consists of two main systems - sales and purchases. There is also a mailing facility which makes use of customer and supplier data from both of these systems.

The series uses disc files and unless a large amount of disc swapping is to be endured a double drive is desirable.

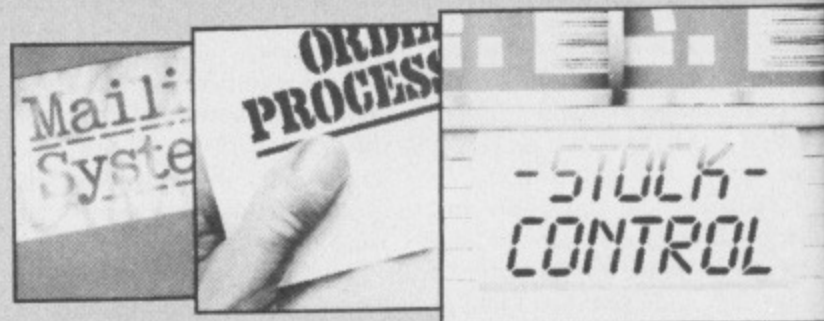
The sales system consists of invoicing, order processing, stock control and accounts receivable modules. The purchasing system consists of accounts payable and purchasing modules.

The modules can be bought separately or those for each system may be linked together, either initially or subsequently, to extend the processing available.

The series is therefore ambitious but I think flawed in some areas and potential users would be well-advised to examine carefully what is on offer before deciding whether or not the series is suitable for their business.

They may find it does not do either at all or easily what they assumed it would do.

Consider the stock system.



This is not updated or checked when the order processing system records that a despatch has been made - stock issues have to be specifically recorded, that is, effectively re-entered using the stock module.

The items purchased through the purchasing system do not in any way link with the items on the stock file.

As another example, invoices can only be produced if an order has been previously entered - even if the order processing module is not being used - but it is only possible to invoice for the whole order, not for part despatches.

Each module purchased has its own instruction booklet but about half of each is common to all. This is obviously so that each module can stand alone, but it does mean that if a number of

modules are purchased it can be a little difficult to appreciate how they interact and a bit of a search to locate answers to problems.

The series has of course many good points. For example, unlike some accounts packages for home micros, the sales and purchases ledgers are kept on the open item system so that details of all outstanding transactions are maintained.

Users are forced to match cash receipts or payments against specific transactions. I also thought that the screen and printed output layouts were good.

This series has the potential of being very good but I think that some modification and rationalisation is needed before it could be thus described.

Ken Garrett

## Terrorists can be unfair at times . . .

HAVE you ever wondered what it is like to patrol a street, just waiting for someone to shoot at

you? That is the theme of *SAS Commander* from Comsoft.

Unlike Northern Ireland however, the terrorists can be distinguished by their uniform. Which is just as well, since approximately 20 per cent of the time they open fire from behind hostages and you must dodge the bullets and hold your fire until the hostage gets out of the way. Shooting a hostage by mistake will earn you an immediate dishonourable discharge.

The game consists of a series of street scenes. In Street 1 there is only one terrorist shooting at a time. In Street 2 there are two on stage at once and Street 3 has three working together.

What happens after Street 3 I don't know - I never survived that long without being hit the four times necessary to kill me.

It seems a little unfair that while the terrorist can angle his shots across the screen to hit you, you can only shoot vertically - this is what makes it so difficult when there are two or three terrorists in action.

There is nothing particularly outstanding about this game. However, its price - £4.95 on cassette for BBC or Electron - makes it better value than a lot of games on the market.

No doubt it will make an acceptable birthday present for many younger readers.

Michael Gilbert



BBC Micro Utilities - a tape-based package - consists of a monitor and several example routines from a fairly good book on 6502 assembler programming on the BBC by Bruce Smith (Shira). This cassette is probably intended as an extra teaching guide to accompany it.

The package as a whole certainly does not come into the all-singing all-dancing bracket, although the initial loading screen did play a bar from Close Encounters with Lord Shiva kicking away out of time in the background.

A major problem with Beemon - the monitor utility - is it is written in Basic, and as such occupies a large chunk of memory which may be needed for other purposes such as your own machine code program.

Still, it features a disassembler, memory modifier, single-stepper, dump routine, memory move and fill routine,

and a cassette interface which is primarily a method of loading and saving your machine code programs.

The monitor runs in Mode 7 only, and is wholly menu-driven.

Most of the features functioned adequately, though not to a level which I would have thought necessary to be a proper training tool. For example, the stepper is not capable of displaying the instructions as it steps along a piece of code.

Also any errors in your machine code program will usually mean that you will have to come out of Beemon, load and

correct your program, assemble it again, save the binary code to tape, and then reload Beemon for another try.

Even worse, the instructions do not give any guide to the addresses where you may load your machine without corrupting Beemon itself.

The rest of the tape is padded out with example routines, such as word and multibyte addition and subtraction, hex and binary conversions, usage of some simple key input routines and so on. Nothing dramatic here except that they may save some typing for people following



Bruce's book.

In conclusion, this package is strictly low-cost beginner's application stuff and it is adequate in that respect. People wishing to take up 6502 programming further will still need to get a proper ROM-based monitor eventually.

Chris Chan

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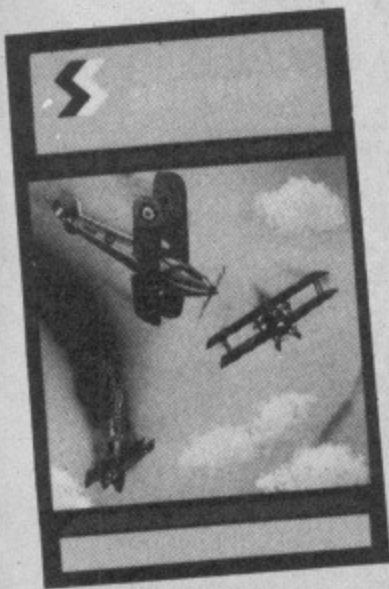
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## Flights through time

At the controls of your sleek craft you are transported through space and time as you single handedly tackle the most sophisticated war machines of five different time periods.

For several years *Space Pilot* has been one of my own particular favourite arcade games. I was therefore overjoyed to find Superior Software's version bore an uncanny resemblance to the original.

The game begins in 1916, the enemy being squadrons of

biplanes. As your ship is technically superior you have little difficulty in wreaking havoc with these antique aircraft. Their only form of attack is to lob bombs at you from the cockpit.

Having limbered up on the first four squadrons, an airship plus escorts appears. Destroy this and you collect a 2000 point bonus and are transported to the next level.

Our next stop is 1940 when we engage battle with squadrons of Spitfires. These prove to be a little more taxing as they can fire back.

They are also accompanied by the occasional larger plane which fires a constant stream of bullets in all directions. These appear if you dawdle around waiting for parachutists to drift down through the screen.

Flying through a parachute is worth 1000 points so these are often worth the risk involved.

Screen three takes place in 1970, when your new opponents are helicopters. You may not rate helicopters as being much of an adversary – and you would be correct – but you try knocking out the damn homing missiles they keep firing in your direction!

The next year, 1980, begins to sort the men from the boys. The jet fighters are fast and they also have no regard for the taxpayers' money as they squander homing missiles two at a time.

I would have loved to have told you all about the UFOs on screen five but due to cir-

cumstances beyond my control there always seemed to be one missile too many heading in my direction. Must be my magnetic personality.

*Space Pilot* is an excellent game for both beginner and hotshot. It begins nice and steady but once you reach the higher levels just watch those bad guys move.

Jon Revis

## Runabout database

COMPARED with the expensive Rolls Royce BBC databases, *Bel Base* is no more than a family run-about.

But then there's a difference between paying almost a third of the price of your machine for one piece of software, and a mere £18 for the disc version of *Bel Base*, which may well do all you want it to. The £49 will buy the ROM version, and if you can envisage a good use for a database on cassette, it will cost you £16.

As an automated card index, the package should satisfy basic home or club requirements. Creation of a file, addition and deletion of data or whole records, and simple searching and retrieval can all be carried out relatively smoothly. Sort speed is about average for a program in this price bracket.

*Bel Base* does lack some

features which many users are rightly beginning to expect as the norm. There's little scope for tailoring, no and/or operators, no file restructure option, no date field and sorting is on one key only.

On the other hand, some touches are quite unusual. A neat macro substitution allows automatic entry of repeated data. A global editing – search and replace – function is handy, though it has obvious dangers for the slaphappy user.

Mailshot – which comes with *Bel Base* but can also be bought separately – is not as impressive as its name suggests. It is little more than a label-generator, but it has a certain flexibility lacking in the report capabilities of some other databases for the BBC.

A companion program – *Bel Graph* (£17) – will produce bar graphs and pie charts from raw data in a *Bel Base* file. But that's as far as integration goes – there is no option in *Bel Base* for creating a spool file, let alone a direct link to a word processor.

The documentation is comprehensive, though the Jaberwocky flavour is a bit strong for the uninitiated and its level of literacy would certainly not have satisfied Lewis Carroll!

*Bel Base* is simple, and the disc-base version is cheap. On these grounds alone it's worth considering. But it's unlikely to toll the death knell for its competitors, even those in its price range.

Katherine Cranford

## Enigmatic workshop is fun

I HAVE been using *Workshop* by Acornsoft for some while now and I still don't have the faintest idea who it is aimed at.

I am convinced that it does its job perfectly, but there again it doesn't seem to have any pre-defined function. If all this sounds confusing, then it is a good reflection on this disc which is fascinating and great fun with little real purpose!

The scenario is a workshop with a choice of three shapes to work with – square, circle or triangle. A number of machines are available which can rotate, cut, stretch, paint the shape as it undergoes a strange metamorphosis before your very eyes.

The shape is first selected

from the shelf page and then moved to the plan stage. Here the shape lies surrounded by the various symbols which represent the various machines available.

These can be selected by use of the function keys as shown on the function strip which accompanies the program.

The drill bores a hole in the shape, placing a hole in the centre of the box. The shape has already been moved around in the box while on the plan page, and so the hole might not be central. A larger hole is made by subsequent presses of Return.

Painting is fairly obvious, with the colours all available except black. A rather interesting effect results from the NOT



function, which changes the shape under consideration from the shape itself to the mould around it. Shapes can be enlarged or reduced by the

arrow keys and the squash machine.

Perhaps one interesting way to get to grips with the program is in the form of a game. It is possible to use the look feature to show the steps of evolution which the shape went through.

If one child were to play around with a shape and machines in any way so wished, then a really challenging problem would be to recreate the original shape from scratch. It then becomes an absolutely fascinating pursuit.

As I said at the beginning, there is no specific purpose resulting from this program but it is enormous fun all the same.

Phil Taylor

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## Trying to get back into the black?

IN the red? Bank manager sending nasty letters? **Making Ends Meet** may help you get into the black again.

It is an educational simulation where the user is placed in the position of a young school leaver about to face the problems of personal budgeting.

It is intended to be used more as a stimulus for class discussion than as an individual learning device so would be a useful teaching aid for social studies and personal development lessons for 15-16 year olds. However it could also be used for a wider range of age groups and subjects.

The excellent screen layout and prompts make the equally excellent written instructions superfluous. After initial inputs giving details of sex, accommodation, transport and so on, the user is led through a number of situations where decisions have to be made with respect to spending and saving each week.

The program entices the user with frivolous ways of parting with money as well as a number of forced expenses of the type which could be expected in real life, such as road tax, new shoes and repairs.

Saving for holidays and entertainment costs are all part

of this well thought out program from Cambridge Micro Software.

At the end of the week the user has the dubious pleasure of seeing the micro spend his money and display the weekly balance, thus giving credence to Micawber's anecdote for happiness or misery.

The micro is the ideal educational tool for this type of interactive modelling since this sort of simulation is far too complex to be carried out using blackboard and chalk.

The booklet which comes with the tape emphasises the need for careful lesson planning

and gives advice on how to use the program along with minimum wages required for different situations and a sample worksheet.

Another plus for this package is that it comes with two utility programs which enable a teacher to modify options and responses generated by the main program.

This is an especially important consideration when buying well-protected software.

The program makes good use of attractive graphics to maintain interest. Highly recommended.

John Howard Daddy

## Enjoy going round the bend

At long last the eagerly awaited conversions of Atari classics are beginning to appear in the shops under the name of Atarisoft. Of the BBC Micro conversions **Pole Position** must be one of the best known.

Up until now motor racing games of this type have involved racing along a straight road weaving left and right to avoid the traffic. The only attempt at relieving the boredom being a change in the background colour.

Atarisoft's **Pole Position** scores very strongly over these earlier versions by the inclusion of that missing ingredient, bends.

The game consists of two sections - a qualifying lap and the race itself. As the game begins an airship and banner cross the skyline announcing the start of the qualifying lap.

The controls are simple - left, right, spacebar to toggle between high and low gears, and Return to brake. There is no accelerator - speed increases gradually in each gear.

The trick to achieving a high score is therefore to drive as smoothly as possible, no screeching around the bends, and the brake pedal is definitely taboo.

If you are to qualify for the main event then you must finish



in the first eight on this practice lap.

Having put in a good time in practice you find yourself on the starting grid. Depending on your time the number of cars starting in front of you will vary.

The airship announces the start of the big race, and the starting lights appear. Red . . . red . . . red . . . green, and you are away, the air heavy with exhaust fumes and burnt rubber, as you scream down the first straight leaving the opposition trailing behind in your wake (OK, so we all get carried away sometimes).

There is just one thing that puzzles me about the game. If I begin the race in pole position then why am I being hassled by a couple of reckless drivers by the time I reach the first bend?

This minor discrepancy aside, I found **Pole Position** graphically superior to the original Atari version. The game has been written to such a high standard that it is infuriatingly addictive.

Jon Revis

## Editing can be dangerous

HANDLING of numerical data is greatly simplified when it is represented in graphic form. However, the process of converting numerics into graphics is often complex and error prone.

To help, there are programs which do all the slog as well as allowing data to be manipulated as required.

Well known programs of this type for CP/M systems or indeed the BBC Micro with Z80 have price tags well into triple figures. So when I received **Datamaster** priced at £14.90, I approached it with trepidation.

**Datamaster** consists of four programs on tape which are chained in as required. The first program prints the title page and assembles a short machine code dump.

The second program - **Unidatam** - handles univariate data. When loaded, the program prints a menu. Through one of the options, you can enter your data then display it in the form of a pie chart or a histogram.

As expected, you can place any text to accompany the diagrams by moving a cursor around the screen and typing the text.

This is where you'll realise that this program is rather badly designed. If you suddenly decide to change or add some data

while editing the screen and go back to the menu, all your handiwork is lost for ever.

This means that you must save the screen every time you want to amend data.

Just to aggravate matters, there are some striking omissions. For instance, you cannot explode part of a pie chart, you cannot print text vertically with rotated text and you cannot shade in areas for emphasis.

Most surprising of all was the omission of an easy automatic axis labelling facility.

The manipulation of data is rather clumsy in that you enter the data number you want to change and input the new value without seeing the old value.

The same sort of criticism goes for the other two programs, **Bidatam** - handles bivariate data - and **Multicart** - handles multiple bivariate data.

One good thing about this package was its manual. It is clear and precise even though it is cheaply produced on a dot matrix printer, although mine may be a pre-production copy.

Although this is easily the cheapest program of this type for the BBC Micro and I quite liked **Multicart**, there are superior disc-based programs costing only slightly more.

Shingo Sugiura

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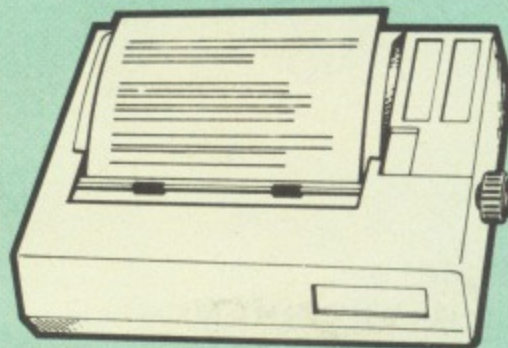
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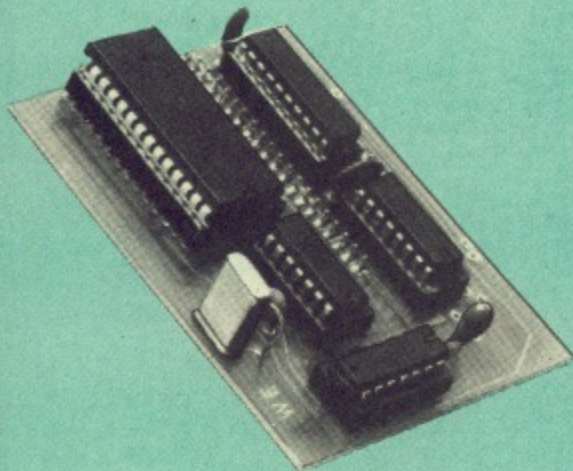
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The DDFS supplied is a new version of the popular Watford Electronics DFS re-written to make full use of the capabilities of the new double density controller. Runs the version of Acornsoft ELITE that we sell.

- Increases storage capacity of your Disc Drives by the maximum physically possible, **80% !!!**
- Our system will use the whole of an 80 track drive. Inferior systems do not allow files longer than &3FFFF bytes, but with our system files can be as long as one disc side.
- Discs may be created in either single or double density format with the built in formatter and in single density mode are fully compatible with normal Acorn format discs.
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- The double density system is of course faster than single density.

The Watford Electronics DDFS implements an extremely comprehensive 8271 emulator so that commands passed through OSWORD & 7F are correctly interpreted. Other manufacturers thought that read and write sector alone were sufficient - we decided to implement every command of the 8271 that was physically possible. We have allowed the use of all the special registers including bad tracks, allowed access to deleted data etc., etc. The emulator itself takes up around 1K of compactly written machine code. We reckon it will run many of the protected discs now available. Gain all the advantages of the WE DFS together with much increased storage and compatibility with many existing protected discs. (please write-in for full technical specifications)

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- "Good value for money" - Beebug
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- "Superior DFS: Excellent disc sector editor" - Computer Answers

Without a doubt the most sophisticated DFS software yet written for the BBC microcomputer. This powerful DFS is fully compatible with the ACORN DFS, yet has much increased power due to the additions, carefully designed to make life easier in normal use. It consists of 16K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

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Watford's DFS is exclusively available from Watford Electronics. We DO NOT retail this product through dealers. Every ROM carries a printed label with our LOGO and a serial number.

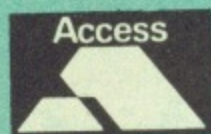
### THE FEATURES OF WATFORD'S SINGLE & DOUBLE DENSITY DFS.

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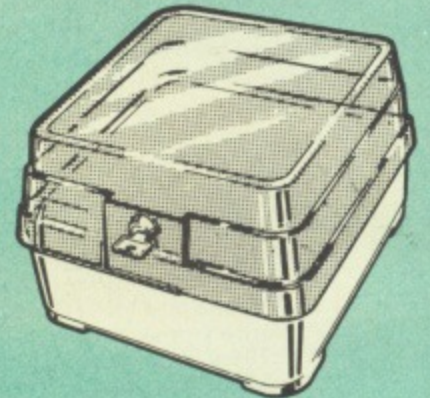
- For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford Electronic's new book entitled 'MYSTERIES OF DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

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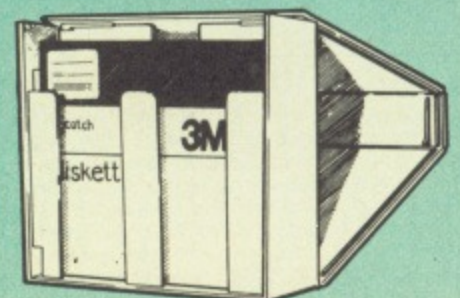
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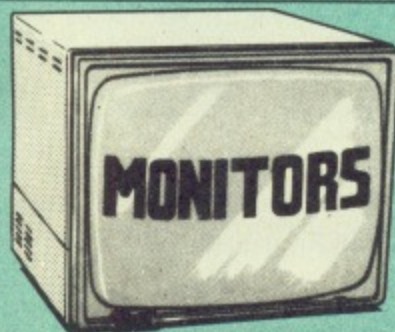
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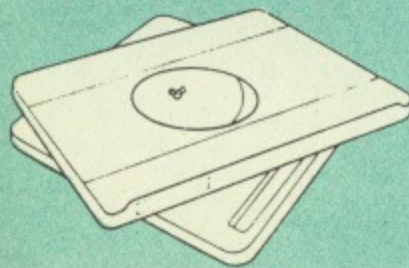
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### P.S.

● You do not require a formatting Disc nor the expensive 40/80 track switchable Drives when using Watford's sophisticated Disc Filing System which has this facility as one of the many facilities incorporated in it as standard.

Cont.

● MITSUBISHI & EPSON Slimline 400K Disc Drives that we supply are Double sided Double Density, 1 Megabyte unformatted, (With BBC Micro 400K after formatting). When used in conjunction with our Double Density Interface, you obtain 725K formatted. Track density is 96 TPI, track to track access time is 3mSec. These drives are very fast, quiet and efficient. We strongly recommend them.

● Extensive test carried out in our workshop has proved that the BBC Micro's own switchmode power supply is capable of driving 2 disc drives and a host of Sideways ROMs without undue heating. We recommend our CLS & CLD range of Disc Drives which will save you considerable expense without sacrificing performance.

● Please send an SAE, for further technical specification on our Disc Drives.

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A ROM based fast spelling checker essential to serious word processing users of the BBC micro.

Compatible with the popular word processors VIEW, WORDWISE and also with \*SPOOLED text files. Allows misspelt words to be changed without returning to the word processor. Simply load the text and execute the spelling checker, correcting the words as you go along, or all at once at the end.

An optimised word compacting technique gives a comprehensive 30,000 word dictionary as standard as well as a user defined dictionary for specialist applications. Efficient data storage also means faster operation, text can be checked at 160 words per minute!!! Equivalent to looking a word up in a standard dictionary in well under half a second!

An ambiguous word checking facility allows partially spelt words to be checked against the dictionary and all the matches displayed. This is ideal when you are uncertain of a spelling and a boon for crossword addicts!

Full access to the dictionary from BASIC allows users to check words from within their own programs. Useful for educational programing and also to compilers of word puzzles and anagram solvers. Save time spent looking in dictionaries, use ROMSPELL.

ROMSPELL is supplied on a ROM with the dictionary disc and full instructions for Only:

**£25**

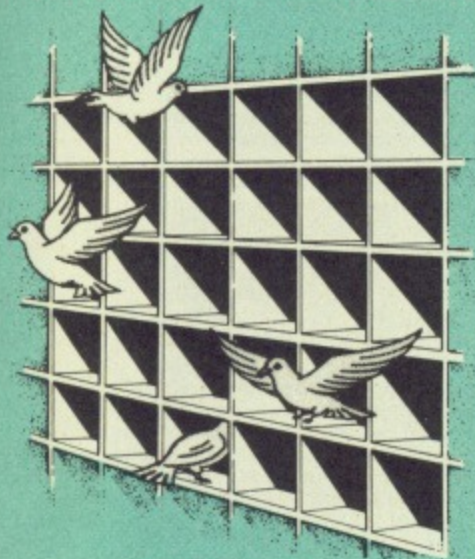
(Please specify 40 or 80 tracks when ordering)

Continued





## TWO DATABASE MANAGEMENT SYSTEMS



### DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious. Despite the ease of use this system provides all the facilities needed for complex data handling problems. The length of database that can be handled is only limited by the total space on the disc. You can have up to 20 fields with page length records up to 254 bytes in length. Adding and deleting records, amend titles, field names and records. Sort on any field and search for any record or group of records in any field. The database may be re-formatted after creation, the system will re-write all your files for you automatically. You may add extra fields and extend the length of existing fields freely. Output formatting is very powerful. You are allowed 40, 80 or 132 column output modes going to printer or screen. Selected fields can be put in any order on the screen or printer, either across the paper or down. Output can start or stop anywhere in the file. Decimal fields are automatically totalled and records output are counted. Version 2, now on sale has improved input and amendments procedures giving full record edit as well as the 3 extra features... String searching, Calculations on numeric fields, and the ability to create sub files from your main files.

On disc at **Only £17**  
(Please specify 40 or 80 track when ordering)

### FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer. File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density. The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis.

Cont.

Operations supported are -, +, \*, /, +-999999 9999.9999 and compare facilities =, >, <, >=, >=, <=, &.. Many keywords are supported by the language: assign, compare, display, and, goto, iff, ift, print, read, search, spool and update. Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

**Only £43**

(Please specify 40 or 80 tracks for the utilities disc)

### DATAGEM

Gemini's 24K ROM based DATABASE Management System  
Special Offer: **£110**

### PEN PAL - VERSATILE LIGHT PEN SOFTWARE

Do you have a light pen that never gets used? Then this piece of software is for you. This package offers many useful facilities that make the light pen a useful device to own. Facilities included are:

- Pixel, Line and Character definition
  - Free hand drawing
  - All Colours
  - Fill, Refill and stripes
  - User defined "Brush strokes" plus character definer
  - Grid, Scale and perspective aids 2 to 200 points palletable in one design with Circles and "rubber banding"
  - Move design/character to any screen position
  - Save and Load screens, User defined characters and line drawings for video titles, own programmes etc.
- This program has many uses in education and at home. It is supplied with a comprehensive instruction manual. Works with Watford, RH, Acorn User, DIY and many other Light Pens.  
Prices TAPE ..... **£11**; ..... DISC **£12**

### LIGHT PEN



This Light Pen for the BBC micro is packaged in a neat pen shape with built in switch. Supplied complete with our sophisticated Pen-Pal software on cassette (see elsewhere in this ad).

**Only £20**

(For software on disc please add £2)

### DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your cassette programs to disc. If you have difficulties transferring your cassette software to your disc system then this is the answer. It handles 'locked' files and full length adventures (up to &e blocks) and programs that load below &E00. It is very simple to operate with instructions supplied. It saves you time and money. (Compatible with Single density Disc Interfaces only.)

**Price £10**

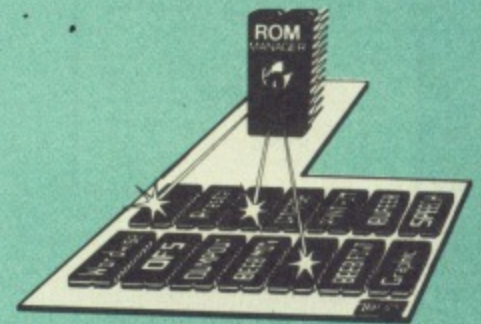
(Please specify 40 or 80 track discs)

### ADE

'Systems' complete program development package in a 16K ROM. Full assembling and debugging facilities provided.

**SPECIAL OFFER ONLY £43**

### ROM MANAGER



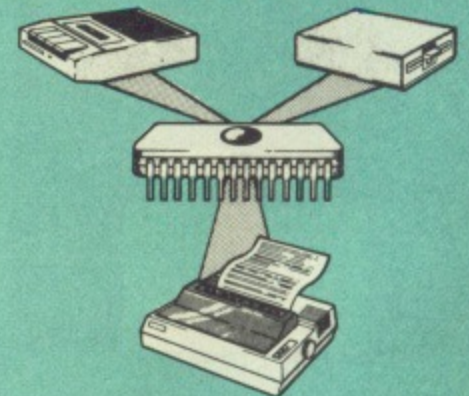
'Provides comprehensive management of all your installed ROMs - BEEBUG Nov. '84'. This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself. ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.

The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

All selection between particular ROMs is by the name of the ROM and this may be abbreviated for convenience. ROM numbers can also be used if required. This ROM is very simple and obvious to use. All the facilities are explained in the clear and detailed manual.

**Price £22**

### BUFFER & BACKUP ROM



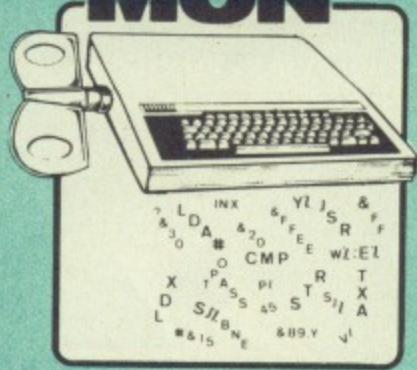
For those with sideways RAM fitted in their machines this utility ROM will make full use of this facility. By using the sideways RAM area for extra memory the following features are implemented:

- ★ 4K or 16K buffer for parallel printer.
- ★ Dumps selection of Disc files to Tape.
- ★ Makes backup copies of tapes on to tape and disc.
- ★ Displays contents of paged ROMs on screen.
- ★ Menu display of ROM filing system contents on Shift-Break.
- ★ Comprehensive manual.

**Only £22**

**Continued** →

# BEEB MON

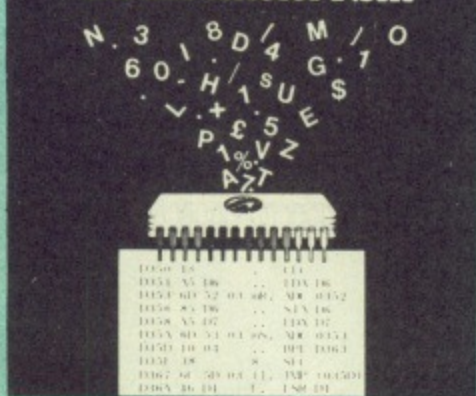


Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics. In use as a debugging tool, you run code under a total emulation system. Ever felt a desperate urge to set a break point in ROM? No problem - you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode. Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a virtual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being executed at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

£24

## Disassembler Rom

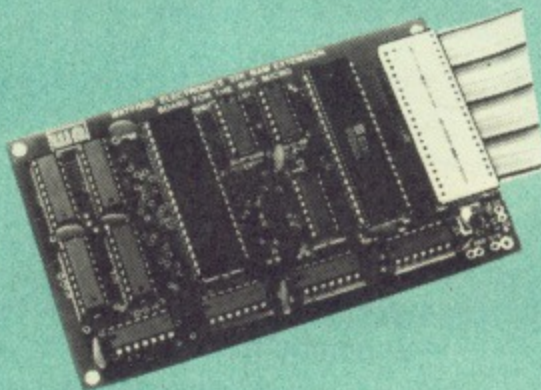


Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use programmers tool.

A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled. Thus DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.

ONLY £18

# 32K RAM EXPANSION BOARD



Now Watford Electronics brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. It's ribbon cable simply plugs into your micro's 6502 processor socket. This compact board which fits inside the computer doesn't just give you 16k or even 20k of extra RAM, but a massive 32K!!!

There are many more useful facilities available with this board:

- The top 20K of the expansion RAM can be used as the screen display memory, leaving all the standard BBC RAM free for programs or data storage. This allows good graphics and long programs to be combined. For instance you could have MODE 0/1/2 GRAPHICS AND 28K OF PROGRAM SPACE. The extra memory can be used by virtually any language or utility such as BASIC, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, etc. and NOW COMPATIBLE with Beebug's TOOLKIT.
- The FULL 32K or the bottom 12K of the expansion RAM can be used as a PRINTER buffer for SERIAL PARALLEL printers, sound channels, RS423, keyboard or speech synthesiser. This allows very long text files to be printed while you are using 28K of program and 20K of graphics! THE BUFFER IS UNIQUE because it replaces one of the BBC Micro's buffers so all the buffer options are available on it. eg. \*FX15,21, 138, 145, ADVAL(-no.) etc.
- This board is the IDEAL COMPLEMENT to any WORD PROCESSING system, disc or cassette based. There is no need to wait for slow printers as you can type in long text in 80 column display mode while printing is going on - TWO JOBS DONE SIMULTANEOUSLY!!! (an equivalent printer buffer would cost you £120 +).
- Unlike our competitors, the board is compatible with a vast range of software and hardware available for the BBC microcomputer, including our ROM expansion boards, double density DFS units, and the ATPL ROM extension board. This is because our board is connected to the computer by means of a ribbon cable without soldering. It can either be left in the micro or stuck to the lid with the 4 self adhesive feet supplied.
- The board comes with a comprehensive manual and ROM based software with a large range of commands for machine code and BASIC users, including many \*HELP messages.
- Now the ROM has had a host of utilities added to the large number already provided and has been made even easier to install.

Only: £65

## GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER £86

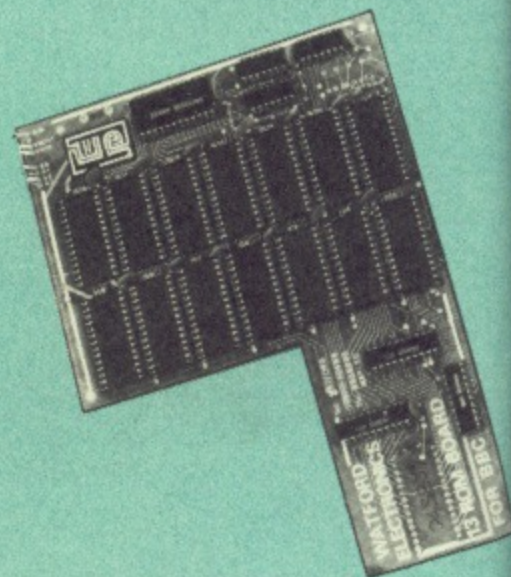
## BEEBFONT ROM

BEEBFONT is a remarkable and different concept BBC software supplied on a 16K ROM. It allows you to display text on the screen in 13 different styles.

It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V - press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size. You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters. A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

SPECIAL PRICE ONLY £32

## Mk-2 13 ROM SOCKET EXPANSION BOARD



Now all lines fully buffered - On board battery back-up facility - will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. Unlike other ROM Boards, this board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, RAM Card, etc., without any clash. (At Watford, we think ahead). Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

SPECIAL OFFER: £30

## COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	£28
Graphics ROM	£28
Disc Doctor ROM	£28
TERMI	£27
COMMUNICATOR	£58

## Wordwise

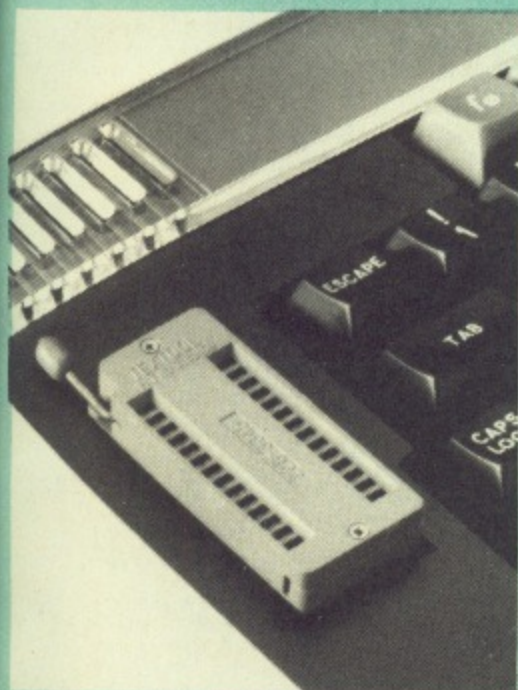
Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

**SPECIAL OFFER THIS MONTH: £32**

## WORDWISE PLUS

Now available from stock **£49**

## SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort - no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

- Very simple to install. **NO SOLDERING REQUIRED.** The ZIF eliminates the possibility of damage to your ROM pins when inserting and extracting them.

- The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new ROM.

- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

- This versatile hardware solves the problem of running out of socket space, simply unplug the ROM and plug in a different one. It is a real must for Professionals and Hobbyists alike.

**ONLY £18**

## WORDWISE PLUS UPGRADES

Existing users of Wordwise can upgrade to WORDWISE + for £17. Please return the old WORDWISE package complete with Chip and MANUAL with your remittance and we will send you the new WORDWISE + package.

**£17**

## BEEBUG SOFT

SLEUTH ROM	£25
TOOLKIT ROM	£23
ACORN 1.2 DNFS ROM	£15
ACORN 1.2 OS ROM	£10
ACORN BASIC 2	£20

**APPROVED** for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use.

## MODEM 84 PRESTEL TERMINAL

For the BBC Microcomputer



The Watford Prestel package consists of the B.T. approved Watford MODEM 84 (1200/75 baud full duplex 1200 baud half duplex direct connect) and a very sophisticated Prestel Terminal ROM. Please write-in for full technical literature.

### PRICES

MODEM 84 (with Lead & Manual)	£55
MODEM 84 complete with PRESTEL SOFTWARE ROM, Lead and manuals	£75
PRESTEL SOFTWARE ROM + Manual	£20
USER to USER 1200 BAUD SOFTWARE ROM	£18

(At these incredibly low prices for such a sophisticated BT Approved Prestel Terminal, Modem 84 has to be the best buy around)  
(Carriage on Modem £2)

## Nightingale Modem

Now Watford brings you PACE's NIGHTINGALE MODEM PACKAGE including the popular Commstar ROM software for the BBC Micro. Nightingale is considered to be by far the most versatile BT approved modem available at the price for the BBC Micro. It is ideal for home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) as well as 300/300 baud full duplex for communication between BBC and other computers, including bulletin boards. A bargain at our

### SPECIAL INTRODUCTORY OFFER

(Price includes COMMSTAR ROM & comprehensive manuals) **£119**

COMMSTAR ROM package **£29**

**NEW LAUNCH**

## 16K DISC RAM

This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- All existing ROMs can be stored on disk and used in DISC RAM.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM.

Only: **£39**

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

## Versatile BEEB SPEECH SYNTHESISER Unit



**SIMPLY the best!** - An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!

**PHONEMES** for word synthesis - That means unlimited vocabulary! No extra speech dictionary chips to buy!

**BUILT-in** Library of approximately 500 words to get you started.

**ENGLISH** accent - Utilises inflexion techniques to produce highly comprehensible speech.

**EASY** to use system - Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!

**COMPACT** unit - The whole system is built into a small case - easily tucked behind the computer. Auxillary output socket provided for direct connection to an external amplifier.

**HOURS** of fun! - Suitable for any application - Games, Educational Programs, Specialised Packages.

We know this all seems too good to be true but **DON'T BE LEFT SPEECHLESS!** Order your Versatile Speech Unit now!

**SPECIAL OFFER £35**

**Continued**

## BOOKS (No VAT on Books)

30 Hour BASIC (BBC Micro) .....	£6.95
35 Education Programs for BBC .....	£6.95
40 Educational Programs for BBC .....	£5.95
100 Programs for BBC Micro .....	£6.95
6502 Application Book .....	£11.95
6502 Assembly Language Program .....	£13.95
6502 Assembly Language Subroutines .....	£14.25
6502 Machine Code for Beginners .....	£5.95
6502 Machine code for Humans .....	£7.95
A young persons guide to BBC Basic .....	£4.50
Advanced Machine Code Technique for BBC .....	£7.95
Advanced Programming for the BBC Micro .....	£6.95
<b>Advanced User Guide for BBC Micro</b> .....	£11.95
Advanced Graphics with BBC .....	£9.95
Advanced 6502 Programming .....	£12.45
Assembly Language Programming on BBC Micro .....	£7.95
Advanced Programming Techniques for the BBC Micro .....	£7.95
BBC BASIC for Beginners .....	£7.95
BBC BASIC .....	£5.95
BBC DIY Robotics & Sensors .....	£6.95
BBC Forth .....	£7.50
BBC MICRO add on guide .....	£6.95
BBC Micro An Expert Guide .....	£6.95
BBC Micro Book BASIC Sound & Graphics .....	£7.95
BBC Micro Graphics and Sound .....	£6.95
BBC Micro Programs in Basic .....	£5.95
BBC Micro <b>ROM PAGING</b> System Explained .....	£2.00
BBC Micro Revealed .....	£6.95
BBC Micro Disc Companion .....	£7.95
BBC Micro in Education .....	£6.50
Basic Programming on BBC Micro .....	£5.95
BBC Software Projects .....	£5.95
Brain teasers for BBC micro .....	£5.95
CP/M Handbook with MPM .....	£11.95
CP/M The software BUS .....	£8.95
Creating Adventure Programs on BBC Micros .....	£6.95
Creative Animation & Graphics .....	£7.95
Creative graphics on BBC Micro .....	£7.50
Complete Programmer for BBC .....	£5.95
<b>DISC FILING SYSTEM (DFS)</b> <b>Operating Manual for BBC</b> .....	£6.95
Discover BBC Machine Code .....	£6.95
Discover FORTH .....	£13.95
DIY Robotics & Sensors with BBC .....	£6.95
Easy Programming for the BBC Micro .....	£5.95
Exploring FORTH .....	£6.95
Further Prog. for BBC Micro .....	£5.95
FORTH on the BBC Micro .....	£7.95
Forth Programming .....	£14.40
Functional Forth for the BBC Micro .....	£5.95
Games BBC Computer Can Play .....	£6.95
Getting more from your BBC & Electron .....	£6.95
Graphs & Charts on BBC Micro .....	£7.50
Graphic Art for BBC Computer .....	£5.95
Handbook of Procedure & Functions for the BBC Micro .....	£6.95
Introducing the BBC Micro .....	£5.95
Introducing LOGO .....	£5.95
Introduction to PASCAL .....	£14.95
Let your BBC teach u to program .....	£6.45
LISP .....	£9.25
Logo Programming .....	£8.95
<b>Mysteries of DISC DRIVES and DFS REVEALED</b> .....	£5.95
Mastering CP/M .....	£13.65
Programming the 6502 .....	£11.95
Programming the BBC micro .....	£6.95
Programming the Z80 .....	£14.95
Programming with Graphics .....	£5.95
Structured Prog. with BBC BASIC .....	£6.50
The Complete FORTH .....	£6.95
The Complete Programmer .....	£5.95
<b>The Epson FX/KAGA PRINTER Commands REVEALED</b> .....	£5.95
Using Floppy Discs with BBC Micro .....	£5.95
Using BBC Basic .....	£6.95
Wordstar & CP/M made easy .....	£6.95

Watford brings you

# THE AMX MOUSE

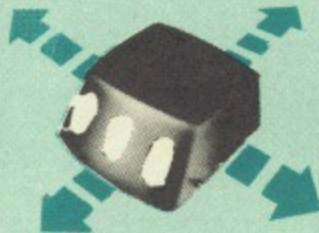
'The program is simplicity itself and the user manual is virtually redundant' ... Micro User Jan. 85.

Bring into your home or office the last word in user friendly input devices for the Beeb. The AMX MOUSE that won the hearts and the minds of thousands of visitors at the Show has arrived at Watford Electronics at a very special price!

Using simple icons, and small movements of the mouse on a work surface, you can select any one of the functions from the pull down menus. The mouse will operate from within Wordwise, View and many other software packages. The three buttons built in to the mouse are user programmable for many extra functions.

The package consists of the mouse, the advanced controlling software in ROM and a disc containing the Icon designer and the AMS ART software.

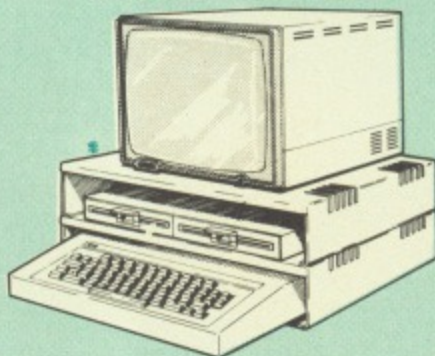
To summarise this superb product a comment passed by a very senior authority on BBC micro at the last Micro User Show was, 'My only criticism of the product is that, IT'S TOO CHEAP!'



OUR SPECIAL INTRODUCTORY  
OFFER PRICE

**ONLY: £68.50**

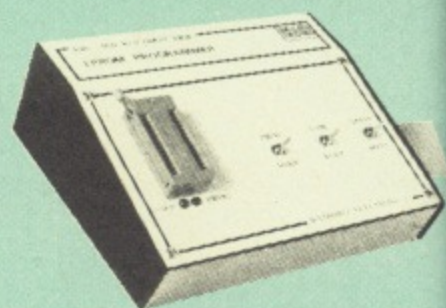
## PLINTHS FOR BBC MICRO AND PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH ..... **£11** (carr. £1.50)  
DOUBLE BBC PLINTH ..... **£20** (carr. £2.00)  
PRINTER PLINTH ..... **£10** (carr. £1.50)

## EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed - wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connect directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

### SOFTWARE PACKAGE

The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and integrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

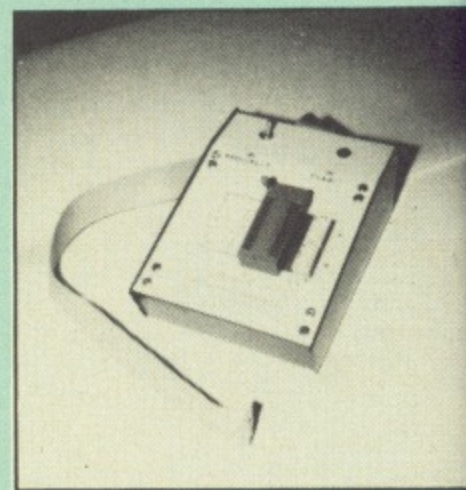
### Software facilities include:

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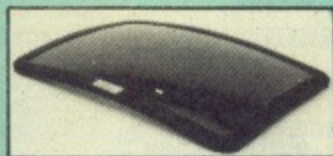
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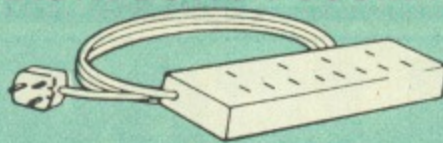
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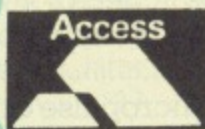
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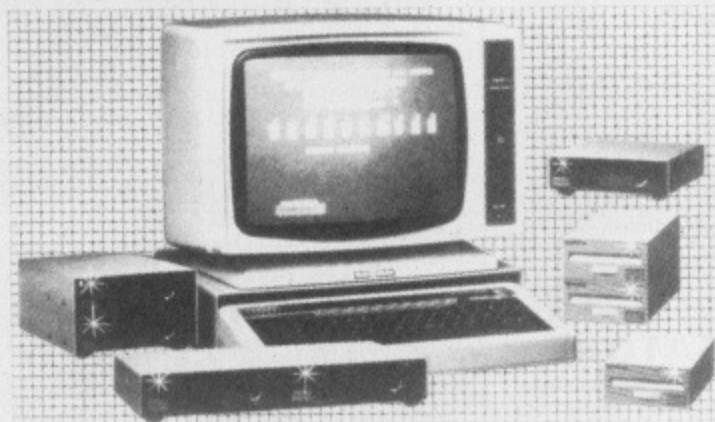
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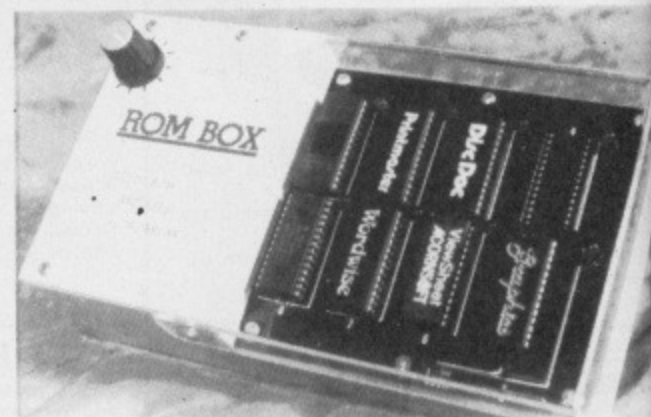
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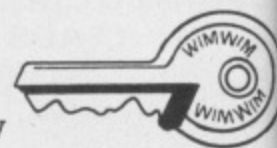
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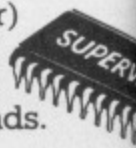
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# PROBLEM PAGE

Your technical queries answered by MIKE COOK

I AM becoming confused about the increasing number of expansion possibilities for the BBC Micro and would be grateful for your help.

My present system is a BBC B with a Watford Electronics DFS, Wordwise, Commstar and Acorn Speech ROMs. My requirements are more ROM space and more memory.

The simplest way would seem to be a sideways ROM board and a second processor. However I am confused about the meaning of sideways RAM, like the Solidisk system.

If I purchased a sideways ROM/RAM board, would this do away with the necessity for a second processor, and how is the RAM used?

Also, if future second processors have larger address buses will this mean money spent now on sideways RAM would be wasted and indeed are these systems likely to be compatible?

Finally, does the sideways RAM take up ROM space, and thereby reduce the number of ROMs one may use? — *John Hammonds, Plymouth.*

● You can have up to 16 sideways ROMs in the computer at one time. If you have any sideways RAM this reduces the number of permitted ROMs.

Many boards are available to give you the extra sockets. A Watford Electronics board allows many more, but they are switched in in banks of 16.

Sideways RAM is used to mimic sideways ROM and although you cannot store programs in it you can store data. For each sideways RAM you

have you will lose a sideways ROM unless it is switched by some other means like the user port (as used on the Solidisk system).

The only way you can get extra storage space for your program is by using a board like the Aries board that bank switches RAM and separates display and program memory.

If you buy a second processor all your sideways ROMs will still work providing the programs have been written properly (which a lot have not been).

However once you have a second processor your display memory is in the original computer and all the program memory is in the second processor. Therefore while you can still use the memory in an Aries board for storing data from machine code programs it is no longer used for storing Basic programs.

## Second drive . . .

I OWN a Cumana 100k single drive, but am now considering buying another single drive unit.

My problem is that the cable will have to be split between the

two cases. This I presume is possible.

I would be very grateful if you would advise me on the connections that will have to be made. — *N.D. Blount, Wolverhampton.*

● A second drive is added by simply placing another insulation displacement edge connector socket on the cable and tightening it up in a vice. The new connector plugs into the new drive.

Alternatively if you specify a double cable with your new single drive the dealer can supply it.

## . . . driving me mad!

I RECENTLY bought Elite on disc for my BBC Micro. However I now have a large problem. In short — it doesn't work.

My set-up is a BBC, a Teac 40 track single sided disc drive which runs from the computer's auxiliary output, and nothing else (ROMs etc). So what's wrong?

The only things that occur to me are that:

● My Beeb is three this month

and the symptoms of ULA failure have been manifesting themselves for the last six months.

● My disc head is out of alignment or some other calibration failure is confusing Elite.

However my drive works perfectly at all other times — if a little noisily, although \*FX255,0,207 seems to cure that, thank you.

I've even tried sink-testing the drive by making it load the same long file 50 times, etc, and no problems.

What happens with Elite is that often, although not always, when it has to load a new section one of two things happens. Either I get a disc error at 66/03 or wherever, or the screen fills up with a meaningless pattern, reminiscent of loading Basic into Mode 0's screen memory, which then resolves into a screenful of flashing green hyphens.

I tried taking the disc back to the suppliers and changing it, but that made no difference. I have had another thought on the matter, which is that my self-fitted stereo speakers might have been interfering, but removing them made no difference either.

Does having joysticks plugged in during loading interfere with Elite in some way?

As you can see from the somewhat less than methodical composition of this letter I am fairly desperate.

Should I ask Acornsoft for a copy on standard 40 format disc, on the theory that it's this weird 40/80 format that's interfering, or what? I'm totally at a loss. — *Ben M. Rapp.*

P.S. The printer isn't connected when I attempt to play Elite!

● I have trouble sometimes getting the 40/80 discs to work on my 80 track drive, so it is possible that you are suffering it too. Your trouble lies in the drive. All the other things you mentioned are just red herrings. (All computers should be clear of fish — *Ed.*)

I always recommend a separate power supply for discs, even for a single one, as there are question marks as to whether the internal supply can cope with the switch-on surges.

If you have a friend with a

## Will these parts do the job?

SINCE buying a modem, ex-British Telecom (type 2B), I have purchased the auto-answer kit at £2.50 from Display Electronics and it is with regards the kit and modem that I'm writing for your advice.

In the description of the auto-answer kit the two items mentioned are a thermistor type 1A and a 1.00mf 250V non-polarised capacitor.

The parts received were a thermistor type 1A-1 and a 1.5uF 63V filmcap capacitor. On querying the differences I

was told that the parts would do the job, though no explanation was given as to the varying values.

Could you explain these anomalies and describe the pin connection from the BBC B to the 25 way (RS232) of the modem? — *P. Edwards, Stockport, Cheshire.*

● The capacitor is meant to reduce any sparking from the relay contacts as they open. The bigger it is the better it does the job.

However, large capacitors are

expensive, and 1uF is reckoned to be big enough. At 1.5uF it will be more than good enough.

The thermistor had a -1 on the end of its type number. This is usually done to indicate different grades of component. When specifying the part no dash value is stated, so any grade is good enough to do the job. As to the 25 way RS232 connector, this is the same as shown on page 406 of the User Guide, and should be wired up like a printer as explained in the guide.

## From Page 59

BBC computer you could try powering your drive from his computer and seeing if it made any difference.

Otherwise you will have to find someone who has the tools and skill to align your disc drive. A standard 40 track disc might ease your problems, but how are you going to persuade Acorn-soft?

## Tropical tracks

TROUBLE in the Tropics. My BBC B keyboard has developed an irregularly occurring fault, but only with the W:E:I:7:9 and cursor  $\uparrow$ : $\downarrow$  keys. They simply don't function despite many "tons" of finger pressure.

The micro is about 20 months old, bought in the UK. Incidentally when the trouble appears, all the other keys operate normally.

To date I've tried keyboard removal and cleaning with a 'switch solvent cleaner' but to no avail. — P.J. Fletcher, Lutong, Sarawak.

- The keys that do not work

## Adding a 2nd keyboard

I WOULD like to add a second keyboard to my BBC Micro. Is it a simple matter of unplugging the BBC keyboard and plugging in a new one, or is it more complicated?

Also where can I obtain an extra keyboard?

I would like to know if it is possible to run the 6502 second processor on a cassette based system.

If I do have to get a disc drive do I also have to buy the 'old' DFS, 0.90, or do I just use the one supplied with the second processor. Also is hi-Basic Basic I or II?

Finally what does the 'LINE' (Ctrl + f8) command do? — Anas Faraj, Bahrain.

- You do not say what you want a second keyboard for. If you unplug the old one then you still only have one!

The best way to add a second keyboard is by using the RS432 input to your BBC computer. Then a simple \*FX2,1 would switch over to your remote

(w e i 7 9) are all on the same address line. What you have is a broken track on the keyboard.

This happens because the key switches are sometimes not fully pushed home before soldering and the copper track takes the strain.

It is difficult to spot the break but it will be on the joint between the bright solder and the green track going away from the key switch.

The best way to find it is with a resistance meter or a battery and torch bulb. Test for continuity between the switch contacts you can see connected together.

Switches on the same line as your faulty ones are f0, t, 0, £. The break is probably in the connection between one of these switches and one of your faulty ones. With a bit of patience you should be able to track it down.

When you find it you should place a soldering iron on it and remove the solder. The copper pad should then come off.

Scrape the green solder away from the track and remake the joint by soldering a piece of tinned copper wire across the break. Do not attempt to bridge this with solder as it will almost certainly crack.

keyboard and a \*FX2,0 issued from the second keyboard would give you command again from the internal keyboard.

You can get a serial keyboard from many sources. One such is Verospeed, Stansted Road, Boyatt Wood, Eastleigh, Hants. SO5 4ZY. The order code is 259-26408A.

It will cost about £110, but you might find that some of the symbols keys produce the wrong symbols due to the fact that the BBC computer uses slightly different standards from most other people. You will also need to supply it with 5 volts at 100mA.

You can run the second processor on cassette and you do not need to buy a DFS, as the second processor comes with one (if you do have 0.90 it must be removed). Hi-Basic is to all intents and purposes Basic II.

The LINE command is part of INPUT LINE and allows you to enter a string variable that contains commas (normally a string delimiter).

IF you have a technical query for this page, send it to Mike Cook, *The Micro User*, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Letters on other subjects should be sent, as usual, to Micromail, which this month starts on Page 151.

## Random access filing

My problem concerns random access filing. I get one of two errors when I add to the disc file, and I can't find any detailed documentation of the errors.

The first is "End of file". The User Guide describes this as "End of file has been reached" but in what way is it an error?

The other error is "Can't Extend".

I only have a dozen records!

The program works in other respects — searching, deleting etc. — Graham Conridge, London.

- The "End of file" error message is produced when you try to read past the end of a file — that is, to read more than is in the file.

This can be caused by reading more than you should or not writing as much as you think.

The "Can't extend" error message is produced when you try to increase the length of a file and the file is not the last one on the disc.

You see the disc allocates space for each file in a very simple manner. It uses contiguous sectors, so if your file is the last one to be allocated it can always extend it by adding more sectors on the end.

However if you have saved something else to disc since the file was created there is no room to put any more sectors on the end.

The solution is to write dummy records to a file when it is first created. In that way you will reserve the space you need.

## RAM chips

CAN you give me some idea of what RAM cards for the BBC would use the HM6264P-15 RAM chip, as I have some and would like to expand the RAM.

Could you also confirm that any added RAM has to be treated like paged ROM? — Martin Underhill, Woking, Surrey.

- I know of nobody who produces a bare board that uses

these chips. As they are 64k chips they are a little awkward to fit into the memory map.

What you could do is make a paged RAM board that appeared in the Jim I/O address space.

However, this could be used for storing only data and not programs. All extra RAM has to be paged. If you use it as paged ROM then the paging software and hardware is already built into the computer.

If it is paged in any other way the paging software must be tapped into the operating system.

This is how the Aries board works — by paging the memory whenever a VDU command is encountered. Thus it automatically separates program space and display space.

## Formatting problems

I HAVE had a Cumana 40 track dual disc drive for six months now. Everything was fine until I tried to format a set of 10 discs. They all passed the test except for one when the computer came up with "Fatal formatting error on disc".

Could you please tell me why this happens and if I can do anything about it? — Victoria Star, Guildford, Surrey.

- This happens from time to time — you have got a bad disc. Despite quality control they do occasionally turn up.

It could also have happened if the disc had been damaged in some way. There is probably some blemish or scratch on it.

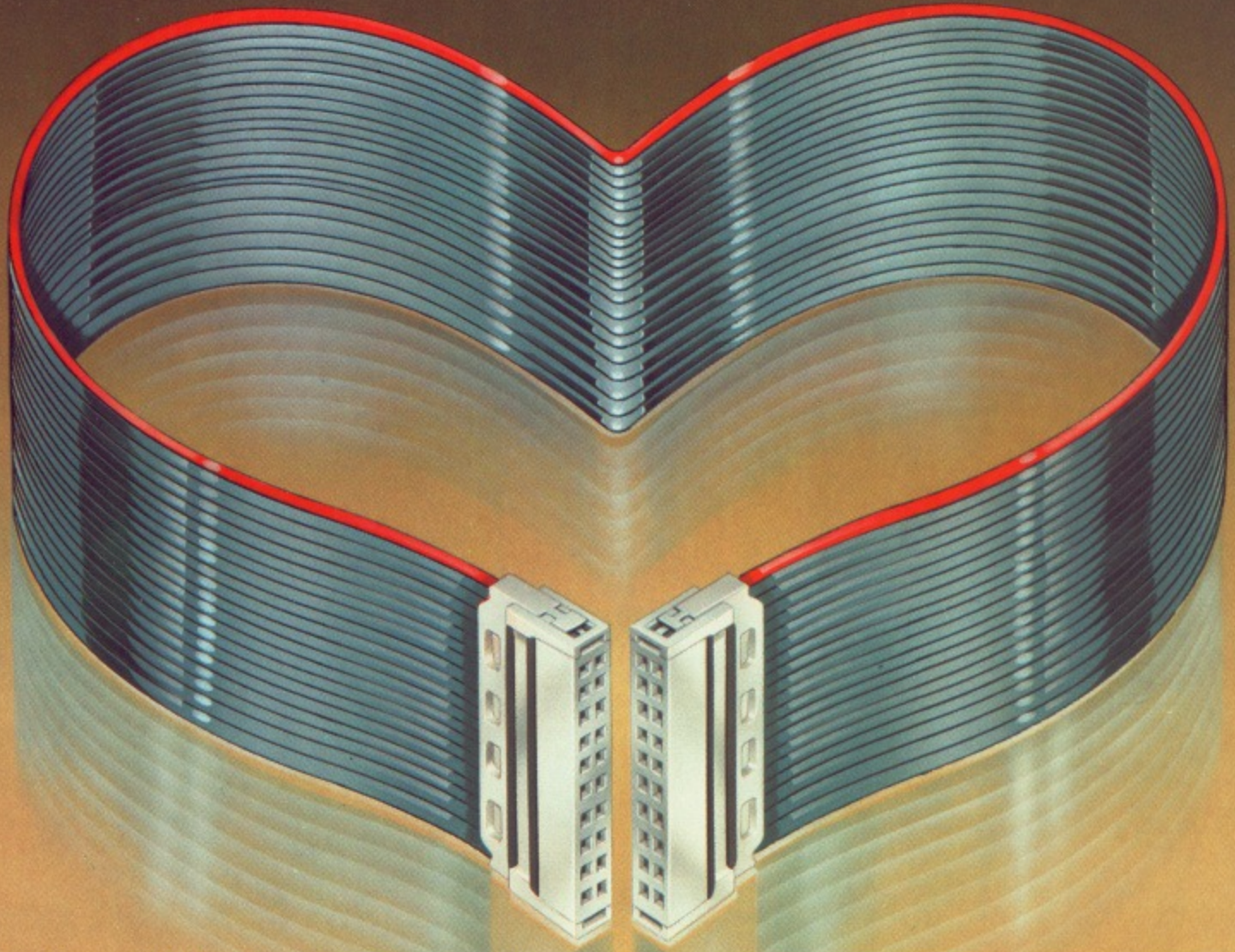
You can try again and reformat it. If it will not then you could try to erase the disc before you try again. To do this wave it over an electro magnet powered by AC. Then, as you wave it slowly move it away. At a distance of about ten feet you can turn the magnet off.

Make sure no other magnetic medium is in the area.

You can try a similar trick with a permanent magnet from a loudspeaker, but it is not as thorough.

If all else fails throw the disc away and chalk it down to experience.

# WHY MICROS LOVE MT80



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# A chip off

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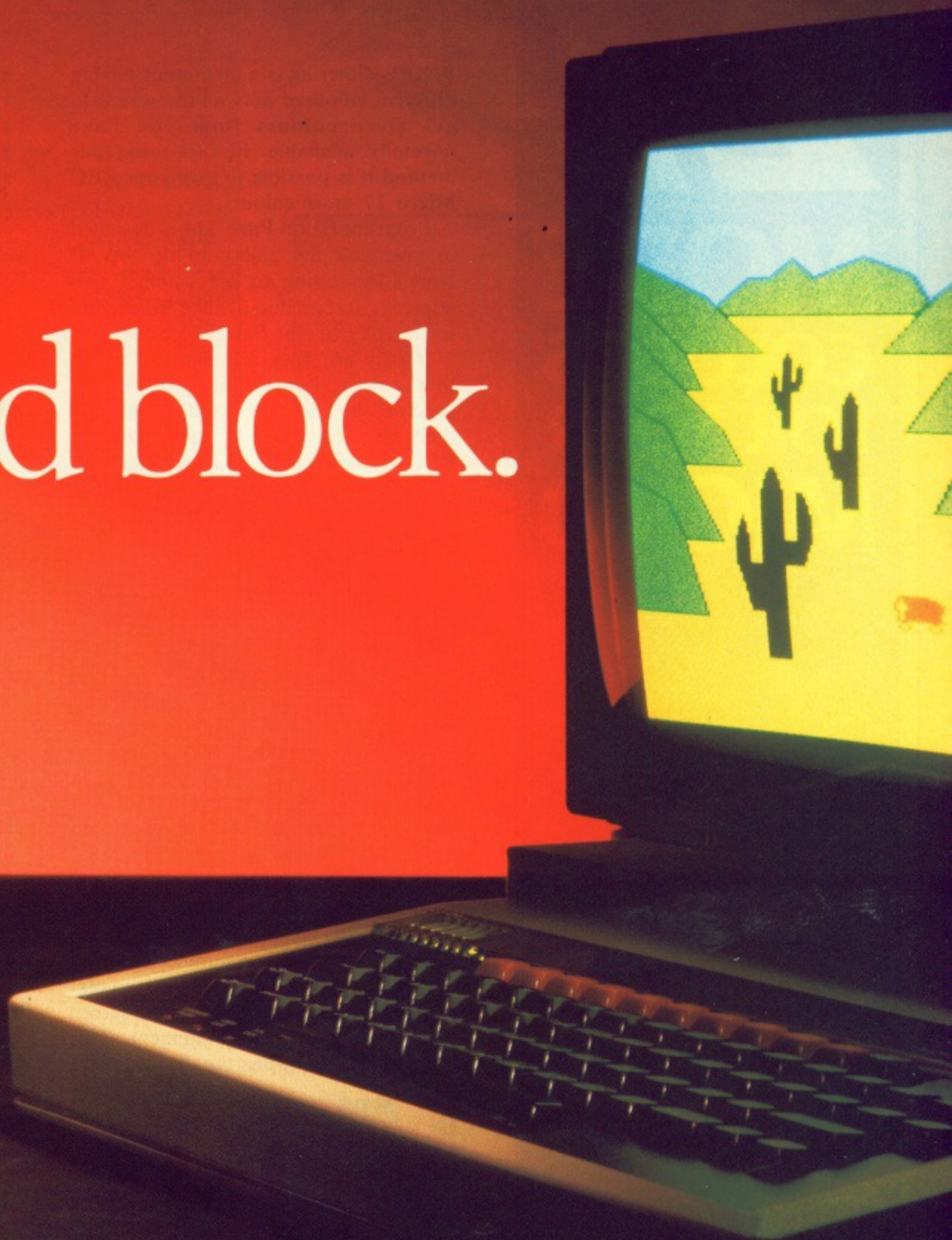
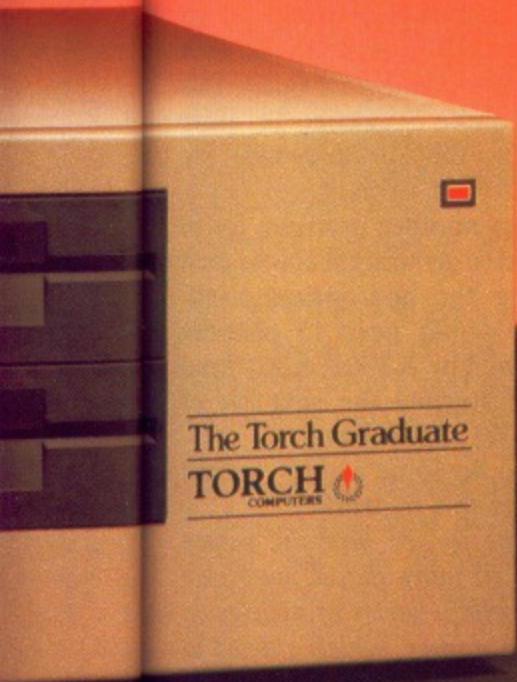
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COMPUTERS

Technical Specification • 8088 16-bit CPU (5Mhz) • 256K RAM • MS™-DOS operating system customised to IBM PC compatibility • Twin double sided, 5 1/4" floppy disc drives (each 360K formatted) • 2 IBM PC compatible expansion slots • Free PSION XCHANGE software (Abacus, Easel, Archive, Quill) • Software compatibility allows Lotus 1-2-3 and popular IBM PC business programs to run without modification, subject to constraints of BBC keyboard and display • Acorn Disc interface is not required • Keyboard, text and graphics by BBC Model B Micro.

# 27 MORE COLOURS FOR YOUR MICRO

The 19th century artist Seurat used a technique called pointillism to create unique colour effects on canvas.

Now PETER WALKER applies the same principle to the micro screen and puts those pixels all in a dither.

PIXEL dithering is a method of mixing different coloured dots on the screen to get more colours than you have normally available. In fact using this method it is possible to give your BBC Micro 27 more colours.

Program III on Page 114 is designed to give you the ability to do this. It works by testing to see whether two adjacent screen dots, called pixels, are set to a particular flashing colour.

If they are, they are changed not to that colour, but to the new colours specified by the programmer. This will then give the effect of increasing the BBC Micro's palette by another colour.

Before we examine Program III in detail though, let's look at the technique behind it.

The principle is quite simple. It works by fooling your eyes into thinking you are seeing one colour instead of two. If we put a red dot next to a blue dot our eyes can distinguish them as two different colours, but if they are very close together we cannot separate them. Our eyes tend to mix them, and we see a shade of purple.

To get a strong impression of this effect we need to alternate the coloured dots on every other line, as in Figure Ia. In this way no one colour can be clearly seen, otherwise we get coloured lines as in Figure Ib, which are not as useful.

We can do this in a number of ways, some quicker than others. One is to plot the individual points onto the screen using Acorn's PLOT statement. This works well, but it has the disadvantage

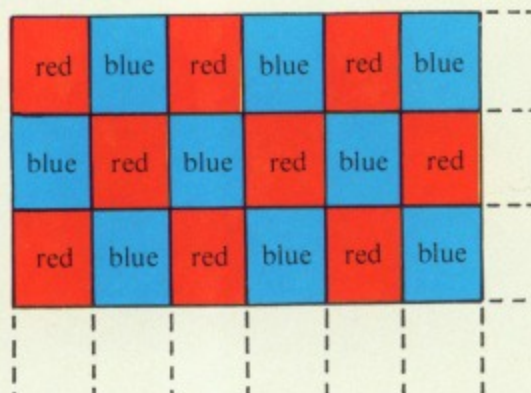


Figure Ia: True dithering-alternating dots

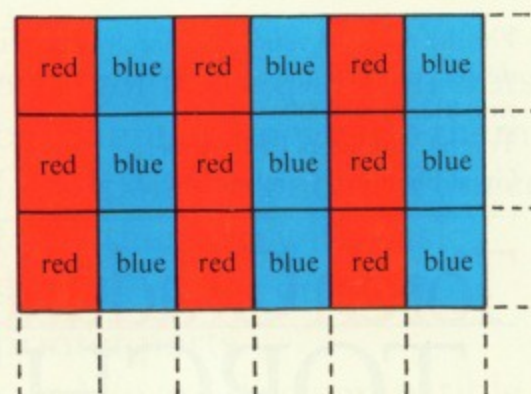


Figure Ib: Failure to alternate produces lines

that it is too slow to be of much use.

The other method is to work out the numbers that are stored onto the screen for each colour, and then store these numbers onto the screen byte by byte. Since this way is very fast, I have used it as the basis of Program III.

Having decided on our approach, we come to our first problem - each screen mode stores the coloured dots in different ways, so we have to decide which screen mode we are to use. As more colours can be achieved using Mode 2 it would seem obvious to use this mode.

Figure II shows part of the screen map for Mode 2. This starts at address &3000 and, although we don't show it, ends at address &7FFF.

Look closely at the numbering system. The screen bytes' addresses do not increase by ones across the lines of pixels as you'd think they would, but go down the screen for eight bytes, then back up to the top and start again. This is done to make it easier to store characters onto the screen, as most are built up from eight bytes.

This creates another problem, for to dither we need to go straight across each line, changing the appropriate pixels. That is, we would need to consider &3000, followed by &3008, &3010 and so on before starting the next line of pixels at &3001, &3009 etc.

We have to do some careful number juggling to get this to work.

If you want to see how the screen layout works in more detail, see Kevin Edwards' excellent series of articles on machine code games, which started in the February issue of *The Micro User*.

Now the screen layout has been considered the next thing to do is to find out how the BBC Micro stores its coloured pixels.

Each byte of the screen memory holds two pixels. These are combined as shown in Figure III. Figure IV shows how this works in practice, giving us a

Colour	Mask	Binary mask
BLACK	0	00000000
RED	3	00000011
GREEN	12	00001100
YELLOW	15	00001111
BLUE	48	00110000
MAGENTA	51	00110011
CYAN	60	00111100
WHITE	63	00111111

Table 1: Masks giving both pixels identical colours



		COLUMN						
		0	1	2	---	78	79	
HIMEM →		&3000	&3008	&3010	-	&3270	&3278	
		&3001	&3009	&3011	-	&3271	&3279	
	ROW 0		&3002	&300A	&3012	-	&3272	&327A
			&3003	&300B	&3013	-	&3273	&327B
			&3004	&300C	&3014	-	&3274	&327C
			&3005	&300D	&3015	-	&3275	&327D
			&3006	&300E	&3016	-	&3276	&327E
			&3007	&300F	&3017	-	&3277	&327F
ROW 1		&3280	&3288	&3290	-	&34F0	&34F8	
		&3281	&3289	&3291	-	&34F1	&34F9	
		&3282	&328A	&3292	-	&34F2	&34FA	
		&3283	&328B	&3293	-	&34F3	&34FB	
		&3284	&328C	&3294	-	&34F4	&34FC	
		&3285	&328D	&3295	-	&34F5	&34FD	
		&3286	&328E	&3296	-	&34F6	&34FE	
		&3287	&328F	&3297	-	&34F7	&34FF	
ROW 2		&3500	&3508	&3510	-	&3770	&3778	
		&3501	&3509	&3511	-	&3771	&3779	
		&3502	&350A	&3512	-	&3772	&377A	
		&3503	&350B	&3513	-	&3773	&377B	
		&3504	&350C	&3514	-	&3774	&377C	
		&3505	&350D	&3515	-	&3775	&377D	
		&3506	&350E	&3516	-	&3776	&377E	
		&3507	&350F	&3517	-	&3777	&377F	

Figure II: Section of Mode 2 screen memory

red pixel followed by a blue one.

To make use of this information a way needs to be found to extract the left or the right pixel from the memory byte. This can be done simply by masking out the parts that are not needed.

Masking is done by using a logical AND operation on the object number. If we need to know the code number for a red pixel two colour masks are needed - one for dealing with the left pixel and one for the right. The two masks in question are &AA and &55, &AA being the right colour mask and &55 being the left colour mask.

All we need to know now is the numbers representing each of the eight colours when both pixels are set to the same colour, as in Table I.

If you type in Program I and run it the screen should fill with blue. Replace the colour number in line 30 with any of the numbers shown above and you should see a different colour.

Now we can do this, let's try to combine two colours red and blue, assigning each to alternate pixels.

To get a red left pixel we use:

$$\&AA \text{ AND } 3 = 2 \text{ ( \%0010 )}$$

To get a blue right pixel we use:

$$\&55 \text{ AND } 48 = 16 \text{ ( \%10000 )}$$

The required colour number is equal to  $2+16=18$  (%00010010). So by adding these two numbers together we

get the colour number we require to display a red and a blue pixel.

If this number is put into Program I as the colour number (line 30) you should see a series of red and blue lines going down the screen. You could try combining other colours and seeing if you have got it right.

Once we understand how we can store colours on the screen it is only a small step to get pixel dithering to work. What needs to be done now is to choose

```

5 REM PROGRAM I
10 MODE 2
20 FOR I = &3000 TO &7FFF
30 ?I=48: REM Colour number
40 NEXT I
50 END

```

Program I

```

5 REM PROGRAM II
10 CALL &0900
20 MODE 2
30 COLOUR136:CLS
40 *DITHER 3,6,8
50 REPEAT
60 RESTORE 140
70 FOR I=1 TO 30
80 READ A%,B%
90 COLOUR136:PRINTSPC(20);
100 *DITHER A%,B%,8
110 NEXT I
120 UNTIL 0
130 END
140 DATA 7,7,0,7,3,7,3,3,3,4,0,3,2,
150 DATA 7,3,6,2,3,2,2,6,2,1,2,6,7,4,7,0,6
150 DATA 6,6,4,6,4,4,2,4,1,7,5,7,1,
150 DATA 5,1,1,0,1,3,5,1,3,4,5,0,5,5,5,1,4

```

Program II

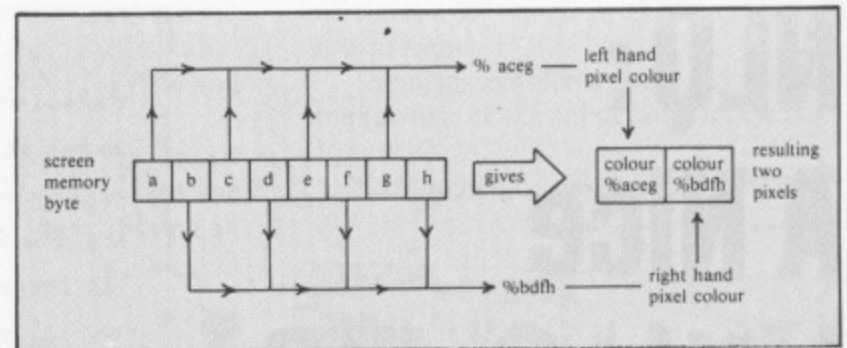


Figure III: How Mode II interweaves pixel colours in memory

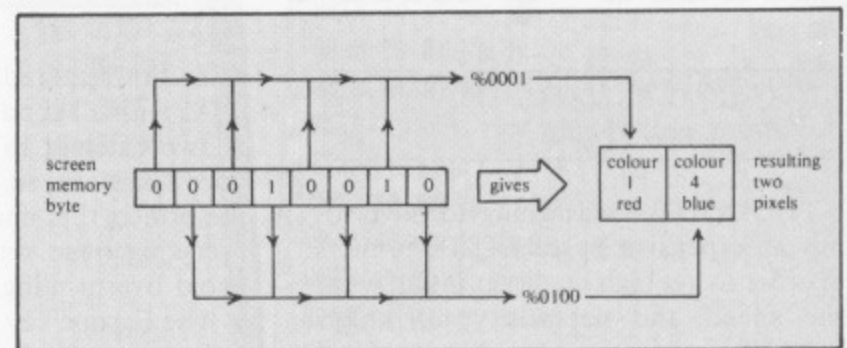


Figure IV: How interweaving works in practice

a colour that we want to change.

As most people who use colour graphics tend to use only colours 0 to 7, it would seem reasonable to use colours 8 to 15 for our "new" ones. We don't lose anything since it is still possible to use these colours even when pixel dithering.

These colour numbers can be tested very simply. As we've seen, to get our dithered pattern we have to consider two dots of colour at a time.

Each screen byte contains two pixels, so by extending the colour mask table shown above it should be possible to test for both of these in one go by testing the contents of the screen against the correct colour mask number.

Program III, the main one, should be typed in as shown in the listing except

**Turn to Page 114**

## NLQ: A Nice Little Quill?

**NLQ ROM**  
*Watford Electronics*

I THOUGHT I was going to have to buy an expensive Epson LQ100 printer in order to get high quality printing with the speed and versatility normally available from a matrix printer.

However Watford have produced an EPROM which enables my Epson RX80F/T to print with near letter quality (NLQ)!

Working on the FX series as well, the 8k chip is, as usual, easy to install, occupying one of the sideways ROM sockets. \*NLQ80 (or \*NLQ100 for 100 character printers) initialises the ROM, setting up the buffer insert vector to point to the NLQ ROM and reserving one page of workspace at &A00.

The instructions indicate that the workspace can also be set in other positions to avoid clashes.

\*NLQTYPE in direct mode or VDU1,129 in Basic alters all printing into NLQ mode. This sets the least significant bit in the number added to 128, the next four significant bits being used to set some special features.

Adding 2, 4, 8 or 16 to VDU1,128 sets proportional spacing, underline, temporary enlarge or enlarge respectively. Temporary enlarge gives double width only until the next carriage return or until cancelled, whichever is the sooner.

These special effects can, of course, be set together so that proportionally spaced and enlarged would be set by using VDU1,146.

Cancelling each command is achieved in similar manner by adding to the base 192. Cancelling NLQ printing requires VDU1,193, while cancelling all NLQ effects is VDU1,223. The ROM can be turned off using \*NLQOFF

This is normal FX/RX printing

Emphasised mode in FX/RX

Double strike on FX/RX increases contrast

This is Watford NLQ printing

NLQ proportional spacing

NLQ underlining is thus.

NLQ enlarged or double width.

NLQ enlarged, underlined proportional

when not required.

As with all good things, there are one or two catches. In NLQ mode \*FX6.0 does not work, so that the dipswitch in the printer that enables a line feed with every carriage return must be set to avoid overprinting.

The Escape key is disabled when text is being transmitted to the printer, so that a printout can only be stopped by holding Escape down and waiting for a line end. In order to send normal control commands to the printer NLQ printing must be stopped and restarted using VDU1,193,1,command,1,129.

The quality of printing produced by the combination of Epson RX/FX and NLQ ROM is tremendous – see the example above – and it is generated at a speed not much slower than double strike printing on the same Epson.

I feel that Watford's NLQ ROM is a valuable asset to anyone who requires better quality printing from their RX/FX printer and at £20 is good value.

It remains for Watford to indicate which of the Epson compatible printers are also supported by NLQ ROM.

**Ian Whitmore**

## Now – a 16k DFS

**DNFS**  
*Acorn*

A NEW DFS has crept onto the marketplace with a surprising lack of fanfare by the company concerned. This is, of course, the Acorn 1.20 DFS.

The old DFS, the 0.90, was supplied on an 8k eprom. The new has now been ROMed onto a 16k chip known as the DNFS, as it now combines the DFS with the Network Filing System (for Econet) as well as Tube software, which drives the Tube if a second processor is fitted.

If you've already used the 0.90, you'll quickly notice the difference. The first and most dramatic is in its speed. As you can see from the benchmarks, it is up to twice as fast.

The main reason would seem to be that the new DFS optimises the movement of the read/write head between tracks. This means that you're much less likely to suffer a lot of stepper motor clattering, which can be more

than a little worrying to beginners, especially with packages such as Wordwise.

In order to achieve this vast improvement the DFS code has extended to just over 8k. Also noticeable are the shorter, more cryptic messages, witness to the squeezing together of the DFS, NFS and Tube software.

At the same time as increasing the speed they've sorted out some of the quirks of the old DFS. For example if the current directory was 'B' and you saved a program with SAVE":1.prog" the old DFS would save it as ':1.\$prog' rather than ':1.B.prog' as would happen with the new DFS. Pressing the Break key no longer resets the currently selected disc drive.

The new DFS now seems to be issued with all the new disc interfaces. It should be available shortly to those who want to buy it separately.

The question arises: "Is it worth while updating my old 0.90 DFS?" If you're

going to get a 6502 or Z80 second processor then don't bother as it will be included in the price of the second processor.

If you just use your disc to load and save programs there's not that much of a speed improvement. If you make fuller use of the filing system with word processing, databases or your own programs I think the DNFS is well worth the £20.

BENCHMARK TEST	0.90	1.2
	DFS	DFS
	Time in secs.	
1 OPEN + CLOSE files *1000	4.3	5.1
2a PRINT 1000 numbers	15.7	6.7
2b PRINT 100 strings	61.0	24.8
3a INPUT 1000 numbers	12.6	5.8
3b INPUT 100 strings	57.1	23.0
4 BPUT 1000 bytes	5.0	3.4
5 BGET 1000 bytes	3.9	2.5
6 Move PTR 1000 places	2.2	2.2
7a Write test relative file	62.9	25.9
7b Read test relative file	58.4	23.5
8a Write relative file backwards	240.3	99.6
8b Read relative file backwards	99.9	39.2

Jim Notman

# ONE MORE MONITOR..

**KMON**  
Kansas City Systems

THIS is yet another entry into the growing number of machine code monitors available for the BBC Micro. In an attempt to be as straightforward as possible commands are one letter long and may be followed by a number of parameters.

Numbers default to decimal so that hexadecimal numbers must be preceded by an & as in BBC Basic. (I know many who prefer monitors to default to hex.)

Rather than always referring to addresses as numbers, labels can be used. The labels using the names of the

operating system calls and vectors have already been defined - the label OSBYTE is given the value &FFF4 and BRKV &200.

Although it mentions the Advanced User Guide it has not defined all the vectors and calls given there, though all

of those mentioned in the User Guide are present.

The disassembler is simple to use and makes use of the predefined labels (see Figure 1).

The single pass assembler is best used

```

Kmon: D &8029,&8044
8029 48      H      PHA
802A B1 F2  --    LDA (&F2),Y
802C C9 0D  --    CMP #&0D
802E D0 17  --    BNE &8047
8030 20 E7 FF --    JSR OSNEWL
8033 A2 00  --    LDX #&00
8035 BD 09 80 ---   LDA &8009,X
8038 D0 02  --    BNE &803C
803A A9 20  -    LDA #&20
803C 20 EE FF --    JSR OSWRCH
803F EB  -    INX
8040 E0 0A  --    CPX #&0A
8042 90 F1  --    BCC &8035
8044 20 E7 FF --    JSR OSNEWL

```

```

Kmon: H &8000,&8000
8000 4C 1B B1 4C 1E 80 C2 12 L..L....
8008 01 4B 4D 4F 4E 00 31 2E .KMON.1.
8010 31 32 00 28 43 29 20 47 12.(C) G
8018 69 62 62 73 79 00 08 48 ibbsy..H
8020 C9 04 F0 28 C9 09 D0 21 ...(...!
8028 8A 48 B1 F2 C9 0D D0 17 .H.....
8030 20 E7 FF A2 00 BD 09 80 .....
8038 D0 02 A9 20 20 EE FF E8 ... ..
8040 E0 0A 90 F1 20 E7 FF 68 .... .h
8048 AA 68 28 60 8A 48 98 48 .h(.H.H
8050 A2 00 B1 F2 DD 09 80 D0 .....
8058 04 E8 C8 D0 F5 C9 2E F0 .....
8060 09 E0 04 F0 05 68 A8 4C .....h.L
8068 47 80 68 68 AA A9 8E 20 G.hh...
8070 F4 FF 68 85 06 68 85 07 ..h..h..
8078 8A 48 98 48 A0 00 E6 06 .H.H....

```

Figure 1

## COMMAND TABLE

Action	Syntax
Single pass assembler	A address
Set breakpoint	B n=address
Clear breakpoint	C n
Disassemble	D start address, <end address>
Edit memory	E address
Fill memory	F address, address, byte block
Hex dump	H address, <end address>
Insert into source code	I <line no.>
JSR to address	J address, <parameters, ...>
Kill source statements	K <line no.), <line no.>
List source code	L <line no.), <line no.>
Move block	M start, end, dest
Overwrite line	O line no.
Select paged ROM	P rom-number
Relocate program	R start, end, org, <dest>
Search for byte	S start, end, byte
Display breakpoint table	T
Move user table	U address
Set variable	V label=expression
Display variable	V expression
Word search	W start, end, address
Give user table extent	X
Compare blocks	Y start, end, block
Delete label	Z <label>
Set scrolling speed	\$ <speed>
Assemble source code	@
Save	s <filename>
Load	l <filename>

## From Page 67

with short pieces of code that have worked out before typing in.

The two-pass assembler has much the same facilities of BasicII. It does produce neater listings, moving between label, mnemonic and operand fields using the TAB key. (Figure II gives an example from their manual.)

1		ORG \$7000
2	START	JSR HEX
3		JSR DSNEWL
4		RTS
5	HEX	PHA
6		LSR A
7		LSR A
8		LSR A
9		LSR A
10		JSR HEX2
11		PLA
12		AND #15
13	HEX2	CLC
14		ADC #48
15		CMP #'9'+1
16		BCC OK
17		ADC #6
18	OK	JSR DSWRCH
19		RTS

Figure II

EQUB, EQUW and EQUS of BasicII have been changed to DFB, DFW and DFS. Rather than setting P% to point to the assembler origin the command ORG is used. An extra command SPC reserves space, equivalent to P%=P%+space\_reserved.

Memory commands that you'd expect to find in a monitor such as fill, move, relocate and edit are there.

Debugging facilities to say the least fall short of what a good monitor should have. Although up to 10 breakpoints can be set, these can only be set in RAM and are not conditional.

A number of zero page locations need to be set so that they can be loaded into the accumulator, X, Y and status registers when code is called with a J command.

There is no single stepping command. The nearest you'll come to this is by setting the breakpoints and looking at the contents of the registers when a breakpoint is reached.

The manual I saw was a preliminary version. Unfortunately it contained a considerable number of errors which

have hopefully been tidied up in the final version. Otherwise it gives a simple account of all the commands and memory usage.

While this package has a reasonable assembler and disassembler, it's not really in the first division as a monitor.

Jim Notman

# Routine routines on disc

Source Library Manager  
Guardian Software

THIS ROM based utility is aimed at the very structured programmer. It offers a means by which procedures may be individually written and then saved to disc, thereby offering the facility for a definition file to pull out the required files back from the disc and combine them in the computer to form a complete program.

The general idea is that this method will use disc space more efficiently as there will be less duplication of commonly used procedures.

The manual to explain this relatively simple concept runs to 15 A4 pages, most of which just explain the virtues of SLM. The actual meat of the document could be drastically reduced and would enhance readability significantly.

The program is invoked by typing \*SLM, upon which the screen reverts to Mode 7 and the main menu page appears. The options from here are to save or load the current piece of Basic as a procedure, save or load a definition file and a few other options enabling deletion, compacting and file extensions.

In use one must first format an area of disc for use as the library file store. This area can be extended if desired. However this is a very slow process - 60 seconds for 10 tracks.

Files will be stored here and will not be accessible without the SLM ROM installed. A programmer might then

write, for instance, the start of a program involving mode settings and procedure calls.

SLM would then be called and instructed to save the file in RAM to disc as a source file. The programmer would then exit from SLM, type NEW and write the first procedure.

On completion SLM would be called once again and the procedure would be saved as a second source file. As well as being able to save each file using an eight character word it is also possible to label each file with a 20 character comment, possibly a reminder of a procedure's parameters.

Assuming that this example program consisted of a start section and a single procedure it would then be required to write a definition file.

This consists of a pseudo Basic program of arbitrarily sequential line numbers each followed by the identity of the source file required in double quotes, such as 10 "START", 20 "PROC". SLM would then be called and this file would be stored as a definition.

To test the program SLM would be requested to "construct defined program" from the menu, and upon giving it the name of the definition file it would build the basic program, in this case by simply joining the first file to the second.

Apart from the dreadful manual, I disliked the menu method of control and especially as it only worked in Mode 7. It would have been easier to use one of the currently available Basic tools packages to save and load individual procedures and merge them into memory when required. A program could then be defined using an EXEC file to call the merging routines.

This would also allow the files to be read from the filing system in the normal way.

I was pleased to note however that the ROM needs no workspace and will operate with a second processor attached.

Library systems are commonly used in higher level languages but these operate very differently from Basic and in many ways subroutines are more exchangeable.

So I am not convinced that beyond keeping disc files in some sort of order and writing readable structured programs a small computer can benefit from a library management system.

Tim Craig

# OXFORD PASCAL



Oxford Computer Systems (Software) Ltd.  
Hensington Road, Woodstock, Oxford OX7 1JR, England  
Telephone (0993) 812700 Telex 83147 Ref. OCSL

## Compilers like these don't grow on trees

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Oxford Pascal comes in two forms:

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**For Disc Users...**Oxford Disc Pascal offers all the above PLUS...a full disc compiler which is capable of using the WHOLE memory for Pascal object code. It is supplied with a powerful LINKER, allowing you to break large programming tasks down into separately compilable, easily-manageable files.

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Many compilers produce little more than an error and line number to help correct mistakes in Pascal programs. Oxford Pascal however, gives you one of 49 friendly and informative error messages. Messages which not only indicate the reason for an error, but also print out the line in question with a pointer to the exact position where the error was detected. Run-time errors are reported using line-numbers from the original source-program, with a full explanation of how the error occurred.

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Price/availability matrix

	BBC 'B'	ELECTRON	C64	SPECTRUM
DISC	£49.95	Not yet!	£49.95	Available April 1st 1985
CASSETTE	£39.95	£59.95 inc. Cartridge	£22.95	

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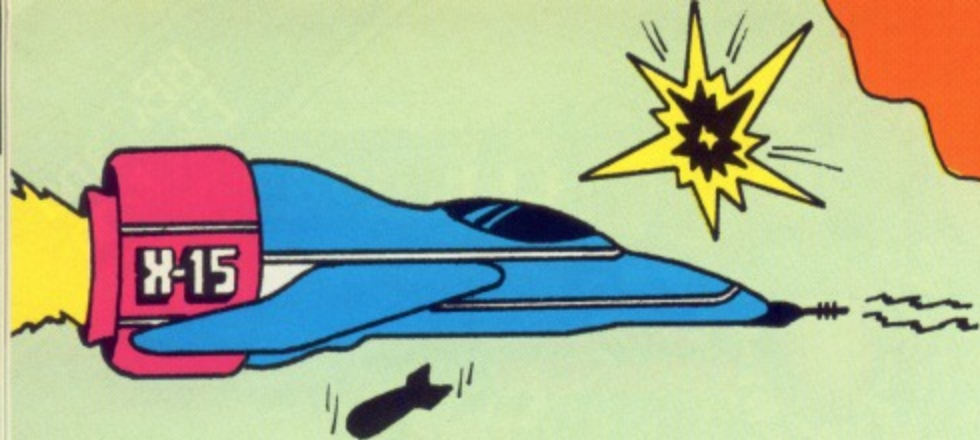
These compilers are being built, using the most modern techniques in automated compiler construction, and will bring to the micro-user, a level of robustness and efficiency, only now becoming available to mini and mainframe users.

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# X-15

**THUNDERING** in from over the sea underneath the clouds of asteroids in your rocket propelled X-15, you begin your attack on the enemy territory.

Squeezing the trigger in front of you sends rockets and bombs carrying destruction, but one slip and your craft will be reduced to molten metal.

In this version of the classic game you move an X-15 through a sideways scrolling landscape of hills, tunnels and cities.

You are attacked by robot planes which try to ram you, and by surface to air missiles. You must also try to destroy fuel dumps and the SAM bases.

In addition there is the ever present danger of colliding with an asteroid or the landscape.

Points are awarded in proportion to the difficulty of the targets you hit – asteroids 5, robot planes 10, fuel dumps, SAMs and SAM bases 50, plus 100 for each section of landscape completed.

When you have destroyed a target you move through the debris unhindered.

The program hinges on producing fast sideways scrolling without using machine code.

To move the BBC computer display sideways two VDU23s are used to write new values for the start of screen memory address to registers 12 and 13 in the 6845 cathode ray tube controller (CRTC) chip.

In the program this is done in line 360. However the snag is that after the VDU23s all the usual functions which access the screen like TAB(X,Y) won't know about the change and will operate at their old positions before the shift.

To make things work properly it is necessary to change the operating system copy of the starting address of screen memory held in locations &350 and &351. This is done in line 340.

A few other interesting techniques are used in the program. For instance, to

speed things up strings are not changed with the usual string operators. Instead they are kept in reserved blocks of memory and changed directly with the indirection operators.

\*FX19 is used in line 350 to synchronize the scrolling with the TV frames. Taking this out will make the program faster, but produce some flickering.

Collisions of objects on the screen are detected by PEEKing at the screen memory. In order to help discover the identity of an object in this way, different logical colours are used for them.

Five logical colours are set to red corresponding to red landscape, red asteroids, fuel dumps, SAMs and robot planes.

A nice touch is the option to define your own keys. Since negative INKEYs are used to detect them you could use the cursor keys to move the X-15 up and down and the Shift and Caps Lock keys for the rockets and bombs.

## PROGRAM STRUCTURE

Lines	
80-220	Main program.
80-130	Set up for game and give instructions.
140-210	Repeat loop which keeps playing games.
160-190	Keep scrolling until X-15 destroyed.
170	Selects landscape.
180	Generates landscape and scroll: inner loop of the game.

## VARIABLES

O%,W%,U%,V%	Used in controlling the sideways scrolling to put the correct values in the CRTC registers.
X%,Y%	x and y coordinates of rocket fired by X-15.
F%	Rockets fired flag and the screen memory location of the rockets.
G%,H%	x and y coordinates of bomb. G% is also used as a flag to detect dropping bomb.
M%	Screen memory location of bomb.
L%	y coordinate of X-15.
D%	Change in L% determined by up/down keys.
I%,C%	Pointers to X-15 string.
E%	Screen memory location of X-15.
B%,T%	y direction coordinates of the upper (lower) most piece of landscape at the bottom (top) of the right hand side of the screen.
N%	Usually a random number.
RX%,RY%	x and y coordinates of robot planes.

RT%,RB%	Minimum and maximum y coordinates for robot planes.
RL%	Robot plane launched flag.
MX%,MY%	x and y coordinates for SAM.
MT%	Maximum y coordinate for SAM.
ML%	SAM printed on screen "ready to be fired" flag.
MF%	"SAM fired" flag.
SC%	Score.
HI%	High score.
NP%	Number of X-15s.
OV%	"Game over" flag.
J%,K%,Z%,R%	INKEY numbers for up, down, bombs and rockets.
A%	Pointer to look up table of integers DIV 3.
S%	Pointer to string to be printed down right hand side of screen.
P%	Pointer to string representing X-15s.
HIS	Name of high score holder.
MUS	SAM going up string.
RUS,RDS,RHS	Robot plane going up, down and horizontally.
DS	Rocket string.
CS	Piece of city string.
XS,YS	Small explosion strings for rockets and bombs.
BS	Blank string.
RS	Bomb string.
POS,PIS	Two sets of X-15 strings to get rocket exhaust effects.
ES	Big explosion string.



## X-15 listing

```

10 REM =====
20 REM
30 REM X-15
40 REM By D. J. Pilling
50 REM (C) The Micro User
60 REM
70 REM =====
80 PROCc
90 PROCs
100 MODE7
110 PROCi
120 MODE2
130 PROCscs
140 REPEAT
150 PROCgs
160 REPEAT
170 NX=RND(3):SCZ=SCZ+100
180 IFNZ=1PROCgrs:REPEAT PROCsc:PRO
Cg:UNTILWX=252 ELSEIFNZ=2 PROCTs:REPE
AT PROCsc:PROCT:UNTILWX=252 ELSE PROC
cis:REPEAT PROCsc:PROCCi:UNTILWX=252
190 UNILOVZ
200 PROCge
210 UNTIL FALSE
220 END
230 DEFPROCsc
240 LX=LX+DX
250 IFIX=PX IX=IX+30 ELSEIX=PX
260 IFINKEYKZ CX=IX+8:DX=1:EX=EX+67
2 ELSEIFINKEYJZANDLX>2 CX=IX+19:DX=-1
:EX=EX-600 ELSECX=IX:DX=0:EX=EX+32
270 IFEX>&7FFF EX=EX-&5000 ELSEIFEX
<&3000 EX=EX+&5000
280 IF?EX PROCexp:ENDPROC
290 OX=OX+32:WZ=WZ+4
300 IFOX=256OX=0:UX=UX+1
310 IFWX=256WX=0:VZ=VZ+1
320 IFUZ=&80UZ=&30:VZ=&6
330 IFFXPRINTTAB(XZ,YZ) " :IFXZ=18F
XZ=0
340 ?&350=OX:??&351=UX
350 *FX19
360 VDU23;12,VX;0;0;0;23;13,WX;0;0;
0;
370 PRINTTAB(4,LX)$CXTAB(19,0)$SZ;
380 IFF?ELSEIFINKEYRZ XZ=7:YZ=LX+DX
:FZ=EX+32:SOUND1,1,200,20 ELSE440
390 IFF?>&7FFF FZ=FZ-&5000
400 IF?FZPROCx(?FZAND170,XZ,YZ):GOT
0440
410 FZ=FZ+32
420 IFF?>&7FFF FZ=FZ-&5000
430 IF?FZPROCx(?FZAND170,XZ+1,YZ) E
LSE FZ=FZ+32:XZ=XZ+1:PRINTTAB(XZ,YZ)D
$
440 IF6Z ELSEIFINKEYYZ HZ=LX+1+DX:6
XZ=7:MX=EX+1312:SOUND2,2,150,15:ENDPRO
C ELSEENDPROC

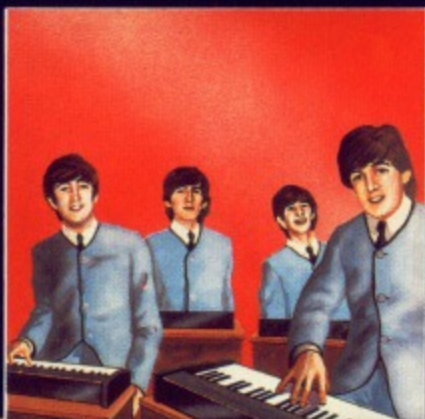
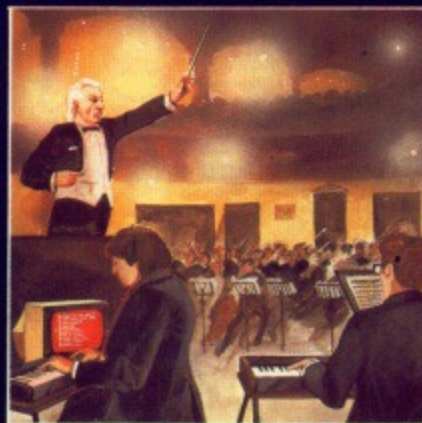
```

Turn to Page 146

## PROCEDURES

- PROCsc** Moves X-15 in response to up/down keys (line 260), checks for impact with anything (280), does scrolling (290-370), sorts out rocket movement (330 and 380-430) and dropping bombs (440-490).
- PROCx(N%,X%,Y%)** Used when the rockets have hit something. N% is the contents of the screen memory at the next position of the rockets (X%,Y%). Checks to see what has been hit. Increments score accordingly. Resets rockets and prints explosion.
- PROCy(N%,X%,Y%)** Repeat of PROC but for bombs.
- PROCTs** Set up for a tunnels section.
- PROCCis** Set up for a city section.
- PROCgrs** Set up for hills section.
- PROCg** Generates hill landscape. Line 740 produces asteroids and line 770 fuel dumps. Line 750 uses PROCru to control robot planes. Rest procedure generates jagged scenery.
- PROCru** Makes robot plane home in on the X-15 while ensuring that it does not demolish landscape.
- PROCmu** Aims the SAMs at the X-15. Handles the movement of the SAM stopping movement when SAM reaches maximum allowed height or when
- PROCCi** Generates city landscape with SAMs, bases and asteroids.
- PROCT** Produces tunnels with fuel dumps and asteroids.
- PROCc** Defines characters and envelopes. Initialises score variables.
- PROCgs** Constructs the strings for the game. Somebody just wrote off an X-15, so generate suitably big explosion.
- PROCexp** Initialises variables at the start of game. Sets up the on screen colours with VDU19s.
- PROCge** Called at the end of each X-15. Tidies things up, clearing sounds, decrementing number of X-15s. If no X-15s left calls PROCgx.
- PROCgx** Displays "game over" screen. States if high score beaten and if so prompts for input of player's name.
- PROCscs** Start of game screen. Shows X-15 over sea, displays scores, waits for Return to be pressed to start game.
- PROCP** Produces animated X-15 in PROCscs.
- PROCd(T%)** Gives a delay of T%+1 centiseconds.
- FNGK** Return the -ve. INKEY number of a key held down. Prompts for the release of the key.
- PROCi** Prints title page and instructions. Defines which keys control things.
- PROCSx** Produces some computer type bleeps.

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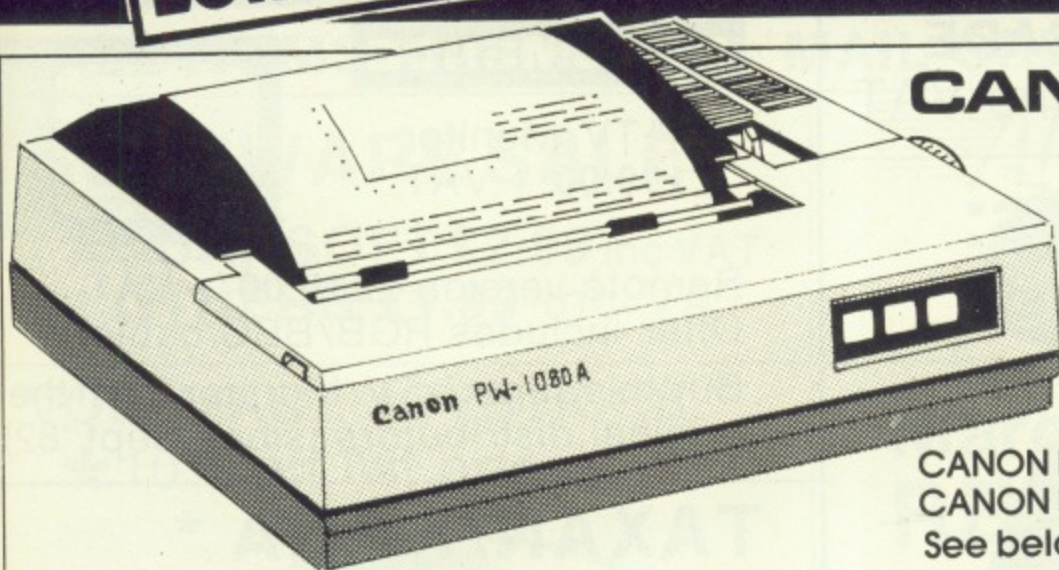




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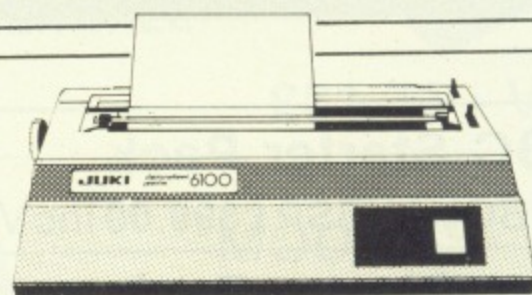
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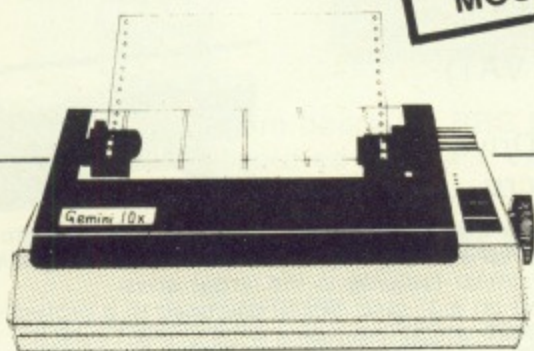
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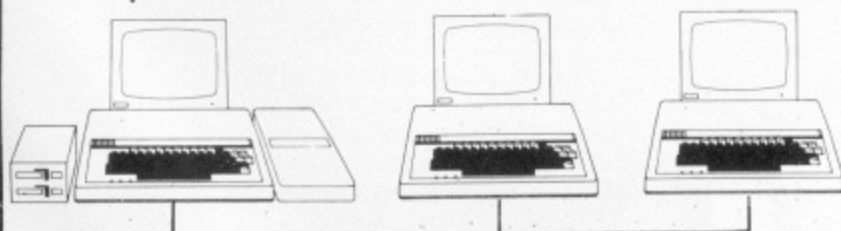
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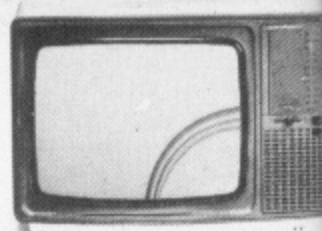


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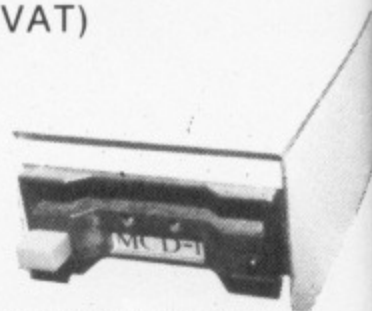
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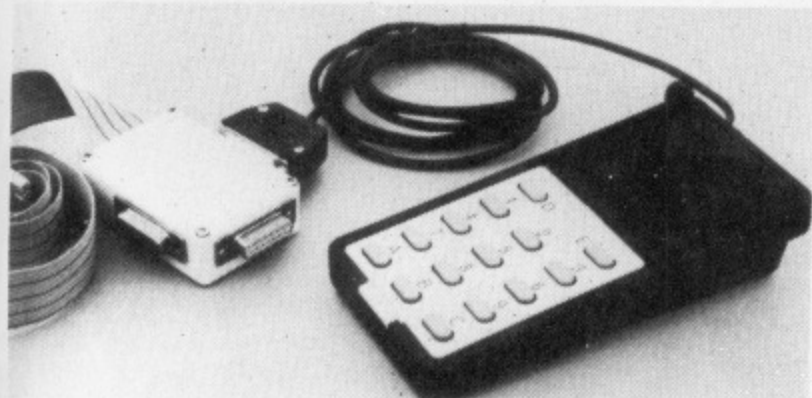
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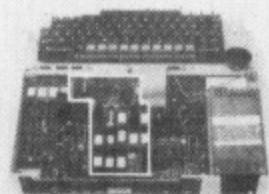
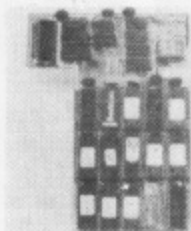


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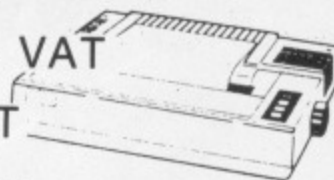


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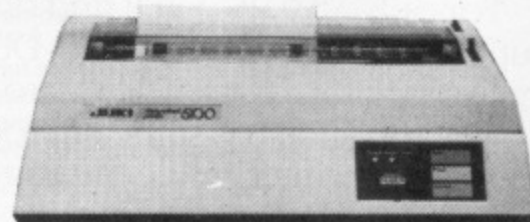
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BU13

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# NEW 16K EPROM

**\*HEX**, Is a full HEX dump, displaying 8 bytes of HEX and ASCII equivalent per line. A status line shows the current address and the byte at this address in: HEX, ASCII, Decimal and either the binary, basic token or assembler mnemonic. Forward and reverse scrolling of the display at normal and

high speeds is a feature, as is a full on screen memory editing facility which allows inputs in either hexadecimal, ASCII characters or assembler mnemonics.

**\*MON**, Serves the same function as \*HEX, but the display is in disassembled opcodes, rather than \*HEX. The editing and scrolling facilities are the same as for \*HEX. An additional feature of \*MON is the ability to directly follow JSR's, branch's etc.

**\*DEBUG**, A full featured program debugging aid, allowing the programmer to see the most intimate details of the program under examination. Features, variable speed, single stepping, breakpoints, continuously updated disassembler, selective HEX dumps (up to 6) plus current stack, all continuously displayed on screen, plus many other features.

**\*DISCED**, A comprehensive disc sector editor enabling any sector of a disc to be read, inspected, edited and written back. It will work with any 40, 80 or dual formatted single density disc.

**\*DGET**, Searches a disc for all occurrences of a string or group of bytes.

**\*REL**, Enables machine code to be easily moved around in memory, automatically adjusting JSR's, JMP's etc.

**\*SLOW**, This command causes the entire computer to slow down to any variable speed between 1 and 255. This can allow the in depth study of graphic's methods etc.

**\*EDIT**, A dynamic basic screen editor, cursor controlled with full forward/reverse scrolling of listing, incorporating insert/delete lines, insert/overwrite characters, enter line from any position after editing.

## "No need to Sweat! Let me be your slave."

**\*REF**, Produces a cross-reference listing of the current basic program. All variable names are listed (WITHOUT HAVING TO RUN THE PROGRAM!) in alphabetical order followed by the line numbers on which they are referenced. Numeric items can also be crossed referenced if desired.

**\*SORT**, A built in sort routine allowing any single dimension array, be it integer, real or string, to be sorted.

**BASIC COMMAND LIST:**  
\*PROG, \*BAD, \*EXTEND,  
\*PACK, \*SORT, \*PAGE,  
\*ENVELOPE, \*FIND,  
\*REPLACE, \*XREF,  
\*TRON, \*TROFF, \*CHAR,  
\*EDIT, \*EDKEY.

**MACHINE CODE  
COMMAND LIST:**  
\*MCODE, \*MOVE,  
\*CROM, \*SLOW, \*GET,  
\*PHEX, \*GO, \*MON,  
\*HEX, \*SPACE, \*DGET,  
\*DISCED, \*DIS, \*DEBUG,  
\*CRC, \*REL.

Designed with the serious programmer in mind, a 16K Eeprom packed with a multitude of programmer friendly utilities, as with all SLAVE'S, SLAVE is instantly available and will obey an extensive range of commands. So why not invest in more muscle for your BEEB, and get some help with the heavy work!!! SLAVE has over 30 comprehensive machine code and basic tools.

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# A notable composer that's hard to beat

**GABRIEL JACOBS tests an extremely user-friendly music synthesiser package**

UNLESS you are in the music business, and in some cases even then, or contemplating producing full orchestral scores, Island Logic's Music System will give you most of what you'll need for your compositions and arrangements — and a great deal of fun too.

It's a piece of integrated software which provides a flexibility and a range of features not available in any other music package for the BBC Micro at a comparable price (£24.95).

On top of this it's about as friendly and docile as could be, though its maximum potential can only be realised by those who know something more about music than playing the comb and paper — despite Island's claim in its advertising copy.

The program comes on a single disc — a double cassette version is available, though it's not quite as powerful — and there is a second disc containing a library of tunes and ready-made sound envelopes.

The system disc contains five interlinked modules. Heart of the package is the input Editor, which uses the BBC's normal three voice (melody) channels plus the percussion channel.

It has a range of four octaves, and includes a broad spectrum of notes, rests, key and time signatures, tempi and musical symbols (including accidentals, ties, repeat signs, 1st and 2nd time bars and so on).

Music is entered directly, one voice at a time, and immediately displayed in standard notation on treble and bass staves. It can be played back when required, in single or multiple voice, from the beginning of a tune or from the cursor position.

The Editor has been provided with a sizeable array of control facilities — insert, delete, re-form bar lines after editing, search, copy or erase blocks, and many more.

An obedient macro utility handles global replacements in volume, pitch and sound envelopes. To take a simple example, you can accentuate the first beat of every bar in your composition in a single operation.

A tune can be instantly transposed into any key, with automatic recalculation of accidentals, including double sharps and flats, and an "autobar"

routine which can be toggled off generates bar lines dynamically at input.

With the Synthesiser you create sets of sound shapes in the form of envelopes which can then be incorporated into the voice lines.

New sets can be made up from parts of previously created files, and the envelopes can be saved in BBC format for your own Basic or machine code programs.

Pitch, amplitude, modulation and frequency are handled either by setting the 19 parameters from the Parameter Screen, or by on-screen editing of an impressive display of matched frequency and amplitude graphs.

Attack, sustain, decay and release can be manipulated with a minimum of fuss, and set with variable rates of change to produce a wide variety of sounds.

The percussion line is serviced by various pre-set rattles, clicks and crashes, but you aren't limited to them, or even to a single percussion line, since percussive envelopes can be used in the voice lines. So it's possible to simulate a complete drum kit.

The effects which can be obtained with the Synthesiser module only serve

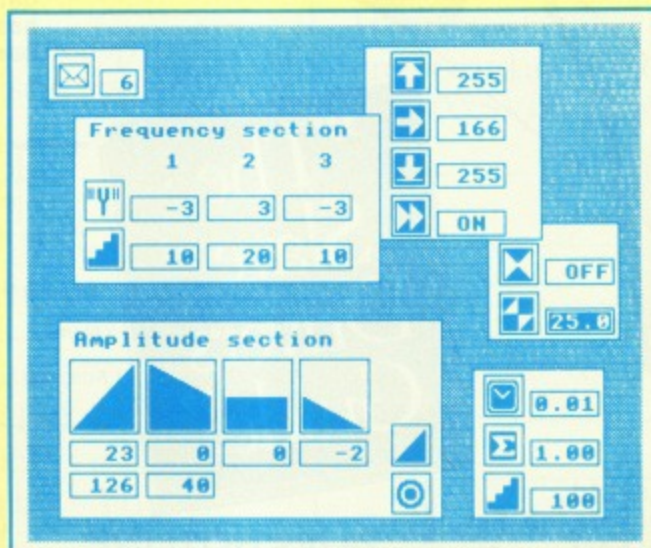
to spotlight the lack of an audio output on the BBC. However if your machine is wired up to a hi-fi system quite spectacular results are possible.

As with all attempts to turn a qwerty keypad into a piano, the Keyboard module takes some getting used to, but once you're familiar with it, it becomes an effective tool. Basically it's a secondary, realtime input routine which emulates on screen not only a piano keyboard, but also a four-track tape recorder with standard playback, record, fast forward and rewind functions.

The Keyboard is handy for experimenting with ideas which can later be committed to the Editor, but primarily it complements the Synthesiser by using envelopes to imitate, as you play, the sounds of conventional musical instruments (within the limits of the hardware — don't expect actually to fool anyone).

A set of default envelopes is loaded with the Keyboard, but new sets can be called when desired.

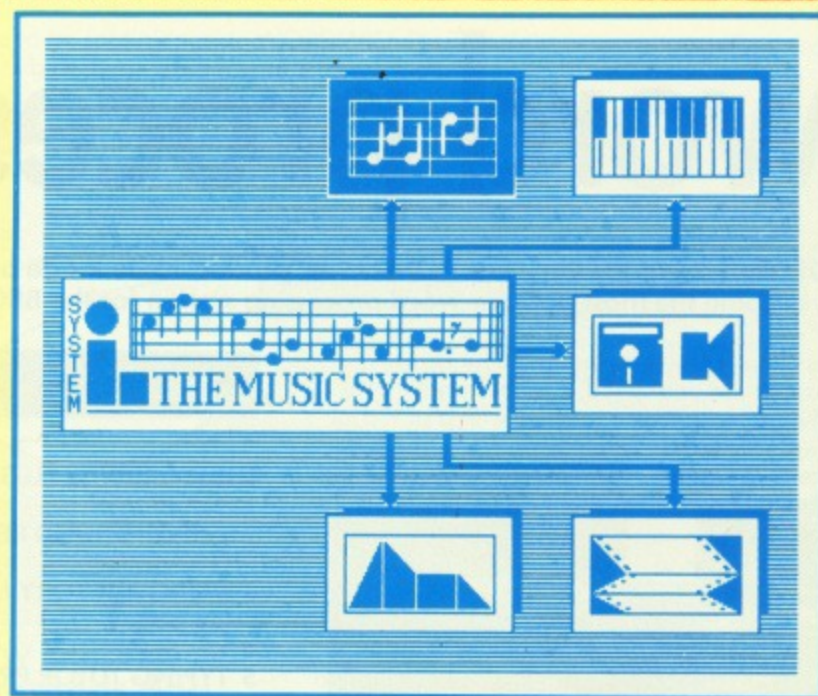
Lines are recorded independently, then played back as others are being keyed in, while a variable background metronome beat holds the tempo steady. And there is a pause facility on



*The Synthesiser*



*The Keyboard*



Above: Control screen  
Left: The Editor

the tape recorder which is useful for practising small sections of music before recording them.

Linker allows for mid-tune key, time and tempo changes by joining together, in any sequence, up to 10 previously-saved music files, plus up to six repeats of any of them.

The Printout module produces very acceptable hard copy, with vertically drawn staves, on an Epson RX, FX or Star Delta printer (other printers will be supported soon, according to the instruction manual).

Since the printer driver is sending bit-image data, output is slow, but drafts can be taken in low resolution mode up to three times faster than its hi-res equivalent.

Draft printing can also be speeded up

by opting not to align bars between staves. You get a more compact output, but it looks less like a typeset score.

Given the care and attention to detail that have gone into producing the package, it's rather surprising that there's no provision in the Printout module for automatic page ejects.

The only way to paginate is to create files which will just fill one page, and with varying bar lengths this can be very tricky.

I can't believe it would have been all that difficult to include a routine which took page length into account and drew a double bar line before a break.

In all the other modules, however, the package has been written to make life as comfortable as possible for the user.

Excellent internal file management

and error trapping make it virtually idiot-proof. And a superb system of user selection by highlight, high speed icons, and overlapping pop-up windows always makes you feel at ease with the program.

The quality and use of graphics from start to finish is beyond criticism.

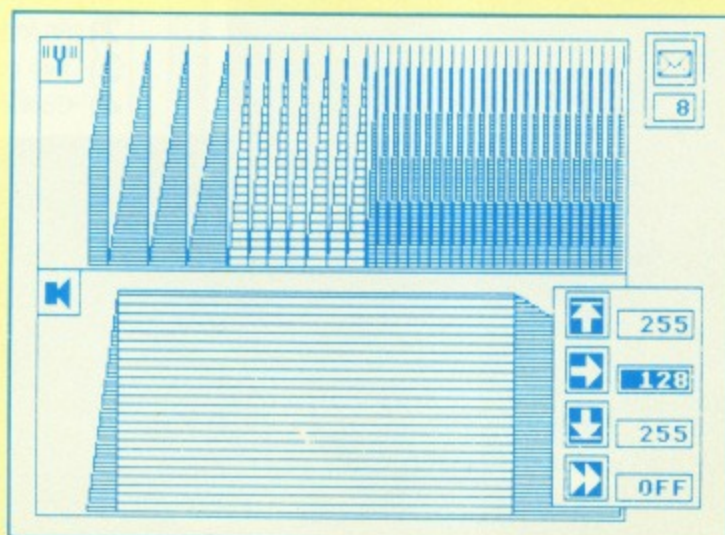
The instruction manual is all lean meat, clear and well-structured, quite an achievement given the complexity of the content. And a double-sided function key strip usefully completes the documentation.

Having said all that, I should stress that the problem of pagination when printing is not the only functional limitation of the program.

For instance, alto and tenor clefs are not catered for. You can't have joined quavers, semiquavers etc, as they would normally appear in a musical score. And there's no provision for dealing with lyrics or marks of expression.

Nor do the Synthesiser and Keyboard modules measure up in every respect to some of their dedicated competitors. But it's hardly fair to compare them with something like Acorn's Music 500, a hardware/software combination priced almost an order of magnitude higher than The Music System.

My view is that Island's design team set their targets more or less right. Only the most nitpicking of critics could ask for much more in an all-purpose, readily-usable and affordable package.



The Synthesiser

# Any improvement on Britain's No.1 word processing ROM...

WORDWISE was the very first ROM based product to be made available for the BBC computer and over the last couple of years it has become the most popular word processing system for the BBC machine with almost 50,000 chips now sold.

It has consistently received excellent reviews for its ease of use and speed. It takes only minutes for the user to become familiar with a powerful professional word processing system.



WORDWISE PLUS is now available extending

the original program in many unique directions. Not only is the program now twice the size but the package includes two completely new manuals—an introductory manual that gently introduces the newcomer to word processing with WORDWISE, and a reference manual listing all the commands.

## THE WORDWISE PLUS PACKAGE CONTAINS

- 1 16K ROM
- 2 SPIRAL BOUND REFERENCE MANUAL (180 pages)
- 3 INTRODUCTORY MANUAL (56 pages)
- 4 KEYSTRIP
- 5 TYPING TUTOR PROGRAM (On cassette)
- 6 EXAMPLE TEXT (On cassette)
- 7 EXAMPLE PROGRAMS enabling mail merging, index generation, etc.

WORDWISE PLUS is completely compatible with all older versions and is able to use existing WORDWISE files without modification.

## WORDWISE PLUS FEATURES

Over the last couple of years we have received countless suggestions for ways of extending or adding new facilities to WORDWISE. It soon became obvious that we would not be able to implement every single suggestion. Indeed, each person uses a word processor in a different way—each individual has differing requirements—a feature that one person may think essential another may have no need for.

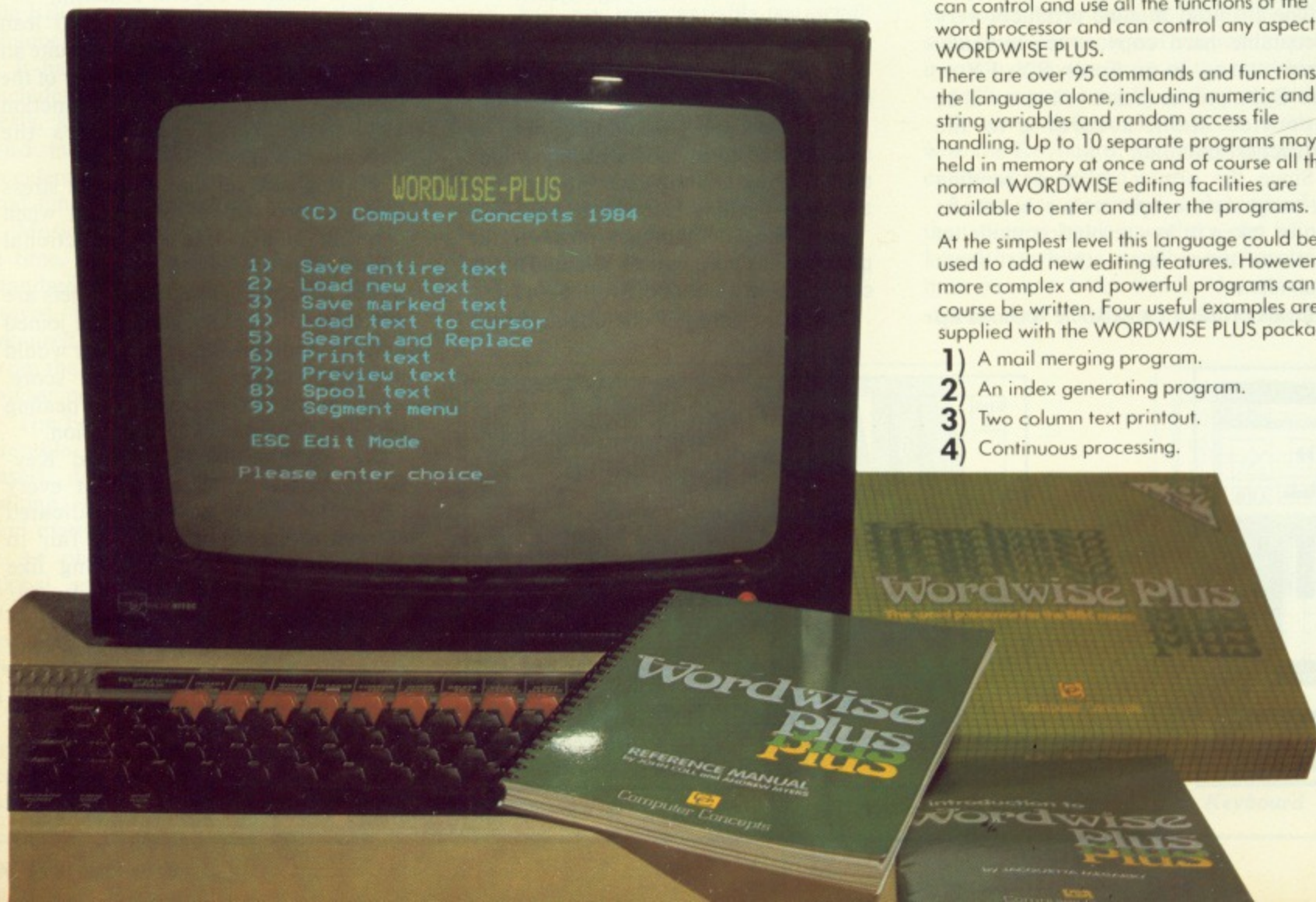
We have overcome this problem in two ways. Firstly we have included the most commonly requested additions and improvements. A number of new editing features and a few more embedded commands have been added.

Secondly a unique BASIC-like programming language has been incorporated. This facility enables the capabilities of this word processor to be extended in an infinite number of ways. The language itself has been designed, like WORDWISE, to be simple to use and understand. Many of the commands look and act like BASIC commands and so will be familiar to many users. However the language can control and use all the functions of the word processor and can control any aspect of WORDWISE PLUS.

There are over 95 commands and functions in the language alone, including numeric and string variables and random access file handling. Up to 10 separate programs may be held in memory at once and of course all the normal WORDWISE editing facilities are available to enter and alter the programs.

At the simplest level this language could be used to add new editing features. However more complex and powerful programs can of course be written. Four useful examples are supplied with the WORDWISE PLUS package.

- 1) A mail merging program.
- 2) An index generating program.
- 3) Two column text printout.
- 4) Continuous processing.





# ...Must Be A Plus

## Word Processing With Wordwise

All the advantages of a ROM—instantly available. One command and your BBC machine becomes a powerful word processing system.

Fast and very simple to use.

The more complex commands are menu driven, enabling those totally unfamiliar with this software to use these more powerful features straightaway.

The function keys are used to full effect with a keystrip clearly showing each function.

Block copies and moves. It is possible to mark any part of your text, this marked section may be instantly moved or copied to any other part of your text. This cut and paste type of operation is a vital part of all word processing operations and with WORDWISE it is simplicity itself.

Automatic headings, footings and page numbering. When printing a document many pages long it is possible to have WORDWISE number the pages for you and put any heading or footing line on each page.

Unique word counting feature. Ideal for journalists, it constantly displays the current number of words typed. It also allows word counting for specific sections of a document.

Works with all filing systems, such as DISC., CASSETTE., and the new ADFS. Works with any printer that works with the BBC machine (most do) and is able to access the special features of any printer (italic, subscripts, etc.). There is no need to buy additional printer driver programs.

Here are a few of the things that have been said about WORDWISE.

"WORDWISE offers an extremely user friendly program . . . it would make an excellent choice for someone rather apprehensive about word processing."  
... E & CM

"WORDWISE has won a devoted fan club because of its flexibility and ease of use."  
... Practical Computing

"On the whole WORDWISE is an excellent wordprocessor . . . WORDWISE is thoroughly recommended."  
... VIEWFAX 258

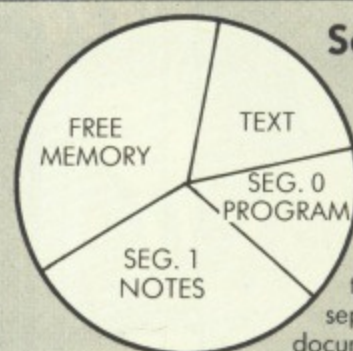
"WORDWISE is straightforward, friendly and excellent value."  
... Practical Computing

"... it is ideal for the home hobbyist and small businessman."  
... A & B Computing

## Word Processing with Wordwise Plus

WORDWISE PLUS still has WORDWISE as its core therefore it is still very user friendly and retains all the features that made WORDWISE the most popular word processor. It now has many new additions making this the most flexible word processor yet.

WORDWISE will continue to be sold alongside WORDWISE PLUS. For those more specialised users who require the added flexibility here are a few of the new features.



### Segments

When using WORDWISE PLUS, the BBC's memory is divided between your text and up to 10 'segments'. Each segment may contain either a program or just normal text. It is therefore possible to store and edit up to 11 separate documents in memory, or 1 document and 10 programs, or any mixture.

Often when writing letters or articles it is useful to keep a notepad, outlining what you intend to write. In WORDWISE PLUS one of the segments could be reserved for an electronic notepad. It would be a simple matter to switch your 'notepad' and your main document with just a single key press.

## Some of the New Editing, Embedded Commands and Wordwise Extensions

WORDWISE PLUS works with the 6502 2nd processor. This allows more text to be stored in memory and 80 column previewing no matter how full memory is.

New embedded command FI will fully indent text against the right margin.

New commands for underlining and bold printing. The bold and underline effects are shown on screen—and it is a simple matter to configure these features for any printer.

Saving and loading of text is now up to 10 times faster on disc, and now the computer gives the user a warning if a document is going to be overwritten on the disc or in memory.

There is now a working filename—i.e. WORDWISE remembers the name of the current document being worked on.

New command deletes markers automatically.

It is now possible to print or preview a file directly from disc without having to load it first.

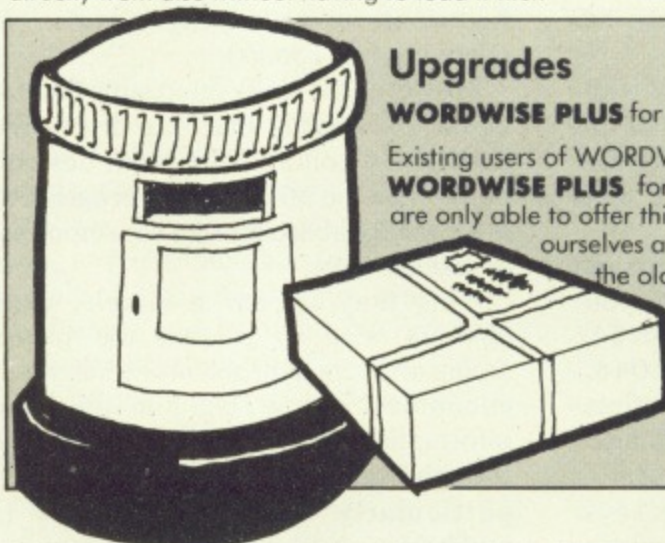
New embedded command 'PS' allows strings to be inserted into the text when it is printed.

New embedded command 'PF' will read a document from file when printing and interpret any embedded command in that file.

Improved search and replace facilities now include wild-cards.

## Example Programs Supplied With Wordwise Plus

- 1) A mail merging program that allows names and addresses to be added to a standard letter. This is a relatively easy job with this language.
- 2) An index generating program. This finds keywords and generates a separate index listing the word and the page numbers where the keywords occurred.
- 3) Two column printout. This program will print your text in two columns across the page.
- 4) Continuous processing. This enables the disc user to process and edit extremely large documents spread over several files as if it were one continuous document in memory.



## Upgrades

**WORDWISE PLUS** for only £21+VAT

Existing users of WORDWISE can upgrade to **WORDWISE PLUS** for £21+VAT (£24.15). We are only able to offer this service through

ourselves at the address below. Please return the old WORDWISE package complete with chip (suitably protected for postage) and the manual with your cheque or P.O. or quote your Access or Barclaycard number. We will then send you the complete new package.

## In The Near Future

HI-WORDWISE for 2nd processors that allows even more user memory, supplied on disc for less than £5 to WORDWISE PLUS owner.

A FAST SPELLING CHECKING PROGRAM.

Both WORDWISE and WORDWISE PLUS are available from all good computer dealers. Alternatively you can obtain these directly from Computer Concepts.

WORDWISE PLUS £49+VAT (£56.35)

WORDWISE £20+VAT (£24.15)



# Computer Concepts

Computer Concepts, Gaddesden Place,  
Hemel Hempstead, Herts HP2 6EX  
Telephone: (0442) 63933



JON Thackray is a Cambridge mathematician who, along with Conway (inventor of the computer game of Life) et al enumerated the sporadic group J4 in 1980.

Now he, together with colleague D. Seal has produced Acheton, a massive disc based adventure from Acornsoft. I wonder which achievement he'll be remembered for...

Group theory developed from attempts to solve equations. How to solve cubic and quartic equations algebraically was revealed in 1575 by Cardan and his brilliant secretary Ferrari. We know very little about Ferrari except that he had a dangerous temper (he lost some fingers in one fight) and even Cardan, not averse to knifing the odd person, was afraid of him.

Nevertheless Ferrari was intensely loyal to Cardan, who gave him the full credit for showing how to reduce the quartic equation to a cubic which can then be reduced to, and solved as, a quadratic.

For the next 300 years mathematicians attempted to reduce (hence solve) the quintic equation. This was eventually shown to be impossible by Abel, a Norwegian, and Galois in the early 1800s. Norwegians seem very unlucky with their discoveries since Galois, a Frenchman, is the better known because he wrote his proof the night before he was fatally shot in a duel at the age of 20.

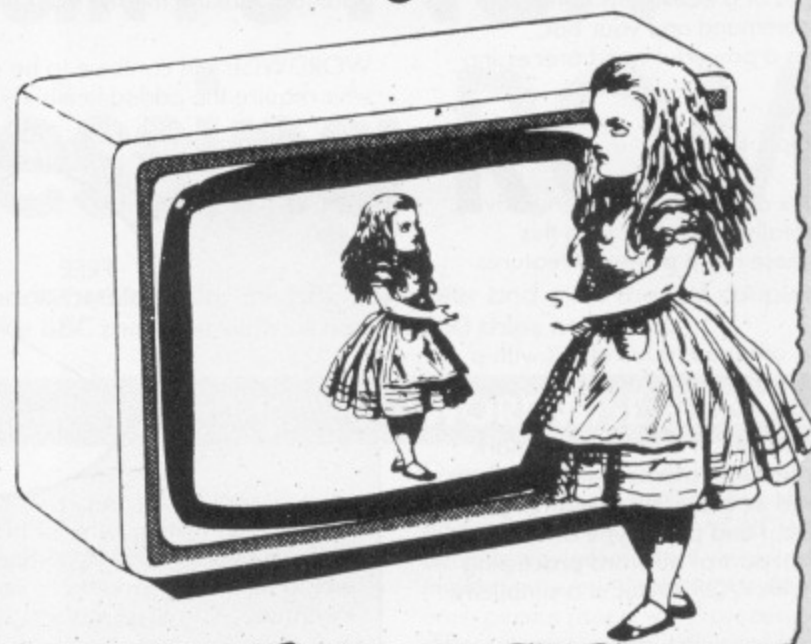
What Galois showed, very simply, is that no matter how you manipulate or substitute the general quintic equation, you always come back to a quintic. Many things behave in this manner – an example is the Rubic cube which has only two groups. If assembled randomly there is only a 50:50 chance it can be solved.

Group theorists had great fun with this "toy", but the subject has had its greatest impact in models of fundamental particles – the quarks and hadrons.

Thackray has obviously also played around in Colossal Cave so now you know why he has called one room J4. Although saying 86,775,571,046,077,562,880 (or PLUGH) has no effect at J4 knowledge of Colossal will help you through some of the problems.

Yet again, plants need watering, keys must be found, mazes mapped in different ways and logical connections made (although why Florence Nightingale should be in a single level Hades is a real puzzle, but then you don't start in the Wood of Errors (see The Divine

## Alice through the VDU



Our monthly foray into Adventure games

# Acornsoft collects the five star prize

Comedy by Dante).

The game comes on two discs and is massive – 350 rooms with a corresponding number of puzzles (some large games have very few puzzles whereas Killworth crams many puzzles in relatively few rooms).

However the really interesting feature of the package is that one disc – the database – contains the room descriptions while the other has the program to drive the database plus an enormous set of hidden hints.

This may appear a simple, even obvious, idea to prevent the player seeing answers to problems he has yet to encounter, but giving him only the information he requests is a difficult though very interesting exercise – particularly when real security is involved.

One simple answer would be to make the adventure "linear", that is there is essentially only one progressive path, through many obstacles, from the start to the final problem. Each obstacle, on

solution, gives a password which can be used to reveal hints or the solution to the next one. Such a design would only reveal the right information.

Unfortunately such a design is very restrictive, so the authors, quite rightly trust the player not to cheat himself. You get a printed set of questions that you can ask about various objects, creatures and locations. For example you can ask what to do with the mushroom – a well known psychedelic treat for some of us.

In order to see as much as possible I immediately read the list – and it doesn't give away very much. How it works is that if you really want to know about mushrooms then you type in the given number and the program gives a set of increasingly revealing hints until, with a warning, it gives the full answer.

Apart from the hints it can also tell you where to find all the treasures (there are over 50) and what their uses are. Where they are is meaningless until you have explored the caves so again

security is good. It is usually obvious what an object is, but I cannot find any dictionary which contains "palantir".

As you play the game your current location is shown at the top of the screen, plus a score that rises if you progress and falls if you are on the wrong track. For example, there are two ways into the cave, but you'll probably only find the correct entrance after using the wrong one.

This is a very carefully designed game with great appeal to us reactionaries who prefer lots of cleverly combined puzzles presented in black and white text - words expand the imagination whereas pictures often restrict it. Someone once said that words often convey more than we mean, being ripples that can cause waves.

If you liked Colossal Cave or getting the point BLACH in Philosophers Quest then this will keep you quiet for a few months. You can usually rely on Acornsoft for a good game, but this is five star.

★ ★ ★

If you, like Thackray, enjoy mathematical puzzles on computers you will probably go for Micro-Maths by K. Devlin (Macmillan). This book is a collection of articles written for the Guardian newspaper (with the spelling corrected) and covers many of the most famous number theory problems such as evaluating PI (to 10 million places), searching for prime numbers and factoring non-primes, Archimedes' Oxen Problem and Fermat's Last Theorem - both Diophantine problems - plus a few apocryphal stories.

One story (opposite "True beyond reasonable doubt") concerns the origin of the term "de-bugging" since it is "well nigh impossible to write a program of more than [6] lines (if that)" without making an error. This reveals that Devlin is *not* a professional computer programmer since he then defines such errors (bugs) as the cause of "mysterious, bizarre results".

Most professionals, like artists, design "top down" - the structure is vastly more important than the details. When the design is coded errors are expected to occur, but the real concern is tuning the performance. Bugs are rarely mysterious and removed, by the professional, without difficulty.

The story is apocryphal. Invented by Commander Grace Hopper of the US Navy (and designer of Cobol) it was actually an in joke about her name. I never believe stories people tell about



themselves - that includes myself, Peary at the North Pole and Christ meeting the Devil. Hearsay from independent sources is usually nearer the truth, so I do believe Amundsen was first to "box" the South Pole.

The demerits of the book are that it is a jumble of interesting odds and ends with little indication of how to find further information. Also many of the problems are ancient history. Maybe Marshall Cavendish could bring out a series on Great Mathematicians and their Discoveries. Their doings are just as interesting as composers and artists and the subject is equally universal.

A book I would like to see would deal with famous computer problems and personalities, a far more recent development. One such problem is called the Polish Firing Squad, Polish because they are very simple minded.

You have a line of N soldiers and each soldier can only see the "state" of his immediate neighbours left and right. The two end soldiers have only one neighbour.

On giving a start command to one end of the line the problem is to coordinate the soldiers so that they all fire together. The soldiers all have the same set of instructions which tells them, at fixed intervals, to observe the "state" of their neighbours plus their own "state" and, from this information, to assume another "state" - they are, in effect, obeying a set of cards similar to the Dropping Bricks problem.

The problems are to construct the minimum number of "states" or cards and find the minimum time required to coordinate the line of soldiers. The time, first found by E. Goto, is  $2^*N-2$  and the minimum number of cards was later found to be nine. I invite the reader to consider the problem.

### The Valley of the Kings, by MP Software

BASICALLY three pyramids to plunder, the main treasure being a golden mask, I'm losing my touch partly because I didn't read the instructions carefully (you can go LEFT and RIGHT) or look at the pictures on the insert.

Consequently I spent some time digging in the car and on the shoulder of the statue plus trying to break out of the first pyramid to the right.

The game does need a few hints but I used MZAP to look at the verbs and objects - some useful verbs are TIE, RUB, REMOVE and THROW. If you are hungry look for JAM.

All the words can be reduced to four letters so other useful objects are SARCOPHAGUS (or SARC) and GASMASK (or GASM).

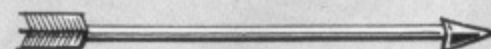


### Sadim Castle, by MP Software

THIS will please you - I haven't got past the wine cellar. If you haven't got that far then drink at the spring and shift the statue - you don't need a SPAD this time.

Both games are small, unassuming and well protected - the easy days of listing out a Basic program have gone. As people are still telling me how to kill the dragon in Twin Kingdom Valley I anticipate a year of being told how to give the Lady Leonora Sadim a decent burial.

Meanwhile I consign her below Ugolino to the frozen centre of Hell where Lucifer gnaws on Brutus, Cassius and Judas Iscariot. Turn LEFT at Lucifer's waist all ye who enter there.



## Remember the Monkeys and Coconuts problem?

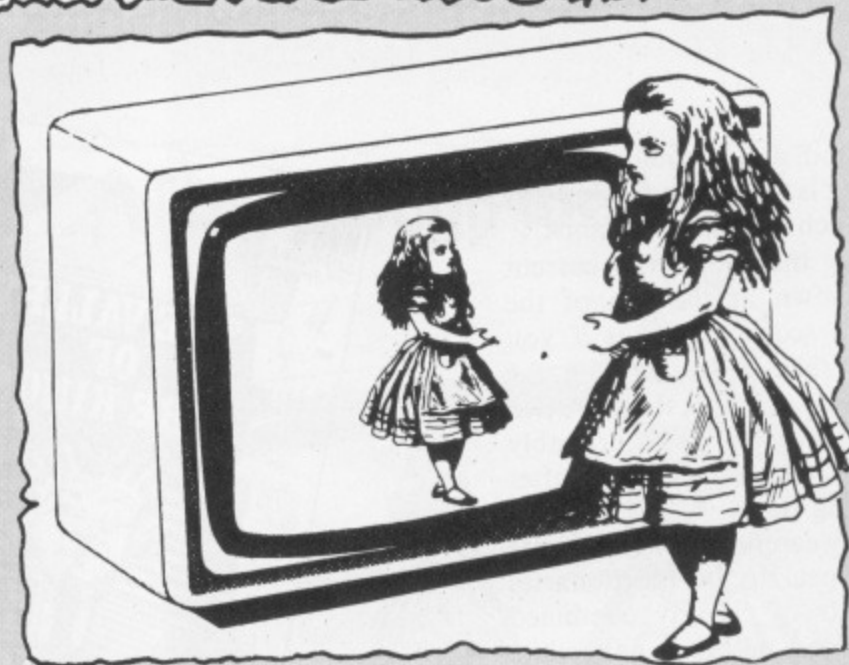
THERE is no solution to the Monkeys and the Coconuts problem.

Before I get Angry Person letters I consider it fair to set such problems (Acheton is full of things you can't or shouldn't do). The hints were Diaphantos and a mention of Fermat's Last Theorem, which is conjectured to be impossible also.

The "solution" was therefore to show that no integer can satisfy the problem of the five men cheating at night followed by a fair split with the three monkeys in the morning.

Proof: The fifth man must leave a pile divisible by 8 - call it  $8*N$ . Therefore the 4th man left  $(8*N)*5/4 + 3 = 10*N + 3$  which must be an odd number - call it Nodd.

Therefore the 3rd man left  $Nodd*5/4 + 3$  which is impossible since  $Nodd*5$



must be odd and therefore indivisible by 4.

In fact whenever  $(5 \text{ men} + M \text{ monkeys})$  is a multiple of 8 ( $M=3, 11, 19 \dots$ ) there is no solution but, surprisingly, there is always a solution otherwise (I have a truly marvellous program to show this but cannot fit it into the article).

An interesting situation occurs when there are 1023 monkeys. In this case the initial pile = 11,533 coconuts and the

final totals are 2103, 1478, 978, 578, 258 for the men and only 6 each (the minimum) for the monkeys. Actually the men are not really cheating because they invest (plant) their profits to grow more economic palm trees and therefore only got one coconut each (sad, isn't it?).

This makes the tax man happy (he has to tax the masses) and stops the monkeys' union from working uneconomic palm trees in the awkward parts of the island.

## Problem

AN example of a group problem was the Filthy Fifteen Prisoners. Although there are thousands of permutations there are only seven "groups" of solutions.

A similar problem is to place eight queens on a chess board so that no queen attacks another. Here there are 12 "groups" of which 11 have no reflection or rotation symmetry and one group which can be rotated 180 degrees back to the same position, namely C1 E2 B3 H4 A5 G6 D7 F8. Therefore the total number of solutions is  $11*8 + 1*4 = 92$ .

Placing N queens on an  $N*N$  board has been investigated up to  $N=16$  (this has 1,846,955 groups giving a total of

14,772,512 solutions). These results were obtained by computer programs that "back track". That is, whenever they cannot place another queen they treat this as a dead end in a maze and return to the last choice (or crossroads) and try another path. You do this when you draw a map in an adventure.

In order to illustrate back tracking I have written another prisoner problem. This time there are 21 prisoners and you must send them out each day in groups of three. Each group is chained together with two pairs of manacles thus  $X <--> Y <--> Z$ .

The prisoners refuse to be chained directly together for more than a day

and the problems are:

- How many days can you keep them happy?
- Give a solution for the maximum number of days. Use the letters A-U.
- Ignoring permutations, what is the total number of solutions?

The best approach is to analyse the problem on paper and only use the program to test your answer. If you make an input error then enter 0,1,1 to clear the current day's entries and enter 0,0,1 to back track to the previous day.

Further modification can make the program select and back track automatically - an exercise I leave to the reader. Alice

```
10 DIM C(21,21),D(21)
20 ON ERROR GOTO 150
30 D(0)=1
40 FOR I=1 TO 21
50 FOR J=1 TO 21
60 C(I,J)=0
70 NEXT J
80 NEXT I
90 D=1
100 PRINT"DAY ";D
110 FOR I=1 TO 21
120 D(I)=0
130 NEXT I
```

```
140 FOR P3=1 TO 7
150 PRINT"GROUP ";P3;
160 INPUT" X,Y,Z ";X,Y,Z
170 IF X>0 THEN 260
180 PRINT"BACKTRACKING"
190 IF Y=0 AND D>1 THEN D=D-1
200 FOR I=1 TO 21
210 FOR J=1 TO 21
220 IF C(I,J)=D THEN C(I,J)=0
230 NEXT J
240 NEXT I
250 GOTO 100
260 IF X=Y OR Y=Z OR X=Z THEN PRINT
```

```
"Don't cheat":GOTO 150
270 IF D(X)+D(Y)+D(Z)>0 THEN PRINT"
You can't do that":GOTO 150
280 IF C(X,Y)>0 THEN PRINT"You did
";X;" and ";Y;" on day ";C(X,Y):GOTO
150
290 IF C(Y,Z)>0 THEN PRINT"You did
";Y;" and ";Z;" on day ";C(Y,Z):GOTO 150
300 D(X)=D:D(Y)=D:D(Z)=D:C(X,Y)=D:C
(Y,X)=D:C(Z,Y)=D
310 NEXT P3
320 D=D+1
330 GOTO 100
```

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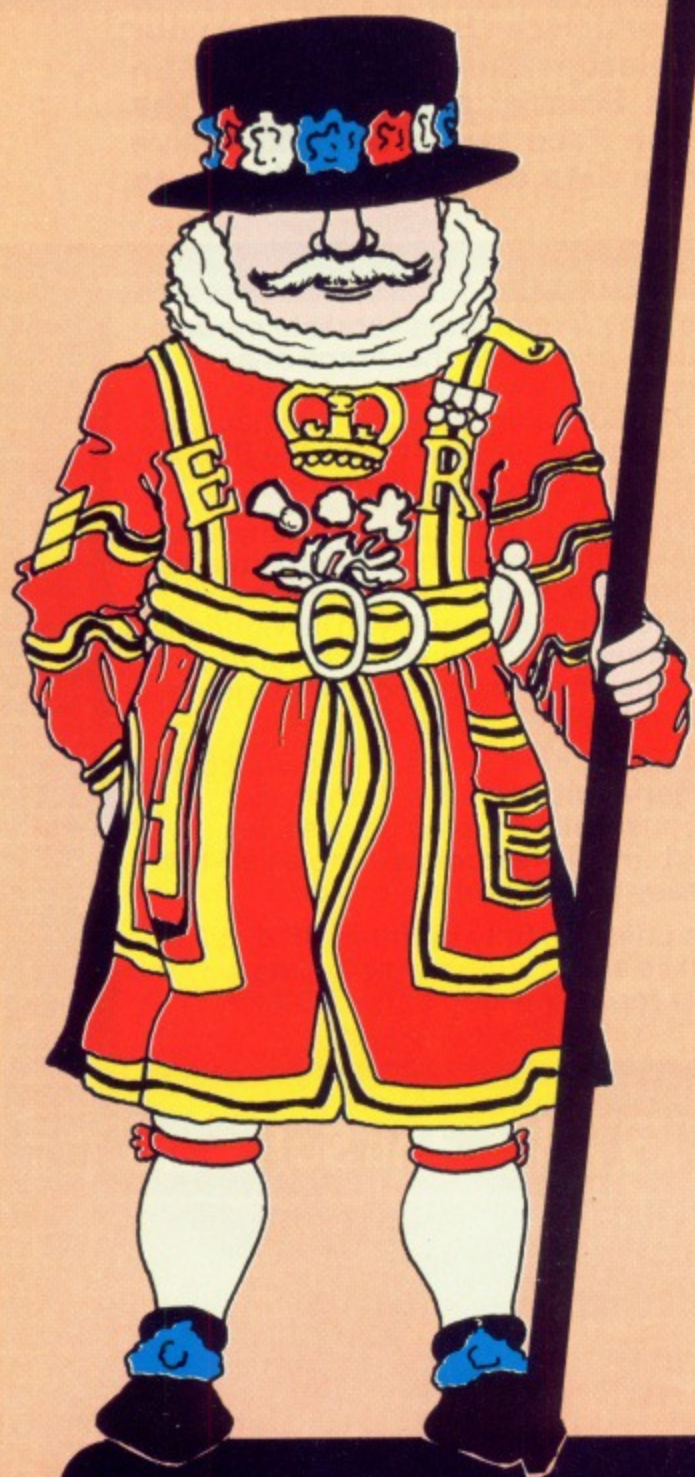
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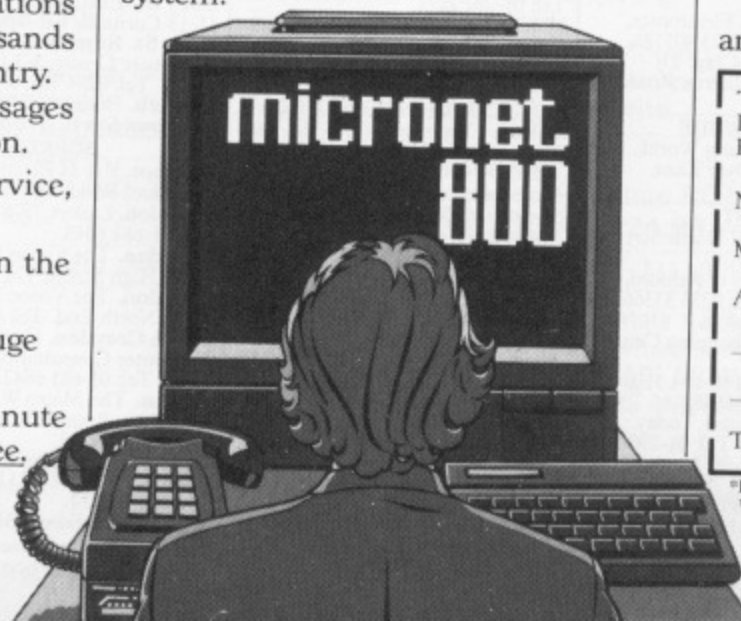
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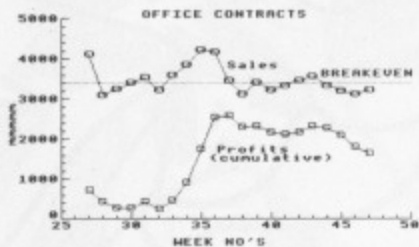


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## Concluding MIKE BIBBY's introduction to programming

WE investigated the Basic keyword LEFT\$ last month and saw how we could use it to "slice off" a specified number of characters starting from the left hand side of a string.

Program I illustrates how it works. *loop%*, the loop variable, determines the size of each slice (line 10).

```
10 REM PROGRAM I
20 MODE 6
30 string$ = "0123456789"
40 FOR loop% = 1 TO 10
50 PRINT LEFT$( string$, loop% )
60 NEXT loop%
```

### Program I

Can you remember what would happen if our loop went from 0 to 11 – that is from before the first character in *string\$* to past the last?

Notice how the program gives us a triangle of numbers. As we've done before, let's turn the triangle upside down. There are two possible ways. We can replace line 40 with:

```
40 FOR loop% = 10 TO 1 STEP -1
```

Another way, though less obvious is to keep the original line 40 but to alter line 50 to:

```
50 PRINT LEFT$( string$, 11 - loop% )
```

Here we're subtracting from an offset of 11. So the first time through the loop, when *loop%* is 1, we take the 10 leftmost characters of *string\$*, (11 - 1).

Next time through *loop%* is 2, so we take 11 - 2 = 9 characters, and so on.

This idea of taking the loop variable away from an offset can be extremely useful – you can have two indexes based on the loop variable.

The first *loop%* is the loop variable itself, and increases as the loop variable does. The second *offset% - loop%* decreases as the loop variable increases.

Don't worry too much about exactly how you'd use these techniques – now you've seen them, they'll come naturally to you when you need them.

We've covered LEFT\$ in some depth now, and it won't surprise you to learn that there's a keyword called RIGHT\$. It works exactly as you would imagine it would – as a sort of mirror image of LEFT\$, slicing a specified number of characters from the right side of a string.

Program II illustrates RIGHT\$. As you can see, it's virtually identical to Program I save that the reference to LEFT\$ is replaced by RIGHT\$.

I don't think we need to belabour the point, it's very similar to LEFT\$.

# The trick with a database is to organise it so you get out more



```
10 REM PROGRAM II
20 MODE 6
30 string$ = "0123456789"
40 FOR loop% = 1 TO 10
50 PRINT RIGHT$( string$, loop% )
60 NEXT loop%
```

### Program II

Remember that when you're using RIGHT\$, the first variable inside the brackets specifies the string you're slicing. The second, numeric variable, tells you how many characters you want in that slice – starting from the right hand side.

If you want more practice with RIGHT\$, use it to replace the occurrences of LEFT\$ in last month's examples.

Now we can use LEFT\$ and RIGHT\$ to interrogate a database. Sounds fancy, doesn't it? Actually, it couldn't be easier. As we mentioned last month, a database is an organised set of records.

Here's the contents of the database we'll be using in our next example:

Tom	Smith
Paul	Jones
Dick	Brown
Jonathan	Johnson

Now the trick with a database is to organise it so that you get "more"

information out than you put in!

In Program III, for example, we're going to read our four people's names into strings and then – using LEFT\$ and RIGHT\$ – have the program print out lists of first, second and full names.

Have a careful look at Program III. It's main part, the control section, is covered in lines 10 to 100.

PROCinitiate (lines 190 to 280) turns off the cursor (line 195) and dimensions the matrix for the strings, *name\$* (line 200).

It also sets up *pad\$* consisting of 10 spaces. We use this to make sure that each name, first or last, is exactly 10 characters long. We touched on this last month. The FOR...NEXT loop of lines 220 to 270 does the work.

Line 230 reads in the first and second name into *first\$* and *second\$* respectively (the data is all on line 2000).

Lines 240 and 250 pad each of these characters out to a length of 10, then 260 concatenates them and stores them in *name\$(loop%)*.

PROCchoice then gives you a menu to choose from, in the manner we discussed last month, and lines 60 to 90 take appropriate action, depending on your choice, which is stored in *choice\$*.

PROCfull\_names (lines 300 to 400) couldn't be simpler: for *loop%* equal one to four, you simply print out *name\$(loop%)*.

However choosing the more friendly first names doesn't pose any problems



# More than you put in

for the micro, either. If you look at PROCfirst\_names, you'll see that it's identical to PROCfirst\_names, except that we print out:

```
LEFT$( name$( loop% ), 10 )
```

instead of simply:

```
name$( loop% )
```

The same goes for the more formal PROClast\_names, except that this time, instead of LEFT\$, we print out:

```
RIGHT$( name$( loop% ), 10 )
```

Easy isn't it? But notice how we did it. We set things up so we could make simple use of LEFT\$ and RIGHT\$ by

carefully organising our database – padding out the names to 10 characters.

When you're writing a program to handle data it pays to have a good think about the form you're going to store it in. A little care in getting it into an easily manipulated form can pay dividends later.

Fine, we know how to carve the beginning (LEFT\$) and ends (RIGHT\$) off strings – but what if we want some characters out of the middle?

Well, we use the appropriately named MID\$ to do that little trick. Take a look at Program IV.

The first point to notice about MID\$ is that it has three parameters or variables inside the brackets.

The first variable defines the string we're going to slice – as it did with LEFT\$ and RIGHT\$. We're also

```
10 REM PROGRAM IV
20 MODE 6
30 string$ = "ABCDEFGH"
35 PRINT "The string is ";
string$
40 length% = 3
50 FOR start% = 1 TO 5
60 PRINT MID$( string$, start%,
length%)
70 NEXT start%
```

Program IV

```
10 REM PROGRAM III
20 MODE 6
30 PROCinitiate
40 REPEAT
50 PROCchoice
60 IF choice$ = "1" THEN
PROCfull_names
70 IF choice$ = "2" THEN
PROCfirst_names
80 IF choice$ = "3" THEN
PROClast_names
90 IF choice$ = "4" THEN END
95 PRINT TAB(4,20) "Press Space Bar
to continue"
96 REPEAT : dummy$ = GET$ : UNTIL
dummy$ = CHR$(32)
97 CLS
100 UNTIL FALSE
110 REM =====
120 DEF PROCchoice
130 PRINT "'Do you wish to
list:-'
131 PRINT TAB(10) "1. Full names"
132 PRINT TAB(10) "2. First names"
133 PRINT TAB(10) "3. Last names"
134 PRINT TAB(10) "4. End"
140 REPEAT
150 choice$ = GET$
160 UNTIL INSTR("1234", choice$)
170 ENDPROC
180 REM =====
190 DEF PROCinitiate
195 VDU 23;8202;0;0;0;
200 DIM name$(4)
210 pad$ = STRING$( 10, " ")
220 FOR loop% = 1 TO 4
230 READ first$, second$
240 first$ = LEFT$( first$ + pad$,
10)
250 second$ = LEFT$( second$ + pad$,
10)
260 name$( loop% ) = first$ +
second$
270 NEXT loop%
280 ENDPROC
290 REM =====
300 DEF PROCfull_names
305 PRINT "The full names are :-"
310 FOR loop% = 1 TO 4
320 PRINT TAB(10) name$( loop% )
330 NEXT loop%
340 ENDPROC
400 REM =====
410 DEF PROCfirst_names
412 PRINT "The first names are :-"
415 FOR loop% = 1 TO 4
420 PRINT TAB(10) LEFT$( name$(
loop% ), 10 )
430 NEXT loop%
440 ENDPROC
500 REM =====
510 DEF PROClast_names
512 PRINT "The last names are :-"
515 FOR loop% = 1 TO 4
520 PRINT TAB(10) RIGHT$( name$(
loop% ), 10 )
530 NEXT loop%
540 ENDPROC
600 REM =====
2000 DATA Tom, Smith, Paul, Jones,
Dick, Brown, Jonathan, Johnson
```

Program III

## From Page 93

familiar with the last variable — this tells us exactly how many characters we want in the slice.

It's the middle variable that's new, but it's fairly obvious when you think about it. With `LEFT$` and `RIGHT$`, we knew where to start slicing our characters from (the beginning and end of the strings respectively), and we kept going until we had our required number of characters.

With `MID$` we don't know where to start — all we've said is the middle of the string. We need to say exactly where in the string we want our slice to start from.

The second variable in the brackets does this, telling us the number of the character at which to start our slice. It then goes right from that character until it's of the required length (specified by the third variable). So:

```
PRINT MID$( "ABCDE", 2, 4)
```

would print out

```
BCDE
```

That is, it starts at the second character and prints out the number of characters specified — four. Notice, by the way, that the 2 and the 4 do **not** mean make the slice from character 2 to character 4, which would give you:

```
BCD
```

The 2 tells you the character to start at all right, but the 4 specifies the **length** of the string from there on — not the character you end on. Given this, Program IV should make sense to you.

```
10 REM PROGRAM V
20 MODE 6
30 string$ = "ABCDEFGH"
40 FOR length% = 1 TO LEN(string$)
50 PRINT "The string is ";
string$
60 PRINT "The length of slice is ";
length%
70 FOR start% = 1 TO 5
80 PRINT MID$( string$, start%,
length%)
90 NEXT start%
100 dummy$ = GET$
110 NEXT length%
```

### Program V

Program V uses nested loops to demonstrate the action of `MID$` more

formally. `string$` is set to `ABCDEFGH` (line 30) and we proceed to take slices of this.

The length of each slice (`length%`) varies in the outer loop (40-110) from 1 to the length of `string$`.

The inner loop (70-90) then shows the effect of using `MID$` on `string$` for the specified `length%` starting successively at characters 1 to 5.

Each time through the outer loop the program waits for a key press (line 100) so you can see what's happening.

You should be used to nested loops by now; getting to grips with Program V should give you a real feel for `MID$`.

Oddly enough, one way we frequently use `MID$` is to pick out a single letter from a string. We do this by setting the third parameter — which dictates the length of the slice — to 1.

For instance:

```
PRINT MID$( "ABCDE", 1, 1 )
```

will give us

```
A
```

while

```
PRINT MID$( "ABCDE", 2, 1 )
```

will give us

```
B
```

since the 2 tells us to start at the second character (in this case B) and to take a slice only one character long — so we simply have B returned.

```
10 REM PROGRAM VI
20 MODE 6
30 INPUT "String", string$
40 FOR loop% = 1 TO LEN( string$ )
50 PRINT MID$( string$, loop%, 1 );
CHR$(32);
60 NEXT
```

### Program VI

Program VI shows how we can use this technique of picking out a single character to "spread out" a given string, `string$`. It does this by inserting spaces between each character of the string.

Our loop variable, `loop%` goes from 1 to the length of `string$` (line 40). We use `MID$` with a length of 1 to pick out each character in turn, and print it with an accompanying space (line 50).

Program VII also uses this technique to pick out individual letters, but it's far fancier — it reverses the string you put in.

We do this by using a loop (60-80) to

```
10 REM PROGRAM VII
20 MODE 6
30 REPEAT
40 reverse$ = ""
50 INPUT "String", string$
60 FOR loop% = 1 TO LEN( string$ )
70 reverse$ = MID$( string$, loop%,
1 ) + reverse$
80 NEXT
90 PRINT TAB(7) reverse$
100 UNTIL FALSE
```

### Program VII

build up a string `reverse$` by adding the single character we've picked out with `MID$` to the **front** of the last `reverse$`. `reverse$` is initially the null string (line 40).

Suppose that, when prompted by line 50, we input ABC. That is, `string$` = "ABC".

The first time through the loop line 70 would make `reverse$` equal to A. This is because, since `loop%` is 1, `MID$` picks out the A of ABC. It then tags onto the back of it the current content of `reverse$`, which is null, and stores the whole back in `reverse$`.

Next time through `loop%` is 2, so `MID$` picks out B. It then adds **after** it the current content of `reverse$`, A, so you end up with BA in `reverse$`.

The last time through `loop%` is 3, so we pick out the C from `string$`. We then tag onto it `reverse$`, which is BA, to obtain CBA, our final `reverse$`, the exact reverse of the string we input.

One of the main uses of `MID$` is to pick out data strings from longer data strings. For example, we might modify Program III to take into account middle names. Each record will then consist of three parts, or fields as they are known.

We would still pad out each field so that it was exactly 10 characters long, so that now each record would be 30 characters long.

We could still use `LEFT$(name$(loop%),10)` to pick out the first names, and `RIGHT$(name$(Loop%),10)` to pick out the last name. To print out the middle names we'd use `MID$` in a loop of the form:

```
FOR loop% = 1 TO 4
PRINT MID$( name$( loop% ), 11, 10)
NEXT loop%
```

As Figure I shows, we know that for

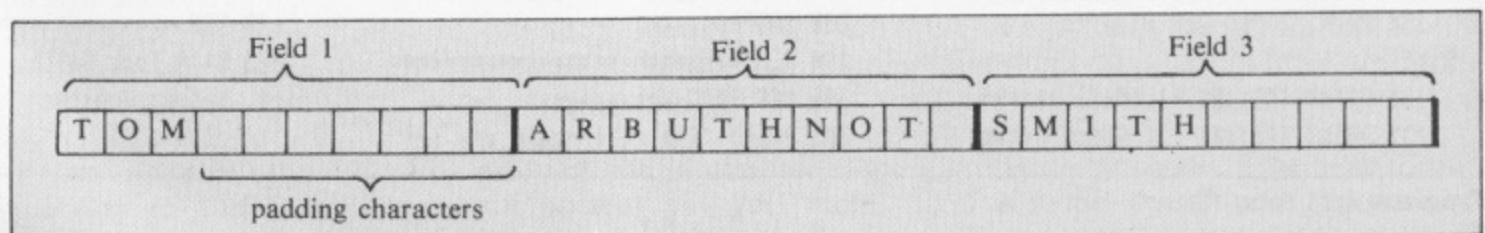


Figure I: Fixed field records

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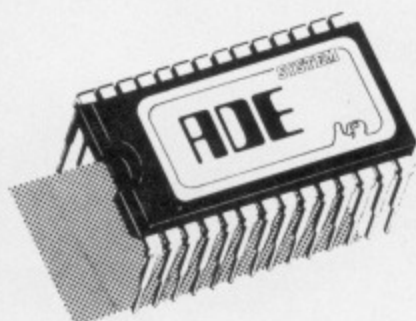
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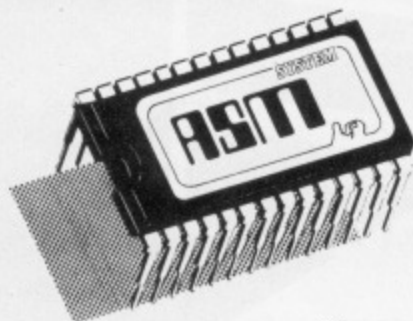
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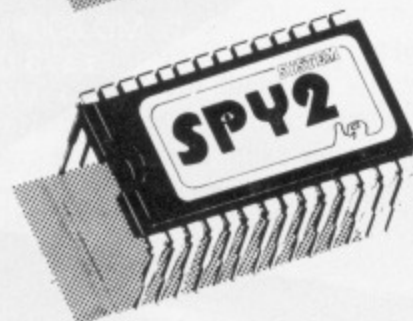
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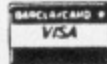
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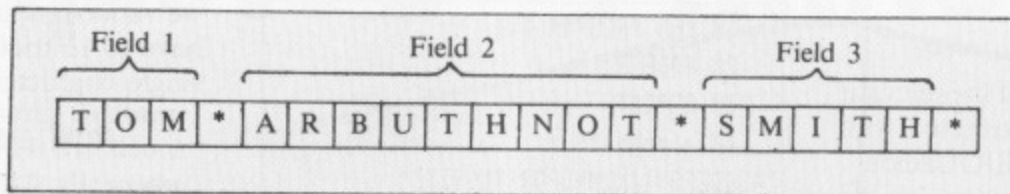


Figure II: Variable field records

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each record, since each field is exactly 10 characters long, the middle name field starts at character 11. We then use MID\$ to pick out the 10 characters starting there to give us the middle name.

We can use MID\$ in this way because we know that the second field starts at character 11 – we've organised our data that way.

Making the fields in every record a standard length can really speed things up – the computer knows exactly where things are to be found in each field.

However those fields are bound to contain a lot of padding blanks which the micro has to remember. So this method of fixed length fields, though quick and easy to program with, is very wasteful of memory.

There is another way of storing records – with variable length fields. You just remember as many characters as you need for each field. You separate each field with a special "marker" character so that the micro knows where one field ends and another begins.

Figure II shows how the record of Figure I would be stored in this method – using an asterisk as the marker. To

```

10 REM PROGRAM VIII.
20 MODE 6
30 REPEAT
40 INPUT "String", string$
50 FOR loop% = 1 TO LEN( string$ )
60 IF MID$( string$, loop%, 1 ) =
"*" THEN PRINT " Asterisk at character
"; loop%
70 NEXT
80 UNTIL FALSE

```

#### Program VIII

find, say, the third field of a record, you search for the second and third asterisks – you then want the characters in between.

This method tends to be less rigid and more economical of memory than fixed length fields. It is, however, far slower, since you have to search each of the records you're considering for the asterisks bounding the field you require.

Program VIII shows the sort of technique we need to find the records. It

hunts out any asterisks in a string.

When you run it enter a string with a few asterisks in it to mimic a record with variable length fields. You'll find it quite simple to follow the action.

```

10 REM PROGRAM IX
20 MODE 6
30 REPEAT
40 INPUT LINE "String", string$
50 FOR loop% = 1 TO LEN( string$ )
60 IF MID$( string$, loop%, 1 ) =
CHR$(32) THEN PROCinsert
70 NEXT
80 PRINT TAB(7) string$
90 UNTIL FALSE
100 END
110 REM =====
120 DEF PROCinsert
130 string$ = LEFT$( string$,
loop%-1) + "*" + RIGHT$( string$,
LEN(string$) - loop% )
140 ENDPROC

```

#### Program IX

Program IX uses the same sort of technique to search for spaces in a string, replacing each with an asterisk. Notice line 40. We're using INPUT LINE for the first time. This works in much the same way as INPUT but accepts everything you type – spaces, commas and all – until you press Return.

INPUT on its own would only accept the characters up to the comma or space, and reject the rest. If you don't believe me, try entering:

123,456

or

GOOD MORNING EVERYONE

into a line something like:

INPUT string\$

To return to Program IX. The loop of lines 50 to 70 then searches the string for spaces using MID\$ and goes to PROCinsert if it finds one.

Notice that when the program does find a space the value of loop% indicates the position of the space in the string. PROCinsert works by splitting the string in two on either side of the space. It uses:

LEFT\$( string\$, loop% - 1 )

to get all the characters on the left of the space. Note the loop% - 1: we want the characters up to but not including loop%.

PROCinsert uses:

RIGHT\$( string\$, loop% + 1)

to find all the characters to the right of the space. Note we start one past loop%. Line 130 then neatly joins these two portions, with an asterisk in the middle. Hence the asterisk appears to replace the space.

Of course, we needn't have replaced the space with one asterisk – we could have inserted, say, the word SPACE. Just because you're getting rid of one character you don't have to replace it with just a single character.

In fact you don't have to replace it at all. In that case Program IX's effect would be to squeeze all spaces from a string.

A word of warning. When you're inserting and deleting from strings remember that the length of the string changes. You can give yourself real headaches if you forget this.

You'd use this replacement technique when you needed to update information – say changing a bride's surname or altering Rhodesia to Zimbabwe and so on.

```

10 REM PROGRAM X
20 MODE 6
30 REPEAT
40 INPUT LINE "String", string$
50 FOR loop% = 1 TO LEN( string$ )
60 IF INSTR( "AEIOUaeiou", MID$(
string$, loop%, 1 )) THEN PROCinsert
70 NEXT
80 PRINT TAB(7) string$
90 UNTIL FALSE
100 END
110 REM =====
120 DEF PROCinsert
130 string$ = LEFT$( string$,
loop%-1) + "*" + RIGHT$( string$,
LEN(string$) - loop% )
140 ENDPROC

```

#### Program X

Program X replaces all the vowels in a string with asterisks. Line 60 does the

## From Page 97

work, using INSTR to see if the relevant character of the string (extracted with MID\$) is in the string "AEIOUaeiou".

Notice that PROCinsert remains the same.

```
10 REM PROGRAM XI
20 MODE 6
30 REPEAT
40 alphabet$ =
"ABCDEFGHIJKLMNPOQRSTUVWXYZ"
50 PRINT "Enter a letter"
60 letter$ = GET$
70 FOR loop% = 1 TO 26
80 IF letter$ = MID$( alphabet$,
loop%, 1) THEN PRINT 'letter$; " is
letter "; loop% ; " of the
alphabet.'"
90 NEXT loop%
100 UNTIL 0
```

### Program XI

Program XI uses the methods we've been looking at to tell you the position in the alphabet of a capital letter you've input. I leave it to you to work out exactly how!

```
10 REM PROGRAM XII
20 MODE 6
30 REPEAT
40 alphabet$ =
"ABCDEFGHIJKLMNPOQRSTUVWXYZ"
50 PRINT "Enter a letter"
60 letter$ = GET$
70 position% = INSTR( alphabet$,
letter$ )
80 IF position% <> 0 THEN PRINT
'letter$; " is letter "; position% ; "
of the alphabet.'"
90 IF position% = 0 THEN PRINT
"CAPITAL letters, please."
100 UNTIL 0
```

### Program XII

Program XII does exactly the same, but using INSTR in a way we haven't seen before. You see, INSTR doesn't only tell you whether a character is in a given string or not – it also tells you where in the string it is.

In line 70 *position%* would have the value 5 if you'd typed in E. If the character wasn't in *alphabet\$*, *position%* would have been 0.

There's a lot more to INSTR than

we've looked at. For a start, you don't have to restrict yourself to looking for single characters. Try:

```
PRINT INSTR( "ABCDE", "DE" )
```

However, that's beyond the scope of this series of articles. You see, rather sadly we've come to the parting of the ways. You've still a lot to learn about programming – as have I – but now you can manage by yourself.

The User Guide and some of the excellent books on the market should make quite a bit of sense to you now, so you should have no trouble learning.

Remember, though, there are really only two surefire ways to learn programming:

- Read other people's programs and try to work out what's going on.

- Do some programming yourself!

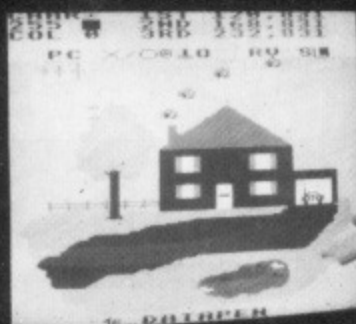
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# To quote a - PHRASE..

ONE of the more interesting enhancements for your BBC Micro is the Acorn speech synthesiser system. It allows the computer to talk in a clear voice but with a limited vocabulary.

The manual which accompanies the upgrade explains in great detail the syntax of the SOUND command used to produce spoken words or part words, but does not tell you how you can incorporate them into a program.

This program, Chatter Box, shows several techniques that can be used to drive the speech synthesiser, and the procedures used may be culled and incorporated into your own programs.

I will not delve into the syntax of the sound statement here because this program will only be of interest to you if you have a speech chip, in which case you will already have the Speech System User Guide which explains it well.

One of the main requirements of a program using speech is to say phrases. If the Acorn manual were to be believed this would have to be done using a long series of SOUND statements, one for each word.

There is an easier way however - by using strings. The procedure \_PHRASE (lines 790 to 860) has a string variable passed to it. Each character of the string corresponds to a word or part word of the phrase to be uttered.

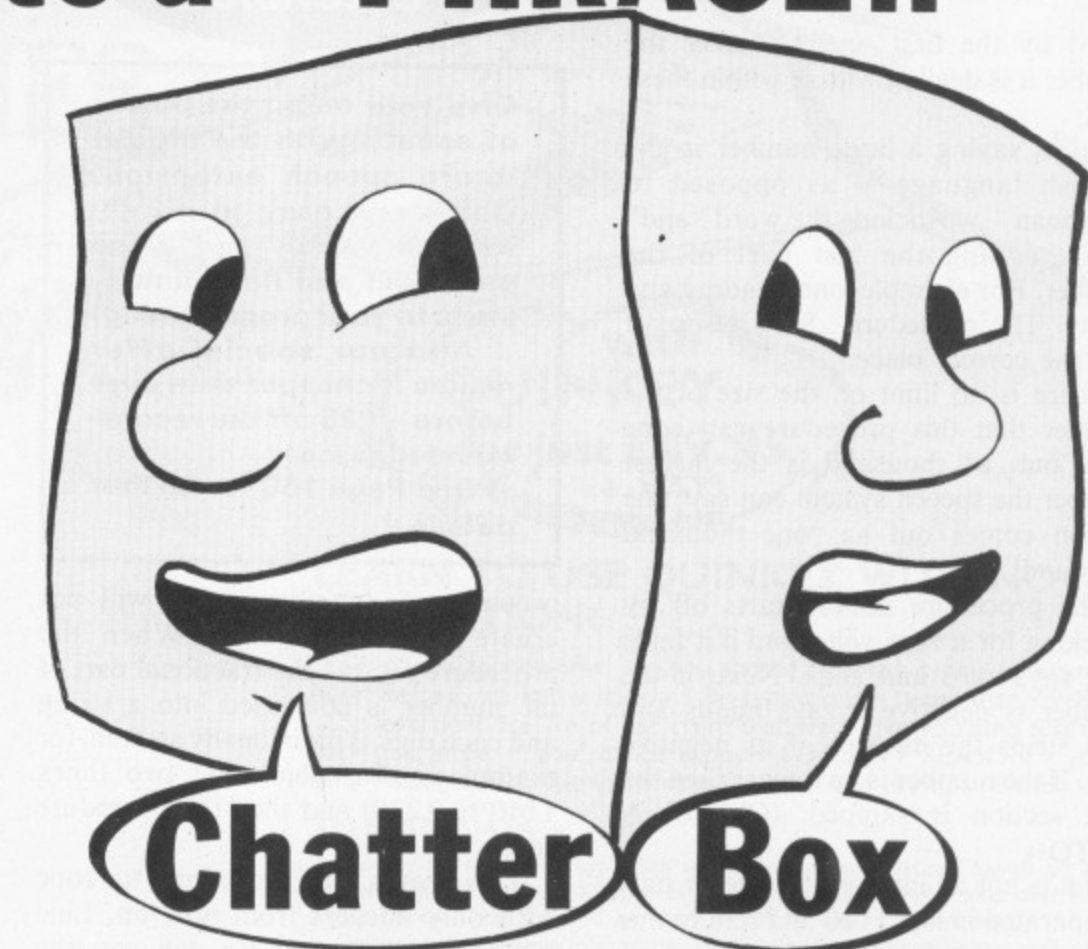
The procedure then scans the phrase, one character at a time, producing each word. The character in a string can only have a value between 0 and 255, but the sound chip requires numbers up to 291. This is remedied in line 830 as, if you define a character in a string to have an Ascii value of greater than 255, you will get a wrap-around effect. That is, 255 is effectively subtracted from the number.

The program can therefore build up phrases in string variables, or string arrays, and simply pass the string to the phrase procedure when required.

There are two ways in which you can build up such string arrays. The first is most useful for short phrases and is shown on line 310 among others.

Each string is built of the individual CHR\$ value for the word. A list of numbers to use is given in appendix A of the speech system manual.

The second way is useful when building up long phrases, and is shown in lines 360 to 410. In this method the numbers making up the phrase are stored in a DATA statement, the first number in the statement being the



## Chatter Box has quite a lot to say for itself

number of elements to be included in the string.

Once the string has been defined it can be used very easily in several different parts of the program. Lines 280 to 640 contain a number memory game like the popular Simon Says.

The computer will ask you to type in a string of numbers. If you get them right it will try you with another set containing one more number. The set of numbers will get longer and longer until you make a mistake. Your score will then be the number you successfully remembered.

The BBC Micro has a long sound buffer and at times you do not want the program to do anything until the phrase has finished. This is achieved by the procedure \_FIN (lines 1030 to 1060) by looping until the sound buffer is empty.

The other major requirement of a speech system is to say numbers. This is not so easy as might at first be assumed. The chip will say certain numbers directly, but others must be built up from their component parts.

The program uses the procedure \_SAY to say the number passed to it. This is written at the end of the program and lines 1070 to 1390 may be incorporated in your own programs.

This procedure also neatly illustrates the use of recursion in programming. Recursion is where a procedure calls itself, one or many times. Of course there must be some restriction on this to stop it crawling up its own FOR/NEXT loop.

When using recursion it is useful to think that the procedure you are writing already exists and can cope with a simple subset of the problem you are coding.

This part of the program contains another procedure \_NUM. This makes the system say any number sent to it in the restricted range of 1 to 99.

It uses the relationship between the numbers used by the speech system and the number you wish to say to achieve this result.

Also several IF statements are used to catch exceptions to this relationship, for example when the number is twelve rather than two teen. This procedure is

By MIKE COOK

**From Page 99**

called by the first one whenever the number it is dealing with is within these limits.

When saying a large number in the English language – as opposed to American – we include the word “and” before saying the last part of the number. For example, one hundred and eighty. The procedure \_SAY inserts it into the correct place.

There is no limit on the size of the number that this procedure can cope with, but, as thousand is the largest number the speech system can say, one million comes out as “one thousand thousand”.

The procedure \_SAY starts off by checking for a zero value and if it finds one, says zero and ends. Next, if the number is negative it says minus and then strips the number of its negative sign. If the number is an integer then the next section is skipped. (Oh no! A GOTO!)

If it is not an integer, the integer part is separated in line 1120 and sent to this procedure to be spoken. This is the first example of the use of recursion.

As the number passed to the recalled

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procedure is an integer we will not create an endless loop. When the procedure returns the fractional part of the number is converted into a string and each digit is individually spoken, for example twelve point one two (lines 1140 to 1230) and then the procedure ends.

This leaves the procedure to cope with only integers from now on. Line 1240 tests to see if we can say the number with our procedure \_NUM. If this is so, we call it and then end. Line

1250 tests if we need to say thousand at some time. If we do, our number is divided by a thousand and then sent to this procedure.

Again this is recursion, the number re-entered is smaller and so eventually this stage will be bypassed.

When the procedure returns the word thousand is said and the number we are dealing with is reduced so that it is the fractional part of division by a thousand. The same happens in line 1260, only this copes with saying hundred. Line 1270 puts the and in the correct place.

Finally line 1280 mops up the last bit of the number.

As you can see, with recursion you can get a small amount of code working quite hard for its living, something rarely achieved when writing programs in Basic.

The procedure described is used in reciting any multiplication table. If you have never heard Kenneth Kendall reciting the minus three hundred and twenty one point seven nine two times table you are in for a treat!

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\* In January 1985, Educational Computing, choosing from 1,500 educational programs, placed Edfax in its Top 10 programs of 1984.

#### EDFAX HAS SO MANY USES

Edfax is ideal for projects like electronic magazines, exhibition notice boards and home data bases. Computer dealers have used them to create software catalogues; schools have created displays of students work for open days; libraries have created information systems; art classes have explored computer graphics; children have illustrated stories and history projects.

The program comes with an 80-page sample database, giving examples of childrens work. You will see that Edfax is entirely content free and can be used right across the curriculum, or at home for recreational purposes

Edfax pages can consist of words, numbers, diagrams, tables, pictures - and a mixture of these.



#### SUPER FEATURES

- The powerful EDIT program allows you to implement all the features of a teletext system, including coloured text and graphics, double height text, flash, conceal/reveal and speedy updates of news pages.
- The program comes in 40-track and 80-track versions, with room for 182 pages of information on the 80-track version. You can build up a collection of disks covering a whole variety of topics.



- Having created your information pages, the DISPLAY program enables any page, or sequence of pages, to be recalled, simply by entering a three-digit page number. Users simply follow the instructions you provide to find their way through the database.
- The cycle page facility enables you to create automatic displays, with variable time delays between the pages. All the pictures on this page were created by schoolchildren using Edfax.

#### FIRST RATE PACKAGE

Parents and teachers will be delighted with the Edfax documentation. This consists of an illustrated 80-page book, in two colours, fitting with the disk into a stout PVC wallet.

A coloured key-strip and screen planning sheet are also included.

The educational thinking behind the disk represents the fruit of extensive school trials co-ordinated by the Microelectronics Education Program (MEP). Edfax was developed by the MEP and is regarded as one of its most significant contributions to educational software development.

#### FURTHER SAVINGS TO BE MADE

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OF THE MONTH**



Only available with the April tape or disc!

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It won't be the White Rabbit who's gasping "I'm late, I'm late". It will be you as you become addicted to this fascinating trial of skill and strategy.

## DON'T FORGET!

*SPECIALLY* selected full-length games – too long to be printed in the magazine itself – now come absolutely free with the monthly tapes and discs from The Micro User.

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March saw Flex as the Freebie. It's an all-action game of skill involving a wizard's store house of DNA and your attempts to grab it in sufficient quantity to exist.



**To order your tape or disc complete the coupon on Page 173**

## Part three

# HOW TO WRITE MACHINE CODE GAMES

By KEVIN  
EDWARDS

# Face up to it, you don't need to move one pixel at a time

LAST month we found that moving objects around the Mode 2 screen — left and right — was quite easy. The main problem was how to delete the character. We solved it by using the EOR function, which provided us with a method of displaying and deleting a character by using just one routine.

This month we're going to move shapes up, down, left and right. In the process we'll also find out how difficult it is to move a shape up and down the screen one pixel at a time. So far, to display characters we've used an indexing method when accessing the screen.

The base location is used to indicate the start position of the character — its top left corner. Changing this base location allows us to move the object to other parts of the screen.

As we saw last time, adding 32 to the base location moves an object right by one character cell, and subtracting 32 from the base location moves the shape left one character cell.

This may satisfy certain needs, but for most cases finer movement is needed.

To do this we subtract or add eight to the base location. Subtracting eight moves the character left by two pixels and adding eight moves the character right by two pixels.

Let me stress that adding or subtracting eight moves the base location to an adjacent column. Remember, each character row has 80 columns of eight vertical bytes — each column byte corresponds to two pixels. That's why the object moves two pixels when eight is added or subtracted.

Moving an object left or right by one pixel is very awkward. This is because each memory location represents two pixels.

It means that in addition to changing the base location, the character data must also be changed — shifted in the appropriate direction by one pixel.

The easiest way to shift the data is to store the character data again — displaced by one pixel.

The result is that twice as much memory is needed to store the character data. In Mode 2, memory is very valuable and so it's always best to avoid repeating data.

Software techniques can be used to shift characters across by one pixel, but these are very time consuming and so are rarely used — speed is considered more important than looks.

Nearly all commercial games written in Mode 2 move characters left and right by two pixels, so don't get paranoid because you haven't got true pixel movement. It's just not worth the extra memory and effort required, and in any case, moving two pixels at a time produces very smooth movement.

If you don't believe me try Program I. All you'll see is a face character go

across the screen — left to right.

Program II allows you to move the face character left or right. The direction is controlled by pressing the Z and X keys — Z to move left and X to move right.

We can now move a character left or right. The next thing to do is move it up or down. I'm afraid this is the most complex part of character movement.

It's simple to move a character up or down by one character line. To do this, 640 must be subtracted or added to the base location. Adding 640 moves down one character line and subtracting 640 moves up one line. Why 640?

Each character line has 80 columns of eight bytes. So the next line begins at the previous line's base location plus 640 (80 \* 8).

The start locations of the first three

```
10 REM PROGRAM II
20 MODE 2
30 FOR pass=0 TO 2 STEP 2
40 PX=&B00
50 [OPT pass
60 .left LDA#19:JSR&FFF4
70 JSR character
80 LDA display+1
90 SEC
100 SBC#8
110 STA display+1
120 STA eor_screen+1
130 BCS no_decrement
140 DEC display+2
150 DEC eor_screen+2
160 .no_decrement JSR character
170 RTS
180 .right LDA#19:JSR&FFF4
190 JSR character
200 LDA display+1
210 CLC
220 ADC#8
230 STA display+1
240 STA eor_screen+1
250 BCC no_increment
260 INC display+2
270 INC eor_screen+2
```

Program II



```

10 REM PROGRAM I
20 MODE 2
30 FOR pass=0 TO 2 STEP 2
40 P%=&B00
50 [OPT pass
60 .right LDA#19:JSR&FFF4
70 JSR character
80 LDA display+1
90 CLC
100 ADC#8
110 STA display+1
120 STA eor_screen+1
130 BCC no_increment

140 INC display+2
150 INC eor_screen+2
160 .no_increment JSR character
170 RTS
180 .character LDY#31
190 .getbyte LDA&C00,Y
200 .eor_screen EOR&5300,Y
210 .display STA&5300,Y
220 DEY
230 BPL getbyte
240 RTS
250 JNEXT
260 FOR loop=0 TO 31

270 READ data
280 loop?&C00=data
290 NEXT
300 CALL character
310 FOR loop=1 TO 75
320 CALL right
330 NEXT
340 END
350 REM Face data
360 DATA5,15,10,15,15,15,15,5
370 DATA15,15,5,15,15,5,0,15
380 DATA15,15,10,15,15,10,0,15
390 DATA10,15,5,15,15,15,15,10

```

Line No.	Description
10-50	Enter assembler.
60	Main entry point. This line executes a *FX 19 command (wait for vertical sync.). Used as a time delay to produce smooth movement without flicker.
70	Delete the face character. Remember, calling an EOR character routine the second time deletes the character.
80-150	Add eight to the base address – move the character right by two pixels.
160	Display the face in its new screen position.
170	End of the main routine.
180-240	Subroutine to display the face on the screen.
250	Exit assembler.
260-290	Read and store the face data in page &C.
300	Put face on the screen – initial set-up.
310-330	Move the face right through 75 positions.
340	End of program.
350-390	Face data.

*Description of Program I*

```

280 .no_increment JSR character
290 RTS
300 .character LDY#31
310 .getbyte LDA&C00,Y
320 .eor_screen EOR&5300,Y
330 .display STA&5300,Y
340 DEY
350 BPL getbyte
360 RTS
370 JNEXT
380 FOR loop=0 TO 31
390 READ data
400 loop?&C00=data
410 NEXT
420 X=0
430 CALL character
440 REPEAT
450 IF INKEY(-98) AND X>0 CALL left
: X=X-1
460 IF INKEY(-67) AND X<76 CALL rig
ht: X=X+1
470 UNTIL 1=2
480 REM Face data
490 DATA5,15,10,15,15,15,15,5
500 DATA15,15,5,15,15,5,0,15
510 DATA15,15,10,15,15,10,0,15
520 DATA10,15,5,15,15,15,15,10

```

Line No.	Description
10-50	Enter assembler.
60	Wait for vertical sync.
70	Delete the face.
80-150	Subtract eight from the base location – move the character left by two pixels.
160	Display the character in it's new position.
170	End of routine.
180	Wait for vertical sync.
190	Delete the face.
200-270	Add eight to the base location – move it right by two pixels.
280	Display the face.
290	End of routine.
300-360	Subroutine to display the face on the screen.
370	Exit assembler.
380-410	Read and store graphic data.
420	X coordinate=0.
430	Display the character.
440	Start of an infinite loop.
450	Check if Z is pressed. Move the character left as long as the X coordinate remains on the same character row. And then decrease the X coordinate.
460	Check if X is pressed. Move the character right as long as the X coordinate remains on the same character row. And then increase the X coordinate.
470	Loop round.
480-520	Face data.

*Description of Program II*

```

10 REM PROGRAM III
20 MODE 2
30 FOR pass=0 TO 2 STEP 2
40 P%=&B00
50 [OPT pass
60 .up LDA#19:JSR&FFF4
70 JSR character
80 LDA display+1
90 SEC
100 SBC#&80
110 STA display+1
120 STA eor_screen+1
130 LDA display+2
140 SBC#2
150 STA display+2
160 STA eor_screen+2
170 JSR character
180 RTS
190 .down LDA#19:JSR&FFF4
200 JSR character
210 LDA display+1
220 CLC
230 ADC#&80
240 STA display+1
250 STA eor_screen+1
260 LDA display+2
270 ADC#2
280 STA display+2
290 STA eor_screen+2
300 JSR character
310 RTS
320 .character LDY#31
330 .getbyte LDA&C00,Y
340 .eor_screen EOR&3000,Y
350 .display STA&3000,Y
360 DEY
370 BPL getbyte
380 RTS
390 JNEXT
400 FOR loop=0 TO 31
410 READ data
420 loop?&C00=data
430 NEXT
440 Y=0
450 CALL character
460 REPEAT
470 IF INKEY(-73) AND Y>0 CALL up:Y
=Y-1
480 IF INKEY(-105) AND Y<31 CALL do
wn:Y=Y+1
490 UNTIL 1=2
500 REM Face data
510 DATA5,15,10,15,15,15,5
520 DATA15,15,5,15,15,5,0,15
530 DATA15,15,10,15,15,10,0,15
540 DATA10,15,5,15,15,15,15,10

```

Program III

Line No.	Description
10-50	Enter assembler.
60	Wait for vertical sync.
70	Delete character.
80-160	Subtract &280 from the base location – move the character up one line.
170	Display the character.
180	Exit.
190	Wait for vertical sync.
200	Delete the character.
210-290	Add &280 to the base location – move the character down one line.
300	Display the character.
310	Exit.
320-380	Subroutine to display the character on the screen.
390	Exit assembler.
400-430	Read and store the face data.
440	Y coordinate=0.
450	Display the face.
460	Start of loop.
470	Check the : key. Move the character up if the key is pressed and the character remains on the screen. And then increment the Y coordinate.
480	Check the / key. Move the character down if the key is pressed and the character remains on the screen. And then decrement the Y coordinate.

Description of Program III

### From Page 104

character rows are &3000, &3280 and &3500 respectively. Each increases by &280 as you go down the screen. The clever among you will know that &280=640.

Also notice that the difference in memory locations between the same position on ANY adjacent character lines is always &280.

Program III allows you to move a character up and down the screen, one line at a time. Use / to move the character down and : to move it up.

Subtracting or adding 640 from the base location produces character movement up or down. What do we do if we want to move the character up or down by one pixel? There is no simple solution.

To simplify things we'll forget moving a whole character and move a single byte instead. First we'll move a byte down the screen.

You'll find it a lot easier to understand the following information if you read it in conjunction with Diagram I.

Initially, the screen location we store the byte in is &3000 – the top left of the screen. To move the byte down by one pixel we increment the screen location by one – to &3001. All goes fine,

incrementing the location until we reach location &3007 – the bottom of the character row.

At this point incrementing the screen location to &3008 moves it to the top of the next column on the same line. In fact, the location we want to store the

		COLUMN						
		0	1	2	...	78	79	
HINEM		&3000	&3008	&3010 ...	&3270	&3278		
		&3001	&3009	&3011 ...	&3271	&3279		
		&3002	&300A	&3012 ...	&3272	&327A		
	ROW 0		&3003	&300B	&3013 ...	&3273	&327B	
			&3004	&300C	&3014 ...	&3274	&327C	
			&3005	&300D	&3015 ...	&3275	&327D	
			&3006	&300E	&3016 ...	&3276	&327E	
		&3007	&300F	&3017 ...	&3277	&327F		
ROW 1		&3280	&3288	&3290 ...	&34F0	&34F8		
		&3281	&3289	&3291 ...	&34F1	&34F9		
		&3282	&328A	&3292 ...	&34F2	&34FA		
		&3283	&328B	&3293 ...	&34F3	&34FB		
		&3284	&328C	&3294 ...	&34F4	&34FC		
		&3285	&328D	&3295 ...	&34F5	&34FD		
		&3286	&328E	&3296 ...	&34F6	&34FE		
		&3287	&328F	&3297 ...	&34F7	&34FF		
ROW 2		&3500	&3508	&3510 ...	&3770	&3778		
		&3501	&3509	&3511 ...	&3771	&3779		
		&3502	&350A	&3512 ...	&3772	&377A		
		&3503	&350B	&3513 ...	&3773	&377B		
		&3504	&350C	&3514 ...	&3774	&377C		
		&3505	&350D	&3515 ...	&3775	&377D		
		&3506	&350E	&3516 ...	&3776	&377E		
		&3507	&350F	&3517 ...	&3777	&377F		

Diagram I

```

10 REM PROGRAM IV
20 REM By Kevin Edwards
30 MODE 2
40 FOR pass=0 TO 2 STEP 2
50 PX=&B00
60 [OPT pass
70 .start LDA#63
80 .display STA&3000
90 LDA display+1
100 AND#7
110 CMP#7
120 BEQ bottom_of_column
130 INC display+1
140 RTS
150 .bottom_of_column LDA display+1
160 CLC
170 ADC#&79
180 STA display+1
190 LDA display+2
200 ADC#2
210 STA display+2
220 RTS
230 JNEXT
240 FOR loop=1 TO 100
250 CALL start
260 REPEAT UNTIL GET
270 NEXT

```

byte in – to move it down one pixel – is &3280 and not &3008.

We now have a problem. How can we tell if we increment the screen location by one or add a much larger number to it?

The clue is that we increment the byte by one only if the current screen location is not at the bottom of the character row and we add &279 if it is at the bottom of the character row – this moves the byte to the top of the next character row.

But how do we know if a screen location is at the bottom of the character row? The answer can be found by using the logical operator AND.

Figure I is a list of some of the locations at the bottom of character row 0. Each location is followed by its binary equivalent.

Have you noticed a pattern? If not, take a look at the binary patterns for the low bytes of the screen locations.

The answer is that the three least significant bits of the low byte of the screen address are all set to 1.

So if bit 0=1 AND bit 1=1 AND bit 2=1 the screen location is at the bottom of the character row.

In practice, we AND the screen location with 7 – we get seven from 4+2+1, bit 2,1 and 0 being set. If the resultant byte is seven then the first three bits of the low byte must be set. In which case the location is at the bottom

Screen location	high byte	low byte
&3007	= % 00110000	00000111
&300F	= % 00110000	00001111
&3017	= % 00110000	00010111
&301F	= % 00110000	00011111
&3027	= % 00110000	00100111
.	.	.
.	.	.
&3277	= % 00110010	01110111
&327F	= % 00110010	01111111

Figure I

Line No.	Description
10-60	Enter assembler.
70	Load the accumulator with the byte to be stored in the video RAM.
80	Store the accumulator in the video RAM – display the byte (two white pixels).
90-110	Check if the location of the byte displayed is at the bottom of a character row.
120	Branch if it is at the bottom of a character row.
130	Increment the screen location – move the byte down one pixel.
140	Exit.
150-210	Add &279 to the screen location – this moves the byte to the top of the next character row.
220	Exit.
230	Exit assembler.
240	Start of loop.
250	CALL the routine.
260	Wait until a key is pressed.
270	End of loop.

#### Description of Program IV

of a character row. In assembly, the required check would look something like this:

```

.down_pixel LDA screenlow
AND #7
CMP #7
BNE not_at_bottom
LDA screenlow
CLC
ADC #&79
STA screenlow
LDA screenhigh
ADC #2
STA screenhigh
JMP rest_of_program
.not_at_bottom INC screenlow
.rest_of_program

```

Program IV moves a byte down the screen one pixel at a time. Press a key to continue the movement. Moving shapes up the screen by a pixel is very similar to moving it down.

A byte can be moved up by decrementing the screen address. When the byte reaches the top of a character row a much larger number must be subtracted from the screen location – this larger number is &279.

Now we have to find a way of testing whether a screen location is at the top of a character row. Again, we do this by

using the AND function. Consider the following locations which are all at the top of character row 1:

Screen location	high byte	low byte
&3280	= % 00110010	10000000
&3288	= % 00110010	10001000
&3290	= % 00110010	10010000
&3298	= % 00110010	10011000
&32A0	= % 00110010	10100000
.	.	.
.	.	.
&34F0	= % 00110100	11110000
&34F8	= % 00110100	11111000
	-----	-----
	????????	?????000
	-----	-----

Again bits 0,1 and 2 of the screen address low byte give us the answer – they are all zero this time.

So if bit 0=0 AND bit 1=0 AND bit 2=0 the screen location is at the top of a character row.

In machine code we AND the low byte with 7, and if the result is 0 then the screen location is at the top of the character row, otherwise the location is



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at another position in the character row.

Here is a check routine for moving a screen location up by one pixel.

```
.up_pixel      LDA screenlow
              AND #7
              BNE not_at_top
              LDA screenlow
              SEC
              SBC #&79
              STA screenlow
              LDA screenhigh
              SBC #2
              STA screenhigh
              JMP rest_of_program
.not_at_top    DEC screenlow
.rest_of_program
```

Program V moves a byte up the screen one pixel at a time – the reverse of Program IV. Press a key to continue the movement.

It's rather complex isn't it? Wait until you've got to do this for a complete character!

That's enough for this month. Try and absorb as much of it as you can before the next instalment.

```
10 REM PROGRAM V
20 REM By Kevin Edwards
30 MODE 2
40 FOR pass=0 TO 2 STEP 2
50 PX=&B00
60 [OPT pass
70 .start LDA#63
80 .display STA&7D87
90 LDA display+1
100 AND#7
110 BEQ top_of_column
120 DEC display+1
130 RTS
140 .top_of_column LDA display+1
150 SEC
160 SBC#&79
170 STA display+1
180 LDA display+2
190 SBC#2
200 STA display+2
210 RTS
220 JNEXT
230 FOR loop=1 TO 100
240 CALL start
250 REPEAT UNTIL GET
260 NEXT
```

Line No.	Description
10-60	Enter assembler.
70	Load accumulator with byte to be stored in video RAM.
80	Store accumulator in video RAM – display byte.
90-100	Check if location of byte displayed is at top of a character row.
110	Branch if it is at top of a character row.
120	Decrement the screen location – move byte up one pixel.
130	Exit.
140-200	Subtract &279 from screen location – this moves the byte to bottom of previous character row.
210	Exit.
220	Exit assembler.
230	Start of loop.
240	CALL the routine.
250	Wait until a key is pressed.
260	End of loop.

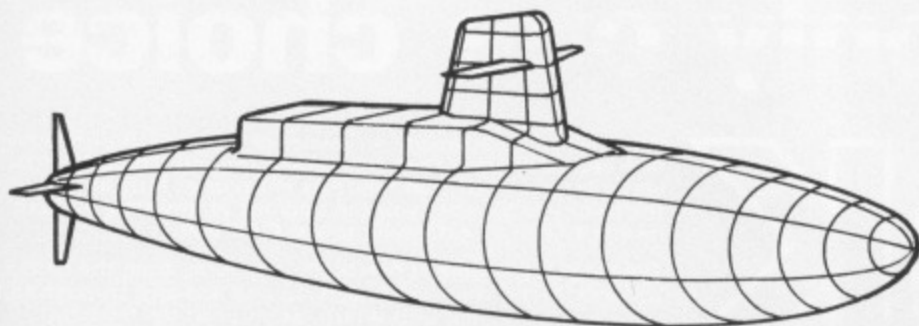
Description of Program V

# sub strike

Your submarine is being attacked by wave after wave of enemy helicopters armed with bombs, depth charges and ASGROC (Anti-Submarine Guided ROCKets), the only way to survive is to blast them out of the sky before they can get you - but look out for crashing helicopters, drifting mines and Sonar Subs - and even the fish are dangerous ...

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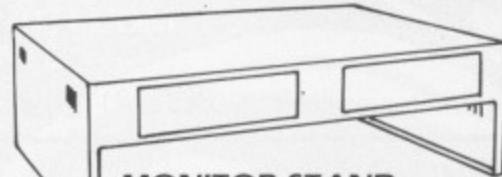
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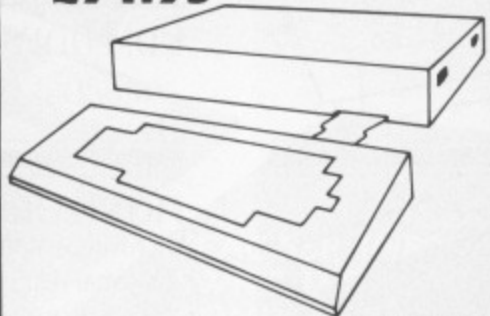
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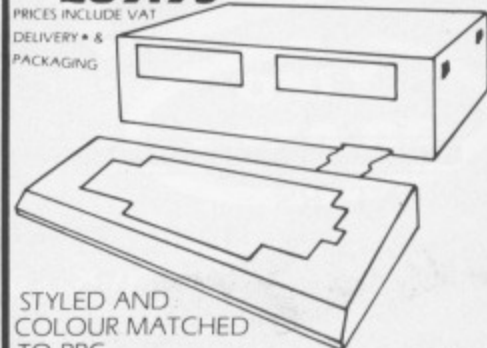
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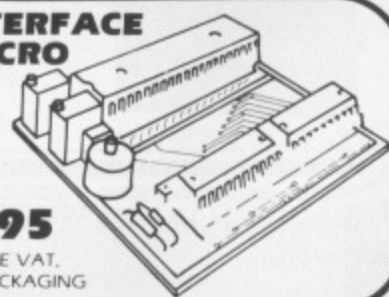
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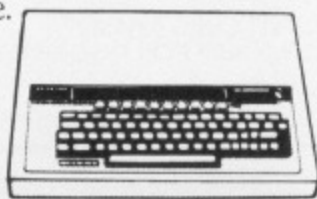
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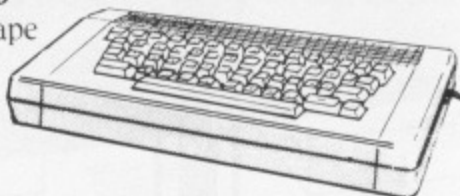
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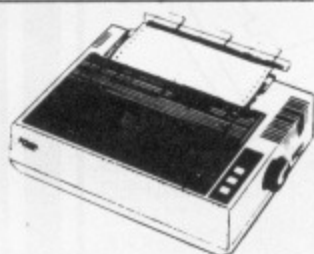


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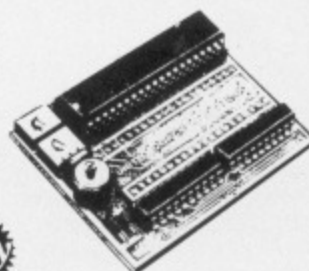
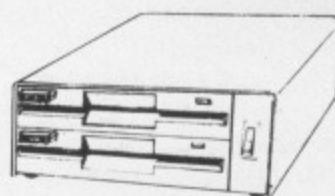
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that you do not need to type in the assembler comments. These are only present so that you can follow the operation of the program and serve no other purpose – so anything on a line that comes after the ‘\’ symbol can be omitted.

Once the listing is entered into the machine you should save the program. When run it will assemble the machine code into locations &900 to &AFF, and once complete it will automatically save the machine code onto disc or tape under the file name DITHER.

This file can be loaded back in your machine whenever you want to use the program. Depending on the type of filing system that you own, this will have to be done in different ways.

If you are lucky enough to own a disc drive then all you need to do is whenever you want to use this routine in any of your programs put at the first line of your program \*DITHER. This will load and initialise the program.

If you are restricted to cassette this code will have to be loaded first and then called from Basic by CALL &0900 to initialise it.

So let's try something. Switch the computer into Mode 2 and type:

```
CALL&0900
COLOUR136:CLS
```

then:

```
*DITHER 3,6,8
```

The screen should start flashing once

you have entered the second line, and, on typing in the third line, the screen should quickly fill with a light green colour. If it doesn't check your program carefully.

Once you know it is functioning properly try typing in Program II. This will show you all the colours that can be achieved using our dithering techniques.

You may notice if you look at the above demonstration program that you do not CALL the machine code, but you use it as if it were part of the computer's own language – you call it by typing \*DITHER.

This is very unusual, and is achieved by patching it into the machine's own command line interpreter.

All star commands are sent to the micro's command line interpreter. What I have done is to intercept this routine by changing one of the system vectors and redirecting it to my own command line interpreter.

This then tests for the word DITHER. If it is not found control passes back to the original routine. If it matches however, the routine passes control to the dither program, which proceeds to pick up the three numbers it requires.

This small section of machine code, from line 90 to line 290 of Program III, could be tailored to work with any machine code routine that you may want to patch into the operating system ... but that's another story.

Data for this program can be passed to it in one of three ways:

- You can type the numbers into the

computer as data in a statement like this:

```
*DITHER(4,5,10)
```

- The colour numbers can be passed in any of the computer's integer variables, from A% to Z%:

```
*DITHER(A%,B%,C%)
```

- A mixture of both of the above methods can be used:

```
*DITHER(A%,B%,15)
```

The three numbers shown in the statement must be in specific ranges. The first two represent the colour numbers that you want to combine to produce your shade. They are in the range 0-7.

The last number represents the flashing colour number with which you want to dither, which should be in the range 8-15.

If any of the three numbers fall outside any of these ranges the error message shown below will be produced:

```
*DITHER(<0-7>,<0-7>,<8-15>)
```

If you experiment with this program you will find it is possible to get some fantastically colourful pictures. Just try it and find out.

If you want to pursue the subject further it is possible to get far more colours than those you can see with Program II simply by altering the dithering pattern used to change the colours.

## Dither listing

```

1 REM*****
2 REM*      Program III      *
3 REM* (c) The Micro User 1985 *
4 REM* Written by P. E. Walker *
5 REM*****
10 $&AF0="*DITHER"
20 FORI=0 TO 2 STEP2
30 P%=&900
40 [
50 OPT I
60 \ &80,81 - ADDRESS WHERE THE 0
LD CLI ADDRESS IS STORED.
70 \ &82,83 - ADDRESS OF THE TEXT
STRING IN MEMORY TO BE CHECKED.
80 \ &84 - VARIABLE POINTER ,
0 IF NUMERIC - 1 IF VARIABLE.
90 SEI \Disable inter
upts.
95 LDA&209:CMP#9:BEQ quit \Test if
*DITHER is already in operation.
100 LDA&208:STA&80 \Save the addre
ss of the old CLI for future use.
110 LDA&209:STA&81
120 LDA#&1E:STA&208 \Change command
line interpreter vector to new routi
ne.
130 LDA#9:STA&209
140 .quit CLI
150 RTS
160 .command_line_interpreter
170 PHA:TXA:PHA:TYA:PHA \Save all
registers for later use.
180 STX&82:STY&83 \Get addre
ss of text line, address in X-Y regis
ters.
190 LDY#0
200 .LOOP LDA(&82),Y \Load cont
ents of address pointed to by &82 plu
s Y.
210 CMP&AF0,Y \Test for
character in string '*DITHER' at &AF0
.
220 BNE exit1 \If not a
match , exit new command line interpr
eter.
230 INY
240 CPY#7 \If we've
reached the 7 characters, text matche

```

```

s.
250 BEQ start_routine \Branch to
start_routine if strings match.
260 JMP LOOP
270 .exit1
280 PLA:TAY:PLA:TAX:PLA \Restore a
ll registers with their original valu
es.
290 JMP(&0000) \Jump to B
eeb's command line interpreter.
300 .start_routine
310 LDA#0:STA&72
320 JSR chopspace \Remove al
l unwanted characters upto required c
hr.
330 LDX&84:CPX#0:BEQ c1 \If &84 eq
uals 0 then we have a numeric literal
.
340 JSR getvar \This take
s the variable name A-Z and gets it's
value
350 JMP c2
360 .c1 CLC:SBC#47 \Subtracti
ng 47 from numeric char codes gives t
he No.
370 .c2 CMP#8:BCS error \Give erro
r message if parameter >= eight.
380 STA&70 \Store thi
s as the first colour code at &70.
390 JSR chopspace \Remove al
l unwanted characters upto required c
hr.
400 LDX&84:CPX#0:BEQ c3 \If &84 eq
uals 0 then we have a numeric literal
.
410 JSR getvar \This take
s the variable name A-Z and gets it's
value
420 JMP c4
430 .c3 CLC:SBC#47 \Subtracti
ng 47 from numeric char codes gives t
he No.
440 .c4 CMP#8:BCS error \Give erro
r message if parameter >= eight.
450 STA&71 \Store as
the second colour code at &71.
460 JSR chopspace \Remove al
l unwanted characters upto required c
hr.
470 LDX&84:CPX#0:BEQ c5 \If &84 eq
uals 0 then we have a numeric literal
.
480 JSR getvar \This take
s the variable name A-Z and gets it's
value
490 JMP c6

500 .c5 CMP#56:BCS one \If first
char >= 8 then numeric is only single
char.
510 LDA#10:STA&72
520 INY:LDA(&82),Y \Get next
char of the two character number.
530 .one CLC:SBC#47 \Subtracti
ng 47 from numeric char codes gives t
he No.
540 CLC:ADC&72 \Add ten t
o number as it was over ten.
550 .c6 STA&72 \Store as
dither colour at location &72
560 CMP#8:BCC error \Range che
ck the number , must be between 8-15.
570 CMP#16:BCS error
580 JMP dither \If all pa
rameters are OK , then call dither ro
utine.
590 .chopspace
600 INY:LDA(&82),Y \Input nex
t character from text string.
610 CMP#91:BCS chop1 \Check if
character is outside the alphabetic r
ange.
620 CMP#65:BCC chop1
630 LDX#1:STX&84 \Chr alpha
betic so set variable flag to TRUE.
640 JMP chopend
650 .chop1 \Range che
ck numeric if outside read next chara
cter.
660 CMP#48:BCC chopspace
670 CMP#58:BCS chopspace
680 LDX#0:STX&84 \Set varia
ble flag to FALSE.
690 .chopend RTS
700 .getvar
710 SEC:SBC#64:CLC \Subtracti
ng 64 from alpha codes gives chr posi
tion.
720 ROL A:ROL A:TAX \Multiply b
y four to give offset in variable tab
le.
730 LDA&400,X \Get low b
yte of the variable as the value.
740 RTS
750 .error
760 BRK \Produce e
rror message if variable out of range
.
770 BRK
780 ]
790 $P%="*DITHER(<0-7>,<0-7>,<8-15>
)"
800 P%=P%+LEN($P%)

810 [
820 OPT I
830 BRK
840 .dither
850 \ &70 - FIRST COLOUR IN THE
REQUIRED COLOUR COMBINATION.
860 \ &71 - SECOND COLOUR IN TH
E REQUIRED COLOUR COMBINATION.
870 \ &72 - THE FLASHED COLOUR
THAT IS TO BE DITHERED WITH THE ABOVE
.
880 \ &73,74 - USED FOR TEMPORARY
STORAGE IN COLOUR CALCULATIONS.
890 \ &75,76 - SCREEN LOCATION THA
T IS CURRENTLY BEING WORKED ON.
900 \ &77 - PIXEL LINE COUNTER.
910 \ &78 - COUNT FOR THE NUMBE
R OF CHARACTER LINSTEP
920 \ &79 - USED TO STORE THE S
CREEN BYTE BEING WORKED UPON.
930 \ X REG - HORIZONTAL CHARACTE
R COUNT.
940 LDA#&2F:STA&76 \
Initialise variables
950 LDA#0:STA&77:STA&78
960 LDA#&F8:STA&75
970 LDX&70:LDA &AE0,X:STA&70 \
Lookup colour masks from table at &AE
0.
980 LDX&71:LDA &AE0,X:STA&71
990 LDX&72:LDA &AE0,X:STA&72
1000 LDX#0
1010 LDA&70:AND#&AA:STA&74 \
Arrange colour mixture into left and
right
1015 LDA&71:AND#&55:ADC&74:PHA \
pixels. Combine colour1 then colour2.
1020 LDA&70:AND#&55:STA&74 \
Combine pixels in opposite order.
1022 LDA&71:AND#&AA:ADC&74:STA&71 \
Colour2 then Colour1.
1024 PLA:STA&70
1030 .START
1040 INX:CLC:LDA&75:ADC#8:STA&75 \
Add eight to the screen address
1045 LDA&76:ADC#8:STA&76
1050 LDY#0:LDA(&75),Y:STA&79 \
Load screen byte and save in &79.
1055 AND#192:BEQ skip \
Check if both pixels are flashing.
1060 LDA&79:CMP&72:BNE pixel \
As flashing, check for correct colour
mask.
1070 LDA&70:STA(&75),Y \
Store colour combination into screen

```

## Dither listing

### From Page 115

byte.

```

1080 JMP skip
1085 .pixel \If both pixels are not
flashing this routine fills the corre
ct one
1090 LDA&79:AND#&AA:STA&73 \
Mask out the right pixel.
1100 LDA&72:AND#&AA:CMPI&73:BNE two \
Test if left pixel is to be dithered
1110 LDA&70:AND#&AA:STA&73 \
Store left pixel until later.
1120 .two LDA&79:AND#&55:STA&74 \
Mask out the left pixel.
1130 LDA&72:AND#&55:CMPI&74:BNE done \
Test if right pixel is to be dithere
d.
1140 LDA&70:AND#&55:STA&74 \
Store right pixel until later.
1150 .done CLC:LDA&73:ADC&74 \
Combine left and right pixel.
1155 STA(&75),Y \

```

Store onto the screen.

```

1160 .skip
1170 CPX#80:BNE START \
Test if we have done 80 bytes.
1180 .restart LDX#0
1190 LDY&70:LDA&71:STY&71:STA&70 \
Swap colour patterns for next line.
1200 INC&77 \
Increment pixel line count by one.
1201 LDA&77:CMPI&8:BNE sub1 \
Test if 8 pixel lines have been done.
1210 INC&78:SEC \
Increment horizontal line count.
1211 LDA&75:SBC#7:STA&75 \
Subtract seven from the screen address.
1215 LDA&76:SBC#0:STA&76 \
1216 LDA#0:STA&77:JMP again \
Reset the pixel line count to zero.
1220 .sub1 SEC
1225 LDA&75:SBC#&7F:STA&75 \
Subtract &27F from screen address thi
s will

```

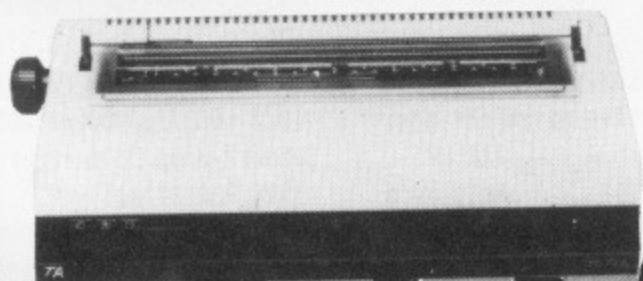
```

1230 LDA&76:SBC#2:STA&76 \
take you onto the next pixel line.
1240 .again LDA&78:CMPI&32:BEQ exit \
Test to see if all the screen is comp
leted.
1250 .cont JMP START
1260 .exit PLA:TAY:PLA:TAX:PLA \
Restore all registers.
1265 RTS
1270 ]
1280 NEXTI
1290 FORI=0 TO 15:READ A:I?&AE0=A:NE
XTI
1300 *SAVE DITHER 900 AFF
1310 END
1320 DATA 0,3,12,15,48,51,60,63,192,
195,204,207,240,243,252,255

```

*This listing is included in this month's cassette tape offer. See order form on Page 173.*

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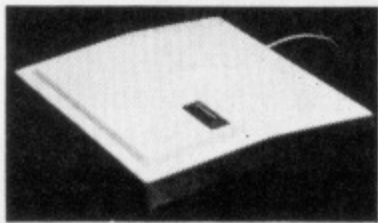
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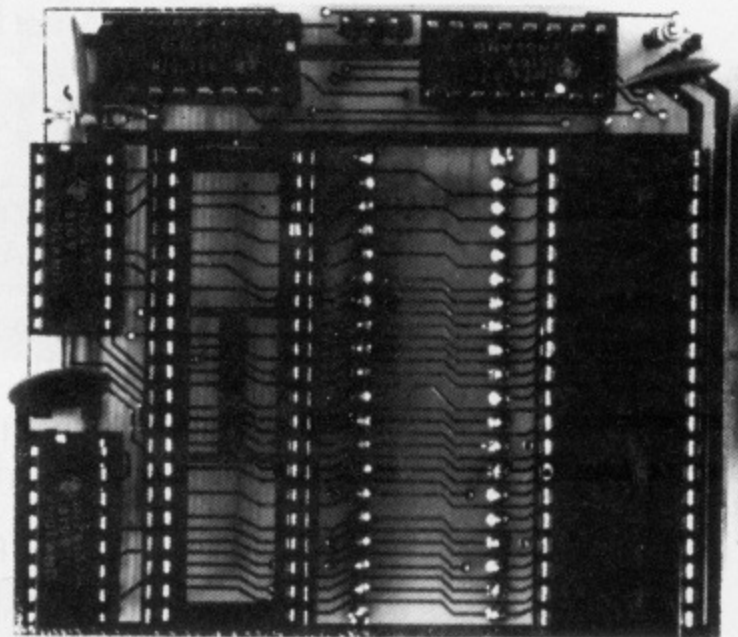
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**UDM**

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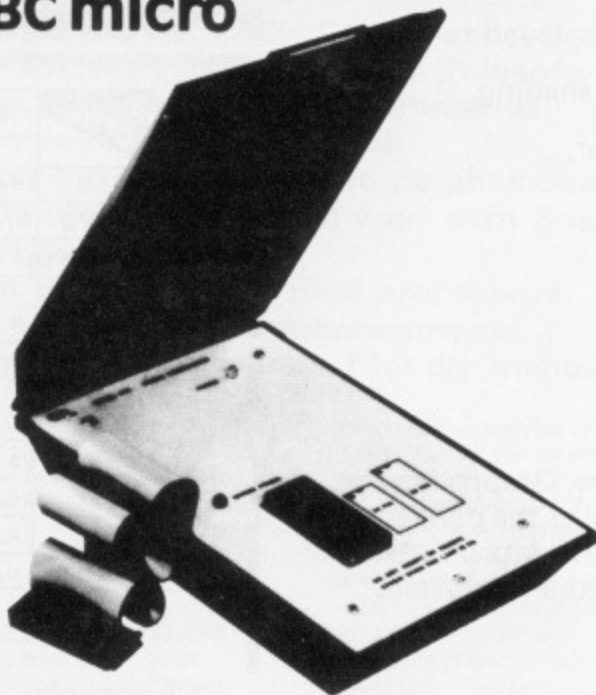
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C3 0.47uF polycarbonate

C4 0.1uF polycarbonate  
C5 10uF Electrolytic  
C6 50uF Electrolytic  
C7 220pF Polystyrene  
C8 C9 0.1uF disc ceramic  
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The order forms for Packs 19 and 20 may be found on page 173.  
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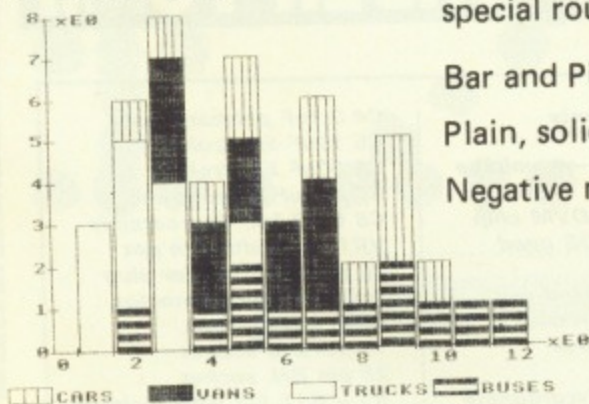
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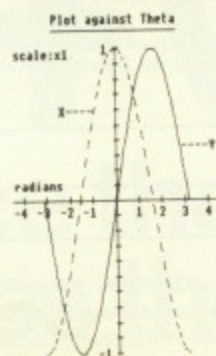
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CEEFAX 700 Tue 12 Feb 11:19/30



Tele- software news -- 703  
CEEFAX index -- 100

**\*CAT Programs available now..701**  
**\*INFO Software described.....702**  
**REM Telesoftware news .....703**  
**TELESOFTWARE The programs...704 to 720**

CEEFAX 701 Tue 12 Feb 11:19/50

**\*CAT Program index**

PATCH2	TFS Upgrade	704
EDITMAG	CEEFAX mag. builder	705*
EDITOR	Teletext editor	706*
COPIER	Tape to disc copier	707
COPYDOC	and documentation	708+
MET2	Weather database	720*
METDATA	datafile for MET2	719*
NLIVE2	Micro Live notes	721+
BUILD	Oxford Delegacy of	709
EXAMS	Local Examinations	710
ADDSUB	software package	711
CENTRE	for exam entries.	712
KEYSET	Save all programs	713
RENUM	to disc before use.	714
SETUP	CHAIN "BUILD" to	715
SUBJADD	create "boot" file.	716
BBCDOC1	Documentation for	717+
BBCDOC2	the exam package.	718+

\* - Brighton Project program  
+ - use PATCH2 to download

CEEFAX 702 Tue 12 Feb 11:20/51

**\*INFO**

**EXAMS**

Pages 709 to 718 contain a package to enable registered centres of the University of Oxford Local Exams Delegacy to create entries for the Summer 1985 O and A level exams.

All programs on pages 709 to 716 must be saved on to disc before use. To create a "boot" file, type CH."BUILD"

Full documentation is provided by BBCDOC1 on 717 and BBCDOC2 on 718. These should be #LOADED using PATCH2, then saved as follows:  
#SAVE BBCDOC1 3000 46E0  
#SAVE BBCDOC2 3000 76EB  
They may then be #TYPED or printed.  
Programs are on 709 to 718

# Switch on to teletext -with your BBC Micro!

ENTER the colourful, fascinating world of teletext with the latest Micro User special offer.

The TTX 2000B Teletext adapter for the BBC Micro not only gives access to BBC-TV's Ceefax and ITV's Oracle but also allows you to download software from the BBC's Telesoftware service.

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- Offers free software from the BBC Telesoftware service.
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- Ensures sensitive signal reception.
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- Access to teletext pages from your own Basic programs.
- Has its own power supply.
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CEEFAX 703 Tue 12 Feb 11:23/31

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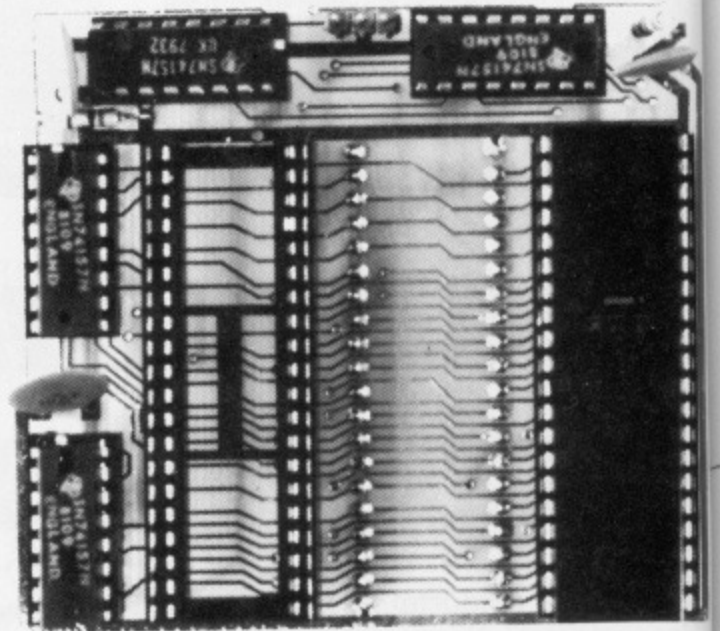
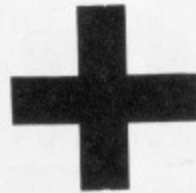
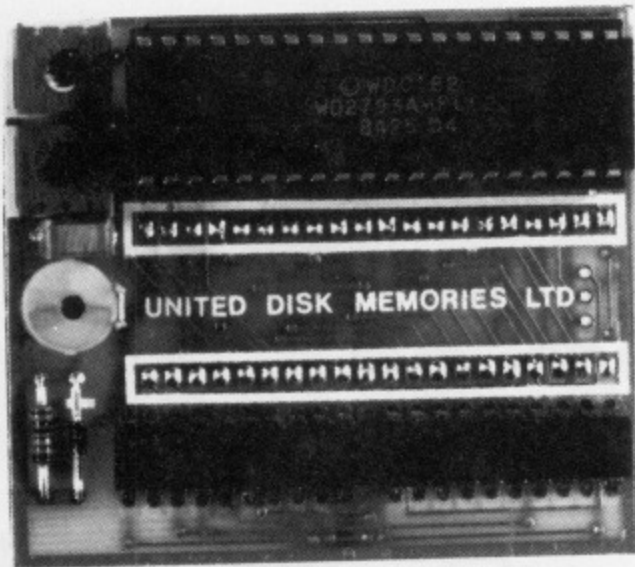
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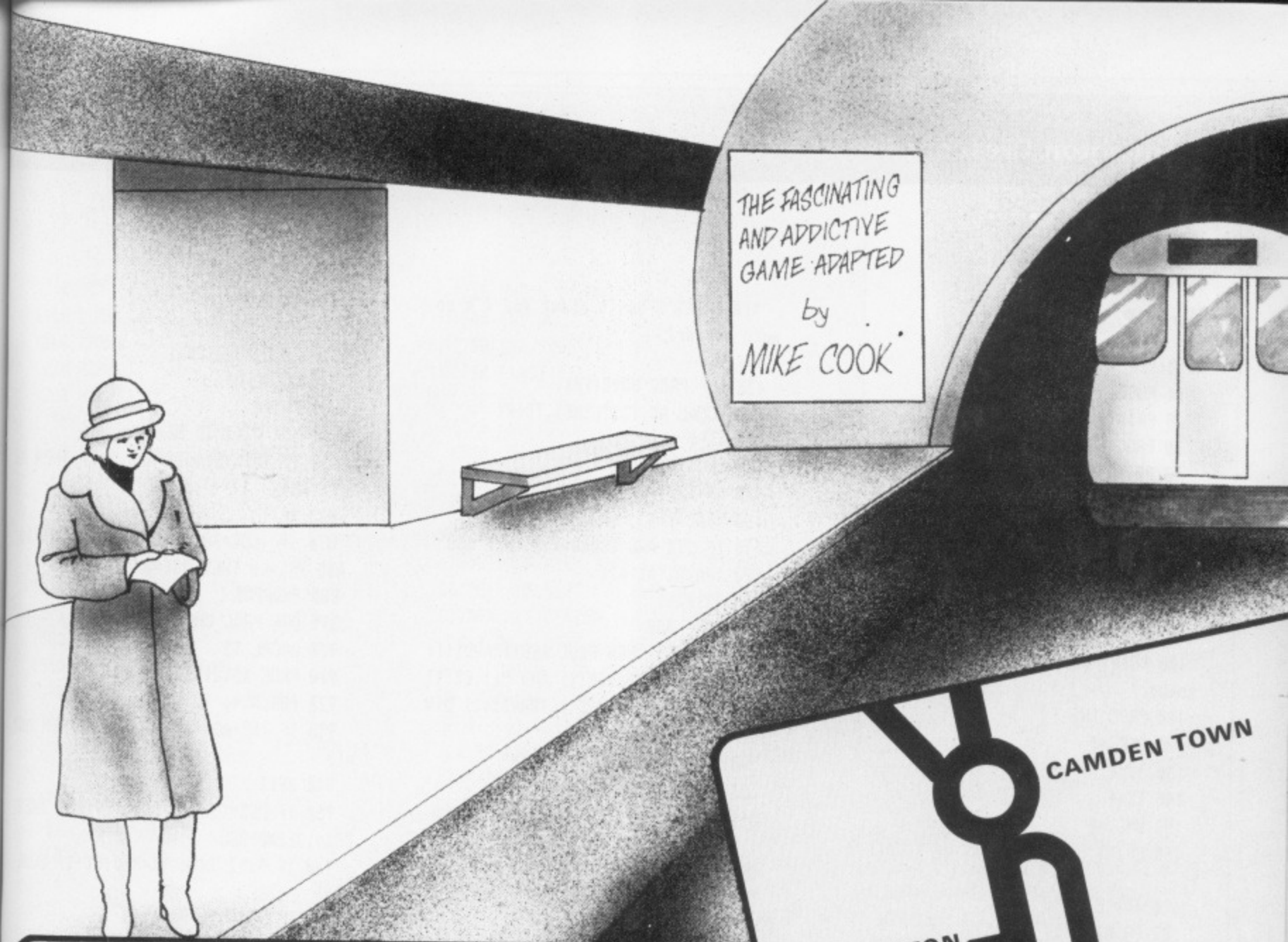


INTO  
JUST  
E TTL

GOES  
CHOICE

AT DELIVER  
DPN

8



# Take the Northern Line to **MORNINGTON CRESCENT**



**MORNINGTON Crescent** is one of the oldest and most fascinating of all the board games that are played without a physical board. It is undergoing a current revival of popularity not witnessed since the rise of chess.

Its bid for popular acclaim began when it was included as one of the games in that popular Radio 4 panel game, I'm Sorry I Haven't A Clue. The almost hypnotic effect on the radio audience was immediately felt.

A lot of people were surprised to know that the simple nursery game we all played as children had a skilful and cunning side to it when played by masters.

Indeed, the Mornington Crescent Amateur World Championship held at Reykiavik, Iceland, attracted a record entry for the third year in succession. Unfortunately the original radio panel members have been banned from this as their amateur status has been removed after accepting money for doing the show.

It is not known who first invented Mornington Crescent but it was certainly played in Chaucer's time. As you know there was no tube station built at Mornington Crescent at that time so they had to use Euston.

This was not such a handicap however, as London was a lot smaller in those days, so Euston was a lot closer to Mornington Crescent than it is today.

Despite its immense popularity it is still difficult for people living in Watford and other remote parts of the country to find a skilled playing partner. Therefore, in conjunction with the English branch of the Society for the Support of Mornington Crescent, *The Micro User* brings you the first ever computer version of the game.

Due to the immense complexity of the full game, it is normally played with a referee who adjudges the exact rules and conditions. As this awaits the development of advanced artificial intelligence techniques, the computer version has had to be simplified.

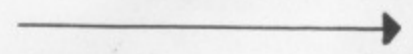
Out goes the famous Crabbit's diagonal rule and some of its variants. Still I think it retains the essential flavour of the full game.

As the listing of the game is quite long we have not got space to print the official version of the rules in this issue.

In next month's *The Micro User* however Dr Richard Taylor-Fischel, one of the leading members of the society, will give a full account of the rules, together with hints and tips for playing.

Officially you are supposed to play the game from memory but a map of the London Underground system would be a benefit for those playing it for the first time.

You will see there is a lot of data in the listing to this game and it all has to be entered correctly. This will really be a test of your typing. If I were you I would invest in this month's cassette or disc.



# Mornington Crescent listing

## From Page 121

```

5 REM (C) The Micro User
10 MODE7
20 PRINTTAB(10,7);
30 PROC_LOGO
40 PRINT"MORNINGTON CRESCENT"
50 PRINT"By Mike Cook"
60 INPUT"Input your name",A$
70 FOR AZ=1 TO ASC(LEFT$(A$,1))+LE
N(A$)
80 TX=RND(AZ)
90 NEXT
100 PRINT"Well that's silly I won't
bother"
110 PROC_INT
120 REPEAT
130 IX=1
140 ZX=4
150 WHO%=0
160 PRINT"Should I play by myself ?
";
170 A$=GET$
180 PRINT
190 IF A$="Y" THEN PRINT "Ok I will
be YOU":QZ=2:WHO%=1:A$="N":GOTO 230
ELSE QZ=1
200 PRINT"Do you want to start (Y/N
) ?";
210 A$=GET$:PRINT
220 IF A$="Y" AND RND(10)>5 THEN PR
INT"TUFF I'm going first":A$="N"
230 IF A$="Y" THEN PROC_YFM ELSE PR
OC_FMOVE
240 CDIRZ=0
250 CSZ=MSZ
260 REPEAT
270 IF CLINEZ<>0 THEN PRINT"Travell
ing ";D$(CDIRZ);" the ";L$(CLINEZ);"
line:-"
280 IF WHO% THEN PRINT"You move to
"; ELSE PRINT"I move to ";
290 PRINT S$(CSZ)
300 PRINT
310 IF WHO% THEN PROC_CMOVE ELSE PR
OC_YMOVE
320 WHO%=WHO% EOR QZ
330 IX=IX+1
340 UNTIL CSZ=13
350 PRINT"Mornington Crescent "
360 IF WHO% THEN PRINT "YOU WIN !!!
" ELSE PRINT "I WIN !"
370 PRINT"Want another game ?"
380 A$=GET$
390 PROC_SPLIGE
400 UNTIL A$="N"

```

```

410 PRINT"I don't blame you I'm so
much better"
420 END
430 DEF PROC_MOVE(FHZ)
440 LOCAL AZ,TX,TLINEZ,TDIRZ
450 SZ=1
460 PROC_WIND(FHZ)
470 AZ=1
480 READ TX
490 IF (TX AND &8000)<>0 THEN 530
500 TRAVDZ(AZ)=TX
510 AZ=AZ+1
520 GOTO 480
530 IF AZ=2 THEN PROC_REC(TRAVDZ(1)
):PROC_TRAVLE(TRAVDZ(1) AND 511,ZZ,(T
RAVDZ(1) DIV 512) AND 1,TRAVDZ(1) DIV
1024):ENDPROC
540 PRINT"Testing moves :-"
550 FOR TZ=1 TO AZ-1
560 TDIRZ=(TRAVDZ(TZ) DIV 512) AND
1
570 TLINEZ=TRAVDZ(TZ) DIV 1024
580 IF TLINEZ=CLINEZ AND TDIRZ<>CDI
RZ THEN 620
590 PRINT CHR$(13);D$(TDIRZ);" the
";L$(TLINEZ);" Line";SPC(8);
600 PROC_REC(TRAVDZ(TZ))
610 PROC_TRAVLE((TRAVDZ(TZ) AND 511
),ZZ,TDIRZ,TLINEZ)
620 NEXT
630 PRINT CHR$(13);CHR$(11);SPC(38)
640 PRINT SPC(38);CHR$(13);CHR$(11)
;
650 ENDPROC
660 DEF PROC_YMOVE
670 TRYZ=2
680 INPUT"INPUT YOUR MOVE ",SM$
690 PROC_SFIND(SM$)
700 IF TRYZ<1 THEN PRINT "YOU LOSE
by failing to make a valid move":CSZ=
13:WHO%=WHO% EOR 1:ENDPROC
710 IF MSZ=0 THEN PRINT"Concentrate
":GOTO 680
720 IF MSZ=? (WZ+LEN($WZ)) AND ((IX
DIV 2) AND 1) THEN PRINT"A brilliant
use of ";$WZ;" rule":CSZ=? (WZ+LEN($WZ
)):ENDPROC
730 PROC_VALID(MSZ)
740 IF MSZ=0 THEN TRYZ=TRYZ-1:PRINT
"WE ARE NOT USING CRABBITS RULE":GOTO
680
750 CSZ=MSZ AND 511
760 CLINEZ=MSZ DIV 1024
770 CDIRZ=(MSZ DIV 512) AND 1
780 PRINT CHR$(11);SPC(38);CHR$(13)
;

```

```

790 ENDPROC
800 DEF PROC_VALID(TSZ)
810 PROC_MOVE(CSZ)
820 LOCAL AZ
830 MSZ=0
840 FOR AZ=1 TO SZ-1
850 IF TSZ=(SZ(AZ) AND 511) THEN M
SZ=SZ(AZ)
860 NEXT
870 IF (CSZ=38 OR CSZ=39 OR CSZ=40
AND TSZ=&D THEN MSZ=0
880 ENDPROC
890 DEF PROC_CMOVE
900 LOCAL TZ
910 PROC_MOVE(CSZ)
920 FOR AZ=1 TO SZ-1
930 IF (SZ(AZ) AND 511)=13 THEN MS
Z=13
940 NEXT
950 IF MSZ=13 AND CSZ<(14+ZX) THEN
CSZ=13:ENDPROC
960 IF SZ>2 THEN TZ=RND(SZ-1) ELSE
TZ=1
970 CSZ=SZ(TZ) AND 511
980 CDIRZ=(SZ(TZ) DIV 512) AND 1
990 CLINEZ=SZ(TZ) DIV 1024
1000 ENDPROC
1010 DEF PROC_TRAVLE(TSZ,DEPTHZ,CDIR
Z,CLINEZ)
1020 LOCAL MARKZ,TEMPSZ,TX
1030 TEMPSZ=SZ
1040 MARKZ=SZ
1050 DEPTHZ=DEPTHZ-1
1060 IF DEPTHZ=0 THEN ENDPROC
1070 PROC_WIND(TSZ)
1080 READ TX
1090 IF (TX AND &8000) <> 0 THEN 11
0
1100 IF (((TX DIV 512) AND 1)=CDIRZ
AND ((TX DIV 1024)=CLINEZ) THEN PROC
_REC(TZ):MARKZ=MARKZ+1
1110 GOTO 1080
1120 IF MARKZ=TEMPSZ THEN ENDPROC
1130 PROC_TRAVLE((SZ(MARKZ-1) AND 51
1),DEPTHZ,CDIRZ,CLINEZ)
1140 MARKZ=MARKZ-1
1150 GOTO 1120
1160 DEF PROC_YFM
1170 REPEAT
1180 INPUT"Ok where do you want to
start ",SS$
1190 PROC_SFIND(SS$)
1200 UNTIL MSZ<>0
1210 WHO%=1
1220 CLINEZ=0
1230 ENDPROC

```

```

1240 DEF PROC_SFIND(SS$)
1250 LOCAL AZ
1260 MSX=0
1270 REPEAT
1280 MSX=MSX+1
1290 UNTIL MSX=N% OR S$(MSX)=SS$
1300 IF MSX(>)N% THEN ENDPROC
1310 PRINT"Your station is not on my
list"
1320 PRINT"IS it one of the followin
g?"
1330 IF LEN(SS$)>4 THEN FX=4 ELSE FX
=LEN(SS$)
1340 REPEAT
1350 P$=LEFT$(SS$,FX)
1360 BX=1
1370 FOR AZ=1 TO N%
1380 IF LEFT$(S$(AZ),FX)<>P$ THEN 14
20
1390 PRINT STR$(BX);" ";S$(AZ)
1400 SX(BX)=AZ
1410 BX=BX+1
1420 NEXT
1430 FX=FX-1
1440 UNTIL FX=0 OR BX<>1
1450 PRINT STR$(BX);" "; "NONE OF TH
ESE"
1460 REPEAT
1470 INPUT"WHICH NUMBER ",MSX
1480 UNTIL MSX<=BX
1490 IF MSX=BX THEN MSX=0 ELSE MSX=S
X(MSX)
1500 ENDPROC
1510 DEF PROC_INT
1520 RESTORE 1830
1530 N%=277
1540 W%=3200
1550 DIM S$(N%),SX(60),L$(115),TRAVD%
(10),D$(1)
1560 A$="Hodgekiss"
1570 FOR AZ=1 TO N%-1
1580 READ S$(AZ)
1590 NEXT
1600 RESTORE 2340
1610 FOR AZ=1 TO 15
1620 READ L$(AZ)
1630 NEXT
1640 $WZ=A$
1650 READ D$(0),D$(1)
1660 ENDPROC
1670 DEF PROC_WIND(SNZ)
1680 LOCAL TX
1690 RESTORE 2080
1700 SNZ=SNZ OR &8000
1710 REPEAT
1720 READ TX

```

```

1730 UNTIL TX=SNZ
1740 ENDPROC
1750 DEF PROC_REC(TX)
1760 SX(SX)=TX
1770 SX=SX+1
1780 ENDPROC
1790 DEF PROC_FMOVE
1800 MSX=RND(N%-1)
1810 CLINEX=0
1820 ENDPROC
1830 DATA HIGH BARNET,TOTTERIDGE,WOOD
SIDE PARK,WEST FINCHLEY,MILL HILL EA
ST,FINCHLY CENTRAL,EAST FINCHLEY
1840 DATA HIGHGATE,ARCHWAY,TUFNELL P
ARK,KENTISH TOWN,CAMDEN TOWN,MORNINGT
ON CRESCENT,EUSTON,WARREN STREET,GOOD
GE STREET,TOTTENHAM COURT ROAD,LEICES
TER SQUARE,CHARING CROSS,WATERLOO,KEN
NINGTON,OVAL,STOCKWELL,CLAPHAM NORTH,
CLAPHAM COMMON
1850 DATA CLAPHAM SOUTH,BALHAM,TOOTI
NG BEC,TOOTING BROADWAY,COLLIER'S WOOD
,SOUTH WIMBLEDON,MORDEN,ELEPHANT & CA
STLE,BOROUGH,LONDON BRIDGE,BANK,MOORG
ATE,OLD STREET,ANGEL,KING'S CROSS,CHA
LK FARM,BELSIZE PARK,HAMPSTEAD,GOLDER
S GREEN,BRENT
1860 DATA HENDON CENTRAL,COLINDALE,B
URNT OAK,EDGWARE
1870 DATA RICHMOND,KEM GARDENS,GUNNE
RSBURY,TURNHAM GREEN,STAMFORD BROOK,R
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1880 DATA TEMPLE,BLACKFRIARS,MANSION
HOUSE,CANNON STREET,MONUMENT,TOWER H
ILL,ALDGATE EAST,WHITECHAPEL,STEPNEY
GREEN,MILE END,BROW ROAD,BROMLEY-BY-B
OW,WEST HAM,PLAISTOW,UPTON PARK,EAST
HAM,BARKING,UPNEY,BECONTREE,DAGENHAM
HEATHWAY
1890 DATA DAGENHAM EAST
1900 DATA ELM PARK,HORNCHURCH,UPMINST
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HOLBORN,RUSSELL SQUARE,CALEDONIAN ROA
D,HOLLOWAY ROAD
1930 DATA ARSENAL,FINSBURY PARK,MAND
R HOUSE,TURNPIKE LANE,WOOD GREEN,BOUN
DS GREEN,ARNOS GROVE,SOUTHGATE,OAKWOOD
D,COCKFOSTERS,UXBRIDGE,HILLINGTON,ICK
ENHAM
1940 DATA RUISLIP,RUISLIP MANOR,EAST
COTE,RAYNERS LANE,SOUTH HARROW,SUDBUR
Y HILL,SUDBURY TOWN,ALPERTON,PARK ROY
AL,NORTH EALING
1950 DATA GOLDHAWK ROAD,SHEPHERDS BU
SH,LATIMER ROAD,LADBROKE GROVE,WESTBO
URNE PARK,ROYAL OAK,GREAT PORTLAND ST
REET,EUSTON SQUARE,FARRINGDON,BARBICA
N,ALGATE
1960 DATA WEST ACTON,NORTH ACTON,EAS
T ACTON,WHITE CITY,SHEPHERDS BUSH,HOL
LAND PARK,QUEENSWAY,LANCASTER GATE,MA
RBLE ARCH,BOND STREET,CHANCERY LANE,S
T. PAUL'S,BETHNAL GREEN,STRATFORD,LEY
TON,LEYTONSTONE,SNARES BROOK,SOUTH WOO
DFORD,WOODFORD
1970 DATA BUCKHURST HILL,LOUGHTON,DE
BDEN,THEYDON BOIS,EPPING,NORTH WEALD,
BLAKE HALL,ONGAR,RODING VALLY,CHIGWEL
L,GRANGE HILL,HAINAULT,FAIRLOP,BARKIN
GSSIDE,NEWBURY PARK,GANTS HILL,WANSTEA
D
1980 DATA WATFORD JUNCTION,WATFORD H
IGH STREET,BUSHEY & OXHEY,CARPENDERS
PARK,HATCH END,HEADSTONE LANE,HARROW
& WEALDSTONE,KENTON,SOUTH KENTON,NORT

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# Mornington Crescent listing

From Page 123

H WEMBLEY, WEMBLEY CENTRAL, STONEBRIDGE PARK, HARLESDEN, WILLESDEN JUNCTION, KE NSAL GREEN

1990 DATA QUEEN'S PARK, KILBURN PARK, MAIDA VALE, WARWICK AVENUE, EDGWARE ROAD, MARYLEBONE, REGENT'S PARK, TRAFALGAR SQUARE, LAMBETH NORTH

2000 DATA STANMORE, CANONS PARK, QUEEN SBURY, KINGSBURY, WEMBLEY PARK, NEASDON, DOLLIS HILL, WILLESDEN GREEN, KILBURN, WEST HAMSTEAD, FINCHLEY ROAD, SWISS COTT AGE, ST. JOHN'S WOOD

2010 DATA AMERSHAM, CHALFONT & LATIME R, CHORLEYWOOD, RICKMANSWORTH, MOOR PARK, NORTH WOOD, NORTHWOOD HILLS, PINNER, NORTH HARROW, WATFORD, CROXLEY

2020 DATA WEST HARROW, HARROW ON-THE-HILL, NORTHWICK PARK, PRESTON ROAD

2030 DATA NEW CROSS GATE, NEW CROSS, SURREY DOCKS, ROTHERHITHE, WAPPING, SHADWELL, SHOREDITCH

2040 DATA BRIXTON, VAUXHALL, PIMLICO, SEVEN SISTERS, TOTTENHAM HALE, BLACKHORS E ROAD, WALTHAMSTOW CENTRAL

2050 DATA DRAYTON PARK, HIGHBURY & IS LINGTON, ESSEX ROAD

2060 DATA WEST RUISLIP, RUISLIP GARDE NS, SOUTH RUISLIP, NORTHOLT, GREENFORD, PERIVALE, HANGER LANE, LIVERPOOL STREET, BAKER STREET, CHESHAM, OXFORD CIRCUS

2070 DATA REDBRIDGE, EMBANKMENT

2080 DATA 32769, 1538, 32770, 1025, 1539, 32771, 1026, 1540, 32772, 1027, 1542, 32773, 1542, 32774, 1029, 1543, 1028, 32775, 1030, 1544, 32776, 1031, 1545, 32777, 1032, 1546, 32778, 1033, 1547, 32779, 1034, 1548, 32780, 1035, 1549, 1065, 32781, 1036

2090 DATA 1550, 32782, 1037, 1551, 1576, 9231, 9768, 32783, 1038, 1552, 9490, 9742, 32784, 1039, 1553, 32785, 1040, 1554, 5394, 5753, 32786, 1041, 1555, 3190, 3703, 32787, 1042, 1812, 2113, 2626, 8468, 8822, 10869, 32788, 1300, 1557, 8410, 8980, 11812

2100 DATA 32789, 1044, 1558, 1057, 32790, 1045, 1559, 32791, 1046, 1560, 9470, 9983, 32792, 1047, 1561, 32793, 1048, 1562, 32794, 1049, 1563, 32795, 1050, 1564, 32796, 1051, 1565, 32797, 1052, 1566, 32798, 1053, 1567, 32799, 1054, 1568, 32800, 1055

2110 DATA 32801, 1058, 1557, 8922, 32802, 1059, 1569, 32803, 1060, 1570, 32804, 1061, 1571, 5290, 5903, 11284, 12358, 32805, 1062, 1572, 4253, 4879, 7439, 7837, 13062, 32806, 1063, 1573, 13349, 14087, 32807, 1064, 1

574, 32808, 1038, 1575, 3194, 3707, 4251

2120 DATA 4764, 7324, 7835, 9230, 9990, 32809, 1066, 1548, 32810, 1067, 1577, 32811, 1068, 1578, 32812, 1069, 1579, 32813, 1070, 1580, 32814, 1071, 1581, 32815, 1072, 1582, 32816, 1073, 1583, 32817, 1584, 32818, 2611, 32819, 2098, 2612, 32820, 2099

2130 DATA 2613, 32821, 2100, 2614, 2142, 32822, 2101, 2615, 32823, 2102, 2616, 32824, 2103, 2617, 3165, 3641, 4756, 32825, 2104, 2618, 3128, 3643, 32826, 2105, 2619, 32827, 2106, 2620, 2150, 2663, 3129, 3644, 32828, 2107, 2621, 3131, 3645, 7741, 7271

2140 DATA 32829, 2108, 2622, 3132, 3699, 7228, 7742, 32830, 2109, 2623, 7229, 7743, 32831, 2110, 2624, 7230, 7744, 9472, 9845, 32832, 2111, 2625, 7231, 7745, 32833, 2112, 2579, 7232, 7956, 32834, 2067, 2627, 7444, 7747, 32835, 2114, 2628, 7234, 7748

2150 DATA 32836, 2115, 2629, 7235, 7749, 32837, 2116, 2630, 7236, 7750, 32838, 2117, 2631, 7237, 7751, 12836, 32839, 2118, 2632, 7238, 7752, 32840, 2119, 2633, 4367, 4681, 7239, 7951, 32841, 2120, 2634, 4168, 4682, 14588, 15101, 32842, 2121, 2635, 4169

2160 DATA 4683, 32843, 2122, 2636, 4170, 4684, 5291, 5804, 32844, 2123, 2637, 4171, 4685, 32845, 2124, 2638, 4172, 4686, 32846, 2125, 2639, 4173, 4687, 32847, 2126, 2640, 4174, 4688, 32848, 2127, 2641, 4175, 4689, 32849, 2128, 2642, 4176, 4690, 32850

2170 DATA 2129, 2643, 4177, 32851, 2130, 2644, 32852, 2131, 2645, 32853, 2132, 2646, 32854, 2133, 2647, 32855, 2134, 2648, 32856, 2135, 2649, 32857, 2136, 2650, 32858, 2137, 32859, 2652, 5791, 32860, 2139, 2653, 3219, 3677, 32861, 2140, 2654, 3186

2180 DATA 3640, 3164, 32862, 2141, 2613, 32863, 2656, 32864, 2143, 2657, 32865, 2144, 2658, 32866, 2145, 2659, 32867, 2146, 2660, 32868, 2147, 2661, 32869, 2148, 2662, 32870, 2149, 2619, 32871, 2107, 2664, 7272, 7748, 32872, 2151, 2665, 5284, 5797

2190 DATA 7273, 7783, 32873, 2152, 2666, 7274, 7784, 32874, 2153, 2667, 4249, 4715, 7275, 7785, 8406, 8917, 32875, 2154, 4202, 4880, 7440, 7786, 32876, 3693, 32877, 3180, 3694, 32878, 3181, 3695, 32879, 3182, 3696, 32880, 3183, 3697, 32881, 3184, 3698

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2210 DATA 32892, 3195, 3709, 32893, 319

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5, 3198, 3712, 32896, 3199, 3713, 32897, 3280, 3714, 32898, 3201, 3715, 32899, 3202, 3716, 32900, 3203, 3717, 32901, 3204, 3718, 32902, 3205, 32903, 3720, 4744, 32904

2220 DATA 3207, 3721, 4231, 4745, 32905, 3208, 3722, 4232, 4746, 32906, 3209, 3723, 4233, 4747, 32907, 3210, 3724, 4234, 4748, 32908, 3211, 3725, 4235, 4749, 32909, 3212, 3726, 4236, 4851, 32910, 3213, 3727, 32911, 3214, 3728, 32912, 3215, 3729, 32913

2230 DATA 3216, 3730, 32914, 3217, 3731, 32915, 3218, 3676, 32916, 4152, 4757, 32917, 4244, 4758, 32918, 4245, 4759, 32919, 4246, 4760, 32920, 4247, 4761, 32921, 4248, 4714, 32922, 4368, 4763, 7323, 7952, 32923, 4250, 4648, 7208, 7834, 32924, 4136

2240 DATA 4765, 7325, 7720, 32925, 4252, 4645, 7205, 7836, 32926, 4367, 32927, 5211, 5792, 32928, 5390, 5793, 5279, 32929, 5280, 5794, 32930, 5281, 5795, 32931, 5282, 5796, 32932, 5283, 5736, 32933, 5224, 5798, 32934, 5285, 5799, 32935, 5286, 5800

2250 DATA 32936, 5287, 5906, 10357, 11024, 32937, 5241, 5802, 32938, 5289, 5668, 32939, 5391, 5707, 32940, 5195, 5805, 32941, 5292, 5806, 32942, 5293, 5807, 5826, 32943, 5294, 5808, 32944, 5295, 5809, 32945, 5296, 5810, 6330, 32946, 5297, 5811, 32947

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2300 DATA 32999, 10512, 10982, 33000, 4841, 33001, 4328, 4842, 4369, 33002, 4329, 4

843, 33003, 4330, 4844, 33004, 4331, 4845, 4  
 338, 33005, 4332, 4846, 33006, 4333, 4847, 3  
 3007, 4334, 4848, 33008, 4335, 4852, 33009,  
 4850, 33010, 4337, 4844, 33011, 4237  
 2310 DATA 4852, 33012, 4339, 4853, 4336  
 , 33013, 4340, 4854, 33014, 4341, 4831, 3301  
 5, 15097, 33016, 15097, 33017, 14584, 15098  
 , 14583, 33018, 14585, 15099, 33019, 14586,  
 15100, 33020, 14587, 14921, 33021, 14409, 3  
 3022, 9751, 33023, 9239, 9984, 33024, 9471,  
 9791  
 2320 DATA 33025, 9342, 9986, 33026, 947  
 3, 9987, 33027, 9474, 9988, 33028, 9475, 330  
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 84, 5898, 33034, 5385, 5899, 33035, 5386, 59  
 00, 33036, 5387, 5901, 33037, 5388, 5902  
 2330 DATA 33038, 5389, 5792, 33039, 413  
 3, 4766, 4680, 5156, 5803, 7240, 7717, 33040  
 , 4203, 4762, 4325, 7322, 7787, 8408, 8919, 1  
 0408, 10983, 33041, 4841, 33042, 5280, 5649  
 , 8310, 8920, 9333, 9743, 33043, 5314, 5825,  
 33044, 7233, 7746, 8212, 8723, 1043, 1556, 3

2768  
 2340 DATA Northern, District, Piccadil  
 ly, Metropolitan, Central, Central, Circl  
 e, Bakerloo, Victoria, Jubilee, Waterloo  
 & City, Escalator Link, Highbury Branch  
 , East London, Piccadilly  
 2350 DATA UP, DOWN  
 2360 DATA 145, 160, 160, 160, 224, 252, 25  
 5, 255, 255, 255, 253, 244, 176, 160, 160  
 2370 DATA 145, 160, 160, 232, 255, 191, 16  
 3, 160, 160, 162, 171, 255, 253, 160, 160  
 2380 DATA 145, 160, 160, 255, 181, 160, 1  
 60, 160, 160, 160, 160, 235, 255, 180, 160  
 2390 DATA 145, 255, 255, 255, 255, 255, 25  
 5, 255, 255, 255, 255, 255, 255, 255  
 2400 DATA 145, 160, 160, 239, 245, 160, 16  
 0, 160, 160, 160, 160, 250, 255, 165, 160  
 2410 DATA 145, 160, 160, 170, 255, 253, 17  
 6, 160, 160, 224, 248, 255, 183, 160, 160  
 2420 DATA 145, 160, 160, 160, 162, 171, 23  
 9, 255, 255, 191, 175, 161, 160, 160, 160  
 2430 DEF PROC\_LOGO  
 2440 RESTORE 2360

2450 FOR AX=1 TO 7  
 2460 FOR BX=1 TO 15  
 2470 READ TX  
 2480 PRINT CHR\$(TX);  
 2490 NEXT  
 2500 PRINT STRING\$(15, CHR\$(8)); CHR\$(  
 10);  
 2510 NEXT  
 2520 ENDPROC  
 2530 DEF PROC\_SPLIGE  
 2540 CLS  
 2550 FOR CX=1 TO 20  
 2560 PRINT TAB(RND(25), RND(17));  
 2570 PROC\_LOGO  
 2580 PRINT  
 2590 NEXT  
 2600 CLS  
 2610 ENDPROC

*This listing is included in this month's cassette tape offer. See order form on Page 173.*



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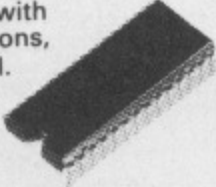
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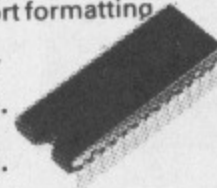
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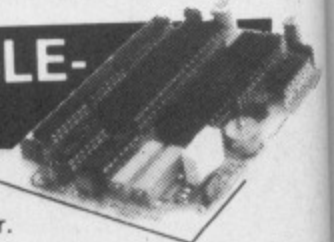
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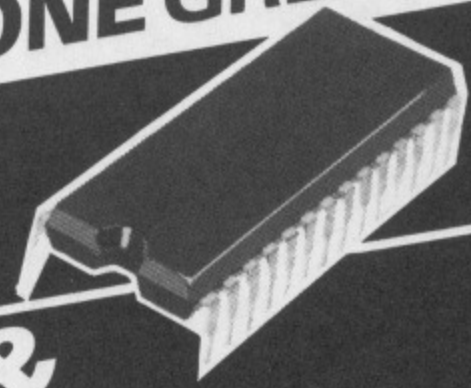
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**IMPORTANT NOTE:**

Please check with us if you decide to use any other disc interface than Acorn or Double-Dos with Scribe or Database.

These are a selection of the many letters that poured in after Acornsoft's Elite took a pounding from two readers in a recent issue of The Micro User.

# The great Elite battle is joined

I CONFESS to being a little surprised at the readers' letters concerning the difficulty of Elite. Have we been playing the same game, I ask myself?

I'm no teenage key basher, far from it. I'm a middle-aged fairly clapped out clergyman who primarily uses the Beeb for word processing.

Rare spare time is normally spent wandering around Level 9 offerings or writing rude letters to Alice, but I did think I'd have a bash at Elite.

Result so far - Dangerous combat status (New Year resolution to become Deadly as soon as possible), 150,000 odd credits in the bank, and I now toddle between a rich industrial and a poor agricultural world trading in computers and doing the odd spot of bounty hunting around the poor A9. (feudal) world.

I honestly don't see what the early problems are (provided you can dock manually ok). I recently started from scratch to help a schoolfriend of my son's who can't manage the docking business.

I traded enough to buy him a docking computer without needing to fire a shot in anger - it simply needed careful selection of trading worlds and goods and took less than an hour.

My only gripes are that I've not got the disc version and so can't undertake missions and some local yokel beat me to Deadly status.

My only offering of advice to A.M.D. of Exeter is to treat everything as hostile at first, and to try combat at zero speed as far as his own ship is concerned.

- Rev. Bob Redrup, Truro, Cornwall.

## Frustration

AFTER reading A.M.D.'s letter I felt I must agree entirely. After all it is exciting but can get very frustrating when being attacked and watching your energy decrease every second.

I have found that whenever in this position I am tempted to hit Break.

Speaking on behalf of the "few pimpled schoolboys", it is very distressing when you have earned 160.0 cr, and you are saving up for a docking computer, slowly.

To earn enough to pay for one

means you must make up to seven or eight trips between stations.

By then you have either crashed or mum is calling you for tea. It's impossible to dock more than three times on the run.

Can anyone invent a program that gives you enough money to buy a docking computer or gives you one?

Please help a poor 15-year-old schoolboy before I give Elite away. - M. Williams, Ramsbottom, Greater Manchester.



## Inspiration

COME on Mr Lemon and A.M.D, are you men or mice? Elite is for the macho among us, and if you can't cope then you must resort to other tactics.

I started off with whiskey and ginger, but this was rather expensive and I kept falling asleep. Then inspiration struck me. A trip to the doctors obtained the biggest bottle of tranquillisers you can get. Pop in a couple and off you go. You'll still get zapped, but no longer care.

P.S. It worked for me, six hours a night for four weeks and now I'm competent. Now where's my prescription! - B.G. Davey, Fareham, Hants.

## Illumination

WHILE engrossed in the Acornsoft Elite, stooging from space station to space station, improving my rating and earn-

ing oodles of boodle I find myself afflicted with a unique space complaint.

Having accumulated all this wealth and goodies, I decided that it was time to invest in a spot of insurance, so purchased an escape capsule. Lo and behold on taking possession, my flight instrument panel was transformed from its usual pleasant red, yellow, green combination to a harsh, but patriotic, red, white and blue.

Unfortunately this makes my compass dot white - which way

chase him to the death (usually at fairly slow speed).

As his evasive pattern is computer generated, it is probably the best one around and as you are following his every move it is more difficult for the others to get a lead on you.

Remember that attack is the best form of defence. You get nowhere by running away.

Thank you Acornsoft for the best game ever for any Micro, and let's have more of this standard. - Andrew Kerr, Dunfermline, Fife.

## Disillusion

I AM a "pimpled schoolboy" as described by a writer to your magazine in January's Micromail. I ordered Acornsoft's Elite as soon as I saw it advertised in The Micro User. It turned up 27 days later. This gave me two weeks before the end of October.

After this time I sent off my blue card (cassette version) saying that I had attained a rating of Deadly. Actually Deadly plus six "Right On Commanders" (you get one roughly every 256 kills and until Dangerous your rating rises every time you get one).

Two weeks later I reached Elite. I also learned I hadn't won the competition.

I can understand older people finding it hard. It took me 12 hours playing time to get familiar with the controls.

Now I find the game boring, although I understand that the disc version is more interesting (acts of heroism, more enemies etc.).

I would be interested in seeing an improved version perhaps in ROM, although I'm not sure of the feasibility of this.

By the way, I am disleksic! (So any others like me don't be disheartened after reading the review). - I. Powell, Whitchurch, Shropshire.

do I fly? - and radar bogies white.

Mind you, there is a cure - jettison the capsule, after which, when the screen clears to status page the colour is back to normal.

Any reason or cure please? My version is on cassette. - M.W. Tillett, Blaenau Ffestiniog, Gwynedd.

## Commiseration

HAVING bought Elite at the tender age of 31, I made Competent in two days and Dangerous four days later.

There I have stayed, probably due to the fact that I have the tape version which does not allow military lasers and I am working in keyboard mode only.

My commiserations with P.R. Lemon and A.M.D. I suspect I have met them on numerous occasions - in battle.

The best tip I can offer when being attacked by three or four nasties is to pick on one and

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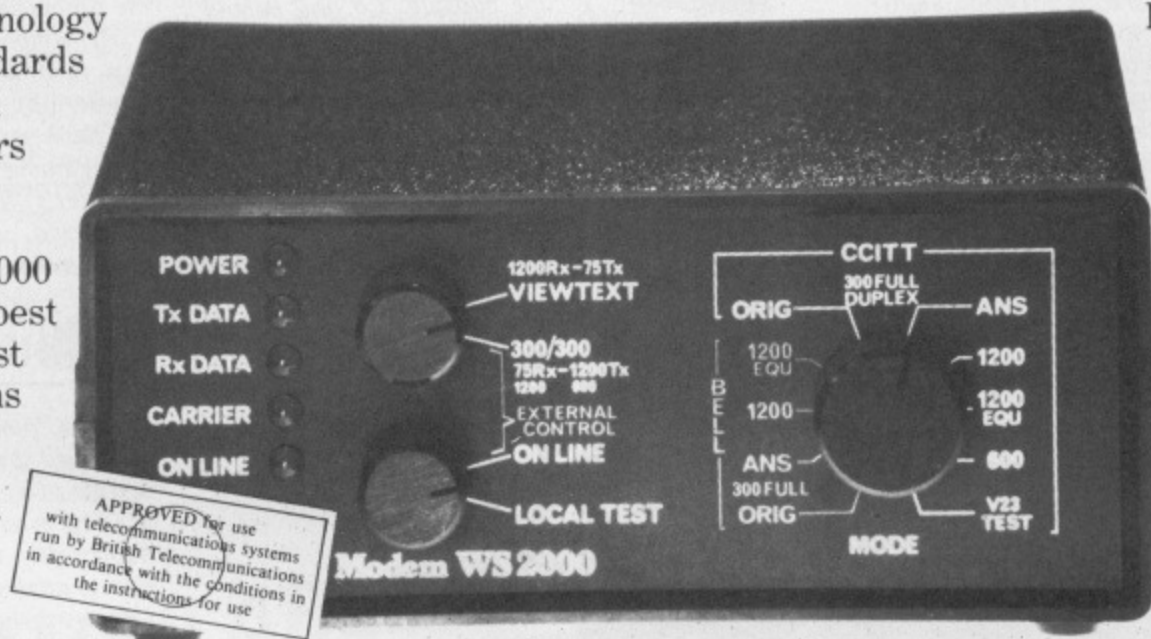
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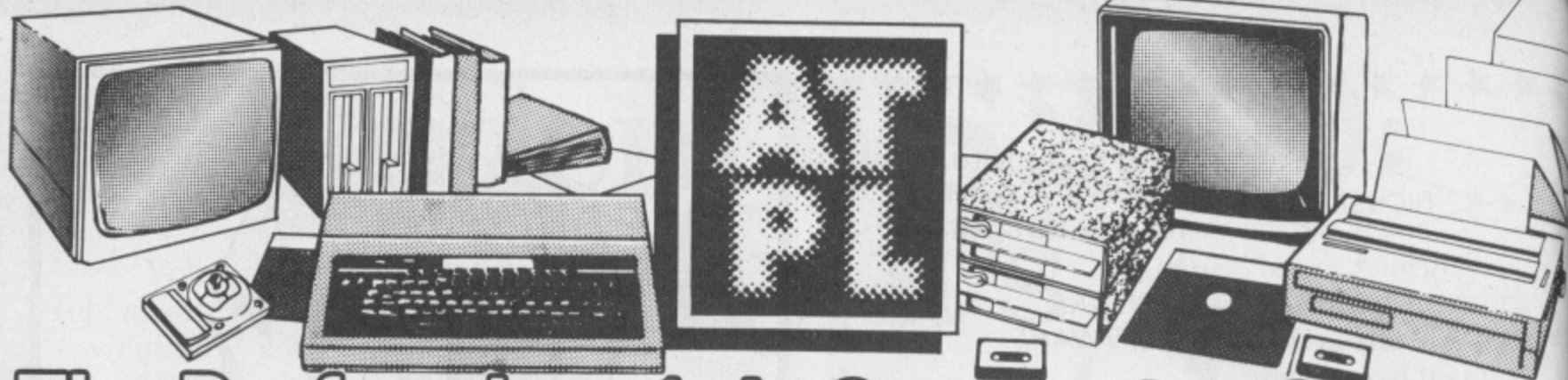
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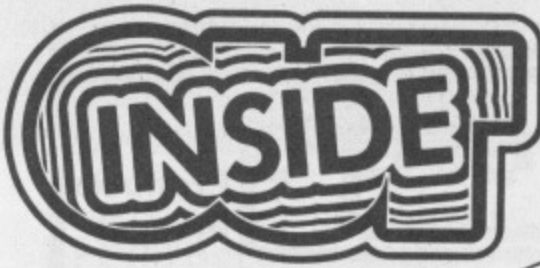
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Here's another piece of exclusive software to help you make the most of the versatile AMX Mouse, which is the subject of our special offer on Page 171

# Kick the keyboard habit - move over to a mouse!

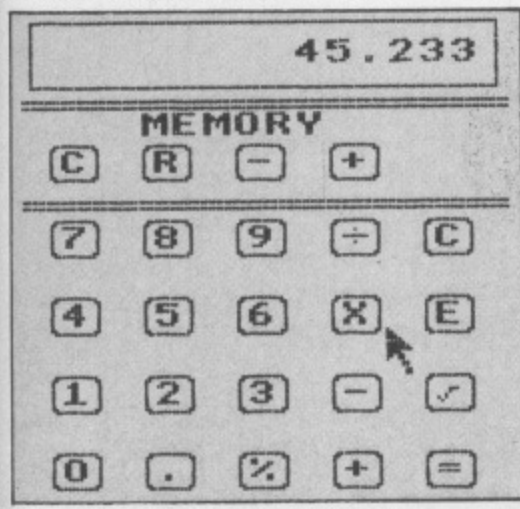


LINKED with the appropriate software, the AMX Mouse can virtually eliminate the need for a keyboard on the BBC Micro.

As an example of how it can be put to good use, here is Mouse Calculator, which is as easy to operate as any simple pocket calculator.

Having loaded the program, you can put your keyboard to one side while you

By  
**GEOFF  
TURNER**



perform any number of calculations simply by moving your mouse cursor around the calculator keys.

I have included instructions (Listing I) for modifying the menu program provided in the AMX software package so that the calculator can be accessed directly from the menu.

If you do not wish to use the menu you must follow this procedure to load

the calculator program. Type as direct commands:

```
#POINTER ON
#BREAK
```

This reserves memory for the pointer. The program may now be loaded with:

```
CHAIN "CALC"
```

If you wish to use the menu program to load the calculator you must amend it by changing the lines as shown in Listing I. Note that 6045 is a new line.

It may be a wise precaution to make a backup copy of your AMX cassette or disc before modifying the menu.

Type in Listing II, and save this to disc or cassette with a filename "CALC". Your mouse calculator is now ready to use.

Simply move the pointer over any of the calculator keys and press one of the

mouse buttons - this, in effect, presses that calculator key. It performs like any pocket calculator, dealing with square roots and percentages as well as the usual mathematical functions.

Complex calculations may be performed by using the memory facility. The memory keys are situated across the top row, and an asterisk will light up when the memory contains any number.

A number entered in error may be cleared with the E key. If a calculation results in a number too large for the computer to handle an overflow message is generated and the calculator will freeze until the key C is pressed.

**Full listing starts on Page 132**

VARIABLES	
BUTTON	Checks mouse buttons.
K%	Key pressed.
N	Number entered.
NS	String of number entered.
A	Accumulator.
AS	String of accumulator.
F%	Function key pressed.
M%	Memory key pressed.
memory	Number stored in memory.
length%	Length of NS.
point%	Status of decimal point.

PROCEDURES	
PROCclear	Clears accumulator.
PROCresult	Displays result.
PROCmove	Moves pointer.
PROCbutton	Checks mouse buttons.
PROCKey	Checks calculator keys.
PROCnumber	Displays number entered.
PROCpoint	Accepts decimal point.
PROCfunction	Identifies function key.
PROCcalc	Calculates result.
PROCnextnumber	Clears last number entered.
PROCpercent	Calculates percentage.
PROCroot	Calculates square roots.
PROCmemory	Updates memory.
PROCoverflow	Deals with overflows.

## Mouse calculator listing

From Page 131

### Program I

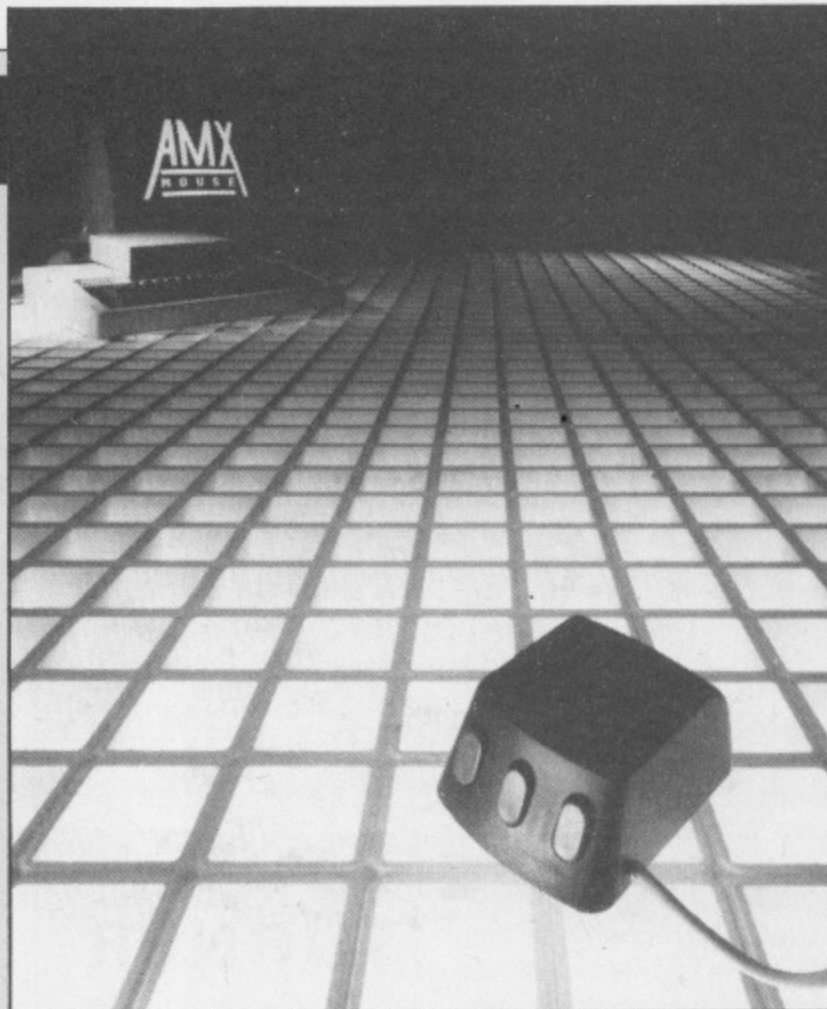
```
40 prog=51:art=53:calc=35
1050 PROCprog(calc,17,10,"CALC'R")
4015 IF NZ<5 THEN 4020
6000 IF NZ<0 OR NZ>4 THEN GOTO 10
6045 IF NZ=4 THEN CHAIN"CALC"
```

### Program II

```
10 REM *****
20 REM *   MOUSE CALCULATOR   *
30 REM * For use with BBC micro *
40 REM *   and AMX Mouse.     *
50 REM * written by Geoff Turner *
60 REM *   (C) The Micro User  *
70 REM *****
80 ON ERROR GOTO 2540
90 REM SET UP SCREEN DISPLAY
100 MODE4
110 VDU23,240,0,0,0,127,0,0,0,0
120 VDU23,241,0,0,14,0,16,00,32,0
130 *DESK
140 *WINDOW 7,25,22,5
150 MOVE 224,719:DRAW 736,719
160 MOVE 224,711:DRAW 736,711
170 MOVE 224,591:DRAW 736,591
180 MOVE 224,583:DRAW 736,583
190 MOVE 240,740:DRAW 720,740
200 DRAW 720,820
210 DRAW 240,820
220 DRAW 240,740
230 PRINTTAB(4,5);"MEMORY"
240 FOR IX=1 TO 13 STEP 3
250 FOR JX=6 TO 18 STEP 3
260 PRINTTAB(IX,JX);
270 IF NOT(IX=13ANDJX=6) THEN *ICON
76
280 NEXT
290 NEXT
300 VDU5
310 VDU29,224;192;
320 X=44:Y=76:MOVE X,Y:PRINT"D";
330 X=X+96:MOVE X,Y:PRINT".";
340 X=X+96:MOVE X,Y:PRINT"%";
350 X=X+96:MOVE X,Y:PRINT"+";
360 X=X+96:MOVE X,Y:PRINT"=";
370 Y=Y+96
380 X=44:MOVE X,Y:PRINT"1";
390 X=X+96:MOVE X,Y:PRINT"2";
400 X=X+96:MOVE X,Y:PRINT"3";
410 X=X+96:MOVE X,Y:PRINT"-";
420 X=X+96:MOVE X,Y:PRINTCHR$(241);
```

```
430 Y=Y+96
440 X=44:MOVE X,Y:PRINT"4";
450 X=X+96:MOVE X,Y:PRINT"5";
460 X=X+96:MOVE X,Y:PRINT"6";
470 X=X+96:MOVE X,Y:PRINT"X";
480 X=X+96:MOVE X,Y:PRINT"E";
490 Y=Y+96
500 X=44:MOVE X,Y:PRINT"7";
510 X=X+96:MOVE X,Y:PRINT"8";
520 X=X+96:MOVE X,Y:PRINT"9";
530 X=X+96:MOVE X,Y:PRINTCHR$(240);
540 X=X+96:MOVE X,Y:PRINT"C";
550 Y=Y+96
560 X=44:MOVE X,Y:PRINT"C";
570 X=X+96:MOVE X,Y:PRINT"R";
580 X=X+96:MOVE X,Y:PRINT"-";
590 X=X+96:MOVE X,Y:PRINT"+";
600 VDU4
610 VDU26
620 VDU23,1,0;0;0;0;
630 *SHOWPOINTER
640 PROCclear
650 PROCresult
660 memory=0
670 REM-----
680 REM MAIN LOOP
690 REPEAT
700 BUTTON=0
710 PROCmove
720 PROCbutton
730 IF BUTTON=1 PROCkey ELSE 9150
740 IF KX<11 PROCnumber
750 IF KX=19 PROCclear
760 IF KX<15 AND KX>10 AND N>0 PROC
calc:PROCresult
770 IF KX<15 AND KX>10 PROCfunction
780 IF KX=15 AND N>0 PROCcalc:PROCr
```

```
result:FX=5
790 IF KX=16 PROCpercent
800 IF KX=17 PROCroot
810 IF KX=18 PROCnextnumber
820 IF KX>19 AND KX<24 PROCmemory
830 REPEAT:UNTIL INKEY(-129)
840 UNTIL FALSE
850 END
860 REM-----
870 REM MOVE POINTER
880 DEFPROCmove
890 REPEAT
900 *MOVEPOINTER
910 UNTIL NOT INKEY -129
920 ENDPROC
930 REM-----
940 REM CHECK IF POINTER IN WINDOW
950 DEFPROCbutton
960 *UPDATE
970 IF POS<8 OR POS>21 THEN ENDPROC
980 IF VPOS<11 OR VPOS>24 THEN ENDP
ROC
990 IF POS=10 OR POS=13 OR POS=16 O
R POS=19 THEN ENDPROC
1000 IF VPOS=13 OR VPOS=16 OR VPOS=1
9 OR VPOS=22 THEN ENDPROC
1010 BUTTON=1
1020 ENDPROC
1030 REM-----
1040 REM IDENTIFY KEY PRESSED
1050 DEFPROCkey
1060 IF POS<10 CX=1:GOTO 1110
1070 IF POS<13 CX=2:GOTO 1110
1080 IF POS<16 CX=3:GOTO 1110
1090 IF POS<19 CX=4:GOTO 1110
1100 CX=5
1110 IF VPOS<13 RX=1:GOTO 1160
```



```

1120 IF VPOS<16 RZ=2:GOTO 1160
1130 IF VPOS<19 RZ=3:GOTO 1160
1140 IF VPOS<22 RZ=4:GOTO 1160
1150 RZ=5
1160 KZ=CZ+(5*(RZ-1))
1170 RESTORE
1180 FOR IZ=1 TO KZ
1190 READ KZ
1200 NEXT
1210 IF KZ<25 SOUND1,-10,200,1
1220 BUTTON=0
1230 DATA 20,21,22,23,24
1240 DATA 7,8,9,14,19
1250 DATA 4,5,6,13,18
1260 DATA 1,2,3,12,17
1270 DATA 0,10,16,11,15
1280 ENDPROC
1290 REM-----
1300 REM DISPLAY NUMBER
1310 DEFPROCnumber
1320 PROCnextnumber
1330 N$=""
1340 IF LEN(N$)>length% THEN 1390
1350 IF KZ<10 N$=N$+STR$(KZ) ELSE IF
point%=0 PROCpoint
1360 PRINTTAB(9,7);SPC(13);
1370 PRINTTAB(22-LEN(N$),7);N$;
1380 REPEAT UNTIL INKEY(-129)
1390 REPEAT:PROCmove:PROCbutton:UNTI
L BUTTON=1
1400 PROCkey
1410 IF KZ=10 AND point%=0 PROCpoint
1420 IF KZ<11 THEN 1340
1430 N=VAL(N$)
1440 ENDPROC
1450 REM-----
1460 REM PLACE DECIMAL POINT
1470 DEFPROCpoint
1480 point%=1:length%=9
1490 IF N$="" THEN N$="0." ELSE N$=N
$+ "."
1500 PRINTTAB(9,7);SPC(13);
1510 PRINTTAB(22-LEN(N$),7);N$;
1520 ENDPROC
1530 REM-----
1540 REM CLEAR ACCUMULATOR
1550 DEFPROCclear
1560 A=0:A$="0"
1570 N$="0"
1580 FZ=1
1590 N=0:length%=8:point%=0
1600 PRINTTAB(9,7);SPC(13);
1610 PROCresult
1620 ENDPROC
1630 REM-----
1640 REM IDENTIFY FUNCTION
1650 DEFPROCfunction
1660 FZ=KZ-10
1670 ENDPROC
1680 REM-----
1690 REM CALCULATE RESULT
1700 DEFPROCcalc
1710 ON FZ GOTO 1720,1730,1740,1750,
1780
1720 A=A+VAL(N$):GOTO 1760
1730 A=A-VAL(N$):GOTO 1760
1740 A=A*VAL(N$):GOTO 1760
1750 IF VAL(N$)<>0 A=A/VAL(N$) ELSE
PROCoverflow
1760 A$=STR$(A)
1770 N=0:N$=""
1780 ENDPROC
1790 REM-----
1800 REM CLEAR REGISTER
1810 DEFPROCnextnumber
1820 N$="0"
1830 N=0:length%=8:point%=0
1840 PRINTTAB(9,7);SPC(13);
1850 PRINTTAB(22-LEN(N$),7);N$;
1860 ENDPROC
1870 REM-----
1880 REM DISPLAY RESULT
1890 DEFPROCresult
1900 PRINTTAB(9,7);SPC(13);
1910 PRINTTAB(22-LEN(A$),7);A$;
1920 ENDPROC
1930 REM-----
1940 REM CALCULATE PERCENTAGE
1950 DEFPROCpercent
1960 N=VAL(N$):A=VAL(A$)
1970 IF N>0 N=N/100 ELSE A=A/100
1980 N$=STR$(N):A$=STR$(A)
1990 PROCcalc
2000 PROCresult
2010 ENDPROC
2020 REM-----
2030 REM CALCULATE SQUARE ROOT
2040 DEFPROCroot
2050 N=VAL(N$):A=VAL(A$)
2060 IF N>0 N=SQR(N) ELSE A=SQR(A)
2070 N$=STR$(N):A$=STR$(A)
2080 PRINTTAB(9,7);SPC(13);
2090 IF N>0 PRINTTAB(22-LEN(N$),7);N
$; ELSE PRINTTAB(22-LEN(A$),7);A$;
2100 ENDPROC
2110 REM-----
2120 REM UPDATE MEMORY
2130 DEFPROCmemory
2140 MZ=KZ-19
2150 ON MZ GOTO 2170,2210,2270,2350
2160 REM-----
2170 memory=0
2180 PRINTTAB(21,11);" ";
2190 ENDPROC
2200 REM-----
2210 N=memory
2220 N$=STR$(N)
2230 PRINTTAB(9,7);SPC(13);
2240 PRINTTAB(22-LEN(N$),7);N$;
2250 ENDPROC
2260 REM-----
2270 IF N=0 AND A=0 ENDPROC
2280 PROCcalc:PROCresult:N=0:FZ=5
2290 memory=memory-A
2300 IF memory=0 PRINTTAB(21,11);" "
;
2310 IF memory<>0 PRINTTAB(21,11);"*
";
2320 PROCclear
2330 ENDPROC
2340 REM-----
2350 IF N=0 AND A=0 ENDPROC
2360 PROCcalc:PROCresult:N=0:FZ=5
2370 memory=memory+A
2380 IF memory=0 PRINTTAB(21,11);" "
;
2390 IF memory<>0 PRINTTAB(21,11);"*
";
2400 PROCclear
2410 ENDPROC
2420 REM-----
2430 REM DEAL WITH OVERFLOWS
2440 DEFPROCoverflow
2450 PROCclear
2460 PRINTTAB(9,7);SPC(13)
2470 PRINTTAB(8,7);"OVERFLOW.KEY.C"
2480 REPEAT:PROCmove:PROCbutton:PROC
key
2490 UNTIL KZ=19
2500 PRINTTAB(8,7);SPC(13)
2510 ENDPROC
2520 REM-----
2530 REM ERROR TRAPS
2540 IF ERR=20 PROCoverflow:GOTO 690
2550 PRINTTAB(0,0);
2560 REPORT:PRINT" at line ";ERL
2570 END

```

This listing is included in this month's cassette tape offer. See order form on Page 173.

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Microvitec 2031 20" Standard Res	£315.00
Microvitec Sinclair QL	£270.00
Philips BM7502 V.H. Res (Green)	£85.00
Normende TV/Monitor	
+ Remote control	£249.00
Ferguson CTV + RGB	£240.00
Philips CTV + RGB	£229.00
Kaga RGB Vision III 12"	£369.00
Kaga 12" H.R. Green	£118.00
Sanyo SCM 14" VHR	£425.00
Novex 1414 colour Monitor	£215.00

### DISC DRIVES

BBC Single 100K Drive	£99.00
BBC Dual 200K	£189.00
BBC Dual 200K 40 Track	£159.00
BBC Dual 400K 40 Track	£299.00
BBC Single 400K 80 Track	£159.00
BBC Dual 800K 80 track	£318.00
BBC Single Power Supply	£20.00
BBC Dual Power Supply	£29.00

### PRINTERS

Brother EP44	£228.00
Brother HR5	£148.00
Canon PW1080A 160 CPS (NLQ)	£289.00
Canon PW1156A 160 CPS (NLQ)	£399.00
Kaga KP810 (NLQ)	£285.00
Kaga KP910 (NLQ)	£399.00
Kaga RS232 + 2K buffer	£95.00
Ensign 1650 165 CPS	£305.00
Epson RX80T 100 CPS	£224.00
Epson RX80F/T 100 CPS	£240.00
MP-165 (NLQ)	£316.00
Panasonic KP1091	£325.00
Seikosha GP100A	£189.00
Epson RX100F/T 100 CPS	£396.00
Epson FX80 160 CPS	£370.00
Epson FX100F/T 160 CPS	£494.00
Shinwa CP80	£199.00
Riteman Compact 120 CPS	£199.00
Star Gemini 10X 120 CPS	£230.00
Star Gemini 15X 120 CPS	£339.00
Epson 814RS232 Interface for FX & RX	£34.00
Epson 814RS232 Interface with 2K Buffer X On/Off	£65.00

### DAISYWHEEL PRINTERS

Brother HR15	£378.00
Brother HR15 Keyboard	£155.00
Brother HR15 Sheet Feeder	£212.00
Brother HR15 Tractor Feed	£71.00
Quen Data 20 CPS	£249.00
Juki 6100 18 CPS	£340.00
Juki Single Sheet Feeder	£230.00
Juki tractor Unit	£115.00
Juki RS232 Interface	£74.00
Juki Spare Daisywheel	£16.00

### COLOUR PRINTERS

Canon PJ1080A 7 Colour 40 CPS Ink Jet	£440.00
Seikosha GP700A 7 Colour 50 CPS	£399.00

### DISKS

Very high quality Fuji Diskettes, guaranteed for life at only £20.00 per box (Double-sided 80 track)

### MODEMS

Pace Nightingale	£135.00
(inc Comstar ROM)	£155.00

### WS2000

A world standard modem switchable between 75, 300/300, 600, 1200/75, 75/1200 baud rate. This is the only modem you would ever likely to need to communicate with any computer throughout the world.

Modem	£148.00
Lead	£7.50
Auto-Dial	£34.00
Auto-Dial Cable	£4.50
Auto-Answer Card	£34.00

### Telemod 2

Switchable modem between 1200/75 and 1200/1200 baud rate that allows you to communicate with services like Micronet, Prestel, Easylink or with other computer users at 1200 baud rate.

Modem	£84.00
Lead	£5.00
Software	£19.95

### Telemod 3

BT approved - switchable between 75, 300/300, 1200/75, 75/1200 and allows you to communicate virtually anywhere in the world. It will allow you to communicate with services like Micronet, Telecom Gold, Prestel, One-to-One, Easylink, Microweb. It comes as a standard with built in board for auto-answer.

Modem	£170.00
Lead	£8.00
Software	£19.95

### BBC BUSINESS SOFTWARE

<b>GEMINI</b>	
Cashbook Acc.	£95.00
Beebcalc	£19.95
Inv. + Statements	£19.95
Commercial Acc.	£19.95
Mailing List	£19.95
Database	£19.95
Stock Control	£19.95
Home Accounts	£19.95
Word Processor	£19.95
Please add £4.00 for Disc Version	

### ACORNOSOFT

Invoicing Order Processing  
Mailing List Purchasing  
Stock Control Accounts Payable  
Accounts Receivable  
Price £23.95 each

### WORD PROCESSING

#### BBC 1

BBC Mod. B, View of Wordwise, High Res. Monitor, Quen Data daisywheel printer, Cassette recorder with 10 cassettes and all the necessary cables and printer paper.

#### BBC 2

BBC Mod. B + DFS, View or Wordwise, 100K BBC drive, High Res. Monitor, QuenData daisywheel printer, 10 diskettes and all the necessary cables and paper £883.00

#### BBC 3

Same as BBC 2 but with 400K drive £963.00

# Recommend Business computer users

## BBC 4

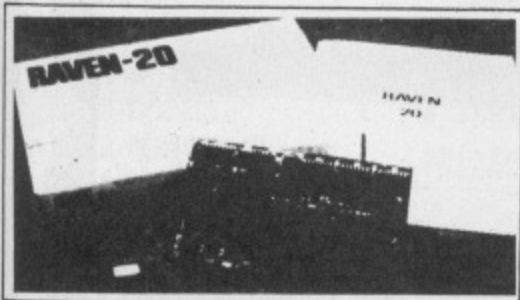
BBC Mod. B + DFS, View or Wordwise, 800K Dual Disc Drive, High Res. Monitor, Juki 6100 daisywheel printer, 10 of 80 track Diskettes and all the necessary cables and printer paper £1,275.00

## ACCESSORIES

BBC Data Recorder	£35.00
DR6 Data Recorder	£25.00
Tornado Joysticks SW self-cen PR	£13.95
Quickshot + I/F for BBC	£19.95
Sureshot Joystick	£18.00
BBC Dust cover	£3.50
RH Light Pen	£44.00
Graph Pad	£115.00
BB Key Function key mask	£1.50
Disc storage box	£18.00
Disc storage box (80)	£24.00
Printer dust cover	£4.50
Monitor dust cover	£4.50
Listing Paper 9.5" x 11" (2,000 sheets)	£15.00
Data Cassette C15	£0.40

## LEADS

Cassette Leads	£3.00
5 pin DIN to 6 pin DIN (RGB)	£3.00
Monochrome monitor lead	£3.25
Disc Drive power leads to BBC (single)	£4.50
(dual)	£5.00
Disc Drive Ribbon Cable (single)	£8.00
(dual)	£10.00



## EXPANSION BOARDS

### RAVEN-20 BOARD

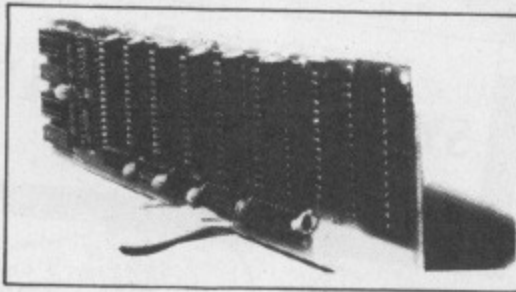
The RAVEN-20 is a 20K RAM EXPANSION for the BBC Micro, Model B, fitted with O.S. 1.2.

This specially designed product plugs in to the CPU socket of your micro (centre socket of the 3 available) with the minimum of effort. The pins are specially custom made, thus avoiding any possible damage to the circuitry.

The RAVEN board provides the user with an extra 20K of usable RAM in screen modes 0 to 3. This together with the aid of software makes the system completely transparent to both the user and the computer.

The RAVEN-20 software ROM gives much more than

just the standard commands, it has been programmed to give more and better commands! Priced at £69.95 inclusive of VAT. Please add £1.50 for post and packing.



## RAM-ROM BOARD

The RAM-ROM extension board gives an extra 6 sockets for extra ROM's and 2 slots of RAM. This RAM is not an extension of BASIC. It is intended that the RAM be used to develop your own ROM based software. There are in fact seven sockets on the board, the 7th replaces the socket on the main board that would otherwise be taken by the ROM board. (The RAM-ROM board can accommodate both 2764 type EPROMS as well as 27128 EPROMS and ROM).

The RAMAMP board will not cause overheating. It comes with fully fitting instructions, tested and heat tested before despatch.

Prices: 1 x 16K RAM fitted £57.00. 2 x 16K RAM fitted £67.00.

## BOOKS

30 Hour BASIC (BBC Micro)	£6.95
35 Educational Programs for BBC	£6.95
36 Challenging Games for BBC	£5.95
40 Educational Programs for BBC	£5.95
100 Programs for BBC Micro	£6.95
Cassette version of above	£10.00
6502 Application Book	£11.95
6502 Assembly Language program	£13.95
6502 Assembly Language Subroutines	£14.25
6502 Machine Code for Beginners	£5.95
6502 Machine Code for Humans	£7.95
6502 Software Design	£10.50
A young persons guide to BBC Basic	£4.50
A Beginners guide to LISP	£10.95
Advanced Machine Code Technique for BBC	£7.95
Advanced User Guide for BBC Micro	£11.95
Advanced Graphics with BBC	£9.95
Advanced 6502 Programming	£12.45
Assembly Language Programming on BBC Micro	£7.95
Advanced Programming Techniques for the BBC Micro	£7.95
BBC Basic	£7.95
Assembly Lang. Prog. on BBC	£7.40
BBC BASIC	£5.95
BBC Computer Magic	£5.50

BBC DIY Robotics & Sensors	£6.95
BBC Forth	£7.50
BBC Lisp	£7.50
BBC Micro An Expert Guide	£6.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro Graphics and Sound	£6.95
BBC Micro Programs in Basic	£5.95
BBC Micro Revealed	£6.95
BBC Micro Assembly Lang. Prog.	£7.95
BBC Micro Disc Companion	£7.95
BBC Micro in Education	£8.50
Basic programming on BBC Micro	£5.95
CP/M The software BUS	£8.95
CP/M Users Guide	£13.95
Creating Adventure Programs on BBC Micros	£6.95
Creative Graphics Cassette (Acornsoft). Has 36 graphics programs	£8.95
Creative Graphics on BBC Micro	£7.50
Complete Programmer for BBC	£5.95
Discover BBC Machine Code	£6.95
Discover FORTH	£13.95
DIY Robotics & Sensors with BBC	£6.95
Exploring FORTH	£6.95
Further Prog. for BBC Micro	£5.95
FORTH Programming	£14.40
Functional Forth for the BBC Micro	£5.95
Games on your BBC Micro	£2.95
Games BBC Computer Can Play	£6.95
Getting more from your BBC & Electron	£6.95
Graphs & Charts on BBC Micro	£7.50
Graphic Art for BBC Computer	£5.95
Graphs and Charts (Cassette)	£7.50
Introducing the BBC Micro	£5.95
Introduction to FORTH	£9.30
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Introducing LOGO	£5.95
Lt your BBC teach u to program	£6.45
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Programming the Z80	£14.25
PASCAL	£9.25
Structured Prog. with BBC BASIC	£6.50
The Complete FORTH	£6.95
Using Floppy Discs with BBC Micro	£5.95
Using BBC Basic	£6.95
Using 6502 Ass. Language	£14.50
Wordstar & CP/M made easy	£6.95

## BEST SELLERS

Frak (Aardvark)	£8.95
Micro Olympics (Database)	£5.95
Chuckie Egg (A'n'F)	£7.00
Fortress (Pace)	£7.95
Contract Bridge (Alligata)	£5.35
Mini Office (Database)	£5.95
747 Flight Simulator (Dr Soft)	£7.15
Elite (Acornsoft)	£14.95

prices inclusive of VAT. Please add £1.50 for P&P.

## HOW TO ORDER

You may purchase any of the items listed by cheque made payable to: Twillstar Computers Ltd. Barclaycard or Access. All you have to do is fill in your requirements on a separate sheet of paper, post to us and we will despatch with 24 hours, subject to availability. All prices inclusive of 15% VAT. ADD £2.50 P&P for orders below £150. Over add £8 P&P. Credit card holders may order by telephone. Give card number, name, address and items required. Please note VAT is not charged on export orders. Export customers please ring for details of P&P.

# TCL



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(01) 574 5271

Open  
6 days a week  
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Monday to Saturday

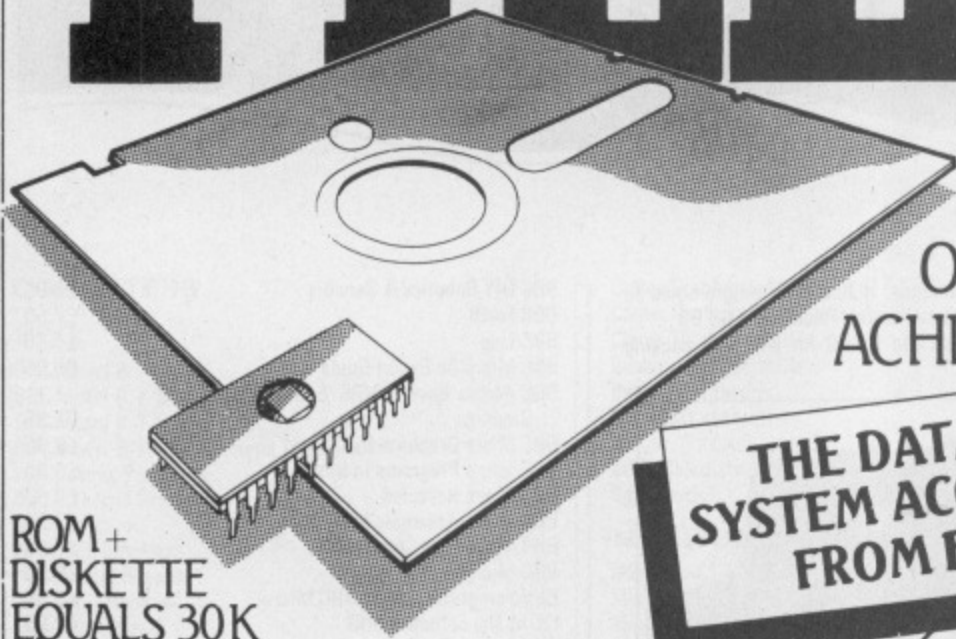


# Twillstar Computers Limited

17 Regina Road, Southall, MIDDLESEX, UB2 5PL. TEL: (01) 574 5271



# FILEAID



ROM +  
DISKETTE  
EQUALS 30K  
SOFTWARE

EXTEND THE CAPABILITIES  
OF YOUR BBC MICRO AND  
ACHIEVE BIG MACHINE FACILITIES

THE DATABASE  
SYSTEM ACCESSIBLE  
FROM BASIC

**£35.00**  
PRICE INCLUDES P & P  
OVERSEAS ADD £3.00  
P & P (AIR)

LINCOLN Microsystems V1.0 (c)1984  
**FILEAID**

Record Description Page 1  
E.G (NEW)

Field name	Length
Item_No%	4
Short_Name\$	30
Price_Each	5
Stock_Level%	4
Supplier_Name\$	40
Supplier_Ref\$	15
Supplier_Tel\$	15

Enter file size => 100

```

10REM Print out E.G File Records
20REM where the Stock_Level < 5
30REM
40REM Setup FILEAID System Variables
50 FRC%=0
60 FILE$="E.G"
70REM Setup E.G Record Variables
80 Item_No%=0
90 Short_Name$=STRING$(30," ")
100 Price_Each=0
110 Stock_Level%=0
120 Supplier_Name$=STRING$(40," ")
130 Supplier_Ref$=STRING$(15," ")
140 Supplier_Tel$=STRING$(15," ")
150REM FILEAID System initial call
160 *FINIT
170REM Position at top of E.G file
180 *FTOP
190REM Print out Qualifying Records
200 REPEAT
210 *FREADN
220 IF Stock_Level% > 4 THEN 250
230 PRINT Stock_Level%
240 PRINT Item_No% Short_Name$
250 UNTIL FRC% <> 0
260 END
    
```

LINCOLN Microsystems V1.0 (c)1984  
**FILEAID**

Audit Report E.G

Maximum Records Available	100	Reorg Count	0
Current Records	78	Reorganize	NO
Record Size	113	Drives	1
Total Fields	7		

Key Field Name Item\_No% Len 4

Access Statistics

Read	Replace	Insert	Delete	R-Delete
218	30	78	0	0

End of Report

LINCOLN Microsystems V1.0 (c)1984  
**FILEAID**

Backup Report # 1 E.G

Entries Processed	78	Entries Remaining	0	Status	WRITE
SEQ:	75				
KEY:	874				
SEQ:	76				
KEY:	908				
SEQ:	77				
KEY:	950				
SEQ:	78				
KEY:	953				

End of Report

- Indexed Sequential Access (Random)
- Dynamic Memory Management
- Record Fields may be Integer/Real/String
- Random Access
- Functions:-  
READ/INSERT/REPLACE/DELETE/REVERSE-DELETE
- Sequential Access
- Functions:-  
TOP/BOTTOM/READNEXT/READPREV
- Multiple Volume Support - Maximum 4 Drives

- Unlimited Number of Files per Program
- BACKUP/RESTORE Utilities
- Maximum Records per File 65,000
- Maximum Record Size 4096 Bytes
- Maximum of 196 Fields (BASIC Variables) per Record
- File AUDIT/INFORMATION Functions
- Comprehensive Manual detailing Concepts/Facilities/Examples

STATE 40/80 TRACK DISKETTE WHEN ORDERING \_\_\_\_\_

SAE FOR FURTHER DETAILS

MU4

Name \_\_\_\_\_

Address \_\_\_\_\_

P.O. BOX 74  
Bradford,  
West Yorks.  
BD6 3RN

**LINCOLN  
Microsystems**



## Chatterbox listing

From Page 100

```

10 MODE 7
20 REPEAT
30 CLS
40 PRINT"THE MICRO USER PRESENTS"
50 PRINT"CHATTER BOX - By Mike Cook"
60 PRINT:PRINT
70 PRINT"THE ACORN SPEECH SYSTEM MUST BE FITTED"
80 PRINT
90 PRINT"1 - Multiplacation Tables"
100 PRINT"2 - Memory Game"
110 PRINT
120 PRINT" YOU CHOSE? ";
130 A=GET AND 3
140 IF A=1 THEN PROC_MULT
150 IF A=2 THEN PROC_GAME
160 UNTIL FALSE
170 DEF PROC_MULT
180 PRINT
190 REPEAT
200 PRINT
210 INPUT"WHAT TABLES SHOULD I SAY",N
220 PROC_TABLES(N)
230 PRINT
240 PRINT"CONTROL Q TO QUIT ANY KEY FOR MORE"
250 A=GET
260 UNTIL A=17
270 ENDPROC
280 DEF PROC_GAME
290 PRINT:PRINT
300 PRINT"CONTROL Q TO QUIT AT END OF GAME"
310 SCORE$=CHR$(275)+CHR$(284)+CHR$(257)+CHR$(131)
320 NO$=CHR$(129)+CHR$(226)+CHR$(267)+CHR$(229)+CHR$(134)+CHR$(283)
330 INV$=CHR$(128)+CHR$(272)+CHR$(143)+CHR$(274)+CHR$(267)+CHR$(229)+CHR$(134)+CHR$(128)
340 OK$=CHR$(128)+CHR$(202)+CHR$(298)+CHR$(180)+CHR$(128)+CHR$(128)+CHR$(228)
350 SCOREND$=""
360 RESTORE 610
370 READ N
380 FOR A=1 TO N
390 READ B
400 SCOREND$=SCOREND$+CHR$(B)
410 NEXT
420 REPEAT
430 N=0
440 REPEAT

```

```

450 N=N+1
460 PROC_PHRASE(INV$)
470 PROC_POSE(N)
480 PROC_FIN
490 *FX21,0
500 T=1
510 REPEAT
520 G=GET AND 15
530 PROC_SAY(B)
540 IF G=(ASC(MID$(Q$,T,1)) AND 15) THEN T=T+1 ELSE PROC_NO(N):T=N+2
550 UNTIL T>=N+1
560 IF T=N+1 THEN PROC_PHRASE(OK$)
570 UNTIL T=N+2
580 PROC_PHRASE(SCORE$)
590 PROC_SAY(N-1)
600 PROC_PHRASE(SCOREND$)
610 DATA 13,243,134,270,271,128,128,128,143,272,162,246,168,212
620 *FX21,0
630 UNTIL GET=17
640 ENDPROC
650 DEF PROC_NO(N)
660 PROC_PHRASE(NO$)
670 FOR A=1 TO N
680 PROC_PHRASE(MID$(Q$,A,1))
690 NEXT
700 ENDPROC
710 DEF PROC_POSE(N)
720 Q$=""
730 FOR A=1 TO N
740 B=RND(10)-1
750 PROC_SAY(B)
760 Q$=Q$+CHR$(B+48)
770 NEXT
780 ENDPROC
790 DEF PROC_PHRASE(P$)
800 LOCAL A,B
810 FOR A=1 TO LEN(P$)
820 B=ASC(MID$(P$,A,1))
830 IF B<36 THEN B=B+256
840 SOUND -1,B,0,0
850 NEXT
860 ENDPROC
870 DEF PROC_TABLES(N)
880 FOR A=1 TO 12
890 PROC_SAY(A)
900 SOUND -1,271,0,0:SOUND -1,134,0,0
910 PRINT A;" X ";N;
920 PROC_FIN
930 PROC_SAY(N)
940 SOUND -1,209,0,0
950 PROC_FIN
960 PROC_SAY(A*N)
970 PRINT " = ";A*N
980 PROC_FIN
990 TIME=0

```

```

1000 REPEAT :UNTIL TIME>120
1010 NEXT
1020 ENDPROC
1030 DEF PROC_FIN
1040 REPEAT
1050 UNTIL ADVAL(-9)=63
1060 ENDPROC
1070 DEF PROC_SAY(N)
1080 LOCAL A,A$
1090 IF N=0 THEN SOUND -1,139,0,0:ENDPROC
1100 IF N<0 THEN N=ABS(N):SOUND -1,219,0,0
1110 IF N=INT(N) THEN 1240
1120 PROC_SAY(INT(N))
1130 SOUND -1,243,0,0
1140 A$=STR$(N)
1150 A=0
1160 REPEAT
1170 A=A+1
1180 UNTIL MID$(A$,A,1)="."
1190 REPEAT
1200 A=A+1
1210 PROC_SAY(VAL(MID$(A$,A,1)))
1220 UNTIL A=LEN(A$)
1230 ENDPROC
1240 IF N<100 THEN PROC_NUM(N):ENDPROC
1250 IF N>999 THEN PROC_SAY(N DIV 1000):SOUND -1,141,0,0:N=N MOD 1000
1260 IF N>99 THEN PROC_SAY(N DIV 100):SOUND -1,140,0,0:N=N MOD 100
1270 IF N<>0 THEN SOUND -1,165,0,0
1280 IF N>0 THEN PROC_SAY(N)
1290 ENDPROC
1300 DEF PROC_NUM(N)
1310 IF N>99 OR N<1 THEN ENDPROC
1320 IF N=10 THEN SOUND -1,264,0,0:ENDPROC
1330 IF N=11 THEN SOUND -1,190,0,0:ENDPROC
1340 IF N=12 THEN SOUND -1,273,0,0:ENDPROC
1350 IF N>19 THEN SOUND -1,((N DIV 10)+32),0,0:SOUND -1,137,0,0: N=N MOD 10
1360 IF N>12 THEN SOUND -1,((N MOD 10)+32),0,0:SOUND -1,135,0,0:ENDPROC
1370 IF N=0 THEN ENDPROC
1380 SOUND -1,N+48,0,0
1390 ENDPROC

```

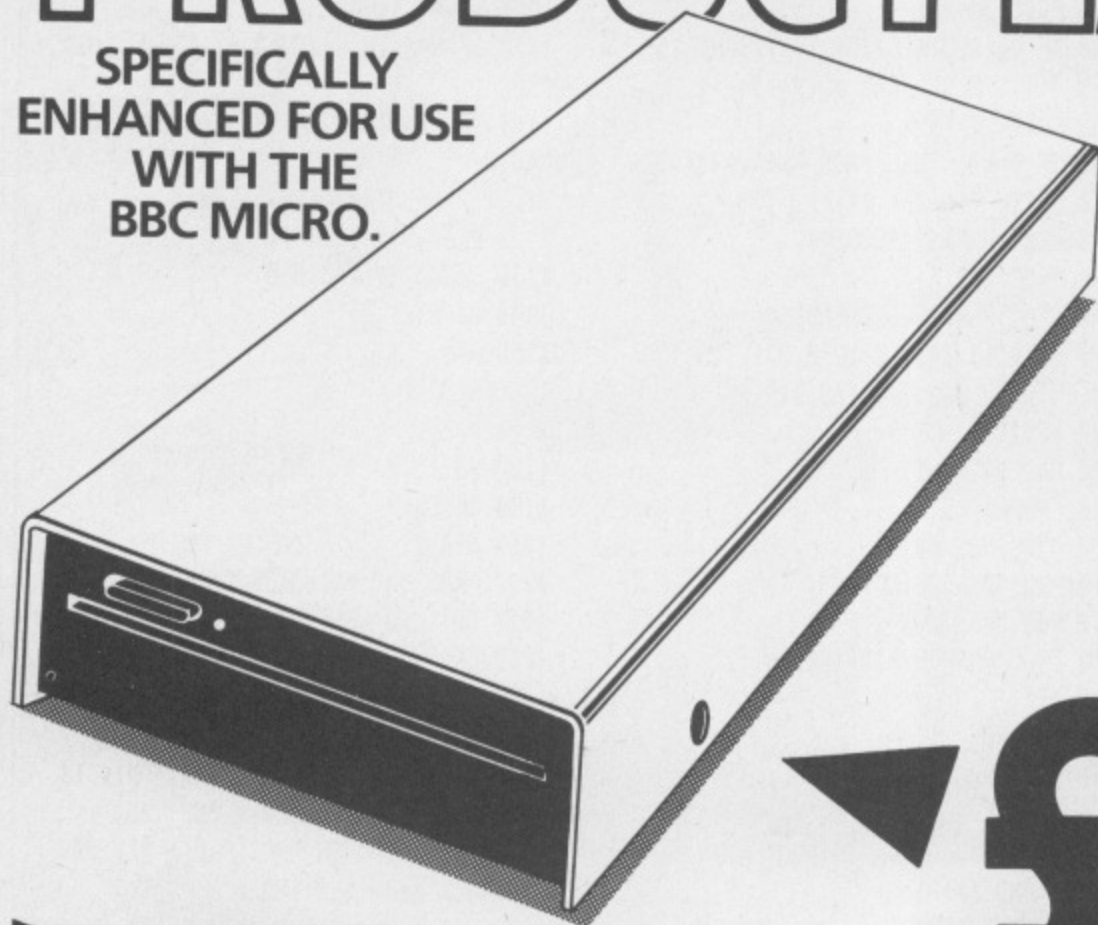
This listing is included in this month's cassette tape offer. See order form on Page 173.

# CHASE DATA

## NEW

# PRODUCT LAUNCH

SPECIFICALLY  
ENHANCED FOR USE  
WITH THE  
BBC MICRO.



Canon 221A "Super-Slim"  
(33.5mm) 80 track double  
sided 400K floppy disc drive  
(40/80 track switching).

Continuing our policy of securing premium  
quality products at budget prices we are  
pleased to announce the new generation  
Canon 221A drive.

**Specifications:**

80 track double sided disc drive. 40/80  
track switching with dual colour LED.  
Capacity 400K in single density, operates in  
double density. Direct drive, track to track  
access 3 ms in 96 TPI mode. Dimensions:-  
1/3 standard height, only 33.5mm.

▶ **£154** INC.

▶ All canon 40/80 switchable disc drives feature an  
on-board dual-colour LED on the front panel to  
show track mode selected.

This is coupled with our  
own unique two-stage  
illumination. To give a  
clear operating status,  
as follows.

40 TRACK MODE: _____	LED GREEN
80 TRACK MODE: _____	LED RED
POWER ON: _____	HALF-ILLUMINATION (GREEN OR RED)
DRIVE SELECTED: _____	FULL-ILLUMINATION (GREEN OR RED)

**SPECIAL OFFER**

WHILE STOCKS LAST



**Specifications:**  
40 track double sided disc drive  
capacity 200k in single density  
Operates in double density  
Track to track access time - 6 ms  
Full 12 month warranty with optional  
extended warranty available

▶ **£95** INC.

CANON 210 2/3 HEIGHT (57.5mm)  
40 TRACK D/SIDED 200K  
FLOPPY DISK DRIVE  
DIRECT DRIVE

**Price Includes:**  
Drive cased with cables,  
manual & utilities disc and  
includes VAT, postage &  
packing.

## FUJI FLOPPY DISCS

	Per box 10	If purchased with disc drive
40 TK SS DD	£17.60	£15.60
40 TK DS DD	£24.50	£22.50
80 TK DS DD	£28.60	£26.60

These prices include VAT & P & P.



### DISCUS

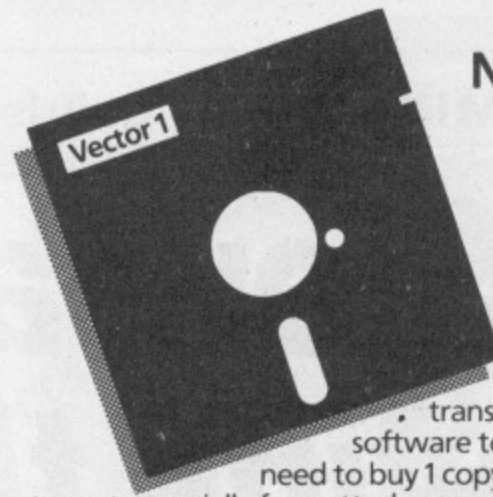
Test utility for testing your own disc drive, at regular intervals to avoid the dreaded flop of your floppy. Menu driven, easy to use, 40 or 80 track versions.

**Tests:** Motor speed, read/write, steptest, alignment test\*, step & read/write test, read only test.

**£8.00 inc. £7.00** if purchased with disc drive.

\*This test requires an oscilloscope & alignment disc.

## NEW SOFTWARE RELEASE FROM CHASE DATA



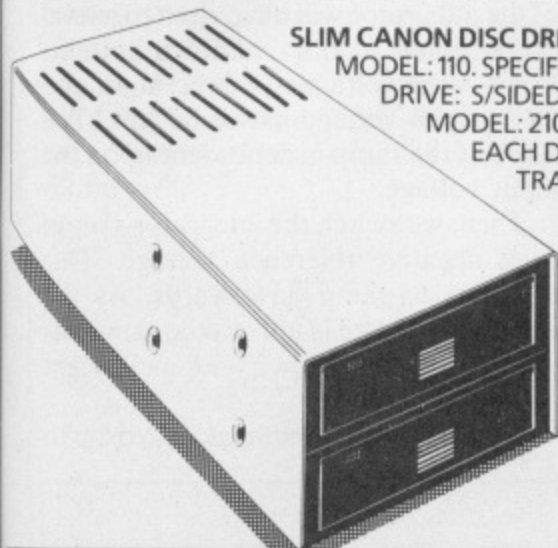
### Vector 1 – The ultimate tape to disk utility

Vector 1 allows you to transfer almost all your tape software to disk. Unlike others, you only need to buy 1 copy of Vector 1 since it transfers tapes to specially formatted program discs. This is easily the most powerful tape to disk utility available.

### Vector 2 – Disk to disk utility

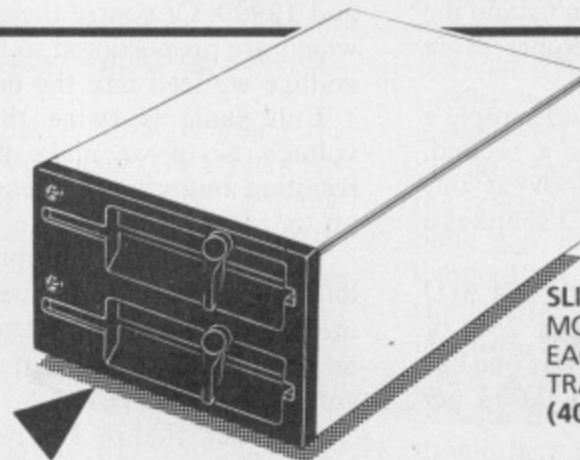
Vector 2 allows you to make backup copies of all your valuable disk software. It is the most advanced utility of its kind available. It is a condition of sale that neither of these products are used for infringement of copyright. Not compatible with double density interface.

**Vector 1 £16** On its own  
**£15** If purchased with disk drive  
**Vector 2 £16** On its own  
**£15** If purchased with disk drive



#### SLIM CANON DISC DRIVES:

MODEL: 110. SPECIFICATION OF EACH DRIVE: S/SIDED 40 TRACK 100K.  
MODEL: 210. SPECIFICATION OF EACH DRIVE: D/SIDED 40 TRACK 200K. MODEL: 220. D/SIDED 80 TRACK 400K. (40/80 TRACK SWITCHING)



SLIM SANYO DISC DRIVES:  
MODEL: 596D. SPECIFICATION OF EACH DRIVE: D/SIDED 40/80 TRACK 400K. (40/80 TRACK SWITCHING)

The Sanyo disc drive is a "half-height" 40/80 track switchable unit of standard dimensions, built to Sanyo's usual high standards of quality and reliability.

All inclusive price list: This means: disc drive + case + all power & data cables + UK carriage + utilities disc & manual + VAT.

Model	CANON				SANYO
	110	210	220	221A	596D
Formatted Capacity per drive on BBC Micro:	100K	200K	400K	400K	400K
Single Drive & Case:	£85	£95	£149	£154	£149
Single Drive & Case PSU:	£110	£120	£174	£179	£174
Dual Drive & Case:	£174	£191	£279	£289	£279
Dual Drive & Case/PSU:	£204	£226	£309	£319	£309

### DON'T FORGET YOUR VECTOR 1 & 2 WHEN ORDERING.

#### Support:

Warranty: All disc drives sold by Chase Data Ltd come with a full one-year warranty on parts & labour with optional extended warranty on all drives.

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MIKE COOK builds a hi-resolution A/D converter

# Slow and steady wins the race

YOU must all know the story of the tortoise and the hare — about the slow ponderous beast and the zippy fast young thing. Well in some ways it is the tortoise I want to look at this month.

It is almost a year since my article about a fast A/D (analogue to digital) converter. That's the hare. Now we are going to look at a slow A/D converter — the tortoise.

It's not for people who can't stand the pace but for those who require more haste and less speed.

You see the fast A/D could sample a voltage about 83,000 times a second, whereas the one we will look at this month can only go at about 3 samples a second.

So why bother? Simple: the fast A/D had a resolution of 1 part in 256, or about 0.4 per cent, whereas this one has 1 part in 20,000, or about 0.003 per cent.

Not only that, but the fast A/D gave you the voltage in arbitrary units just like the built-in analogue input port. This one gives you the reading in volts and allows you to measure positive or negative voltages.

The built-in converter will only give you about 10 bits of accuracy — that is, 1 part in 1,024 — and even then the results tend to drift with temperature. So if you need a stable, accurate method of measuring voltages, this is for you.

There are many different ways of performing a digital to analogue conversion. In most cases we have a three way trade-off between cost, accuracy and speed.

The computer's own A/D makes a good compromise but it is not suited to all situations. There are several digital voltmeter chips on the market, most of which are intended to be wired up into instruments and interfaced directly to a display.

However, one stands out among the crowd, not only for producing 4-bit BCD (binary coded decimal) outputs, but also for having a good resolution of four and a half digits.

*The chorus of "What on earth is half*

*a digit?" is no sooner starting than I am explaining. It's strange a funny voice does not come out so well in print.*

A full digit is one that can take any value from zero to nine. A half digit is one that can only have the values zero and one. I know that's more like a fifth of a digit but I don't make up the rules.

Therefore, with four and a half digits our output is going to range between 0 and 19999. Of course these are in units which are proportional to the reference voltage we feed into the device.

Full scale is twice the reference voltage. So if we make it 1 volt the resulting outputs will measure directly up to 1.9999 volts.

Before we see how to make one, let's look at the theory. The method we will use is known as the dual ramp method and is the same as that used in the computer's own A/D.

Consider Figure 1. This shows an integrator whose input is switchable

between two voltages. Its output is fed to an inverting buffer to get the signal the right way up.

Remember that an integrator produces a rising voltage or a ramp when fed with a steady voltage. The larger the voltage the faster the ramp will climb.

So we switch the integrator over to the unknown voltage for a fixed length of time. When the time is up, the output of the integrator will have risen to a level proportional to our unknown voltage. For a large voltage it will be high, and for a small voltage it will be low. The slope of the ramp is dependent upon the input voltage.

Then, we switch the integrator's input to a negative reference voltage. This causes it to ramp downwards. As the reference voltage is always the same this time, it will ramp down with a constant slope.

If we time how long it takes to drop to

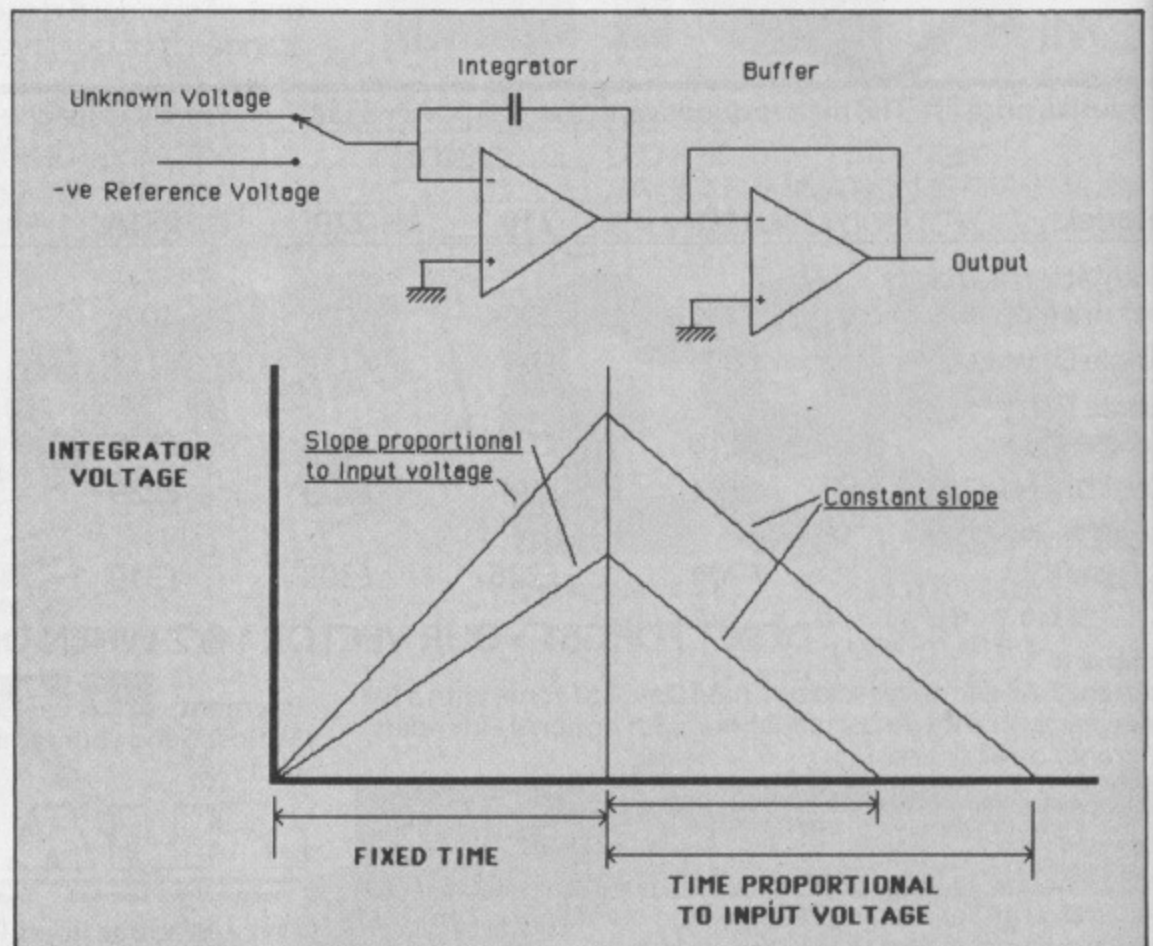
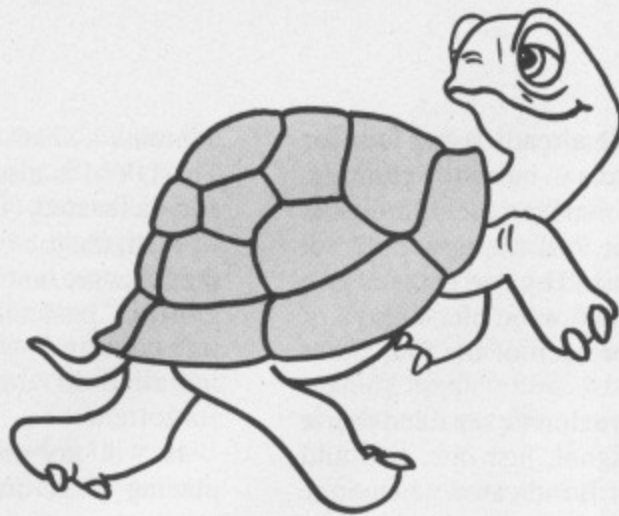


Figure 1: Dual Ramp A/D

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## Part 25



zero we have a measure of how high it was to start with. This is rather like measuring the depth of a well by dropping a stone and timing the splash, or the cries of an intrepid potholer.

Now, it is very easy to measure time digitally. We just count how many cycles of a fixed frequency oscillator have occurred and we know the time.

If we use the same oscillator to time the ramp up period we don't even have to know what the frequency is. We have a measure of the voltage merely as a ratio of the two times.

All that is required of the oscillator is that it has short term stability and all will be well.

Finally, there is an auto zero phase when the integrator is switched to zero volts. This allows compensation for any offset voltages in the various internal amplifiers.

Offset voltages are small voltages present on the input of amplifiers even when there is no signal present. These get added to any input signal and tend to give what is called a DC offset on the outputs. Without this form of compensation, accuracy would be severely limited.

Basically that is what is going on inside Digital Voltmeter (DVM) ICs. So let's see what else we need to hang around it to achieve a working system.

The full circuit of our DVM board is shown in Figure II. The circuitry consists of two halves – the analogue side (right) and the digital side (left). The integrating capacitor C3 is the critical one.

For standard results polystyrene or polycarbonate can be used, but for the ultimate in accuracy polypropylene capacitors should be used. Unfortunately these can cost up to £4 each so I would try an ordinary one first.

The various other components around pins 4 to 8 are all concerned with the integration or auto zero. Pin 2 has the reference voltage and is fed from a band gap voltage regulator IC. This is temperature compensated and quite stable. It produces 1.2 volts and so resistors R11, R9 and VR1 tap this down to the 1 volt needed.

Note that for fine adjustment VR1 should be a multi-turn helical pot. This type gives ten turns or so over its whole range, thus allowing very accurate setting up.

You might have some software already compensating for the 1.8 volts reference in the BBC Micro. If you want to use the same reference voltage with this DVM board you should change R8 to about 6K8 to allow the reference to be set at 0.9 volts.

The two inputs to the DVM are marked HI and LO and should be connected to the high side and low side of what you want to measure. These terms are, of course, relative and LO should be taken as being close to the signal ground.

There is on the board an optional wire link labelled LK1 which ties the LO input to the system common and thus to earth. This is the most conventional way of using the board and so this link should be made unless you have specific reasons for wanting it to be open.

At the input, R4 and C4 form a filter to remove any high frequency noise. At the rate of conversion of the DVM it will not affect us. However if you are

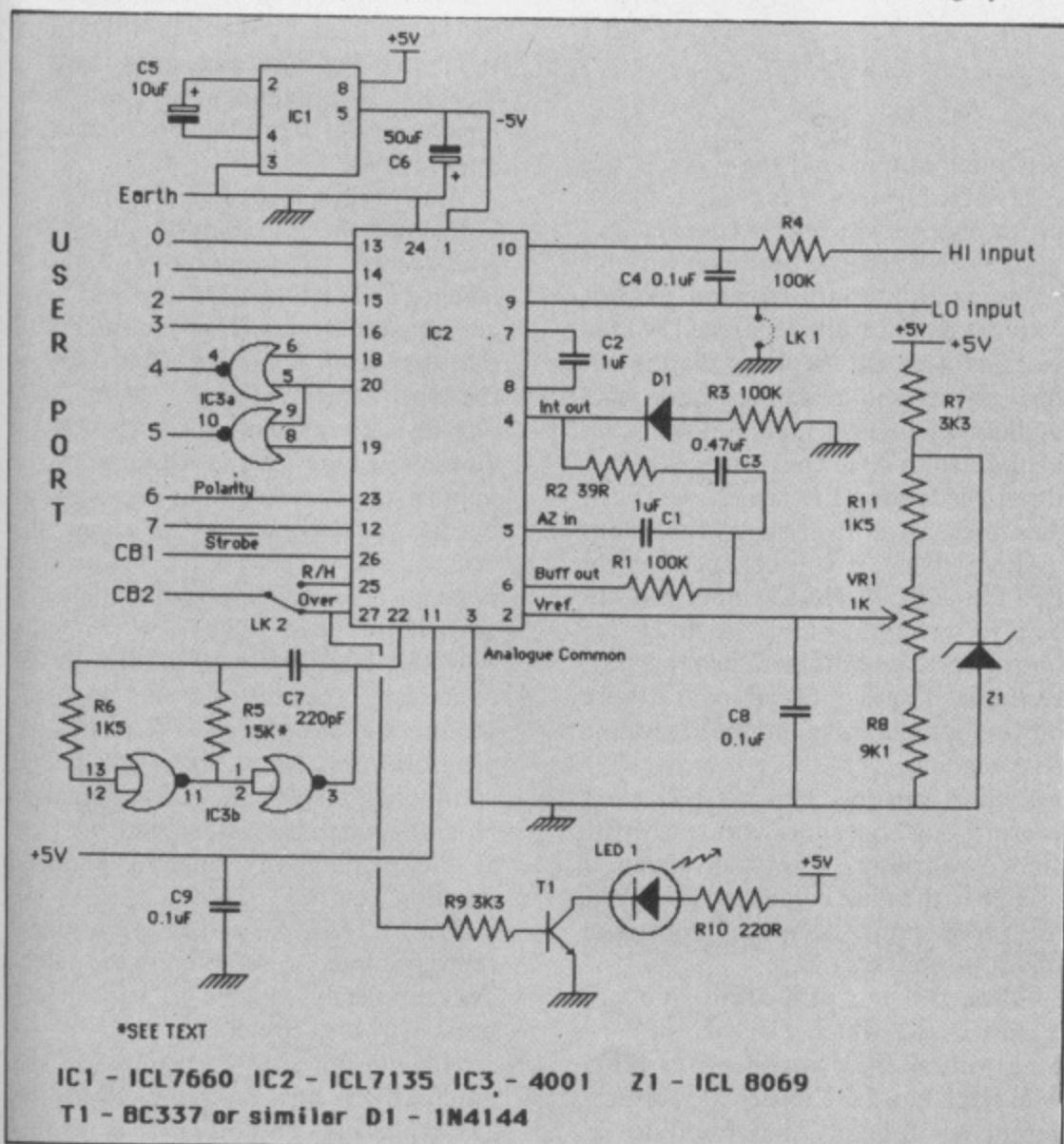


Figure II: Digital Voltmeter

## From Page 141

measuring higher voltages, C4 can be replaced with a resistor to cut down the input. This will of course reduce the input impedance of the DVM to that of the potential divider.

Finally, on the analogue side, the analogue earth is brought out on a different pin from the digital earth. If you are laying this out yourself make sure there are no heavy digital (fast changing) currents flowing in the analogue common wiring.

Of course the analogue and digital grounds are connected together electrically but you shouldn't mix them. This means there should be separate digital and analogue structures, just linked at one point.

Now on the digital side we must supply the DVM chip with a negative voltage supply. As this chip takes rather a lot of current we cannot use the trick of generating a negative supply from the clock oscillator as we did with the fast D/A converter. Instead the best solution is to use a negative supply generator chip - this is IC1.

It uses the same principle as we used before, namely an oscillator feeding into a capacitor and the output being rectified. But the charging and discharging switches are a lot more efficient.

You could power the chip off the -5V output from the computer's auxiliary power socket, then you could eliminate this chip. However it is included to make a neat unit only requiring a connection to the user port.

Two gates of IC3 are used as a feed-back oscillator. R5 determines the frequency and hence the conversion time. The value shown will produce about two and a half readings every second. You can push this up to about four a second by making R5 10K.

If you make it any faster you can get a pedestal or constant offset reading imposed on the output. This can be subtracted quite easily with software if you want faster times. With the components shown the clock should be at about 100KHz, but it can be increased up to 1MHz.

The signals are multiplexed at the output. That is, the digits are constantly changing - first the bits of the first digit and then the bits of the next digit and so on. These outputs are connected to the first 4 bits of the user port.

In order to know which bit is currently being produced one of five outputs on the DVM chip goes low. Each output signals its own digit.

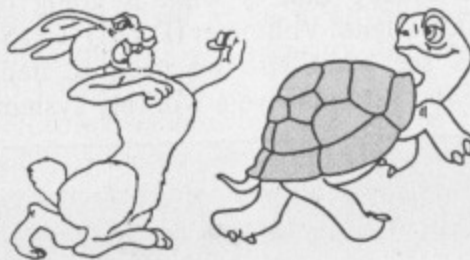
As we have only eight inputs on the

user port and are already using four for the values we have to be a little cunning. The output line marking the fifth digit is connected to bit 7 of the user port but the others are mixed by two gates to give a unique combination on bits 4 and 5 of the user port for each of the four other digits.

It turns out we don't even need to use the digit four signal, just one, two and three. Digit four is indicated when none of these outputs are signalling at the same time as digit output five is not signalling. This leaves us with one free user port line, bit 6, which is used to look at the polarity of the signal.

In order to read in the signals the DVM chip produces a strobe pulse for each of the digits the first time they appear after a conversion. This is connected to control line 1 of the user port and is used to generate an interrupt which causes the computer to read the new value.

Finally we come to control line 2. Unfortunately we have two useful lines that could be connected here. One is the



over-range output and the other is the RUN/HOLD input. Link LK2 allows you to choose which you connect up.

I have written the software around the over-range connection which produces an interrupt when the DVM is being fed with more voltage than it can cope with. The reading under this condition will be zero and not full scale like the BBC's A/D converter. Also this output feeds an LED which will flash when there is an over-range condition.

Alternatively, if you connect control line 2 to the RUN/HOLD input you will have to program the VIA to make control line 2 an output. When it is held low the DVM will not produce any more conversions and will continue to give the same reading.

A short positive pulse - you can't generate one too short with the BBC Micro - will initiate a new conversion. If it is held high or not connected the DVM will "free run", giving a continual stream of conversions.

I have laid out a printed circuit board for the DVM which can be obtained along with all the components as Body Build Pack No. 22. Construction should present no difficulty, but for those of you with little experience the pack

contains a sheet on constructional tips. The DVM is also available ready made and calibrated. (Details on page 117.)

Well, the job is only half done without the software, and this is shown in Listing I. It is basically an interrupt-driven background task, designed to be installed in the computer and then forgotten.

It will go on taking readings and placing them in memory. When you want them you simply read in the appropriate memory location.

While it is located in my favourite place, the RS432 buffer, it can be moved to any protected memory location. The only lines which need to be changed are 90, 1060, 1070 and 1130.

Basically the program is split into two parts, one that initialises the patch and one that reads the DVM. The first part intercepts the unrecognised interrupt vector and routes it into the reading routine. It also initialises the VIA and prepares some memory locations.

When the DVM generates an interrupt, the read routine labelled RDVM is executed. This tests to see if it is a new reading or an over-range interrupt.

Assuming it is a new reading, it takes the reading and places the four least significant bits in a page zero memory location. It finds out what location by looking at the digit indicator signals on bits 4, 5 and 7.

When the last digit of a sample has been read in, the binary values are transferred to a memory location labelled VSTRING. On the way they are converted into Ascii characters so that they form a voltage string - hence the label name.

This is done so that the BASIC VAL command can convert them into a number the computer can use, which is by far the easiest way of doing the conversion. Also this technique prevents a BASIC program reading in a partially updated value.

If the interrupt was caused by an over-range condition the program produces a short bleep. The rest of the program is a short loop which will continually display the current reading. Now the patch is installed you can look at the reading any time by pressing function key f0.

The Break key has also been reprogrammed to re-initialise the patch. To completely remove it, you should press Ctrl and Break.

Having obtained a display of the readings it is now time to calibrate the DVM. What you need is a known voltage source or a way of measuring

# THE BEEB BODY BUILDING COURSE

one. Simply connect it up and adjust the pot VR1 until the reading is correct.

Remember the absolute accuracy of a reading is usually not as important as the relative accuracy, so if you do not have an accurately known voltage source it is not such a disaster. You can even use the voltage reference on the DVM board.

The junction of R7 and R11 should be at 1.2 volts. I have a specially precise

voltage cell for my calibration. Do not use an ordinary battery unless you monitor the voltage with another meter as the output is not exactly what is printed on the case.

Well there you have it, a digital voltmeter for all your serious data logging applications, which is as precise as you can get for a computer this side of £300.

See you next month.

```

10 MODE7
20 PRINT"THE BEEB BODY BUILDING CO
URSE"
30 PRINT"4\ Digit DIGITAL VOLTMETE
R"
40 PRINT"By Mike Cook"
50 PRINT
60 PRINT"DVM Reading Background Ta
sk Patch"
70 PRINT"Press any key to continue
"
80 A=GET
90 CODEX=&A00
100 IF ?&207=&A THEN GOTO 1020
110 FOR C%=0 TO 3 STEP 3
120 P%=CODEX
130 (
140 OPT C%
150 .INSTAL LDA #0
160 STA &FE62 \ MAKE USER PORT INPU
TS
170 LDA &FE6C
180 AND #15 \SET UP CONTROL LINES
190 STA &FE6C
200 LDA #13
210 STA VSTRING+7
220 LDA #&FE \ ASCII (-&30) FOR DEC
IMAL POINT
230 STA &74
240 SEI \DISABLE INTERRUPTS
250 LDA &206
260 STA TEMP \MOVE VECTORS
270 LDA &207
280 STA TEMP+1
290 LDA #(RDVM MOD 256)
300 STA &206
310 LDA #(RDVM DIV 256)
320 STA &207
330 CLI
340 LDA #&98 \ENABLE INTERRUPT
350 STA &FE6E
360 RTS
370 .TEMP NOP
380 NOP
390 .VSTRING
400 NOP:NOP:NOP:NOP:NOP:NOP:NOP
410 NOP:NOP:NOP
420 .RDVM PHA \ READ THE DVM
430 TXA :PHA
440 TYA :PHA
450 LDA &FE6D \ INTERRUPT FLAG REG
460 ASL A \ PUT BIT 7 INTO CARRY
470 BCC RECOVER \NOT A USER PORT IN
TERRUPT
480 ASL A :ASL A : ASL A \PUT CB1 F
LAG INTO CARRY
490 BCC OVERRANGE \ NOT A READING T
HEREFORE AN OVER RANGE
500 LDA &FE60
510 TAX
520 AND #&80 \SEE IF LAST DIGIT
530 BEQ DIGIT
540 \LAST DIGIT FOUND
550 TXA
560 AND #1
570 STA &75 \ STORE MOST SIG BIT
580 TXA
590 ROL A:ROL A:ROL A:ROL A \ PUT P
OLARITY INTO BIT ONE
600 AND #2 \REMOVE OTHER BITS
610 EOR #2 \ INVERT THE BIT
620 CLC
630 ADC #&FB \ADD OFFSET TO IT
640 STA &76 \STORE THE SIGN
650 JMP RECOVER \ FINISHED THIS DIG
IT
660 .DIGIT
670 TXA
680 ROR A :ROR A :ROR A :ROR A
690 AND #&3 \JUST LEAVE ADDRESS BIT
S
700 TAY \ PUT ADDRESS INTO Y
710 TXA \ GET VALUE FROM X
720 AND #&F \REMOVE OTHER BITS
730 STA &70,Y
740 TYA \FIND OUT IF IT IS DIGIT ZE
RO
750 BNE RECOVER \BRANCH IF IT IS NO
T
760 \TRANSFER NUMBERS INTO A STRING
770 LDX #7
780 LDY #0
790 .LOOP LDA &6F,X
800 CLC
810 ADC #&30
820 STA VSTRING,Y
830 INY
840 DEX
850 TXA
860 BNE LOOP
870 .RECOVER
880 PLA :TAY
890 PLA :TAX
900 PLA
910 JMP (TEMP)
920 .OVERRANGE \ INPUT TO DVM TOO H
IGH
930 \ ACTION WITH THIS PROGRAM - BL
EEP
940 LDX #&76 \LSB OF SOUND PARAMETE
RS
950 LDY #0
960 LDA #7 \BLEEP COMMAND
970 JSR &FFF1 \OSWORD SOUND COMMAND
980 JMP RECOVER
990 ]
1000 NEXT
1010 CALL INSTAL
1020 CLS
1030 REM SET UP SOUND PARAMETER BLOC
K
1040 !&76=&FFF10001
1050 !&7A=&0001000C8
1060 *KEY0 P.VAL($2614)IM
1070 *KEY10 CALL &A00!M
1080 PRINT TAB(0,5);"Digital Voltmet
er Patch Now Installed"
1090 PRINT"KEY f0 Will print reading
when ESCAPED"
1095 PRINT"Over-range reading will c
ause a BLEEP"
1100 REPEAT
1110 A$=""
1120 PRINT TAB(0,10);"DVM READING ";
1130 V=VAL($2614)
1140 PRINT V;" Volts"
1150 UNTIL FALSE

```

*This listing is included in this month's cassette tape offer. See order form on Page 173.*

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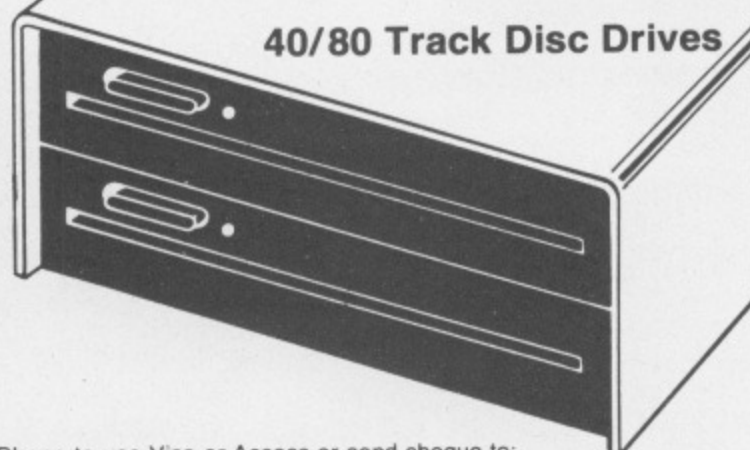
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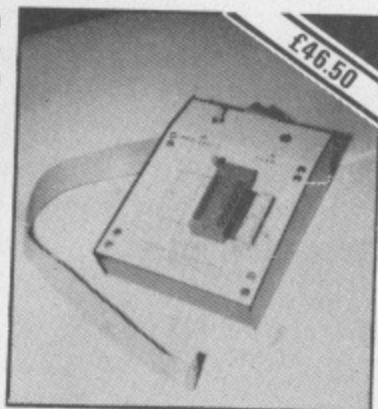
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Year	Company A		Company B	
	Sum	NPV	Sum	NPV
1	50000	50000	50000	50000
2	50000	46729	50000	46729
3	50000	43672	50000	43672
4	65000	53059	50000	40815
5	65000	49588	50000	38145
6	65000	46344	75000	53474
7	84500	56306	75000	49976
8	84500	52622	75000	46706
9	84500	49180	75000	43651

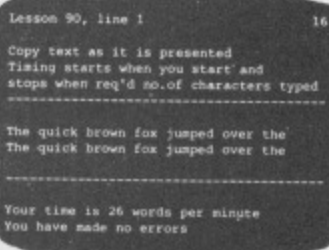
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\* delete as appropriate.

MU4

# X-15 listing

## From Page 71

```

450 IFM%>7FFF M%=M%-45000
460 IF?M%PROCY(?M%AND170,6%-1,H%):E
NDPROC
470 M%=M%+640
480 G%=G%-1:IFHX>13 PRINTTAB(G%,H%)
" * ELSEPRINTTAB(G%,H%)R$:H%=H%+1
490 ENDPROC
500 DEFPROCx(N%,X%,Y%)
510 SOUND&11,0,0,1
520 F%=0:IFN%<42 SC%=SC%+5 ELSEIFN%
<162 ENDPROC ELSEIFN%=168 RL%=FALSE:S
OUND&13,0,0,1:SC%=SC%+10 ELSEIFN%=162
ML%=FALSE:MF%=FALSE:SOUND&13,0,0,1:S
C%=SC%+50 ELSE SC%=SC%+50
530 SOUND&4,5,3:PRINTTAB(X%,Y%)X$
540 ENDPROC
550 DEFPROCY(N%,X%,Y%)
560 SOUND&12,0,0,1
570 G%=0:IFN%<42 SC%=SC%+5 ELSEIFN%
<162 PRINTTAB(X%,Y%)CHR$32:ENDPROC EL
SEIFN%=168 RL%=FALSE:SOUND&13,0,0,1:S
C%=SC%+10 ELSEIFN%=162 ML%=FALSE:SOUN
D&13,0,0,1:MF%=FALSE:SC%=SC%+50 ELSE
SC%=SC%+50
580 SOUND&4,5,3:PRINTTAB(X%,Y%)Y$
590 ENDPROC
600 DEFPROCts
610 IFB%<32T%=B%-14:B%=T%+26 ELSEB%
=38:T%=12
620 $S%=CHR$17+CHR$(6+RND(6))+B$+ST
RING$(T%DIV3,S$)+STRING$(8,B$)+STRING
$((50-B%)DIV3,S$)
630 S%?(2+T%)=246:S%?B%=236
640 ENDPROC
650 DEFPROCcis
660 B%=35:T%=3
670 $S%=CHR$17+CHR$7+B$+STRING$(11,
B$)+STRING$(5,C$)
680 ENDPROC
690 DEFPROCgrs
700 B%=35:T%=3
710 $S%=CHR$17+CHR$(6+RND(6))+B$+ST
RING$(11,B$)+STRING$(5,S$):S%?B%=236
720 ENDPROC
730 DEFPROCg
740 IF(W%AND12)=12 PRINTTAB(19,RND(
AZ?(B%-2)))::VDU17,RND(6),248
750 N%=RND(6):PROCRu
760 IFW%=128 S%?1=RND(6)+6
770 IFN%=3 PRINTTAB(19,AZ?(B%-2))::
VDU17,15,227
780 IFN%AND1 IFB%<47 S%?B%=32:B%=B%
+3:S%?B%=236:ENDPROC
790 IFB%>20 S%?B%=244:B%=B%-3:S%?B%
=237
800 ENDPROC
810 DEFPROCRu

```

```

820 IFRL%=TRUE ELSEIFW%>180 ENDPROC
ELSSERT%=T%?AZ:RB%=AZ?(B%-2)-1:RX%=19
:RY%=(RT%+RB%)DIV2:RL%=TRUE:PRINTTAB(
RX%,RY%)RH$:SOUND3,6,100,50:ENDPROC
830 RX%=RX%-1:IFRX%<7:RL%=FALSE:SOU
ND&13,0,0,1:ENDPROC
840 IFRY%>L% IFRY%>RT%:PRINTTAB(RX%
,RY%)RU$:RY%=RY%-1:ENDPROC
850 IFRY%<L% IFRY%<RB%:PRINTTAB(RX%
,RY%)RD$:RY%=RY%+1:ENDPROC
860 ENDPROC
870 DEFPROCmu
880 IFN%=3:PRINTTAB(19,AZ?(B%-2))::
VDU17,15,242
890 IFML% ELSEIFW%>180 ENDPROC ELSE
MT%=T%?AZ:MY%=AZ?(B%-2):MX%=19:ML%=T
RUE:PRINTTAB(19,AZ?(B%-2))::VDU17,13,
242:ENDPROC
900 MX%=MX%-1:IFMF% ELSEIFMX%-6<=MY
%-L% MF%=TRUE:SOUND3,3,50,15 ELSEENDP
ROC
910 IFMY%=MT% OR MX%<7 ELSEPRINTTAB
(MX%,MY%)MU$:MY%=MY%-1:ENDPROC
920 PRINTTAB(MX%,MY%) " "
930 ML%=FALSE:MF%=FALSE:SOUND&13,0,
0,1:ENDPROC
940 DEFPROCci
950 IF(W%AND12)=12PRINTTAB(19,RND(A
Z?(B%-2)))::VDU17,RND(6),248
960 N%=RND(6):PROCMu
970 IFN%AND1IFB%>20 S%?B%=240:B%=B%
-3:S%?1=N%+6:ENDPROC
980 IFB%<47 B%=B%+3:S%?B%=32
990 S%?1=N%+6
1000 ENDPROC
1010 DEFPROCT
1020 IF(W%AND12)=12PRINTTAB(19,AZ?(B
%-2)-RND(7))::VDU17,RND(6),248
1030 N%=RND(6):IFN%=1:PRINTTAB(19,(B
%-2)DIV3)::VDU17,15,227
1040 IFW%=128 S%?1=RND(6)+6
1050 IFN%AND1 IFT%<24 S%?(2+T%)=244:
T%=T%+3:S%?(2+T%)=247:S%?B%=32:B%=B%
+3:S%?B%=236:ENDPROC
1060 IFT%>3 S%?B%=244:B%=B%-3:S%?B%
=237:S%?(2+T%)=32:T%=T%-3:S%?(2+T%)=24
6
1070 ENDPROC
1080 DEFPROCC
1090 VDU23,226,0,0,126,0,0,126,0,0
1100 VDU23,227,255,129,153,145,153,1
45,145,255
1110 VDU23,230,96,112,252,123,123,25
2,112,96
1120 VDU23,234,219,0,109,0,0,109,0,2
19
1130 VDU23,235,109,0,219,0,0,219,0,1
09
1140 VDU23,236,128,144,208,216,248,2
48,252,255

```

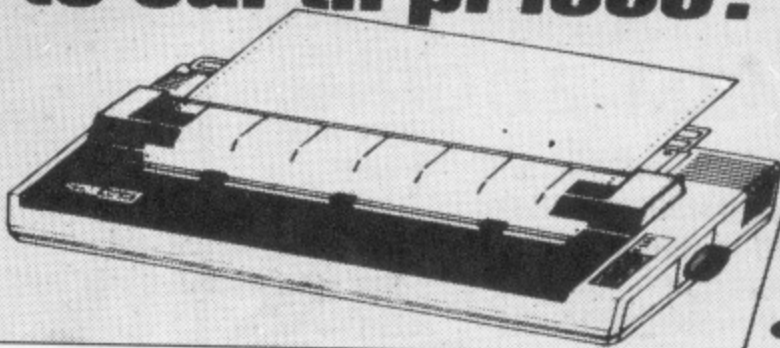
```

1150 VDU23,237,1,1,9,9,29,95,127,255
1160 VDU23,240,255,255,195,195,195,2
55,255,255
1170 VDU23,241,20,28,8,8,8,8,8,0
1180 VDU23,242,66,66,66,66,66,231,23
1,66
1190 VDU23,243,0,0,0,1,3,39,255,255
1200 VDU23,244,255,255,255,255,255,2
55,255,255
1210 VDU23,246,255,252,248,248,216,2
08,144,128
1220 VDU23,247,255,255,223,157,137,1
37,129,129
1230 VDU23,248,146,84,56,56,56,56,84
,146
1240 VDU23,249,136,73,42,28,255,28,4
2,41
1250 VDU23,250,144,1,36,137,0,18,33,
132
1260 ENVELOPE1,1,-3,-3,-3,10,10,10,1
27,-1,-1,-1,126,110
1270 ENVELOPE2,1,-1,-1,-1,80,80,80,1
27,0,-1,-1,126,126
1280 ENVELOPE3,1,1,2,100,100,100,5,5
,0,-2,50,126,1
1290 ENVELOPE4,1,0,0,0,10,5,5,127,0,
-2,-2,126,126
1300 ENVELOPE5,1,0,0,0,10,5,5,127,-1
,0,-1,126,126
1310 ENVELOPE6,1,15,-15,-15,4,2,2,5,
0,0,-15,80,80
1320 HIX=0:HI$="JOE ZERO":SC%=0:NP%=
3
1330 ENDPROC
1340 DEFPROCS
1350 MU$=CHR$32+CHR$8+CHR$11+CHR$17+
CHR$13+CHR$242
1360 RU$=CHR$32+CHR$8+CHR$11+CHR$17+
CHR$14+CHR$243
1370 RD$=CHR$32+CHR$8+CHR$10+CHR$17+
CHR$14+CHR$243
1380 RH$=CHR$17+CHR$14+CHR$243
1390 D$=CHR$17+CHR$1+CHR$226
1400 C$=CHR$240+CHR$8+CHR$10
1410 S$=CHR$244+CHR$8+CHR$10
1420 Y$=CHR$32+CHR$8+CHR$10+CHR$17+C
HR$7+CHR$249
1430 X$=CHR$17+CHR$7+CHR$249
1440 E$=CHR$17+CHR$7+CHR$32+CHR$250+
CHR$17+CHR$3+CHR$249+CHR$17+CHR$7+CHR
$250+CHR$10+STRING$(3,CHR$8)+STRING$(
3,CHR$250)+CHR$11+CHR$11+STRING$(3,CH
R$8)+STRING$(3,CHR$250)
1450 B$=" "+CHR$8+CHR$10
1460 R$=" "+CHR$17+CHR$1+CHR$8+CHR$1
0+CHR$241
1470 P0$=CHR$17+CHR$1+CHR$235+CHR$17
+CHR$3+CHR$230
1480 P1$=CHR$17+CHR$1+CHR$234+CHR$17

```

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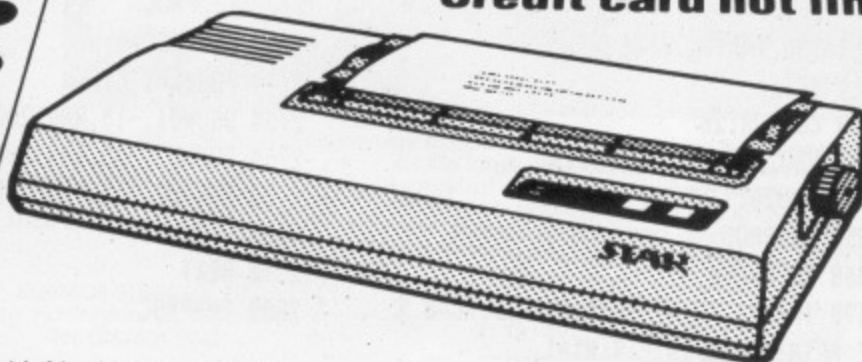
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Telex 295 931 Unicom G Telephone 01-482 1711

## X-15 listing

From Page 146

```
+CHR$3+CHR$230
1490 DIMPX 60
1500 DIMAX 66
1510 FORIX=0TO66:AX?IX=IXDIV3:NEXT
1520 $PZ=" "+P0$+CHR$13+" "+CHR$10+
CHR$8+P0$+CHR$13+" "+CHR$11+CHR$8+P0
$+CHR$13+" "+P1$+CHR$13+" "+CHR$10+C
HR$8+P1$+CHR$13+" "+CHR$11+CHR$8+P1$
+CHR$13
1530 DIMSZ 100
1540 ENDPROC
1550 DEFPROCexp
1560 PRINTTAB(5,LX)E$:SOUND0,5,5,30
1570 SOUND&11,0,0,1:SOUND&12,0,0,1:S
OUND&13,0,0,1
1580 PROCd(8)
1590 FORIX=1TO12:VDU19,0,IXMOD6,0,0,
0:PROCd(9):SOUND1,-15,RND(200),3:SOUN
D2,-15,RND(200),3:SOUND3,-15,RND(200)
,3:PROCd(3):NEXT:PROCd(50)
1600 WX=252:OVX=TRUE
1610 ENDPROC
1620 DEFPROCgs
1630 FX=0:GX=0:DX=0
1640 UX=&30:OX=0:VX=&6:WX=0
1650 EX=18887
1660 LX=10:OVX=FALSE:
1670 MLX=FALSE:MFX=FALSE
1680 RLX=FALSE
1690 VDU19,15,1,0,0,0
1700 VDU19,14,1,0,0,0
1710 VDU19,13,1,0,0,0
1720 FORNX=1TO6
1730 VDU19,6+NX,NX,0,0,0
1740 NEXT
1750 BX=35
1760 ENDPROC
1770 DEFPROCge
1780 *FX21,0
1790 SOUND&11,0,0,1:SOUND&12,0,0,1:S
OUND&13,0,0,1
1800 NPX=NPX-1
1810 IF NPX=0 PROCgx
1820 PROCscs
1830 ENDPROC
1840 DEFPROCgx
1850 VDU19,7,7,0,0,0
1860 COLOUR132:CLS
1870 COLOUR131:VDU28,0,26,19,4:CLS
1880 COLOUR129:VDU28,1,25,18,5:CLS
1890 COLOUR7:PRINTTAB(7,1)"X-15"
1900 PRINTTAB(4,3)"GAME OVER"
1910 PRINTTAB(1,6)"YOUR SCORE ";SCZ
1920 PRINTTAB(1,8)"HIGH SCORE ";HI$
1930 IFSCZ<HI$PRINT" BY "HI$:60TO19
70
1940 IFHI$=SCZ PRINT"" YOU EQUALED
THE" ELSEPRINT"" YOU BEAT THE"
```

```
1950 PRINT" HIGH SCORE !"" ENTER
YOUR NAME"" > ";
1960 INPUT"A$:IFLENA$>1260TO1870 EL
SEHI$=A$:HI$=SCZ:60TO2000
1970 PRINT"" RETURN FOR"" ANOTHE
R GAME"
1980 REPEATUNTILINKEY(0)=TRUE
1990 REPEATUNTILGET=13
2000 PROCsx:SCZ=0:NPX=3:COLOUR128:VD
U26:ENDPROC
2010 DEFPROCscs
2020 CLS
2030 VDU23;8202;0;0;0;
2040 VDU19,10,4,0,0,0
2050 COLOUR138:PRINTTAB(0,15)SPC40
2060 COLOUR131:VDU28,0,31,19,17:CLS
2070 COLOUR129:VDU28,1,30,18,18:CLS
2080 VDU19,7,7,0,0,0
2090 COLOUR7
2100 PRINTTAB(6,1)"X-15"
2110 PRINTTAB(1,3)"X-15's -> ";NPX
2120 PRINTTAB(1,5)"SCORE -> ";SCZ
2130 PRINTTAB(1,7)"HIGH -> ";HI$
2140 PRINTTAB(1,9)"BY -> ";HI$
2150 PRINTTAB(1,11)"RETURN TO START
";
2160 COLOUR128:VDU26
2170 FORIX=1TO10:PRINTTAB(RND(20)-1,
RND(9));:VDU17,RND(6),248:NEXT
2180 REPEATPROCp:PROCd(5):UNTILINKEY
-74
2190 VDU19,9,1,0,0,0
2200 COLOUR137:COLOUR7
2210 VDU28,1,30,18,18:CLS
2220 PRINTTAB(6,1)"X-15"
2230 VDU26
2240 FORIX=9TO-3 STEP-1
2250 COLOUR128:PROCp:COLOUR137:PROCd
(10)
2260 IFIX>-1 A$=STRING$(8,STR$IX+" "
):SOUND1,-15,IX*10+100,2:SOUND2,-15,I
X*15+100,2 ELSEIFIX=-1 A$=STRING$(4,"
80 "):SOUND0,-15,6,20
2270 CX=(IX+4)MOD4:IFCX=3 CX=4
2280 *FX19
2290 VDU19,9,CX,0,0,0:COLOUR7
2300 PRINTTAB(2,22)A$ TAB(2,24)A$ TA
B(2,26)A$ TAB(2,28)A$
2310 NEXT
2320 COLOUR128
2330 VDU28,0,31,19,17:CLS
2340 VDU26
2350 ENDPROC
2360 DEFPROCp
2370 IFNX=1 PRINTTAB(5,10)P0$:NX=0 E
LSE PRINTTAB(5,10)P1$:NX=1
2380 ENDPROC
2390 DEFPROCd(TX):TX=TIME+TX:REPEAT
UNTIL TIME>TX:ENDPROC
2400 DEFFNGK
```

```
2410 IX=0
2420 REPEAT
2430 IX=IX+1
2440 IFIX=127 IX=1
2450 UNTILINKEY-IX
2460 PRINTTAB(1,16)" O.K. RELEASE KE
Y ";
2470 REPEATUNTILNOTINKEY-IX:PROCd(10
)
2480 PRINTTAB(1,16)SPC20
2490 --IX
2500 DEFPROCi
2510 VDU23;8202;0;0;0;
2520 FORIX=0TO10
2530 A$=CHR$(129+IXMOD6)+CHR$157+CHR
$135+CHR$141+"< "+STRING$(5," X-15 ")
+" >"
2540 PRINTA$'A$
2550 NEXT:PROCsx
2560 PROCd(25)
2570 VDU28,0,19,39,2:CLS
2580 PRINT"" PILOT YOUR X-15 THROU
GH THE TUNNELS"" AND OVER THE HILLS
AND CITIES"
2590 PRINT" AVOID THE MISSILES AND
ASTERIODS"
2600 PRINT" BOMB AND ROCKET AS MAN
Y FUEL DUMPS"" AND MISSILE BASES AS
YOU CAN"
2610 PRINT"" FIRST SELECT YOUR KEY
S >>"
2620 PRINTTAB(1,14)" HOLD DOWN KEY F
OR UP ";
2630 JX=FNGK
2640 PRINTTAB(1,14)" HOLD DOWN KEY F
OR DOWN ";
2650 KX=FNGK
2660 PRINTTAB(1,14)" HOLD DOWN KEY F
OR BOMB ";
2670 ZX=FNGK
2680 PRINTTAB(1,14)" HOLD DOWN KEY F
OR ROCKETS ";
2690 RX=FNGK
2700 PRINTTAB(1,14)SPC30TAB(1,14)" O
.K. ";
2710 PROCd(40)
2720 ENDPROC
2730 DEFPROCsx
2740 FORIX=1TO10
2750 SOUND1,-15,RND(200),1
2760 SOUND2,-15,RND(200),1
2770 SOUND3,-15,RND(200),1
2780 PROCd(8)
2790 NEXT
2800 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 173.



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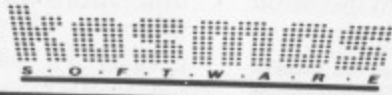


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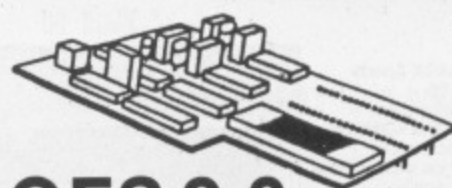
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# MICROMAIL

I FELT a great deal of sympathy towards your correspondent A.S. Dawson in Micromail of October, 1984. The problems he encountered in devising his Spanish vocabulary program seem the same as those which I encountered with a French vocabulary program I devised for my daughter as my first programming effort.

At that time, October, 1983, the BBC was relatively new to Western Australia and I had great trouble in finding someone to help me with the problem.

Eventually it was overcome, by brute force, but at the expense of having to type all DATA in inverted commas. Many was the hour!

As I was not using Shift nor a colour monitor I did not encounter the colour problem. I can assure you that my DATA problems were NOT caused by use of indirection operators for at that time I was not up to them in the User Guide!

The tokens only seemed to appear if the program was LISTed before it was run.

I worked out the most commonly used accented letters for myself and these work on the function keys without Shift. I thought the Epson manual might be a help in designing them, but it does not cover all the ones I wanted the way I wanted them.

A copy of the nine I used done on the "Quick March" program from the Micro User of February, 1984, is reproduced here. Given that French characters

## French - with quite a lot of tears . . .

```

5 MODE6
10 VDU23,128,12,48,60,10
2,126,96,60,0
20 VDU23,129,48,12,60,6,
62,102,62,0
30 VDU23,130,48,12,60,10
2,126,96,60,0
40 VDU23,131,24,36,60,6,
62,102,62,0
50 VDU23,132,24,36,60,10
2,126,96,60,0
60 VDU23,133,24,36,56,24,
24,24,60,0
70 VDU23,134,24,36,60,10
2,102,102,60,0
80 VDU23,135,24,36,0,102,
102,102,62,0
90 VDU23,136,0,60,102,96,
102,60,16,8
100 VDU23,137,48,12,0,102,
102,102,62,0
110 *FX255,128

```

exist and that there is a very limited number of ways that they can be reproduced in a dot matrix printing head or within the VDU command, it is difficult to see how these could be

copyright.

The program gives the code for 10 French accented characters to be typed in directly from the function keys without Shift.

Another problem which I have encountered is spaces. I have found it particularly difficult with the formatted listings you use when there are a lot of spaces together.

Even with non-formatted listing it can be difficult to count when the program line is broken over two lines. I now have the answer from my end both from the screen and printout aspects.

A copy of a VDU routine which allows a program to be printed out on an Epson FX-80 with a block character instead of a space is printed below:

```

VDU2,1,27,1,58,1,0,1,0,1,0,
1,27,1,37,1,1,1,0,1,27,1,38,
1,0,1,32,1,32,1,139,1,0,1,
85,1,170,1,85,1,170,1,85,1,
170,1,85,1,170,1,0,1,0,1,0

```

As an older micro user I find it easier to check listings from a printout rather than the screen.

I really look forward to your magazine each month and as I

got myself a composite TV-monitor for Christmas my two teenage daughters are now prepared to play some of the games I have typed in from The Micro User.

My husband is next on the list! - Noreen Kennealy, Nedlands, Western Australia.

## Trak Ball troubles

I WISH to point out the mistake you made in transposing certain connections in the diagram on page 120 of the February 1985 issue of The Micro User.

What is shown as pin 4 should be pin 8, pin 8 should be pin 3 and what is shown as pin 3 should be pin 4. In other words:

```

4 ==> 8
8 ==> 3
3 ==> 4

```

as on my original copy.

Fortunately, in my experience supplying the Trak Ball with incorrect voltages like this will do it no harm. - Mike Cook.

● Sorry, our mistake. Thank you for pointing it out.

## Tip for second processor users

THE following may be of use to those with a 6502 second processor:

It may at some point be necessary to know the Operating System High Water Mark (OSHWM) in the I/O processor, for instance when saving the section of memory containing the definitions of Ascii codes 32-196.

The value of OSHWM will vary depending on the filing system(s) fitted and if the second processor is not being used it is

simply the value of PAGE as set up by the operating system.

However with the second processor active, PAGE is set at &800 regardless of the filing systems fitted and so a method is needed to find OSHWM across the tube.

Both the user guide and advanced user guide document OSBYTE call &83 (131) as a means of reading OSHWM, but when used in the second processor it merely returns the value of PAGE in the second

processor - &800.

The advanced user guide also details OSBYTE &B4 (180), and says that it is equivalent to OSBYTE &83 as far as reading OSHWM is concerned.

However this is not the case. With the second processor turned off the two calls do indeed return the same result, but when used from within the second processor, OSBYTE &B4 returns the high byte of OSHWM in the I/O processor.

This can then be used to save

the definitions of Ascii codes 32-196 that lie in the &600 bytes below it, or as a pointer to free memory in the I/O processor.

The following function returns the value of OSHWM:

```

1000 DEF FN_ioOSHWM
1010 LOCAL AX,XX,YX
1020 YX=&FF:XX=0:AX=&B4
1030 =USR(&FFF4) AND &FF00

```

- Keith Miller, Leighton Buzzard, Beds.

# MICROMAIL

## Pilot error

I TYPED in the excellent program Pilot from the February issue. All was working well until I tried to insert blank lines while in the editing mode.

I hastily tried to find out what was causing the weird and wonderful results. Eventually, I found that line 1370 needed a slight modification to put everything right.

Here it is for any other readers who had problems editing. — C. Belly, Cardiff, Wales.

```
1370 FORI=MX-NB TO C STEP-
1:FORI1=0T01:P$(I1,I+NB)=P$(
I1,I):NEXTI1,I
```

● Thanks for the modification. This little gremlin slipped through unnoticed.

## Is there life in a Shinwa?

I WAS interested to read the letter from W. Edmunds in the January issue of Micro User, and agree that after spending an evening with a Shinwa CP-80 printer and the manual supplied I was still no better informed as to how I could bring the machine to life.

Unfortunately the manual does not include an interface guide for use with the BBC Micro and the only information I have found useful in it so far has been the internal DIP switch settings and the table of printer control codes.

I suspect the manual has been written around another micro and can only lead to confusion when read by a BBC owner.

The best advice I can give would be to first read the BBC user guide and understand the printer VDU commands and control codes before tackling the Shinwa manual.

To get the printer to do anything useful the operation of the printer DIP switches as explained in the printer manual should be studied.

The printer will be supplied

with auto line feed off, which means you don't get a program listing even if you have worked out how to turn the printer on and off using Ctrl B and Ctrl C.

Initially the DIP switch should be set to give auto line feed operation. The printer will now give a normal non-emphasised character listing in its default mode after power up.

To change the text type and do all the useful things mentioned in the manual you need to send control codes to the printer to change its default settings.

The printer will accept Escape codes which can be used in Basic programs and these normally follow a VDU command in the program or can be entered from the keyboard before printing starts.

Certain frequently used Escape codes have equivalent Ctrl codes which are sometimes easier to remember for direct keyboard entry. The ESCAPE character is not the Escape key or "E" on the BBC but the decimal code 27 followed by a second decimal parameter, separated by a "," delimiter, which is the control code shown in the printer manual. For example Italic character set "on" would be VDUI 27,52.

For graphics use Watford Electronics can supply printer driver software which is compatible with the Shinwa CP-80 and this should avoid having to cope with the "bit image mode", although nearly all the control codes seem to be Epson compatible.

Most word processor packages will require auto line feed to be "off" to allow underlined text.

To avoid repeated software initialisation of the printer I have extended the DIP switch to a toggle switch on the printer front panel to allow external selection of the line feed option.

The Shinwa printer is normally supplied with the paper out sensor enabled and this will inhibit any printing near the bottom of a single A4 sheet because the sensor is fitted well back from the print head.

Issue an ESCAPE code to disable this function before printing, or change the internal DIP switch setting.

Finally, when printers are

driven from software other than the BBC's own OS the ESCAPE commands may be in a different form and the software manual should be consulted.

The Scribe package from Merlin Computer Products allows control codes to be embedded in text to change the text type, etc. However these are of the form 27X where 27 is the decimal code for escape and "X" is the Ascii character equivalent of the decimal values tabled in the printer manual. — D.C. Hawthorne, Chandlers Ford, Hampshire.

## PROCsearch

I WAS interested in a recent letter to Micromail on the structured programming debate, whose author complained about the difficulty of finding the whereabouts of a PROC in a long program.

This is certainly a valid point, for GOSUB1200 tells you immediately where to look, whereas you have to trace through the whole program to find PROCmissiles.

I have, however, found a method of easily locating a PROC using the TRACE

facility. Type TRACEON, followed by PROCmissiles in immediate mode, and the procedure is executed, with line numbers displayed as usual, except the first line.

Why this should be I do not know, but it does mean that one line procedures cannot be traced by this method.

The answer is to ensure that DEFPROC occupies a line of its own, with the rest of the procedure following on another line.

When the program is complete the two lines can be made into one if desired. — K. Down, Rhyl, Clwyd.

## Streamlined files

I AM trying to streamline my use of View and Viewsheets by using a BOOT file to set up my preferred mode and colour on Shift+Break. I find a difference in their reaction to the commands in the Exec files.

The View version is 2.1 and that of Viewsheets 1.0 I use a BBC Model B with 6502 second processor and Pace discs, OS

## Perfection — well almost!

I WRITE about Robin Nixon's program Catalog printed in your December 1984 issue. This program is almost exactly what I needed — well almost, but then no program is perfect!

I was unable to make PROCROCS work, and I discovered that the problem was my personal habit of separating procedure definitions with blank lines to improve the legibility of listings. By blank lines I mean line numbers maintained by a single space.

The remedy is to split line 1352 and insert the statement:

```
IF G1%=13 GOTO 1390
```

after the PROCRS call.

The DATA statements in line 1550 appear to be unnecessary.

PROCDRIVE would \*CAT the alternate drive but would not toggle between drives unless this

line was inserted:

```
665 IFDN%=2 THEN *DRIVE 2
ELSE *DRIVE 0
```

Also the program would crash if it attempted to CHAIN or LOAD a file that had been SPOOLED or SAVED. The remedy is to add the following code, either in PROCFX or in a new PROC to be called from line 240:

```
execution_address%=(%7800A
+(PC%/10*8) AND %FFFF: IF
execution_address%=%8023
ENDPROC ELSE
PROCsomething_else
```

I will leave your readers to write their own procedure to deal with machine code files and SPOOLED files. — Gordon Edgar, Saffron Walden, Essex.



● *Want to write to Micromail? The address is: Micromail, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.*

1.2, tube 1.1, DFS 1.2 a Juki 6100 and a Microvitec Cub monitor.

I have set up the !BOOT file with the following lines for Viewsheet which sets the TV interlace off, Mode 3, white on blue background with black lines for easy reading and the Juki printer driver:

```
*TV0,1
MODE 3
VDU19,0,4,0,0,0
*SHEET
PRINTER JUK14
```

The same sequence of commands substituting \*WORD for \*SHEET however does not set the colour. I think it must be reset by View when initiated as there is a brief blue flash. Can you help with a sequence which will achieve the required results?

View also seems to respond differently to Viewsheet as the printer driver is wiped out when a file is loaded after loading the printer driver. Can you help with this one? — A.M. Cameron, Sauchie, Clackmannanshire.

● The reason that the screen colours revert to normal when you call View is that on start up, View looks at the current screen mode and does a machine code mode call with that value.

For example, if you're in Mode 3, typing \*VIEW will immediately do another Mode 3.

The reason that View does this is to make sure that there isn't a text window defined (which would upset its operation).

Unfortunately, as you discovered, this also resets the colours.

Viewsheet, on the other hand, is cleverer. It first restores default windows (VDU 26 or Ctrl Z equivalent), then just clears the screen (VDU 12 or Ctrl L equivalent). This leaves the colours untouched.

The solution is to set the colours once you're in View. In theory you could put the required control codes in the \*EXEC file, but since you are probably using View itself (or \*BUILD) to make the \*EXEC file, this could be a bit tricky. So define a function key to produce the codes, then call it. Your

\*EXEC file becomes:

```
*TV0,1
MODE 3
*KEY0!S!0!D!0!0!0!
*WORD (or *SHEET)
*FX138,0,128
NEW
PRINTER JUK14
```

Function key 0 is defined to have the same effect as the VDU statement. Then after View or Viewsheet has been called, the \*FX inserts that key's code into the keyboard buffer, causing the control codes to be executed.

This method has the advantage that the colours can be set at any time just by pressing f0.

Notice the NEW before the PRINTER command. This gets round the second problem. There is a bugette in View which causes any printer driver loaded before the first NEW (or LOAD) to be very volatile—that is, it disappears at the earliest opportunity.

Typing NEW before it is loaded makes the printer driver act as it should.

## Printin proced

THERE are a number of useful procedures for Wordwise and the FX80, some of which can be used or adapted for other printers.

The FX80 bail-bar (paper tear-off) is six normal line feeds (1 inch) from the print position.

To use continuous fan-fold paper conveniently, set the top of the paper to the bail-bar, PL to 60 and TS to 0. Then find from the format display (Option 7) where the exact beginning of the second page comes in the text.

At this point enter BP and set PL to 66 and TS to 6 (or whatever you want). Do not omit the BP!

At the end of the last page set PL to 72 and enter OC12 (form feed). This will stop the paper with the perforation at the bail bar, ready to tear off.

It is possible, with a little care, to print in one piece a document which is too long for Wordwise

to store, without the "join" showing.

The control code GF will, of course, only work for purely Ascii, not Wordwise files.

The procedure is to print the first part of the document, count the number of printed lines visible from the top of the last page with the bail-bar and add 6 (unless a special line-spacing has been set with OC27,N (N = 0,1,3 or A): LS does not change the line-spacing for the present purpose).

Subtract the result from 66 (or whatever PL suits the paper), and set PL for the first page of the second part of the document to this value, with TSO.

From the Option 7 display, find the end of the first page, enter BP at this point in the text

and set PL and TS to their normal values.

It does work, but care is needed. For instance, make sure that there are no blank lines between the end of the text of the first part and the "End" indicator.

The following !BOOT and function key assignment program has been found extremely useful and may be of interest to other Wordwise persons.

The key strings are not particularly original, but the scope for creativity is limited and this collection has stood the test of time.

The character N has to be replaced by the appropriate number, taken from the printer manual. — J.M. Woodgate, Rayleigh, Essex.

```
10 REM Program WPKEY          CRIPT
20 REM Assigns Shift/Con      200 *KEY8!!!OC27,33,N!!"
trol/function keys          210 REM PRINT MODE SELECT
30 REM Author J.M.Woodga     ION
te May 1984
40 *KEY0!M!M!M!T!6!!"      220 *KEY9!!!OC27,52!!"
50 REM NEW PARAGRAPH        230 REM ITALIC FONT
60 *KEY1!!!L!#!!M!#!"      240 *KEY11!!!OC27,53!!"
70 REM DELETE LINE          250 REM ROMAN FONT
80 *KEY2!!!OC27,45,1!!"     260 *KEY12!!!C1!!"
90 REM UNDERLINE            270 REM CANCEL INDENT
100 *KEY3!!!OC27,45,0!!"    280 *KEY13!!!IN6!!"
110 REM END UNDERLINE      290 REM INDENT 6
120 *KEY4!!!OC27,82,N!!"    300 *KEY14*!!!0!#!!0!A!!
130 REM INTERNATIONAL CHA   10!#!!0!A!#!*!A
RACTER SETS                 310 REM DELETE MARKERS
140 *KEY5!!!OC27,83,0!!"    320 REM "" CHARACTER NOT
150 REM SUPERSCRIP          TO BE USED IN TEXT
160 *KEY6!!!OC27,83,1!!"    330 *KEY15!!!OC27,37,N,0!
170 REM SUBSCRIPT           !"
180 *KEY7!!!OC27,84!!"      340 REM SELECT ROM OR DOW
190 REM CANCEL SUPER/SUBS   NLOAD CHARACTER SET
                               350 *WORDWISE
```

## Going cross-eyed?

FOR anyone who, like me, goes cross-eyed trying to locate procedures and functions in a long listing, here is a rough and ready but effective routine to insert a couple of blank lines at the start of each function or procedure definition when listing to screen or printer without having to use memory by leaving blank lines in the program.

It works by detecting the

passage of the letters DEF through the operating system which is directed through the routine by altering the write character vector with function key 1.

When this occurs two back-space/delete characters (127) are sent to remove the DE already printed, then three

# MICROMAIL

## From Page 153

carriage returns and line feeds, and six spaces are sent before continuing with the listing.

No attempt is made to miss DEF or DEEEF(!) within variable names or REM statements etc., and a printer listing is left with the extra DE.

To trap these minor faults would considerably complicate the routine, and hardly seems necessary for a simple programming aid.

Function key 2 resets the vector to the original value. This value of &E0A4 is correct for OS 1.2; if there is any doubt for other OS issues, it can be found by typing:

```
PRINT ^?&20E+256+?&20F
```

If the routine is to be assembled at a different address to &900 the vector address in Key 1 should be altered to suit. — Peter Vasey, South Shields.

```

10 AZ=&E0A4
20 FORN%=@T02STEP2
30 P%=&900
40 [OPTN%
50 CMP#68:BEQD
60 CMP#69:BEQE
70 CMP#70:BEQF
80 .no JSRAX:JSRclear:RT
S
90 .D STA#70:JSRAX:RTS
100 .E LDX#68:CPX#70:BNEo
o:STA#71:JSRAX:RTS
110 .F LDX#68:CPX#70:BNEo
120 LDX#69:CPX#71:BNEo
130 LDA#127:JSRAX:JSRAX
140 LDA#13:JSRAX:LDA#10:J
SRAX:LDA#13:JSRAX:LDA#10:JS
RAX:LDA#13:JSRAX:LDA#10:JSR
AX
150 LDA#32:JSRAX:JSRAX:JS
RAX:JSRAX:JSRAX:JSRAX
160 LDA#68:JSRAX:LDA#69:J
SRAX:LDA#70:JSRAX
170 .clear
180 LDA#0:STA#70:STA#71:R
TS
190 ]
200 NEXT
210 *KEY1 ?&20E=0: ?&20F=9
IML.01IM
220 *KEY2 ?&20E=&A4: ?&20F
=&E0:IML.00IM
    
```

## Problems with Music Maker

SINCE our Music Maker program was issued a problem has been traced.

It only arises when Music Maker is used with an operating system or filing system which does not conform exactly with the Acorn specification. Rather surprisingly, we have discovered this includes the Acorn DFS 0.9.

According to specification, any unknown OS or FX call made by a program should be ignored by any service utility which encounters it, and passed on to the next utility in line.

Any calls which go through

the system without being trapped are deemed errors and may be dealt with by a user specified routine.

This, of course, is a convenient way of having a machine code program communicate with Basic, and Music Maker does so.

The Acorn 0.9 DFS does pass on the call, but only after attempting some form of DFS operation (we know not what!) which may in itself cause an error.

If you have an Acorn 0.9 DFS or you have had any problems with Music Maker freezing at the end of playing a sequence, please execute the following lines from the keyboard of your

BBC Micro, with the Music Maker tape or disc in your drive (remembering to rewind tape if necessary):

```

*BASIC
MODE 7
*LOAD PLA0BJ
?&33BA=7
*SAVE PLA0BJ 3000 3000
    
```

If you are using a disc it may be necessary to remove the write protect sticker, and use \*ACCESS to unlock and lock the file.

If you have experienced this fault we would be pleased if you would let us know, telling us what sideways ROMs you are

Ctrl/A Delete letter	Ctrl/D Delete word	
Ctrl/S uc/lc or lc/uc	f1 OC27,129 f2 oc27=	

Use following with f1 OC27 ... f2:-

Backspace .....	8
Column width n .....	81,n
Compressed characters ON/OFF .....	15/18
Dot graphics 640 dots/line .....	75
"          1200          " .....	76
Double strike ON/OFF .....	71/72
Double width ON/OFF .....	87,1/87,0
"          "          (1 line) ..	14/20
Emphasize ON/OFF .....	69/70
Form length n (default 66) .....	67,n
Italics ON/OFF .....	52/53
Line feed n/72 ins. ....	51,n
"          n/216          " .....	74,n
"          "          (1 line) ..	48
"          1/8 in. ....	50
"          1/6 in. (default) .....	49
"          7/72 in. ....	57/56
Paper sensor ON/OFF .....	78,n/79
Skip perfn. n lines ON/OFF ..	83,1/84
Subscript ON/OFF .....	83,0/84
Superscript ON/OFF .....	12
Top of form (next) .....	0
Tabulation ON/OFF .. 68,n1,n2,n3 ..	9
Tabulate to next tab. stop .....	45,1/45,0
Underline .....	

Use with f1 OC ... f2		
1	-	31
2	-	145
3	-	144
4	-	147
5	-	129
6	-	130
16	-	131
17	-	133
19		134
21		149
22		150
23		151
24		152
25		153
26	^	154
28	^	156
29	^	157
30	^	158
224	.	159

## Big in Japan

I REFER to my letter about the Shinwa CP80 in the January issue of the Micro User, headed "Japanese English".

Since writing to you, helpful advice has come from readers, who clearly read Micromail carefully...

I enclose an aid-memoire to assist any readers who may benefit from it. — Edmund W. Jupp, Lymington, Devon.

Music  
drive  
ape if

using. We hope this problem has not caused you inconvenience. — Nic Small, Marketing Manager, F'Soft.

## Basic II glitch

REFERRING to Mr Rouke's letter in your November 1984 issue in connection with inaccuracies in LEN, I wish to point out that this occurs only in Basic II and not in Basic I.

Basic II appears to have a rather inconsistent behaviour pattern in printing out decimal numbers.

With some it seems to work perfectly but not so with others. As an example of the glitch in Basic II if the following is entered:

```
A=45.1:PRINT
LEN(STR$(A$)):PRINT A$
```

returns 11 and 45.09999999 whereas in Basic I it returns 3 and 45.1.

The length it returns is that of

the printed number, even if the number is not actually printed, and not that of the number as entered.

It is a pity that Basic II (also HiBasic) has this glitch. No doubt Basic III will eliminate this only to produce new glitches.

There are other difficulties in Basic and to see one of them you can try the following:

```
FOR N= 0 TO 3 STEP .01:
NEXT:PRINT N
```

It will return 3.00999996 in both Basics and not 3.01 as would be expected. This is as a result of the way Basic works in handling decimal numbers.

Various versions of Basic in most machines have this type of inaccuracy, but pocket calculators seems to retain full accuracy right up to the 9th or 10th decimal place.

The moral of the story is to use a calculator to calculate and a computer to compute (manipulate data). — R. Immelman, Somerset West, South Africa.

## Improving Rover

I ENCLOSE some alterations which I think improve the Rover game from your January 1985 issue.

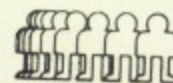
I give below the details of the amendments:

- 230 Change order of instructions to give correct print of score.
- 310 Change x coordinate to agree with line 440 (avoids print of extra character preceding the score).
- 1045 Flushes INKEY buffer to avoid pick up of any previous key depression.
- 1070 Gets rid of unprintable COLOUR 4 generations.
- 1090 Clean up of test for end of line. With 1045 above gives correct dog movement on bonus run.
- 1180 Inserts "no bonus" print when dog lands on tree.

The whole program has been packed to remove spaces and REMs to avoid "no room at line 850" which sometimes occurs on later screens when scrolling.

I hope these amendments will assist your readers in getting more enjoyment out of this very good game. — C.G. Brown, Hornchurch, Essex.

```
230 .....:sc% = sc% +
fly%: PROCfood:.....
310 ....PRINT
TAB(16,1)....PRINT
TAB(16,1)
1045 *FX15,1
1070 FOR i= 0 TO 39
STEP2:COLOUR
RND(3).....
1090 .....IF x=40
y=y+2: x=0
1180 VDU22,7:a$=CHR$141+
CHR$131+ CHR$136+"No bonus
!!":PRINT TAB(0,10): FOR
i=1 TO 2: PRINT
SPC(12);a$:NEXT: etc
```



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# MICROMAIL

## Loop jumping

IN the February issue your dismissal of Mr Balcombe's problem of jumping back into a loop such as:

```
10 FOR X= -1 TO 1
20 PRINT SQR(X)
30 NEXT
```

is not the best solution. BBC Basic is so flexible that errors are likely to occur in loops, for example when EVALuating input expressions as in the following program to print out a table of values:

```
10 INPUT "f(x)=" f$
20 FOR x= 0 TO 10
30 PRINT "f(";x;)"=";EVAL f$
40 NEXT
```

If this is RUN and the function f\$="1/(x-5)" is input, then the loop breaks down at x=5 and the remainder is not executed. A better solution is:

```
10 INPUT "f(x)=" f$
20 a=0:ON ERROR:PRINT "undefined": a=x+1
30 FOR x = a TO 10
40 PRINT "f(";x;)"=";EVAL f$
50 NEXT
```

and the best (to cover the case of an error when x=10) is:

```
10 INPUT "f(x)=" f$
20 a=0:ON ERROR:PRINT"undefined": a=x+1
30 IF a<=10 THEN FOR x=a TO 10:PRINT "f(";x;)"=";EVAL f$:NEXT
```

Try the program with f\$="1/(x-5)" and f\$="1/(x-10)" to see how it copes.

Similar problems occur with errors in REPEAT:UNTIL loops and in procedures and user-defined functions.

The solution is to place an ON ERROR routine just before the loop or procedure and to include

an error-handling procedure to take care of the error before resuming action, for example:

```
100 ON ERROR PROChandle_error
110 PROCsuspect
```

will handle an error that may occur and re-enter the suspect procedure or, better:

```
100 condition = TRUE:ON ERROR PROChandle_error_and_set_condition
110 IF condition THEN PROCsuspect
```

can be written to handle the error and set a condition so that the suspect procedure is only re-entered if the condition is true.

The problem with BBC Basic is that any error kills the Basic stack and forgets about loops, procedures etc. But it can be turned to advantage to extricate oneself from deeply nested loops and procedures by purposely creating an error.

My favourite, which I use in all my published programs, is to use the Escape key to come out of any depth of nesting and return control of the program to a choice of options at a specified line, say 1000, using the following:

```
100 ON ERROR PROCcheck_escape: PROChandle_error
.....
.....
32000 DEFPROCcheck_escape:IF ERR<> 17 THEN ENDPROC
32010 ON ERROR GOTO 1000
32020 #
```

When an error occurs, PROCcheck\_escape tests whether the Escape key has been touched (error 17). If it has not, the procedure ends and passes on to the error-handling procedure.

If it has, the syntax error in line 32020 sets off the ON ERROR in line 32010 and directs control back to line 1000

where the main menu of action occurs.

After pressing Escape the Basic stack and all loops are cleared, returning the program to a pristine pure state ready to continue with further choices.

Dirty programming? Of course! But the BBC Micro's ON ERROR is a dirty command and it takes one to clean one! - Dr David Tall, Kenilworth, Warks.

## Shifting fields

WHEN trying out a program on my BBC B I came across an interesting effect.

The program was:

```
10 MODE 7
20 FOR A=1 TO 40
30 PRINT A,A;
40 NEXT A
```

According to the User Guide the computer defaults to four print fields in Mode 7 and numbers are printed to the right of each field.

As far as I understand it line 20 tells the computer to print the first value of A in the first and second print field, the second value of A in the third and fourth print field, the third value of A in the first and second print field on a new line, etc.

This works fine for a few lines but then the print fields shift.

I cannot find anything in the User Guide, or any other book I have, to explain why this happens. Can you explain it for me? - Janet C. Quarton, Lochgilhead, Argyll.

● It looks as if you've found a quirk in the way the BBC calculates field positions, unless anyone else knows why it happens.

## A date with the coffee capers

I WONDER if you might be interested in what I think is a discovery that I have made?

I had been trying for some weeks to make a back-up copy of a "protected" disc that I have bought, with no success.

During one of my sessions my wife spilled a cup of sweet coffee over the protected disc and a blank disc as well. They were in such a mess that in order to clean them I had to open their protective covers and soak them in water.

I put them on a warm shelf to dry, but my wife pushed them to one side, "out of the way", as she put it.

I forgot about them for a couple of weeks then when I came back to them they were stuck together. I didn't know which was which so I tried to \*CAT. them, but to no avail (dreaded DISC ERROR 18 00/00).

You can imagine my amazement when I discovered that a little judicious use of Disc Doctor's \*DZAP revealed that BOTH discs contained information!

The "blank" disc seemed to have the information back-

wards, as indicated by the reversed catalogue number 5841.

Fortunately I am into electronics so I did a little jiggery-pokery on the drives and in no time had them running backwards. There it was - an exact copy of my "protected" disc, only in reverse.

I can only imagine that this is just another example of the well-known print through effect observed on cassette and reel-to-reel tapes due to the adjacent coils being stored in close proximity.

I am now trying to make a second copy of the reversed disc, which will be the correct way round, of course.

If this experiment turns out to be successful it will render all methods of protection valueless to anyone with a little technical skill and a lot of imagination. - D. Brandon, Chester.

● It certainly makes a fool out of software houses who prevent us making legitimate backup copies of our programs.

Our intrepid editor even tried to see if beer had the same effect - until he noticed the date on your letter was April 1.

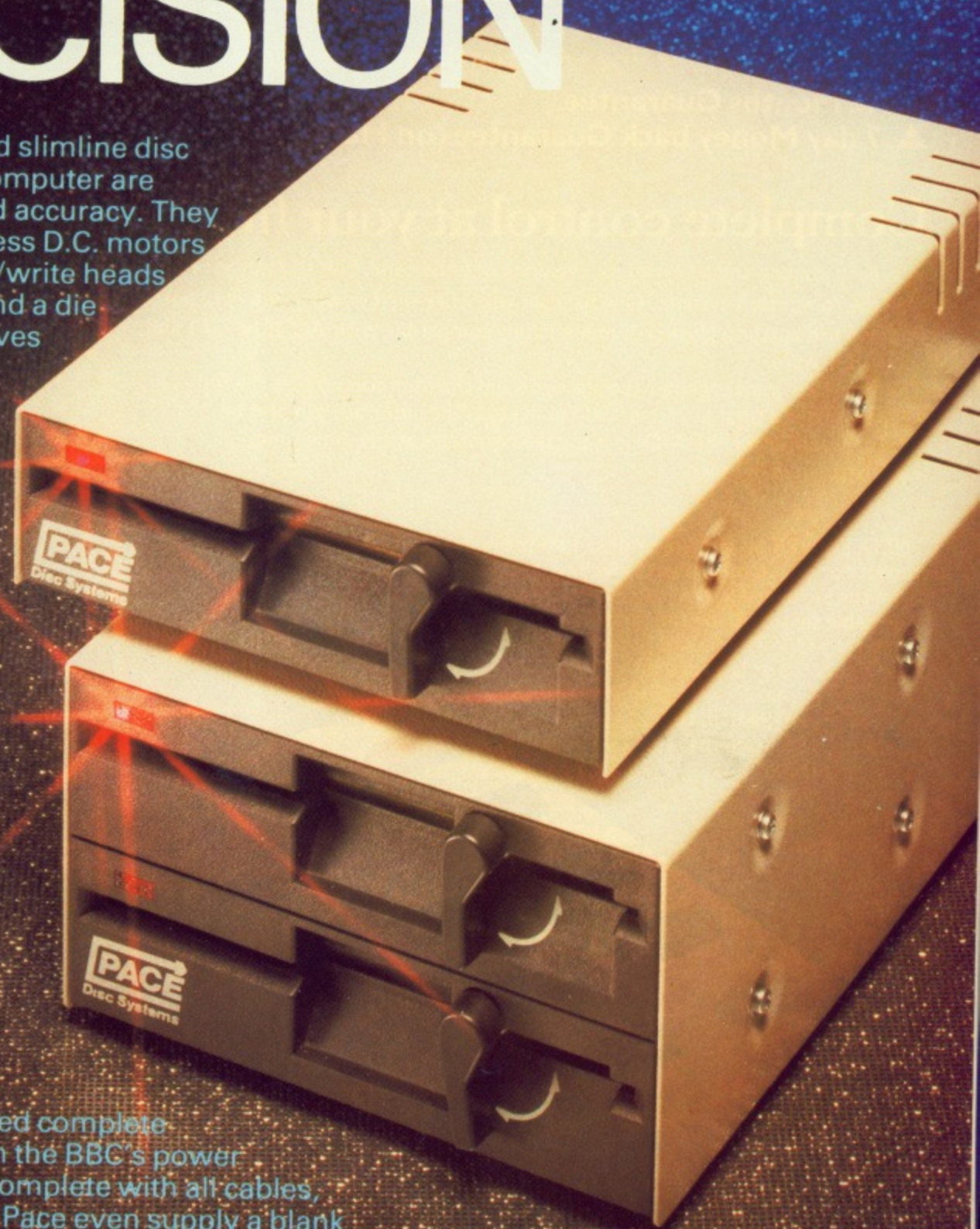
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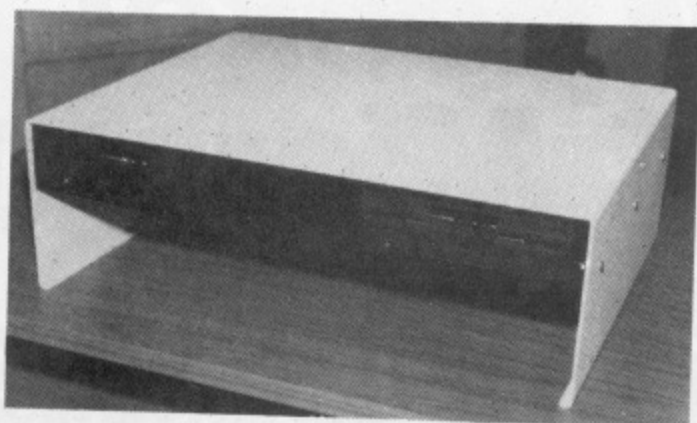
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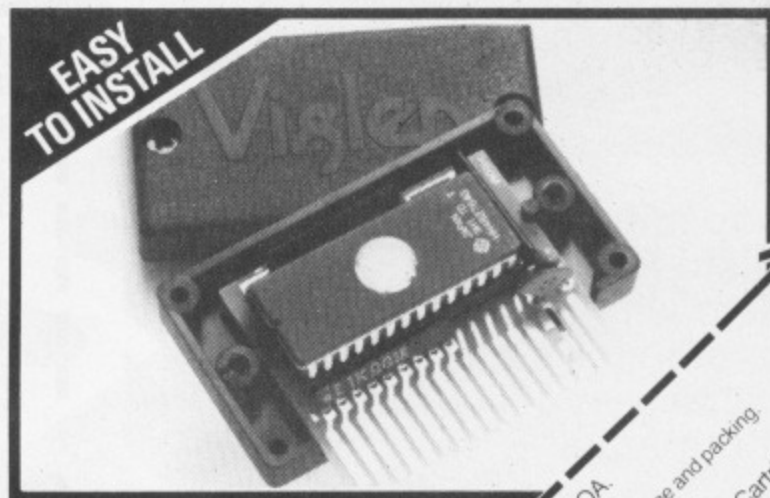
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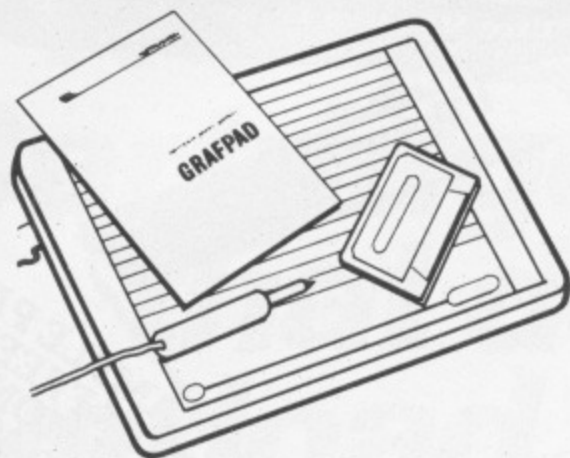
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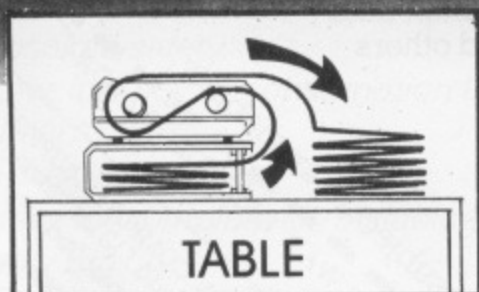
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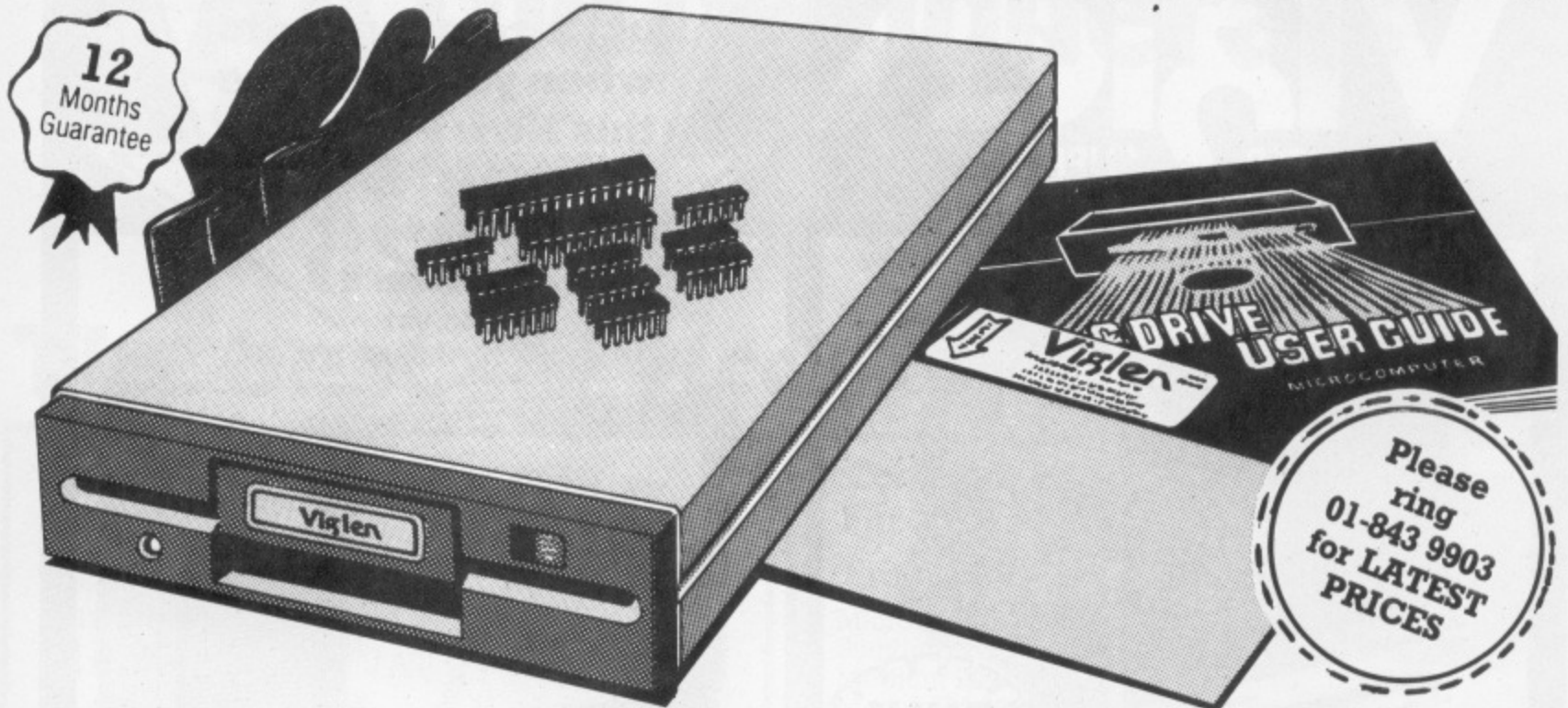


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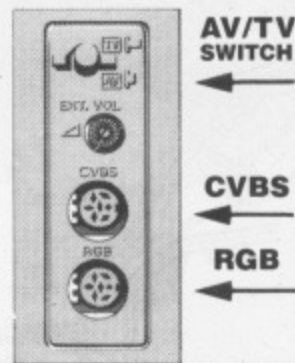
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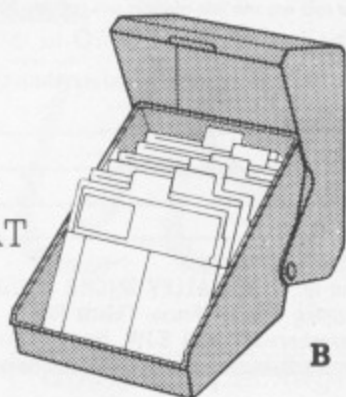
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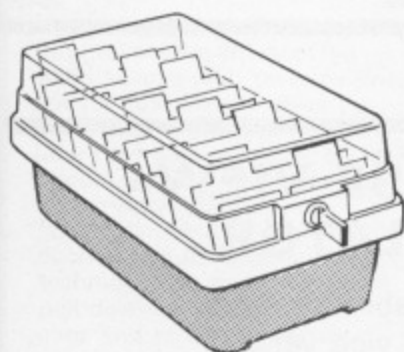
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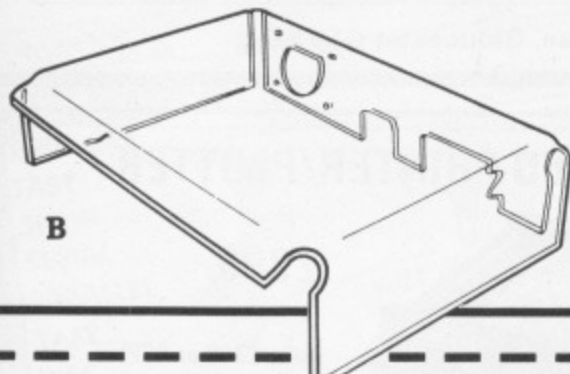
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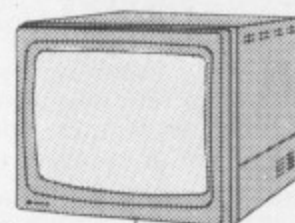
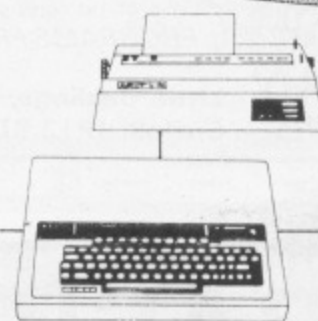
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MU/485

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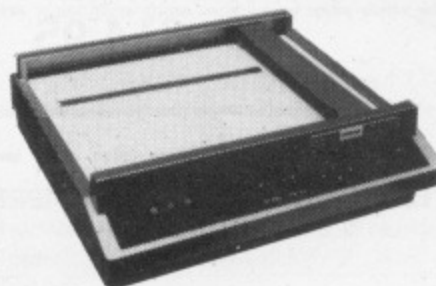
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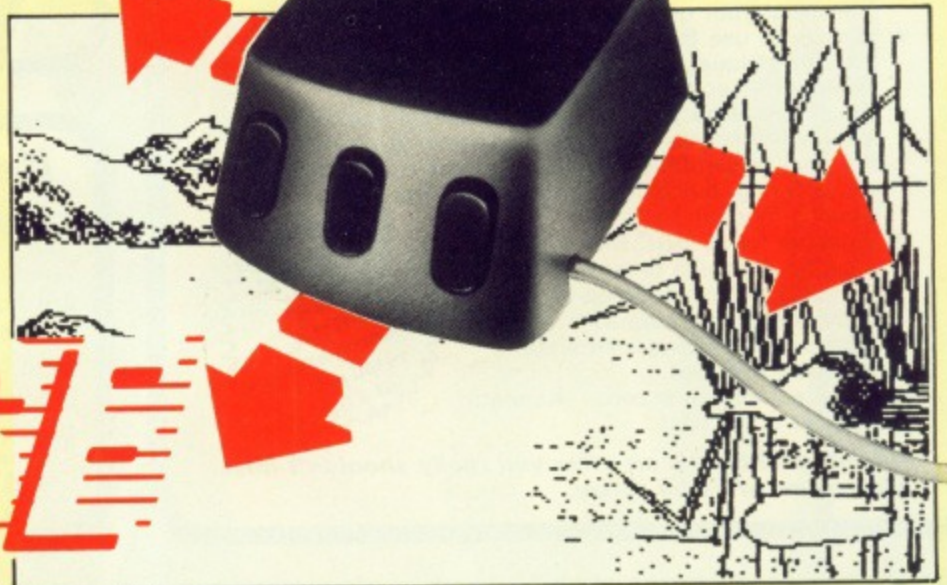
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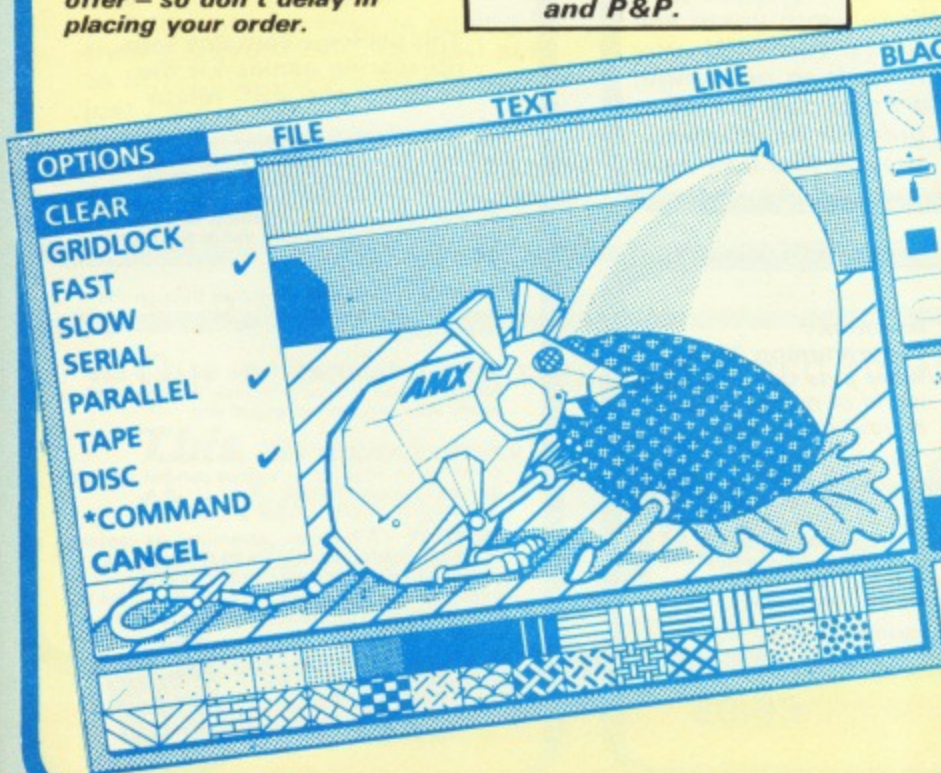
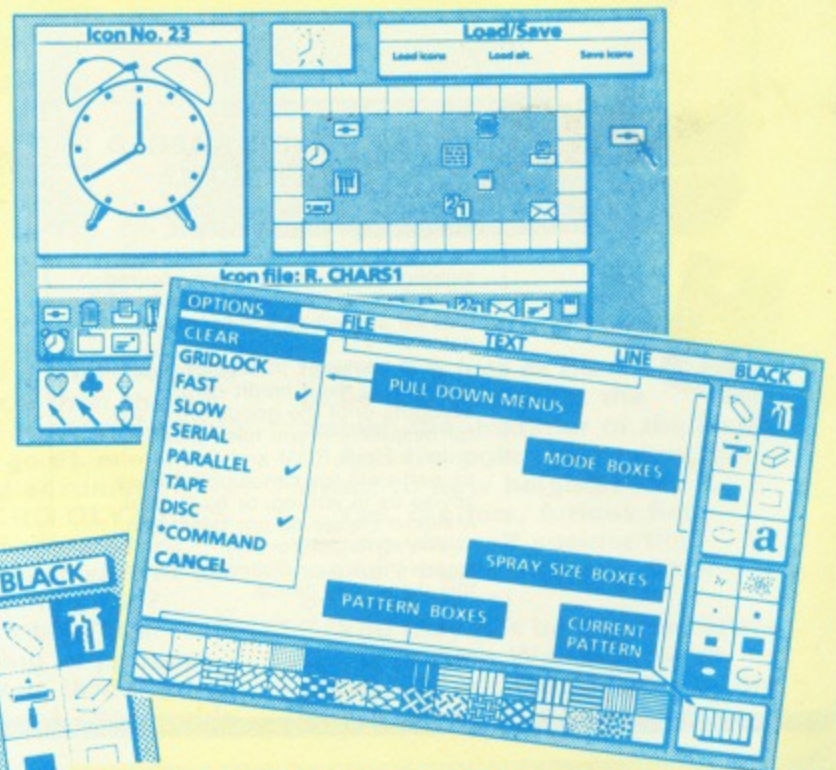
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The first in the series, "Getting Started in Sounds & Graphics", is now available.

In this compilation of their highly praised series of articles in *The Micro User*, Michael Noels, Paul Jones and Nigel Peters explore the BBC Micro's outstanding sound and graphics capabilities.

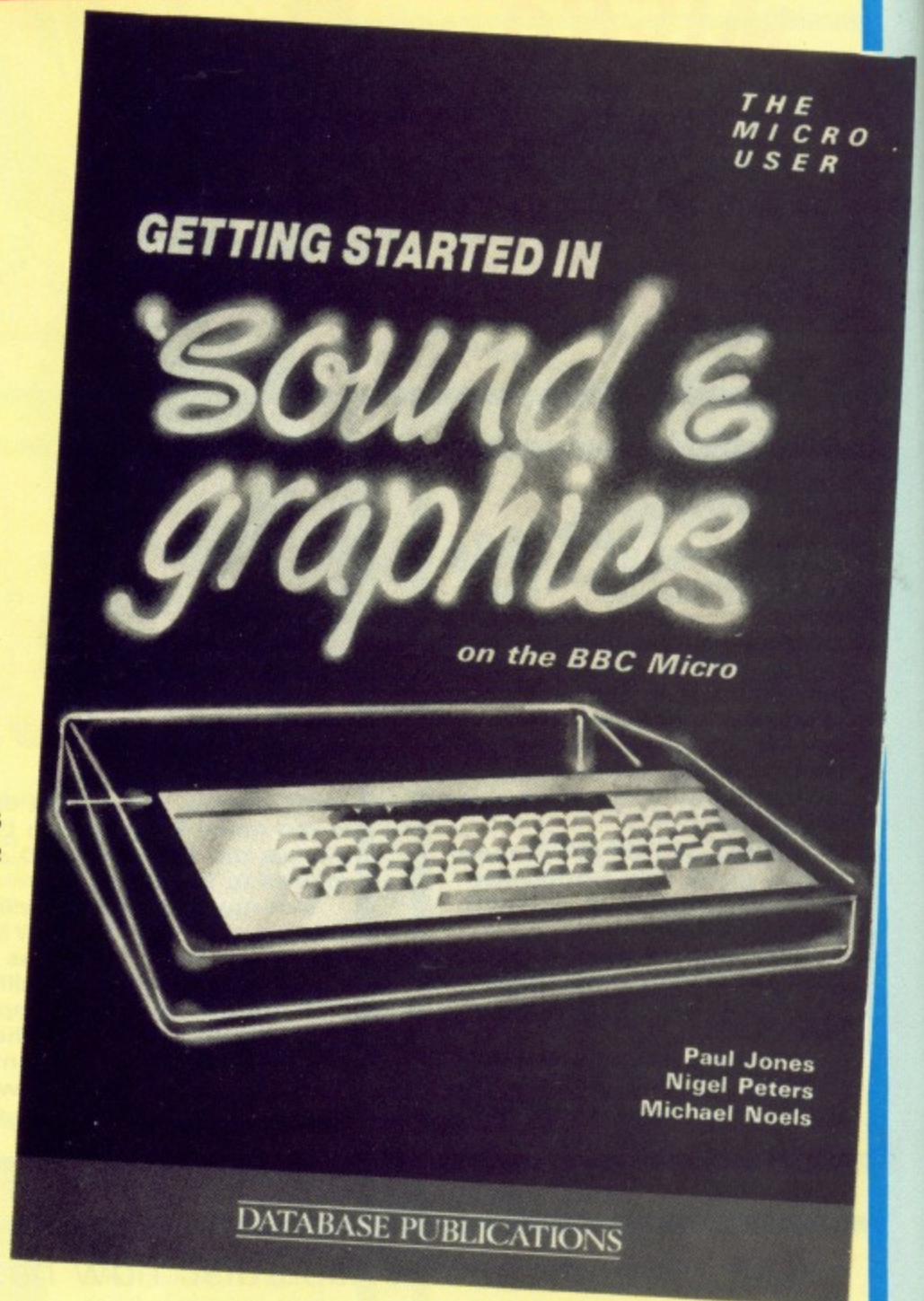
Step by step, with clear explanations and lots of examples, they show you how to harness the power of your micro to create dazzling displays and superb sound.

Assuming only a rudimentary knowledge of Basic, the authors thoroughly explain all the programming methods involved, ranging from the simplest to the most complex.

Lots of books describe the BBC Micro's graphics and sound capabilities – this one shows you how to exploit their tremendous potential to the full.

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*It's the most popular program we've ever produced!*



*Contains 32 page booklet giving clear, easy-to-follow instructions on all 4 programs*

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**MARCH 1983:** Deathwatch, Bingo and other programs from Vol. 1, No. 1.

**APRIL:** King Kong, Nim, and other programs from Vol. 1, No. 2.

**MAY:** Air Strike, Pelmanism, Anagrams, and other programs from Vol. 1, No. 3.

**JUNE:** Space Pilot, Nomism, and other programs from Vol. 1, No. 4.

**JULY:** Tenpin, a simulation of Tenpin Bowling. Spacepods, beat the alien hordes. Cup, exciting 3D graphics techniques; Test and Steady, programs to accompany the Beeb Body Building Course. Breakfix, don't let Break destroy your precious variables!

**AUGUST:** Fruities, driven by strange urges you climb the ladders of adventure to risk all in the gardens of unearthly frights. Animation, a suite of programs that really bring your screen alive. Casdise, the machine code downloader for your disc system. Mode 7, colour routines.

**SEPTEMBER:** Robin & Marian, rescue Maid Marian from the Sheriff of Nottingham. Galactic Invaders, an exciting arcade game. DFS Benchmarks, 14 DFS test programs. Animation, new techniques. Terminal, connect a BBC Micro to a mainframe.

**OCTOBER:** Fishing, a compulsive day's angling. Joykey, convert programs to joystick. Pentest and Bellringer, for Micro User lightpens. Contours, an educational program. Link BBC Micros to each other. Plus all the listings from the first Electron User.

**NOVEMBER:** Goblins, an enchanted journey. Blackjack, the casino favourite. Charge and Pendulum, Body Building Course part 9. Sideways, program in ROMs. Pendraw, a light pen sketching program. Plus all the programs from the second Electron User.

**DECEMBER:** Tower, rescue London's treasure. Santa, help Father Christmas. VDU 23, an invaluable character defining utility. Paged, graphic techniques. Plus all the listings from the third issue of Electron User.

**JANUARY 1984:** Barrels, an all-action arcade game. Noteplay, an entertaining musical utility. Dump1 and Dump2, multitone screen dumps. All the programs from our Sound, Beginners' and Graphics articles. Plus 12 programs from the fourth Electron User.

**FEBRUARY:** Invasion, the classic arcade game. Frogs, fun for

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all the family. Engvgen, a logic game. Balance, a number learning program. Key, single key entry for the BBC Micro. Plus nine other programs from *The Micro User*. **MARCH:** Mazemunch, block-busting arcade action. Birthday, family fun for our anniversary. Derrick, number fun for infants. Pixelpen, high resolution for lightpens.

**APRIL:** Microgolf, the simulation. Eastermaze and April Fool, seasonal games. Seawall and Magic Square, maths fun. Filer and Album, a database of sounds. TRX1, TRX2, RS423 driver. Heartrate, monitor your fitness.

**MAY:** Dug Dig, asteroid adventures. Damraider, naval action. Envaid, easy envelopes. Steppers, Body Building motor control. Spiro, graphics windows. Adventure, a trapdoor maze. Renumber, program utility. Bigletter, large type. Memory, RAM efficiency.

**JUNE:** Roadracer, 3D driving action. Quadline, four-in-a-line logic game. Monitor, machine code debugging routines. Toolkit, 8271 disc controller explored. Areas, easy maths. Spell, spelling education.

**JULY:** Doomrun, deep space drama. Backgammon, the classic board game. Keys, user defined key editor. Save? and Tidisk, disc utilities. Alice1 and Alice2, mini-adventures. Terminal1 and Terminal2, two communication programs. Acoustic, software for the Body Build Modem.

**AUGUST:** Castle, an enthralling adventure program. Gridman, a high speed game of strategy. Tedit, a superb Teletext editor. Dsquare, simple number fun. Dedit, a versatile disc editor. Input, the ultimate general input routine. Bells, Alice's mini-adventure.

**SEPTEMBER:** Villains, save your crystals from the evil onslaught. Rollerball, an intriguing game of strategy and agility. Microterm, comms terminal. T/Textdump, Mode 7 screen dump. Numbersign, simple number skills test for infants.

**OCTOBER:** Wampus, explore the labyrinth and slay the beast. Balloon, brave the caves, escape the Goulogs. Splits, split screen utility. Pageram, paged RAM programs. Input1/2, alternative

inputs for the disabled. Morecol, extended colours. D/A, a waveform generator. Integer, direct addressing speed.

**NOVEMBER:** Buster, line up the diamond blocks. Duel, two player action. Seaside, picture fun for the young. M7letters, teletext large letters. Dscload, loading large disc files to &E00. 6502, second processor programs. Synth, musical Body Building programs.

**DECEMBER:** Painter, can you paint the precipitous pyramid? Miner, delve into the deadly mine's depths. Snowvad and Carol, two seasonal programs. Garden, shape-matching for infants. Medit, a memory editor. Catalog and Save, useful disc utilities. Ladders, Alice's mini-adventure. Plus *Omega Probe* - a full length machine code arcade game.

**JANUARY 1985:** Rover, guide our retriever to his rations. Backgammon, an exciting two player version. Matchwood, shape recognition for infants. Messages, machine code printing. Speedtext, display text at different rates. Search, a powerful programming tool. Second processor, Body Building and graphics routines. Plus *Galactic Tycoon*, our superb free game.

**FEBRUARY:** Helicopter Dogfight, two player action. Craal, dungeon adventure. Pilot, the CAL language. Riddle, your first Pilot program. Disdump, the ultimate disassembler. Talker, a powerful speech chip utility. Change, program tidier. In/out - output from assembler. All the programs from Alice, Body Building and machine games. Plus *Atomic Protector* - a full length machine code arcade game.

**MARCH:** Astromines, exciting space action. Castle, addictive two player catapult battle. Data Maker, take the tedium out of entering Data. Disc Search, powerful string search utility. Command, give your BBC and Epson printer the same character set. Break Key, a useful routine to disable Break. All the programs from Alice and Machine code games. Plus *Flex* - a full length machine code arcade game.

**APRIL:** X15, sideways-scrolling arcade spectacular. Mornington Crescent, fun and games on the London underground. Calculator, superb AMX mouse mathematics utility. Dithering, useful colour mixer. Chatterbox, powerful speech chip procedures. All the programs from Alice, Body Building and Machine Code games. Plus *Rabbit Run* - a full length machine code arcade game.

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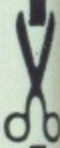
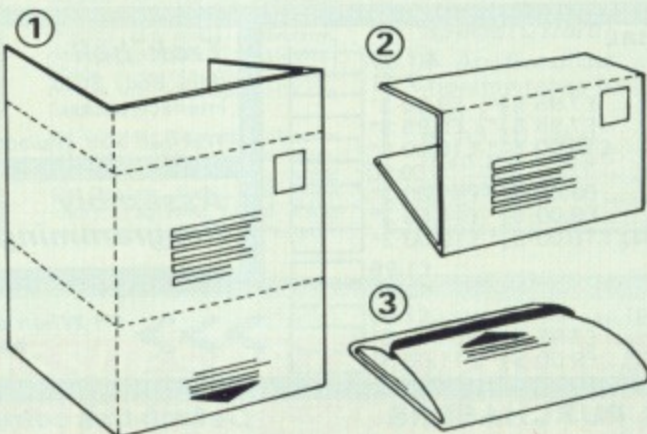
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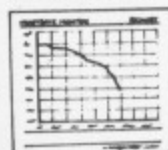
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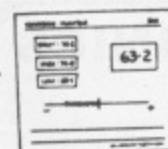
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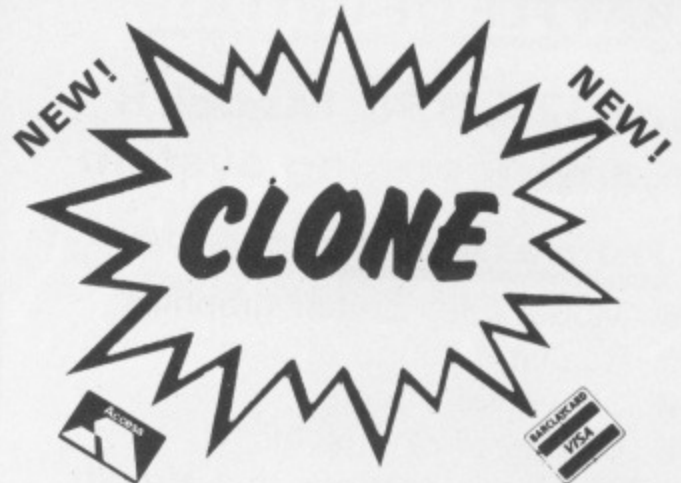
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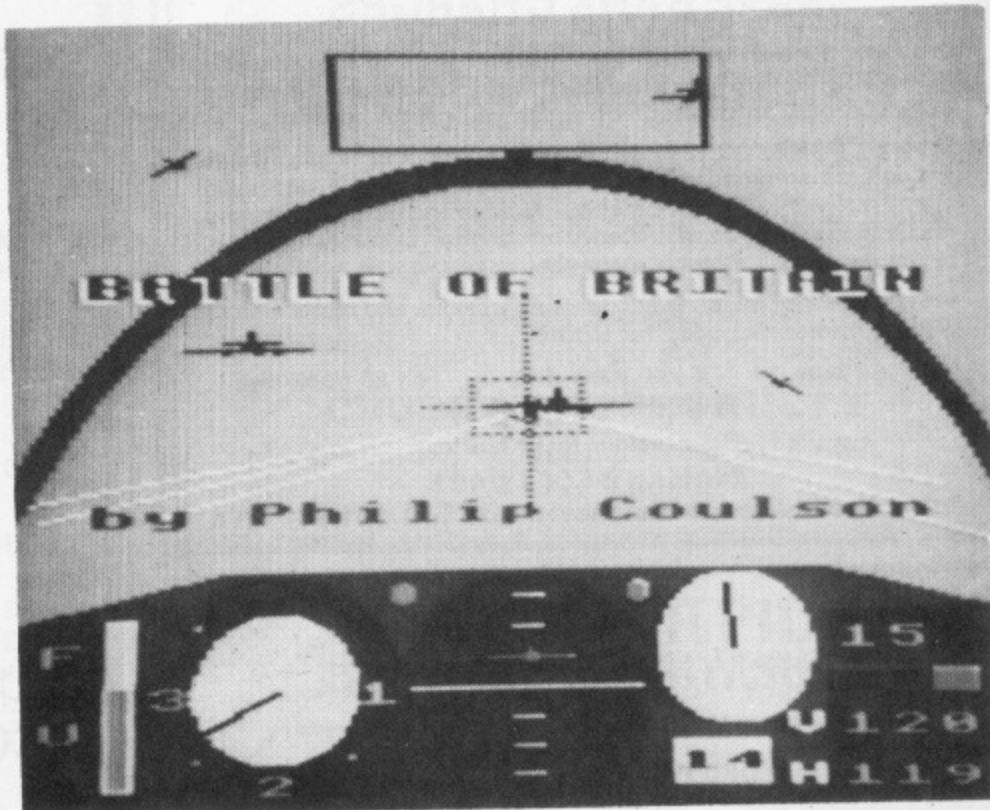


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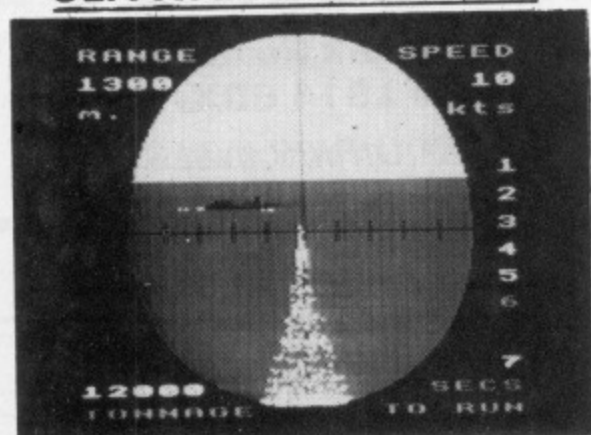
"Tally-ho!" The sky is suddenly full of planes. You get a Heinkel 111 in your sights and have to use all your skill to hold him there as he jinks and weaves to avoid the devastating fire power of your eight Browning machine guns. Your aim is good, and he explodes in flames, strewing wreckage in your path.

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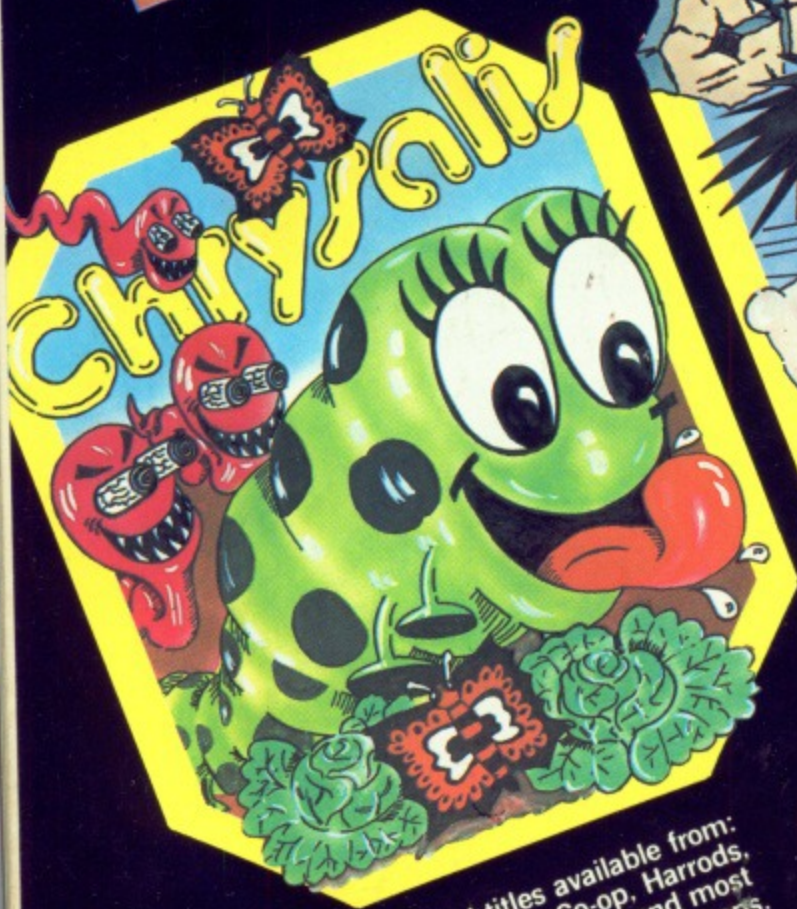
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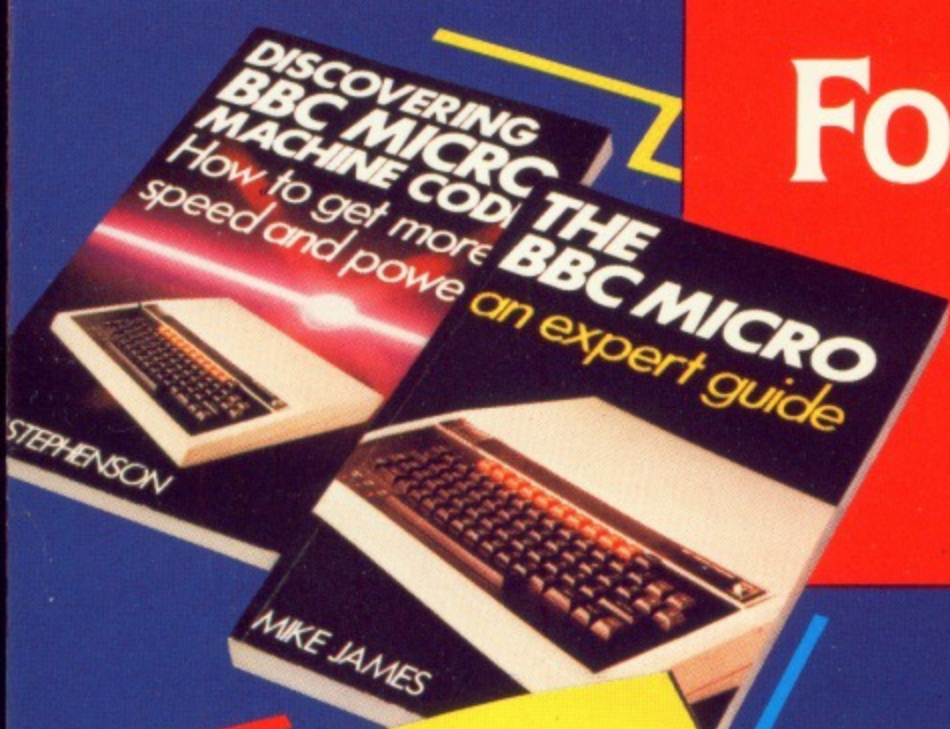
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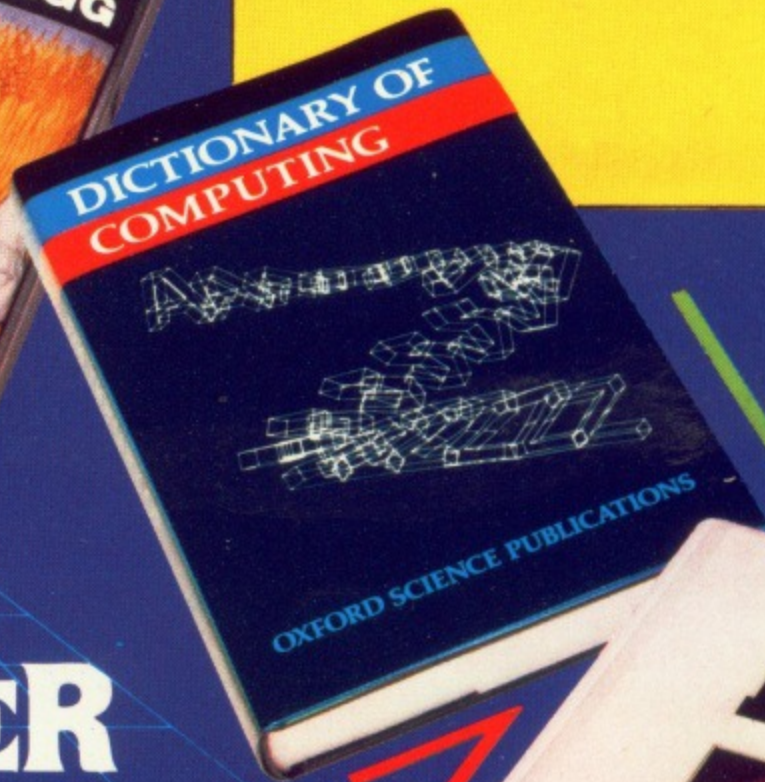


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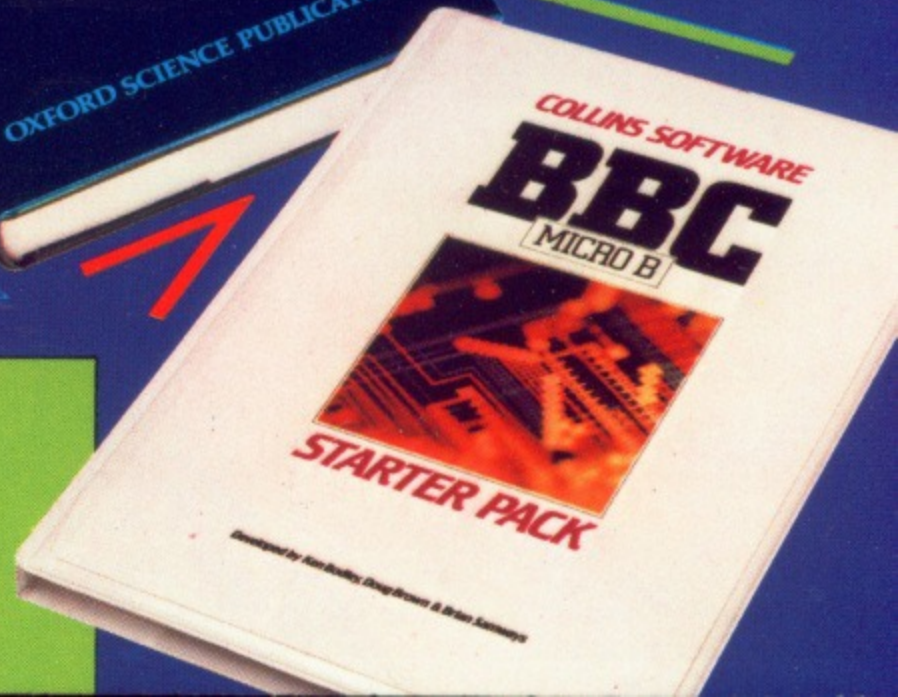
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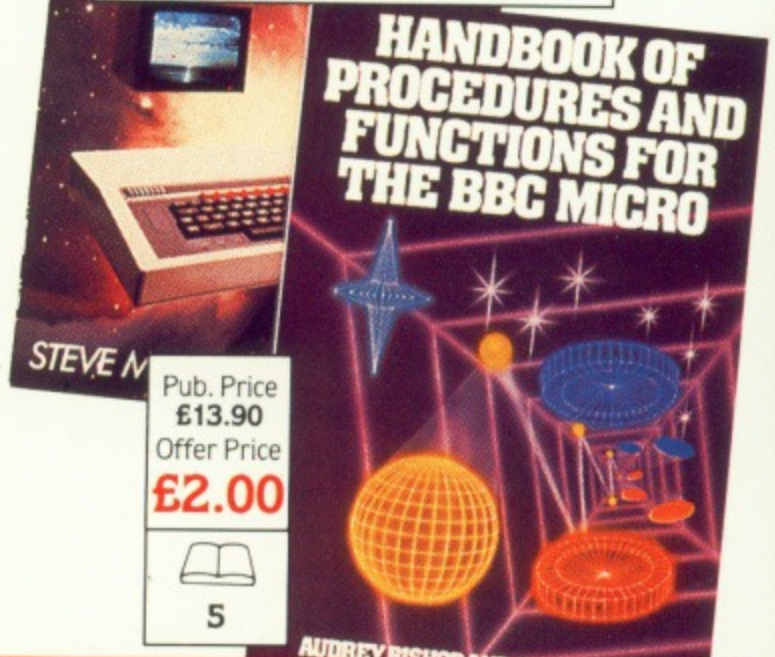
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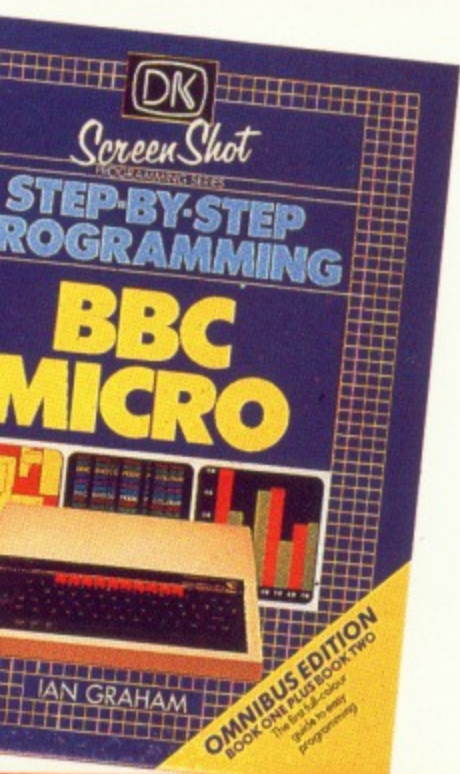
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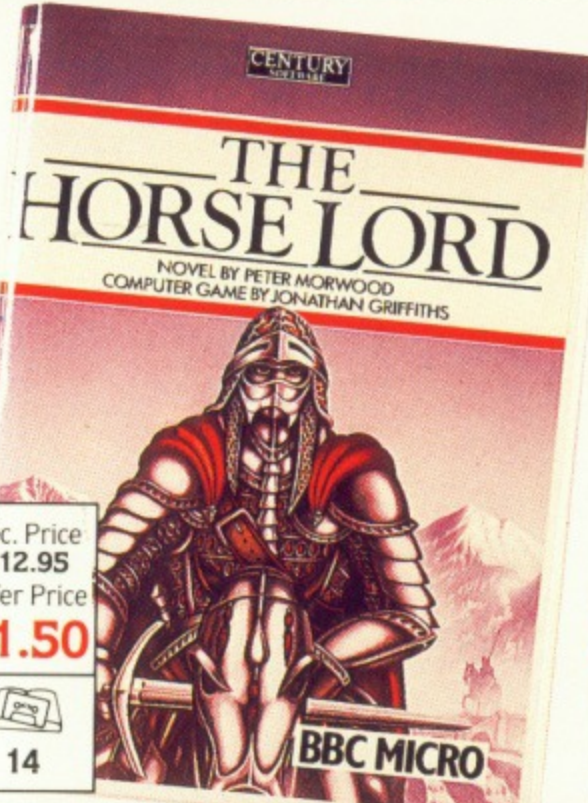
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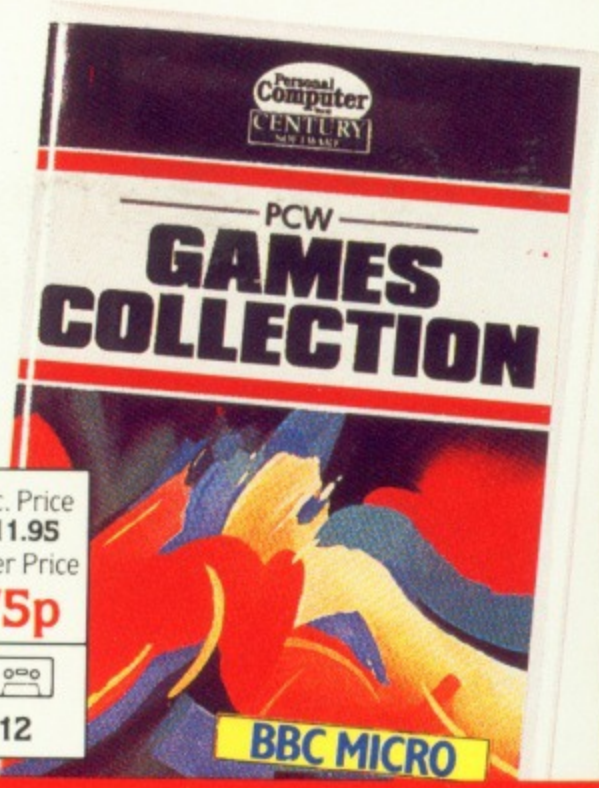


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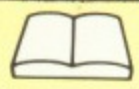


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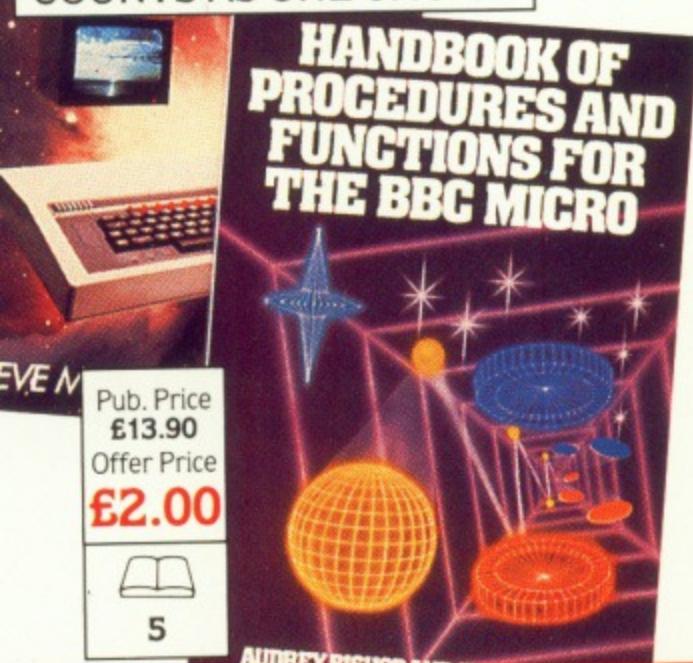
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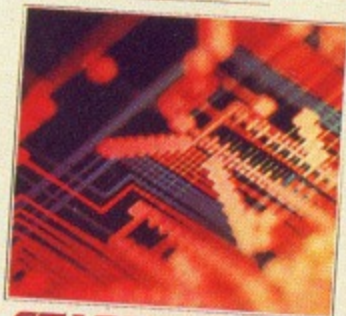
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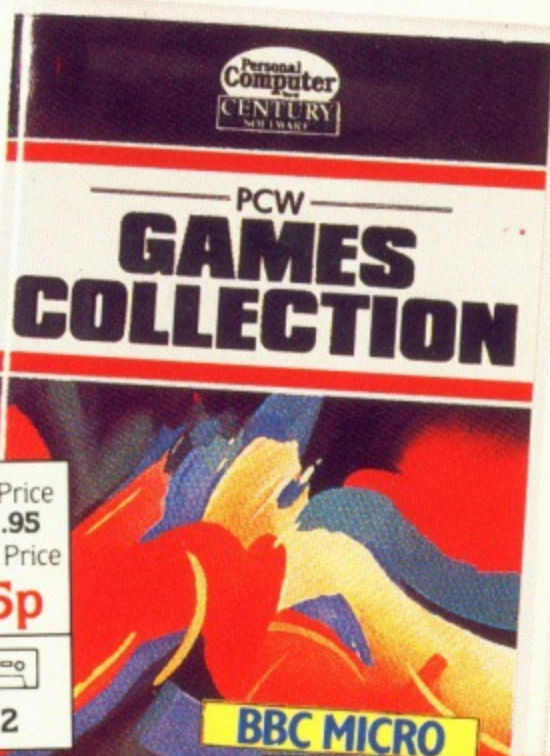


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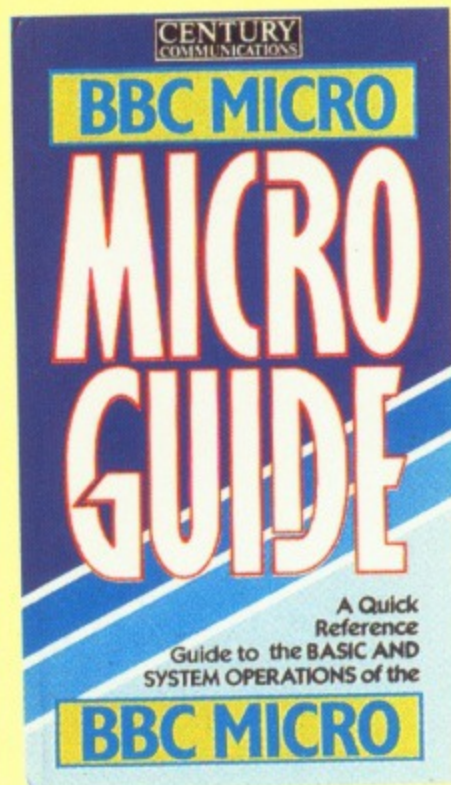
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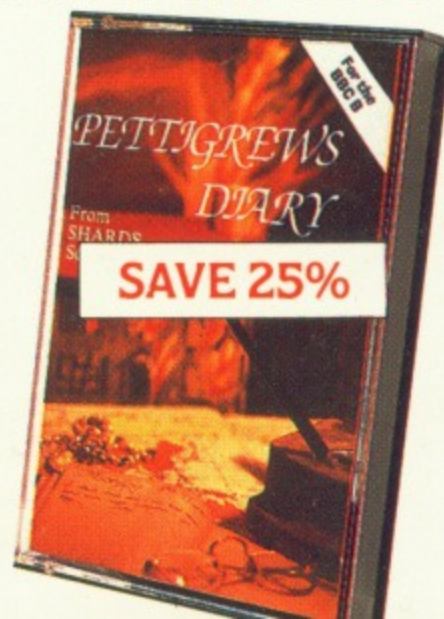
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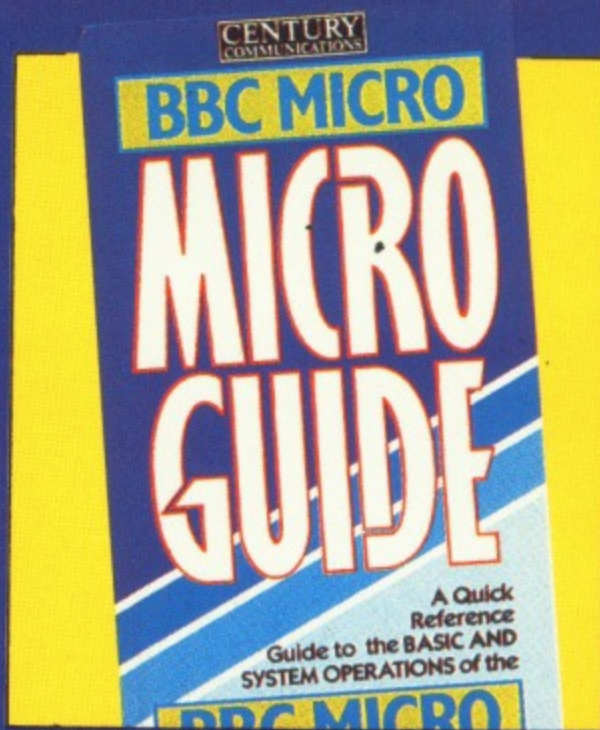
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