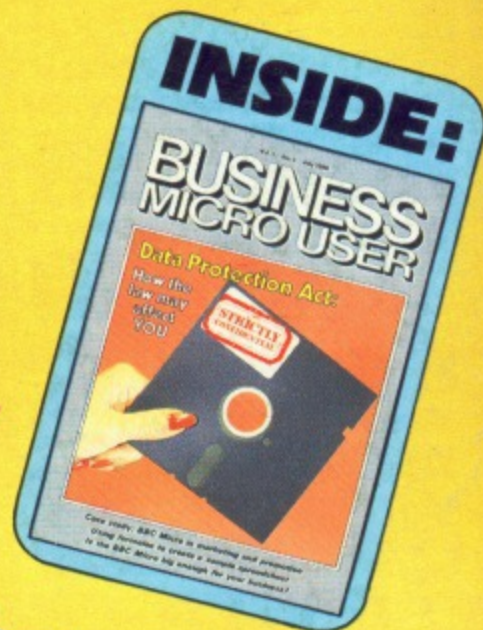


A Database Publication

THE MICRO USER

Volume 4
Number 5
July 1986
£1.25



Top-selling guide to the BBC Micro!

P·L·A·Y·T·H·E

*Royal
Wedding*

G·A·M·E



Under test: Le Modem

View printer driver generator

Making the most of the Master

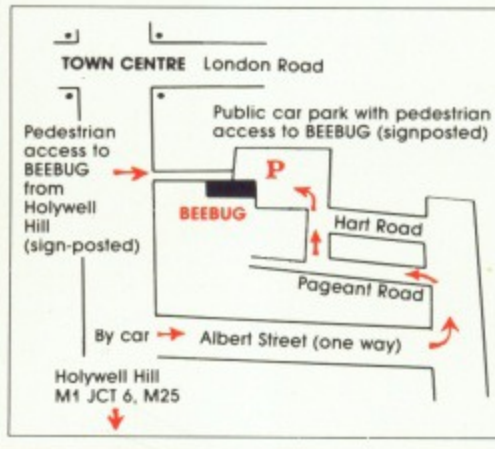
UP-TO-THE-MINUTE GUIDE TO ROM SOFTWARE

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The products in this price list are available in our showroom in St. Albans and by mail order. Telephone your order on 0727 40303 or send the order form to the address below. Alternatively come along and see us. We are open 9 - 5.30 Mon - Sat, and there is ample parking at the rear of our premises.

We take both Access and Visa credit cards. Simply telephone us on our multi-line telephone number 0727 40303 quoting: Cardholder's Name, Cardholders Address, Cardholder's Telephone number, Credit Card number, expiry date, order details.

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Tel: 0727 40303 — Multi-lines

- Computers
- Printers
- Monitors
- Disc Drives
- Budget Discs
- Software

COMPUTERS

Special Offers

The Acorn Second Processors are reduced this month, along with other Acorn add-ons. The IEEE Interface is a new addition to our range, allowing connection of scientific instruments to your Beeb, priced at £315

Disc Starter Pack

We are pleased to continue the special Disc Starter Pack for users who are still cassette-based. Consisting of an Acorn 1770 disc interface, Cumana CSX100 drive, Disc Drive Guide, and 10 Beebug discs all for only £170, this will finally dispense with laborious loading from cassette!

| Code | Description | Price Inc VAT |
|------|----------------------------------|---------------|
| 0200 | Master 128 | 489.00 |
| 0202 | Master ET | 389.00 |
| 0230 | 65C102 Co-Processor 6502 'Turbo' | 115.00 |
| 0234 | M128 Econet Module | 48.00 |
| 0235 | M128 Eprom Cartridge | 14.00 |
| 0240 | M128 Reference Manual 1 | 14.50 |
| 0241 | M128 Reference Manual 2 | 14.50 |
| 0242 | M128 Advanced Ref Manual | 19.50 |
| 0203 | '6502' 2nd Processor | 187.00 |
| 0204 | 'Z80' 2nd Processor | 364.00 |
| 0205 | Acorn Prestel Adaptor | 128.00 |
| 0206 | Acorn Teletext Adaptor | 138.00 |
| 0237 | Acorn IEEE Interface | 315.00 |
| 0217 | 1770 Disc Interface Kit | 48.00 |
| 0218 | ADFS Upgrade for 1770 DFS | 29.00 |
| 0208 | 1.2 Operating System | 5.35 |
| 0209 | 1.2 DNFS Rom | 19.50 |
| 0210 | A to B Upgrade Kit | 69.00 |
| 0212 | Acorn Speech Upgrade | 46.00 |
| 0214 | Watford DDFS Kit + Manual | 60.00 |
| 0222 | Disc Starter Pack | 170.00 |
| 0223 | Acorn 1.2 Disc Upgrade Kit | 89.00 |
| 0224 | BBC Carrying Case | 14.95 |

MONITORS

The Microvitec 1451 is our most popular RGB monitor and is this month reduced to only £260. The 1451 is especially suited for high resolution colour graphics and 80 column word processing. The CT2007 monitor has similar features with the added attraction of television, all for only £225

| | | |
|------|-----------------------------------|--------|
| 0501 | Taxan KX1202 12" Green Long Pers. | 116.00 |
|------|-----------------------------------|--------|

| | | |
|------|--------------------------------------|--------|
| 0502 | Taxan KX1203 12" Amber Long Pers. | 116.00 |
| 0503 | Zenith 123 12" Green | 82.80 |
| 0504 | Zenith 122 12" Amber | 87.40 |
| 0556 | Monitor Lead BNC for Taxan/Zenith | 3.90 |
| 0530 | Microvitec 1431 Med-res Monitor | 206.00 |
| 0531 | Microvitec 1451 Hi-res Monitor | 260.00 |
| 0532 | Philips CT2007 14" TV/Monitor | 225.00 |
| 0534 | Philips CT1114 14" TV/Monitor | 200.00 |
| 0550 | Monitor Lead RGB for M'vitec/Philips | 5.75 |
| 0535 | Supervision III RGB Monitor | 379.99 |
| 0555 | Supervision Monitor Lead | 7.00 |
| 0570 | Stand for Supervision (KTS2) | 29.00 |
| 0552 | Single Plinth for Monitor | 12.65 |
| 0553 | Double Plinth for Monitor | 23.00 |

PRINTERS

Colour

The Canon PJ1080A colour printer gives excellent colour graphics when used in conjunction with our own Dumpmaster II rom.

Plotters

The popular Plotmate Plotter finally has it's long awaited big brother, which creates high quality drawings using plot/draw commands up to A3 in size.

| | | |
|------|--------------------------------------|--------|
| 0300 | Brother HR 15 Daisywheel | 325.00 |
| 0302 | Canon PW1156A 15" | 405.00 |
| 0303 | Canon PJ1080A colour | 460.00 |
| 0304 | Epson LX 80 | 230.00 |
| 0313 | LX80 Tractor Feed Unit | 23.00 |
| 0315 | LX80 Cut Sheet Feeder | 55.00 |
| 0306 | Epson FX 80 (while stocks last!) | 273.00 |
| 0308 | Epson JX 80 Colour Printer | 520.00 |
| 0318 | Epson H1 80 Plotter | 380.00 |
| 0319 | Epson FX85 NLQ Printer | 438.00 |
| 0309 | IBICO LTR1 Letter Quality | 132.00 |
| 0310 | Juki 6100 Daisywheel Printer | 359.00 |
| 0311 | Taxan KP810 NLQ Matrix Printer | 265.00 |
| 0340 | Lin. Graph. Plotmate A4 Plotter | 340.00 |
| 0331 | Lin. Graph. Plotmate A3M Plotter | 630.00 |
| 0316 | Taxan KP910 15" NLQ Matrix Printer | 390.00 |
| 0400 | Printer Roller Cleaner Kit | 6.00 |
| 0401 | 2M Printer Lead | 8.00 |
| 0402 | Ribbon for Epson FX/RX/MX80 FX85 | 3.00 |
| 0403 | Ribbon for Epson FX/RX100 FX105 | 4.00 |
| 0408 | Ribbon for Canon PW/Taxan KP/Cen.H80 | 5.00 |

| | | |
|------|--------------------------------------|-------|
| 0413 | Ribbon for Epson LX 80 | 4.50 |
| 0415 | Ribbon for Epson JX 80 | 14.95 |
| 0418 | Ribbon for Juki 6100 (Single Strike) | 1.55 |
| 0414 | Ibico Ink Roller | 4.60 |
| 0406 | Paper 2000 sheets 11x9.5" 70gsm | 14.50 |
| 0452 | Paper 2000 sheets Real A4 80gsm | 28.75 |
| 0453 | Paper 1000 sheets 2-part carbonless | 23.00 |
| 0407 | 3.5" 1 7/16" Labels 1000 | 4.00 |
| 0416 | Dust Cover KP810/PW1080A | 5.45 |
| 0404 | Daisywheel for Juki 6100 | 20.50 |
| 0405 | Daisywheel for HR-15 | 20.50 |
| 0419 | Fontaid ROM & Disk 40T | 30.00 |
| 0420 | Fontaid ROM & Manual 80T | 30.00 |
| 0421 | Fontaid Extra Disc "A" 40T | 15.00 |
| 0422 | Fontaid Extra Disc "A" 80T | 15.00 |
| 0432 | TCS26 Printer Sharer | 22.49 |

DISC DRIVES

The Acorn hard disc drives are a new addition to our range, giving extensive storage space with Level 3 fileservers software as standard. (S—single drive, D—dual drive, X—excluding power supply unit)

| | | |
|------|----------------------------------|---------|
| 0622 | Acorn 10MB Winch with f'server | 1250.00 |
| 0623 | Acorn 30MB Winch with f'server | 1850.00 |
| 0600 | Cumana CSX100 100K 40T | 110.00 |
| 0610 | Cumana CS100 100K 40T | 140.00 |
| 0601 | Cumana CDX200 200K 40T | 218.00 |
| 0602 | Cumana CSX400 400K 40/80T | 150.00 |
| 0603 | Cumana CS400S 400K 40/80T | 170.00 |
| 0604 | Cumana CD800S 800K 40/80T | 330.00 |
| 0614 | Cumana CS100E 100K 40T | 130.00 |
| 0615 | Cumana CS400E 400K 40/80T | 165.00 |
| 0654 | Disc Storage Box —up to 50 discs | 9.00 |
| 0655 | Lockable Disc Box holds 35 | 13.80 |
| 0656 | Lockable Disc Box holds 85 | 17.25 |

Dynamic Discs

Price includes postage and free storage box

| | | |
|------|----------------------------------|-------|
| 0657 | Beebugsoft 10x 48TPI SS DD Discs | 13.90 |
| 0658 | Beebugsoft 10x 48TPI DS DD Discs | 18.90 |
| 0659 | Beebugsoft 10x 96TPI SS DD Discs | 18.90 |
| 0660 | Beebugsoft 10x 96TPI DS DD Discs | 19.90 |
| 0661 | Beebugsoft 25x 48TPI SS DD Discs | 33.50 |
| 0662 | Beebugsoft 25x 48TPI DS DD Discs | 43.90 |
| 0663 | Beebugsoft 25x 96TPI SS DD Discs | 43.90 |
| 0664 | Beebugsoft 25x 96TPI DS DD Discs | 46.20 |
| 0665 | Beebugsoft 50x 48TPI SS DD Discs | 53.90 |
| 0666 | Beebugsoft 50x 48TPI DS DD Discs | 77.90 |
| 0667 | Beebugsoft 50x 96TPI SS DD Discs | 77.90 |
| 0668 | Beebugsoft 50x 96TPI DS DD Discs | 84.90 |

OTHER HARDWARE

The AMX Mouse and associated software are all on special offer at present. This is a limited offer, and prices can only be maintained while stocks last. Similarly the range of Voltmace joysticks are reduced for a limited period.

Music 500

The Acorn Music 500 joins our range of musical add-ons. This allows the Beeb to produce sounds of professional standard. It includes an impressive demonstration cassette.

| | | |
|------|----------------------------|-------|
| 0701 | Aries B32 RAM Card | 86.00 |
| 0702 | Watford 32K RAM Card | 65.00 |
| 0703 | AMX Mouse | 69.00 |
| 0704 | ATPL ROM Board for Model B | 39.00 |
| 0735 | ATPL Battery Backup kit | 17.00 |
| 0740 | Aries B12 Rom Board | 45.00 |
| 0749 | Aries B12C Adaptor | 6.90 |
| 0736 | Watford Mk12 Rom Board | 36.80 |
| 0737 | Watford Battery Backup | 3.45 |

| | | |
|------|------------------------------------|--------|
| 0755 | Write Protect for Mk12 | 2.30 |
| 0705 | 2764 8K eeprom | 3.45 |
| 0706 | 27128 16K eeprom | 4.60 |
| 0707 | 6264 8K ram | 4.50 |
| 0708 | Eeprom Extractor Tool | 3.45 |
| 0709 | Watford Eeprom Eraser | 32.20 |
| 0747 | U.V. Tube for Eeprom eraser | 10.35 |
| 0710 | Softlife Eeprom Blower | 75.90 |
| 0714 | BBkey Function Key Labels | 2.00 |
| 0715 | Dust Cover for BBC | 2.99 |
| 0716 | Music 500 | 114.00 |
| 0717 | Watford Sideways ZIF | 17.25 |
| 0718 | Voltmace Delta 3B Single Joystick | 10.00 |
| 0719 | Voltmace Delta 3B Twin Joystick | 17.00 |
| 0720 | Voltmace Delta 14B Joystick | 12.50 |
| 0721 | Voltmace Delta 14B/1 Interface | 12.50 |
| 0741 | Voltmace Delta ASC | 8.50 |
| 0742 | Delta Driver Disc 40T | 9.00 |
| 0743 | Delta Driver Disc 80T | 9.00 |
| 0744 | Delta Driver Cassette | 5.00 |
| 0726 | 8 way DIP switch | 0.98 |
| 0727 | RS423 domino plug | 0.46 |
| 0728 | RGB 6 pin DIN plug | 0.46 |
| 0729 | Cassette 7 pin DIN plug | 0.30 |
| 0730 | 3-core 6 amp Mains Cable per m | 0.36 |
| 0731 | 4-core RS423 Cable per m | 0.60 |
| 0732 | 6-core RGB or Cassette Cable per m | 0.50 |
| 0761 | Nightingale/Commstar Combo Pack | 140.00 |

SOFTWARE

Latest titles include Micros in Business priced at £65 which is an excellent demonstration of how to use micros in an office environment. The View range are on offer this month, including View 3.0 which at £69 incorporates the Printer Driver Generator.

| | | |
|------|------------------------------|-------|
| 1000 | Acomsoft View | 45.00 |
| 1001 | Acomsoft View Sheet | 45.00 |
| 1002 | Acomsoft Hi-View | 45.00 |
| 1019 | Acomsoft Viewstore ROM | 45.00 |
| 1021 | Acomsoft Viewindex Disc | 11.00 |
| 1022 | View 3.0 Rom | 69.00 |
| 1003 | Acomsoft Lisp Rom | 48.00 |
| 1004 | Acomsoft BCPL | 51.00 |
| 1026 | BCPL Standalone Generator | 48.00 |
| 1005 | Acomsoft Comal | 48.00 |
| 1006 | Acomsoft Logo | 65.00 |
| 1007 | Acomsoft ISO Pascal | 65.00 |
| 1028 | Pascal Standalone Generator | 32.00 |
| 1008 | Acomsoft Basic Editor | 28.00 |
| 1011 | BBCsoft UltraCalc 2 | 70.00 |
| 1013 | View Printer Driver Cassette | 8.00 |

| | | |
|------|------------------------------------|--------|
| 1014 | View Printer Driver Generator Disk | 9.00 |
| 1015 | Acomsoft Revs Disc | 17.00 |
| 1024 | Acomsoft Revs Cassette | 14.00 |
| 1029 | Revs 4 Tracks Disc | 11.95 |
| 1032 | Revs 4 Tracks Tape | 9.00 |
| 1016 | Acomsoft Aviator Disc | 17.00 |
| 1017 | Acomsoft GXR B | 28.00 |
| 1018 | Acomsoft GXR B+ | 28.00 |
| 1027 | Micro PROLOG | 74.00 |
| 1031 | Acomsoft Termulator Rom | 30.00 |
| 1033 | Microtext Rom | 53.00 |
| 1034 | Microtext Plus | 240.00 |
| 1035 | 6502 Development Pack | 45.00 |
| 1036 | 6502 2nd Proc Elite | 18.00 |
| 1038 | Database Disc | 14.50 |
| 1039 | Creative Sound Disc | 19.00 |
| 1040 | Micros in Business Disc | 65.00 |
| 1100 | Wordwise Plus | 46.00 |
| 1102 | Wordwise | 28.00 |
| 1103 | C.C. Graphics ROM | 25.00 |
| 1104 | Printmaster (Epson) | 28.00 |
| 1105 | Printmaster (Star) | 28.00 |
| 1106 | Accelerator | 56.00 |
| 1107 | Speech ROM | 28.00 |
| 1108 | Acorn Speech Processor (with 1107) | 10.00 |
| 1109 | Disc Doctor | 28.00 |
| 1110 | Intersheet | 47.70 |
| 1111 | Hi Intersheet Disc | 5.75 |
| 1112 | Hi Wordwise Plus Disc | 5.75 |
| 1113 | Caretaker Rom | 28.00 |
| 1114 | Interchart | 29.90 |
| 1115 | Speech System Inc TTS | 33.50 |
| 1118 | White Knight Mk 12 Disc | 18.40 |
| 1119 | White Knight Mk 12 Cassette | 9.50 |
| 1123 | "SPEECH" Disc 40/80T | 11.95 |
| 1150 | AMX Desk Disc | 19.00 |
| 1151 | AMX 3D Zicon Disc | 19.00 |
| 1152 | AMX Database Disc | 19.00 |
| 1153 | AMX XAM | 19.00 |
| 1154 | AMS Pagemaker Plus | 40.00 |
| 1155 | AMS Superart Rom | 40.00 |
| 1156 | AMX Paint Pot Disc | 11.00 |
| 1160 | AMX Utilities | 11.00 |
| 1170 | Fleet Street Editor 40T | 34.00 |
| 1171 | Fleet Street Editor 80T | 34.00 |
| 1172 | Mini Office II Cassette | 14.50 |
| 1173 | Mini Office II 40T | 16.50 |
| 1174 | Mini Office II 80T | 16.50 |

ORDER FORM

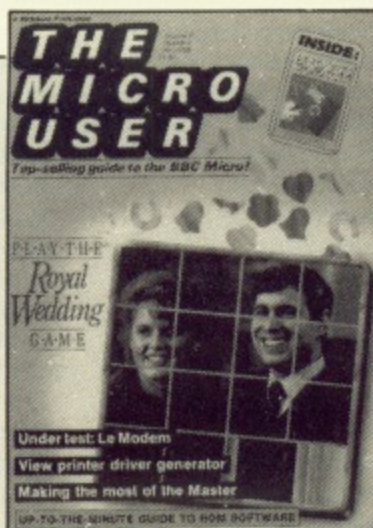
CARRIAGE. Please add **£1.00** carriage to all orders except Computers, Monitors, and Printers **add £7.00.** Disc Drives, 2nd Processors, Modems etc. **add £5.00.** Listing Paper **add £2.00.**

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| | | | | |
| NAME: | | | SUB TOTAL | £ |
| ADDRESS: | | | CARRIAGE | £ |
| POSTCODE: | | | TOTAL | £ |
| ACCESS/BARCLAYCARD NO: <input type="text"/> | | | | |

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55,496
July-December 1985

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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REGULARS

11 News

All the latest happenings and new arrivals in the ever changing world of your BBC Micro.

51 Machine code

We investigate how a byte's contents vary and start to make use of the BBC Micro's built-in assembler.

71 Adventures

The Mad Hatter provides the beginner to adventures with some helpful ideas to get him started.

83 MicroLink news

A monthly progress report on the growth of the nationwide on-line database for micros.

84 Begin here

We continue to take the novice round in circles using the power of nested FOR ... NEXT loops.

91 Master Class

More on making the most of the Master: All about the ADFS, the Editor and the real time clock.

116 Body building

How to make trackballs and mice compatible with the versatile AMX software.

121 Micromail

The part of the magazine you write yourselves - your news, views, brainwaves and moans.

FEATURES

30 ROM survey

This comprehensive survey shows what's currently available on ROM for your BBC Micro.

96 Dual catalog

We show you how to get 56 files on one disc surface using the Acorn Disc Filing System.

101 Viewgen

Here's a versatile printer driver generator for View, plus full details on how it works.

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Here's your chance to buy one of the most acclaimed books on programming the BBC Micro – for *HALF* the normal price!

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Back issues
Binders
Body Building kits
Dust covers
Educational Specials
Software

**All on the
order form
on Page 143**

GAME

20 **Royal Wedding**

Fond of sliding block puzzles or not, you'll enjoy this entertaining teaser. And it's designed to celebrate the most exciting royal event of the year.

REVIEWS

45 **ROM roundup**

The latest tape-to-disc ROM from Vine Micros and Crash Barrier's Meta Assembler are tested.

67 **Software scene**

From Bruce Lee to Jack Attack, Tennis to Moon Cresta, we try out some of the latest software.

77 **Propak**

We take a look at a disc-based assembly language development package from Dataview Wordcraft.

88 **Hardware scene**

Watford Electronic's latest communications package, Le Modem, is given a thorough evaluation.

BUSINESS MICRO USER

3 **Data protection**

How the Data Protection Act could affect BBC Micro users, plus advice on what a minimum micro system for businesses should consist of, and where best to buy your hardware and software.

10 **Application**

How the BBC Micro has come to the aid of a one-man marketing and promotions business.

13 **Spreadsheets**

More on entering formulae: Advice for beginners on creating a simple spreadsheet.

Wanted: educational writers

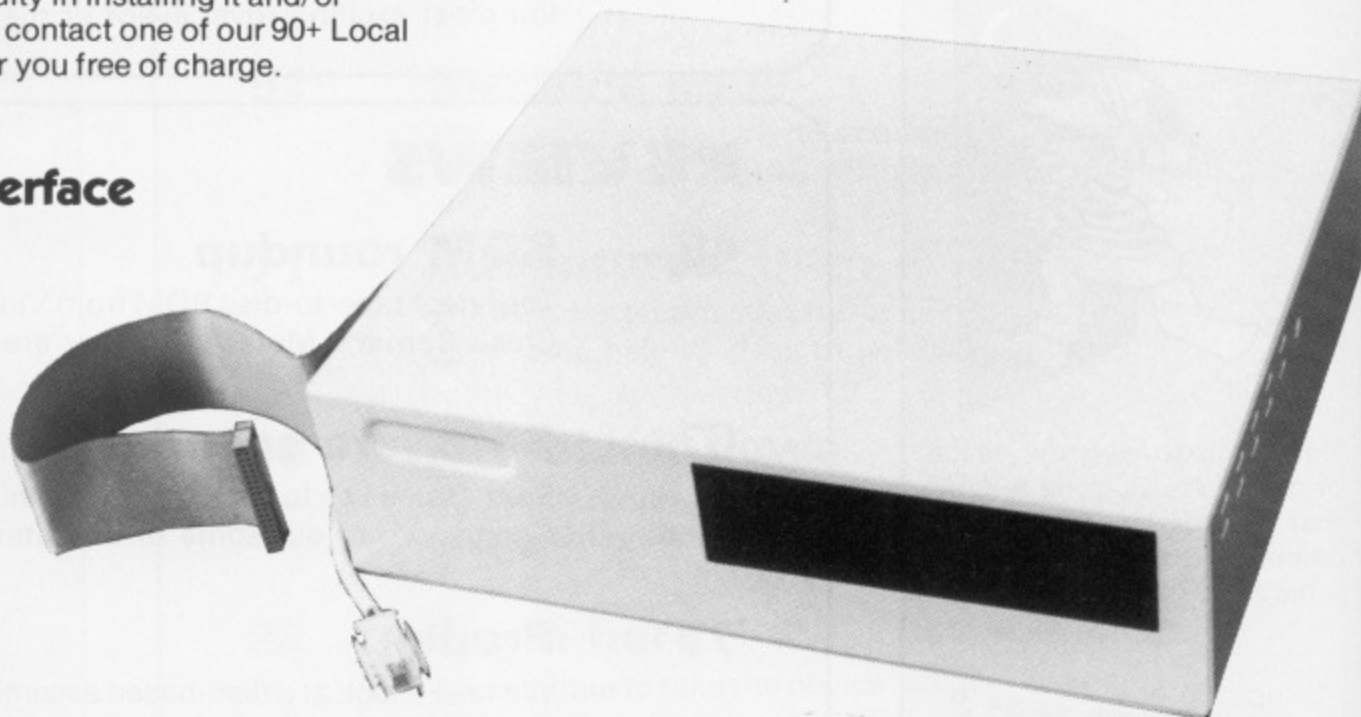
Here at Micro User, we're planning to increase our coverage of the education scene. So if you're a teacher or concerned parent with ideas for articles on learning with the aid of the BBC Micro, we want to hear from you. Write to Mike Bibby.

Disc Interfaces

Solidisk offers well designed Disc Interfaces enabling your computer to use floppy disc drives. If you feel you would have any difficulty in installing it and/or adding disc drives, you can contact one of our 90+ Local Experts who will install it for you free of charge.

The 1770 Disc Interface

The Solidisk 1770 Double Density Disc Interface has only four components and can easily be fitted even by a novice. The 1770 Disc Interface is supplied with Solidisk 2.2 DFS ROM.



The Solidisk 1770+8271 Disc Interface

If you already have a 8271 Disc Interface, then the Solidisk 1770+8271 Interface will give you the best of both worlds. You can select either the 8271 or the 1770 at a flick of a

switch. The 1770+8271 Interface is supplied with the Solidisk DFS+ADFS ROM set. This is available in two 16K or one 32K ROM.

Features built into ROM

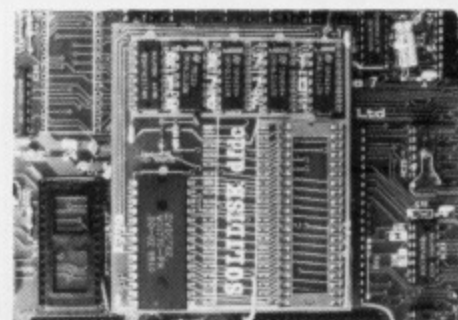
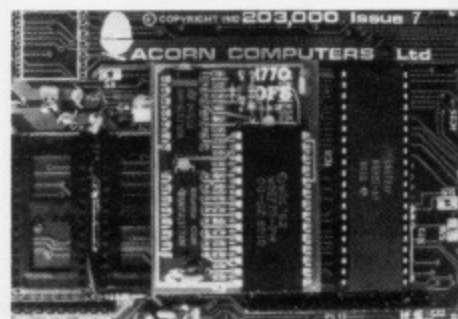
| | DFS 2.2 | ADFS |
|-------------------------------------|---------|-------------|
| Disc formatter | yes | yes |
| Disc verifier | yes | yes |
| Memory editor | yes | yes |
| Disc sector editor | yes | yes |
| Disc copier | yes | yes |
| Recover & Restore | yes | yes |
| Read track & Write track | yes | yes |
| Run 8271 floppy disc controller | yes | no |
| Osword 7F emulator for 1770 | yes | yes |
| Tape to disc | yes | yes |
| Download | yes | yes |
| DFS files to ADFS | no | yes |
| ADFS files to DFS | no | yes |
| 40/80 switching for 80-track drives | yes | only in DFS |
| Solidisk Winchester | no | yes |
| 6502, Z80 and 32016 compatible | yes | yes |
| Read & Write IBM-PC DOS discs | yes | yes |

Both the DFS and ADFS have every facility that you would expect. They can run most protected software, such as Elite, Castle Quest, Island Logic's Music System etc. Other features include read after write, and the option of double density operation (with the 1770 chip) giving 60% extra storage capacity. Their compatibility with all Acorn Second Processors (6502, Z80 and 32016) and Econet File Server (Level 2), and their capability of reading from and writing to IBM-PC DOS diskettes (with the 1770 chip) reflect the broad range of applications supported. Both 1770 and 1770+8271 Disc Interfaces are compatible with Acorn 1770 DNFS and ADFS ROMs.

The DFS and ADFS ROMs can be used to enhance both standard Acorn 8271 or 1770 Disc Interfaces, on the BBC Model B or the B Plus.

Prices, inclusive of VAT

| | |
|---|--------|
| 2.0 DFS ROM and manual | £10.00 |
| ADFS+DFS ROM set and manual | £20.00 |
| Upgrade from 2.0 DFS to ADFS | £10.00 |
| 1770 Disc Interface, 2.0 DFS ROM and manual | £45.00 |
| 1770 Disc Interface, ADFS, DFS ROMs and manual | £55.00 |
| 1770+8271 Disc Interface, 2.0 DFS ROM and manual | £50.00 |
| 1770+8271 Disc Interface, ADFS, DFS ROMs and manual | £60.00 |



SOLIDISK MEMORY UPGRADES

Solidisk memory upgrades for the BBC Model B offer excellent value for money. Their designs stand out for compatibility, speed, versatility and computing power. They use the latest component technology to achieve the lowest possible power consumption and size at low cost.

External ROM Cartridge

This comprises an adaptor which plugs into any ROM socket, and a blank cartridge which will accept one or two ROMs. These may be of 16K, 32K or 64K, depending on the capacity of the ROM socket holding the adaptor. This system is particularly useful for seldomly used ROMs, which are well protected by the cartridges. They can be installed and removed repeatedly without any risk to the ROMs and are compatible with Acorn cartridges.

Fourmeg CPU and ROM Expansion

The Fourmeg board plugs into the 6502 Processor socket, and two additional connections are made by sprung clips. It also provides one 64K and three 32K additional ROM sockets.

By adding faster memory and a 4MHz Processor, this board enables the BBC to run most programs in half the time. The new Processor is equivalent to that used on the Acorn TURBO board. It will run most Master software such as the new BASIC 4 and at twice the speed.

A switch selects between normal (2MHz) and fast (4MHz) speed. The higher speed is available to all ROMs and RAM installed in the Fourmeg board. The rest of the machine is unaffected.

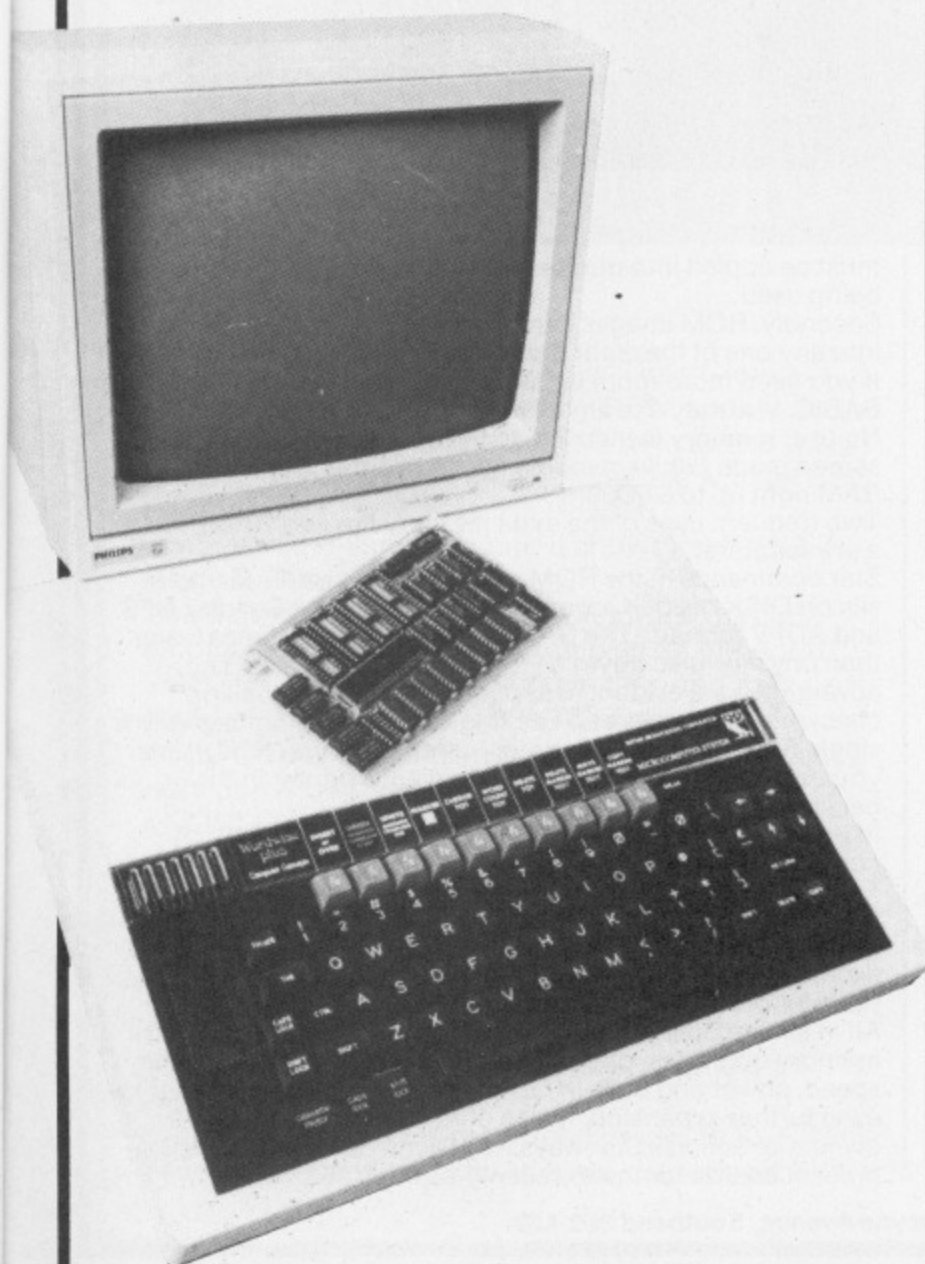
Fourmeg Board with 32K RAM

This comprises a Fourmeg board with 32K RAM and a 16K MANAGER ROM. This extra RAM gives Shadow RAM and Sideways RAM capability. Shadow RAM supports the screen in any mode, leaving all the machine RAM free. Sideways RAM can contain the images of two Sideways ROMs or used as RAMDISK or printer buffer. Shadow and Sideways RAM, and the four additional ROM sockets can be switched to the fast 4MHz speed.

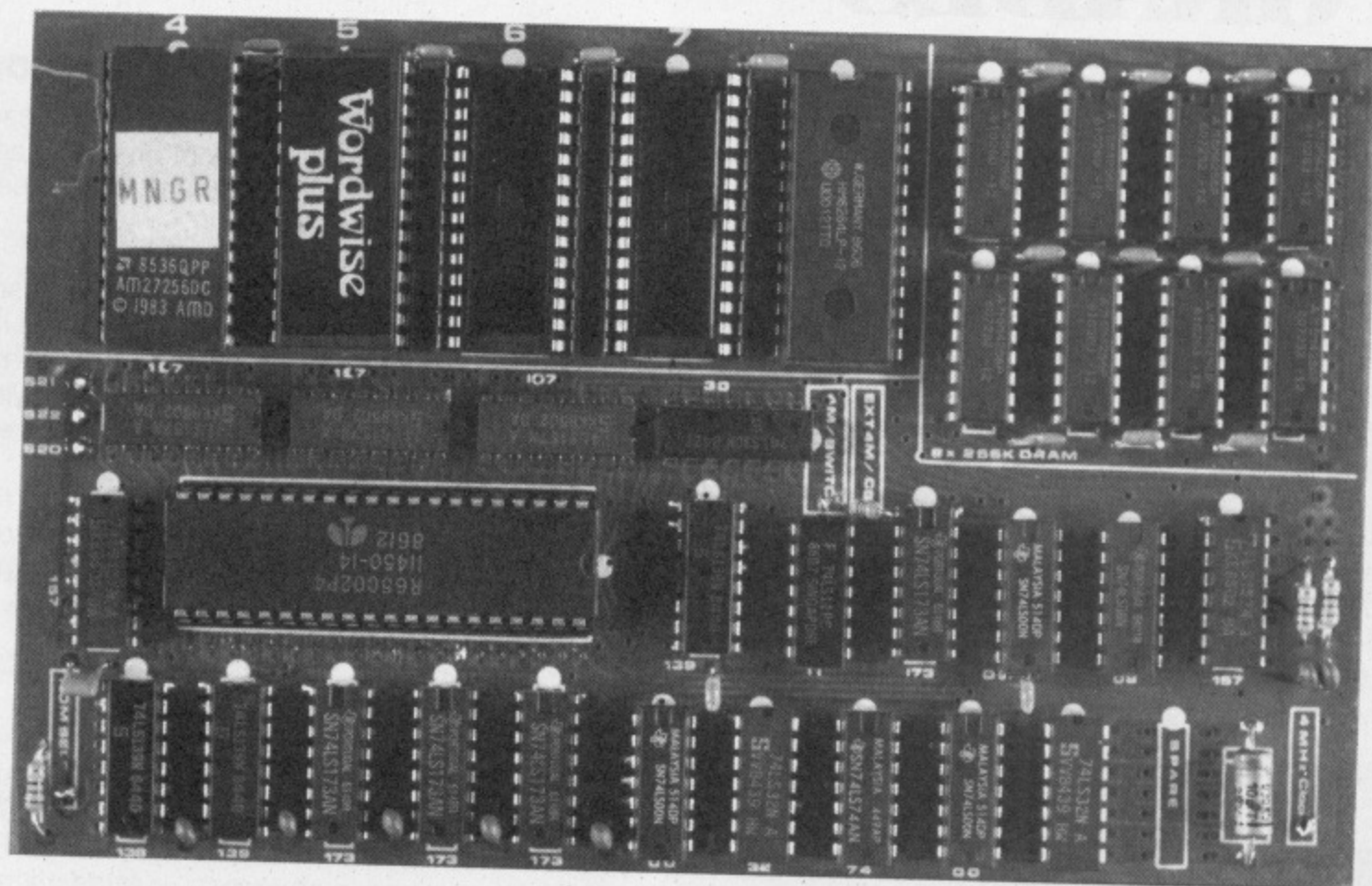
32K, 64K and 128K Sideways RAMS

These are the most popular add-ons for the BBC Model B. You can start with 32K and upgrade later to 64K, 128K (and even 256K). The 64K and 128K RAM boards have two 32K additional ROM sockets.

Solidisk Sideways RAM boards are compatible with most add-ons except ROM boards — which they replace. Sideways RAM can run almost all software that is normally available in ROM. Solidisk has a large library of application programs. These include Word-processor, Spelling Checker, Database, Spreadsheet, Extended Basic, Sprites, Ramdisc, Printed Buffer, Machine Code Monitor etc. and more than 70 computer games especially written for Sideways RAM. The programs are available in three packs, each of 5 discs, in 40 or 80-track formats. Pack 1 is included with all Sideways RAM board. Packs 2 and 3 cost £10.00 each (£1.00 p&p). Pack 3 consists entirely of games and game design tools.



The Fourmeg 256



The memory limit on the BBC Micro can now definitely be a thing of the past. The new Solidisk Fourmeg 256 board offers all you could wish for.

It has 256K of extra RAM, a superfast 4MHz processor, sophisticated memory management, sockets for high capacity ROMs and 48K of software in ROM.

All this is built into a board only a tenth as large as the BBC computer, yet containing even more devices.

It is compatible with most hardware add-ons — except Sideways ROM expansion, which it replaces.

Fitting it is easy. You remove the existing processor from its socket and plug the new board in its place, push on three colour-coded wires, clip on two mini-hooks and it's ready. Switch on the computer and you will immediately see the difference.

The message "Solidisk 256K expansion (4MHz)" announces the new memory size and speed.

A switch at the back lets you select between the old (2MHz) and the new (4MHz) speed.

The BBC Micro at 4MHz easily surpasses the new MASTER 128K on benchmarks.

For example, it runs the benchmark using Basic 4 in only half the time taken on the MASTER 128K.

If you have too many ROMs to plug in at once, the Fourmeg 256 offers TWO ways out. First, it includes additional high capacity (and fast) ROM sockets. Moreover, two or four normal ROM images can be stored in one high capacity ROM chip (by "Vertical Stacking") — so more can be made immediately available at your fingertips.

★HELP shows only up to 16 ROMs or ROM images but ★ROMS will show them all — up to 64. The ROMs with lower numbers (0-15) are directly accessible, as usual. The others

must be copied into number 15 — with ★SELECT — before being used.

Secondly, ROM images can be stored on discs and loaded into any one of the eight Sideways RAM banks available.

If you need more room in "languages" such as VIEW or BASIC, you may use any of the eight SHADOW RAM banks. No user memory is then lost to the screen, whatever the screen mode (while machine coded programs can access RAM right up to &FC00!).

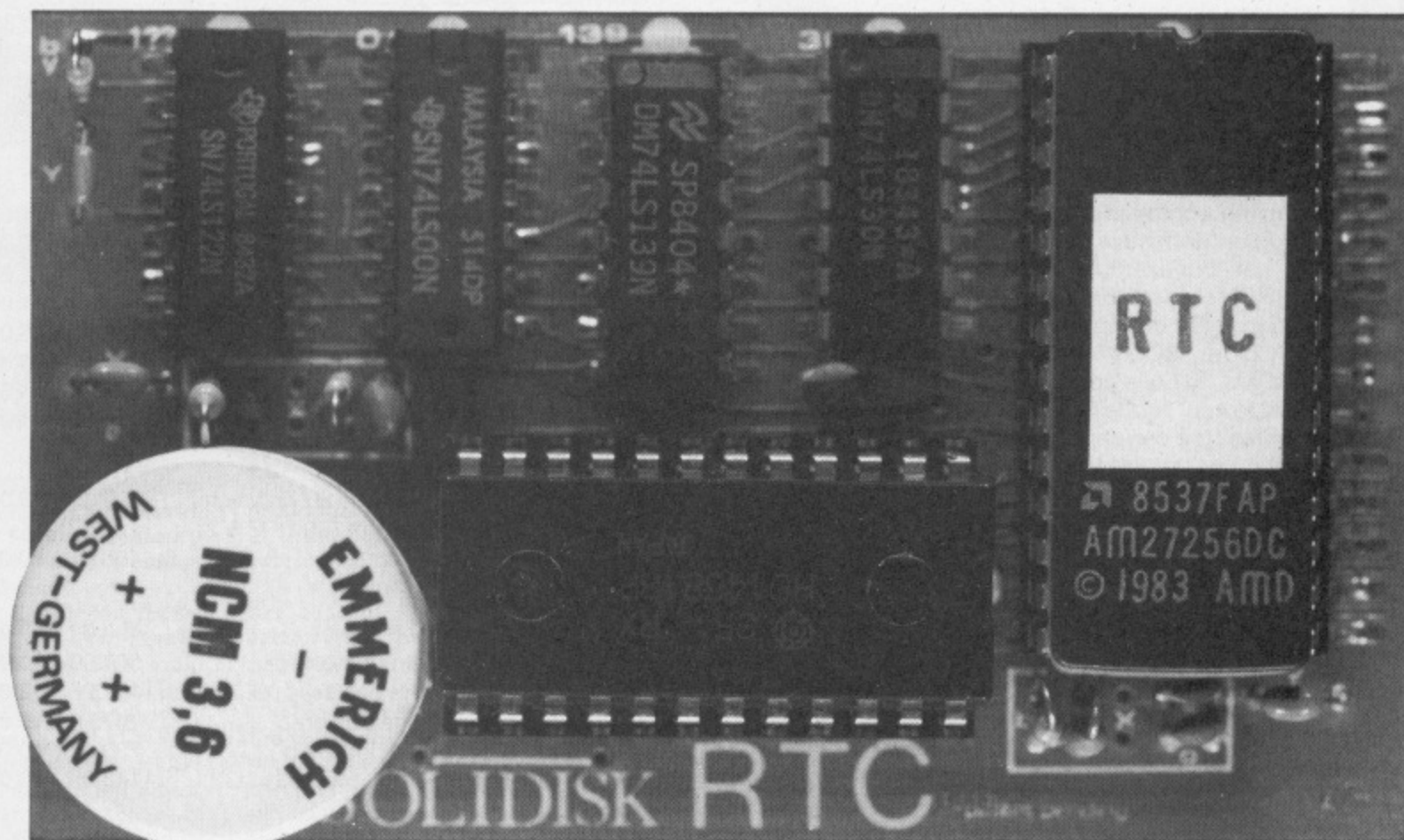
Two frequent uses of the extra memory are as a RAMDISK or a printer buffer.

Star commands in the ROM can turn the extra RAM into a silicon DISK of 200K, compatible with both the Solidisk DFS and ADFS formats. The RAMDISK is at least 10 times faster than physical disc drives as it has no moving parts. The advantages are evident in applications such as spelling checkers, databases and backing up and copying files with a single floppy drive. The printer buffer saves you time, it lets you use the computer while feeding your printer in the background.

In addition, the MANAGER ROM offers over 30 star command utilities to save time and effort using the computer. To complement such a powerful product, Solidisk has arranged with Computer Concepts to bundle the famous WORDWISE PLUS wordprocessor ROM and manuals. This excellent product, worth £45.00 on its own, became the best selling wordprocessor for the BBC computer last year. All in all, the Solidisk Fourmeg 256 represents the ultimate in memory upgrades, offering an unmatched combination of speed, power and built-in facilities, while still having room for even further expansion. It also offers an upgrade step for owners of Solidisk Sideways RAM, who can trade in their present boards for the excellent Fourmeg 256.

Solidisk Technology Ltd 17 Swayne Avenue, Southend SS2 6JQ

The STL RTC



The STL RTC (Solidisk Real Time Clock) is easy to fit: plug it into any ROM socket on the BBC Micro — and that's it. There are no wires to worry about and it's fully compatible with all BBC add-ons.

Switch on the computer and it shows itself as "STL Clock & Desk".

The hardware is an ingenious electronic circuit, employing the same "clock" chip as on the Acorn MASTER Series. It has the same time and date and many of the auto "CONFIGURE" features.

★CLOCK will show the time continuously in the top right corner of the screen.

★NOCLOCK turns it off

It will respond to ★TIME, ★FX141 and ★FX142, and Oslow &E and &F. If you have BASIC 4, it will also respond to TIME\$="date, time". Otherwise, you may use ★SETTIME instead.

Interesting results can be obtained even with simple programming:

```
10 REPEAT : UNTIL INSTR(TIME$, "07:30") ;
```

```
PROCwake-me-up.
```

It will also set options for screen mode, BOOT, TUBE, keyboard repeat rate, sound level, disc speed, MODEM

protocol, UNPLUG ROMs etc. on power up. ★INSERT will cancel the effect of ★UNPLUG.

★ROMS shows the names of all the ROMs in the machine.

★CONFIGURE issued on its own will list all options available.

If used with any of the options, it sets the machine accordingly.

★STATUS displays the current options.

The STL RTC also provides a desktop — with accessories — that you can use with an AMX MOUSE or a MARCONI TRACKER BALL. This is the fashionable "user interface" that everyone is talking about. With ★DESK, you can use the mouse to perform most usual disc operations — format diskettes, show disc directories, copy files, and run programs etc. It is compatible with both DFS and ADFS.

The accessories — a calculator and an appointment diary — may be "popped down" from the top of the screen, over any application program.

At only £29.00 inclusive of VAT, the Solidisk Real Time Clock is without doubt a fantastic purchase. It will add enjoyment and convenience to the everyday use of your BBC micro.

80-Column Colour ROM!

No, this is not an April fool, it's a MAJOR enhancement to all Model B's, you can now have AS MANY AS YOU LIKE, 80 column — IN COLOUR — screens, with blinking, underlining and reverse!

Two new colour boards, STL Colour 1 "ROM" and STL Colour 2 "ROM" can enhance considerably the display capabilities of all Model B Micros. Both of them appear as 16K Sideways ROMs (which they contain) to the computer. Each of them contain all intelligence, ROM, RAM and logic capable of driving a colour display unit in both 40 and 80 column, in colour. Both have external "SYNC" input for "GENLOCK" use. For example, one BBC Micro can use 8 STL Colour "ROMs" to interface with 8 different users. One application is low cost public Multi-Terminal Videotext system, STL Colour "ROMs" can be used together with STL Keyboard "ROMs" to build complete "smart" terminals. You may use it just to add "Mode 8" to your BBC Micro and at the same time replace the ordinary "SHADOW RAM". The Colour "ROM" does not use the BBC RAM, leaving you with HIMEM at 8000.

The STL Colour 1 "ROM" has 16K of private Display RAM while the STL Colour 2 "ROM" has 128K. Using compressor techniques (like mode 7), an 80 column x 25 row screen can occupy as little as 2-3K of RAM against 16K in BBC mode 3, this increases considerably writing speed to the screen while offering attractive colour, blinking and underlining features. The Colour 1 "ROM" can produce 40 column in 8 colours (similar to Mode 7 Teletext) or 80 column in 4 colours, with flashing, underlining and reverse. It also has 1024 semi-graphic characters.

The Colour 2 "ROM" can produce 40 column screens in 32 colours, 80 column screens in 16 colours and colour graphics.

The software in ROM will make the new screen completely transparent to the user, in BASIC and in machine code, except that "poking" directly to the screen is not allowed.

Prices:

STL Colour 1 "ROM", from £40.00 inc. VAT.

STL Colour 2 "ROM", from £150 inc. VAT.

Availability:

Delivery of the STL Colour 1 "ROM" is expected at the beginning of July, the Colour 2 version will be on sale at the Acorn User Show.

You can ring (or fill in the coupon below) for a colour leaflet or, if you can't wait, place an order right now with us, you will have 15 days to examine the products and decide whether to keep them or send them back. You may also rent them, with colour monitors for exhibitions, conferences etc . . .

Solidisk local experts

Soidisk has a nationwide network of more 90 local experts and a growing number of experts overseas. They do not usually sell our equipment but can generally fit it free of charge. Please ring Solidisk Sales office. If you wish to call at our office for a fitting however, it is necessary to make an appointment.

Telephone Southend (0702) 354674 (16 lines)

ORDER BY MAIL: Please complete the coupon opposite (or a copy) and send it to:

Prices, inclusive of VAT:

RAM/ROM expansion

| Qty | Price | P&P |
|-------|--|-------------|
| ..... | External ROM cartridge adaptor | 15.00 1.00 |
| ..... | Basic Fourmeg Board | 30.00 1.00 |
| ..... | Fourmeg Board with 32K RAM | 69.00 1.00 |
| ..... | Sideways RAM 32K with software pack 1 | 50.00 1.00 |
| ..... | Sideways RAM 64K with software pack 1 | 80.00 1.00 |
| ..... | Sideways RAM 128K with software pack 1 | 125.00 1.00 |
| ..... | 256K Board with WW+ and Manager ROM | 175.00 1.00 |
| ..... | Real Time Clock and SOLIDISK ROM | 29.00 1.00 |

Disc Upgrade

| | | |
|-------|--|-------------|
| ..... | 1770 Upgrade with 2.2 DFS ROM | 45.00 1.00 |
| ..... | 1770 + 8271 Upgrade 2.1 DFS ROM | 60.00 1.00 |
| ..... | ADFS + DFS ROM set | 20.00 1.00 |
| ..... | Upgrade from DFS to ADFS + DFS | 10.00 1.00 |
| ..... | Solidisk 80 track double sided drive | 109.00 3.00 |
| ..... | Dual Drives, CPU and Keyboard case | 230.00 6.00 |
| ..... | CPU and Keyboard case alone | 30.00 6.00 |
| ..... | EFS for the Electron | 59.00 1.00 |

Wordprocessor Package

| | | |
|-------|--|--------------|
| ..... | Wordprocessor for the B+ or Master | 309.35 10.00 |
| ..... | Wordprocessor with 1770 DFS & 2 drives | 458.85 10.00 |

Winchesters

| | | |
|-------|---------------------------------|---------------|
| ..... | 10 MB 5¼in. Beeb powered | 499.00 10.00 |
| ..... | 10 MB 5¼in. mains powered | 569.00 10.00 |
| ..... | 20 Mb 5¼in. Beeb powered | 661.25 10.00 |
| ..... | 20 Mb 5¼in. mains powered | 747.50 10.00 |
| ..... | 20 Mb 3½in. Beeb powered | 720.00 10.00 |
| ..... | 40 Mb 3½in. mains powered | 1148.85 10.00 |

Modems

| | | |
|-------|---|------------|
| ..... | Linemaster ROM and manual | 10.00 1.00 |
| ..... | Telemod 1 MODEM (BABT approved) with Linemaster ROM | 50.00 3.00 |
| ..... | Other MODEMS | P.O.A. — |

Datalife Diskettes

| | | |
|-------|-------------------------------|------------|
| ..... | MD525 (SS/DD) box of 10 | 16.00 1.00 |
| ..... | MD557 (DS/QD) box of 10 | 25.00 1.00 |

EPROMS

| | | |
|-------|--------------------------------------|------------|
| ..... | 2764-25 25pcs. (to clear) | 25.00 1.00 |
| ..... | 27128-25 (or better) pack of 5 | 25.00 1.00 |
| ..... | 27256-25 (or better) pack of 3 | 25.00 1.00 |
| ..... | UVIPROM Eprom Programmer | 19.00 1.00 |
| | UVIPROM32 for our 27256's | 21.00 1.00 |
| | UVIPAC Eprom eraser | 20.00 1.00 |
| | Solidisk Toolkit ROM | 10.00 1.00 |

Total

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|--|
| Name: |
| Address: |
| |
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| VISA |
| ACCESS |
| We reserve the right to change prices and specifications without notice. If you wish to call at our office, please telephone for an appointment. |

Acorn can't make enough Masters

ACORN has ramped up production of the Master 128 to 50,000 machines a month — yet it still cannot meet demand.

A survey conducted by *The Micro User* reveals that the company could currently be selling 100,000 machines every four weeks.

Typical of the dealers contacted was Bill Wood, managing director of Comp Shop, who said he could sell double his quota.

"We are suffering from acute product starvation", he said. "At the moment we have a waiting list of 150 people and the list is growing day by day".

A company source told

The Micro User that production has in fact already been increased twice since the launch.

It was first raised 10 per cent at the end of January due to the initial response and since then by a further 10 per cent.

"We are restricted by the terms of our contract with AB Electronics as to the percentage by which we can increase production", admitted the Acorn informant, "otherwise we would have ramped up even more to try and clear the order book."

"You can be certain that we are just as frustrated about the situation as are both the dealers and the prospective customers".

However not all dealers are convinced that Acorn is pulling out all possible stops to meet the demand.

"We see this as them being over-cautious, based on the problems that brought them almost to their knees last year", said one.

"They are frightened to death of being caught in that same position with a sudden fall in demand and huge stocks."

"But we are left losing sales in droves. And people will only wait so long before deciding to spend their money on other machines."

"Once again Acorn have found a winner without being able to capitalise on it to the full".

Insure your BBC Micro

A UNIQUE personal computer insurance package which for the first time offers breakdown cover is now available to subscribers to *The Micro User*.

Underwritten by the giant Cornhill Insurance group, the scheme also provides protection against theft, accidental loss and damage at savings of up to 50 per cent, making it the cheapest in the country.

While the theft clause only applies to micros that are stolen from lockable buildings, the accidental loss and damage cover is for anywhere in the UK — even while the computer is in transit.

Negotiated by Database Publications on behalf of its readers with leading brokers Mason and Mason of Wilmslow, the breakdown section covers call out,

labour and materials charges for all micros not under warranty.

As with all current policies, different rates apply to urban and metropolitan areas, the latter being judged high risk areas for theft. Cover for a £500 system — micro and peripherals — would cost in the region of £16 a year.

Businessmen who subscribe to *The Micro User* will also have the opportunity to join a company scheme which provides additional cover.

"The market has been crying out for a policy of this kind — particularly involving breakdown — for years", says Derek Meakin, head of Database. "We are just pleased that we are able to offer it first to subscribers to *The Micro User*".

For further details see Page 142.

RADIATION CHECK ON YOUR MICRO

A DO-it-yourself home radiation detector based on the BBC Micro is to be made available in the UK in the wake of the Chernobyl disaster.

The brainchild of Mike Cook, technical editor of *The Micro User*, it will provide an accurate reading of deadly radioactive fall-out at a price the man on the street can afford.

"A lot of people have expressed concern since the Russian accident over the degree of accuracy of reports on the potential dangers to themselves", says Mike Cook.

"With the detector they'll be able to know the true situation — and hopefully put their minds at rest".

Such was the interest generated by the prototype, demonstrated for the first time at the Electron and BBC Micro User Show, that it attracted national media coverage.

However the detector will not go on public sale. Instead it will be exclusive to readers of *The Micro User*, appearing as part of the Beeb Body Building Course in next month's issue.

Although the price has yet to be decided, it will be considerably cheaper than the £500 needed for a comparable geiger counter.

The home radiation detector in fact incorporates a geiger-muller tube as found in a geiger

counter.

But it replaces the conventional electronic counters and scalars by linking up to a BBC Micro via an interface. Then, with suitable software, the readings appear on the monitor.

Yet it remains the role of the geiger-muller tube to detect radioactive disintegration.

It achieves this by the gas it contains reacting to both Beta and Gamma rays — the type of highly-dangerous fall-out which can penetrate buildings.

"By using a BBC Micro you get a more accuracy than you do with more conventional radiation measuring equipment", says Mike Cook.

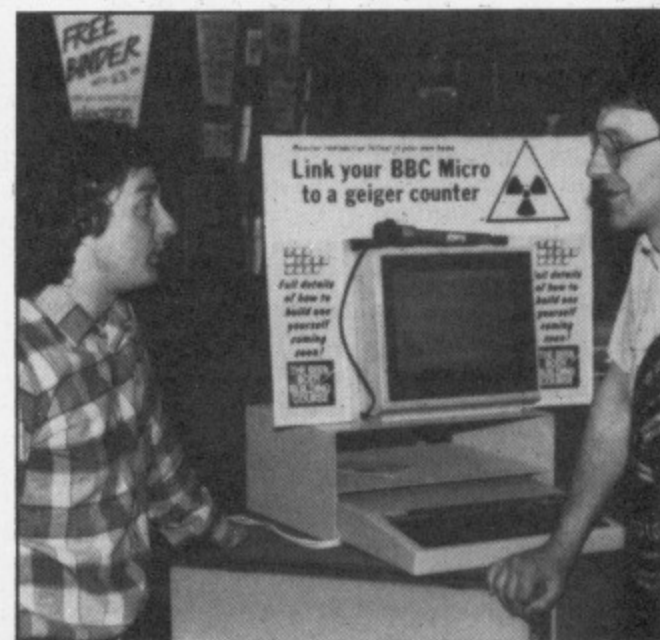
Fascinated

A lecturer in physics at Manchester Polytechnic, Mike Cook became fascinated by nuclear radiation when taking atomic physics as part of his degree course.

This resulted in him "playing around" with radiation level detectors for blast furnaces.

"In fact I've had a personal home detector lying around in very primitive form for years", he said.

"It was the intense interest of late in the subject that persuaded me to dust it off and redesign it for our readers".



Mike Cook, left, explains his home radioactive fall-out detector at the Electron and BBC Micro User Show

MICRO USER HELPS SPEED MEDICAL BREAKTHROUGH

THE Micro User has come to the aid of Christopher Crowhurst the 16-year-old whizz kid whose programming skills have achieved a breakthrough in medical software that could save many lives.

Plymouth schoolboy Christopher recently delighted researchers at the world famous Johns Hopkins teaching hospital in America – and made headlines around the world – by solving a problem that had baffled expert computer programmers for years.

Working on his BBC Micro Christopher pinpointed errors in a program designed to read data from blood pressure tests on the eyes which can predict the chances of heart attacks or strokes.

As a result software can now be produced that will eventually put early detection of potential cardiac victims within reach of every doctor with a micro.

Hampered

But work on the project has been hampered by lack of technology to test Christopher's new program here and in America.

Although the software is known to do its job perfectly only slow running versions of it have been possible. This affects its value because data doesn't change quickly enough to give the sort of readings doctors need for accurate diagnosis.

What was needed by Christopher and the scientists at the Johns Hopkins medical research team was additional power for their BBC Micros so that the program wouldn't hang and stop when it was being run.

After a plea for help from Christopher's father *The Micro User* came to the rescue in the shape of technical editor Mike Cook's long-running

body building course.

A prototype circuit board, and diagrams showing how it should be implemented, were rushed to Christopher so that he could build the necessary add-ons.

Christopher will be in the US this month on a bio-medical research fellowship at Johns Hopkins in Baltimore putting the finishing touches to his program and adapting it for other micros.

No delays

Before leaving he said: "I could have designed and built a circuit board of my own but it would have taken a long time, and if I'd made the slightest error I wouldn't have known how to find and correct it."

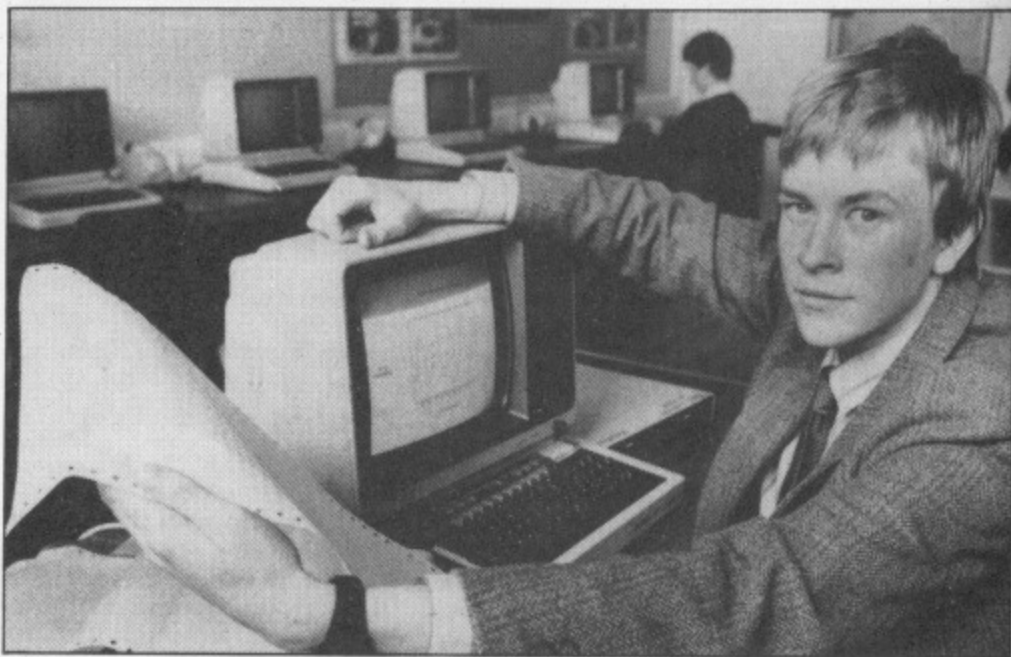
"Thanks to *The Micro User* I now have the extra technology I need for myself and the doctors at Johns Hopkins, so there should be no delays in completing the job."

"From now on I can send programs to America and know that they will work properly as I have been able to test them here beforehand, and also know the people over there can run the software effectively on their BBC Micro."

The Americans are so pleased with Christopher's expertise as a programmer they want him to stay over there as long as he likes, but he'll be returning to England at the end of the month.

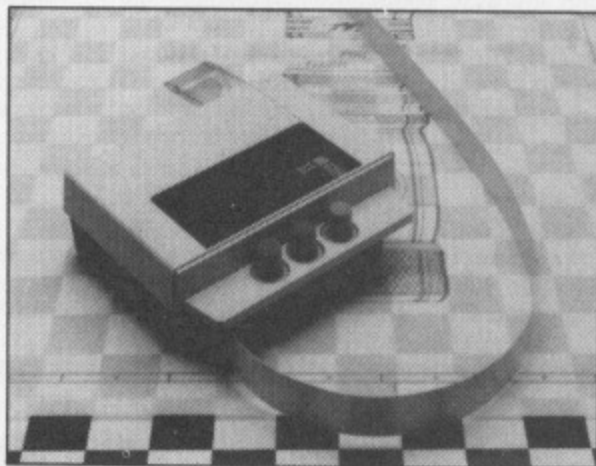
He explained: "I'm more interested in rock climbing and sailing than computers and I'll be going to Scandinavia for the tall ships race in August with the Sail Training Association."

"But I'm also looking forward to going to America. It's the first time I've been abroad on my own, and it's nice to think that I may have helped the doctors over there to perfect a program that could save lives".



Christopher Crowhurst . . . on research fellowship

More plotters



BASED on its award winning GR1500 plotter, the Penman II range for the BBC Micro – three new models for professional CAD, business and educational markets – has been launched by Penman Products.

The new designs are capable of accurate plotting on drafting film up to A0 size, and the provision of an RS232 port means they can be used as CAD workstation plotters.

Penman II can be used with most software packages as a direct replacement for the HP7475A plotter or the HP7585 A1 plotter, and is suitable

for CAD packages such as AutoCAD and RoboCAD PC.

It operates in one of two modes chosen for either plain paper or partially transparent drafting media such as polyester film or popular grades of tracing paper.

Penman IIB for A3 sized plots costs £395, Penman IID for A1 sized plots is £595, and Penman IIE for A0 sized plots costs £695.

Owners of Penman GR1500 models can convert their plotters to Penman II by returning them direct to Penman Products.

PRINTER SWITCHES

TWO printer switch boxes for the BBC Micro have been brought out by C.F. Terrell.

The PS1 allows two BBC Micros to be connected to one printer and costs £35. The PS2 serves two printers and costs £38.

Both models come with cables, connectors and push-button changeover switch.

TOLKIEN TAKE-OFF

FOLLOWING its successful Bored of the Rings, CRL has announced another Tolkien take-off from Delta 4, The Boggit.

Split into three parts, the game allows the player to move freely between each part – data concerning his progress being transferred between the programs to ensure continuity.

The game has split screen graphics and more than 100 locations to explore. Price: £7.95.



The Show ... Mecca for micro men and women

Four records go at the big Show

WITHIN an hour of the doors being opened for the Spring Electron & BBC Micro User Show the scene was set to eventually break not one but four records.

At that time the turnstiles were temporarily closed because of

the volume of people flooding into the New Horticultural Hall.

It was a situation that was to be repeated on several occasions during the three day event which attracted more than 16,000 visitors, an all-time high.

The first day alone saw more than 5,000 enthusiasts converge on the hall – the largest ever number during a working day.

Yet another record fell when it was assessed that more than £1,200,000 worth of business had been achieved at the show, beating the previous best by £200,000.

Nor were the smiles confined to the faces of exhibitors. A survey of stands showed more than 500 special offers on display – close to 100 in excess of the former record.

"It was just fantastic", reported John Huddleston of Advanced Computer Products. "We took more on the first morning than for the whole of any of the previous shows."

"The only trouble is

that having exhibited at the last few shows, I'm now running out of superlatives to describe them".

And he said that interest in the new Master was phenomenal.

Although ACP was only able to demonstrate the company's new Advanced 1770 DFS for the Master at the show – "the documentation wasn't ready" – it still attracted several hundred advance orders at £34.50.

"We were particularly pleased about this", said John Huddleston, "for we believe this is the first add-on to take full advantage of the Master's facilities".

Yet another package for the Master which attracted maximum crowd attention was Pagemaker from Advanced Memory Systems of Warrington.

Already a best seller on the BBC Micro, it combines a low cost typesetter, graphics and word processor on two ROMs and two discs.

Priced at £49.95, it

Turn to Page 15

Key to communication for the handicapped

NORTH Wales educational software company Clwyd Technics had chalked up a string of heartwarming success stories with a product for handicapped BBC Micro users.

Its Keymaster keyboard emulator enables even severely disabled people to control any commercial software with the help of simple aids such as a one or two switch system, joystick or blow-switch.

And if the user has reached an advanced educational standard where faster typing is required, Keymaster Predictive Typing speeds up keyboard manipulation.

A display at the bottom of the screen shows the five most likely letters to be used next, and selection is made by using the cursor.

If the required letter is not in the first five shown the next most likely five letters are displayed.

Keymaster and Keymaster Predictive Typing have already made a big difference to the lives of several severely handicapped youngsters.

Laura Whitehead, a 21-year-old living in Blackpool, has only one movement – she can move her head from side to side – but she has successfully completed an O level sociology course using Keymaster.

The special needs tech-



Laura Whitehead ... typing speed doubled

nology unit of the North East Wales Institute in Clwyd, which has close links with Clwyd Technics, developed a special head-switch with which Laura could operate the system.

The combination of Keymaster and Predictive Typing dramatically improved Laura's control over her BBC Micro and her typing speed was doubled.

Another pupil to benefit from Keymaster is Richard, a 12 years old, an anethoid spastic with no power of speech whose only voluntary movement is an ability to move his left arm 18 inches from side to side.

With the educational level of a seven-year-old, he was being held back by his difficulty in communicating even though he was of average intelligence.

Various teaching aids have been tried without success – the most useful being a system of lettered

blocks which Richard could arrange to make words – before his teachers saw a demonstration of Keymaster.

Nine months later Richard can take part in lessons, write his own stories and do sums.

As Keymaster doesn't disable the keyboard he can also play computer games with another child who is able to use the keys while Richard controls his end with two lever switches.

Pleased with Richard's success, the school bought a second Keymaster for use by another athetoid spastic called David.

David, aged five, is not as severely handicapped as Richard and with therapy will eventually be able to speak. His teachers expect that with the help of Keymaster from such an early age he will be able to keep up with other children at the school.

Now 64k in all modes

A NEW add-on board which solves the 32k user RAM problem was unveiled at the Electron and BBC Micro User Show.

Developed by Watford Electronics, it provides 58k of RAM in all modes while in Basic II or View 2.1.

Breaking away from his packed exhibition stand managing director Nazir Jessa told *The Micro User*: "We have achieved what others thought impossible and have given people what they want – 64k in all modes".

The board is currently

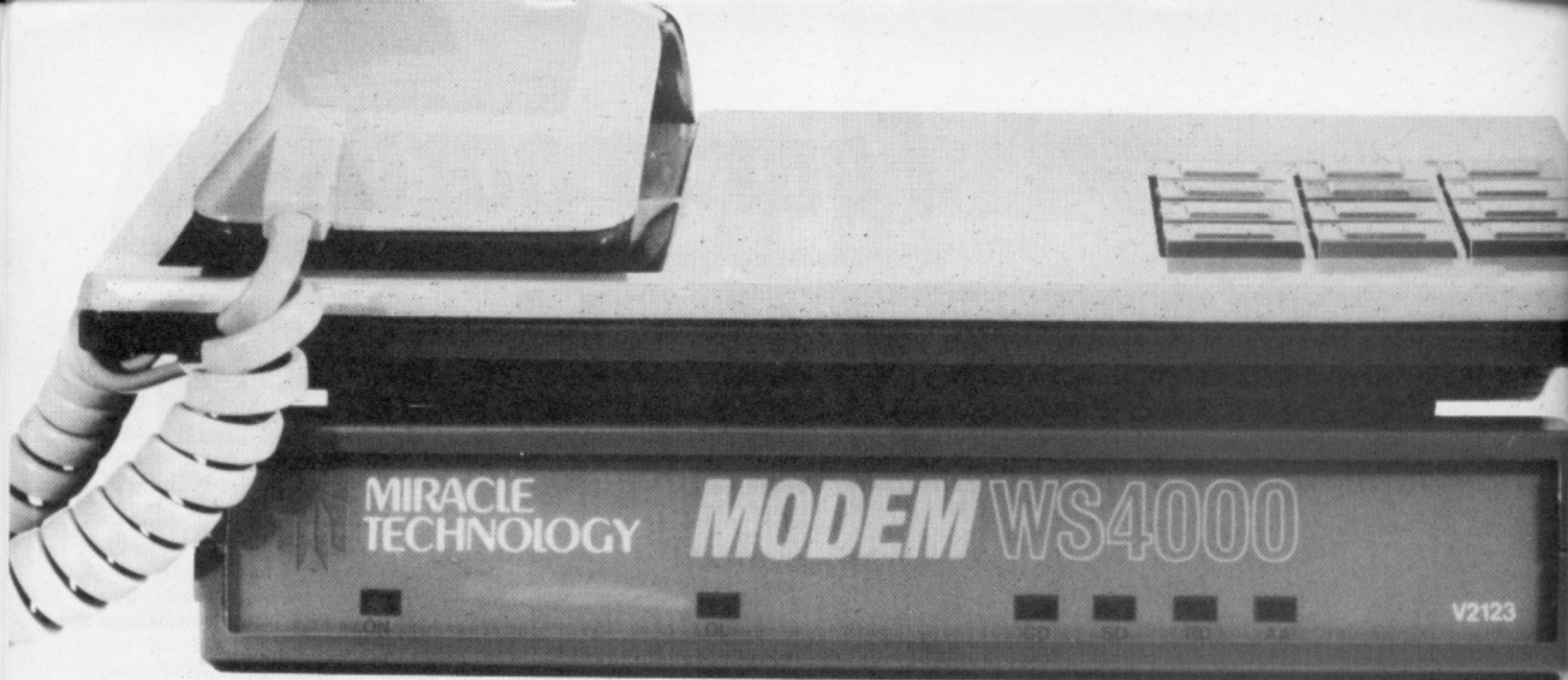
subject to patent application.

Watford provided yet another answer at the show when it demonstrated its new high capacity Winchester disc.

A solution to floppy disc space problems, it was billed by Watford "as the optimum balance between reliability and cost".

The drive is intended for use with ADFS and is suitable for connection to the standard BBC B, the B+ and the Master.

Watford has as yet to announce the price but it is believed to be in the region of £700.



Within Your Reach

£149.95* for a Hayes compatible, autodial, autoanswer with speed seeking smart modem from one of the UK's best-known modem manufacturers — that really brings the world of data communications within your reach!

If that wasn't enough, the new WS4000 is also fully intelligent and speed buffered. And you can add your choice of optional extras now or later, taking it right up to full V22 or even the 2400 bps V22 bis standard.

For only £149.95* you can reach out to Prestel, Telecom Gold, Micronet, Microlink and the world's databases, bulletin boards and telex links through your own telephone line. User-user file transfer too.

WS4000 is made to the same high quality as all our products. The price breakthrough is a direct result of our massive component buying power through high volume sales to business, home, educational and Government users throughout the world.

If £149.95* is within your reach — then so is the world.

*Price excludes VAT. Total delivered price, UK mainland, is £178.19. Prestel, Telecom Gold, Micronet and Microlink are registered trade marks of those companies. Access & Visa cards accepted.



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New graphics program for education

IT took a three-man team three and a half years to write and develop a new graphics package, Image, to aid in art and design on school BBC Micros.

At its launch at Homerton College, Cambridge, by the Cambridge University Press, 120 educational advisers, inspectors, teachers, art college lecturers as well as representatives of computer manufacturers, industry and commerce saw demonstrations of Image by local school-children.

The program team comprised Fred Daly, director of Information Technology, art lecturer David Spence and programmer Chris Forecast.

More than 130 teachers as well as local education advisers helped with the development and finally, for one year, the program was tested in 25 schools in the Essex, Cambridge and East Anglia areas.

Guest speaker was Professor Brian Allison, Dean of the Faculty of Education, Humanities and Social Science at Leicester Polytechnic.

He said children spent an alarming amount of

time watching television and videos. He called the computer games arcades the playgrounds that introduce children to some of the most advanced forms of computer technology.

"Paradoxically very little time is spent in art and design programs in schools helping the children to understand and be critical of, in the positive as well as the negative sense, their most frequently encountered visual images", he said.

"The low availability of suitable and accessible software has given little encouragement to the possibilities of the computer as an art medium. It is my belief that Image may change that situation".

Image can be used with keyboard, joystick, mouse or graphics tablet. The image can be modified or changed, and colours can be mixed. Video pictures can be transferred to the computer screen.

Up to 24 separate screen designs can be stored on a second disc in the package, Sketchbook.

The two discs each cost £39.95.



Screen dump from Image

AZIMUTH CHECK

AN azimuth alignment program which will reduce misloads and minimise the risk of bad saves has been released for the BBC Micros by Global Software.

Operation Alignment is said to help keep cassette heads at the optimum 90 degrees.

The package contains an alignment program tape as well as a screw-driver for adjusting the tape heads.

Price: £5.95.

BBCs mean business



MORE than £400,000 has been invested by Twillstar Computers to promote their sales of BBC Micros.

Over the last three years business boomed so much at their 750 sq ft West London shop that the company was forced to move to larger premises. Now two ware-

houses covering 7,000 sq ft in Southall have been converted into a well-stocked warehouse and adjoining showroom.

The 15 strong staff can now offer full repair facilities and sales advice as well as being able to provide instant stock from the warehouse. Said managing director Sevy

Dhesi: "The BBC Micro has certainly brought about increased sales".

ELEGANT ACCENT

BBC Micro users can now produce voices "with a real English accent" with a Phonetic Synthesiser from Loughborough Sound Images.

Dr Geoff Duck, the company's technical director, says: "People think all synthesisers talk like a Dalek or with a transatlantic drawl."

"Britain has long been a leader in speech research and our system builds on this."

"It speaks with a real English accent and has a natural intonation. The user can tailor the sounds to create accents, and even use another language".

The synthesiser can be adapted for voice-over use with games and can be used to help children to improve their reading ability. Price: £347.

From Page 13

lends itself to letters, posters, menus, in fact anything that needs to be created on A4 size paper.

On the modem front Pace was displaying its internal Master modem for the first time, but it wasn't for sale, as it is still awaiting BABT approval.

Meanwhile arch rival Modem House was also apparently offering a similar product, but wasn't prepared to reveal how it is fitted at this stage.

Over on the DataStar stand managing director Barry Krite was doing a roaring trade in Magic Modems, the device which has recently been given BABT blessing.

Computer Concepts almost made it to the show with saleable versions of its revolutionary new word processor Inter-Word, but not quite.

Despite working against the clock to provide the latest in its suite of integrated programs for the BBC Micro, only a few pre-production prototypes made it to the stand.

However, based on Computer Concept's first class reputation, there seemed no shortage of customers eager to put their money down for empty boxes and wait for the chip.

Wandering around the show produced a number of noteworthy items.

Solidisc was showing off its 256k 2/4 mb ROM RAM board with company representatives insisting that all the bugs have now been ironed out.

HCCS was offering a keyboard based music system in various configurations. Its top of the range Echosound ROM package was reduced from £99.95 to £69.95 for the show.

Micro Aid had its new extended payroll package on view for the first time for £57.

Viglen was seen to be taking advantage of the boom in interest for the Master with a version of its BBC Micro replace-

ment case. With the keyboard as a separate unit, it was being sold for £79.

Overbase - a new company - was eagerly promoting its "Thingy" with balloons and stickers all over the place.

This is a simple but effective plastic device using Velcro strips to attach it to a monitor. Incorporated is a clip to hold paper which can then be easily read by anyone using the keyboard.

"We hope to make a million out of it - and thanks to the success of this show, we are well on our way", a company spokesman told *The Micro User*.

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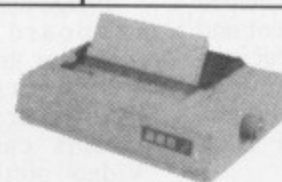
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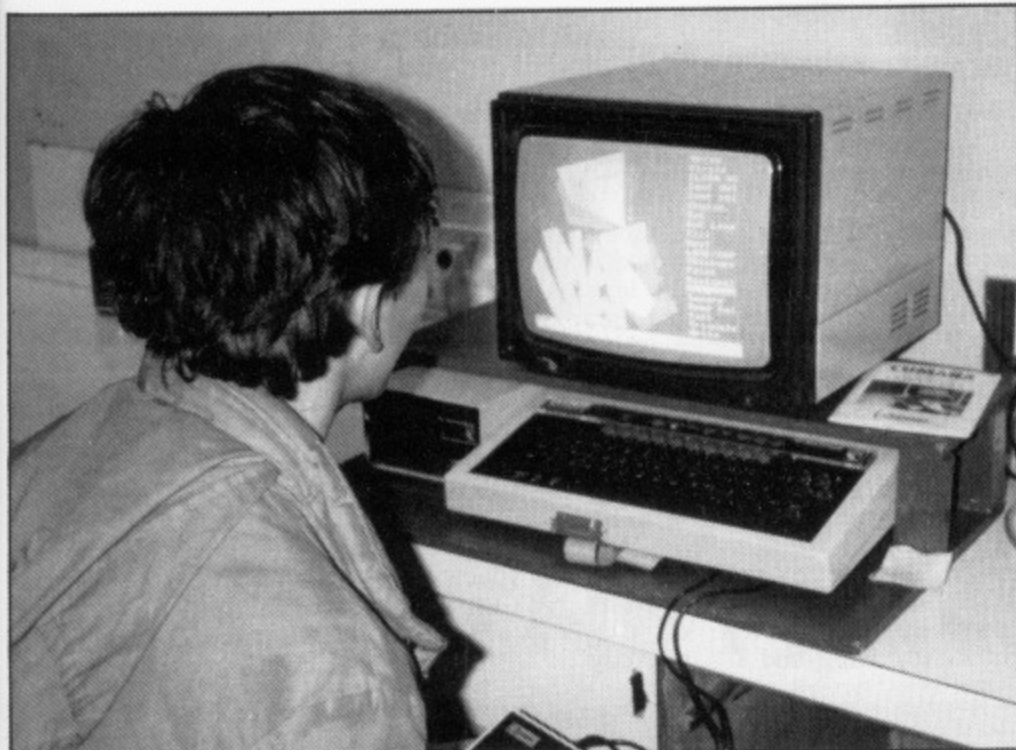
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A youth club member at Sheffield works on the BBC Micro brought in by the community mini-bus

Mobile micro helping youth

PHYSICALLY and mentally handicapped children, youth club members and unemployed young people are being introduced into the computer world by a run-about BBC Micro.

Liz Prior, computer projects supervisor at the Earl Marshall Youth Centre at Sheffield, South Yorkshire, daily runs a mini-bus, with nine other helpers, visiting special clubs for the handicapped and drop-in centres for the jobless.

The project has developed within the centre with the help of youth club leader Gwyneth Harris. She and Liz and two members of the team were delegates to the national conference in London where the application of computers in youth work was debated.

Youth leaders were told by Ed Berman, founder of Inter-Action, an educational charity set up in 1968 as a non-profit making organisation: "Youth clubs could transform themselves into occupational springboards if they used computers in an imaginative way".

In the Sheffield area, Liz is aiming for just that. "If we can give them the opportunity to have a go with a computer and stimulate their interest, they could go on to evening classes and colleges providing computer training", she said.

Arcade shoot-out type

games are discouraged. "We carefully select software and encourage the use of strategy games, adventures and quiz-based programs which require logical skills or participation with others", she continued.

While the BBC Micro is taken about the area youth clubs, priorities are given to organisations which are not funded and special clubs for the disabled or youth clubs which have integrated handicapped people.

Said Liz: "When working with any disabled young people we try to use a touch pad and joysticks to reduce the need for the keyboard and this seems successful."

"Sometimes working in pairs they can provide a good team operating the computer. We also like to encourage sessions just for girls. We feel they can gain more confidence working together without intimidation from the boys".

After the conference the Department of Education and Science announced a £75,000 grant over the next three years to Inter-Action for their youth club community computer projects.

It is subject to them raising matching funds. Already partial backing has been received from the Tudor Trust, Save and Prosper and United Business Systems.

Modems in Schools decision under fire

THE Department of Trade and Industry stands accused of rejecting the principles of free enterprise with its £1 million Modems in Schools scheme, according to a story in the latest issue of the communications magazine *TeleLink*.

It follows the DTI's decision to limit the choice to two modems — the Dacom DSL 2123AD and the Tandata TM512.

Barry Krite, boss of DataStar Systems, the company behind the Magic Modem for the BBC Micro, is so incensed at what he considers to be an arbitrary decision that he has asked his local MP to raise the matter in the House.

"The whole business is

nothing short of disgusting", he told *TeleLink*.

"Here we have a Conservative government which constantly advocates the merits of free enterprise when one of their own departments is actually turning its back on it".

Discounts

According to the DTI the reason why the two particular modems were chosen was that the companies offered major discounts on their products. Whereas the

usual prices for the models are in the region of £300, it is believed the DTI has paid only £110.

"It would seem they are suggesting that they have got the best deal for the taxpayer", reports Barry Krite.

"But when it is not left to ordinary market forces how will they ever know? The only thing I can guarantee is if that's the price they are paying then they could have got a much better deal from other manufacturers — including ourselves".



Samantha and Martech MD David Martin

PMS 6502 for BBC

A BBC Micro version of the PMS 6502 second processor from Permanent Memory Systems will be launched within the next few weeks, the company has announced. The price is expected to be under £100.

Play your cards right with Sam

BBC Micro owners who play their cards right will be able to see more of busty Samantha Fox, for Martech has signed up the top model for a version of Strip Poker.

Samantha, in digitised pictures, starts off fully clothed, including a coat. Then the card game starts.

David Martin, manag-

ing director of Martech, said: "Sam starts to strip should the opponent win a hand. But I can tell you it will need a great poker player to get her to strip fully!"

The program, which also includes Seven Card Stud introducing three international poker players as opponents, costs £14.95.

BBCs could join Navy

ACORN will be competing when tenders are invited by the Royal Navy to supply standard micros for floating classrooms for its junior officers and young sailors.

At present Britain has had to double to 70 per cent the number of sailors in sea-going jobs, cutting the time spent in educational training ashore.

Some warships have a variety of computers,

bought from ship's funds, for study and recreation as well as the officially installed computers needed for analysing the performance of weapons.

But the Royal Navy wants a standard machine capable of helping sailors' basic education in mathematics, English and other subjects, as well as professional courses, previously taught ashore.

The idea is, by providing a standard computer, a

step-by-step teaching system can be worked out so sailors can learn either computerised operational work or CSE and GCE subjects at their own pace and be able to go back over parts they do not understand.

The Royal Navy at present has 25 submarines, three aircraft carriers, 14 destroyers, four Fleet tender training ships, an ice-patrol vessel, eight survey ships, and a

number of frigates, which would all need computers, the larger vessels requiring many additional machines.

An Acorn spokesman said: "We certainly would be interested in submitting a tender to the Royal Navy. We believe the BBC Micro and of course the Master would be ideal with all the educational software back-up which could cater for all sections of study".

Comms link boosts Mini Office II

MINI Office II, successor to the 1985 Business Program of the year Mini Office, is reaching an even wider audience than the first version.

The addition of two new modules - label printing and communications - to the original combination of word processor, database, spreadsheet and graphics has given the software even wider appeal.

As well as business users and computer training course operators, educationalists at all levels from college to primary schools are buying the program, as are hospitals and even government departments.

Mini Office II, which is available from all leading multiples like Boots and W.H. Smith, is being used in Health Service administration, to train youngsters in business technology at places like Newport Itec, and in schools for children of British Army personnel.

"Mini Office II is training administrators of the future", says a spokesman for the publishers, Database Software.

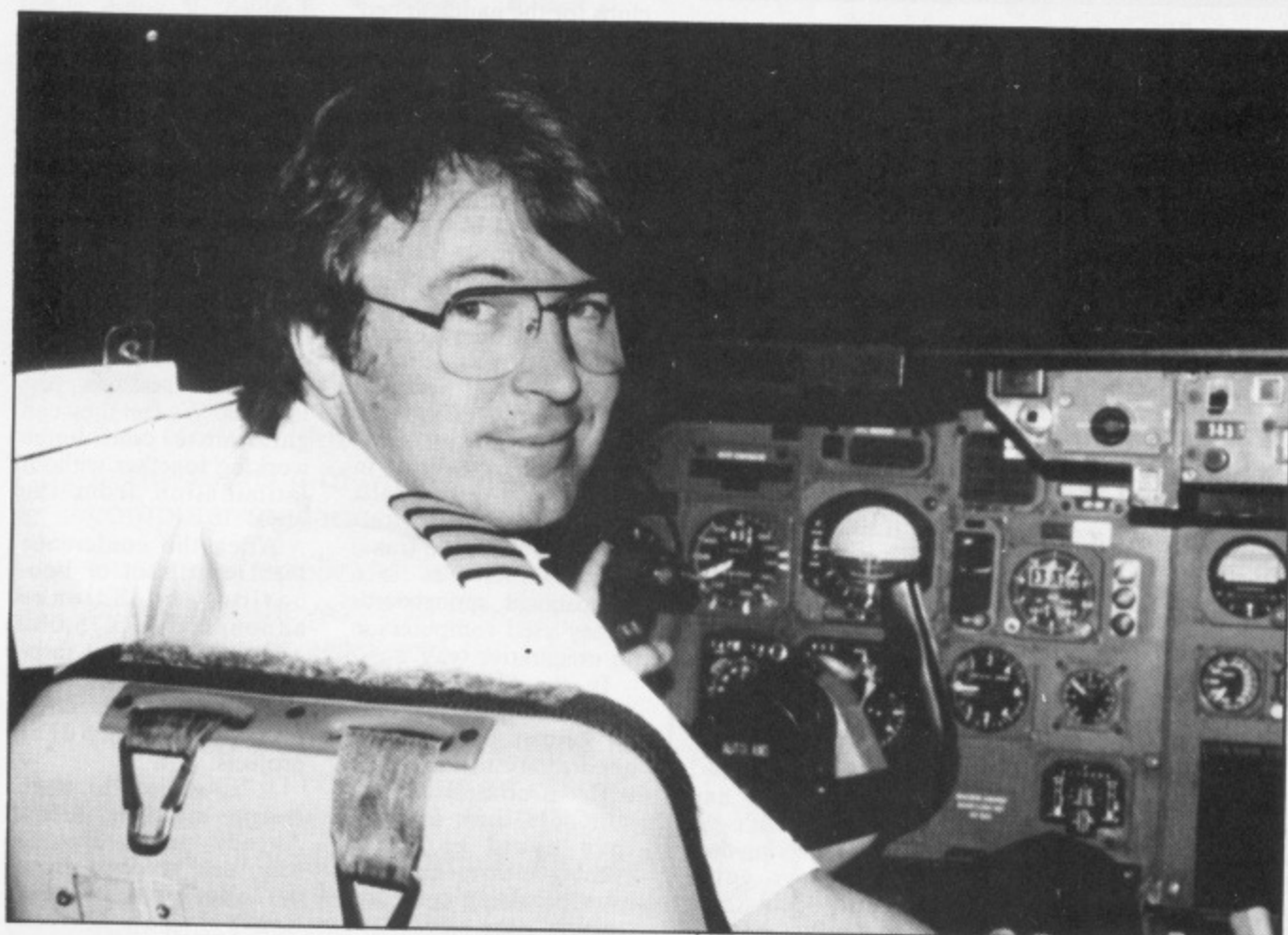
"Even primary schools are using it because its excellent graphics make it an attractive teaching tool for the youngest age groups, while at the same time it is sophisticated enough for any businessmen or office administrator".

Mini Office II costs £14.95 on cassette, £16.95 on 5¼-in disc and £19.95 on 3in disc.

IT'S MAGIK

LATEST adventure released by Level 9 for the BBC Micro is Price of Magik.

The object is to take over the Red Moon crystal ball and learn spells to control an enemy. It costs £9.95 on cassette.



New model on way?

ACORN is saying nothing about rumours of a new machine in the pipeline to take on the Amstrad PCW range, which has a virtual monopoly in its section of the market.

Stories circulating at the Electron & BBC Micro User Show had Acorn bringing out a scaled down Master with big Electron style ULA, two 3in disc drives, 64k, green screen and bundled software for around £400.

SIMULATOR HAS A REAL PILOT

A BRITISH Airways Tristar captain is one of the "crew" behind the first flight simulation program for two linked BBC Micros.

Roger Selby (pictured above) combined his day-to-day flying skills with the expertise of Nick Brown, whose background is in military flight simulation, to come up with Double Phantom from Doctor Soft.

Demonstrated on BBC Television's Micro Live

recently, it is claimed to be unique in that it is multi-user, being able to run simultaneously on two machines.

The essential element is the special hardware link supplied with each program. This connects any two BBC Micros which then become separate "aircraft" flying in shared airspace, with each able to see the other outside.

As a result the linked simulators are able to

perform spectacular aerobatic displays or take part in combat dogfights.

"From the pilot's point of view, I was able to check the realism of instrument and outside view response", says Roger Selby.

"Meanwhile Nick Brown made sure we traded excess ground clutter for speed and smoothness of motion".

Double Phantom costs £19.95.

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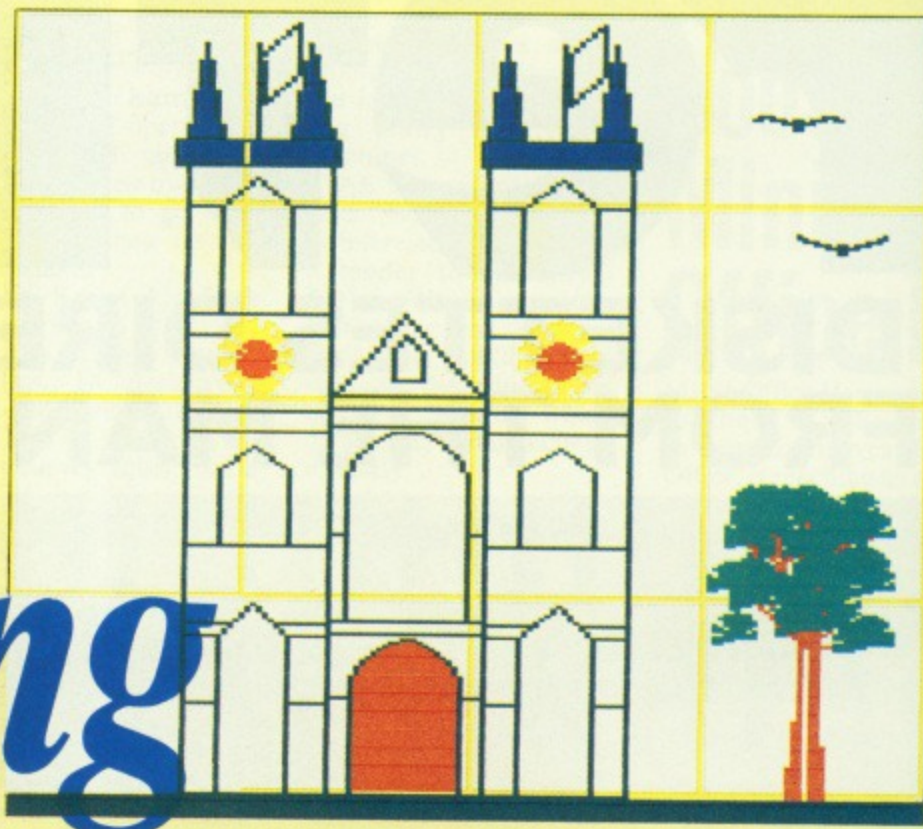
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MU7



Royal Wedding



By **GORDON KEY** and **DAVID McLACHLAN**

TO celebrate this month's Royal Wedding we've come up with a real tester — a sliding block puzzle based on the happy occasion.

When you run the program you will be offered a choice of four inbuilt pictures on the wedding theme or of loading a pre-recorded Mode 2 screen of your own. You will then be presented with the complete picture.

Once you've studied it, shuffle the

picture with Tab and attempt to solve the resultant jumble. The keys you'll need to sort it all out are:

| | |
|---|--------------------|
| : | Move tile up |
| / | Move tile down |
| X | Move tile to right |
| Z | Move tile to left |

Tab can be pressed at any time to further shuffle the tiles. Should you give up, pressing Return will undo all your

moves and any entered by Tab, and the puzzle will be solved for you in a few seconds — provided less than 2000 moves have been made!

Pressing Escape at any time after that will return you to the menu so that you can select another picture.

The program's operation is quite simple. Two short machine code routines are assembled at &110 and &900. The first is used to move a block or tile by accessing the screen directly, and the second prints large letters.

The first routine unfortunately makes the program incompatible with the 6502

VARIABLES

| | |
|-------|---|
| A% | Flag for PROCmove and a CALL variable for PROCbig. |
| C% | General purpose for colour value. |
| D% | Start of data storage for saving moves. |
| E% | Determines souvenir balloon's speed. |
| F% | Local flag for FNpic5. |
| H% | Byte pointer for move storage. |
| I% | Inkey value and secondary counter. |
| M% | Call address for the machine code routine. |
| N% | New tile number (the tile that will be moved). |
| O% | Old tile number (the number of the blank space). |
| P% | Bit pointer for move storage. |
| R% | Value for the radius of the circle drawn by PROCc. |
| S% | Flag to indicate that at least one move has been saved. |
| FI% | Number of steps in circle loop. |
| ST% | Step number. |
| TY% | Type of circle (filled, not filled, spoked). |
| COL% | Colour of circle. |
| c(24) | Cosine array. |
| s(24) | Sine array. |
| \$D% | Used by FNpic5 for passing strings to the command line interpreter. |



second processor and shadow modes, but it is necessary for speed.

The screen is split into 16 equally sized tiles which are numbered from 0 to 15. Two integer variables, N% and O%, are then used to pass the new and old tile numbers to the assembly routine via the CALL statement using the parameter block provided in page six by Basic. The routine also transfers the contents of the

first variable to the second.

Each time a tile is moved – including random moves generated by pressing Tab – the move is recorded by PROCsave. This stores four moves in a single byte of memory starting at &A00. Due to this efficient method of storage almost 2000 moves can be safely stored.

Pressing Return solves the problem by simply reversing all moves until the picture is restored. If the computer beeps while you are playing, it means



that the available storage memory is full and you have two options.

You can either press Return to solve the puzzle, or press C to continue, but note that Return will no longer solve the puzzle as the counter (H%) is zeroed.

If you select option 5 in order to load your own Mode 2 picture this should have been previously saved to tape or disc using the command *SAVE <filename> 3000 +5000.

On selecting this option you are given the choice of entering a filename or a star command. This facility is useful for cataloguing tape or disc, changing drives and so on, though take care as some commands could destroy the

program (selecting another language for example).

If a disc error occurs this will be displayed for a short period before you are returned to the menu.

When saving your own screen, it is advisable to set up a window using VDU 28,0,31,4,25. Although this makes reading a little difficult, anything that you type or the computer outputs will print on the part of the screen where the missing tile starts and not destroy your picture.

You should note that due to the length of the program several sections are deleted after use before the main program is run. It is therefore essential



that you do not add any extra spaces as you type it in and save the program before running it.

Also the program is downloaded to &1100 if page is higher. This still allows users of most types of DFS to load their own Mode 2 screens.

The following function keys are defined and called from within the program:

- f0 Downloads the program if necessary.
- f1 Deletes all the assembler code.
- f2 Deletes the instructions.

Full listing starts on Page 109

PROCEDURES

| | | | |
|-------------------|--|---------------------------------|--|
| play | The main game repeat loop. Repeats indefinitely until Escape is pressed. | grid(gc%) | Draws the grid in the colour gc% that separates the 16 picture titles and sets the initial values for the puzzle. |
| move | If A% is TRUE this procedure makes the souvenir balloon picture move by redefining the actual colour displayed by colour numbers 1 through 12. | title | Sets the initial program variables and runs the title sequence. |
| get | Gets keyboard input and returns the new title number (N%). | writeword (x%,y%,word\$) | Writes word\$ in big letters at x%,y%. |
| del(d%) | A delay procedure that runs independently of TIME. | f(X%,Y%,C%) | Fills an area from X%,Y% in the colour C% |
| save(h%) | Records each move whether entered from the keyboard or generated by PROCshuffle. Each move is stored as a two bit number thus enabling four moves to be stored per byte of memory. | inst | Prints the menu of options, gets the one required and returns a string that tallies with the appropriate picture function. |
| solve(d%) | Solves the puzzle by reversing all moves until the picture is restored. | dim | Dimensions and sets the values of the SIN and COSIN arrays used by PROCs. |
| shuffled() | Randomly shuffles the picture tiles. Draws a circle controlled by the numerous parameters. | big(A\$,X%,Y%,c%) | Prints A\$ at X%,Y% in colour c% and in double height characters. |
| | | code | The assembly language procedure for moving the tiles. |
| | | code2 | The assembly language for the big letters routine. |

INTER-WORD

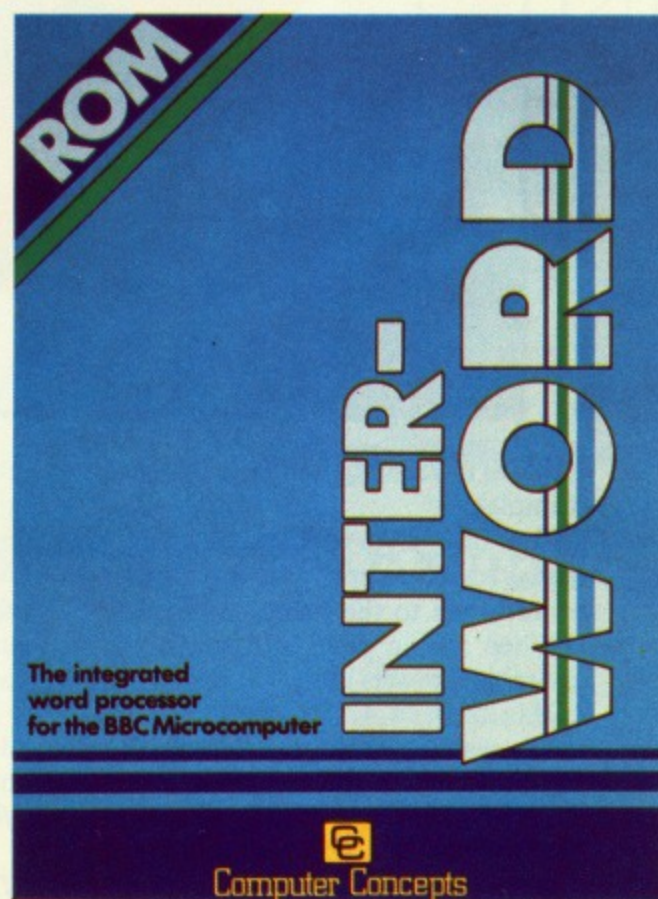
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COMPATIBLE WITH THE BBC MICRO MODELS B, B+, B+128 & MASTER

INTER-WORD

INTER-WORD shows an accurate image of the final printed text during editing. It is continually re-formatted as new text is entered, so ensuring that the screen always accurately represents the final document. Justified text is also shown while editing; this includes left, right and fully justified and centred text.

The layout of text is controlled by rulers. These are extremely easy to insert and just as easily changed to give a different format. Any aspect of the ruler can be changed by 'dragging' its position marker using the cursor keys. No description can do justice to the intuitively simple ruler editing.

Although embedded commands are little used in INTER-WORD, some embedded commands are still allowed and may be 'hidden' in the text without upsetting the screen format, appearing only if they need to be edited. ANY codes for ANY printer can be included at ANY point within the text. Standard effects such as bold and underlining are shown on-screen. A simple printer code menu allows codes for any printer to be easily included.

provides a simple and very effective means of moving or copying any section of text to any other position in the document. However INTER-WORD has extended the marked section idea so that it may be centred or underlined or emboldened etc.

Comprehensive search and replace functions are included. The search and replace strings are stored so they may be used again and again. The user has the choice of case dependent searches or not. Wildcards are allowed.

INTER-WORD is very easy to use. Page format, preferences etc. are controlled from a series of pull down menus. Incorrect settings are impossible to enter, being rejected before they can cause a problem.

The latest computers make use of menus in the same way

There is even a menu giving direct access to the associated SPELLING CHECKER ROM expected to be released later this year. This will be an entirely ROM based checker with over 50,000 words on chip ensuring that it is extremely fast. It also allows user defined dictionaries on disc or sideways RAM.

as INTER-WORD. There is no need to remember long lists of commands or values which may follow them, all options are shown on the menus.

For example there is a 'preference' menu. This allows easy selection of screen colour, key repeat rates, screen mode, whether TABS and CR are shown on screen or not, etc. There is a comprehensive 'printer setup' menu. This controls things like the number of copies printed, the number of columns, the line spacing etc.

Another menu is for control codes, so that the codes for underlining, bold and other screen effects may be set for any printer.

Saving and loading is performed via a file selector menu which lists the filenames and allows selection by name or by moving the cursor. Once tried, any other method of entering filenames becomes a real chore.

Most functions are controllable by one or two key presses as an alternative to menus. This allows users to choose whichever option suits their preference and experience.

Inter-word features include: a simple and very effective means of moving or copying any section of text to any other position in the document. However INTER-WORD has extended the marked section idea so that it may be centred or underlined or emboldened etc. Comprehensive search and replace functions are included. The search and replace strings are stored so they may be used again and again. The user has the choice of case dependent searches or not. Wildcards are allowed. INTER-WORD is very easy to use. Page format, preferences etc. are controlled from a series of pull down menus. Incorrect settings are impossible to enter, being rejected before they can cause a problem. The latest computers make use of menus in the same way. There is even a menu giving direct access to the associated SPELLING CHECKER ROM expected to be released later this year. This will be an entirely ROM based checker with over 50,000 words on chip ensuring that it is extremely fast. It also allows user defined dictionaries on disc or sideways RAM.

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Multiple-column printout facility is an integral feature. After setting the text width to suit one column and setting the number of columns, printing out is just a matter of pressing a key.

INTER-WORD uses a similar method of marking sections of text to WORDWISE. This



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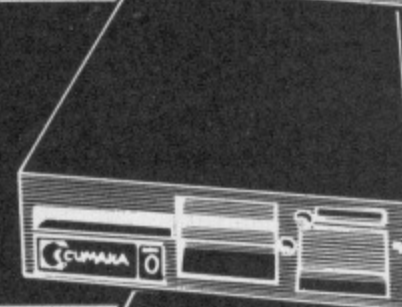
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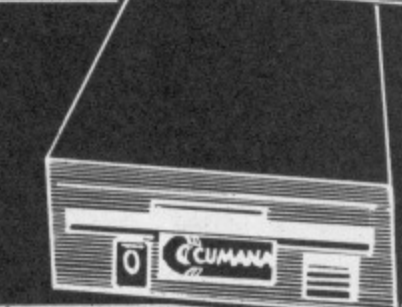
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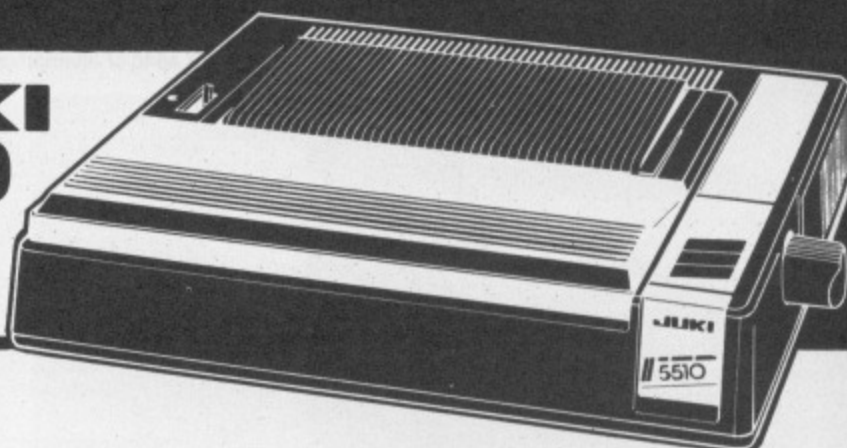
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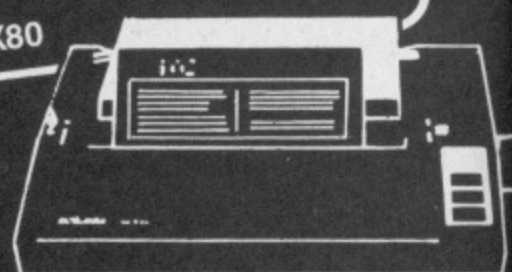
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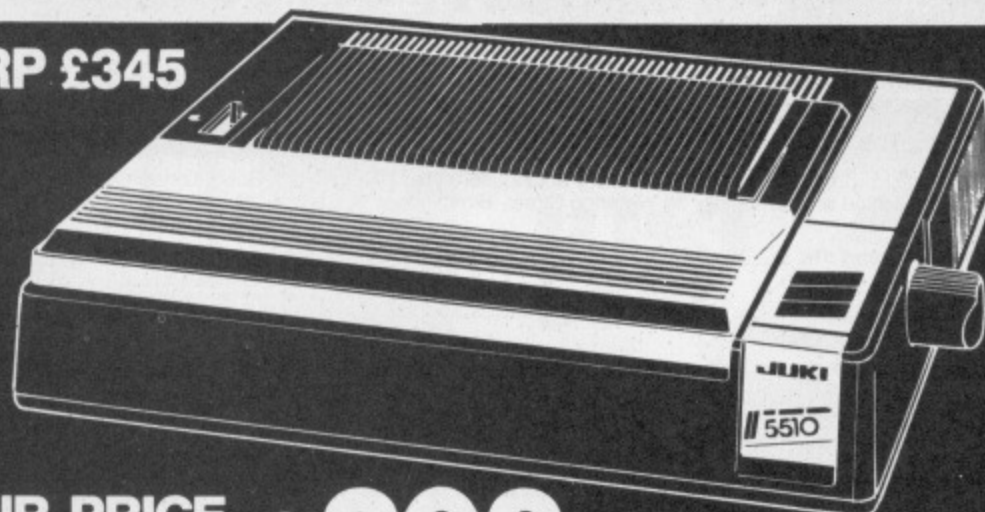
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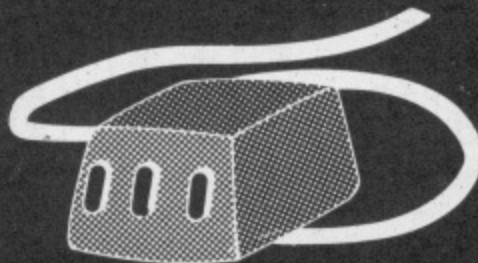
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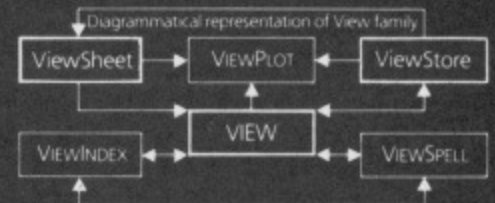
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| GREMLIN £33.35 8k | cco | This is a machine language monitor ROM designed for use as an aid to development and debugging of machine code programs. It works in any screen mode and has a built-in help menu. |
| MACRON £30.00 16k | cms | A macro assembler for the BBC Micro. Provides its own screen editor with automatic formatting on screen. Assembly can be from disc so allowing very long source codes, limited only by disc space. Features include conditional assembly, user defined macros, chaining source files and so on. |
| ROMAS £51.75 16k | wat | Powerful multi CPU assembler for 6502, 65C02, Z80, 8085, 8041, 6809 and Z8 processors. Includes macro editor, powerful assembler directives and disc to disc assembly. |
| SPY2 £29.99 8k | sys | A front panel debugging monitor, disassembler and disc utility ROM for inspecting, modifying, debugging and disassembling machine code programs. Also features a relocater and program trace facilities. SPY2 will access any ROM. ROM memory may be displayed, single-stepped or disassembled. Includes a disc formatter as well as a non-destructive single track reformatter. |
| VASM £23.00 16k | auc | Assembler with extended instruction set for 65C02. Produces Intel object code files, and has a routine to convert to binary image. Includes local labels, conditional assembly, dynamic equate facility and file include facility. |

Toolkits

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| ADDCOMM £28.00 8k | vin | Graphics and toolkit ROM adding 40 new commands to Basic including sort routine and graphics fill. |
| ADVANCED ROM MANAGER £9.99 8k | acp | Utility for ROM and sideways RAM users. Features bi-directional hex/Ascii/65C02 disassembler and editor. Turn off unwanted ROMs and make files suitable for ROM filing system. |
| ADVANCED DISC TOOLKIT £34.00 16k | acp | It features ADFS disc utilities in ROM; disc commands automatically operating in DFS/ADFS; memory editor operating on both sides of the Tube; hex/Ascii/65C02 disassembler editor; memory/disc editor operates in 40/80 column modes; transfer files between disc, tape, ADFS, Net. |
| ADVANCED DISC INVESTIGATOR £28.75 16k | acp | Disc utility. Features: Backs up most protected disc; copies 40 track to 80 track; verifies to name; standard disc edit; checks and repairs faulty track; creates new disc format; operates in single and double density with 1770. |
| BASIC EDITOR £29.00 16k | aco | A utility ROM which provides powerful full-screen editing facilities for developing and maintaining Basic programs. Many of the facilities of a word processor are provided such as the ability to move or copy blocks of program lines. In addition you can define the target of jump instructions as labels and then automatically insert the appropriate line number when the editing sequence is complete. |
| BASIC EXTENSIONS £19.95 16k | mpw | Adds three new structures and further LISTO options: WHILE, ENDWHILE, CASE, WHEN, OTHERWISE, ENDCASE, LOOP, EXITIF, ENEXIT, ENDLOOP, FIF, THEN, ELSEIF, ENDF. Altogether there are nine new statements and 16 new commands. Also adds a variety of new keywords to Basic. |
| BROM £30.00 8k | cla | Full screen editing of Basic programs. Provides 21 extra commands for Basic programmer, including error trapping variable lister, formatted lister, find and replace (including Basic keywords), ROM on/off. |

Assemblers/Monitors

| | | |
|------------------------------|-----|--|
| ADE £59.95 16k | sys | Complete development package for assembly language programmers. ROM contains a 6502 macro assembler, text editor, monitor and disassembler. |
| AID £24.35 8k | lms | Features unique dual screen facility enabling two concurrent screens, so use of AID monitor does not mean loss of your graphics screen. 40 commands. |
| ASM £34.93 8k | sys | ASM provides all the features of the ADE macro assembler on its own ROM. The program source file may be written using any editor (even Wordwise or View!). Reference manual and utility/macro library disc. |
| BEEBMON £27.60 8k | wat | 6502 disassembler/monitor package. Allows full emulation of 6502, with correct handling of code in any sideways ROM, including DFS. |
| EXMON II £27.80 8k | bbs | Features dual screen operation, a full screen memory editor and over 60 commands. If you are debugging a program with a visual display, you can single step through it and 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 memory and so on. |
| FMON £10.35 8k | fso | Machine code monitor which is relocatable to any part of RAM. There is a line by line assembler and a relocater program. It has all the usual monitor routines such as block move, change memory, disassemble, trace mode, break points and full support of VDU and MOS commands. FMON also has more powerful commands, including user-defined variables and procedures. |

| | | |
|---------------------------------------|-----|---|
| BROM+ £34.50 16k | cla | Contains most of the commands of BROM plus commands related to disc handling and several utilities. Disc commands include disc edit, disc find, format (both sides), DGET and DPUT. General commands include FNkey, memory edit, memory find, ROM list, ROM on/off. Basic commands include a fast cross referencer and partial renamer. |
| CARETAKER £29.00 8k | cco | Includes 17 new commands to aid writing and debugging Basic programs. For instance *RENUMBER can renumber parts of programs and move them to any other position in the program. *SQUASH packs a program down to the smallest it can go. |
| DISC DOCTOR £29.00 8k | cco | A general purpose utility ROM adding 20 new commands to the BBC Micro. The extensive range of disc commands includes a disc search routine, a sector editor, and a formatter which gives the capability for 60 files per side. The more general purpose commands include some memory search routine, and an interactive memory editor (MZAP). Also included is a disassembler. |
| FLOPPY-WISE PLUS £20.95 16k | sof | Half of this 40 command toolkit is for disc users, with search and edit functions, repair, tape/disc transfer, clone disc backup, multicopy, disc protect, and an automatic menu for any selected drive. Basic programmers are catered for with find and move commands, search and edit routines for both sides of the Tube and any sideways ROM, and autosave. Also included is a full menu-driven ROM management system with RAM load and save. |
| GRAPHICS ROM £29.00 8k | cco | Includes over 28 new graphics related commands. Sprite graphics and LOGO type turtle graphics are provided, as are commands for filling a shape with colour, circle and arc drawing, 3D graphics routines, drawing large multicoloured characters, routines for scaling all subsequent graphics commands, making the results bigger or smaller, or rotating all further graphics output by a certain angle around a certain point. |
| INTER-CHART £32.00 16k | cco | A graph and chart drawing program which can take data from either the keyboard, from an Ascii file prepared on a word processor, or directly from another ROM-LINK package, such as INTER-SHEET. Graphs can be either line, bar or pie charts, and all aspects of the graph can be controlled by the user. Provision is made to allow dumping to a printer. |
| MATRIX £41.40 8k | vin | Use Basic commands to perform matrix operations including arrays, linear simultaneous equations. Swap names of variables. |
| MEGA ROM £34.95 16k | chs | Adds over 60 commands to your BBC Micro. Covers graphics, sound, printing, programming, disassembly, memory and disc search and edit, re-direction on pressing Break, file-handling and formatting. |
| PRINTMASTER £29.00 8k | cco | This printer utility ROM enables the user to access the special features of their printers easily. Two versions are available, one supports the Epson MX, RX, FX and compatible range, and the other is for the STAR Delta, DP, Gemini and Radix printers. Printmaster can dump a fully shaded version of any mode screen to the printer, even Mode 7 teletext graphics. |
| ROM MASTER £14.95 8k | chs | Incorporates several utilities to help prevent the interference which can occur between ROMs, as well as commands to encrypt and de-encrypt a file based on an entered password. |
| SCYTHE £24.00 8k | chs | Covers ROM management, utilities for the disc user, aid for the machine code or Basic programmer, as well as general utilities. |
| SLEUTH £27.80 8k | bbs | This Basic debugging tool features single stepping through Basic, dual screen operation, breakpoints, accelerator, full feature control screen and trace, a sophisticated line trace facility. |

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| SPEECH ROM £29.00 8k | cco | This ROM uses one of the Acron speech chips, the TMS 5220, to provide an infinite vocabulary. Phrases are entered as a series of phonemes, the individual sounds needed to make that phrase. The phrase can be given a specific intonation pattern, which means you can emphasise certain words, or express surprise, resignation and so on. It can even sing! |
| TOOLKIT PLUS £33.90 16k | bbs | Basic programmers' aid. It offers over 40 new command features which may be called individually or from a menu. It includes a powerful full-screen editor and a unique syntax checker, which will spot mistakes as you key in your program. |
| TOOLSTAR £29.57 8k | pac | A suite of programmers' tools which have been designed specifically to aid program development and debugging. It is transparent to the user and operating system and occupies no user RAM. Comes with comprehensive easy to use manual. The many commands are in three groups: Basic, disc and memory tools. Toolstar can also utilise your own routines in RAM. |
| VIEWSPELL £39.95 8k | aco | An automatic spelling checker, enabling you to produce error-free documents every time. The program will check each word in your document against its master dictionary of 70,000 words. Alternatively, create your own dictionary of technical terms or names and addresses. ViewSpell can also search your dictionary for words beginning or ending with certain letters. |

Wordprocessors

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| ALPHA £34.50 16k | auc | A fully-fledged word and language processor with built-in lexicon. Can be used to build up a word list for classroom or individual use. |
| EDWORD2 £45.95 8k | clw | Includes a comprehensive range of facilities and is easy to use. It can be used at primary and secondary schools, and also at universities. It is also of value as a writing tool for children with special needs. It comes complete with comprehensive documentation and teaching guidelines. |
| MERTEL SCRIBE £52.13 8k | mer | Full random access. Up to 255 pages in one document. 80 column editing. See it as you print it. Own universal printer driver included. |
| PENDOWN £39.10 16k | log | A "what you see is what you get" word processor, designed for use in primary schools. Features scratchpad utility for planning your text. Comes with disc containing a dictionary, a range of font styles and a font editor. |
| ROMSPELL £28.75 16k | wat | Takes text files and checks them against the 30,000 word system dictionary and a user defined dictionary. |
| TITAN £95.00 16k | mer | Integrated wordprocessor spelling checker database, statistics and graphics. Includes disc. Master only. |
| VIEW 2.1 £59.80 16k | aco | An award-winning word processor with advanced facilities designed to help both the professional user and the beginner to create high quality documents. |
| VIEW 3 £89.70 16k | aco | Specially designed for use with the BBC Micro B+. This package contains a comprehensive user guide and the Printer Driver Generator program on both disc and cassette. |
| WORD AID £23.00 16k | wat | Powerful extension ROM for Wordwise Plus. Adds a host of extra utilities via new menu of options. Powerful and simple in use. |

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| WORDWISE £40.00 8k | cco | Popular word processor for the BBC Micro. It gives the user total control over text entered into the machine. The more complex operations are menu driven. Wordwise works with all filing systems and with any BBC Micro compatible printer without needing printer drivers. |
| WORDWISE PLUS £49.00 16k | cco | An enhanced version of Wordwise. It still has Wordwise at its core but the existing features have been enhanced with new embedded commands and so on. The major change is the addition of a full programming language which allows the user to add any features he needs. |

Miscellaneous Utilities

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| DDFS FULL KIT £54.00 16k | wat | Features include commands of standard WE DFS, but with DDFS capability, giving 80 per cent increase in storage. Extremely powerful 8271 emulation. |
| DDFS PLUS £34.50 32k | wat | Extended version of the WE DDFS. Now incorporates many Acorn 1770 DFS commands, with even more extensions to follow. |
| DFS-AID £16.52 8k | lin | General purpose disc management package. |
| DOUBLE-DOS £45.00 16k | mer | Double density DOS for BBC+. Standard BBC DFS compatible. Gives 720k in one file. 159 files in one directory. Ideal for large databases. |
| DUMPMASER £27.00 16k | bbs | Provides fast machine code dumps using up to eight shades and will accurately copy your screen in any of the graphics modes and even in the teletext mode. It also includes a special 'snapshot' facility to produce screen dumps from a game, or any other program, at the press of a key (unless protected). Compatible with most printers suitable for the BBC Micro. |
| DUMPOUT 3 £28.75 8k | wat | Takes an image from the screen and produces a copy on the printer. Various actions can be performed, including positioning, scaling and rotating. |
| EPSON NLQ £28.75 8k | wat | Advanced printer utility ROM that makes a standard RX or FX printer print in NLQ (near letter quality). |
| GXR £29.90 16k | aco | Extends the standard PLOT and VDU calls to provide circle plotting, ellipses, parallelograms, dotted and dot-dash patterns, shading patterns, colour fill, shade fill and sprites and includes a built-in sprite designer. |
| HELP ROM £27.00 16k | bbs | Provides comprehensive on screen information to aid programming. Contains 28,000 characters of text to help you when you get stuck for a command or its syntax. For a piece of information simply type, for example, *H Print, *H OPT or *H FX. |
| ICON MASTER £29.60 16k | bbs | Automates the creation of an icon-driven user interface. It allows you to design a screen containing icons and then use it in your own programs in place of a normal menu. May optionally be controlled with the AMX mouse. Icons (sample sets provided) are designed on a special screen editor and are compatible with AMX icons. |
| LBO £19.95 8k | gem | Life and business organiser, featuring diary and appointment scheduler, notebook, reminders, month and week planner, search facility, user-defined categories and built-in calendar. |
| DATASTAG £49.95 8k | mer | Statistics and graphics. Uses data from Mertec Database. Very powerful stats plus full range of graphics. Up to four graphs on one screen. |

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| MUROM £27.80 8k | bbs | Create your own tunes and sound sequences either with Murom's editor and a musical score or by using the BBC Micro to simulate a piano keyboard. Edit your own 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. |
| NLQ DESIGNER £28.75 8k | wat | Advanced font editor and designer for the NLQ fonts for the KP810 and GLP NLQ printers. Specify GLP or KP810 printer. |
| NOVACAD £90.85 16k | tec | Computer aided 2D drafting package. Powerful icon creating facility allows drawings with up to 500 lines to be converted into icons. Single drawing can have up to eight levels, display on each level can be configured independently. Horizontal and vertical scaling. High level zoom. Printer routine for Epson printers. Optional versions for use with AMX Mouse and Tracker Ball. Plotter driver generator available as separate package. B+ and 6502 second processor compatible. |
| PAGEMAKER £49.95 8k | ams | Produce your own newspapers, posters and leaflets with this complete graphics design system and word processor rolled into one. Two ROMs, two discs and an extensive manual. |
| PROTECTOR £24.95 8k | gem | Designed to make confidential disc data secure and unavailable to those without the required password. |
| REPLAY £35.00 8k | vin | Tape to disc transfer utility. Dumps whole of 32k memory once activated by a hardware switch. Also allows screen print out for games. ROM connected to PCB and three connection points in the computer. No soldering. (All hardware supplied.) |
| ROMIT £29.60 16k | bbs | A RAM filing system providing over 20 new commands which enable you to create a silicon disc with its own filing system commands; put your own Basic or assembler programs (or any files) into RAM and then make them into Eproms; use your sideways RAM as a printer buffer so that you can continue to use your computer for other work at the same time as printing long documents. |
| SCRIBECHEC £24.95 16k | mer | Spelling checker for Scribe, View and Wordwise. No limit on document length. ROM and RAM dictionary. Speed 3,000 wpm for Scribe, 1,500 wpm others. |
| SECURITY £9.95 8k | sof | This sits in the machine and displays your name and address and other personal details on power-up. If required a coded entry to the computer can be programmed in. |
| SJ CONTROL £45.00 8k | com | Adds extra Basic keywords to control all the BBC Micro's ports. Includes built-in RS423 terminal emulator. Output configurations are single or multiple bit, set high, low or unchanged, toggled or user-defined. |
| SPELLCHECK III £31.30 16k | bbs | Provides an automatic spelling check for letters and documents produced on Wordwise and View. It is supplied on 16k ROM (including about 2,000 words) with an accompanying dictionary disc containing an additional 6,000 words. This dictionary automatically accepts new words as you use it. |
| TRANSFEROM £28.75 8k | wat | For transferring games from tape to disc utilising sophisticated copying techniques. |
| U2 UTILITY ROM £32.20 8k | kmc | For use with Acorn 6502 and Z80 second processors, the U2 gives up to 28k printer buffer, executes input/output code from Tube, can turn off Mode 7 interface, identifies and kills ROMs, facilitates fast data transfer between processors (64k per second) and has an easy screen save for 6502. |

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| VIEWPLOT £29.95 8k | aco | ViewPlot enables you to produce excellent line graphs to illustrate sales figures, for example. You could use the program to draw pie charts to demonstrate the voting breakdown in a local election, or bar charts to display the resources used on different projects. |
| DFS ROM £18.40 16k | wat | An alternative to the Acorn DFS, the Watford Electronic's DFS offers many useful features over and above the Acorn DFS, and yet retains full compatibility with the Acorn DFS. |
| WORDEASE £25.20 32k | bbs | Aims to streamline word processing on Wordwise Plus. It provides a number of new applications, such as mail merging and label printing, and some handy programming utilities such as a program compactor and variable display. It also allows you to easily move around segment and text areas at the touch of a key. |

Languages

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| ACCELERATOR £56.00 16k+8k | cco | A comprehensive BBC Basic compiler, it can compile almost any Basic program. It gives full floating point arithmetic. Most programs not only run faster, but are more compact. Faster but larger machine code programs can be produced from many programs, with certain limitations such as only integer arithmetic. (2 ROMs.) |
| BCPL £59.80 16k | aco | A flexible structured language that is easy to learn. It is particularly good at handling input and output, and is often used to write utility programs. |
| COMAL £49.85 16k | aco | A general purpose language which has been chosen as the educational standard in many European countries. It includes a number of features which encourage well-structured programming and facilitate debugging and maintenance of software. A comprehensive user guide is supplied. |
| FORTH £49.85 16k | aco | A complete implementation of the language to the 1979 specification. It is a compiled language so programs run very fast. The pack includes a tape or disc with a Forth dictionary and compiler. |
| ISO-PASCAL £69.00 32k | aco | A full implementation of Pascal to the ISO standard, with extensions to take advantage of the BBC Micro's special facilities (sound, graphics and so on). A disc is supplied with an extended compiler to take full advantage of a 6502 Second Processor if fitted. (2 ROMs.) |
| LISP £49.85 16k | aco | The fundamental language of artificial intelligence research it offers more flexibility in data and control structures than traditional languages. The system contains a number of extensions to basic Lisp. |
| LOGO £69.00 32k | aco | A full implementation of Logo, containing all the standard turtle graphics techniques and list processing functions. Additional features include changeable screen mode allowing multi-colour graphics, sound commands for four-part harmonies, multiple screen turtles which can be independently controlled, split and variable sized graphics and text windows. (2 ROMs.) |
| LOGO £69.10 16k | log | A full implementation featuring full-screen editor, and fully extensible at machine code level. Optional extras include a hardware sprite board with 32 sprites, and an advanced Logo disc including a control Logo extension. |
| LOGO £40.00 16k | los | A full implementation of Logo. Includes two toolkit discs containing applications, interfaces and extensions. Runs in sideways RAM. |

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| MICRO-PROLOG £79.95 16k | aco | Designed to emphasise human logic rather than machine procedure and to put artificial intelligence techniques within the grasp of the micro user. The language readily lends itself to relational database, expert system, and problem-solving applications. Contains a version of the interpreter to take full advantage of a 6502 Second Processor if fitted. |
| MICROTEXT PLUS £253.00 16k | aco | A frame-based authoring package developed by the National Physical Laboratory. The system that enables interactive computer applications to be developed by users with little or no previous programming experience. |
| MULTI-BASIC £34.00 8k | cms | A comprehensive control language. It allows BBC Basic users to write and run event driven multi-tasking programs. It extends Basic making control programs, shorter, simpler, and more readable. It is fully multi-tasking with up to eight background tasks running concurrent with the main program. There is no interference with normal Basic functions. |
| MULTI-FORTH £46.00 16k | sky | Based on the Forth 83 standard, features multi-tasking operating system, 6502 assembler, screen editor and unique stack display utility. |
| OPEN LOGO £69.95 32k | bbc | Full implementation of Logo, written by the Open University complete with 120pp tutorial and 320pp reference manual. Tube version included in pack. (2 ROMs.) |

Communications

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| COMMSOFT £30.00 8k | sof | Features include a direct file transfer utility and an editor for creating viewdata frames. You can prepare mailboxes off line and send using high speed send function. |
| COMMSTAR £33.92 8k | pac | Menu driven integrated Viewdata and Ascii communications software on ROM. Full error checking routines, programmed function keys, and manual all enhance Commstar's user friendliness. Creates an intelligent, buffered, communications terminal with storage to the current filing system thus allowing manipulation of data off-line. A comprehensive range of data parameters and communications protocols are supported. |
| COMMUNICATOR £60.00 16k | cco | Designed to operate as a full VT 100 terminal, allowing the home user to talk to mainframes which normally expect to talk to a VT 100. It can operate at baud rates up to 19200 baud with full handshaking. It can also be used to talk to general purpose electronic mail systems or bulletin boards. |
| DATABEEB £28.75 8k | mir | This ROM-based intelligent firmware gives your BBC Micro plus a suitable modem access to a range of databases and information sources such as Prestel, Viewdata, Telex and MicroLink. The package includes a user guide and function key card. Databeeb handles baud rates of 1200/1200, 1200/75, 75/1200, 300/300 and 600/600. |
| LE MODEM £102.38 16k | wat | Powerful and complete modem package. V21 and V23 CCITT and Bell 103/113/118 formats are supported. Auto dial and auto answer are included as standard with full software support. |
| TERMI II £29.00 16k | cco | Turns a BBC Micro into an easy to operate communications terminal, which can be connected to almost any other computer with a serial RS232 interface, either directly or via a modem. It allows files to be transmitted or received to and from disc, and can send incoming data to a printer. TERMI II can be configured to act like many semi-intelligent terminals, for example VT52 or ADM3A. |

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| TERMINATOR £34.50 16k | aco | Enables the BBC Micro to emulate a variety of industry terminals. The emulations provided are: ANS (VT100); VT52; Tektronix 4010; a 'dumb' terminal; a 'hardcopy' terminal, and a special 'BBC terminal' which enables the host's output to be sent directly to the BBC Micro's VDU drivers. |
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Databases

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| DATABASE £49.95 8k | mer | Full random access. 4,000 records. One record 96 fields, one field 900 characters. Total flexibility of search and printed output. Integrates with Scribe to produce powerful mail merge. |
| DATASCRIBE £69.95 16k | mer | Combines Scribe, a virtual memory wordprocessor which can edit a file up to 256 pages in length, and Database with full report facility and mailmerge. |
| DATAGEM £69.50 16k+8k | gem | Random access database allowing up to 5,000 records, and 62 fields. All data types accepted, with comprehensive maths functions and relational fields. Search on any combination of fields, sort, send data to 'Wordwise' and 'View', and design reports for printer. Database may be re-structured without loss of data. |
| FILEAID £30.43 8k | lin | Database accessible from Basic. |
| QUEST £24.15 16k | auc | Quest is a command driven information handling package. Designed to meet the needs of both Primary and Secondary schools, Quest allows the user to set up his own databases with up to 20 fields, edit existing databases and then to interpret them. Data can be sorted out and justified. Utilities allow data to be displayed as a bar chart or scatter diagram. |
| VIEWSTORE £59.80 16k | aco | A powerful, general-purpose database manager with a range of possible applications. Database information is divided into records, and records are divided into fields. Utilities supplied on an accompanying disc include a flexible report generator and a program to convert databases from the formats used by other programs (including Acornsoft Database). |

Spreadsheets

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| INTER-SHEET £49.00 32k | cco | Includes a large range of high precision mathematical functions, and special sheet functions like SUM, MIN, MAX. It can send data directly to other Rom-Link packages, for instance, for displaying as graphs in Inter-Chart. Also data can be transferred to and from popular word processors. |
| ULTRACALC2 £79.50 16k | bbs | Full function spreadsheet program including lookup facilities. Will spool files to most word processors. Operates in all screen modes. Simple command language. Works on Electron. |
| VIEWSHEET £59.80 16k | aco | A special feature of ViewSheet is the ability to replace row and column numbers with headings, thus facilitating reference to all areas of the spreadsheet. You can print out either the entire worksheet or selected windows in special arrangements. |

Addresses

| | | | |
|-----|--|-----|---|
| aco | Acornsoft, Unit 8, Cambridge Technopark, 645 Newmarket Road, Cambridge CB5 8PD. Tel: 0223 214111 | gin | Ginn and Co, Prebendal House, Parson's Fee, Aylesbury, Bucks. HP20 2QZ. Tel: 0296 88411/6 |
| acp | Advanced Computer Products, 6 Ava House, High Street, Chobham, Surrey GU24 8LZ. Tel: 0276 76545 | kmc | Kent Micro Computers, 57 Union Street, Maidstone, Kent, ME14 1ED. Tel: 0622 52784 |
| auc | AUCBE, Endymion Road, Hatfield, Herts. AL10 8AU. Tel: 07072 65443 | lin | Lincoln Microsystems, PO Box 74, Bradford BD6 3RN. Tel: 0274 604571 |
| bbs | BBC Publications, British Broadcasting Co., 35 Marylebone High Street, London W1M4AA. Tel: 01-580 5577 | los | Logo Software, 316a Richmond Road, Twickenham, Middlesex TW1 2PD. Tel: 01-891 0989 |
| bbs | Beebugsoft, PO Box 50, St Albans, Herts. Tel: 0727 40303 | log | Logotron, Ryman House, 59 Markham Street, London SW3 4ND. Tel: 01-352 1088 |
| bev | Bevan Technology, Gresham Chambers, 14 Lichfield Street, Wolverhampton, West Midlands WV1 1DG. Tel: 0902 23546 | mer | Mertec, 33/36 Singleton Street, Swansea SA1 3QN. Tel: 0792 467980 |
| cms | Cambridge Microprocessor Systems, 44A Hobson Street, Cambridge CB1 1NL. Tel: 0223 324141 | mpw | Micro Power, Northwood House, North Street, Leeds LS7 2AA. Tel: 0532 458800 |
| chs | Chalice Software, 3 Merlin Way, Covingham, Swindon. Tel: 0793 615026 | mir | Miracle Technology, St Peters Street, Ipswich IP1 1XB. Tel: 0473 216141 |
| cla | Clares Micro Supplies, 98 Middlewich Road, Rudheath, Northwich, Cheshire CW9 7DA. Tel: 0606 48511 | pac | Pace Micro Technology, Juniper View, Allerton Road, Bradford BD15 7AG. Tel: 0274 488211 |
| clw | Clwyd Technics, Unit 4B, Antelope Industrial Estate, Rhydymwyn, Nr Mold, Clwyd CH7 5JH. Tel: 0352 83 751 | sky | Skywave Software, 73 Curzon Road, Bournemouth BH1 4PW. Tel: 0202 302385 |
| col | Colne Robotics, Beaufort Road, East Twickenham, Middlesex TW1 2PQ. Tel: 01-892 8197/8241 | sdf | Soft Machinery, 68 Botley Road, Oxford OX2 0BU. Tel: 0865 726803 |
| com | Commotion, 241 Green Street, Enfield EN3 7SJ. Tel: 01-804 1378 | sof | Software Services, 65 South Mossley Hill Road, Allerton, Liverpool L19 9BG. Tel: 051 427 7894 |
| cco | Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts. HP2 2EX. Tel: 0442 63933 | sys | System, 12 Collegiate Crescent, Sheffield S10 2BA. Tel: 0742 682321 |
| fso | FSoft, PO Box 352, Brighton BN1 3AY. Tel: 0273 736042 | tec | Technomatic, 17 Burnley Road, London NW10 1ED. Tel: 01-208 1177 |
| gem | Gemini, Gemini House, Exmouth EX8 4RS. Tel: 0395 265165 | vin | Vine, Marshborough, Sandwich, Kent CT13 0PG. Tel: 0304 812276 |
| | | wat | Watford Electronics, 250 High Street, Watford WD1 2AW. Tel: 0923 37774 |
| | | wig | Wigmore House, 32 Savile Row, London W1X 1AG. Tel: 01-734 8826 |

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| ADJ22 Ref. Manual Part I | £14.95 (c) | View 3.0 User Guide £10 (d) |
| | | Viewsheets User Guide £10 (d) |

UPGRADE KITS

| | | | |
|--|------------|-----------------|---------|
| 1.2 OS ROM..... | £7.50 (d) | Econet Kit..... | £55 (d) |
| DNFS ROM..... | £17.50 (d) | | |
| 1770 DFS Upgrade for Model B..... | £43.50 (d) | | |
| ADFS ROM (for B with 1770 DFS & B plus)..... | £26 (d) | | |
| 64K Upgrade Kit for B plus | £35 (d) | | |

ECONET ACCESSORIES

| | | | |
|---------------------------|----------|-----------------------------|----------|
| Econet Starter Kit..... | £85 (b) | Econet Bridge..... | £174 (b) |
| Econet Socket Set..... | £34 (c) | Printer Server Rom..... | £41 (d) |
| File Server Level I..... | £75 (d) | 10 Station Lead set..... | £26 (c) |
| File Server Level II..... | £210 (d) | Adv. Econet User Guide..... | £10 (d) |

ACORN 32016 CO-PROCESSOR

Acorn Cambridge Co-processor combines with the BBC micro to provide full 32 bit processing. The National Semiconductor 32016 processor performs all language and application processing, the NS32081 floating point processor maximises the performance and provides support for IEEE standard fp handling.

The specially developed operating system PANOS, provides efficient interfacing between the languages and the hardware and software of the BBC micro incl. the variety of ACORN filing systems: DFS, ADFS and NFS. PANOS provides a variety of utilities including a full screen editor and a linker providing access to both library routines and cross language linking.

FORTAN 77, PASCAL and C languages with mainframe type implementations, fully compiled and provided with appropriate library support are included. Other languages include, Cambridge LISP with its compiler, a 32016 assembler and a 32bit interpreted implementation of BBC BASIC with full screen editor. 1 Mbyte of RAM is included as standard.

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Please phone or write for full specifications on the Cambridge Co-processor and Cambridge Workstation.

WINCHESTER DRIVES

Acorn Hard Discs are now available in 10 and 30 Mbyte versions. The drive plugs into the 1 MHz bus. The ADFS filing system with its hierarchical filing structure provides excellent file management facilities. Data transfer rate of 1Mbit/sec and average seek time of 85 ms provides the user very fast access to very large amounts of data. File Server Level III is installed as standard on Acorn Winchesters. The non Acorn drive is fully compatible with the Acorn ADFS system or Torch Z80 system and offers good value for money.

| | |
|---------------------------------|-----------|
| Acorn 10 Mbyte Winchester | £1100 (a) |
| Acorn 30 Mbyte Winchester Drive | £1630 (a) |
| 20 Mbyte Hard Disc | £1025 (a) |

TECHNOLINE

PHONE
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01-450 9764
FOR DETAILED SPECS
ON THE MASTER
SERIES & UPGRADES

Technical Information:
1200/75 Baud. Standard Viewdata/Prestel Protocols.
Please note that a 'Prestel' type terminal must be used.

Please phone for our latest Educational Price List.

TECHNOLINE offers you
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Products
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Techno-Line 01-450 9764
24 hour, 7 days a week
or 01-452 1500
(weekdays 7pm-9pm,
24 hours weekends)

EPROMs/RAMS

| | | | |
|----------------|-----------|---------------|-------|
| 2764-25..... | £2.00 (d) | 27128-25..... | £2.50 |
| 6264LP-15..... | £3.40 (d) | | |

ACORN 2nd PROCESSORS

Acorn Z80 2nd Processor: Z80 CPU with 64K of RAM housed in a separate case with a integral power supply interfaces with the BBC computer through the TUBE. It converts the BBC into a CP/M system and its comprehensive package of software provides a suitable basis to set up a business system.

Acorn 6502 2nd Processor: This processor provides faster data processing speeds and larger memory. Particularly useful for use with Hi View processor for production of large documents.

MULTIFORM Z80 2nd PROCESSOR

This processor converts your BBC into a power CP/M system and is capable of operating in almost any CP/M format. Full details on page 29.

TORCH Z80 2nd PROCESSOR

ZEP100: This Z80 processor with 64K fits internally in the BBC computer and has the operating system in a ROM. It is supplied with the PERFECT suite of software comprising of a database, wordprocessor and a spreadsheet and a BBC BASIC for Z80.

TZDP240: ZEP100 with TECHNOMATIC PD800P dual drive with built-in monitor stand.

ACORN TELETXT ADAPTOR

This adaptor will convert the BBC computer into a teletext receiver capable of decoding and displaying the CEEFAX and ORACLE pages and monitor screen. These pages can also be saved for later reference. BBC transmit educational software on their CEEFAX system which can be downloaded free of charge.

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 IEEE compatible devices. Typical applications in experimental work in academic and industrial laboratories, with advantage of speed, accuracy and repeatability. The interface is micro-powered and comes with cables, IEEEFS ROM, and user guide.

ROBOCOM 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 192 drawings may be saved on a disc. In total, a friendly yet sophisticated CAD system offering tremendous value.

ROBOCOM BITSTICK I

ROBOCOM BITSTICK II: This package is as Bitstick I with software upgraded to allow scaling and auto dimensioning. Multiplotter driver is supplied with the package.

Upgrade for Bitstick I to II

Bitstick Multiplotter Driver (most popular plotters included)

Epson FX80 Screen dump routine for Bitstick I

Epson FX80 dump for Bitstick II

DISC DRIVES

All drives listed below are fully compatible with single and double density DFSs. The larger capacity referred to below is for the Acorn's ADFS system.



Your computer installation can look like this with our PD800P drive. This highly successful drive offers unique features:

New slimline Mitsubishi mechanisms with ultra low power consumption (only 8 watts per mechanism), front locking lever and capable of single or double density operation. Ultra fast track access times and head settling times.

Fully compatible with the DFS and ADFS filing systems on the new MASTER's range.

40/80 switchable with switches located on the front panel. A generously rated switch-mode power supply ensures reliability with minimum heat dissipation for long periods of operation.

The mechanisms are set inside a sturdy monitor stand painted in 'BBC-matching' beige. Its 'looks' are enhanced by its black front panel, with attractive enamel-white markings.

These disc drives with a built-in monitor plinth provide a compact installation and give a professional look to the system.

As with all standard TECHNOMATIC drives it comes complete with a data cable, and a mains lead with a suitably fused 13A moulded plug.

PD800P 2 × 400K/2 × 640K 40/80T DS **£260 (a)**

3.5" DRIVES

These compact drives, used with most of the new 16 bit micros offer fast access times and high performance with minimum of power consumption. The mechanisms are 80 track double sided and are capable of both single and double density operation. The single drive is offered in a dual case with a blanking plate for future upgrading. The drives are offered with or without integral mains power supply and they are supplied with all the necessary cables to make them ready for connection to a computer. Mains powered drives are supplied with a lead with suitably fused 13A moulded plug.

1 × 400K/1 × 640K 80T DS : **TS35 1** **£109 (b)**; **PS35 1** with psu **£124 (b)**
2 × 400K/1 × 640K 80T DS : **TD35 2** **£199 (b)**; **PD35 2** with psu **£219 (b)**

PD800



TECHNOMATIC's stacked drives are housed in smart metal casings painted in BBC beige colour and are built to the same exacting standards as PD800P drives. The drives are fitted with integral switch mode power supply and supplied with a mains lead with a suitably fused 13A moulded plug and a data lead.

These drives are fitted with the new model MITSUBISHI mechanisms, which have been specially adapted for us to fit the 40/80 track switches on the front panel of the mechanisms. This would mean that the user no longer needs to grope at the rear of the drive to set the correct track setting.

PD800 (2 × 400K/2 × 640K 40/80T DS) **£240 (a)**

TD800 (as PD800 but without the psu) **£225 (a)**

TECHNOMATIC's single drives are also housed in metal casings painted in BBC beige colour and are offered with or without power supply. All drives are supplied with data cables and suitable power leads. Mains powered drives have a lead suitably fused with a 13A moulded plug.

1 × 400K/1 × 640K 40/80T DS

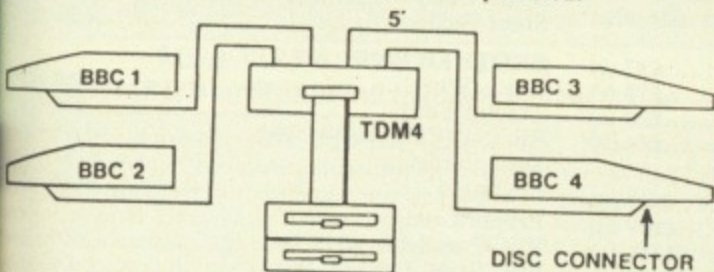
TS400 **£109 (b)** **PS400** with psu **£129 (b)**



TD35 2

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications — simply plugs into the computers disc interface connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same discs, i.e. two quads connected together will allow 7 computers to share 1 drive. Units are supplied with 5' of cable per outlet as standard. Mains powered.



TDM4 Quad Unit (up to 4 computers) **£135 (a)**
TDM2 Dual Unit (2 computers) **£75 (b)**

DISC STORAGE BOXES

NON LOCKABLE **DB530** 30 × 5 1/4" **£6.00 (c)**
LOCKABLE **DB340** 40 × 3 1/4" **£8.50 (c)**
DB550 50 × 5 1/4" **£9.50** **DB570** 70 × 5 1/4" **£11.00 (c)**
DB5100 100 × 5 1/4" **£13.00 (6b)**

3M 5 1/4" FLOPPY DISCS

40 T SS DD **£10.50**
40 T DS DD **£12.75**
80 T SS DD **£14.75**
80 T DS DD **£16.00**

(£1 extra for library case packing)

3M 3 1/2" FLOPPY DISCS

80 T SS DD **£18 (d)** 40 T DS DD **£25 (d)**

Discs in packs of ten

Available at the new greatly reduced prices (for limited period only)

SPECIAL BULK DEAL

High quality 5.25" with our usual lifetime warranty. The discs are packaged in a lockable plastic box.

50 Single Sided 40 track Double Density **£42.50 (b)**
50 Double Sided 40 track Double Density **£55.00 (b)**
50 Double Sided 80 track Double Density **£65.00 (b)**

DRIVEHEAD CLEANING KIT

The FLOPPICLENE drive head cleaning kit is an ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminates the risk of contamination and abrasion of sensitive driveheads. These risks are normally inherent in the reusable drivehead cleaning kits. **5 1/4" £14.50 (d)**
Floppiclene with 20 disposable cleaning kits. **3 1/2" £16.00 (d)**



01-208 1177

BBC Computer & Econet Referral Centre

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London NW10 1ED
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Telex: 922800
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London W2
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Orders welcome from government depts & educational establishments.

All prices ex VAT
Prices are subject to change without notice

Please add carriage
(a) £8 (Datapost)
(b) £2.50
(c) £1.50
(d) £1.00

EPSON PRINTERS

LX80 £195 (a) Tractor Feed £20 (c)

FX85 £315 (a) FX 105 £449 (a)

A limited no of FX80s available at £260 each.

LQ Range: This range with 24 pin dot matrix printers offers a high, 200 cps, draft speed and superb correspondence quality print at 67 cps and truly high resolution graphics and a variety of fonts.

LQ800 £495 (a) LQ1000 £729 (a)

TAXAN PRINTERS

KP810 (80 col).....£230 (a)

KP910 (156 col).....£379 (a)

NEW

JUKI 5510 PRINTER

A new dot matrix printer from the reliable JUKI stable. Features include a fast 180 cps. NLQ at 40 cps. Full EPSON/IBM compatibility. 3K buffer as standard expandable to 15K. Full graphics capability and a variety of fonts including international characters set. Can be upgraded to a seven colour printer. Sheet feeder available as optional extra. **£229 (a)**

COLOUR PRINTERS

EPSON JX80 4 colour. £420 (a)

Integrex Colour Jet Printer. £549 (a)

Canon PJ1080A £369 (a)

JUKI 5510 colour upgrade. £99 (b)

CENTRONICS GLP

A NLQ printer at an affordable price. Fully compatible with Epson control codes offering a variety of fonts including super and subscripts, and a variety of graphic modes. Serial and parallel interfaces fitted as standard. Friction feed as standard. **£109 (b) Tractor feed £14 (d)**

DAISY WHEEL PRINTERS

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

BROTHER HR15 £315 (a)

JUKI 6100: * 15 cps * 2K Buffer * Switchable 10/12/15 cpi * Proportional printing * Linear Motor for maximum reliability.

JUKI 6100 £249 (a)

DOTPRINT PLUS

The most versatile NLQ rom for the BBC Micro. DOT PRINT PLUS not only gives you the 10 character pitch at 6 lines/in with underlined and double width characters as required but unlike all other NLQ roms, it offers a lot more.

* a built in CHARACTER FONT EDITOR enables disc users to create their own type faces for using in printing spooled text files.

* a built in View Printer Driver.

* MICROSPACING for professional justification in VIEW and — with discs — in WORDWISE/PLUS.

* true BOLD PRINT in addition to double width.

* 12 char pitch as standard — providing 96 CHARACTERS PER LINE on the FX/RX 80 for example.

* simple control codes allow VARIABLE PITCH LINE SPACING in 1/72" increments and VARIABLE PITCH from 12 cpi in increments of 1/240". (10 cpi can be selected by a single control code).

Suitable for use with printers fully compatible with EPSON quad density graphics.

DOTPRINT PLUS for FX/RX and compatibles. £28 (d)

DOTPRINT Dual for MX Range. £28 (d)

PRINTER BUFFER & SHARERS

BUFFALO 32K Buffer for EPSON PRINTERS: This compact 32K buffer can be fitted internally on most EPSON printers within a few minutes. It does not require external power or any modification to the printer. It will hold about 15 A4 pages of text freeing your computer for other jobs in a fraction of the time it would normally have to wait for the printer to finish all that printing. Supplied with full fitting instructions.

Buffalo 32K Buffer £75 (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. 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.

Available in 64K and 256K versions

TSB 64 £199 (b) TSB 256 £275 (b)

A Serial Buffer/Sharer will soon be available. Please send for details.

PERIPHERAL & COMPUTER SHARERS

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 external power input required.

All lines on the sharers are fully switched (36 on parallel and 25 on serial)

| | Parallel | Serial |
|-------------------------------|----------------|----------------|
| 3 Computers to a Printer | 36V36-3 £69(c) | 25V25-3 £64(c) |
| 4 Computers to a Printer | 36V36-4 £85(c) | 25V25-4 £74(c) |
| 2 Computers/2 Printers x-over | 36V36-X £69(c) | 25V25-X £69(c) |
| BBC Cable Set 3 to 1 (1m ea). | £32(c) | £34(c) |
| BBC Cable Set 4 to 1 (1m ea). | £39(c) | £41(c) |

BBC Computer Sharer: TCS26:

1 computer to 2 printers fitted with Cable. **£19.50 (c)**

PRINTER ACCESSORIES

EPSON ACCESSORIES:

| | |
|---|---------|
| Interfaces: | |
| 8143 RS232..... | £28 (d) |
| 8148 + RS232 + 8K..... | £75 (d) |
| 8165 IEEE + Cable..... | £65 (d) |
| 8148 RS232 + 2K..... | £57 (d) |
| 8132 Apple II..... | £60 (d) |
| 8177P NLQ for FX80 + /FX100 +..... | £99 (d) |
| Parallel & Serial Buffers of various size also available. | |
| FX80/80 + /85 Tractor Attachment..... | £37 (c) |
| FX80/80 + Paper Roll Holder..... | £17 (c) |
| LX80 Tractor Feed..... | £20 (c) |
| LQ800 Tractor Feed..... | £44 (b) |

SHEET FEEDERS:

| | |
|------------------------|----------|
| 8338 LX80..... | £49 (b) |
| 8333 FX100 + /105..... | £169 (a) |
| 8331 FX80 + /85..... | £129 (b) |
| 8330 RX80 +..... | £129 (b) |
| LQ800..... | £129 (b) |

Ribbons:

| | |
|--|-----------|
| RX/FX100/100 +. FX105..... | £10 (d) |
| RX/FX80/80 +, FX85..... | £5 (d) |
| LX80..... | £4.50 (d) |
| H180 Pen Set (Aqueous/Ball point)..... | £7.50 (d) |

Dust Covers:

| | |
|------------------------|-----------|
| FX80..... | £5.50 (d) |
| TAXAN/Canon KP810..... | £6 (d) |
| FX100..... | £7.50 (d) |
| KP910..... | £7 (d) |

EPSON HI-80 PLOTTER

EPSON technology has once again scored a first by introducing a sophisticated A4 size plotter that does not need specialised software or programming skills to operate it and yet keep the cost within the reaches of all computer users. Features include 4 pens at a time — upto 16 colours to choose from, a variety of pen nibs, high speed plotting. Powerful software command codes include single commands to plot circles, eclipses or triangles. Line or bar graphs and pie charts can be plotted in a variety of exciting styles very simply by keying in the data into the computer.

Detailed leaflet on request.

Epson HI-80 Plotter £325 (c)

HITACHI 672 PLOTTER

A high speed, compact A3 plotter with 4 colours and high accuracy. Both serial and parallel ports as std. Plots on either OHP film or plain paper. Operates on HP GL or single character command codes and is easy to interface to most graphics software. **£465 (c)**

GRAPHICS PLOTTER

Available again with considerable enhancements to the original model. Plotting area has been increased to A3 size with a resolution of 0.1mm. Opto sensor converts the plotter into an input device to scan and digitise pictures, travel mazes and investigate methods of artificial intelligence. A more powerful drill/round attachment and scriber provide facilities for drilling on various materials and fine line drawing on coated materials. **£629 (c)**

Total cost:
Basic plotter and accessories available separately. Send for details.

PLOTMATE

From Linear Graphics a range of fast, accurate and easy to use plotters.

The A4 Plotmate is the ideal drawing companion for all BBC micros, the Master and Cambridge Work Station. Plugs into the user port or printer port of your BBC Micro and directly drives the BBC graphics commands in BBC Basic, Logo or indeed any high level language without the need for additional driver software.

Plots onto paper, card or acetate film in up to 16 colours using fibre, OHT or ballpoint pens.

A4 Plotmate £299 (a)

A4M and the new A3M models plug into BBC and all leading micros. They run on a wide range of Linear Graphics and third party software. Numerous functions and add-on capabilities make them ideally suited to the requirements of Education, Industry and Business environments including mathematical modelling, data display, CAD, mapping, optical scanning and P&ID design.

A4M £399 (a) A3M £549 (a)

TAXAN CANON Accessories:

| | |
|------------------------|-----------|
| RS232 + 2K buffer..... | £78 (d) |
| Ribbon..... | £6 (d) |
| JUKI 6100 | |
| RS232 Interfaces..... | £65 (d) |
| Tractor Feed..... | £129 (d) |
| Ribbon (Carbon)..... | £2.00 (d) |
| Spare Daisy Wheel..... | £14 (d) |
| Sheet Feeder..... | £182 (d) |

BROTHER HR15

| | |
|----------------------------|-----------|
| Daisy Wheel..... | £18 (d) |
| Tractor Feed..... | £90 (d) |
| Ribbon (Carbon/Nylon)..... | £3.00 (d) |
| Sheet Feeder..... | £182 (d) |
| Keyboard..... | £135 (d) |

Printer Leads:

| | |
|-------------------------------|--------|
| BBC Parallel Lead (1.2m)..... | £6 (d) |
| BBC Serial Lead (1.2m)..... | £6 (d) |

Other lengths can be supplied on order:

| | |
|-----------------------------|---------|
| IBM Parallel Lead (2m)..... | £12 (d) |
|-----------------------------|---------|

PAPER & LABELS

Plain Fanfold paper with micro perforations:
2000 sheets 9 1/2" x 11".....£13 (d)
2000 sheets 14 1/2" x 11".....£18.50 (d)

Labels/1000:

| | |
|----------------------------------|-----------|
| Single Row 3 1/2" x 1 7/16"..... | £5.25 (d) |
| Triple Row 27/16" x 17/16"..... | £5 (d) |

MULTIFORM Z80

The MULTIFORM Z80 2nd Processor for the BBC Micro — opens the horizons of CP/M software to the BBC micro user

- * Will enable running of almost any CP/M applications software
- * Will enable transfer of data between different disc formats
- * Emulates the two terminals most frequently used by CP/M software

MULTIFORM Z80 interfaces directly to a normal BBC micro requiring no hardware changes. It is supplied with OS/M operating system in rom which can run all software that obeys CP/M 2.2 constraints and its configuration is not hardware specific.

MULTIFORM Z80 is truly flexible and can be used with any BBC micro drive system, single or dual drive, 40 or 80 track format and single or double sided. Unlike other currently available Z80 processors for the BBC micro, there are absolutely no restrictions on the type of drive that can be used with the MULTIFORM Z80.

MULTIFORM Z80 plugs into the 1MHz bus connector of the BBC micro. It is mains powered and does not put any extra load on the BBC's psu. The data cable can be several feet in length, allowing convenient siting of the MULTIFORM Z80, unlike present second processors, which have 8" cables.

Twenty eight CP/M formats are supplied which include: Acorn Z80, RML 380Z and 480Z, Torch (read only), Osborne, Televideo . . . we also offer to configure other formats at an extra charge."

Rom based OS/M operating system is fully compatible with Acorn's single and double density disc interfaces. Installing the OS in rom allows more space on discs for programs and data and response to system commands is very fast. (Note: Single density DFS will only read/write to single density CP/M formats).

MULTIFORM Z80 can format, read or write from a very wide range of CP/M disc formats. On a dual drive system, the drives can be set up independently to run two different formats at the same time. This will enable:

- * The user to buy software from a very wide range of suppliers without having to worry about the type of format supplied.

- * Interchange of valuable data and files among users of various CP/M computers.
- * Using a system at home for preparing data required in the office.
- * Software writers/developers to write software in any one format and transfer it to any other format without having to pay for expensive porting charges.

MULTIFORM Z80 is supplied with a library of a number of popular CP/M formats and a utility disc containing a program for creating files for the additional formats. Each library can load 32 formats and there are no restrictions on the number of libraries that can be created.

The utility disc also contains a program to interconvert ASCII texts wordprocessed on a normal BBC and under OS/M or CP/M.

MULTIFORM Z80's terminal emulation includes the ADM-3A, the HAZELTINE 1500 and the BBC VDU making the installation of most of the well known CP/M software easy.

MULTIFORM Z80 converts your BBC computer into an almost universal CP/M machine and adds the power of being able to run two different formats simultaneously, which currently is possible on only the very sophisticated specialist machines.

For any one working or intending to work in a CP/M environment, MULTIFORM Z80 is an indispensable tool.

In offices where there are a multitude of CP/M machines and a few BBCs, MULTIFORM Z80 will prove to be invaluable for transferring data between the various CP/M machines.

MULTIFORM Z80 (including utility disc, library disc and manual) **£299 + £4 p&p**

(When ordering please specify the type of DFS, MULTIFORM Z80 will be used with)

SPECIAL MULTIFORM UTILITY to read and write to IBM PC Disc. **£49 (d)**

CP/M SOFTWARE FOR TORCH & ACORN Z80 PROCESSORS

We can now supply almost any CP/M based software package in a format suitable for the Torch Z80 and Acorn Z80 second processors. Phone for details on prices for popular packages for IBM

Please phone for our new professional software catalogue

WORDSTAR PROFESSIONAL The advanced word processing package comprising of WordStar, MailMerge, StarIndex and SpellStar, a total combination offering substantial savings on individual prices. WordStar is the best selling word processing program on the market. Extensive operator aids include a comprehensive friendly manual, step-by-step training guide, command cards, on-screen menus. Spellstar checks text files against its 20,000 word-plus dictionary. You can both add to the dictionary and create specific supplementary ones. Mailmerge is ideal for mailing applications. It enables the fast production of personalised form letters, mailing labels, invoices, etc. StarIndex creates alphabetical indexes, tables of contents, paragraph numbering etc.

WORDSTAR PROFESSIONAL £310 (a)

WORDSTAR £275 (a) WORDSTAR Upgrade to W/S Prof £195 (a)

DBASE-II Undoubtedly 'The Database', can be used for an almost limitless number of business applications, ranging from mailing list preparation through to running accounting ledgers and payrolls. An on-disc tutorial takes you from setting up a simple file all the way through to setting up custom screens and reports. Automatic calculations may be performed on data. Fields or entire databases may be modified or replaced with single, English-like basic commands; Dbase-II can therefore be used by general personnel having no programming knowledge. It can be tailored to suit a variety of professions and individual needs, with files such as accounting, payroll, time billing, job costing, scheduling and mailing lists. It can access several files at a time. It is fast, flexible and powerful. **£310 (a)**

SAGE ACCOUNTS: This package has been designed for the smaller business, for the user who is unfamiliar with computers but wanting to computerise the bookkeeping and accounting

functions. Sage is easy-to-learn and easy-to-use and is complete with a full tutorial booklet and a free manufacturers 90-day 'Hot-Line' support. It is a truly integrated package (all on one disc!) and covers Sales, Purchase & Nominal Ledgers, with a capability of handling up to 999 accounts per ledger. It will handle all your Sales and Purchase invoices and can easily generate account & management reports. **£375 Sage plus (£695)** for the larger business, and **Sage Payroll (£195)**

Other packages available include PRO-PASCAL, CIS-COBOL, Supercalc II, MACRO-80 etc. Please telephone with your requirements.

A.T.I. Trainers — these superb interactive training discs simulate the package being studied. A unique screen technique provides a friendly interaction — in the upper area, a faithful reproduction of the screen is displayed, while at the bottom, a series of prompts and explanations lead the student through the exercise. ATI trainers available include Wordstar, dBase-II, dBase-III, Multimate, Multiplan, Word at **£75 (b)**. Please phone for other trainers.

TORCH GRADUATE IBM SOFTWARE: We are able to supply most popular software packages including: WORDSTAR, WORD, EASY-WRITER, Dbase-II & III, LOTUS-123, VISICALC, SAGE etc. Please telephone with your requirements.

PROFESSIONAL SOFTWARE PUBLICATIONS

| | | | |
|------------------------|-------------------|-----------------------|-------------------|
| Wordstar made easy | £16.95 (c) | Multimate Complete | |
| Introduction to | | Guide | £16.95 (c) |
| Wordstar | £17.95 (c) | ABC of LOTUS 123 | £15.95 (c) |
| Wordstar Handbook | £11.95 (c) | The RS232 Solution | £17.95 (c) |
| dBase-II for the first | | CP/M Bible | £15.95 (c) |
| time user | £16.95 (c) | Soul of CP/M | £14.95 (c) |
| Understanding | | CP/M Handbook | £14.95 (c) |
| dBase-II | £22.95 (c) | Mastering the | |
| Understanding | | CP/M | £17.95 (c) |
| dBase-III | £22.95 (c) | Computer Spreadsheets | £7 (d) |
| Multiplan Made Easy | £18.95 (c) | (no VAT on books) | |

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Orders welcome from
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establishments.

All prices ex VAT
Prices are subject to
change without notice

Please add carriage
(a) £8 (Datapost)
(b) £2.50
(c) £1.50
(d) £1.00

MONITORS

(All Monitors supplied with BBC Lead)

RGB MONITORS

| | | |
|----------------------|------------------|----------|
| 1431 14" RGB Std Res | 452 × 585 pixels | £179 (a) |
| 1451 14" RGB Med Res | 653 × 585 pixels | £229 (a) |
| 1441 14" RGB Hi Res | 895 × 585 pixels | £375 (a) |

MICROVITEC 14" RGB/PAL/Audio

| | | |
|--------------------|------------------|----------|
| 1431AP 14" Std Res | 452 × 585 pixels | £199 (a) |
| 1451AP 14" Std Res | 653 × 585 pixels | £275 (a) |

The above monitors are available in plastic or metal case.

MICROVITEC 20" RGB/PAL/Audio

| | | | |
|--------------------|----------|-------------------|----------|
| 2030CS 20" Std Res | £380 (a) | 2040CS 20" Hi Res | £685 (a) |
|--------------------|----------|-------------------|----------|

TAXAN 12" RGB

K12SV3: A high performance high res monitor with desk matt screen with options to switch to monochrome green/amber. IBM Compatible **£324 (a)**

MITSUBISHI XC1404 14" Med Res RGB:

BBC/IBM Compatible. A new monitor with etched dark screen with both brilliance and contrast controls giving sharp graphics and text display. **£219 (a)**

MONOCHROME MONITORS

TAXAN

| | |
|--|------|
| KX1201G 12" HI-RES green etched screen | £90 |
| KX1203A 12" HI-RES amber etched screen | £105 |

PHILIPS

| | |
|--------------------------------|-----|
| BM7502 12" HI-RES green screen | £75 |
| BM7522 12" HI-RES amber screen | £79 |

ACCESSORIES

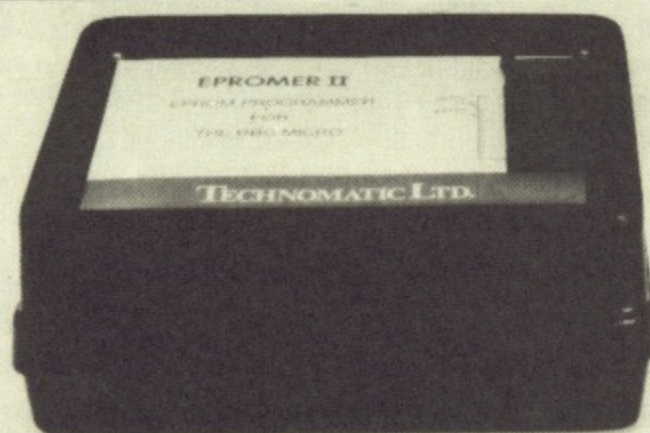
| | |
|---|---------|
| Microvitec Swivel Base (14" plastic monitors) | £20 |
| Taxan Swivel Base for mono monitors with integral clock | £22 |
| Philips Swivel Base | £14 |
| Monitor Stand. BBC B + B | £10 (c) |
| Double Tier Plinth. BBC B + B | £12.50 |
| Taxan RGB Cable | £5 (d) |
| Microvitec RGB Cable | £19.50 |
| Monochrome BNC/PHONO Cable | £3.50 |

TOUCHTEC-501

Designed for use with Microvitec metal cased monitors, and using the RS socket, this unit brings genuine touch-screen operation to your BBC. for the educational users. Supplied with a users handbook and utilities containing starter programs and development software. **£25**

Touchtec 501

EPROMER II



A sophisticated eprom programmer that handles the full range of popular single rail eproms (incl 27256) and allows the user full control of the programming process.

Its powerful menu driven software makes the programming of eproms simple, efficient and eliminates the need to have fiddly switches for selecting eprom types, programming voltage or method. The features include:

- Integral power supply ensures no power drain from the computer.
- Interfaces through 1 MHz bus, fully buffered.
- Clear and simple instructions displayed on the screen make the programming easy for both the first time user and the advanced user.
- Eproms upto 16K (27128) programmed in single pass (27256 in two passes).
- Selectable programming voltage 25/21/12.5V
- Selectable programming method — normal or high speed algorithmic. High speed programming enables 27128 to be programmed in just over 2 mins. Normal programming skips addresses with FF data to increase programming speed. Automatic verification on completion of programming.
- User can select any section of the eprom from a single byte to its full address range to Blank Check/Read/Program/Verify enabling program development/changes very simple.
- Full screen editor with HEX/ASCII input.
- Data input from keyboard/Tape/Disc/Eprom.
- Software interface for integration of user's special requirements.
- Constant display of all options selected.
- Several BBC BASIC programs can be entered on a single eprom.
- Checksum facility allows for easy identification of programmed roms.
- Enter OS Commands from within the epromer program.

EPROMER II with Manual & Software on disc **£99 (b)**
ROM image of software supplied on disc for use with sideways ram.
ROM based software if required. **£5 (d)**

UV ERASERS

UV1T 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)**

UV1B as above but without the timer. **£47 (b)**

PORTAL ROM EMULATOR

NEW

Real time evaluation of all listed eproms at 150 ns — hundreds of times faster than a typical eprom write/erase cycle (4Kbytes/sec, no erase time) completely software driven (by Meta Assembler) — compatible with 'port back' processors.

Don't blow an eprom each time you test your code on your target system. Use a PORTAL eprom emulator instead. Upto four independent PORTALs can be used on the same BBC lead. Each PORTAL has a length of cable with 28 pin header which plugs into the eprom socket you need to emulate — that's it. All the rest is handled by META. Your code is sent down the PORTAL during assembly, with various options ie two PORTALS for data bus, sequential PORTAL skipping etc.

PORTAL is supplied in a custom steel case with 13 LEDs to indicate the status of its various functions. Comprehensive documentation and software included.

Two versions of PORTAL are currently available.

| | |
|--|-----|
| PORTAL 128 (2716/2732/2764/27128) | £18 |
| PORTAL 512 (all above + 27256 and 27512) | £28 |

Please send for detailed specification sheet

REAL-TIME CLOCK CALENDER

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 including a simple demonstration diary/planner application program on disc. **£29 (d)**



ROM/RAM EXPANSION SYSTEMS

ATPL SIDEWISE ROM EXPANSION BOARD A well constructed expansion board simple to instal and requires no soldering. All buses are buffered. It allows sideways rom expansion to 16 ROMs. One socket has been split into two 87K sockets allow the use of 8K CMOS RAM. Battery backup option allows data retention in RAM when the computer is switched off. Several link selectable options including protect for the RAM. ATPL Board **£37 (d)** Battery Backup Kit **£18 (d)**

COMPUTER VILLAGE CV-16 Rom Board

A neatly designed, simple to instal board allows full sideways rom expansion to model B. Two sockets for 8K CMOS RAM allow a total of 16K for which battery backup is fitted as standard.

RAMROM-15 The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction. attractively packaged in a BBC color metal case, allowing easy access to all the sockets. No soldering is required. All 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. Battery back-up fitted as standard. For development work and further expansion, most of 6502 processor signals are available. Supplied with utility disc and full instruction manual. **£7**

(Above boards are for use with standard BBC computer and not compatible with others unless specifically mentioned)

TECHNOMATICS

Please add carriage

(a) £8 (Datapost)

(b) £2.50

(c) £1.50

(d) £1.00

COMMUNICATIONS

MIRACLE WS3000 Range: * A new, professional series of intelligent modems with full auto dial and auto answer facilities as standard. * HAYES protocols are implemented allowing the use of a wide range of well proven communications software. 'Plain English' command structure simplifies the use of the modem even for the first time user. * All models feature a centronics compatible printer port allowing direct output to a printer. * A line sharing facility that allows WS3000 to differentiate between calls intended for data, and those for speech. * An intelligent speed buffered RS232 port and a wide range of available data rates makes this one of the most powerful multi speed range of modems available. * Line noise filtering ensures error free transmission and reception of data on long or noisy lines. * Internal battery backup allows storage of 63 names and telephone nos. * This range of modems can be factory fitted with high security data access protection system. * Models V2123 and V22 can be factory upgraded to V22bis standard giving a single compact modem capable of data rates from 75bps to 2400bps.

WS3000 V21/23: This modem complies with the CCITT V21, V23 and Bell 103 standards and operates at CCITT standards for 300 bps, 75/1200 bps, 1200/75bps full duplex, 600bps and 1200bps half duplex, and the Bell standard for 300bps full duplex. **£295 (b)**

WS3000 V22: This modem operates on all V2123 standards plus V22 standard for 1200bps full duplex V22bis standard. **£495 (b)**

WS3000 V22bis: This modem operates on all V21/23 and V22 standards plus 2400bps full duplex. **£650 (b)**

BBC Data Cable for WS3000
£6 (d) Data cables for other micros available.

WS4000/'SCHOOLS' MODEM, a new low-cost high performance 'Hayes' intelligent modem with A/Dial and A/Answer and V21/23 at **£149 (b)**

A V22 upgrade can be added at **£250**, and V22bis at **£405**. Other options, all priced at £50 are battery backup, Bell standards, Call Monitor, Control port and Tone Dialling. Please send for full details.

MIRACLES WS2000 This highly successful world standard modem, having BT approval, covering V21, V23, (BELL 103/113/108 outside the UK) and including 75,300,600, 1200 Baud ratings. What possible 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 £102 (c)

Data 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) **£4 (d)**

WS2000 Auto-Answer Card £30(d).

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

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

DS1 Disc (for Commstar): When used with the Auto-dial card, SKI 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 and protocols for autodialling **£10 (d)**

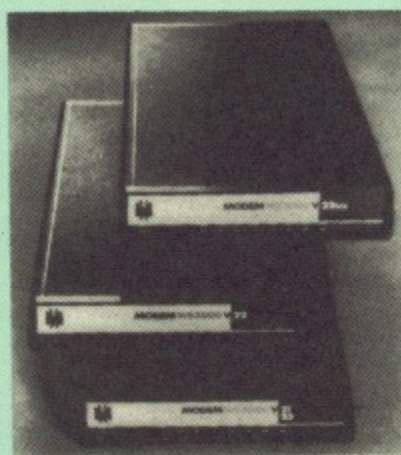
GEC DATACHAT 1223 Modem: An economically priced BABT approved modem complying with CCITT V23 standard capable of operating at 1200/75bps and 75/1200bps and 1200/1200bps pseudo full duplex. It is line powered does not require external power source. It is supplied with software suitable for connecting to PRESTEL, Micronet 800, Telecom Gold and a host of bulletin boards.

SPECIAL OFFER

£75 (b)

As reviewed in June issue of Acorn User
'Worthwhile and above all easy to use package'

APPROVED for connection to telecommunication systems specified in the instructions for use subject to the conditions set out in them.



COMMUNICATIONS SOFTWARE

DATA-BEEB An advanced communication ROM from Miracle Technology. Its many features include both Viewdata (Prestel) and Terminal modes, Auto-Answer and Auto-dial for fully expanded WS 2000's etc. Macro facilities allow flexible use of its many facilities e.g. automatic dialling, log-on, going to a specific page printing it, and going off-line, all in one operation. **£24 (c)**

TERMULATOR An advanced terminal emulator on a 16K Rom. Emulation include VT52/100, Tektronix 4010 etc. Allows a BBC to be used as a terminal for almost any mainframe computer or computer network. **£25 (c)**

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eeprom. 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). **£49 (c)**

RS232 Solution (Book) **£15.95 (c)**

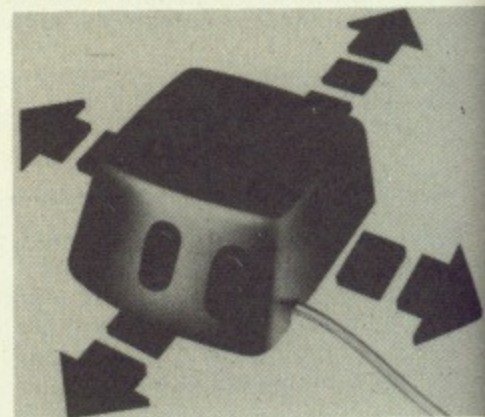
COMMSTAR An ideal communications rom for both Prestel and bulletin boards. Facilities include Xmodem, clock etc. **£28 (c)**

RS232 Solution Book **£17.95 (c)**

AMX MOUSE with SUPERART

The mouse will now be available with enhanced software, the 'SUPER ART' which is compatible with 6502 2nd processor, the ARIES RAM board, BBC + shadow mode, tape and ACORN DFS and ADFS. Allows full use of colour in mode 1. Disc users can create colour pictures in A4 size with dot pattern editing, use of icons, additional text styles, superb zoom in colour.

There is a variety of optional software to make the mouse one of the most versatile peripherals that can be added to the BBC micro.



AMX Mouse with Super Art

AMX Super Art Package on its own

AMX PAGEMAKER provides a high resolution A4 Typesetting and Artwork system. **£43 (c)**

AMX 3D ZICON will let you transform three dimensional vector data into 3D on screen graphics. **£21 (c)**

AMX DATABASE is a new filing system with 1000 records per file and unlimited number of fields per record. **£21 (c)**

Fleet Street Editor £38 (d)

RB2 TRACKER BALL

A precision built tracker ball. Software allows RB2 to function instead of cursor keys, for word processing, CAD/CAM etc. Software includes graphics/CAD package.

RB-21 (with 'icon artmaster'). **£59 (c)**

BBC COMPUTER SPARE PARTS

| | | | |
|-----------------------|--------|--------------|-------|
| Complete Keyboard | £52 | UPD7002 | £52 |
| Power Supply Unit | £52 | DS3691 | £32 |
| Keyswitch | £1.75 | 7438 | £0.40 |
| Keyboard Connector | £4.00 | 74LS00 | £0.10 |
| Video ULA | £18.00 | 74LS04 | £0.10 |
| Serial ULA | £14.00 | 74LS10 | £0.10 |
| UHF Modulator | £4.50 | 74LS123 | £0.10 |
| 6502A 2MHz CPU | £6.50 | 74LS163 | £0.10 |
| 65C02 CMOS CPU | £12.00 | 74LS244 | £0.10 |
| 6512AP CPU | £12 | 74LS245 | £1.10 |
| 6522 VIA | £3.50 | 74LS373 | £0.10 |
| 6522A 2MHz VIA | £5.50 | 74LS393 | £1.10 |
| LM3 24 op-amp | £0.45 | 8271 | £1.10 |
| SAA 5050-Teletext | £9.00 | 88LS120 | £3.10 |
| 6845SP CRT Controller | £6.50 | 4464 RAM | £8.10 |
| | | O/S Basic B+ | £1.10 |

All the above carry Carriage Code (d)

MERLIN

MERLIN is the ultimate utility ROM for the BBC and BBC PLUS (Master coming soon) — an optimum combination of the most useful, of Disc, Memory, and ROM management utilities. A total of no less than 57 essential commands ensure that this will be the last utility ROM you will purchase. It is supported by a 106 page comprehensive manual with detailed syntax, argument and error messages for each command, and all the utilities are fully 'Tube' compatible.

A selection of just some of the commands include:

APPEND — append Basic files
ARCHIVE — a unique disc/tape archive system
CDIS — a 6502/65C02 disassembler, also able to disassemble sideways
ROM/RAM and optional printer output.
CLONE — protected disc copier.
DBYTE — Disc byte search utility.
DSTRING — disc string search utility allowing localised string search.
DUAL/SWAP — allows second catalogue on disc for 60 files/side of disc.
EDSEC — an interactive disc editor, able to directly access sectors, read and write to sectors marked deleted, and editing of protected discs.
FORM — a formatter able to format all or part of disc.
GPACK/GEXPAND — an all-mode screen file compacter/expander enabling saving of upto 70% of screen memory.
MBYTE/MSTRING — memory byte/string search utility.
MEDIT — interactive memory editor.
REPAIR — attempts to recover data from a track and repair.
ROFF — disable a ROM.
SEEDIT — interactive 'protected-disc' editor.
ZDUP — disc backup/format utility for ACORN & TORCH Z80 users.

As there are so many new commands, we have prepared a detailed leaflet describing all the commands — this is available on request.

MERLIN £37.50 (b)

FIRMWARE AND SOFTWARE

LANGUAGES

META-ASSEMBLER: For full details please see page 6 of this advertisement.

6502 DEVELOPMENT PACKAGE A Macro-Assembler with utilities for use with the 6502 2nd Processor. Enables the serious programmer to develop large programs in assembly language. £39 (d)

ACORN MICRO-PROLOG: The logic programming language seen as the language for programming in the future and used extensively in the artificial intelligence field. A simple 'front end' is supplied to make syntax more user friendly for new users. 16K Rom, manual and extension modules. £62 (c)

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. £47 (c)

ISO PASCAL Stand ALONE GENERATOR: Utility to convert programs produced using ISO PASCAL for stand alone applications. £28 (d)

ACORN LOGO A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with a tutorial course and technical manual. £42 (b)

LOGOTRON logo £56 (c)

BCPL A full implementation of the BCPL compiler language consisting of the language of 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. £42 (b)

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. £15 (d)

BCPL STAND ALONE GENERATOR £36 (d)

Acorn LISP Rom, Acorn FORTH Rom, Acorn COMAL, (each) £39 (d)

MICROTEXT A frame based authoring system from National Physical Laboratory for interactive computer tutoring. Disc based. £46

OXFORD PASCAL A fast, compact P-Code compiler, that fully utilises BBC Graphics and sound, contains a powerful editor, and produces 'standalone' software. (Specify 40/80T) £35 (c)

DATABASE MANAGEMENT SYSTEMS

VIEWSTORE.....£37 (d) MASTERFILE II.....£17.00 (d)
STARdataBASE.....£49 (d) GEMINI'S DATAGEM.....£59 (c)

WORD-PROCESSORS

VIEW.....£37 (d) HI VIEW.....£36 (c)
VIEW VERSION V3.0.....£56 (c) VIEW INDEX.....£9 (d)
VIEW PRINTER DRIVER GENERATOR.....£8 (d)
VIEWSPELL.....£52 (d) WORDEASE.....£24.50 (d)
WORDWISE.....£25 (d) SPELLCHECK III.....£31 (d)
WORDWISE PLUS.....£42 (d) INTERWORD.....£49 (d)
EDWORD II.....£42 (a)

SPREADSHEETS

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. £37 (d)

VIEWPLOT: A disc based Linear graph/barchart/piechart plotting program. £25 (d)

INTERSHEET The new spreadsheet from Computer Concepts. Many advanced facilities including 105 character display, several spreadsheets may be used at once, may be used with View & Wordwise etc. etc. £45 (c)

INTERCHART Graphics Package for the Intersheet. £30 (d)

ULTRACALC £39 (d) QUICKCALC £14.50 (d)

UTILITIES

ACCELERATOR.....£49 (d) ACORN BASIC EDITOR £24 (d)
BROM.....£28 (d) SLEUTH.....£24 (d)
TOOLKIT plus.....£31 (d) EXMON-II.....£22 (d)
HELP II.....£27 (d) DISC DOCTOR.....£26 (d)
DISCMASTER.....£18 (d)
ACORN GRAPHICS ROM GXR. £21 (d)(specify BBC B or PLUS)
COMPUTER CONCEPTS GRAPHICS ROM.....£20 (d)
PRINTMASTER.....£25 (d) DUMPMASTER II.....£26 (d)
FONTWISE.....£10 (d) FONTWISE PLUS.....£16 (d)
HERSHEY CHARACTER FONT GENERATOR.....£18 (d)
ICON MASTER.....£29 (d) STUDIO EIGHT.....£19 (d)
BILLBOARD.....£18 (d) CC SPEECH ROM.....£28 (c)
ACORN'S CREATIVE CC TEXT TO
SOUND.....£15 (c) SPEECH.....£34.70 (d)
ACORN'S SPEECH ROMIT.....£29 (d)
PROCESSOR ROM.....£15 (d) REPLICA III.....£12 (d)
PROGRAM BUILDER.....£18 (d) COMMUNICATOR.....£49 (d)
DATABEEB.....£24 (d) TERMINATOR.....£25 (d)
COMMSTAR.....£26 (d) MINI OFFICE II.....£14.75 (d)

When ordering software on disc please specify track format (40/80)

BOOKS

No VAT on books; Carriage (c)

LANGUAGES:
 6502 Assy Lang Prog.....£19.95
 6502 Programming.....£16.95
 8086 Book.....£23.95
 Acorn BCPL User Guide.....£15.00
 Acorn FORTH.....£7.50
 Acorn LISP.....£7.50
 S-PASCAL.....£7.50
 Acorn ISO Pascal Ref Manual.....£12.50
 Intro to COMAL.....£10.00
 Intro to LOGO.....£7.50
 Micro Prolog Ref Manual.....£12.50
 Creative Sound.....£7.50
 Introduction to Pascal.....£16.50
 Prog the Micro with Pascal.....£8.50
 The UNIX Book.....£7.50
 Unix User Guide.....£19.95
 Understanding Unix.....£18.45

BBC MICRO BOOKS FOR BEGINNERS:
 BBC User Guide Acorn.....£15.00
 BBC PLUS User Guide.....£15.00
 Drawing your Own BBC Programs.....£6.95
 Introducing the BBC Micro.....£4.50
 Mathematical Programs in BBC Basic.....£9.95

PROGRAMMING/UTILITY
 Advanced User Guide.....£12.50
 Adv BASIC Rom User Guide.....£7.50
 Advanced Prog Tech for BBC.....£8.95
 Applied Ass./Lang on the BBC.....£9.95
 BBC Micro Advanced Programming.....£9.95

BBC Micro Sideways ROM's RAM's
 BBC Micro Sideways Roms.....£9.95
 B. Smith.....£9.95
 Guide to the BBC ROM.....£9.95
 Exploiting BBC BASIC.....£6.95
 Further Programming for BBC.....£4.00
 Programming the BBC.....£6.50
 Structured Programming.....£6.50
 Using BBC BASIC.....£10.00
 View 3.0 User Guide.....£12.50
 Viewstore.....£12.50
 Viewsheets.....£12.50
 Word Processing on BBC (Wordwise + Epson).....£5.25

SOUND & GRAPHICS:
 Advanced Graphics with BBC.....£6.00
 BBC Graphics & Sound.....£7.50
 Creative Sound on the BBC.....£9.95
 Graphics on the BBC Micro.....£6.00

DISC DRIVE SYSTEMS:
 Advanced Disc User Guide.....£14.95
 BBC Micro Disc Companion.....£7.95
 Disc Book.....£3.50
 Disc Programming Techniques.....£7.95
 Disc Systems.....£6.95

APPLICATIONS:
 BBC Filing Systems & Databases.....£7.95
 Business Programming on BBC.....£7.95
 Business Applications on BBC.....£7.95
 DIY Robotics & Sensors.....£6.95

TECHNOMATIC

01-208 1177

BBC Computer & Econet Referral Centre

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 Telex: 922800
 (close to Dollis Hill) ⊕
West End Branch
 305 Edgware Road
 London W2
 Tel: 01-723 0233
 (near Edgware Road) ⊕

For fast delivery telephone your order on 01-208 1177 using VISA/Access Card

Orders welcome from government depts & educational establishments.


All prices ex VAT
 Prices are subject to change without notice
 Please add carriage
 (a) £8 (Datapost)
 (b) £2.50
 (c) £1.50
 (d) £1.00

EDUCATIONAL SOFTWARE



We are pleased to announce that we now stock the full range of BBC Publications Educational software for the BBC computers. This software which is in many cases developed alongside radio and TV programs from the BBC Education Department, has all been tested in many schools, and by education experts to ensure the high quality one would normally expect from BBC. These packages supplement the class room learning by providing moving and colourful graphical displays which normally cannot be easily produced on the blackboard and help in ensuring clear understanding of a variety of subjects. The software has received wide acclaim from teachers, and in the educational press. All cassette programs transfer easily to disc, and all disc programs can be run on 40 or 80 track drives.

PRIMARY LEARNING


ASTRONOMY

Aimed at the 9-12 age group, programs include Phases of the Moon, Eclipses, Seasons of the Year, Planetary Motions and Lander which is a gravitationally accurate game. All programs feature colour graphics  £12 (d)


COMPUTERS AT WORK: THE WORK GAME

Uses the technique of computer synchronised audio to illuminate two of the most important applications of computers — robotics and information technology. Includes a complete database program, tutorial on word processing principles, and robot control program driven by a logo-type language.  EC £13 (d)  EC £17 (c)

DRAWSTICK

For children aged 8 upwards allowing them to create pictures, charts, maps and diagrams. It is sufficiently sophisticated for use by older children and adults. Pictures are saved in a compressed form, and can be incorporated in your own programs. Uses keyboard or joystick.  £9 (d)

INTRODUCING GEOGRAPHY

Four exciting graphic adventure simulations to bring geography to life for the 9-13 age group. River involves navigating a river's course to the sea. In Flight, you fly an aircraft round the world. Summit takes you up Mount Everest, and Nomad involves survival in the desert.  £17.20 (d)

MATHS WITH A STORY 1

Four primary-level maths programs suitable for children of a wide range of abilities. Topics include symmetry, co-ordinates, and probability. £9.50 (d)

MATHS WITH A STORY 2

These further four maths programs are for the same age/ability range as pack 1, and cover similar topics, from different angles. £9.50 (d)

NUMBER GAMES

Six maths programs designed to please the eye and stimulate the mind of any active and adventurous child aged 8 upwards. EC £8.65 (d)

USING YOUR COMPUTER

A friendly and original introduction to computers using the computer synchronised audio technique. Written for a 8-12 year old but also suitable for any complete novice. Total of 80 minutes of audio material and 14 programs. £26.00 (c)

WORD PLAY


An elegant but simple program to introduce primary school age children to the concept of word processing. Search, delete, justify etc have small animal icons associated with them. Fun manual for small children. £10.75 (d)

DRAWSTICK


£8.50 (d)

SECONDARY LEARNING


ADVANCED LEVEL STUDIES: STATISTICS

Six programs covering the central concepts and principles of statistics. Topics covered are Discrete Data and Binomial Distribution, Continuous Data and the Normal Distribution, Hypothesis testing and confidence intervals, Central Limit theorem and Estimation, Simulations, Correlation and regression.  £25 (d)


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
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Designed to provide a basic introduction to information technology for young people and adults. The course assumes no prior knowledge of the subject and is suitable for use in secondary schools, further education colleges, ITes and adult education centre. This software can be used alone, or in conjunction with the BBC's Inside Information radio series.  EC £11 (d)


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Developed by the Open University to provide a full implementation of Logo — the language of learning — for the BBC Micro. 2 x 16K ROMS and two detailed manuals (120pp and 300pp)  EC £61 (c)


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A secondary level physics program allowing the student to learn about waves by displaying waveforms on screen. Parameters can be altered and the results observed immediately.  £15 (d)


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A secondary level program about using computers for control. The pack gives three simulations of control systems. Control is achieved using a subset of 6502 assembly language. A program editor is supplied.  £15 (d)

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This secondary level interactive program in three parts follows the space shuttle from launch to recapture of a satellite in space. Students knowledge of Newtonian mechanics is tested at each stage.  £20 (d)

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This program allows students to take the part of groups who manage a nature reserve according to their own special interests. The object is to keep all groups satisfied. EC £20 (d)



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 Disc

EC Network Compatible

 Audio Cassette

Source file assembler

KEVIN EDWARDS reviews the Meta Assembler development system

*Product: Meta Assembler
Price: £145 plus VAT
Supplier: Crash Barrier, Freepost,
Flitwick, Bedford MK45 1YP. Tel:
0525 717148*

META Assembler, from Crash Barrier, is a development system for the BBC Micro which allows you to create and assemble source files for a wide range of processors including the 6502, 6800, 6809, Z80 and 68000/8. The object code produced can then be sent to the target machine via the RS423 port using the built-in serial communications software.

The package consists of two sideways ROMs, an A4 file containing the documentation, two system discs and a function key strip for the editor.

The first disc contains example source files for a maze game and shows many of the useful features provided by the assembler. The other disc has the translation files for the different processors.

These contain exact details of the instructions for each processor so that Meta can check the syntax of the source and produce the correct object code.

Once the ROMs have been fitted the command *META is used to enter the system, after which the currently selected drive is started up and the file *ROOT* – if present – is loaded from the current directory. The main menu is now displayed with 10 options (see Figure I).

If no root is found, as is the case when Meta is first used, option 7 should be selected from the menu. This creates the root file for the processor being used. It achieves this by reading in the relevant

translation file from the system disc.

Next, the amount of RAM to be reserved for the labels must be chosen. This is in 2k steps between 2k and 10k – sideways RAM may also be used. The smaller the label space the greater the maximum size of the modules/macros that can be present in memory.

When a program is being assembled the first file loaded is always *ROOT*. Without this, Meta doesn't know what type of source code it's assembling. Using the instructions within the root the various modules are now loaded and assembled.

Pressing Escape while at the main menu enters the Meta editor. This produces a clear and detailed Mode 7 screen showing the amount of text memory left, the name of the file being edited and the target processor type.

Movement through the text is achieved using the cursor arrows as well as Shift, Ctrl and Tab. The function keys are used to drop, kill and find markers, move and delete text, and so on. Pressing f8 evaluates the numeric expression at the cursor position. This useful facility permits symbols to be examined after assembly.

Creating the source is a simple task as the editor is easy to use and provides all of the facilities you'd expect to find in a

source file editor.

Although the screen can only display 40 characters across, remarks can be placed on an adjacent screen. This is automatically displayed whenever the cursor is moved off the left or right edges.

If, during assembly, the mnemonic/directive field of the source file is not recognised Meta will search the current directory for the corresponding filename. This is loaded and the assembly continues from where it left off.

These external files may be either modules or macros. In the case of macros relevant parameters are passed in the operand field.

Meta supports many directives, including the high level instructions IF, ELSE, ENDIF, REPEAT and UNTIL. Figure II lists the directives and their associated parameters.

The directives *OBSSEND* and *OBFORM* control the destination and format of the object code respectively – see Figures III and IV.

The *OBSSEND* 6 option sends data to the eprom emulator, *PORTAL* – also available from Crash Barrier. This makes the object code appear in the target processor's memory map just as if it had been placed in eprom – very clever. At last programs can be tested immediately after assembly without the hassle of programming eproms.

Meta supports all the standard bitwise, logical and arithmetic operators and works to 32 bits so that the 68000 can be catered for. Expressions can be nested by square brackets up to eight levels. The \$ symbol can also be used to refer to the current value of the program counter.

The radix designators for constants may be altered, permitting you to prefix hex numbers with \$ or & or suffix them with H. For example, the following are all equivalent hex numbers – \$BF, &BF

META ASSEMBLER MAIN OPTION PAGE

- 0) Find String
- 1) Save Module to DISK
- 2) Load Module from DISK
- 3) Search/Replace
- 4) Load to cursor
- 5) Save between markers
- 6) Assemble
- 7) Create ROOT Module
- 8) Set Serial Options
- 9) Enter Serial Communicator

Type your choice

ESC = Editor

Figure I: Main option page

| | | | | | |
|---------|------------------------------|--------|---------------------------|--------|----------------------------|
| DISPLAY | <string> | DC.L | <long-word>,<long-word>.. | GLOBAL | |
| EJECT | | DS.B | <no. of bytes> | ALIAS | <string> |
| PAGE | | DS.W | <no. of words> | LOAD | <filename> |
| FORM | | DS.L | <no. of long-words> | SKIP | <no. of bytes>,<fill byte> |
| HEADER | "<string>" | EQU.B | <byte>,<byte>.. | SLIST | <ram bank>,<ram bank>.. |
| LIST | ON/OFF | EQU.W | <word>,<word>.. | OBFORM | <format> |
| PASS1 | ON/OFF | EQU.L | <long-word>,<long-word>.. | OBSEND | <destination> |
| ENABLE | <option> | EQU.S | "<string>" | ORG | <new address> |
| PRIN | <ctrl code>,<ctrl code>.. | FCB | <byte>,<byte>.. | OFFSET | <offset> |
| PRINT | <expression> | FDB | <word>,<word>.. | END | [<execution ads.>] |
| TITLE | "<string>" | FCC | "<string>" | IF | <expression> |
| FIELDS | <lab.>,<opc.>,<oper.>,<lab.> | MODULE | ON/OFF,[<ctrl code>].. | ELSE | |
| DATA | <byte>,<byte>.. | MACRO | <param>;param.. | ENDIF | |
| DC.B | <byte>,<byte>.. | MEND | | REPEAT | |
| DC.W | <word>,<word>.. | LOCAL | | UNTIL | <expression> |

Figure II: Meta directives

From Page 45

and OBFH.

All symbols defined within macros are automatically made LOCAL, unless the GLOBAL directive is used at the start of the source file. The opposite happens with modules.

Alias labels permit string symbols to be defined. Each time the alias label, preceded with a colon, is located its value is substituted in the source before being assembled.

If Meta encounters a problem during assembly one of around 35 different messages will be produced. In addition to this the editing cursor is placed over the statement in question, ready for modification.

As well as the editor and assembler Meta also supports serial communications.

The serial options menu – obtained by selecting option 8 from the main menu – allows you to define the settings for serial communications. This includes the baud rates for receive and transmit, data format, whether control characters are filtered, and so on.

When any of these are altered the translation file in memory is also

| OBSSEND format | Destination |
|--------------------------|--------------|
| 0 | Nowhere |
| 1,<load>,<exe>,<fsp> | File |
| 2 | User port |
| 3 | Printer port |
| 4,<baud> | RS423 |
| 5,<bank> | Sideways RAM |
| 6,<EPROM>,<PORTAL>,<opt> | PORTAL |

Figure III: OBSSEND options

updated so that the options are retained whenever ROOT is loaded – assuming the root file has been loaded and saved during the process.

Option 9 is the actual serial communicator from which you can talk to the target computer. As with the editor, you can use f8 to evaluate an expression, the result of which is automatically sent to the other system.

Meta has plenty more features which are beyond the scope of this review. Every facility I required was there and worked in just the way I wanted it to.

This flexible, straightforward and

comprehensive cross assembler is a pleasure to use. Let's hope more products of the same quality appear in the future.

| OBFH format | Format type |
|-------------|-----------------|
| 0 | No output |
| 1 | Straight binary |
| 2 | ASCII space |
| 3 | Intel hex |
| 4 | Motorola |
| 5 | Internal |

Figure IV: OBFH options

PROBLEM

I WOULD be grateful if you would throw some light on the following problem encountered with my BBC Micro fitted with an Acorn DFS supplied by Viglen.

Certain discs such as the Viglen utilities and Paul Daniel's Magic

SOLED

There is nothing wrong with your computer, it is your disc drive that is out of alignment.

There is a switch inside the drive that detects when the head is at track zero. On your drive this is out slightly so the head is not being positioned correctly.

This is fine on your own discs as the tracks were formatted with this misalignment "built in". However on discs formatted on other drives

Show will not auto boot, catalogue or load on my machine – I obtain disc fault OC at 00/00. The same discs function perfectly on any BBC Micro at my place of work.

What puzzles me is that all discs that I have personally formatted and saved programs on function correctly every time. – R. Brown, Skelmersdale.

the head is not being correctly positioned over the track and so it can not read it.

Try swapping the disc drive with the one you have at work to confirm this. If you have your drive re-aligned there is a danger that it will not read your own discs any more, but you should be able to reach a compromise position where you can read both.

Adjustment of this switch should only be attempted by a competent engineer who has the correct test gear.

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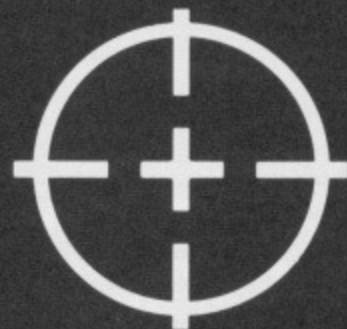
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*It will draw praise
from designers ...*



*... pass the
laboratory test ...*



*... and be an
education in itself ...*



Product: Replay

Price: £35

Supplier: Vine Micros, Marshborough,
Nr. Sandwich, Kent CT13 0PG. Tel:
0304 812276

MANY facilities are advertised to enable BBC Micro users to copy or back-up protected programs and transfer them from tape to disc.

While some break the protection in the process and thus assist software piracy, others are more responsible, using techniques which retain the protection. Vine Micros, who already leads the field in the latter group with the TD ROM, now supplies Replay.

It consists of a 16k eprom mounted on a 28 pin socket connected by a set of leads to a small printed circuit board which in turn is connected to a 16 pin IC header, two small connectors and to a push button switch.

Installation instructions are easy to follow and although fitting is slightly more complex than a simple ROM, it should present no difficulty to the average BBC Micro user. Once fitted my micro behaved as normal, with no clashes revealed during the time I have had the review copy.

Vine Micros matches Replay to the floppy disc controller chip, so I assume it acts as its own disc filing system. Vine also claims that different Replays will not load files from each other or other systems, so continuing the backup with protection afforded by TD ROM.

Typing *REPLAY reveals the main system menu – see Figure I – from which each freshly formatted disc for use with Replay must be specially initialised. After this they cannot be used with other data.

Transferring files from any other

Back-up without danger of piracy

By IAN
WHITMORE

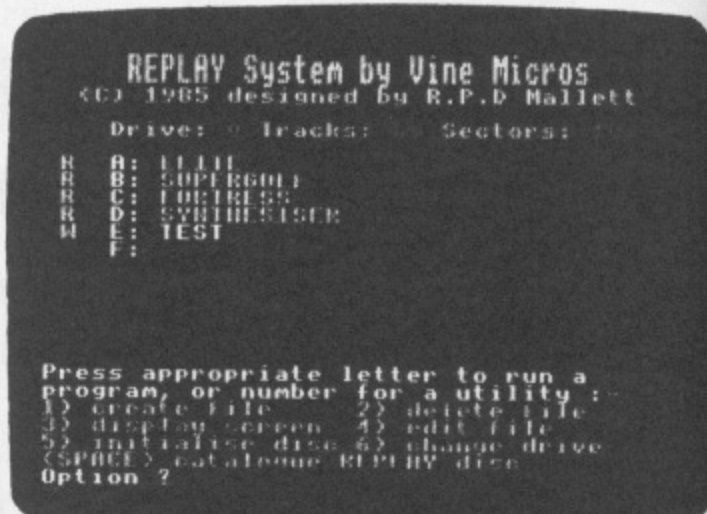


Figure I: Main system menu

system requires a file to be created on the Replay disc using option one. After pressing Break, you load or run your game or utility in the usual way, from tape or disc, pressing the Replay button when you have reached a stage that you want to save.

This freezes the micro, leaving only the keys needed in Replay still active and the Caps Lock and Shift Lock lights flashing alternately. Pressing function keys 0, 1, 2 or 3 will save the whole of the BBC Micro's 32k of memory on to the relevant side of a Replay formatted disc, then allow the program to continue.

In order to re-run your program from the Replay disc you must re-enter the main menu and press the relevant letter

key. The program is loaded and continues from the point it was saved.

It is also possible just to load the screen, which can then be dumped to a printer with a suitable dump routine. Using this facility I have been able to produce dumps of program screens – Figures II and III – previously impossible without a lot of hard work, if at all.

In the development of Replay Richard Mallet found one area of problems in the special screen formats used by some games and utilities.

The 6845 video controller chip possesses a number of registers which control the display. Several of these are write only and are thus unreadable by Replay which reloads the screen but is garbled. The ROM has the ability to write to these registers when reloading a program, obtaining the data from one of two sources.

For several named games, such as Elite, the data is held on the chip and is programmed in when the game is originally saved on a Replay disc if it has been given the correct name.

The second way is to use the edit facility – see Figure IV – from the main menu. You are presented with a screen allowing the setting of most of the 6845

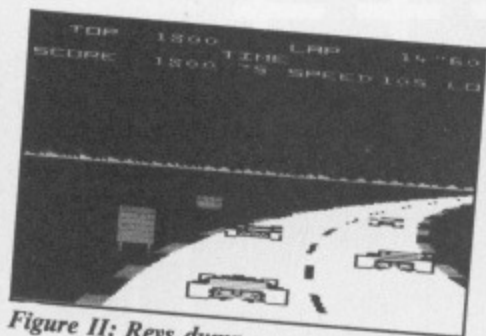


Figure II: Revs dump

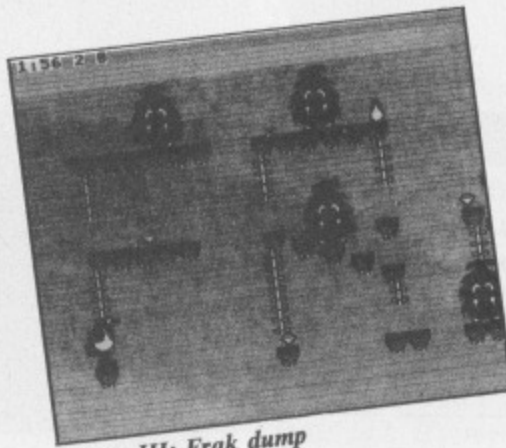


Figure III: Frak dump

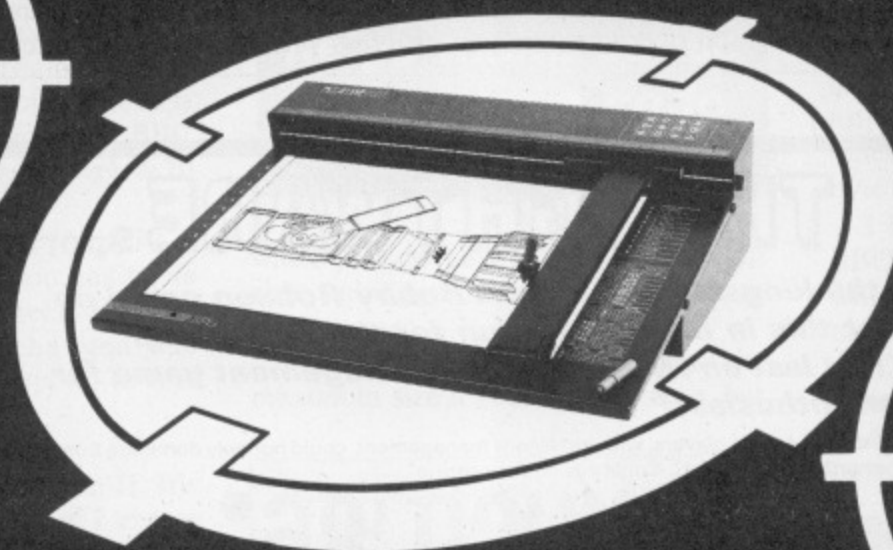
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PROBLEM

I USE a BBC B with a TV and sometimes the screen jumps and flickers. It appears to happen randomly. — Warren Day, Enfield.

SOLOVED

This is probably due to a faulty socket or connection in the UHF modulator. You can get replacement modulators from Watford Electronics.

It is simple to replace but you will need a large capacity soldering iron, say about 40W.

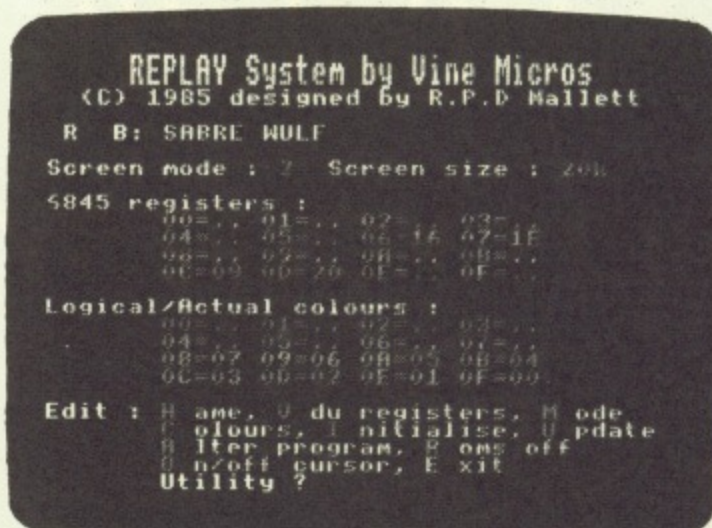


Figure IV: 6845 edit facility

From Page 48

registers, the logical/actual colours and the screen mode.

It is also possible to alter the program — Vine Micros provides tips for infinite lives and so on on some games. Other facilities switch off ROMs and cursor, and allow files to be continuously updated so you can save a game over and over again as you progress with it.

Replay transferred every file I tried from tape to disc, and has replayed almost everything set for it. Although not a 100 per cent successful in reloading screens I found it very useful, providing easy access to screens for dumping for reviews.

Here is the opportunity for BBC Micro users who have many games on tape to transfer them to disc with ease and at a reasonable cost.

QUAL-SOFT

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AMSTRAD ACTION
REVIEW Jan '86

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- ★ ANY team formation you choose. 2 from 5 substitutes.
- ★ In match tactics: any no. of individual player adjustments.
- ★ Your qualification group: full results and table.

TAPE 2 (Finals)

- ★ Choose a 20 man squad to take to the finals.
- ★ Group of 4 prelims. 16 to final knockout comp.
- ★ Extra Time, PENALTY SHOOT-OUTS, where relevant.
- ★ Formation and strength information on opposition.
- ★ 2 from 9 substitutes (the FA tells us so).

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QUAL-SOFT comments: With 5 levels of play, 12 depths of sophistication, and "fun" graphics, this game can be enjoyed by an 8 year old youngster as a "fun" game, and by the most sophisticated as a tactical/strategy challenge of the highest order.

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INCREMENTING MEMORY VIA ABSOLUTE ADDRESSING

WE have already met two additional registers for the 6502, the X and Y registers. We saw that we could increment and decrement these with INX, INY and DEX, DEY, although we couldn't do so with the accumulator.

We could however increment memory via absolute addressing. We can also increment memory via zero page. Program I shows how.

| Locations | Mnemonics | Opcodes |
|-----------|-----------|---------|
| 2000 | LDA #00 | A9 00 |
| 2002 | STA &70 | 85 70 |
| 2004 | INC &70 | E6 70 |
| 2005 | RTS | 60 |

Program I

Here the first two instructions make the contents of &70 zero. Notice the zero page STA and the fact that &70 is one of the memory locations the BBC Micro reserves for us in zero page, &70 to &8F.

We then INC the value of &70 – again a zero page instruction, taking its contents to one. To check that its contents really have changed use Hexer's display memory option or try:

PRINT *70

Now have a look at Program II. It's virtually the same as Program I except that it starts by storing &FF into &70, then increases the contents of &FF by one.

Program II is by way of an experiment. We know that the largest number we can store in a memory location is &FF. So what happens when we increase it by one?

If you run it you'll probably be surprised to find that &70 now contains

| Locations | Mnemonics | Opcodes |
|-----------|-----------|---------|
| 2000 | LDA #FF | A9 FF |
| 2002 | STA &70 | 85 70 |
| 2004 | INC &70 | E6 70 |
| 2006 | RTS | 60 |

Program II

zero. It's easily explained though. The contents of a byte act a bit like those of a car's odometer – the display that gives a

car's mileage. When you get past the maximum (999,999 on the odometer, 255 on the byte) the contents of both become zero.

Another way of looking at it is that

MIKE BIBBY
helps make sense
of machine code
– Part 6

when you go past a byte's maximum size you've gone round the clock and are back at zero.

So if you increase a byte past its maximum size it goes back to zero, but

| Locations | Mnemonics | Opcodes |
|-----------|-----------|---------|
| 2000 | LDA #00 | A9 00 |
| 2002 | STA &70 | 85 70 |
| 2004 | DEC &70 | C6 70 |
| 2006 | RTS | |

Program III

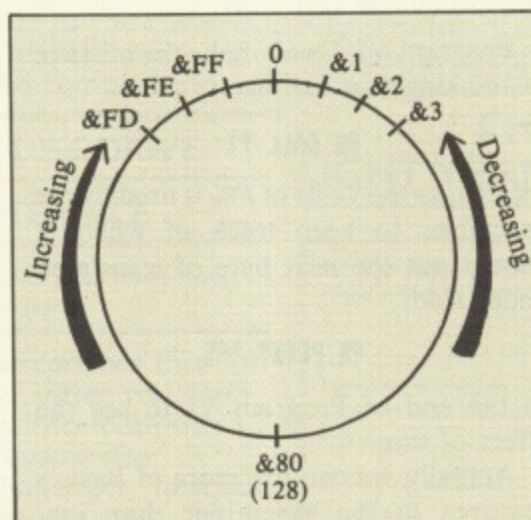


Figure 1: How a byte's contents vary

what happens if you decrease it past its minimum size zero?

Program III shows the answer – when you decrease zero by one you're left with &FF. In other words we've gone round the clock backwards. Figure I shows how this works in practice.

And now for something completely different. Take a look at Program IV, our beeping program. It should present no problems, we just translate the appropriate hex code from the mnemonics then poke it into memory byte by byte via Hexer and run it.

I have however mentioned that the BBC Micro has a built-in assembler which will translate or assemble our mnemonics into opcodes for us. Not only that, it even stores it in the appropriate memory locations.

All we have to do is to enter our mnemonics with line numbers in front of

```
LDA #7
JSR &FEE
RTS
```

Program IV

them, as in an ordinary Basic program. However the BBC Micro needs to know three additional things:

- Where to put the code.
- Where the mnemonics to be translated start.
- Where the mnemonics finish.

Program V shows how we would accomplish the assembly of Program IV in practice. Again I stress that Program V is a Basic program with line numbers. The assembler is an intrinsic feature of BBC Basic. Other Basics are not so generous.

Line 10 tells the assembler where to

From Page 51

put the code. This is determined by the value of *P%*. In this case we're storing it at &900, a safe location in an area of memory reserved for cassette output

```
10 P%=&900
20 [
30 LDA #7
40 JSR &FFEE
50 RTS
60 ]
```

Program V

operations which we won't be using.

Line 20 tells BBC Basic that the next lines are mnemonics to be translated into hex and stored from *P%* onwards. It uses the left square bracket (I) to indicate this. In Mode 7 this appears as a left-pointing arrow.

Lines 30 to 50 then contain the mnemonics to be assembled or translated into hex. You should be able to follow this by now – the only new things are the line numbers.

Line 60 tells Basic that we've finished all the mnemonics we wish to assemble by using the righthand square bracket]. This appears as a right-pointing arrow in Mode 7.

To assemble the code – that is, to translate from mnemonics into hexadecimal – we simply RUN the Basic program. Figure II shows the output on your screen, giving feedback on the assembly in much the same form as we're used to – locations where it's stored, the mnemonics and the opcode.

Note that although we've run the Basic program so that it puts the code into memory we still haven't run the actual code itself. To run it we need to:

CALL &900

CALL is the Basic keyword that hands control of things over to the machine code program at the address specified. It's up to you to supply the code at the address and make sure that it ends with an RTS to return to Basic.

Don't confuse the two operations – you RUN the Basic program to put the

```
0900
0900 A9 07 LDA#7
0902 20 EE FF JSR&FFEE
0905 60 RTS
```

Figure II: Output of Program V

code into memory, then you run the assembled code with a CALL to its start address. If you wanted you could run the code immediately after it has been assembled by adding:

70 CALL &900

to Program V.

Take a look at Program VI. Believe it or not the machine code generated is identical to Program V. I've used the assembler's ability to deal with variables or labels to good effect though. By defining *beep=7* in line 10 we can use:

LDA #beep

instead of:

LDA #7

which I think you'll agree is far more readable.

Similarly the assignment of line 20 means I can use:

JSR oswrch

rather than:

JSR &FFEE

It's good practice to use labels in this fashion instead of numbers. It makes

```
10 beep=7
20 oswrch=&FFEE
30 P%=&900
40 [
50 LDA #beep
60 JSR oswrch
70 RTS
80 ]
```

Program VI

programs far clearer, particularly when the listings get longer.

To run the assembled code automatically you can add:

90 CALL &900

to Program VI. Don't make the mistake of thinking you can use:

90 CALL P%

though, as the value of *P%* is used by the assembler to keep track of where it should put the next byte of translated code. Add:

90 PRINT *P%

to the end of Program VI to see the effect of this.

Actually we can use more of Basic's features in the assembler than just variables. As Program VII shows we

can use functions too. In line 60 we want to load the accumulator immediately with the Ascii code for the letter A. Instead of:

60 LDA #65

or:

60 LDA #41

we can use:

60 LDA #ASC("A")

The rest of the program is very similar to one we had last month. As we press a key the letter displayed changes from A to B to C. This time though the letter is displayed at the top right of the

```
10 MODE 7
20 topright=&7C27
30 oswrch=&FFEE
40 P%=&900
50 [
60 LDA #ASC("A")
70 STA topright
80 JSR oswrch
90 INC topright
100 JSR oswrch
110 INC topright
120 RTS
130 ]
140 CALL &900
```

Program VII

screen, hence the label *topright*. See if you can work out exactly how it works for yourself.

For homework this month try creating versions of Programs I, II and III using the built-in assembler. Actually you should be able to run any of the programs we've met so far this way. I suggest you run them all with *P%* at &900 for the time being. Remember your programs must:

- Set *P%* to locate the code in memory.
- Have [before the mnemonics to be assembled.
- Have] after the mnemonics.

If you use Programs V and VI as models you won't go far wrong. Remember to check the code generated by the assembly against the code I've given before you CALL it, just in case of any slips.

● *There's a lot more to using the assembler than you've met so far, but you've had more than enough to be going on with. Get plenty of practice in, as we've got some interesting ideas next month.*

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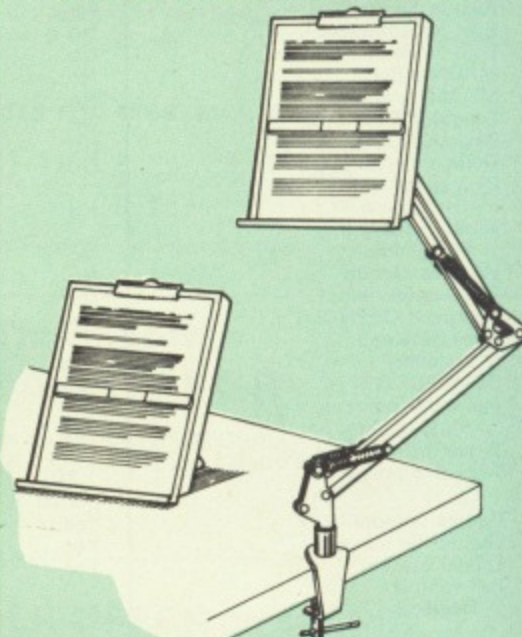
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WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. - Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc - Ours allows both of these! Operates both in Single & Double Density modes.

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD & 7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- Complete DDFS Kit incl. fitting instructions **£46**
- DDFS Manual (no VAT) **£6.95**
- We will exchange your existing Single Density DFS Kit for our DDFS Unit at **£35**

Watford Electronics DDFS PLUS for the BBC B Plus

Watford Electronics was the first company to produce a serious alternative Disc Filing System (DFS) for the standard BBC micro. Since then, we have been refining and advancing this sophisticated product right up to today.

Now WE'VE DONE IT AGAIN! Watford proudly presents the Double Density Disc filing system for the BBC B+, with all the advantages of the advanced Watford DDFS available on the new BBC B+ DDFS.

Acting as a powerful alternative DFS to Acorn's '1770 DFS' supplied with the BBC+, this superb addition to any BBC+ greatly enhances its performance with a simple fitting operation.

DDFS PLUS incorporates all the features of the Watford's popular DFS & DDFS for the BBC B, (at the same time retaining full compatibility with Acorn DFSs), plus it has the following extra features:

Automatic density selection - Full single and double density operations - Extremely powerful and comprehensive OSWORD & 7F emulation - Any file can be full size of disc - Density of last access assumed for speed - Automatic 40/80 stepping swapped on error - All Acorn's extra disc commands implemented.

As you can see from the above information, Watford's DDFS for the BBC+ is far more sophisticated and well thought out than the standard. Take any disc produced by any Watford DFS from the standard BBC and catalogue straight off with no problems.

Unlike the Acorn 'ADFS', our DDFS+ system is just as easy to use as the standard DFSs, with no new complex concepts to have to learn. The features within our DFSs have been constantly enhanced over a period of three years during the time that they have been released; significant attention has been paid to feedback from our customers so that the features offered are carefully honed to the requirements of hobbyists and serious programmers alike.

The Watford DDFS+ is supplied with a comprehensive DDFS manual that explains the basics of disc drives, DFSs, etc. Priced at only £30 including the manual, the Watford DDFS+ is surely one of THE best buys you could make for your BBC B+!

Join the leaders in BBC peripherals; join Watford Electronics - committed to supporting the BBC micro.

DDFS PLUS (for BBC Plus) £30
(Price includes comprehensive manual)

Special DISC UPGRADE OFFER

Acorn/BBC 100K Single Slimline 40 track Disc Drive and Watford's or Acorn's Single Density Standard Disc Interface Kit complete with Utility Disc and Manual.

Only **£99** (carr. £6)
(Offer valid while stocks last)

All prices Exclusive of VAT

By popular demand our retail shop is now open until 8.00pm. every Thursday.

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

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'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.

£5.95 (Book No VAT)

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

ACORN WINCHESTER DRIVES

Complete with Level 3 File Server Software.

10 Megabyte **£1050.00**
30 Megabyte **£1549.00**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). Both are of Japanese manufacture.

With two prices in a box (e.g. £295/£299), the first price is for the standard drive and the second for the same unit in switchable type. Users of either of the two Watford DFSs will not need switchable drives as their DFS will provide software switching for them.

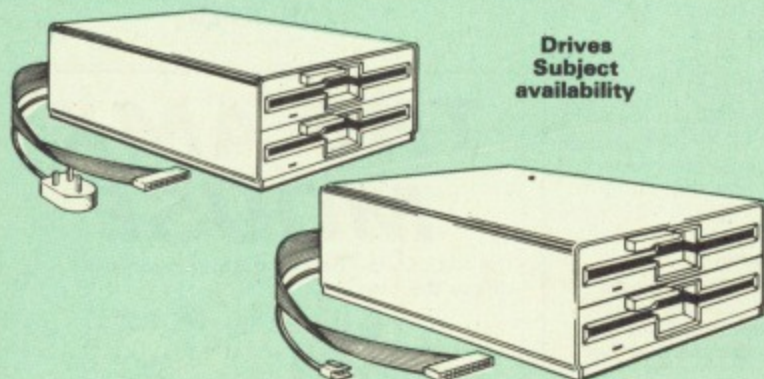
All our Disc Drives (except CLS100) are Double Sided and will operate in both Single and Double Density modes. Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.

Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality Epson and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. All single disc drives with power supply, (i.e. CS100, CS200 & CS400S) are supplied in a twin case with twin data cable for later inclusion of a second drive). At Watford we anticipate your needs of tomorrow not just today!

When using a BBC Micro, most people find themselves preciously short of space. The Watford's BBC Micro Plinths form an ideal way of recovering some of this space; your BBC, disc drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. Some of our competitors offer disc drives built into plinths, but these aren't as sensible as you might think. With a Watford Plinth, your disc drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen and paper, reference manuals, etc. Follow the trend with Watford Plinth.



Drives
Subject
availability

| Capacity | Drives without P.S.U. | | Drives with P.S.U. | |
|---|------------------------------------|------------------------------------|----------------------------------|----------------------------------|
| | Single | Twin | Single | Twin |
| 100K (180K) | CLS 100 £75 | | CS 100 £116 | |
| 200K (360K) | CLS 200 £102 | CLD200 £185 | CS 200 £116 | CD200 £199 |
| 400K (720K) | CLS 400 £104 £105 CLS400S | CLD 400 £185 | CS400 £123 £124 CS 400S | CD400 £205 |
| 800K (1.44M) | | CLD800 £194 £195 CLD 800S | | CD800 £218 £219 CD 800S |
| ● TWIN Disc Drive Case, complete with Power Supply & Cables £35 Securicor carriage on Disc Drives £6 | | | | |

Prefix C = Cased Drive
L = Less PSU
S = Single
D = Double

Suffix S = 40/80 Switchable

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).

All our switchable drives now have a smartly mounted front panel 40/80 switch for ease of use.

3M - DISKETTES

Top quality 3M - SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

- 10 x 5 1/4" S/S D/D 40 Track Diskettes **£11**
- 10 x 5 1/4" D/S D/D 40 Track Diskettes **£13**
- 10 x 5 1/4" S/S D/D 80 Track Diskettes **£19**
- 10 x 5 1/4" D/S D/D 80 Track Diskettes **£20**

- 10 x 3 1/2" S/S D/D 40/80 track Discs **£25**
- 10 x 3 1/2" D/D D/D 40/80 track Discs **£35**

TOP QUALITY 5 1/4" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

- 10 x M4 S-S D/D 40 Track Discs **£10**
- 10 x M5 D/S D/D 40 Track Discs **£12**
- 10 x M7 D/S D/D 80 Track Discs **£17**

- 3" Double Sided Discs **£4 each**

This month's STAR OFFER

Buy any two packs of the 3M or our own brand TOP QUALITY DISKETTES and we will give you absolutely FREE - yes absolutely FREE - our 5 1/4" Floppy Disc Head Cleaner Kit.

(Offer valid while stocks last)

Special BULK OFFER on 5 1/4" DISCS

(Supplied packed in plastic storage Units)
(Lifetime warranty on Discs)

| Type | Description | Pack of 20 | Pack of 50 |
|------|----------------------------------|------------|------------|
| M4 | Single/Side Double/Density 48TPI | £17 | £42 |
| M5 | Double/Side Double/Density 48TPI | £21 | £56 |
| M7 | Double/Side Double/Density 96TPI | £29 | £70 |

DISC ALBUMS

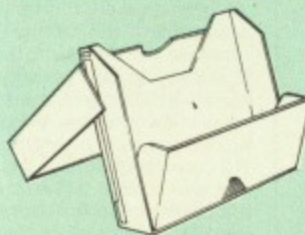
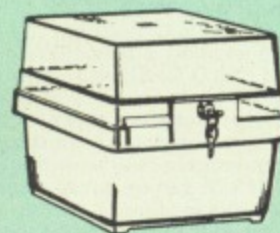
Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- M35 - holds upto 40 discs **£9**
- M85 - holds upto 95 discs **£11**



PLASTIC LIBRARY CASES

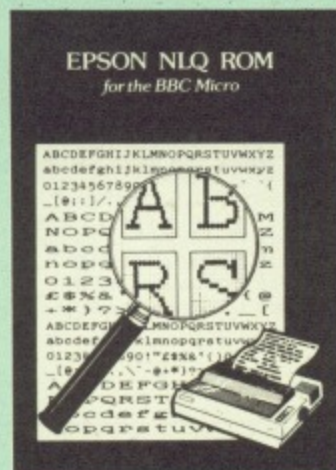
FOR 5 1/4" DISC STORAGE
holds 10 Discs.

£2.00

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

£8



Harness the full potentials of your Epson RX & FX Printers. Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ1 (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:

- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used separately or in any combination.
- Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £25

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM. A must for all VIEW and NLQ ROM users.

£7.00

(Hi-View compatible)

THE NLQ DESIGNER

KAGA KP810/910 and Canon PW1080 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! For the BBC Micro. This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on. Downloadable Fonts require 6264 RAM chip fitted.

A 40 or 80 track (please specify) disc containing 3 example fonts is included in the package.

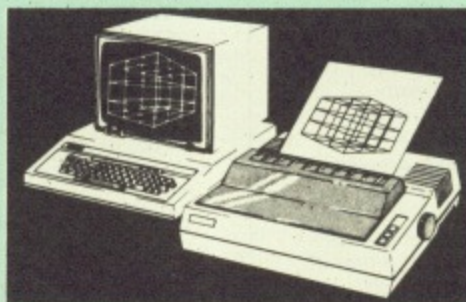
(P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM & FONT Disc **£25**
- Kaga Individual FONT ROMs **£15**

(Write in for further details).

ALL PRICES EXCLUSIVE OF VAT

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!

The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.

Two commands are used to operate the dump routines:

*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:

- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985

"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . ."

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.

"Well, here is that winner!"

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

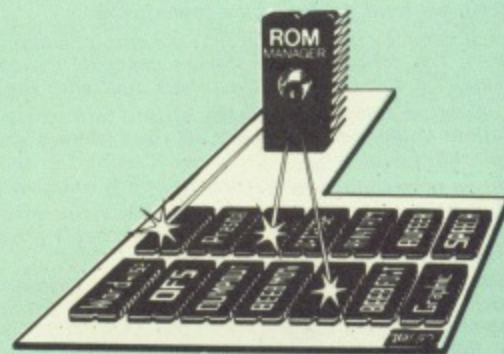
"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £25 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Mannesman Tally etc. Price including comprehensive manual

£25

ROM MANAGER



Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)

Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.

Many more facilities available.

SPECIAL OFFER £18

BEEBFONT ROM

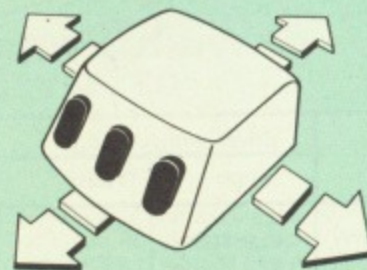
BEEBFONT is a remarkable and different concept in BBC software. It allows you to display text on the screen in 13 different styles. It is supplied complete with a Spooler and Editor on 40 or 80 track disc.

(Please write in for technical details).

ONLY £25

THE AMX MOUSE

The AMX Mouse needs no introduction. It is simply the best.



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £65 (carr £1.50)

| | |
|----------------------|---------------|
| AMX DESK Package | £20.00 |
| AMX UTILITY Package | £12.00 |
| AMX SUPERART Package | £43 |
| AMX PAGE-MAKER Pack | £43 |
| AMX 3D ZICON Disc | £21 |
| AMX Database Disc | £21 |
| AMX XAM Educational | £21 |

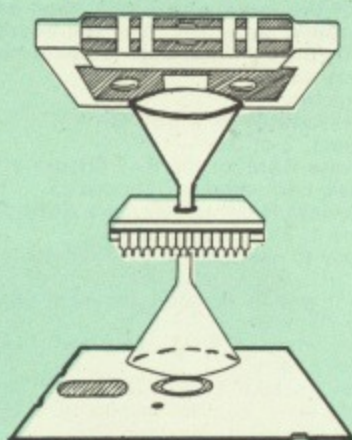
RB12 MARCONI TRACKER BALL

This popular unit is supplied complete with software.

Price: £50

TRANSFEROM

(Tape to Disc Utility)



The only TAPE to DISC Utility ROM that works with our Double Density Disc Interface. Not compatible with 1770 DFS.

This advanced and sophisticated utility ROM for the BBC Micro has the following features:

- Fully menu driven for ease of use
- Copes with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games
- Supplied with comprehensive manual

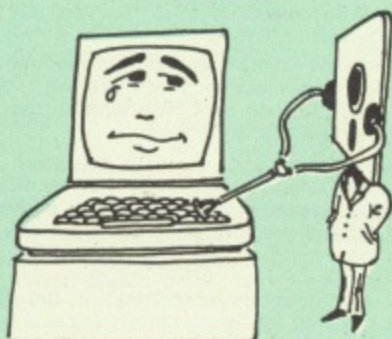
TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required - Single or Double Density.

£25.00

All prices exclusive of VAT

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

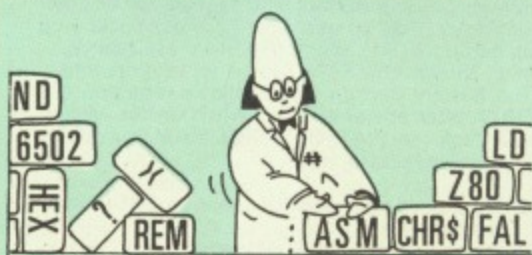
Continued

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

ROMAS

THE CROSS ASSEMBLER AND
MACRO EDITOR
FOR SERIOUS PROGRAMMERS!



ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8 P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referencer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at... **Only £45**

Please specify 40 or 80 track disc when ordering.

ADE

'Systems' complete program development package in a 16K ROM. We are now supplying the new 6502 2nd processor compatible version.

SPECIAL OFFER ONLY £40

ULTRACALC 2

The mark 2 version of the BBC Publications' extremely popular electronic spreadsheet ROM.

Only: £66

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only £20

ROM-SPELL

"way ahead of any competition"



ROM-SPELL is probably THE most advanced and fastest spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. '85), which we feel sure will convince you that this is THE only spelling checker worth considering.

"The editing system is very neat and simple, instead of replying to queries and beeps all of the time..."

"The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc can be examined and taken out if necessary". "... that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very popular product indeed".

"... ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP/M and MSDOS, namely Spellstar and has a speed/performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".

"... and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, ... I feel confident that ROM-SPELL will woo the word processing public with no problems at all".

Compatible with: View, Wordwise & Wordwise +.

Don't settle for less, Buy the best.

£25

(Not compatible with 1770 DFS)
(Please state 40 or 80 track disc)

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

BEEBMON

BEEBMON is the most powerful and versatile machine code monitor from Watford Electronics. BEEBMON offers some superb features specially designed to make the task of understanding and debugging machine code easier; indeed BEEBMON is probably the only product with sufficient power to aid in the debugging of such complex pieces of software as a DFS. Offering a total emulation mode, BEEBMON can be used to single step through code anywhere in memory. All breakpoints are emulated and the workspace is totally relocatable, allowing for the simulation of all those "awkward" pieces of code.

(Write in for technical details.)

£24

DISASSEMBLER ROM

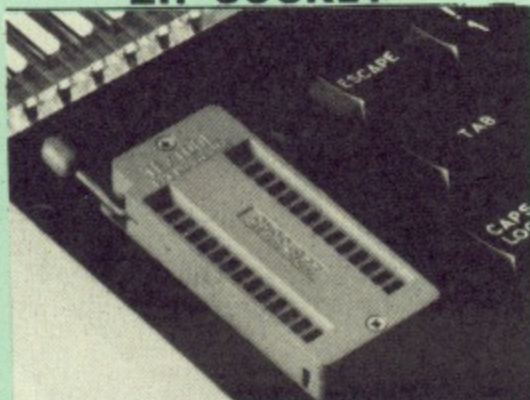
Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use programmers tool.

Please write in for technical details.

ONLY £16

Continued

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 (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- 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 lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)

● BBC B+ compatible. Is ideal for use with KAGA KP810 and GLP printers to allow easy swapping of preprogrammed FONT ROMs.

ONLY £15 (carr £2)

16K Sideways RAM Modules

This is it! The revolutionary design RAM Module you've been waiting for. Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.

Key points to note about this new addition to the Watford range of products are:

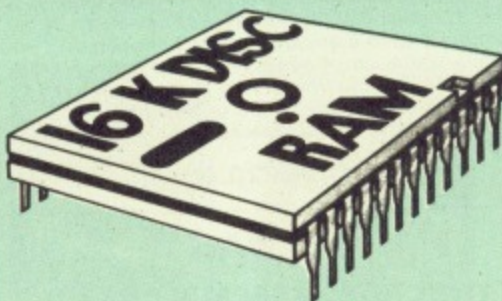
- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Works with any ROM.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: £29 (carr £2)

Optional extras

READ and WRITE protect Switches **£2 each**
Battery for Battery Backup **£3**

All prices exclusive of VAT



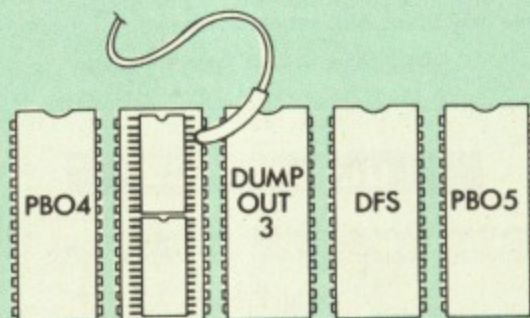
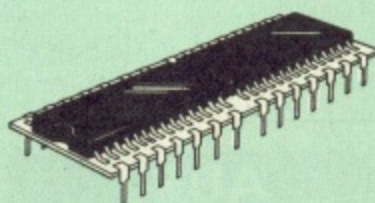
This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write 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 in conjunction with our Buffer & Backup ROM.

New Low Price: £30 (carr £2)

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

SOLID STATE 16K SIDEWAYS RAM



This new unit from Watford, which utilises the latest in Static RAM technology, offers 16k of easy-fit sideways RAM in a very compact unit with a footprint no larger than a standard 28pin EPROM. With only a single flying lead terminating in a mini hook-on probe, to fit, (no soldering required) this compact unit works with any BBC Micro with or without a ROM board. **Compatible with BBC B Plus.** Like our other 16K RAM Modules, this unit is very simple to fit.

Only £28 (carr 2)

Supplied complete with comprehensive software on Disc, Operating and fitting instructions.

Do you find the 16K Sideways RAM Units confusing? If so, we have compiled this quick questionnaire to help YOU decide which is the best one for you. If the answer to any of the questions is yes, then use the index number to select from the boards below. Options in brackets indicate possible secondary choices.

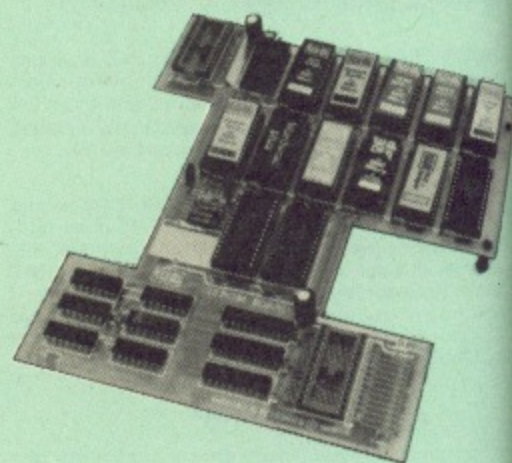
Do you require:

- Sideways RAM for a BBC B? Choose 1, 2 or 3.
- Sideways RAM for the B+? Choose 1.
- A small, basic module? Choose 1.
- A sideways RAM module for a ROM board? Choose 1, 2 or 3.
- An easy to use utilities disc? Choose 1, 2 or 3.
- More than one module installed at once? Choose 1 or 3.
- To use sideways RAM as a printer buffer? Choose 1 or 3.
- Battery Backup? Choose 2 (3).
- Write protect for RAM (makes ROM look like RAM)? Choose 2 (3).
- Read protect (allows recovery from crashes)? Choose (3).

Key:

- 1) Solid State 16k Sideways RAM
- 2) 16k Disc RAM
- 3) 16k RAM module

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16. Also permissible, are various configurations of RAM (up to 16k) and different sized EPROMs (see below).

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

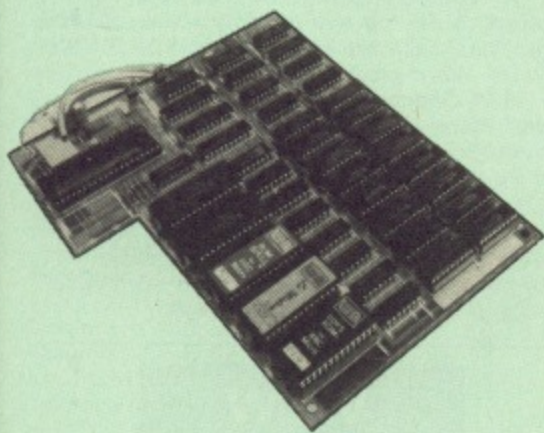
- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 can take the following chips: 2716, 2732, 2764, 27128, 6116, 6264.
- Read protect to make RAM "Vanish"; allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32

Battery backup fitted £36 (carriage £2)

Watford ROM/RAM CARD

A must for all serious users



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with ALL BBC micros (not BBC Plus).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Can run ANY BBC ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD & 7F for ROM-SPILL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM/RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally. Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM/RAM Board.

The ROM/RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, should the user wish to upgrade in the future. Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM **£45**
- ROM/RAM card with 64k dynamic RAM **£69**
- ROM/RAM card with a massive 128k dynamic RAM **£109**

(carriage on ROM/RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit **£7**
- Battery backup **£3**
- Read and Write protect switches **£2 each**
- Complete ROM/RAM board (all options installed) **£125**

Le Modem



The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- A complete communications terminal that transforms your BBC Micro into a very powerful World/wide data transfer system.
- Auto Dials, Auto Answers, Auto Baud selects and is completely controlled by your Micro. There are no external controls!
- Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.
- Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.
- Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELESOFTWARE to be downloaded.
- A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!
- FULLY controlled by simple *COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!
- Connects to the 1MHz bus. A *AUDIO ON/OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.
- Completely self contained with internal mains power supply. (Even a free mains plug is fitted!)
- A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.
- Packaged in such a way that you need nothing else except a BBC Micro to communicate with computers all over the world.
- FREE 3 months subscription to Micronet and FREE registration to MicroLink to start you up.
- BBC Master compatible.
- BT Approval applied for.

Price: **£89**
(carr £3)

PROHIBITED from direct or indirect connection to any telecommunications system run by British Telecommunications. Action may be taken against anyone so connected without approval.

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£115
(carr £3)

(Price includes: Nightingale Modem, Commstar ROM pack, Cables & Comprehensive manual)

- Nightingale Modem without software **Only £99**
- COMMSTAR ROM package only **£29**
(P&P on modem £2.00)
- Auto Dial/Auto Answer Board **£48**
- Auto Dial Utilities Disc **£9.50**
- OBBS Bulletin Software **£20.00**

THURSDAY LATE OPENING

By popular demand, our retail shop will now be open until 8.00pm. every Thursday.

LOGOTRON LOGO

The popular Logotron Logo in ROM.
Recommended by most Education authorities.

Only: £52

Viglen Console Unit

Enhance the appearance and convenience of your BBC Micro with the Viglen console unit.

£42 (carr. £4)

GLENTOP's 3D GRAPHICS

Development System

£22

DATAGEM Database

Now compatible with Watford DFS's

Whether you have a single 40 track drive or a Winchester hard disk, this system will make use of ALL your disk space, treating up to 4 drive surfaces as ONE CONTINUOUS FILE.

AMATEURS & PROFESSIONALS

For newcomers to databases as well as seasoned users, DataGem represents an ideal starting point. Structuring your file and layout couldn't be simpler using DataGem's on-screen 'painting' format. You can have up to 62 fields or data items wherever you want them on a scrolling 120 x 120 card. Colours are all definable, and field data and field titles may be separated if required. Data entered may be stored in up to 8 tiers or 'levels', as well as within the whole database file. Scan one level or the whole database for records that match your search parameters, and place them in another data level for later manipulation. DataGem also boasts limited facilities for producing data merged letters, and may be configured as a 62 cell spreadsheet.

£59

BT TELEPHONE CONNECTORS

- LJU 1/4A Mini Line Master **£4.50**
- LJU 1/6A Mini Line Slave **£3.00**
- LJU 2/4A Line Master **£4.00**
- LJU 2/6A Line Slave **£2.50**
- LJU 3/4A Flush Master **£3.95**
- LJU 3/6A Flush Slave **£2.75**
- LJU 10/3A Dual Splitter **£5.50**
- 4 Way BT Plug **£0.75**

Versatile BEEB SPEECH SYNTHESISER Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued

COMPUTER CONCEPT'S ROMS

| | |
|-------------------------|-----|
| ACCELERATOR | £51 |
| CARETAKER Basic Utility | £27 |
| Graphics ROM | £25 |
| Disc Doctor ROM | £25 |
| TERMI | £27 |
| COMMUNICATOR | £58 |
| SPEECH ROM | £26 |

Wordwise

The most popular Wordprocessor for the BBC Micro.

Special Offer: £28

Wordwise plus

£40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text/segment area.

Only £24

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS

Supplied on disc. This version requires a WORDWISE-PLUS ROM to be present in the machine. It gives up to 44k of text space on the 6502 2nd processor.

£5

Inter SHEET

The most powerful spreadsheet package available for the BBC Micro. Ultra-fast replication and calculation times help make this the easiest to use. It has received very favourable reviews. Unique 105 column screen mode. Supplied in 2 ROMs.

£40

INTER-CHART

This unique program is the only one of its sort on the market. Accepts data from a variety of sources and plots line graphs, bar charts or pie charts. Up to 16 separate charts may be stored in memory. Built in screen dump for EPSON compatible printers, but can use other printer dump routines.

ONLY: £26

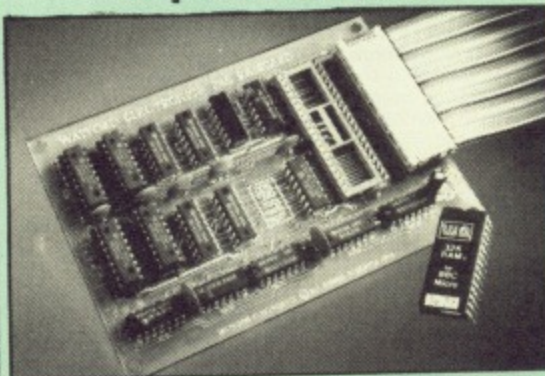
All Prices Exclusive of VAT

GRAPH PAD

With this popular Mk II British Micro's Graph Pad, you can add new dimensions to your computer enjoyment. It helps you to create your own applications programs by the simple use of the Graphpad. Ideal for educational use. Supplied complete with cables, Manual and Software Cassette.

Special Offer £51 (carr £3)

32K SHADOW RAM- Printer Buffer Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B+ or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

● IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer - type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

● "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free - 5 times as much as normal.

● In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

● Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

● Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15, 21, 138, 145, ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

● Ensure COMPATIBILITY with a vast range of hardware (including our ROM board, the ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, Music 500's AMPLE). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable and has the power consumption of a couple of ROMs!

● Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages, and a comprehensive manual is supplied free.

● Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only: £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORD PROCESSING DEAL !!!

Watford Electronics, already renowned for quality products at discount prices, are offering, for a limited period only, the truly spectacular BARGAIN OF THE YEAR!

A Watford's 32K RAM Card (offering printer buffering and shadow screen RAM facilities) with the well known WORDWISE PLUS Word processor.

32K Shadow RAM Card/Printer Buffer and Wordwise Plus (a very powerful package) for the absolutely astounding price of:

Only £75 (carr £2)

(P.S. For an extra £14, we will include Word-Aid ROM package for the Wordwise Plus, if bought at the same time.)

VIEW

VIEW WORDPROCESSOR 2.1 £39

VIEW 3.0 ROM

This latest version features automatic relocation with a 6502 second processor and takes full advantage of any shadow memory fitted. BBC B Plus compatible. Supplied complete with Printer Driver Generator tape.

Price: Only £60

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£38

VIEW SHEET (Acornsoft) £39

VIEWSTORE £39

**Watford's own Sophisticated
VIEW PRINTER DRIVER
for Epson FX80 & KAGA KP**

Only £10

**VIEW DRIVERS FOR JUKI &
BROTHER HR15 PRINTERS**

Only £10

**VIEW/VIEW SHEET PRINTER
DRIVER for SILVER REED**
(Officially approved by Silver Reed)

Only: £10

OMNIREADER

OCR at a price you can now afford

The manually operated omnireader is preprogrammed to read 4 common type faces - including: KAGA Courier 10, Courier 12, Letter gothic & Prestige Elite. It reads a line of text in about 3 seconds & is ideal for inputting already typed material into wordprocessor packages, such as View or WW, Databases or Spreadsheets. Comes complete with power supply, instruction manual, longrule & Dustcover. Also available on disc for the BBC is a utility program which merges input from the service port with the keyboard thus allowing full editing control whilst using the omnireader. Also included is a Basic program which displays the pixel map image obtained from the omnireader - ideal for doing your own OCR.

(As seen on the TV programme Micro LIVE)

Price: £175

BOOKS (No VAT on Books)

| | |
|--|--------|
| 30 Hour BASIC (BBC Micro) | £7.95 |
| 40 Best machine Code Routines | £7.95 |
| 6502 Assembly Language Program | £19.95 |
| 6502 Application | £11.95 |
| 6502 Assembly Language Subroutines | £19.95 |
| 6502 Development System | £7.50 |
| 68000 Assembly Lang. Programming | £19.95 |
| 6800 Machine Code Programming | £12.95 |
| 6800 Programming the | £22.95 |
| A User Guide to Wordwise Plus | £9.95 |
| A Young persons Guide to BBC Basic | £5.95 |
| Advanced Disc User Guide | £14.95 |
| Advanced BASIC ROM User Guide | £9.95 |
| Advanced Machine Code Technique for BBC | £7.95 |
| Advanced Programming for the BBC Micro | £6.95 |
| Advanced User Guide for BBC Micro | £13.50 |
| Advanced Graphics with BBC | £9.95 |
| Assembly Language Programming on BBC Micro | £11.50 |
| Advanced Programming Techniques for the BBC Micro | £8.95 |
| Adventure into BBC BASIC | £6.95 |
| Applied Assembly Lang. for BBC | £9.95 |
| Assembler Routines for the 6502 | £7.95 |
| Assembly Language Programming FOR the BBC Micro | £8.95 |
| Assembly Language Programming on the BBC & Electron | £8.95 |
| Basic Programming on the BBC Micro | £6.95 |
| Basic ROM User Guide | £11.95 |
| Basic User Guide for BBC Micro | £10.00 |
| BBC B+ User Guide | £14.95 |
| BBC BASIC | £5.95 |
| BBC Forth | £7.50 |
| BBC Machine Code Portfolio | £7.95 |
| BBC Micro add on guide | £7.95 |
| BBC Micro Advanced Reference Guide | £10.95 |
| BBC Micro Advanced Programming | £9.95 |
| BBC Micro Book BASIC Sound & Graphics | £7.95 |
| BBC Micro ROM Book | £9.95 |
| BBC Micro ROM PAGING System Explained | £2.00 |
| BBC Micro Disc Companion | £8.95 |
| BBC User Guide | £10.00 |
| BBC Wargaming | £8.95 |
| BCPL User Guide | £14 |
| Business Applications on BBC | £7.95 |
| Complete FORTH | £6.95 |
| CP/M - 86 User's Guide | £19.95 |
| CP/M Bible | £16.50 |
| CP/M Handbook with MPM | £9.95 |
| CP/M Plus Handbook | £13.95 |
| CP/M Soul of | £16.50 |
| CP/M The software BUS | £8.95 |
| Creative Animation & Graphics | £7.95 |
| Creative graphics on BBC Micro | £7.50 |
| Disc Drive Projects for Micros | £5.45 |
| DISC FILING SYSTEM (DFS) Operating Manual for BBC | £6.95 |
| Disc Programming Techniques | £9.95 |
| Discovering BBC Micro Machine Code | £6.95 |
| Disc System for the BBC Micro | £6.95 |
| Exploring FORTH | £6.95 |
| Filing System & Databases for the BBC Micro | £7.95 |
| FORTH on the BBC Micro | £7.50 |
| Functional Forth for the BBC Micro | £5.95 |
| Graphics for Children | £6.95 |
| Graphs & Charts on BBC Micro | £7.50 |
| Guide to BBC ROM | £9.95 |
| Hackers Handbook | £4.95 |
| Hackers Handbook - New | £6.95 |
| Handbook of Procedure & Functions for the BBC Micro | £6.95 |
| Interfacing & Robotics on BBC | £15.95 |
| Interfacing Your BBC Micro Into View | £8.95 |
| Introduction to COMAL | £4.50 |
| Introduction to LOGO | £9.50 |
| Introducing 'C' | £6.95 |
| Introducing CP/M on the BBC Micro | £9.95 |
| 2nd Processor | £9.95 |
| Introducing LOGO | £5.95 |
| Introduction to FORTH | £8.95 |
| Introduction to PASCAL | £17.95 |

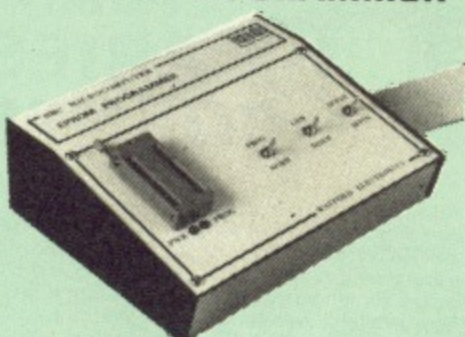
| | |
|---------------------------------|--------|
| ISO -PASCAL Reference Manual | £9.95 |
| Let your BBC teach u to program | £5.45 |
| LISP 2nd Edition | £14.95 |
| LISP, A Beginners Guide to | £10.95 |
| Logo Programming | £9.95 |

Mysteries of DISC DRIVES and DFS

| | |
|------------------------------------|--------------|
| REVEALED | £5.95 |
| Mastering CP/M | £17.95 |
| Master Advance Reference Manual | £19.95 |
| Master Reference Manual Part 1 | £14.95 |
| Master Reference Manual Part 2 | £14.95 |
| Micronet Handbook | £6.95 |
| Programming the 6502 | £16.95 |
| Programming the Z80 | £19.95 |
| Sensing & Control Projects for BBC | £5.95 |
| S-PASCAL on BBC Micro | £7.50 |
| Structured Basic | £7.95 |
| Structured Prog. with BBC BASIC | £6.50 |
| Termulator Manual | £4.95 |
| The Complete FORTH | £6.95 |
| The Complete Programmer | £5.95 |

The Epson FX/KAGA PRINTER

| | |
|-----------------------------------|--------------|
| Commands REVEALED | £5.95 |
| Turtle Graphics on BBC Micro | £7.50 |
| Using Floppy Discs with BBC Micro | £5.95 |
| View Guide | £4.50 |
| Viewsheets User Guide | £10 |
| Using BBC Basic | £4.95 |
| Wordstar & CP/M made easy | £7.45 |
| Wordwise Plus Guide | £9.95 |
| Z80 Assembly Language Programming | £19.95 |

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. Connects 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:

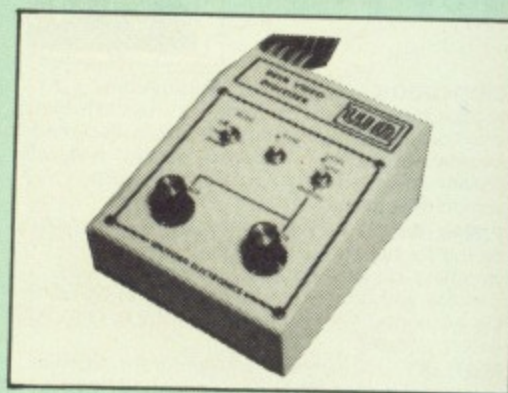
Load File - Save File - Down Load EPROM - Program EPROM - Verify - Blank Check - Editing of memory contents prior to programming.

Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

SPECIAL OFFER £69 (£3 carr.)**TEX EPROM ERASERS**

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** - Standard version erases up to 16 chips. **£28 (carr £2)**
- **ERASER GT** - Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30 (carr £2)**
- Spare UV tubes. **£9**

BEBB VIDEO DIGITISER

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£110 (Carr. £3)

(Price includes: Digitiser Unit, Software in ROM & a Comprehensive Manual)

Magazine Maker

(As seen on TV)

A combination of the AMX Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within AMX Pagemaker to illustrate magazines or newsletters - in fact anything that needs to be created on A4 size paper.

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Features include:

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- Urgent notice board.
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Use LBO to organise your life from today until 1999! It can handle literally hundreds of multi-line messages, as many as you are ever likely to need. Despite the very wide range of facilities offered, this professional program is VERY easy to use and requires absolutely NO knowledge of computers. A vital aid to your everyday life, LBO is GREAT FUN TO USE!

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- BEEBLOT GRAPHICS
- WORD PROCESSOR

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SPREADSHEET – Offers a wide range of invaluable calculation and editing features. Beebplot will take files created by Beebcalc to provide data portrayal in graph, histogram or pie chart format.

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ARIES CORNER

Aries Computers was the first company to commercially market what is now known as SHADOW RAM. As part of its continued expansion policy, Watford Electronics is proud to announce that the Aries range is now available exclusively from Watford Electronics and their dealers.

The Aries range, designed by experts offers you the solution to your upgrade nightmares. All the Aries products are compatible with double density disc controllers, modems, second processors, ECONET, hard discs, EPROM programmers and of course, other members of the Aries family and most of the much wider Watford family (some products advertised here perform identical functions and hence cannot be used together). Several major companies now test all their products to ensure compatibility with the Aries B20 & B32.

In quality of construction, the Aries range sits alongside the Watford range in setting a standard against which others are judged. Custom made connectors eliminate the damage to the BBC machine caused by inferior products.

The Aries B-32 Shadow RAM Card

18 months of intensive research and development have produced a worthy successor to the widely acclaimed Aries-B20; the revolutionary Aries-B32. This 'second generation' expansion board features 32k of RAM and a 16k ROM socket.

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: B-32 **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries B-20 and the Aries B-32. For the business user or educationalist, the compact and secure internal fitting is ideal, with the ROM board tucked neatly inside the lid where it will not cause overheating problems. The serious software developer and the hobbyist may prefer to mount the board externally, giving instant access to the sockets for experimental purposes. A zero-insertion force (ZIF) socket may be fitted to the board to enhance this mode of operation.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable 'mother board' which carries the extension ROM sockets and a small 'base board' on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have an B32 or B20, a small adaptor module (the Aries B-12C) is available at a nominal cost. The 6264 static RAM chips used to provide the sideways RAM are advertised elsewhere in our advert.

Price:

Aries B-12 **£40**. Aries B-12C **£5**

THE ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GP-IB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

Aries B-488 Unit: **£238** (Carr £3)

THE ARIES RANGE HARDWARE REQUIREMENTS

Aries B-32 – BBC B, MOS 1.20, hardware plugs into CPU socket.
Aries B-12 – BBC B, MOS 1.20, hardware plugs into all four sideways ROM sockets and connects to the B32 or the B20. The adaptor Aries B-12C module is necessary where these are not fitted.
Aries B-488 BBC B, MOS 1.20, Hardware plugs into 1MHz Bus.

VOLTMACE JOYSTICKS

| | |
|-----------------------------|-----|
| Delta 3B Single Joystick | £10 |
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| Delta 14B Single Joystick | £12 |
| Delta 14B/1 Adaptor Module | £12 |
| Transfer Software Disc/Tape | £7 |

ROM EXTRACTION TOOL

This extremely useful tool allows you trouble free chip removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip.

Price: £2

SURGE PROTECTOR Plug

Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. A must for every computer user.

Protection for only £8.75

Replacement FLEXIBLE KEYBOARD CONNECTOR

A 'Keyboard to Micro' replacement jumper lead.

£4

ATTACHE CARRYING CASE for BBC Micro

The Attache carrying case is attractively finished in mottled antique brown leatherette. The case is made of tough plywood, providing a very solid and safe way to carry your BBC micro. There is room provided to fit all the leads necessary behind the computer and manuals in the front. Locks supplied with two keys. Price £13 (£2 carr.)

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Top grade tested C12 Data cassettes supplied in library cases 35p each; 10 for £3.20.

SPARES for BBC Micro

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| UHF Modulator | £4; | Case | £25 |
| Speaker Grill | £1; | Speaker | £2 |
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8way DIP SWITCH £0.85

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(All ready made and tested)

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| to 3 Jack Plugs | £2.00 |
| 6 pin DIN to 6 pin DIN Plug (RGB) | £2.50 |

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Supply from BBC power supply to standard Disc Drive connector.

Single £3.00 Dual £3.75

DISC DRIVE INTERFACE LEADS

BBC to Disc Drives Ribbon Cable
Single £4 Twin £6

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| | Plugs | Sockets |
|------------------------|-------|---------|
| RGB (6 PIN DIN) | 30p | 45p |
| RS423 (5 pin Domino) | 40p | 50p |
| Cassette (7 pin DIN) | 25p | 65p |
| ECONET (5 pin DIN) | 20p | 30p |
| Paddles (15 pin 'D') | 110p | 215p |
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| Disc Drive Plug 4 way | 75p | — |
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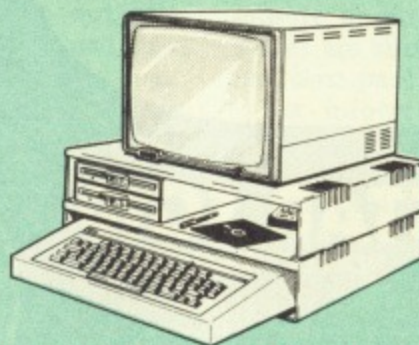
20, 40 and 80 column operation. Compatible with ASMO (449). English/Arabic printer interface software. Numeric entry from either left or right of number. Communications software to send or receive 7 or 8 bit data.

Different shapes of Vowels (e.g. Shadda, Fatha, etc). Different shapes of Hamza. Full English and Arabic character sets with all special characters.

£85

(Price includes Alnoor ROM, Operating Manuals & a full set of Arabic/English Keytops)

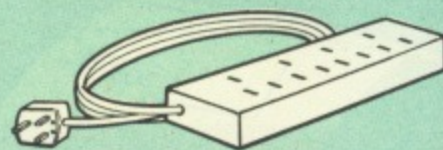
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Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or 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) |
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4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. Allows the whole system to be switched on from one plug.

£9.50 (carr £1.50)

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The Acorn Music 500 System is probably the most powerful piece of music generating hardware available for the BBC Micro.

£95 (carr £4)

28 pin ZIF SOCKET (Textool) £6.95

28pin DIL HEADER PLUG
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28way 55p/ft; 34way 60p/ft.

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Soldering Iron (Antex 17 Watt), Ideal for electronics PCB work £6
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| 2764-250nS | £2.00 | SAA5050 | £8.75 |
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| 4020 | £0.90 | ACORN BASIC 2 | £19 |
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| 65C02 CMOS | £10.00 | Acorn BCPL | £42 |
| 6512A | £10.00 | Basic Editor | £25 |
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| 74LS163 | 70p | Micro Prolog | £64 |
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Underline; Backspace + Lots more
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NLQ Designer for Canon and Taxan Kaga
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FONTAID requires 6264 RAM Chip in printer

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Please state 40 or 80 track when ordering.

ROMS of individual fonts are available and can be
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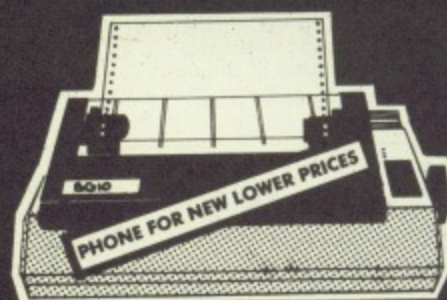
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NLQ Mode 17 x 11 Matrix
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Boxes keep young students engrossed

Program: *Box of Treasures*
Price: £26.45 (disc only)
Supplier: 4mation, Linden Lea,
 Rock Park, Barnstaple,
 Devon EX32 9AQ. Tel: 0271
 45566

BOX of Treasures contains five programs related to the theme of boxes, though each can be used in a variety of situations.

The Adventure uses excellent animated Mode 7 graphics for 15 locations on a 3 x 5 grid. You explore to discover your task, but the idea is to rescue Henry, find the magician and choose from three possible endings.

There are no red herrings, blind alleys or deaths. Children thought it superb, apart from the cursor controls being the wrong way round, as in pressing the up key to move down.

Box Draw produces complex eight colour designs by drawing up to 100 rectangles. You can fill in, half fill, outline or delete, the scale can be altered and picture position changed.

Blank is a most useful utility with endless applications – you

can design forms containing up to 40 vertical lines, 40 horizontal lines and 30 text strings in a choice of three line thicknesses and two text heights.

Make-a-Box can be used as an introduction to a boxes project, or simply to stimulate the imagination.

Choose the characteristics and details of a box, and the design is drawn on screen.

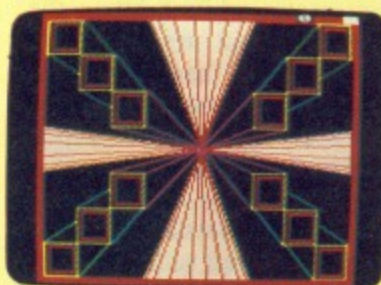
The two former programs have editing facilities and the results of all three can be saved, loaded or dumped to a printer.

Create is the weakest part of an excellent package. Stories can be created with static or animated Mode 7 illustrations, but producing anything worthwhile is time consuming.

The program is not particularly user-friendly and there are several error trapping bugs.

Frequent disc changeovers are required and the program hangs up if a child accidentally inserts the data disc instead of the program disc, and all data is lost.

Also the option of deleting a



picture from a set does not work.

Two Epson screen dumps, five example files and a 55 minute audio tape of three stories are also included in this first class package.

Six information booklets provide a wealth of follow-up ideas to stimulate work across the curriculum away from the computer.

This package is different from previous 4mation products, but

you will quickly recognise its value when you use it. Despite my criticisms of Create, I would strongly recommend it to any class teacher.

Jim McHugh

| | |
|-------------------------|----|
| Sound | 8 |
| Graphics | 10 |
| Educational Value | 10 |
| Value | 10 |
| Overall | 10 |

A shoot-out to give the keys some stick

Program: *Moon Cresta*
Price: £7.95 (cassette), £9.95 (disc)
Supplier: Incentive, 54 London Street, Reading RG1 4SQ.
 Tel: 0734 591678

WITH software houses currently tending to prefer levels and ladders games and multi-screen maze adventures, it's nice now and again to get back to a real hectic key bashing shoot-out.

With this new release from Incentive that's just what you'll let yourself in for.

The original version of this game was very popular in the arcades when Defender was just arriving on the scene, and it's a reasonably faithful representation of it, even down to the catchy fanfare.

Against a backdrop of falling stars you arrive on the scene in a three stage rocket. Immediately stages two and three drop back out of sight to be on stand by, and you are let loose in only the nose section, stage one. This has

a single laser cannon, and you use it to see off wave after wave of alien nasties as you dodge left and right across the screen trying to avoid contact with them.

Should you emerge successfully from four waves of attacks you move on to the first docking stage.

Here you must try to join with stage two of your ship, the object being to continue the fray with this stage attached. Fail and you must carry on with stage two, as your original ship explodes in fragments.

Whether using stages one and two, or just stage two on its own, a docking exercise with stage three awaits should you survive four more waves of aliens.

This stage also has two forward facing lasers further outboard providing a possible total of five should you dock successfully.

All the lasers fire virtually simultaneously with three rapid presses of a single key and this extra firepower is a situation to

be achieved as often as possible.

There are 10 waves of aliens, with pairs of waves virtually identical, the only difference being their colour. For example, waves one and two are large swirling sprites looking rather like enormous eyelashes.

You can only destroy half of each alien when you hit it; half remains to carry on the fight, and they have the un-nerving habit of sometimes going off the bottom of the screen and approaching from the rear. One touch from these and you explode.

Wave 5 and 6 are devious beasts and caused me a lot of heartache. They dart around the screen erratically and hyperspace at random, re-appearing wherever suits them.

They sometimes materialise over your ship's position, resulting in an immediate explosion and the loss of a ship. There's not a lot you can do about this and it's the only part of the game I disliked.

There's a reasonably safe



zone to the extreme left and right of the screen, but it cramps your style to stay there.

The game has many of the extras you would expect from first class software – user-definable keys, a joystick option, one or two players, and a facility to turn off the well used sound.

It's also great fun to play and extremely addictive, but I don't think it is likely to leap to the top of the charts.

David Andrews

| | |
|-------------------|---|
| Sound | 8 |
| Graphics | 9 |
| Playability | 9 |
| Value | 9 |
| Overall | 9 |

Triple helping of blockbusters

Program: Cosmic Battlezones
Price: £9.95

Supplier: Ultimate Play the Game, Unit 10, The Parkway Industrial Centre, Heneage Street, Birmingham B7 4LY. Tel: 021-359 3020

THIS is a compilation tape containing three of Ultimate's earlier blockbusters.

The first offering is Jetpac, a tale of spaceship construction on a hostile planet.

Not being a wealthy spaceman you cannot afford a ready-built ship, so you order a kit from the Acme Interstellar Transport Company.

They are obviously a bit of a cowboy outfit as they deliver each section of the ship by dropping it from orbit.

Your task is to fly around

using a jetpac and construct your ship. Unfortunately the weather is not too good and everything must be done in the midst of a meteor storm.

The title tune is excellent, the graphics large and colourful and the game is great fun to play.

Game number two is called Lunar Jetman. The Acme rocket disintegrates while orbiting the moon and you are forced to make a crash landing. In this game you take the wheel of a lunar rover and try your hand at rallying on the moon.

Upset by the intrusion, the moon's inhabitants activate their defence systems. You must therefore destroy every missile base before an attack upon the Earth takes place.

Once again we have a combination of large colourful sprites and a fast and furious zap

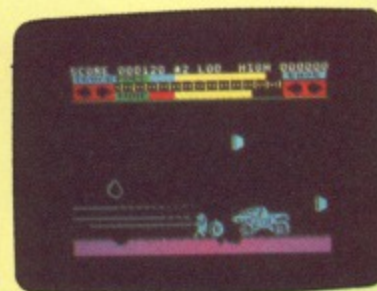
and blast game.

Alien 8, the third offering, is aimed at the more intelligent gamer. The game incorporates Ultimate's now famous Filmation graphic effects. These consist of single colour, high resolution, three dimensional characters and backgrounds.

A huge starship contains the complete knowledge and a few chosen survivors of a dying planet.

As the ship nears its destination it slows from hyperwarp speed. Unfortunately the defence systems have failed and the craft is open to attack from alien life forms.

Alien 8 is the ship's robotic caretaker who must repair the damaged life support systems and activate the cryogenic chambers in which the crew members are frozen. Each room



on the starship contains a puzzle of some sort based around an object which may or may not be useful.

It's a game to keep the keenest of minds absorbed for hours.

The Cosmic Battlezone compilation should appeal to both arcade addicts and puzzle solvers alike. And what's more it's excellent value for money.

Steve Brook

| | |
|-------------------|---|
| Sound | 7 |
| Graphics | 9 |
| Playability | 8 |
| Value | 9 |
| Overall | 8 |

A bargain in the pond

Program: Savage Pond
Price: £2.99

Supplier: Bug-Byte, Liberty House, 222 Regent Street, London W1R 7DB. Tel: 01-439 0666

TO most people a frog is a small green slimy amphibian which sits lazily on a lily pad devouring passing flies. I too had this impression until I tried my hand at the tadpole survival course, otherwise known as the Savage Pond.

The screen displays a cross sectional view of the pond. When the game begins the pond is quite barren except for a handful of hydra on the bottom.

Having emerged from one of three eggs you begin to stuff yourself with the nutritious amoebae which float in water.

These are useful for gaining points, but do little to aid your progress towards becoming a frog.

Froghood is achieved by consuming the worms which drift from the surface to the bottom. For every five worms consumed you take a step towards maturity. Nine such steps and you become a frog.

Unfortunately for our wriggling buddy, life is not a bed of lilies. Apart from the deadly hydra you must also cope with



eggs dropped by passing dragonflies.

It is imperative that these are consumed before they reach the bottom because if they are allowed to hatch you will meet your maker at the jaws of a dragon fly larva.

For each step you take towards maturity a new hazard is introduced to the pond.

These take the form of jellyfish, spiders, and even radioactive waste.

Savage Pond was reviewed in this magazine over 18 months ago and received a very favourable reception. It has now been re-released at less than half the price and is therefore a bargain not to be missed.

Carol Barrow

| | |
|-------------------|---|
| Sound | 7 |
| Graphics | 7 |
| Playability | 8 |
| Value | 8 |
| Overall | 8 |

Lost in the translation

Program: Bruce Lee
Price: £9.95

Supplier: US Gold, Parkway Industrial Estate, Heneage Street, Birmingham B7 4LY. Tel: 021-359 3020

DURING my teenage years Kung Fu was all the rage, and Bruce Lee was its greatest exponent. I'd seen Enter the Dragon so many times that I knew each scream and yell backwards.

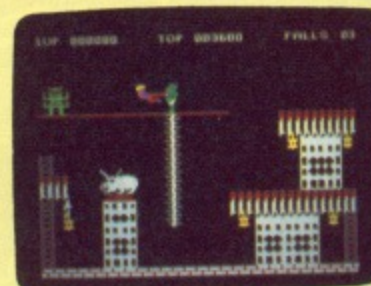
It was therefore with great excitement that I loaded up Bruce Lee from US Gold.

Lee, under your control, must penetrate the fortress of an evil wizard in order to claim his fortune. By destroying the wizard you will earn immortality and fabulous wealth.

The castle is constructed in the form of a series of ladders and levels-style screens. Bruce must run around these collecting the Chinese lanterns which hang from the buildings.

Only when every lantern has been collected will other gateways open, allowing access to new rooms.

As lantern gathering is a bit of a namby-pamby task for our hero, a few bad guys are thrown in for light relief. These can be rendered unconscious with a flying kick or punch.



It is advisable to get the first punch in because once you hit the floor you are likely to lose several lives.

Your inscrutable opponent has a habit of kicking you as you get to your feet.

The graphics for both the characters and the background are very crude, containing little detail and being rather angular in design.

The animation is poor, with visible flicker evident on most movements of the characters. Use of sound is negligible and there is no high score table.

Once again US Gold has proved it can convert a first class Commodore 64 game into a third rate BBC version.

Jon Revis

| | |
|-------------------|---|
| Sound | 5 |
| Graphics | 5 |
| Playability | 5 |
| Value | 5 |
| Overall | 5 |

Is there a Becker in the box?

Program: Tennis
Price: £2.99

Supplier: Bug-Byte, Liberty House, 222 Regent Street, London W1R 7DB. Tel: 01-439 0666

SHOULD you be one of the many thousands of people who spend Wimbledon fortnight glued to the TV set you may have considered trying a computer simulation.

Bug-Byte have just released one such program, though I doubt whether it's destined to be a winner.

You have the option of playing one or three sets with either four or six games per set.

Control is via keyboard or joystick and your opponent is always the computer — you cannot challenge a friend.

This is a pity as the computer provides such stiff opposition that you will normally only win one or two points during a complete set.

The court is drawn with



perspective going into your screen, the computer always being at the top of the screen.

Serving is performed by pressing the fire button, but do remember to keep your feet behind the baseline or you will be foot faulted.

Your player can travel left, right, and up and down the court, and balls can either be volleyed or taken as groundstrokes.

When volleying from the net I would suggest that you do not stand too close as you will tend to hit the ball out of court.

I can only assume that the angle of the shot which you play is determined by your position in

relation to the ball, though I didn't find that this made too much difference.

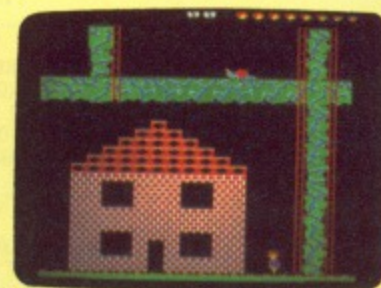
The ball's flight and its associated shadow, was relatively smooth, although on several occasions it vanished for a fraction of a second in mid-flight.

The characters representing the players are large, angular and rather crude. The best part of the screen is the scoreboard where electronic style numbers display sets, points, and server.

Had the game employed a user selectable skill option it would probably have had more lasting appeal. But in its present form I feel it would soon be abandoned by a thoroughly demoralised player.

James Riddell

| | |
|-------------------|---|
| Sound | 6 |
| Graphics | 6 |
| Playability | 6 |
| Value | 6 |
| Overall | 6 |



Dodge the giant

Program: Jack Attac
Price: £2.99

Supplier: Bug-Byte, Liberty House, 222 Regent Street, London W1R 7DB. Tel: 01-439 0666

ONCE upon a time there was a young man named Jack who had a beautiful girlfriend called Jill — until the local giant incarcerated her in his castle.

Being a brave sort of chap Jack, decided to enter the castle to attempt a rescue.

The castle takes the form of a 45 screen maze which you must negotiate in order to find the key which will unlock Jill's dungeon.

Different areas are sealed off by coloured doors, unlocked by coloured keys which are to be found around the castle.

I don't know if the giant is a greengrocer in his spare time but the castle is littered with pieces of fruit. Every one must be collected before you are allowed to free Jill.

As soon as you have released your beloved, the giant will awaken. You must therefore escape from the castle within the next two minutes or you've got big problems.

The 45 screens do not need to be completed in sequence, and you are free to wander from place to place as you seek the next key.

Each screen is big, colourful and normally patrolled by a nicely detailed bad guy.

There are also secret passages which can take you from one section to another without the need for a key.

Jack Attac is a well written, fun to play, and sensibly priced program.

James Riddell

| | |
|-------------------|---|
| Sound | 7 |
| Graphics | 7 |
| Playability | 8 |
| Value | 8 |
| Overall | 8 |

Useful practice for shakely spellers

Program: Better Spelling
Price: £9.95 (cassette), £12.95 (disc)

Supplier: School Software, Meadowvale Estate, Raheen, Limerick, Ireland. Tel: 010-353 61 27994

BETTER Spelling is a program designed for 9 to 14-year-olds to reinforce the various rules of spelling.

I would assume these rules have already been taught at school, in which case this program is ideal for giving pupils more practice in applying them.

It is divided into 11 sections, each demonstrating a certain spelling rule or grouping words which have irregular plurals or past tenses, and so on.

The first section, for instance, covers plurals ending in ies and eys, such as daisies and donkeys. The rule is clearly written, as are all the instructions throughout.

In this exercise the singular word is given and the pupil is asked to type in the plural.

A correct answer merits a "Well done" and a happy note of music, while an incorrect response receives a "Hard luck"

plus a suitable low note and the correct answer is given to the pupil.

I would have liked to have seen the questions that were answered incorrectly repeated at the end of each exercise and repeated again until the correct answer was given. This would reinforce the correct spelling.

The number of correct and incorrect answers is shown on the screen throughout the exercise, but at the end only the number of wrong answers is given.

Why not show the number of correct answers as well, and perhaps even the percentage accuracy?

The first exercise has 20 words. Others have as many as 50 words or as few as nine.

The first and second exercises are relatively easy — they are all fairly common words which most top junior children should know.

The third exercise on irregular plurals — larvae, radii, emphases and so on — is much more difficult. It helps if you know some Latin.

The sections on prefixes and

suffixes require some vocabulary knowledge — the pupil has to choose the correct prefix or suffix from a given list and add these to the base words.

The last section on common spelling errors is very useful. It presents you with a sentence which you must complete by choosing the correctly spelt word from the list of options.

I'm sure more words could have been included in this section, but I was glad to see all the common ones, especially "there, their, they're" and "of, off".

Finally there is the option of having sound or not. I didn't like to hear a little bleep or varying pitch every time I pressed a key. In a crowded classroom this might be annoying.

This is a useful program to give pupils who need more practice in applying spelling rules.

Carole Sillers

| | |
|-------------------------|-----|
| Sound | 4 |
| Graphics | N/A |
| Educational Value | 8 |
| Value | 8 |
| Overall | 7 |

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Methodology in our madness

THIS month I want to take a closer look at starting adventures and pass on a few tips about good methodology, as the way you tackle an adventure can make all the difference between success and frustration.

At the risk of stating the obvious, do read the cassette inlay or other documentation carefully before starting. Apart from telling you how to load and run the game, how to save and so on, there is nearly always a general background description – and this can contain useful clues.

Thus, Red Moon made it clear that "Magik" was operative in the game, which automatically made me think of words to say and things to wave or rub. After all, that's how magic usually works.

It also meant that I didn't take things at their face value – not that you ever should where good adventures are concerned – but instead I tried to think how they might have a magical use.

You can also learn from the inlay the type of vocabulary to use. You find out if it is a simple verb-object system where

you TAKE SWORD, WAVE TALISMAN, and such like, or whether a more complex and sophisticated parser is in use so that you can enter longer instructions as in Melbourne House's The Hobbit, Level 9's The Worm in Paradise, or something in between like Village of Lost Souls by Magus.

Adventures are sometimes like crossword puzzles so you need a copy of Roget's Thesaurus from time to time to work out alternative ways of saying what you think needs to be done when all that the computer answers is: "Eh?", "Gibberish!" or "I don't understand".

If it's a cassette-based game you can spend the loading time reading the inlay and sometimes you can listen to a piece of music as well.

The best adventures are easy to get into – nothing too demanding in the early stages, but quite often there is an implied invitation to do something right at the start.

With Colossal Adventure the obvious thing is to go into the hut and see what's inside and have a peep down the well. Often you will be given a strong hint



where to deposit any treasures collected so as to score maximum points.

Some points are usually awarded for collecting a treasure, but a few are reserved for when you dump it in the right place. Thus, in Village of Lost Souls, points are awarded for putting the necklace on the altar in the church.

I try to remember to have a look at what equipment I have been given to start with. You look at the opening description, and the question is put "What now?", or something similar.

Type in INVENTORY, and you'll be told if you have anything by way of possessions. INVENTORY can usually be shortened to INV – indeed many words can be shortened in this way.

Another useful thing to do at the start is to find out the maximum number of points you can score – type in SCORE and you may be told: "You have 0/1200 points". You may also be given a comment about your status as an adventurer which will be very low at this stage, but expect it to improve as your score points mount up.

Lastly, type in HELP to see whether you get clues in the game. Now you are ready to start.

I generally tackle an adventure in three stages – an initial romp around that's not very serious followed by a careful and systematic mapping exercise that may take several sessions to complete. Finally, I try to solve the puzzles, having got some idea of how to tackle them during the mapping session.

Often you will need to solve puzzles at critical points before you can explore



From Page 71

deeper into the adventure – there's a locked door or grating or cave for example.

Usually, as the screen fills up with print it scrolls upwards automatically, but not always. I was baffled in Acheton until I realised the program put the computer into PAGE mode, and that when a screen was filled by a long description all I had to do was to press the Shift key. The documentation hadn't made that clear, and I was afraid my BBC Micro was hanging up on me due to a bug somewhere.

I shall deal with mapping in some detail next time, but now I want to offer some help in reading between the lines of descriptions.

You are always given a list of the available exits from a location – unless it is a maze – but sometimes these are not all of them. There may be an invisible one from time to time which only appears when you have successfully solved a puzzle or when you are carrying the right object.

A clue to this possibility in an adventure may be the phrase: "Visible exits are..." I often try all the directions of the compass plus up and down if I suspect a concealed exit, and if the response is: "You can't go that way yet", then I can be sure of a concealed exit in that particular direction.

Next job is to decide how to make the exit appear – if there has been an object somewhere such as a pair of spectacles that's a logical thing to try first, but it may not be the easy.

The other helpful hint you may get from a programmer is along similar lines – you try to do something and get the response: "You can't do that yet!", which again suggests that there's something else to be done first.

Expect clues of this sort from any decent programmer.

Although they want to fox you from time to time, above all else the programmers of adventure games want you to enjoy yourself and buy their next offering.

A passing word in defence of reviewers – we aren't blasé types who have seen it all before and are bored with every offering shown to us. We are ordinary folk who have children, cats,

Help Line

REQUESTS for help are starting to come in. Antony Lowe sent the following example of the ideal letter:

"I would be grateful if you could answer some of my queries about Level 9's Colossal Adventure. Firstly, could you tell me where the pirate's chest is and which maze it's in?"

"Also, is there a way to stop the dwarf throwing weapons at you?"

"Lastly, is the bear tied to the chain of any significance?"

This letter told me all I needed to know to give precise answers to Antony, not least because I have solved Colossal Adventure.

I expect there are others with similar questions, so here are the answers in a little more detail than I sent to Antony:

Pirate Pete's chest is in the same maze – to get here go to the southern end of the secret N-S canyon where the STAL-ACTITE is and climb DOWN.

The maze is not too difficult – the final move is NE – and if the pirate has stolen something from you there you'll find the chest and any stolen treasures. The chest itself is a treasure.

The dwarves are a nuisance and the only way to avoid them is to keep clear of the central cave area so when the axe is thrown TAKE it, THROW AXE at the dwarf and kill it, then TAKE AXE again.

I have a feeling the dwarves only get

bothersome once you've reached a certain score, and are a cunning ploy of Pete Austin's to stop you carrying too many treasures.

I don't want to give too much away here, so answers are in the form of clues. The bear is important, you've got to make friends with him – is he hungry? Separate him from the chain (a treasure) and he will help you scare off a villain.

Here are two cries for help where I can't supply answers as I haven't got the games yet. Alex Plant of Sheffield is having trouble with Hampstead – maps please from anyone who has mastered it.

Alex, can you let us know exactly where your trouble lies so that I can include the right part from a successful map – if we get one?

C. Briancourt of Welling has played Epic's The Wheel of Fortune hundreds of times, but only gained 5 per cent of the possible maximum score. Can someone send me a map – it sounds like a game worth doing.

Finally, I get the impression that adventuring is a pastime shared equally between the sexes, and would be interested to know if there is any great variety in game preferences.

Have you a top ten so far as adventure games are concerned – what are your favourite features and pet hates? Let us know.

Happy adventuring.

computers, jobs (hopefully, in this day and age) and all we want to do is to spread the news that adventures are the best thing to happen to computers.

This magazine is run by enthusiasts. We want software houses to succeed, we want to see more people buying adventure games, we want to spread the interest among as many people as possible, so here is a prolonged plea for help.

Software houses – send your games (preferably on disc, 40 or 80 track – I've a switchable drive) to the office so that I can review them.

Readers – particularly first time adventurers or those thinking of taking the plunge into their first game – what do you need to know? Send an SAE plus the name of the adventure you are interested in, the location you are at and the problem you face, and we'll try to help you.

I shall be delighted to receive maps of

completed games from experienced adventurers and any tips that you would care to pass on. It might even be possible to offer a small prize from time to time.

One bit of disappointing news for me concerns the disc version of The Hobbit. As a Tolkien fan, and having played it on the Spectrum, I had been looking forward to seeing how the pictures looked on the BBC Micro.

Sadly it crashes if your micro is fitted with the DNFS, as mine is, and although I am going to try and borrow a machine with an earlier version of DFS I shan't be able to give a report this month.

I should be pleased to have readers' reactions, though – particularly from any who won it as a prize in The Micro User competition. If enough readers contact Melbourne House they might feel it worthwhile to issue an amended version to suit the DNFS.

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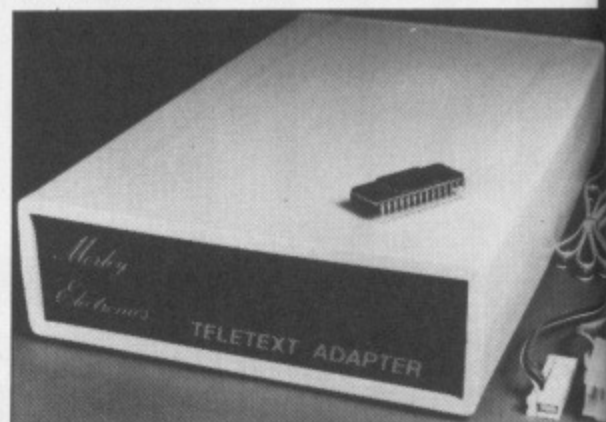
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● Utilis disc available including printer drivers allows pages to be selected and dumped direct to a printer (no more TV or Radio Times to buy).

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'Dangerous' * commands such as *COMPACT, *COPY, *BACKUP etc are intercepted and the BBC's RAM from page 2 to &7FFF is saved to RAMdisc workspace, and may be recovered using a * command. This prevents accidental corruption of any programs/data in RAM you may have been using at the time. The save operation delays the * command by just under 0.4 seconds. The BBC's RAM can also be saved by an interrupt-driven routine which can be enabled by a * command.

The 'filing system wedge' ROM supplied supports load/save, byte file access, all relevant OSFSC commands, and contains a formatter, verifier and 'sector' editor for use with the RAMdisc.

Catalogue structure allows up to 2,709 files.

APPLICATIONS

Programs and ROMs can be written to take advantage of directly accessing a single RAMdisc, allowing the possibility of spreadsheets with more than 512 x 512 cells, million-character documents with immediate access and editing of any section, manipulation of 2 floating-point arrays each with 228 x 228 elements, a fast-access database with 10,000 100-character records, or even just a large printer buffer!

Accessible through the user's software for direct storage of eg: basic procedures, variables, large arrays etc which can be downloaded into the BBC's RAM or read directly. (We are hoping to be able to supply an extended basic ROM late this year, to allow 'transparent access' to the Ramdisc, which will effectively expand the BBC's RAM to about 1020k.)

OPTIONAL SIDEWAYS RAM UTILITY (suitable for use with any 16k SWR)

Sideways ROM images can be saved to the RAMdisc under a special directory which, when enabled, will be used when an unrecognised * command is trapped for the ROM to load sideways ROMs from disc into sideways RAM. The * command will then be



passed to the new ROM image and if still unrecognised the next ROM will be loaded. If no ROM loaded from the RAMdisc intercepts the * command it will be passed to the current filing system as usual. ROMs on RAMdisc can be individually disabled in the same manner as 'real' ROMs in the BBC itself. Up to 104 8k ROMs can be saved onto the standard 1Mb RAMdisc, and the total load time (excluding time taken by the ROMs to process the command) for 100 ROMs is just under 9 seconds. All relevant control software for disabling/enabling ROMs etc. is provided. (Supplied on ROM.)

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Filing charge: 20p per unit of 2,048 characters per month.

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Any charges that may be applicable are shown to you before you obtain access to the database.

MicroLink PSS service: 2.5p per minute or part (300 baud); 3p per minute or part (1200/75 baud).

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Telex registration: £10.

Outgoing telex: 5.5p per 100 characters (UK); 11p per 100 (Europe); 18p per 100 (N. America); £1.25 per 400 (Rest of world); £2.75 per 400 (Ships at sea).

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Telemessages: £1.25 for up to 350 words.

Telemessages can be sent with an illustrated greetings card for 65p extra.

Radiopaging: No charge.

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Software over the telephone

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What you need to access MicroLink

You must have three things in order to use MicroLink: a computer (it can be any make of micro, hand-held device or even an electronic typewriter provided it has communications facilities), a modem (it can be a simple Prestel type using 1200/75 baud, or a more sophisticated one operating at 300/300 or 1200/1200 baud), and appropriate communications software.

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Product: ProPak
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 CO1 2XB
 Tel: 0332 371428

WHEN I first saw the name of the software company on the package it was rather like meeting a friend of old.

Dataview Wordscraft may not be known for writing software in BBC Micro circles, but I remembered one of their earlier products, Wordcraft, a superior word processing program for Commodore computers that dates back to the bad old days before there was a BBC Micro.

Their current offering, ProPak, is a comprehensive assembly language development package which is supplied on disc. It costs £69.95, and consists of five main programs: ProEdit, a full screen text editor; ProAsm, the 6502 assembler; ProLoad, an Object code module loader; ProMon, a machine code monitor and debugger; and ProRom, which is eeprom programming software.

Each module is designed to be loaded from disc and run from RAM. In addition there are extra versions of three of the modules – ProEdit, ProAsm and ProMon – also on the disc. These can be burnt on to eproms, so that they will run just like a ROM.

An eeprom programmer is available for another £69.95 to complete the package and make full use of the ProRom software.

I remembered from Wordcraft that the company is very conscious of software piracy and every package has a unique serial number displayed on the screen. The main protection against software theft is provided by a dongle, a small hardware device plugged into the computer in order for the software to work.

On the BBC Micro this dongle is a small plastic box which plugs into the analog port. It doesn't normally interfere with other software. The only problem that may arise is that other hardware, for example joysticks, may need to be plugged into the port instead.

Most of the programs use the function keys to enter commands. Keystrips, detailing the commands, are supplied neatly spiral-bound together.

The easiest way to start using this package is from the menu, obtained by pressing Shift+Break, as seen in Figure

Welcome back, old integrated friend..



Figure I: ProPak main menu

By JIM
NOTMAN

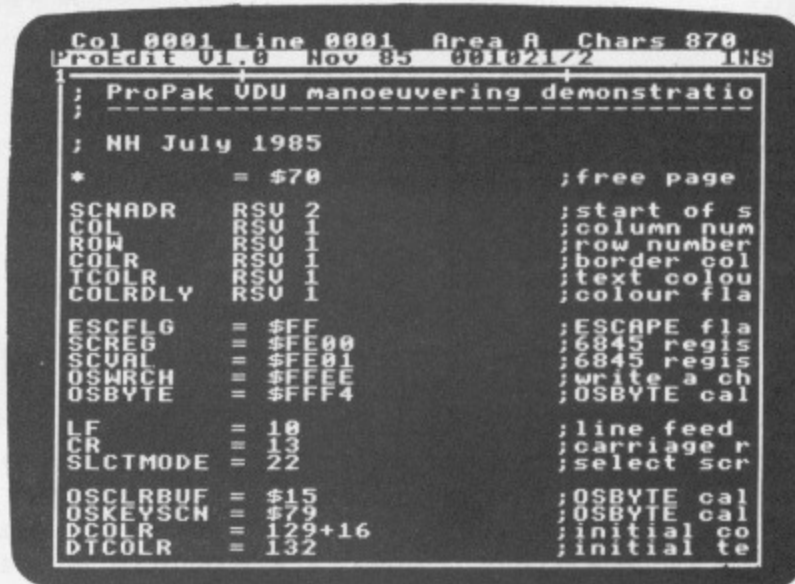


Figure II: ProEdit

I. Any module can then be selected by pressing one key. An important option, Set free memory, permits PAGE to be lowered to make more memory available to the software.

Each module can still be called directly without the menu, for example *PROEDIT.

Figure II shows that when ProEdit is initialised it turns the screen display to Mode 4. The top line displays the current position of the cursor, the current text area and the amount of memory still free for text.

The second line is where messages and commands are entered and at the end of that line there is an indication of whether text is to be inserted (INS) or

will overwrite any text (OVR) at the cursor position.

The area for display of text has a border drawn around it like a window. The text area is usually much larger than the window, but the cursor can be moved anywhere within the text by moving the window around with the cursor keys.

Copying, deleting and inserting blocks of text is done by a cut and paste technique. For example, to move text from one position to another place the cursor at the start of the block to be moved and press the Block remove key.

Then move the cursor to the end of

From Page 77

the block. As it moves, the relevant text is highlighted by having the colours inverted. The spacebar is then pressed to show the end of the block and all of it is then cut from the screen and put in a temporary buffer.

The cursor can now be moved to where the block of text is to be placed and the block insert key pressed, copying the buffer back into the main text area. This sounds complicated, but soon becomes second nature.

The memory is divided into a maximum of 26 different text areas, and text can be transferred from one area into another.

Up to nine screen windows can be defined to keep track of the various text areas, as in Figure III. The number of each window is displayed in its top left corner.

With PAGE at the normal DFS value of &1900 there is only space for 2527 characters with the disc version, increasing to 13535 characters with the ROM version. The 40 column mode is usually satisfactory for assembler code.

An 80 column screen mode is only possible with the ROM version, but is not very practical with only 735 bytes free with PAGE at &1900. For more room it will be necessary to lower PAGE to &1500 or &1200 from the initial ProPak menu.

It is disappointing that it will not work with the 6502 second processor or even with shadow RAM on the B+ or extra shadow RAM boards because this impressive text editor is limited by a shortage of memory. Who wouldn't love to use this with an 80 column mode and all those windows?

In common with most other assemblers each line consists of up to

four fields — with a label, mnemonic, operand and comment.

The Mostek-type mnemonics used are similar to those used in the built-in assembler in BBC Basic. Acorn are unusual in using an & to precede a hexadecimal number. It is more usual to have a \$ and this assembler will accept both.

Only the standard 6502 instructions are allowed. None of the extensions which take advantage of the extra instructions and addressing modes of the 65C02 in the second processor, and 65C12 for the new BBC Master are supported.

There is an extensive list of assembler directives available from ORG to specify the code origin, to INPUT which allows keyboard inputs during assembly.

Assembly takes place in two passes and is fast if the assembled code and reference tables will fit into memory. If not, assembly must be from disc, which greatly limits the speed of access.

Different assembler sections can be chained together during assembly. The listing of the assembly, including a table with the values of all the labels, can be directed to screen, printer or disc.

There is detailed reporting of any errors encountered. Two types of output file can be produced, one that is in a form that can be *RUN and one which produces object file modules for ProLoad.

ProLoad is a linking program which can combine separate program modules, producing a memory usage table as it does so.

More complex manipulations are possible. For example code may be executed at load time to permit scrambling of the code, to prevent software piracy.

When called, ProRom enters a front panel as shown in Figure IV. The upper screen shows the contents of the various registers, status flags, part of the stack and disassembles the instruction found at the program counter.

Full memory editing is allowed in either a hexadecimal and Ascii display or a disassembly. The disassembly precedes hex values with a \$ and does not use labels such as OSBYTE, only giving addresses such as &FFF4.

It is very colourful, but can be difficult to read if you've only got a monochrome TV, with red on a black background.

For debugging, there is an ability to single step through both ROM and RAM, and a comprehensive breakpoint system. Up to nine breakpoints may be set at any time. They can be set to interrupt the program when there is any change to a register or a code between a specific area is executed, when writing to or reading from any range of memory locations, when the contents of the accumulator, X or Y registers has a particular value and on execution of any specified op values.

To fully use ProRom you need the optional eprom programmer which will read and write to 2k, 4k, 8k and 16k eproms. Commands include a blank eprom check, a hexadecimal dump and a disassembler.

You'll be spoilt for choice with four different programming methods, from the slow normal to a very fast test which is able to program a 16k eprom in about 30 seconds.

To complete the extensive software there are more than 190 pages of A5 spiral bound documentation.

Verdict: Apart from the limitations mentioned this is a striking piece of integrated software.

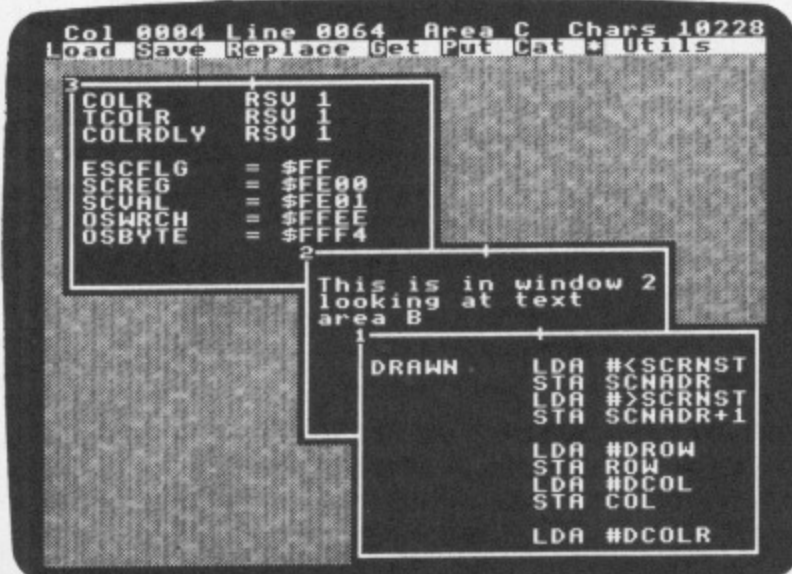


Figure III: Text screen windows

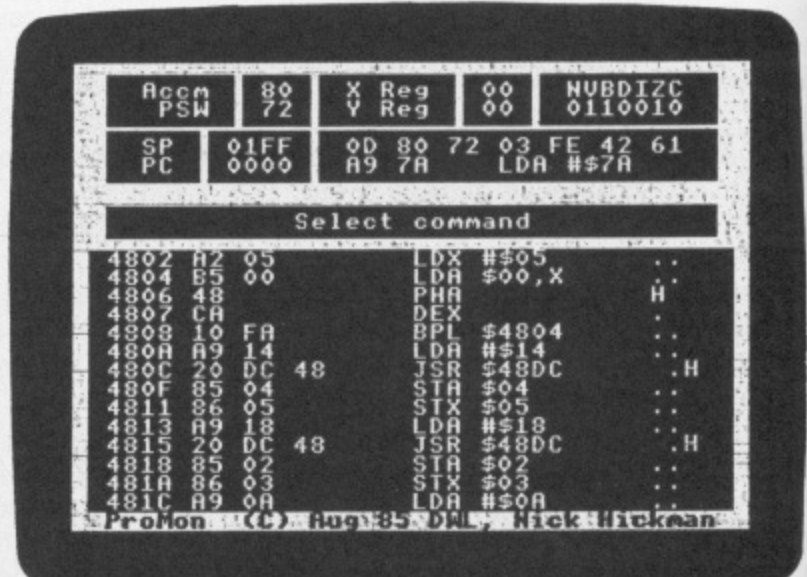


Figure IV: ProMon front panel

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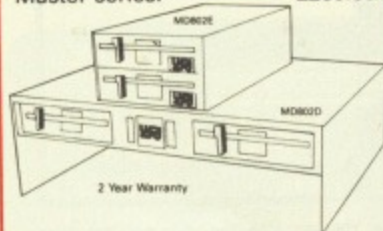
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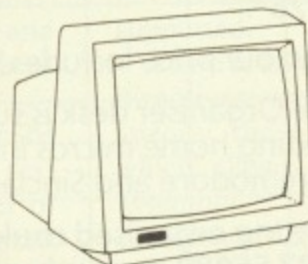
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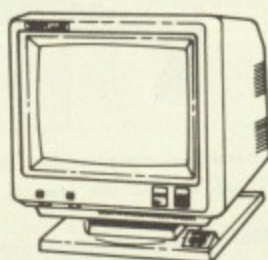
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3. Free Mode
In the free mode the command VT and FF code are read as a data fill end code. Of the two printers the data is automatically sent to whichever unit is free for service first. This means that the print time of a amount of data is minimized by using two printers without regard to the data list size.

NOTE: This means that if you try to print two reports at the same time, on two printers, the printers may intermix pages.

4. Command Mode
In the command mode the operation is similar to the manual mode. Data sent is not determined by the SELECT key, but by a certain command the required printer is selected and the number of copies is assigned. This command is internally processed as a control code and is not output.

5. Clear Key Mode

The clear key mode is furnished for cleaning an error occurring during the printing and data input. The function is to stop the printer currently under operation and erase the copy count. However, only the last data input remains and can be reprinted by pressing the COPY key.

FEATURES

1. A printer currently under operation is indicated by an LED, and therefore is immediately known.
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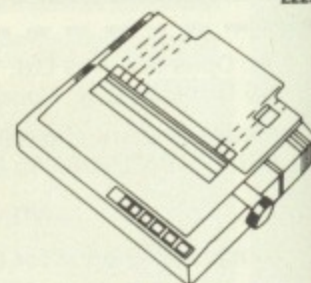
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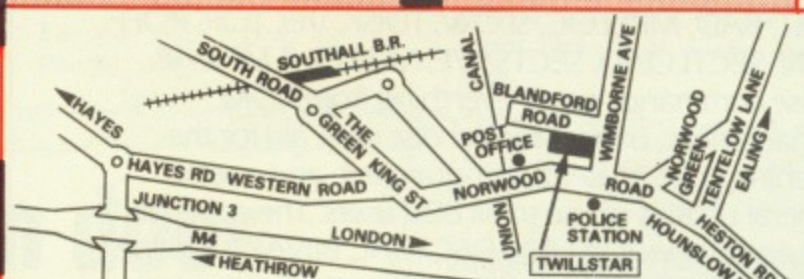
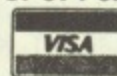
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The Scythe toolkit contains a version of the VECTOR 1 tape to disc system, which will transfer most protected tapes, but we have not stopped there. The Scythe has been packed with a host of other commands: MDIS, SDIS, MEDIT, KLIST, BASE, ROMLIST, ROMSAVE, NROM, FLUSH, FORMAT, VERIFY, FREE, SFIND, BFIND, XLIST, BAD, MRELOC, SLOW, TDISK, VECTOR, ROFF, RON, SECTLOAD, SECTSAVE, MSHIFT & MSWAP. These commands cover everything from ROM management, utilities for the disc user, aid for the machine code or BASIC programmer, and a set of general utilities of use to all BBC users. The commands will accept input in HEX, DECIMAL, BINARY and the resident INTEGER variables making the Scythe very easy to use. The Scythe comes complete with a comprehensive manual and a free utilities disk.

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ROM MASTER

ROM Master is a budget utility ROM designed for people with several ROMs on their BBC computer. ROM master has several utilities to help prevent the interference which can occur between different ROMs, any ROMs that cause problems can be switched off even through <CTRL> <BREAK>. Using ROM master has been designed to be as easy as possible. Most commands will accept lists, so you can, for example, switch off several ROMs with just one command. ROMs can be specified by their socket numbers or their title or even abbreviations of the title. 20 commands are available, please send for full details.

As a bonus feature for anyone who has files they want to keep from prying eyes, ROM master contains the commands SCRAMBLE & UNSCRAMBLE which will encrypt or de-encrypt a file based on an entered password. The encryption used is highly sophisticated so unless you know the correct password the file cannot be read.

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NEWSLETTER

Scoop from Japan

ONE of the first reports of the arrival of Prince Charles and Princess Diana in Japan on their recent visit, came direct to the UK from a MicroLink subscriber, beating some of the international news agencies to the punch.

Journalist Yuichi Ishikawa timed his message 12.00 BST, 8 May 86, with the subject matter in capital letters: "WELCOME ROYAL COUPLE TO OUR COUNTRY".

He even took time to design on his terminal two flags – the Rising Sun of Japan and the Union Jack.

His message read: "I Japanese subscriber of MicroLink honour to report the Royal Couple from UK landed safely at Osaka International Airport now. We are pleased their visit. Weather: fine. Temp. 70 degF.

"She wear white one piece. Grandson of Emperor, Hironomiya, meet at airport. Today they will stay Kyoto, beautiful old capital of Japan. I wish they see not only traditional Japan but also High Techs.

"Now weather is getting rainy. Did they come with bad weather of England?" he joked.

Exporters pick MicroLink

ONE of Britain's leading import-export organisations has chosen MicroLink as the communications medium for its near 10,000 members around the world.

The prestigious British & Overseas Institute of Import Export Traders is a totally non-profit association run solely by its members who volunteer for election as officers.

It was founded in 1972 by a group of small companies and individuals who pooled their resources and knowledge to start a joint export sales drive to promote their respective products in Europe.

From this small beginning the Institute has grown to be a highly respected organisation with members all over the world.

"As its main function is to bring exporters into contact with overseas importers, it is a logical progression to require a quick and efficient standard means of communication", a spokesman said.

"As a result of this requirement the products and services committee of the Institute recommended all members to start using electronic mail".

Bill Vickerman, chairman, and Bob Pinder, senior

exports consultant – both based in Liverpool and already MicroLink users – said they chose MicroLink because it was reasonable in cost and highly effective in its means of communicating with members.

"It is a quick means of spreading the information that our members need to conduct their business efficiently", said Mr Vickerman.

"It is also a British service that is constantly bringing out new and better means of communication and in its way is a vital aid to our continual search for further British export trade".

Key in for world's hotels

MORE good news about the International Official Airline Guide, which was added to MicroLink's growing list of value added services last month.

As well as supplying the very latest data from more than 750 airlines worldwide – with details of 1½ million flights – and ensuring trouble-free and more economical flight arrangements, OAG also takes the strain out of choosing a hotel at the other

end of your journey.

The same source that provides you with unbiased, up-to-date flight and fare information now brings a world of hotel and motel listings to your computer terminal.

Through the medium of MicroLink you can press a few keys and view over 17,000 North American hotels, more than 9,000 in Europe and 3,000 in the Pacific area.

You simply tell the OAG Electronic Edition the city you're going to and the location you prefer – near the airport, downtown or in a nearby suburb or resort – and in seconds you get a comprehensive alphabetical listing of hotels and motels in the location you've selected.

These come complete with name, address, telephone numbers, range of room rates and quality ratings.

Opening the golden door

MEMBERSHIP of MicroLink doesn't just mean access to its broad range of communications and other value added services. It also opens the door to a wealth of information on the host Telecom Gold system.

The main MicroLink menu

makes it simple to dial up the many fascinating databases on Telecom Gold.

Latest addition to the list is World Reporter, a massive full-text database of international news, current affairs and business information, operated by Datasolve.

Its sources include some of the world's leading news gatherers including the Financial Times, Washington Post, The Guardian, The Economist, New Scientist, News Service of Japan, TASS from the USSR and the BBC.

YOUR chance to join MicroLink – Page 75

IN our last look at FOR...NEXT loops we introduced the command STEP which allowed us to vary the amount the control variable changed for each time round the loop.

This time we'll be taking another look at FOR...NEXT loops, but concentrating on what are known as nested loops.

And what, you may well ask, is a nested loop? To put it simply it's a loop inside another loop. By now you should be used to the idea that a FOR...NEXT loop consists of the loop control structure — the FOR and the NEXT.

Inside this come all the lines we want repeating, the body of the loop. Now what if the body of the loop is itself a loop? Program I poses the question.

Program II goes the whole hog and actually has one loop inside the other. Run it and you'll see it produce the following output:

```
Outer loop cycle number 1
Inner loop cycle number 1
Inner loop cycle number 2
Inner loop cycle number 3
```

```
Outer loop cycle number 2
Inner loop cycle number 1
Inner loop cycle number 2
Inner loop cycle number 3
```

```
Outer loop cycle number 3
Inner loop cycle number 1
Inner loop cycle number 2
Inner loop cycle number 3
```

It's not very exciting, but it does show nested loops in action. There's obviously an outer loop with the control variable *outer* and an inner loop controlled by *inner*.

But how do they work? To answer that question let's have a look at Program III, a very simple listing with one FOR...NEXT loop in it.

Elegant, isn't it? All it does is produce:

```
*****
```

The FOR...NEXT loop cycles 10 times, printing out an asterisk each time round. The semicolon at the end of line 30 ensures that they all appear on the same line.

The final PRINT just moves the

The ins and outs of loops

Part 7 of
**PETE
BIBBY's**
series for
the micro
novice

cursor to the next line down at the end of the program. Try leaving both out and see what happens.

Now suppose that you wanted, for reasons best known to yourself, five of these rows of 10 asterisks. You could get them by writing a program that uses the FOR...NEXT loop of Program III five times in succession.

However there's a much better way of doing it as is demonstrated by

```
10 REM Program I
20 FOR loop=1 TO 5
30 PRINT "Suppose this was a loop"
40 NEXT loop
```

Program I

```
10 REM Program II
20 FOR outer=1 TO 3
30 PRINT "Outer loop cycle number";outer
40 REM Inner loop starts
50 FOR inner=1 TO 3
60 PRINT "Inner loop cycle number";inner
70 NEXT inner
80 PRINT
90 NEXT outer
```

Program II

```
10 REM Program III
20 FOR asterisk=1 TO 10
30 PRINT "*";
40 NEXT asterisk
50 PRINT
```

Program III

Program IV. Run it and see what happens. Exciting, isn't it?

Some of the program is familiar. Lines 40, 50 and 60 are taken directly from the previous program. The FOR...NEXT loop formed by these lines obviously produces the rows of 10 asterisks. But how do we get five of these rows?

The answer to that is that we've put the FOR...NEXT loop we've lifted from Program III into another FOR...NEXT loop formed by lines 20 and 90.

This outer FOR...NEXT loop cycles five times as the variable *row* goes from 1 to 5. Each time round the loop the program performs the lines that it finds sandwiched between the FOR of line 20 and the NEXT of line 90.

Now these lines in themselves happen to form an inner FOR...NEXT loop with the control variable *asterisk*. When it comes to this loop the micro obeys it in exactly the same way as it did in Program III, producing the required line of 10 asterisks.

Then after a REM and PRINT for neatness's sake the program comes to the NEXT of line 90.

Now unless the control variable *row* is greater than 5, the program goes back to the corresponding FOR of line 20 and the whole thing begins again. Hence the five rows of 10 asterisks:

```
*****
*****
*****
*****
*****
```

To put it another way, there is a


```
10 REM Program IV
20 FOR row=1 TO 5
30 REM Inner loop start
40 FOR asterisk=1 TO 10
50 PRINT "*";
60 NEXT asterisk
70 REM Inner loop end
80 PRINT
90 NEXT row
```

Program IV

outer loop – with control variable *row* – and an inner loop – with control variable *asterisk*. The outer loop is repeated five times.

The first time round the outer loop *row* is equal to 1. The program then meets the inner loop and obeys that, the control variable *asterisk* going through all its values from 1 to 10. This produces one line of asterisks.

Now the inner loop is finished, the program carries on to the following lines and comes to the NEXT of line 90.

Since *row* is only 1 the outer loop is still operating. The outer loop control variable *row* is now increased by one, becoming 2, and the outer loop begins again.

The program carries on and meets the inner loop again. And once more it obeys it 10 times, with the resultant row of asterisks.

When the inner loop has finished its work the program carries on, finds that it hasn't yet satisfied the conditions of the outer loop and so performs it yet again – *row* now being 3.

The program only finishes when the outer loop has been performed five times, with the inner loop going through all its 10 cycles for every pass of the outer loop.

Program V shows this happening. Notice how in line 30 I've used the control variable *row* to give the number of the cycle. The result is:

```
Outer loop cycle 1
*****
Outer loop cycle 2
*****
Outer loop cycle 3
*****
Outer loop cycle 4
*****
Outer loop cycle 5
*****
```

which shows how the loops combine to produce the output.

Now that we've seen how we can have one FOR...NEXT loop nested inside another Program II should make a lot more sense. Let's see what else we can do with them. Have a go at Program VI.

This is much the same as the previous programs. There's an outer loop with a control variable *row* taking values from 1 to 5.

The inner loop however is slightly different. It still has the control variable *asterisk*, but now it is taking values from 1 to *row*. Run the program and you'll find that you get a triangle of asterisks:

```
*
**
***
****
*****
```

If you manage to control your excitement it's easy to see what's happened. The outer loop behaves just as before with *row* being 1, then 2 and so on to 5.

The inner loop goes through all its cycles for each pass of the loop, again just as before.

What's different is that the inner loop's control variable goes through the range 1 to *row* each time, and not 1 to 10 as previously.

This means that the number of times the inner loop is performed – and hence the number of asterisks printed each time round the outer loop – depends on the value of *row*.

The first time round the outer loop *row* is 1 and so the inner loop only produces one asterisk. The second time round the outer loop *row* has the value 2. This means that the control variable of the inner loop, *asterisk* now ranges from 1 to 2.

The inner loop cycles twice and we get two asterisks. When *row* becomes 3 the inner loop cycles three times with three asterisks being printed on that line, and so it goes on.

If you can't understand it try working through the program line by line, noting down the values of *row* and *asterisk* at each step. You'll soon see what happens.

Remember that the inside loop goes through all its cycles for each time round the outer loop. All we've done is

to make the number of cycles of the inner loop dependent on how many times the outer loop has been performed.

All this putting asterisks on the screen leads naturally to an extension of the PRINT command, TAB. To see what it does ask yourself how would you get an asterisk on the screen five character spaces in from the edge? One way would be to use:

```
PRINT "    *"
```

where our asterisk is preceded by four spaces.

This does the job but it's messy. A much nicer way is to use TAB. By now you should be used to the PRINT command telling the micro to display something on a screen line. Well the TAB command tells it where on the line to print it. The solution to the problem is:

```
PRINT TAB(4) "*"
```

The number in the brackets after the TAB tells the micro how many character spaces in from the left of the screen to print whatever comes next – in this case the asterisk.

It may seem odd that it's 4 and not 5, but this is because computers start counting at 0, not at 1 as we do. So the far left space on a line is numbered 0, the

```
10 REM Program V
20 FOR row=1 TO 5
30 PRINT "Outer loop cycle ";row
40 REM Inner loop start
50 FOR asterisk=1 TO 10
60 PRINT "*";
70 NEXT asterisk
80 REM Inner loop end
90 PRINT
100 NEXT row
```

Program V

```
10 REM Program VI
20 FOR row=1 TO 5
30 FOR asterisk=1 TO row
40 PRINT "*";
50 NEXT asterisk
60 PRINT
70 NEXT row
```

Program VI


```
10 REM Program VII
20 FOR row=5 TO 1 STEP -1
30 FOR asterisk=1 TO row
40 PRINT "*";
50 NEXT asterisk
60 PRINT
70 NEXT row
```

Program VII

From Page 85

next 1, the next 2 and so on. Try:

```
PRINT TAB(0) "*"
PRINT TAB(1) "*"
PRINT TAB(35) "*"
PRINT TAB(90) "*"
PRINT TAB (8) "*"

```

and see what happens. Incidentally the last one is a deliberate mistake and shows what happens if you inadvertently put a space between the TAB and the opening bracket of the following number.

Not only can you use PRINT TAB to display anywhere on a line you can also use it to pick which line you want to print at. This is done by having another number inside the brackets.

This tells the micro how many lines down from the top of the screen you want the output. And again the top line is numbered 0, the second line down 1 and so on. The whole command takes the form:

```
PRINT TAB(column,row)
```

or

```
PRINT TAB(across,down)
```

if you find that easier. Try the following – preferably after clearing the screen with CLS:

```
PRINT TAB(0,0) "*"
PRINT TAB(5,5) "*"
PRINT TAB(19,4) "*"
PRINT TAB(100,100) "*"

```

and you'll soon have the hang of it.

After that diversion let's get back to using FOR...NEXT loops to put more asterisks on the screen. Try out Program VII.

This is more or less the same as the previous program except that a STEP of -1 is used to make row take decreasing values from 5 to 1. This means that our

```
10 REM Program VIII
20 CLS
30 FOR column=0 TO 19
40 FOR row=0 TO 19
50 PRINT TAB(column,row) "*"
60 NEXT row
70 NEXT column
```

Program VIII

triangle of asterisks is now upside down:

```
*****
****
***
**
*
```

I'll leave it to you to figure out the exact details.

Our previous two programs have used the control variable of the outer loop to influence the inner one. It's very often the case that the control variables that are used to govern our loops are also used inside them. Take a look at Program VIII which produces a

PROBLEM

I HAVE a BBC Micro, issue 4 Board, OS 1.2. Recently it has developed an annoying fault. When playing games sound is breaking up the picture.

I am using a portable TV as a VDU, but there is no such problem when using it as an ordinary TV even with the sound turned full up. Can you please suggest a remedy?
– Edward Dipple, Reading.

SOLVED

Some combinations of TV and computer cause sound-on-vision. You could have a TV engineer adjust the sound trap notch filter on your TV. Alternatively cut the power lead into the modulator and insert a 10R resistor, then connect a 50uF capacitor between the modulator side of the resistor and the modulator case.

```
10 REM Program IX
20 CLS
30 FOR row=0 TO 19
40 FOR column=0 TO 19
50 PRINT TAB(column,row) "*"
60 NEXT column
70 NEXT row
```

Program IX

quadrilateral of asterisks.

Here we have yet another pair of nested loops. The outer loop has the control variable column which varies from 0 to 19. The inner loop has row as its control variable. The interesting part is line 50 which uses the values of row and column with TAB to position the asterisks.

Each time round the outer loop the inner loop cycles 20 times, producing a column of asterisks. The next time round the column is one space to the right and so on.

Program IX does the same thing but in a different way. Now the output appears row by row. This is because the outer loop of Program VIII is the inner loop of Program IX and vice versa.

And that's all for now. We've seen how loops can be nested inside each other and how the control variable of the outer loop can be used to influence the inner loop.

We've also seen how the loop control variables can be used inside the loops, in this case deciding the position of the asterisks.

● I'll leave you with this problem until next time. Both the triangles of asterisks had their hypotenuses to the right. Can you modify them so that the triangles have their hypotenuses to the left as in Figure I and II? Have fun trying.

```

      *
     **
    ***
   ****
  *****

```

Figure I

```

*****
****
***
**
*

```

Figure II

Beebaid

A new ROM from
Jaysoft

Master your Model B

BEEBAID offers model B users the following Master facilities: Tube switch on/off commands, more effective use of the shift key, interlace correction in graphics modes; and for

users with battery backed Ram, can enable/disable Roms across even a power off. BEEBAID users need never key CHAIN, LOAD, *RUN, *ACCESS, *LOAD, *COPY,

*COMPACT, *INFO, *DUMP, *TYPE, *DELETE, *EXEC commands ever again! Why BEEBAID? Simply Because Each and Every Beeb needs Automatic Interactive Displays!

ROM SOCKET DISPLAY

| SOCKET | TITLE |
|-----------|-----------------------|
| F Write | |
| E | AUTO BEEBAID 0.05 |
| D | BASIC (C)1982 Acorn |
| C | DISC DOCTOR 1.09 |
| B | TOOLKIT1.21 |
| A | DFS,NET(C)ROFF |
| 9 | WORDWISE-PLUS1.49 |
| 8 Write | |
| 7 | FX-80 PRINT 1.00 |
| 6 | BEEBMON1.00 |
| 5 | The BASIC Editor 1.32 |
| 4 | BASIC(C)1983 Acorn |
| 3 Disable | |
| 2 | |
| 1 | |
| 0 | |

Socket F in control

LOAD MENU DISPLAY

| Drive 0 | 01--SAMPLE | Load Menu |
|---------|------------|--------------|
| A | \$.IBOOT | B B.METEORS |
| C | \$.METEORS | D M.ARCADEN |
| E | B.DEFENDR | F \$.DEFENDR |
| G | R.AUTOBEE | H R.The BASI |
| I | B.CANDLE | J B.VULTURE |
| K | \$.JBEPSON | L B.MATCH |
| M | M.FEASIBL | N \$.UNLOCK |
| O | B.DISPROG | P \$.DISPROG |
| Q | B.DFSPACE | R B.LOADMNU |
| S | B.TITLES | T B.LOADER |

DISC FREE SPACE DISPLAY

| Drive 0 | 01--SAMPLE | 80 Track |
|---------------------|------------|--------------------|
| FILENAME | SIZE FREE | FILENAME SIZE FREE |
| Catalogue | | |
| \$.IBOOT | 1 | B.METEORS 4 |
| \$.METEORS | 34 | M.ARCADEN 76 |
| B.DEFENDR | 6 | \$.DEFENDR 35 |
| R.AUTOBEE | 64 | R.The BASI 64 |
| B.CANDLE | 3 | B.VULTURE 28 |
| \$.JBEPSON | 11 | B.MATCH 24 |
| M.FEASIBL | 71 | \$.UNLOCK 2 |
| B.DISPROG | 1 | \$.DISPROG 1 |
| B.DFSPACE | 1 | B.LOADMNU 1 49 |
| B.TITLES | 20 | B.LOADER 3 299 |
| Largest free space: | | 299 sectors |
| Total free space: | | 348 sectors |
| Catalog entries: | | 20 Free: 11 |

*AUTOMATIC FEATURES

Permanent cure for screen jitter in graphics modes – essential if you've spent a fortune on a monitor!
HI-BASIC automatically selected when 6502 second processor active.
Shift key switched for ease of keying lower case BASIC variable names.
Increases the speed of that slow keyboard by 30%!
Automatically prevents disks being permanently disabled by some games – no need for power off.

*ROM CONTROL

Elegant mode 7 colour display of Rom/Ram sockets showing Rom title and read/write/disable status.
Switch Roms off and on – permanently for users of battery backed Ram – even across a power off! (Like the Master Series).
Copy Roms to disk by name or socket number. Transfer any Rom to sideways Ram.
Query read/write/disable status of Rom/Ram sockets.
Handles multiple sideways Ram sockets.
Tested with ATPL, Solidisk, Watford and Acorn User Ram extensions.

*MENU FACILITIES

Three menus available, Load menu, Run menu, and Disk Free Space display. All Menus are mode 7 colour displays accessible using a * command, or more efficiently using L/Break, M/Break and O/Break.
Menus are 'networked', switch between them at the touch of a key.
Load menu loads BASIC programs and automatically lists them with page mode set on – with a single keystroke! However, if you have The Acorn BASIC Editor Rom in your machine, it is entered with insert mode set.
Load menu also loads machine code programs at the correct address for subsequent disassembly. Automatically detects a Rom and prompts for a destination Ram socket.
Touch the COPY key and invoke the Copy menu. Select the files, select the target drive, and BEEBAID does the rest for you. Handles duplicate files, locked files and multiple destination drives.
The Run menu enables BASIC and machine code programs to be executed easily – by all the family! Supersedes all other well known Run menus – B, B+, Master and Tube compatible.
Disk Free Space Display shows the size of all files on a disk and the location of the free space. Touch a key to swap between hex and decimal. Hit 'C' for automatic compact.

*AND MUCH MORE

Dump the current text window to the printer with *DTWindow.
Zeroise memory segments using *ERASE commands, including selectable Ram sockets.
Turn the Tube on and off using *TUBEON and *TUBEOFF. Preserves status of text or programs held in second processor.
Relocate any memory segment with *SHIFT.
Relocate any BASIC program with *MOVE.
Disable the Econet system using *NONET.
Load a program to the correct address using *DOWNLOAD.
Enhance your BBC Micro with some 20 additional Break commands.

*DISK FILE INDEXING SYSTEM

In addition to all the facilities already listed, the BEEBAID Rom is supplied with a Disk File Indexing system. This system automatically maintains an index of all your software and allows you to categorise your programs, eg. Games, Educational, Simulation etc. It can be dynamically tailored to your own requirements, eg. your disk drive configuration and which directories you want to index. The Index may be searched by program name, disk number or category. It is supplied on a 40/80 compatible disk with its own bound manual and it is FREE!

BEEBAID is fully 6502 second processor compatible and has been tested on model B, B+ 128 and Master Series machines using the Acorn DFS. It has been tested with several sideways Ram boards including ATPL,

Watford, Solidisk and Acorn User, using single and multiple Ram sockets. It has also been compatibility tested with many other Roms including the VIEW family, Wordwise and Wordwise Plus, AMX Mouse, Disc Doctor,

BITSTIK, Teletext, Prestel and many more. BEEBAID eliminates conflicting Rom problems.

To order your copy of BEEBAID, simply fill in the cutout and send it with a cheque or postal order payable to:

JAYSOFT at:
114 KINGSWAY, WEST WICKHAM,
KENT BR4 9JQ

Please send me BEEBAID packages comprising 16K Rom, 40/80 compatible disk and 2 manuals at £34 inclusive. I enclose a cheque/postal order for £

Name

Address

.....

.....

.....

Order dispatched by return of post.

ONE of the nice things about working for *Micro User* is that you get to see all the latest products in return for doing a review. And there was quite a list of people waiting to get their hands on Le Modem. Fortunately a few pounds spent on the editor at the Ram and Buffer ensured me the job.

And money well spent it was. Le Modem is a multi-baud rate, auto-answer, autodial modem for the BBC Micro from Watford Electronics for the incredibly low price of £89.

The immediately apparent feature is the lack of knobs or buttons on its sleek 6 x 9 x 2 inch case – just a set of four monitor LEDs (power, tx, rx and on line) plus RS423 lead and ribbon cable. This ribbon cable, which clips into the 1MHz bus carries the signals needed over and above those of the RS423 port for the auto functions.

Once you've connected up cable and lead all that remains is to plug in the ROM-based software – something we should all be used to doing by now – and you're away.

If you've ever had any experience of modems you'll know the frustration that comes with your first experiments. Am I doing something incorrectly, is the software being stupid, is the other end of the comms link down or have I just got the leads the wrong way round?

With Le Modem there's none of this, thanks to its self-test mode. The simple *TEST command puts you into a routine that checks its four baud rates (300 answer and originate, 1200 and 75 baud) giving you aural feedback through the internal speaker and the usual success messages. Very reassuring.

In all – remembering that my lid's

Le Modem smooths comms connections

MICHAEL NOELS reviews an exceedingly helpful black box

never screwed down – it took me about 10 minutes to get from unpacking the box to the successful message stage.

Then came the first logging on, and the discovery of one of the outstanding features of Le Modem: The ease with which you can get through to the really important databases such as Prestel and MicroLink.

I opted for Prestel first. This section of Le Modem is called appropriately enough, Le Prestel. With a simple:

*CALL PRESTEL 618

I was in. Prestel was automatically dialled and I was at the familiar header frame. From then on all was plain sailing. In fact, since Le Modem's special features are function key driven, I was able to access them simply by following the key strip. Figure 1 shows what's available.

Straight away I was experimenting with saving pages – these automatically go onto the V directory – and printing them off. The printer driver is necessarily rudimentary because of space considerations. It ignores graphics totally, just giving you the text.

Mind you, if you're versatile enough to write your own graphics dump, Le Prestel can accept it. There's a special

key for a user function which allows you to call your own machine code routine.

Another useful feature is the ability to tag pages. This allows you to mark special pages which you can return to at a keystroke. If you've every been lost in the Prestel maze you'll know how handy this can be. In fact you can tag up to three pages, allowing you to mark deeper and deeper nodes as you get further into Prestel.

After three tags, a subsequent tag causes the first tag to be lost. Once you get used to the system you wouldn't be without it.

Downloading software was just as easy. In fact the hardest part was wading through Micronet to find some to download. Once there a simple key press followed by a filename was all that was needed. The downloading proceeded without a hitch – and not only was I able to save it, while still on line I was able to enter Basic to test it and then return to Prestel with *PRESTEL. Neat.

Sending a mailbox was as easy as everything else had proved. I simply dialled up *77 and sent myself a message, so I could check it was there when I logged off (another single function key feature).

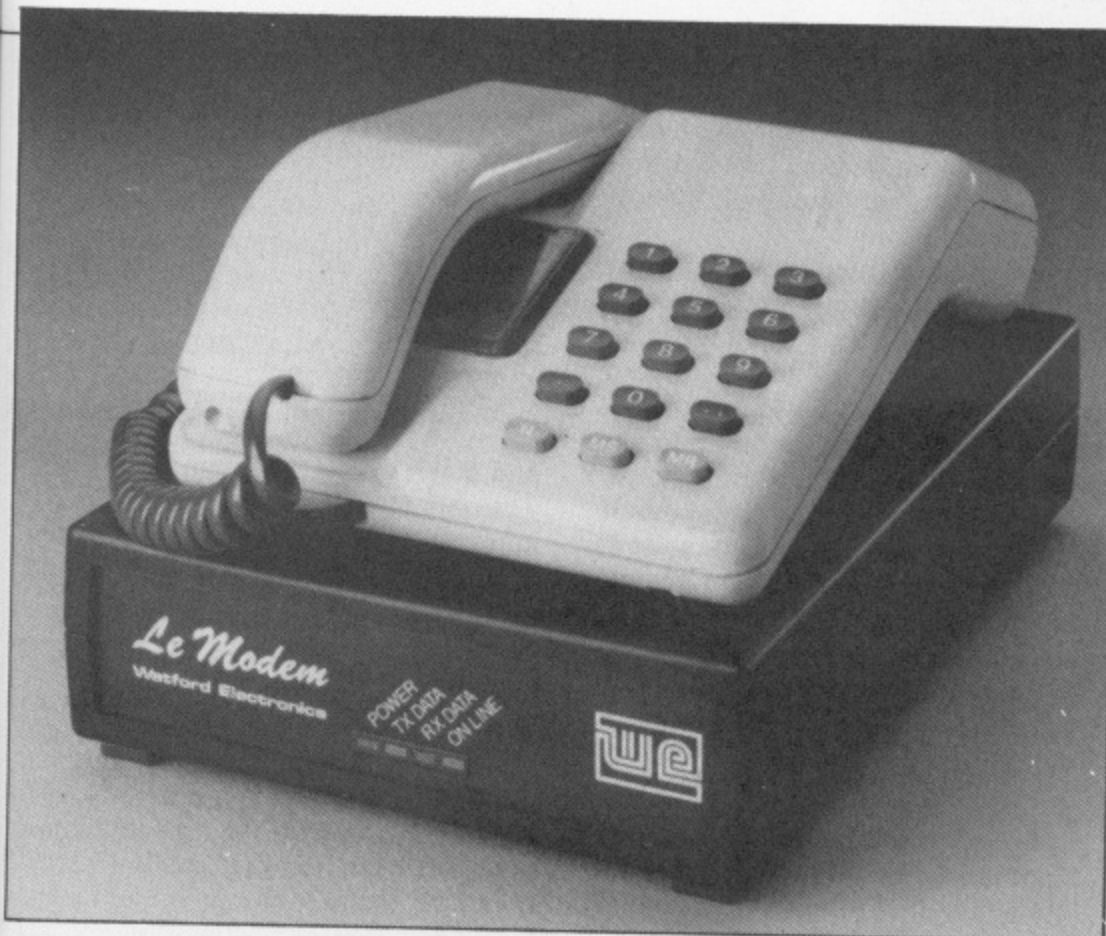
There's also a mailbox editor which

| LE PRESTEL | RECALL TAG | SEND MAILBOX | LOAD MAILBOX | USER FUNCTION | CHANGE I.D. | LOG OFF | RUN DOWNLOADED PROGRAM | * CAT | | |
|------------|------------|--------------|--------------|---------------|-----------------|-------------------------|------------------------|-----------|------------|-----------|
| | TAG PAGE | EDIT MAILBOX | SAVE MAILBOX | REVEAL | RETURN TO BASIC | DOWNLOAD TELE. SOFTWARE | SAVE PROGRAM | * COMMAND | PRINT PAGE | SAVE PAGE |
| | f0 | f1 | f2 | f3 | f4 | f5 | f6 | f7 | f8 | f9 |

Figure 1: Le Prestel function keys

| L'EMULATOR | | | | | SPOOL FILE ON/OFF | | | * CAT | | |
|------------|-------------------|---------------|------------------|-----------------|-------------------|------------------|-----------------|-----------|---------------|----------------|
| | LOCAL ECHO ON/OFF | SCREEN COLOUR | CHARACTER COLOUR | SEND ASCII FILE | RETURN TO BASIC | X MODEM TRANSMIT | X MODEM RECEIVE | * COMMAND | FILTER ON/OFF | PRINTER ON/OFF |

Figure 2: L'Emulator function keys



a screen you don't want to be saved, however.

By now, the proceedings were being recorded by being spooled to disc. I then told MicroLink I was going to send some mail, then pressed f3 to send the prepared file. Again the screen was saved and I was asked for a filename.

At this point the disc drive was being kept busy with information going in both directions. I then chose printer on with f9 and the goings on went to printer as well as disc. Try as I might, I couldn't confuse L'Emulator at all. Everything worked perfectly.

Later experiments with sending and receiving files via the Xmodem protocols were equally successful, as were the tests of the other commands.

So far I'd been trying Le Modem out at a high level, using *CALL. However Le Modem is based on a hierarchy of command functions and *CALL is at the top. Program I shows the Basic equivalent of *CALL using the lower level commands.

There's not room to go into the structure in full, suffice it to say that there are sufficient commands to let you configure the terminal as you want – almost.

The only annoying omission was the lack of a chat mode. This was intentional – the designer reckoned that if you want to chat on the phone you should use your mouth and ears. However this isn't possible for the deaf and even if you're not handicapped this way it's still useful to chat when transferring a set of files, for instance.

You can create a chat mode of sorts, but I found I needed my end of line character to be a line feed only and this isn't supported, though it does give all the other terminators plus local echo, filter mode and handshaking. These can all be altered via the constantly available terminal status screen.

The modem itself is controlled by a section of software called Le Key, mainly by star commands. While they're beyond the scope of this review, they do let you get to grips with the modem operation, as Figure III shows.

I became involved with them when I wanted to test the auto-answer facility. The manual explains them in detail, and within quarter of an hour I knew enough to write Program II, which worked first

allows you to prepare and store your own mailboxes inexpensively offline and then despatch them when you're logged on. You need to take care to get your message the right size for the reply form.

To sum up, Le Prestel gave me all I wanted for Prestel communications, working reliably and satisfactorily.

Next on my list of tests was calling MicroLink, Database Publications' own section of Telecom Gold. The part of the software that deals with this is known as L'Emulator, and all it needed was a simple:

***CALL BTGOLD 0618330091**

This automatically dials up the required number, then, when you're through, logs you on at 1200/75 baud with an 80 column screen. There are two possible drawbacks to this.

The first is that if you're interested in sending a lot of characters you may want 300/300 baud to save bills. This is easily remedied. You can:

***CALL BB**

followed by the 300 baud PSS number. Although designed for bulletin boards – hence the BB – it works equally as well with 300 baud Telecom Gold.

The second and more serious drawback is that you're stuck in 80 column mode. There's no optional 40 column mode for those of us without high resolution monitors. This omission

was, I am told, due to lack of room in the ROM.

These quibbles aside, the terminal emulation worked fine on MicroLink. I decided to give it as fierce a test as I could manage. L'Emulator claimed to be able to:

- Spool the proceedings on to disc.
- Load and send a prepared Ascii file from disc.
- List the proceedings on printer.

I tried all three at once. I prepared a Wordwise file of electronic mail and then logged on. I then pressed Shift+f4 to select spool file (see Figure II), was told to wait while the current screen was saved, then was asked for the filename I wanted.

On balance, this screen saving is a good idea. Once you resume communications after stopping to issue a command or change a parameter the screen is restored, so you don't lose track of what's going on. It can sometimes be a bit irritating waiting for

```
10 *MODEM PRESTEL
20 *DIAL 618
30 TIME=0
40 REPEAT
50 *CARRIER
60 UNTIL ?&3A0<>0 OR TIME=3000
70 IF TIME >= 3000 THEN STOP
80 *AUDIO OFF
90 *SEND
100 *PRESTEL
```

Program I: Basic equivalent of *CALL

From Page 89

time. Certainly the scope is there for more sophisticated programs, including bulletin boards. Watford themselves promise more software products based around Le Modem.

However the manual doesn't go into all the details you'd need to write your programs at assembler level. There's no jump block table, for instance.

So how does Le Modem compare with other software/modem combinations? If you're a straightforward user of Prestel, MicroLink or other large

mainframe databases, or simply want to log on to bulletin boards, Le Modem is ideal for you. Everything you want is just a star call away.

If you're a dedicated hacker you may find Le Modem's super simple system too pre-packaged and slick for your liking. Comms freaks tend to prefer buttons to press and on-screen control panels to select from rather than the more automated service of Le Modem.

However the majority of comms users are not hackers. They just want to get to their information from remote databases with the minimum of fuss,

```
10 ON ERROR PRINT "ESCAPE": STOP:
*HANGUP
20 *ANSWER B4
30 IF ?&3AB<>ASC("T") THEN *HANGUP
40 *AUDIO OFF
50 *TERM80
```

Program II: Simple auto-answer

and that's what Le Modem gives them. The only major drawback is that its BT approval is still in the pipeline. When that comes through Le Modem should achieve the success it fully deserves.

***answer [n]** Waits for n rings then answers phone checking for 300 then 1200/75 carrier.
***audio [on/off]** Monitors line via internal speaker.
***call []** Followed by telephone number, autodial and logs on to one of 11 possible services. For instance, *call prestel.
***carrier** Checks to see if carrier present.
***data** Sets data, parity and stop bits of data word from eight different combinations.
***dial []** Dials following telephone number.
***endcall** Checks for carrier. If not it hangs up.

***hangup** Drops telephone line.
***listen** Grabs telephone line and turns on monitoring by internal speaker.
***modem** Either displays status or sets modem to a service. For instance, *modem prestel.
***prestel** Calls Le Prestel.
***reset** Issues a software reset.
***send** Sends a carrier.
***test** Tries out the four baud rates supported.
***term80** Calls the 80 column terminal program L'Emulator.

Figure III: Le Modem star commands



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Master ADFS in action

Part 2 of ROY McCLOY's series on mastering the Master

NOW that my Master 128 was becoming more familiar and part two of the reference manual had arrived I felt ready to take an everyday user's look at what the Advanced Disc Filing System (ADFS) could offer, how EDIT worked, and how on earth could I get the real time clock to print the date in my View files.

I had delayed buying a non-Acorn double density disc filing system (DDFS) for my old Model B because of incompatibility problems although I desperately wanted more disc storage capacity for long data files and text files.

As a mediocre Basic programmer I used to think that I would never need more than one disc for all my program files, plus another for back-up, and the catalog length of 31 filenames was the limiting factor – mitigated to a great extent by the superb Watford DFS with its double length catalog.

Word processing soon brought an end to my contentment and even my double sided 80 track discs seemed to shrink overnight. It wasn't long before I was buying discs in packs of 10. Would the ADFS be the answer? How does it differ from the ordinary DFS? Are the commands the same? Can I transfer all my existing files to a double density disc?

For the technically minded Jim Notman has reviewed the ADFS – *The Micro User* December 1985 – running on a 1770 board in a Model B where it was slow and pushed PAGE up to an

alarming &1D00. Fortunately on the Master PAGE remains fixed at &0E00 whatever the filing system and the ADFS runs considerably faster.

The ADFS requires the disc to be formatted with 16 sectors per track instead of the standard 10, thus increasing storage capacity by 60 per cent. The formatting program would not fit into the mega-ROM in the Master and comes on the Welcome disc and is run by: `*$.LIBRARY.AFORM`.

Now for the good news. The ADFS only supports two disc drives, 0 and 1, but if you have double sided discs and disc drives the disc can be formatted so that both sides – that is drive 0 and 2 under the standard DFS – form one continuous usable surface, which is drive 0 in the ADFS. The same applies to the use of drive 1 – the old drives 1 and 3 – if you have dual drives.

When formatting you respond with S for Small to format one side of a 40 track disc. Similarly M for Medium formats a single sided 80 track disc or L

for Large for the maximum storage capacity, of 654.4k on a double sided 80 track disc and available on drive 0 or 1. This compares with 204.4k available per drive – 0, 1, 2 or 3 – on an 80 track disc using the standard DFS.

This is when the few differences in using the ADFS start to become apparent. You cannot read a standard DFS formatted disc when in the ADFS or vice versa. When you place a disc in a drive or change discs it is important to mount it. In the ADFS you no longer have `*DRIVE` but `*MOUNT0` and `*MOUNT1` initialise their respective drives.

Typing `*ADFS` is equivalent to `*MOUNT0`. If you `*MOUNT1` you can then boot files in drive 1 using Shift+Break, provided of course that `*OPT4,3` has been used to set the EXECute option on the disc. This very useful facility is not available with the DFS on drives other than zero.

It took me some time to load my first file successfully from an ADFS disc since I kept getting the error message "not found". It was my first introduction to the hierarchical filing system of the ADFS. Not surprisingly the Welcome guide only has five pages out of 250 on the ADFS. The Welcome disc has an ADFS tutor containing about 10 Help pages and four simple tests.

Unfortunately Acorn chose rather meaningless names for their examples of directories. Let me give you a more practical example in Figure I. As in the ADFS, \$ is the root directory which is initialised when you `*MOUNT` the disc. This root directory contains one file, !BOOT, and two directories, View and Programs.

In turn, the directory View contains three more directories – Utils, Letters and Reviews. The directory Utils contains three of my View utility files, F-KEYS which provides my own

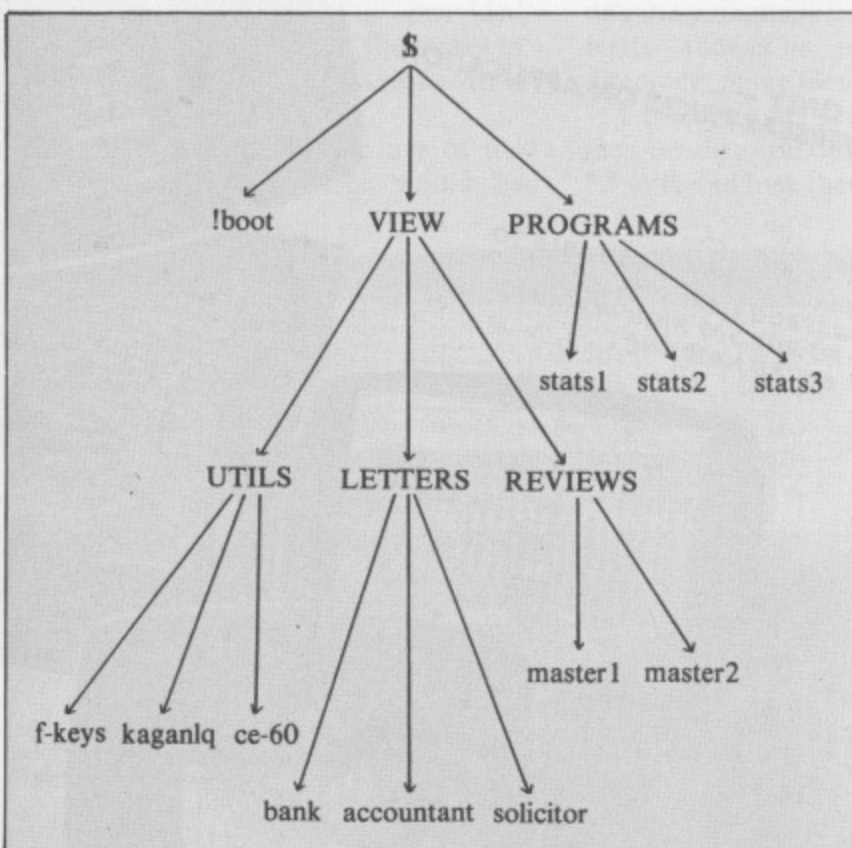


Figure I: ADFS hierarchical filing system – directories in capitals, files in lower case

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|------------|-------------------------------|
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| 3. P.3 | in 'database' interrogator |
| 4. P.4 | cassette file input demo |
| 5. P.5 | mixed MODE display |
| 6. P.6 | Program PHLIST |
| 7. P.7 | DEEBUG MENU Vol. 3 No. 4 |
| 8. P.8 | PROGRAM FILE PRIMARY DISPLAY |
| 9. P.9 | PROGRAM EDITOR PROGRAMMER |
| 10. P.10 | PROGRAM EDITOR DISC verifier |
| 11. P.11 | PROGRAM REPLAY |
| 12. P.12 | PROGRAM BINARY TREE DEMO |
| 13. P.13 | LINKED LIST DEMO |
| 14. P.14 | LINKED LIST DEMO (INDIA MEMO) |
| 15. P.15 | LINKED LIST DEMO (INDIA MEMO) |
| 16. P.16 | PROGRAM Dynamic Memory BUFFER |
| 17. P.17 | PROGRAM Static CATALOGUE |
| 18. P.18 | PROGRAM RECURSIVE TREES |
| 19. P.19 | PROGRAM COMPRES |
| 20. P.20 | PROGRAM COMPRES |
| Total file | |

From Page 91

function key definitions for View — see *The Business Micro User*, April 1986 — and CE-60 and Kaganlq which are two printer driver programs.

The directory Letters contains three View text files and two more text files are stored under directory Reviews. The directory Programs contains three statistics program files. To load a letter to my bank manager into View I have to type `LOAD VIEW.LETTERS.BANK`.

The \$. can be omitted from the front if you have mounted that disc but to load this text file from a disc in drive 1 while still mounted drive 0 you would have to type `LOAD:1,$.VIEW.LETTERS.BANK`.

In other words you have to specify the pathway to the file via the appropriate directories in the form: Specific filename = \$.directory_name(s).filename.

This may seem to involve a lot of extra typing of complex filenames but it makes for very ordered disc filing and it is much easier to remember what various files are for. You are allowed up to 47 files in any one directory so provided you keep creating directories or sub-directories you are not limited to a fixed number of files per disc.

Also the ADFS not only allows up to 10 characters per filename or directory name but the use of wild characters when LOADING and CHAINING files. When in View the bank letter could be abbreviated to `LO V*.L.*B*` provided all the directories and the filenames in directory Letters have unique first characters.

Another example of the use of the hierarchical directory tree would be

`CHAIN“$.PROGRAMS.STATS2”` or abbreviated to `CH.“$.P*.S*2”` to CHAIN the Basic file STATS2.

You can create directories by `*CDIR` filename and select a directory by `*DIR` filename. Once in a directory sub-directories can be created by `*CDIR`. `*TITLE` no longer titles the whole disc in the ADFS but titles the current directory. This becomes obvious when you look at the catalog.

`*CAT (*)` does not catalog all the files on the disc as in the DFS but merely the root directory \$. Thus in my ADFS example — Figure 1 — typing *. only produces the list: !BOOT, VIEW, PROGRAMS. The directories are distinguished by the access codes DLR after them, but more of this later. To see the catalog of files and sub-directories in any directory type: *.directory_name. Therefore *.PROGRAMS produces the catalog STATS1, STATS2, STATS3.

Jim Notman outlined the new ADFS commands in his review last December. There are some omissions such as `*WIPE` and `*DRIVE` and some changes, for example `*SPOOL` becomes `*SPOOLON`.

Two of them, `*ACCESS` and `*COPY`, had me stumped for some time before I realised that they had a different syntax from their DFS equivalents. When I first copied some files to an ADFS disc and tried to run them I kept getting an “access violation” error. In order to load or run a program or file you must have read access: `*ACCESS` directory_name.filename R. Similarly write access is set by `*ACCESS` directory_name.filename W.

I therefore set read/write on all my files on disc (unlocked) by `*ACCESS` *. *WR and lock them all by `*ACCESS`

*. *WRL. Typing `*ACCESS` *. *L would lock all files but remove read/write access, hence the cause of the access error message after I first locked a file this way and then tried to CHAIN it.

`*COPY` has the syntax: `*COPY` :source_drive.source_dir.filename :destination_drive.destination_dir

Thus `*COPY $.PROGRAMS.STATS1` \$. copies the file STATS1 from directory PROGRAMS to the root directory \$. Similarly `*COPY :0.$VIEW.LETTERS.BANK :1$.NEWVIEW` copies file BANK from drive 0 to directory NEWVIEW on drive 1 provided that this directory already exists on the disc in drive 1.

You cannot copy files from an ADFS disc to a DFS disc in this way just as you cannot `*BACKUP` from a DFS formatted disc to an ADFS disc or vice versa. That is where you need the very useful utility program Copyfiles from the Welcome disc which will transfer files either way between DFS and ADFS discs.

I found the copy mode L, for list, a powerful option in this program particularly if you answer the source file specification with an asterisk to copy all files across in one go.

The Advanced Disc Toolkit ROM from Advanced Computer Products which I mentioned in my first Master article last month, and which was reviewed in the February issue, has the command `*XFER` as one of its invaluable ADFS commands. `*XFER` will transfer single files between disc filing system, drives and can rename the directory/filename at the same time.

Transferring to the ADFS was well worth the effort. The differences in commands and syntax are minor and the hierarchical tree filing system is very logical with no practical limits to the number of files that can be stored in the catalog.

A major in-built feature of the Master is the editor. It provides very powerful text editing facilities with all the features of a full word processor but does not format text on the screen unlike View. It is therefore very like Wordwise to use, with formatting commands embedded in the text.

The editor can be used at many different levels of complexity and I found it very easy to get into at an elementary level. Mind you, with only

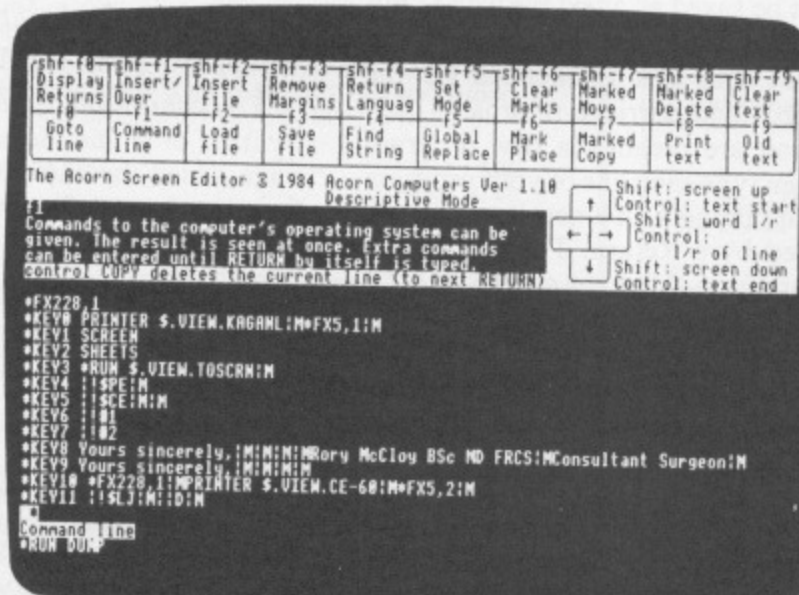


Figure II:
The editor screen
in descriptive mode

From Page 93

10 pages devoted to it in the Welcome manual I did not appreciate it could do much more.

However when part two of the reference manual arrived with 67 pages of instructions I began to realise just what potential the editor has. For now I will stick to the simple uses, and deal with the wide-ranging formatting power and commands next month to show how it can be used for word processing. Undoubtedly most users will find that it is ideal for creating or editing Basic programs.

It is vital to appreciate that the editor only uses text files – that is, sequences of characters stored as an Ascii code. Therefore you can enter editor by *EDIT, and the memory buffer will be empty, or *EDIT filename which will load the specified file from disc into memory – but it cannot be a Basic program.

If you want to edit a Basic program file all the Basic keywords do not exist as Ascii code but in a special tokenised form. One answer would be to SPOOL it, but on the Master Basic 4 has the command EDIT which converts the tokens into appropriate Ascii values.

To use this command you have to be in Basic, then LOAD the program file and type EDIT (without the *) when you will enter the editor and find that the line numbers have gone.

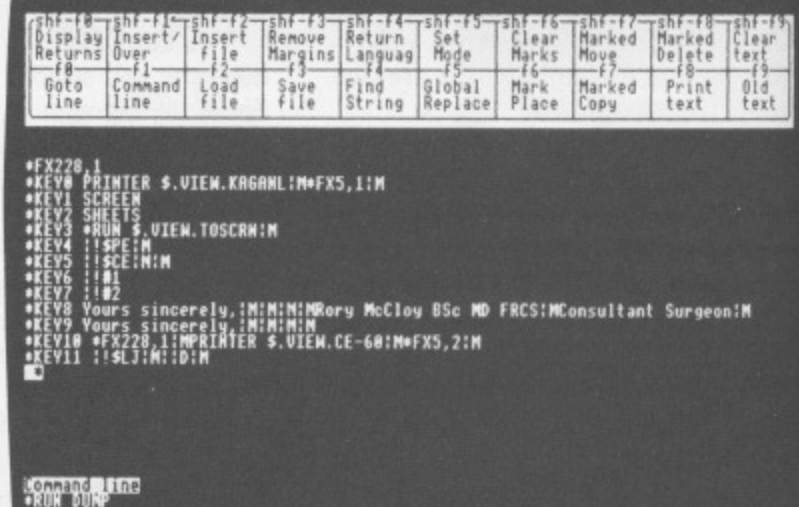
At first the editor will appear in Mode 131 – Mode 3 with shadow memory on – in the full descriptive (D) mode and is shown in Figure II editing my text file for defining the function keys in View.

Further Help prompts appear in another screen window within this information screen area as you use various command functions. While it looks impressive and is helpful for the first few times you use the editor, it does seriously limit the amount of text you can see on the screen at any one time.

It doesn't take long to become familiar with the use of the keys and you don't need all the screen information that the descriptive mode provides. It is then preferable to go to the keyword (K) mode which leaves you with the function key definitions in a window at the top of the screen (Figure III) and more room on the screen for your editing.

This mode has little advantage over

Figure III:
The editor in
keyword mode



the straight numeric mode – 0, 1, 3, 4, 5, 6 or 7 – with no screen window apart from the status line at the bottom of the screen, and using the card keyboard strip provided with the computer. In this case you are left with virtually the entire screen to visualise your program/text file.

The D and K modes obviously use Mode 128 – Mode 0 with shadow memory on – for their screen displays. The mode in which you last used the editor is stored in the battery back-up CMOS RAM and this saves you resetting your chosen mode each time you enter the editor.

Text files can be loaded and saved directly using the keys f2 and f3 and I find the editor very useful for making quick changes to, or creating, !BOOT and EXECute files which are of course Ascii text files.

Basic programs have to be loaded into Basic and entered using EDIT as described above. After editing they cannot be saved as a text file with f3 but you have to return to Basic, using Shift+f4 and this retokenises all the keywords and carriage returns.

If you are creating a new program you then type each line of your program without numbers on a new line – that is, followed by a Return. The first line of your program should be simply AUTO.

You cannot save this text file using the return to language method instead you save it as a text file with f3 and then *EXEC text_filename. This will load the program into memory and use the Basic command AUTO to add the line numbers for you. You can then SAVE or RUN it as a normal Basic program.

I mentioned the real time clock last

month and how the time can be displayed using *TIME. The time or date function can be entered into a View text file so that when it is printed or screened it uses the current date or time. My secretary finds this very useful when she is printing out letters and memos which may have been entered a day or so earlier.

But how do you do it? The manuals don't tell you, but I later found out that they could be entered in the View text using !D for the date and !T for time. I tried this but simply got !D and !T printed out as text.

After hours of frustration I eventually discovered that the !D or !T must be accompanied by the EDIT commands to centre, left justify or right justify, or be part of a header or footer definition. Thus the following examples will result in the current date being printed:

```
LJ !D
CE !D
RJ !D
DH ///!D//
DF ///!D/
```

You cannot simply enter !D on a line by itself or within the body of the text. I have added the date entry to my list of function key definitions for View as follows:

```
*KEY11!$LJ!M!ID!M
```

I defined it for the Copy key so that Shift+Break+Copy in the edit mode of View produces a line with the current date left justified.

● Next month I will be taking a look at some of the new features of View 3.0 over previous versions, together with the advanced features of the editor.

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ONE of the biggest restrictions of the Acorn Disc Filing System is that of limiting you to only 31 files per disc surface. If, like me, you are fond of short, sweet programs, the "Catalogue full" error soon becomes evident.

A full catalogue can often leave one quarter, if not half of a disc unavailable.

There are several solutions to the problem, most involving extra expense. Changing to a different DFS is one approach but is often costly.

Another is to write a utility for eeprom or sideways RAM, but again the initial expense of an eeprom programmer or of the sideways RAM detracts from the appeal.

The final approach to be considered is that of a DOS where the commands are stored on the disc itself, as is the case with some CP/M systems.

No outlay is required and the only overheads are those of the command files in the catalogue and a small amount of disc space. However as the number of files is to be doubled the space taken up in the catalogue will become almost unnoticed.

We will really need only two commands, one to alternate between the different catalogues and one to catalogue both halves of the disc at once.

The extra catalogue will take up two sectors, and if we can keep the command files short, say less than 256 bytes each, we will lose just 1k of disc space altogether.

In order to implement the utility we must first look at the way the Acorn DFS lays out information in the catalogue, which consists of the first two sectors on the disc, that is track 0, sectors 0 and 1.

Sector 0 contains the information for part of the disc title and the names and directories of all 31 files on a normal disc.

The eight bytes at the beginning of the sector contain the first eight bytes of the disc title, and each successive set of eight bytes contains the seven letters of the filename plus a further byte containing both the directory and the locked status of the file.

This is repeated for all files on the disc up to a maximum of 31 which will use $8+31 \times 8=256$ bytes, the whole of sector 0. The locked status is kept in the most significant bit of the directory byte.

Sector 1 contains the remaining bytes of the disc title, some general information about the disc, load and execute addresses, length and start sector of each file of the disc. The first

four bytes of the sector contain the last four bytes of the disc title.

The fifth byte contains the number of times the disc has been written to. This is the number shown in the brackets after the disc title when a *CAT is performed.

The sixth byte contains the number of files on this side of the disc, multiplied by 8.

The seventh byte contains the boot up option as set by *OPT4,n in bits 5 and 4, and the two most significant bits of the number of sectors on the disc in bits 1 and 0. Bits 7,6,3 and 2 are not used.

The eighth byte contains the eight least significant bits of the number of sectors. (The maximum possible number of sectors is a ten bit number.) Following these eight bytes are sets of eight bytes corresponding to those in sector 0, but containing the file info for each file — more on those later.

In the catalogue covering the first half of the disc we can alter bytes 7 and 8 to halve the number of sectors on the disc. This will prevent the DFS "seeing" the inner half of the disc, and effectively it will be write protected.

We will also need a dummy file to stop the DFS overwriting the second catalogue when it saves further files.

In the second catalogue we add a dummy file covering the first half of the disc to protect the information there and to make the DFS save any further files from track 20 (on a 40 track disc) or track 40 (on an 80 track disc). The full number of sectors on the disc is required in this catalogue.

The two command files in sectors 2 and 3 of track 0 are accessible to both catalogues and so a second copy of them is not required in the second half of the disc.

The two commands to be implemented are *SWAP and *XCAT, the first loading the two catalogues from track 0 sectors 0, 1 and track 0 sectors 4, 5 into memory and then saving them into the opposite area.

This is carried out using the OSWORD command with the

accumulator containing &7F, which is specific to the DFS and can be used to perform various functions including the loading and saving of sectors. The command *XCAT catalogues both halves of the disc by:

- Issuing a *CAT command.
- Issuing a *SWAP command.
- Issuing another *CAT command to print out the new catalogue.
- Issuing *SWAP to return the disc to its original state.

As the files are *RUN they must be in machine code, which has the added advantages of being fast and that it does not use much memory, and therefore disc space.

The dummy file must be created in the catalogue in order to stop various parts of the disc being overwritten.

To create the dummy entry we need to consider the file information stored in sector 1 of the catalogue. The information for each file is stored in eight bytes and consists of:

LOAD address (18 bits)
Execute address (18 bits)
Length (18 bits)
Start sector (10 bits)

They are stored in the following order:

2 bytes — load address, 16 least significant bits.

2 bytes — execute address, 16 least significant bits.

2 bytes — length, 16 least significant bits.

1 byte — 2 most significant bits of each of the above and 2 most significant bits of start sector in the order.

bits 7,6 Execute address

bits 5,4 Length

bits 3,2 Load address

bits 1,0 Start sector

1 byte — 8 least significant bits of start sector.

In the catalogue for the first half of the disc the dummy file is 512 bytes long and starts at sector 4, corresponding to the alternative catalogue.

In the second catalogue the dummy file has a length of half the disc capacity,

56 files per disc!

Steve Glennon shows how it's done

less 1k since it starts at sector 4, leaving 1k of disc space before it, and extends halfway across the disc.

Files are stored in the catalogue in reverse order, that is the first file on the disc is the last entry in the catalogue, so in each catalogue *dummy* is the first entry, *xcat* is the second and *swap* is the third. The sets of eight bytes of file information are stored in the same order as the filenames.

The program to produce the dual catalogue disc is shown in Listing I. It prompts for the number of tracks on the disc and the drive which is to be split.

The program then checks whether the disc is already split by checking whether the number of sectors on the disc tallies with the number of tracks entered earlier.

It also checks if the files *swap* or *dummy* exist, and if any of the above indicators of the disc being split already exist, the program aborts.

The number of files on the disc is also checked, and if any exist the program stops since it can only deal with a

formatted, but otherwise empty disc.

When all the above safeguards have been performed the disc is split by producing the two catalogues and saving them using *OSWORD &7F*. The two commands are then assembled and saved to disc, this time using **SAVE*.

After running the program the number of available files is effectively increased from 31 to 56. Not 62, as three files are entered in each catalogue. Disc space has only been decreased by four sectors (1k), though – a fair exchange! More of the disc is now available for storage, especially where many short files are saved on one disc.

The catalogues may be interchanged by simply entering **SWAP*, and both catalogues may be shown by entering **XCAT*.

As the program stands, both commands execute with the read/write head stationary over track 0.

If the dual catalogue disc is write-protected the alternative catalogue can't be written to the disc on sectors 0 and 1, so disabling the two

commands.

If either is tried on a write-protected disc the error message "Swap error" is given.

The only other limitation is that the two commands should not be used when files are open as they use pages &12 to &15 for the swapping of the catalogues and **XCAT* executes in page &16.

If a disc is to be backed up using **BACKUP*, the current catalogue must be that covering the second half of the disc. To find out which catalogue you are in type **INFO \$.DUMMY*. The length of the program will be either &0200 or greater than &6C00 (&18C00 for an 80 track disc).

The larger value indicates that you are in the catalogue covering the second half of the disc. I find it useful to put 1 and 2 in the titles of the two catalogues to keep track.

**Full listing starts
on Page 98**

PROGRAM STRUCTURE

| | | | |
|-----------|---|-----------|---|
| 70-140 | Main program which calls several procedures. | 2060-2110 | Save alternative catalogue to track 0 sectors 4 and 5 and restore first catalogue in &0E00-&0FFF. |
| 160-240 | Define variables. | 2130-2230 | Assemble and save the two command files. |
| 260-350 | Find out whether 40 or 80 track drives. | 2280-2410 | Start of swap, get current drive using <i>OSGBPB</i> , store in drive number. |
| 370-440 | Find out which drive to split. | 2430-2460 | Set up X=Sector number, Y=Track number, A=Store page number load two sectors. |
| 460-480 | Load old catalogue. | 2480-2610 | Repeat load as for 2430-2460 and save in similar manner. |
| 490-540 | Check number of sectors, check for dummy, swap and ends if any wrong. | 2630-2670 | Restore catalogue to &0E00-&0FFF. |
| 550-590 | Check to make sure no files, if there are, end. | 2680 | End of swap routine. |
| 620-690 | Set up <i>OSWORD</i> parameter block to load two sectors in the order drive number, buffer address, number of params to follow, 8271 command, track, sector, sector size/number of sectors. | 2700-2750 | Start parameter block set up for <i>OSWORD</i> read sectors. |
| 700-710 | Set up A%,X%,Y% and call <i>OSWORD</i> . | 2770-2810 | Start parameter block set up for <i>OSWORD</i> write sectors. |
| 720 | Checks if disc error has occurred. | 2830-2970 | Set up rest of parameter block and call <i>OSWORD</i> . |
| 750-820 | Set up parameter block to save two sectors. | 2980-3000 | Check for disc errors. |
| 830-850 | Set up A%,X%,Y%, call <i>OSWORD</i> and check for disc error. | 3020-3050 | Error message "Swap error". |
| 880-920 | Set up A%,X%,Y% for <i>OSWORD</i> . | 3070-3110 | Set up A,X,Y and call <i>OSWORD</i> . |
| 940-990 | Check catalogue for \$.swap. | 3130-3140 | Storage places for drive number and block. |
| 1020-1070 | Routine to get name from catalogue. | 3180-3240 | Send <i>*DRIVE</i> drive via <i>OSCLI</i> . |
| 1090-1110 | Get number of sectors on disc from catalogue. | 3260-3350 | Assembly of <i>XCAT</i> doing <i>*CAT</i> , <i>*SWAP</i> , <i>*CAT</i> , <i>*SWAP</i> . |
| 1130-1190 | Check for \$.dummy in catalogue. | 3370-3420 | Sends <i>*/SWAP</i> via <i>OSFSC</i> . |
| 1210-1230 | Get number of files from catalogue. | 3440-3460 | <i>SWAP</i> string. |
| 1250-1270 | Print out "Already Split" message. | 3480-3490 | Do <i>*CAT</i> via <i>OSFSC</i> . |
| 1290-1350 | Save new files in correct order to set up new catalogue. | 3550 | Return character for <i>CAT</i> drive number parameter. |
| 1370-1520 | Load catalogue, alter it and save to disc. | 3600-3640 | Disc error routine. |
| 1560-1660 | Set up sector 0 of alternative catalogue. | 3660-3740 | Basic I patches for <i>EQUB</i> and <i>EQU5</i> . |
| 1680-2050 | Set up sector 1 of alternative catalogue with file information for dummy, <i>XCAT</i> , <i>SWAP</i> . | | |

From Page 97

```

10 REM SPLIT CATALOGUE DISC
20 REM PRODUCING PROGRAM
30 REM REQUIRES ORDINARY
40 REM FORMATTED DISC
50 REM (C) The Micro User
60
70 MODE7
80 PROCinit
90 PROCfortyeighty
100 PROCwhichdrive
110 PROCcheckdisc
120 PROCsplit
130 PROCsaveswap
140 END
150
160 DEF PROCinit
170 OSWORD=&FFF1
180 OSBPB=&FFD1
190 oscli=&FFF7
200 DIM paramblock 13
210 catplace=&E00
220 sector0=&E00
230 sector1=&F00
240 ENDPROC
250
260 DEF PROCfortyeighty
270 REPEAT
280 PRINTTAB(0,10)"Forty or Eighty
Track Drive? (F/E) ";
290 G$=INKEY$(100)
300 G$=CHR$(ASC(G$)AND&4F)
310 UNTIL G$="F" OR G$="E"
320 PRINT G$
330 totaltracks=80
340 IF G$="F" totaltracks=40
350 ENDPROC
360
370 DEF PROCwhichdrive
380 REPEAT
390 PRINTTAB(0,12)"Which Drive do y
ou wish to split? (0-3)"
400 drive=BET
410 drive=drive-40
420 UNTIL drive<4 AND drive>=0
430 PRINTTAB(5,16)"Splitting Drive
";drive
440 ENDPROC
450
460 DEF PROCcheckdisc
470 track=&0:sector=&0
480 PROCloadcat
490 PROCcheckforswap
500 IF split<>0 THEN PROCalreadyspl
it:END
510 PROCchecknsectors

```

```

520 IF nsectors/totaltracks<10 THEN
PROCalreadysplit:END
530 PROCcheckfordummy
540 IF dummy<>0 THEN PROCalreadyspl
it:END
550 PROCchecknfiles
560 IF nfiles=0 ENDPROC
570 CLS
580 PRINT"This disc already contain
s files!"
590 END
600 ENDPROC
610
620 DEF PROCloadcat
630 ?paramblock=drive
640 paramblock!1=catplace%
650 paramblock?5=3
660 paramblock?6=&53
670 paramblock?7=track%
680 paramblock?8=sector%
690 paramblock?9=&22
700 PROCaxy
710 CALL OSWORD
720 IF paramblock?&A<>0 THEN PROCer
ror
730 ENDPROC
740
750 DEF PROCsavescat
760 ?paramblock=drive
770 paramblock!1=catplace%
780 paramblock?5=3
790 paramblock?6=&40
800 paramblock?7=track%
810 paramblock?8=sector%
820 paramblock?9=&22
830 PROCaxy
840 CALL OSWORD
850 IF paramblock?&A<>0 THEN PROCer
ror
860 ENDPROC
870
880 DEF PROCaxy
890 AX=&7F
900 X%=paramblock MOD256
910 Y%=paramblock DIV256
920 ENDPROC
930
940 DEF PROCcheckforswap
950 split=0
960 FOR dir=sector0+&00 TO sector0+
&F8 STEP &00
970 IF CHR$((dir?7)AND &7F)="$" THE
N PROCname ELSE GOTO 990
980 IF NAME$="swap " THEN split=1
990 NEXT
1000 ENDPROC
1010

```

```

1020 DEF PROCname
1030 NAME$=""
1040 FOR A=0 TO 6
1050 NAME$=NAME$+CHR$(dir?A)
1060 NEXT
1070 ENDPROC
1080
1090 DEF PROCchecknsectors
1100 nsectors=256*((sector1?6)AND3)+
(sector1?7)
1110 ENDPROC
1120
1130 DEF PROCcheckfordummy
1140 dummy=0
1150 FOR dir=sector0+&00 TO sector0+
&F8 STEP &00
1160 IF CHR$((dir?7)AND &7F)="$" THE
N PROCname ELSE GOTO 1180
1170 IF NAME$="dummy " THEN dummy=1
1180 NEXT
1190 ENDPROC
1200
1210 DEF PROCchecknfiles
1220 nfiles=(sector1?5)DIV8
1230 ENDPROC
1240
1250 DEF PROCalreadysplit
1260 CLS:PRINTTAB(0,10)"DISC ALREADY
SPLIT!"
1270 ENDPROC
1280
1290 DEF PROCsplit
1300 PROCchange_drive
1310
1320 REM SET UP FILES IN CATALOGUE
1330 *SAVE"swap "FF0A00 +100 FF0A0
0
1340 *SAVE"xcat "FF1600 +100 FF0A0
0
1350 *SAVE"dummy "0000 +200 0000
1360 track=&0:sector=&0
1370 PROCloadcat
1380
1390 REM ALTER OLD CATALOGUE
1400 REM AND PUT IT BACK
1410 REM PUT dummy IN DIR $ AND LOCK
ED
1420 sector0?&0F=&A4
1430
1440 REM DISC INFO
1450 sector1?5=3*8
1460 newsectors=totaltracks*5
1470 sector1?7=newsectors AND &FF
1480 hnsects=sector1?6
1490 hnsects=hnsects AND &FC
1500 hnsects=hnsects OR(newsectors D

```



```

IV256)
1510 sector176=hnsects
1520 PROCsavecat
1530
1540 REM NOW SET UP NEW CATALOGUE
1550
1560 !sector0=0
1570 sector0!4=0
1580 $(sector0+8)="dummy"
1590 sector0?&0F=&A4
1600 $(sector0+&18)="xcat"
1610 sector0?&17=&A4
1620 $(sector0+&18)="swap"
1630 sector0?&1F=&A4
1640 FORX=sector0+&20 TO sector0+&FF
1650 ?X=0
1660 NEXT
1670
1680 REM DISC INFO
1690 !sector1=0
1700 sector174=0
1710 sector175=3*8
1720 newsectors=totaltracks+10
1730 hnsects=newsectors DIV256
1740 sector176=hnsects
1750 sector177=newsectors AND &FF
1760
1770 REM FILE INFO FOR "dummy","xcat",
"swap"
1780 sector1!&08=0
1790 duallength=totaltracks+5-4
1800 sector1?&0C=0
1810 sector1?&0D=duallength AND&FF
1820 sector1?&0E=(duallength DIV256)*
16
1830 sector1?&0F=4
1840
1850 sector1?&10=0
1860 sector1?&11=&16
1870 sector1?&12=0
1880 sector1?&13=&16
1890 sector1?&14=0
1900 sector1?&15=1
1910 sector1?&16=&CC:REM LOAD,EXECUT
E ADDRS IN I/O uP
1920 sector1?&17=3:REM START SECT
OF XCAT
1930
1940 sector1?&18=0
1950 sector1?&19=&0A
1960 sector1?&1A=0
1970 sector1?&1B=&0A
1980 sector1?&1C=0
1990 sector1?&1D=1
2000 sector1?&1E=&CC:REM LOAD,EXECUT
E ADDRS IN I/O uP
2010 sector1?&1F=2:REM START SECT

```

```

OF SWAP
2020
2030 FORX=sector0+&20 TO sector0+&FF
2040 ?X=0
2050 NEXT
2060 trackX=0:sectorX=4
2070 PROCsavecat
2080 trackX=0:sectorX=0
2090 REM RESTORE CATALOGUE
2100 PROCloadcat
2110 ENDPROC
2120
2130 DEF PROCsaveswap
2140 FOR PASS=0 TO 2 STEP2
2150 PROCassemble
2160 NEXTPASS
2170 FOR PASS=0 TO 2 STEP2
2180 PROCasm1
2190 NEXTPASS
2200 *SAVE"swap" "FF0A00 +100 FF0A0
0
2210 *SAVE"xcat "FF1600 +100 FF160
0
2220 *ACCESS XCAT L
2230 *ACCESS SWAP L
2240
2250 PRINT"FINISHED"
2260 ENDPROC
2270
2280 DEFPROCassemble
2290 PX=&0A00
2300 [OPT PASS
2310 .begin
2320
2330 .getcurdrive
2340 LDX #block MOD256
2350 LDY #block DIV256
2360 LDA #6
2370 JSR 090BPB
2380 LDA block+2
2390 SEC
2400 SBC #48
2410 STA driveno
2420
2430 .swap LDX #0 \Sector no.
2440 LDY #0 \Track no.
2450 LDA #&12 \Store page no.
2460 JSR load2sects
2470
2480 LDX #4 \Sector no.
2490 LDY #0 \Track no.
2500 LDA #&14 \Store page no.
2510 JSR load2sects
2520
2530 LDX #4 \Sector no.
2540 LDY #0 \Track no.
2550 LDA #&12 \Source page no

```

```

2560 JSR save2sects
2570
2580 LDX #0 \Sector no.
2590 LDY #0 \Track no.
2600 LDA #&14 \Source page no.
2610 JSR save2sects
2620
2630 .restore_catalogue
2640 LDX #0
2650 LDY #0
2660 LDA #&0E
2670 JSR load2sects
2680 RTS \End of routine
2690
2700 .load2sects \Load routine
2710 PHA
2720 LDA #&53 \issue read to
8271
2730 STA block+6
2740 PLA \Restore acc.
2750 JMP setupblock
2760
2770 .save2sects \save routine
2780 PHA
2790 LDA #&48 \issue write to
8271
2800 STA block+6
2810 PLA \Restore acc.
2820
2830 .setupblock
2840 STA block+2 \Source or stor
e page no.
2850 STX block+8 \Sector no.
2860 STY block+7 \Track no.
2870 LDA driveno
2880 STA block \Drive no.
2890 LDA #0
2900 STA block+1
2910 STA block+3
2920 STA block+4
2930 LDA #03
2940 STA block+5
2950 LDA #&22 \2 sectors of 2
56 bytes
2960 STA block+9
2970 JSR osword \issue command
2980 LDA block+&0A \error code
2990 BNE discerror
3000 RTS
3010
3020 .discerror BRK
3030 OPT FNequb(201)
3040 OPT FNequs("Swap error")
3050 BRK
3060

```


From Page 99

```

3070 .osword LDA #&7F
3080 LDX #block MOD256
3090 LDY #block DIV256
3100 JSR OSWORD
3110 RTS
3120
3130 .driveno BRK
3140 .block
3150 ]
3160 ENDPROC
3170
3180 DEF PROCchange_drive
3190 drive=drive+48:REM CHANGE TO AS
CII CHAR
3200 $&C00="DRIVE "
3210 ?&C06=drive
3220 ?&C07=&0D
3230 X?=&00:Y?=&0C:CALL oscli
3240 ENDPROC
3250
3260 DEF PROCasm1
3270 P?=&1600
3280 [OPT PASS
3290

```

```

3300 .bothcats
3310 JSR cat \Do #cat
3320 JSR doswap \Do #swap
3330 JSR cat \Do #cat
3340 JSR doswap \Do #swap
3350 RTS
3360
3370 .doswap
3380 LDA #2 \Do #/SWAP vi
a OSFSC
3390 LDX #string1 MOD256
3400 LDY #string1 DIV256
3410 JSR osfsc
3420 RTS
3430
3440 .string1
3450 OPT FNequs("SWAP")
3460 OPT FNequs(13)
3470
3480 .cat
3490 LDA #5
3500 LDX #string MOD256
3510 LDY #string DIV256
3520 .osfsc JMP (&21E)
3530
3540 .string

```

```

3550 OPT FNequs(13)
3560
3570 ]
3580 ENDPROC
3590
3600 DEF PROCerror
3610 CLS
3620 PRINT"Disc error No.&";*parambl
ack?&A
3630 END
3640 ENDPROC
3650
3660 DEF FNequs(Z$)
3670 ?P?=Z$
3680 P?=P?+1
3690 =PASS
3700
3710 DEF FNequs(Z$)
3720 $P?=Z$
3730 P?=P?+LEN(Z$)
3740 =PASS

```

This listing is included in this month's cassette tape offer. See order form on Page 141.



DOES IT MAKE SENSE TO BUY A DISC DRIVE AND LOAD MOST OF YOUR PROGRAMS FROM TAPE?

In a world where time is money and delay is frustration, the REPLAY System can bring taped software into the disc era. There is no other way of transferring software to disc that is so effective and efficient as REPLAY. Thousands have now been sold and acclaimed by the users as indispensable. REPLAY is more than a transfer utility...

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WRITTEN WITH THE COOPERATION OF
THE CIVIL ENGINEERING DEPT.
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A **PRINTER** driver is a software patch which allows a program such as the View word processor to make use of the various facilities offered by different types of printer — underlining, proportional spacing, italics and so on.

These are switched on and off by sending a control code, usually **CHR\$(27)**, followed by one or more characters — none of which are printed — which define the command.

Printing resumes at the next character following the command sequence but including the additional effect that was programmed. It is the printer driver's job to send an appropriate sequence of characters to a printer every time a particular feature is requested.

Life would be easy if every type of printer responded to the same control codes in the same way, but as they don't the driver has to be tailored to a particular make or model of printer. However when changing printers it is only necessary to change drivers, and not the whole word processor to retain compatibility.

The authors of View built into their word processor the facility of being able to use a printer driver. Special printer commands are addressed to the driver and incorporated into the text as highlight characters typed in using the two function keys defined for that purpose.

When the text is printed, all characters including the highlights are sent to the printer driver first. The driver traps the highlights and replaces them with commands that the printer will respond to.

This means that a feature such as underlining can be programmed into the text with a single character whereas the printer command that will eventually be transmitted is usually several characters long.

Viewgen is a Basic program which can generate a View compatible driver for most printers used with the BBC Micro. This is achieved by editing the data statements at the end of the program and then running it.

Type in the program exactly as given, taking particular care to get the conditional statements right. Also be sure to get all the labels in the assembler section typed in correctly — some are

Patch in View to the printer of your choice

**PETE SMITH describes a printer
driver generator for View**

array elements.

When you come to the data statements note that they are all structured in the same way — a header string followed by numeric data and a terminator (**&FF**). The latter is used to tell the generator program that it has come to the end of a sequence. Neither the string data nor the terminators are included in the driver when it is assembled.

The first data statement should contain the filename you wish to assign to the assembled driver followed by the number of pairs of enable/disable commands to be assembled (and **&FF**).

The commands are grouped in pairs since they are switched on and off by the same highlight code. The first pair will be activated by sending highlight code 128 to the driver, the next pair by 129, and so on.

However, the next set of data, print pound, is not counted in this total. Pound trapping is included since the pound sign is not a standard Ascii code, though it can usually be printed somehow. If you do not wish to take advantage of pound trapping type in 96 — the Ascii code for the BBC pound sign — instead:

```
DATA Pound sign,96,&FF
REM No pound trapping
```

Otherwise type in the relevant command bytes, for example for a Juki 6100:

```
DATA Print pound,27,73,&FF
REM Pound trapping
```

When using the driver, if an out-of-

range control code is sent — that is higher than the last highlight code number assigned when the driver was generated — this is trapped and ignored, but in addition pound sign trapping is disabled.

This allows the normal Ascii character 96 — the grave accent — to be printed. A second out-of-range highlight code will turn on pound sign trapping again.

The sample commands given in the listing apply to the Epson RX80 printer. For a different machine it will be necessary to refer to the instruction manual to determine the code sequences to be built into your driver. Each command will probably begin with the character ESC (Ascii 27) and will be followed by one or more Ascii codes.

For example, on the Epson RX80 bold print — double strike — is achieved by the command ESC, G — enable, or ESC, H — disable. To enter this into the generator program you have to type in the following:

```
DATA Bold print,27,71,&FF
DATA Cancel bold,27,72,&FF
```

where ESC is represented by 27 and the Ascii codes for G and H are 71 and 72 respectively. The numeric data may be entered as decimal or hexadecimal, but remember to include the preceding **&** to indicate hex if you use that format.

Certain commands have no logical disable, for example changing pitch on a daisywheel printer. In this case the disable command could be a default

From Page 101

state – say, 12 pitch.

However if you wish to leave a command permanently enabled when it is invoked omit all the numeric data from the disable sequence. You must still enter a header string and terminator, but put nothing in between. Thus for the Juki 6100 a typical sequence might read:

```
DATA 15 pitch,27,31,9,&FF: REM enable  
DATA None,&FF: REM no disable
```

You should be able to fit about 16 pairs of two and three byte commands into the available space, together with a short print pound sequence. The highlight keys in View can be programmed to produce any value, so you are not restricted to just two commands.

However the values generated should all be greater than 127 to be recognised by the driver. You should refer to the View instruction manuals to see exactly how to program the highlight keys.

Each command can have any number of characters, but the space reserved by View for the driver is limited to 256 bytes. The length of the driver is checked after assembly to make sure that this figure is not exceeded.

When the program is run the printer driver is assembled from the source code and the printer control codes held in the data statements are poked into memory with it.

Every time the terminator byte &FF is encountered 128 is added to the previous data byte to signal end of data to the driver. The driver automatically subtracts these values before it transmits the characters to the printer.

During assembly hard copy of the data may be obtained including the relevant View highlight code for ease of checking and for reference. Which code number a highlight command will respond to depends on the order you typed in the commands.

After assembly the driver and appended data are automatically saved to disc or tape and can be loaded into memory from View command mode by typing:

PRINTER NAME

where NAME is the filename of the driver you have created. Don't worry about the file arguments – View specifies the load address when you issue the PRINTER command.

Since the driver is meant to run at &400, an area reserved by the Basic ROM, it is assembled in the user RAM area. As a result all absolute addresses within the driver have to be adjusted before it will work.

Users of Basic II may use the extended OPT command, but I have made it possible for the program to run on Basic I machines as well by labelling all the relevant assembler statements with elements of the array *b* and then adjusting the addresses using PROC-basic1 after assembly.

The first five instructions of the driver must be jumps pointing to the various routines it will be expected to perform. These are print a character, enable the printer (equivalent to VDU2), disable the printer (VDU3), and set and report on microspacing.

The last two facilities are not implemented here and the JMPs point straight to an RTS instruction, causing View to issue a warning if you attempt to select microspacing.

During printing View enters the driver at the first JMP instruction with the next character for printing in the accumulator. The driver first checks whether it is a control code or a pound character, and if it is neither sends it to the printer and exits via an RTS instruction.

If the pound character is recognised the print pound sequence is sent. If the character to be printed is a highlight code the driver will recognise it because it is a number greater than 127 – the maximum value of an Ascii character.

After trapping a highlight code the next step is to work out which printer command has been requested. The method I have adopted is to use a look-up table which holds, not the printer commands themselves, but their addresses in memory, like the index to a book.

Each command consists of two parts, enable and disable, so the index table will have to be twice as long as the number of commands. Pointers within this table are calculated from the highlight code itself by subtracting 128

from its value and multiplying the remainder by two, giving values 0, 2, 4 and so on. This gives offsets to the enable command addresses, counting from the start address of the index table. The disable address offsets can be determined by adding one to the above, that is 1, 3, 5 and so on.

Once the address of the start of a command has been loaded from the index table the data it points to is sent to the printer a byte at a time until bit 7 of one of the bytes is set (the terminator).

This quite powerful feature of the driver means that a command can have many bytes or just one. Thus several printer commands can be linked and turned on and off by a single highlight code.

For example, you might wish to title a letter using italic, underlined, enlarged, emphasised type on an Epson RX80 printer. This could be done by defining highlight 129 in the generator program with the following data:

```
DATA Titling,27,52,27,45,1,27,87,1,27  
,69,&FF  
DATA Cancel,27,53,27,45,0,27,87,0,27,  
70,&FF
```

All of the enable characters would be sent to the printer if the driver trapped code 129 once, and all the disable characters would be sent if the same code was trapped a second time.

This is possible due to another useful function of the index table which indicates whether or not a command is active by toggling bit 7 of an enable command address in the index table every time that command is processed. This causes enable and disable sequences to be sent alternately.

If no disable sequence was given for a command when the driver was assembled both enable and disable offsets point to the same place, that is the same command is sent to the printer repeatedly. All flags are reset to zero when a printer on command is processed.

The generator program and the drivers it produces are all compatible with Basic I, Basic II and the Tube. The driver will not work with printers which require control codes greater than 127.


```

10 REM VIEWGEN
20 REM by P.R.Smith
30 REM (c) The Micro User
40 REM Printer Driver Generator
50 REM for VIEW
60 :
70 MODE7
80 poundata=0
90 osascii=&FFE3
100 oswrch=&FFEE
110 oscli=&FFF7
120 @%=4
130 RESTORE 1860
140 READ file$,n%,d%
150 DIM driver% 300,par% 30,index(2
  *n%),b(13)
160 limit=2*n%
170 PRINT "Hardcopy? y/n ";:y$=GET$
180 IF INSTR("Yy",y$)<>0 VDU2
190 PRINT "VIEW Printer driver gene
  rator"
200 PRINT "Filename: ";file$
210 PROCassm
220 data%=P%+2*n%
230 PROCpokedata
240 IF end%-driver%>256 PRINT "No r
  oom for all the data!":END
250 PROCbasic1
260 PRINT "Press Space Bar to save"

270 REPEATUNTILGET=32
280 PROCsave
290 PRINT "Driver created & stored"
300 END
310 :
320 DEFPROCpokedata
330 REM
340 REM Create data table
350 REM Data stored sequentially
360 REM Last character in each comm
  and has bit 7 set automatically.
370 REM
380 ?(pound+5)=data%-P%
390 PRINT " VIEW"TAB(7)"HIGHLIGHT"
  TAB(29)"COMMAND"TAB(1)"CODE"TAB(7)"COM
  MAND"TAB(29)"CHARACTERS"
400 READ d$
410 PRINT " ***"TAB(7);d$;TAB(27);
420 FOR IX=0 TO n%-1
430 index(2*IX)=FNpoke
440 IF same=TRUE index(2*IX-1)=inde
  x(2*IX-2)
450 READ d$
460 PRINT128+IX;TAB(7)d$;TAB(27);
470 index(2*IX+1)=FNpoke
480 READ d$
490 PRINTTAB(7)d$;TAB(27);

500 NEXTIX
510 end%=FNpoke+base
520 IF same=TRUE index(2*IX-1)=inde
  x(2*IX-2)
530 VDU13,3
540 REM
550 REM Create index table containi
  ng
560 REM offsets to first chr. of ea
  ch command
570 REM
580 FOR IX=0 TO n%-1
590 PX?(2*IX)=index(2*IX)
600 PX?(2*IX+1)=index(2*IX+1)
610 NEXTIX
620 ENDPROC
630 :
640 DEFFNpoke
650 REM
660 REM Poke data,
670 REM update data pointer,
680 REM calculate offset for index
  table
690 REM
700 start%=data%
710 REPEAT READ d%
720 IF d%<255 ?data%=d%:data%=data
  %+1:PRINTd%;
730 UNTIL d%=255
740 PRINT
750 IF data%>start%?(data%-1)=?(da
  ta%-1)+128:same=FALSE ELSE same=TRUE
760 =data%-P%
770 :
780 DEFPROCbasic1
790 REM
800 REM Adjust all absolute address
  es within driver to run at &400
810 REM
820 FOR IX=0 TO 13
830 get%=(b(IX)+1)
840 addr%=(get% AND &FFFF)-diff%
850 !(b(IX)+1)=(get% AND &FFFF0000)
  +addr%
860 NEXTIX
870 ENDPROC
880 :
890 DEFPROCsave
900 REM
910 REM Save driver
920 REM
930 file$="S."+file$+" "+STR$~drive
  r%+" "+STR$~end%+" 0 0"
940 XX=par%:YY=XX DIV 256
950 $par%=file$
960 CALLOscli
970 ENDPROC

980 :
990 DEFPROCassm
1000 REM Driver source code
1010 FOR opt%=0 TO 2 STEP 2
1020 PX=driver%
1030 diff%=driver%-&400
1040 [OPTopt%
1050 .b(0) JMP printtext \ Main entr
  y
1060 .b(1) JMP vdu2 \ points.
1070 .b(2) JMP vdu3
1080 .b(3) JMP muspace
1090 .b(4) JMP reply
1100 .printtext PHP \ Preserve
  registers
1110 PHA
1120 TXA
1130 PHA
1140 TSX \ Copy accu
  mulator
1150 LDA &102,X \ from stac
  k
1160 BPL printer \ Print if
  not a highlight...
1170 ASL A \ ...If it
  is calculate index address
1180 CMP #limit \ Address o
  ut of range?
1190 BCC continue \ Continue
  if not
1200 .b(5) LDA pound+1 \ Else disa
  ble
1210 EOR #&80 \ pound
1220 .b(6) STA pound+1 \ trapping
1230 BNE out \ and exit
1240 .continue
1250 TAX \ Get offse
  t
1260 .b(7) LDA base,X \ to printe
  r commands
1270 PHA
1280 EOR #&80 \ Toggle co
  mmand active flag
1290 .b(8) STA base,X
1300 PLA
1310 BMI cancel \ Branch if
  flag already set
1320 .return TAX
1330 .transmit LDA #1 \ Send code
  s to
1340 JSR oswrch \ printer o
  nly,
1350 .b(9) LDA base,X \ prefaced
  by VDU1
1360 PHA \ Preserve

```


From Page 103

end of command status

```
1370 AND #7F          \ Set bit 7
to zero
1380 JSR oswrch        \ Send comm
and character to printer
1390 INX               \ Increment
pointer
1400 PLA               \ Recover s
tatus
1410 BPL transmit      \ Continue
until...
1420 BMI out           \ ... end o
f command detected
1430 .b(10)
1440 .cancel LDA base+1,X \ Get offs
et to
1450 BNE return        \ cancel c
ommand
1460 .vdu3 LDA #3      \ Disable
```

PROBLEM

I HAVE some questions regarding copy protection. On some discs if you try to make a backup using one of the numerous copy discs on the market it appears to transfer OK, yet when you try to boot the backup disc you get a full screen message usually in colour sometimes flashing or animated.

How is this done? — John Dowden, Canberra, Australia.

SOLVED

I AM afraid that by telling you how to protect software I would also be telling you how to remove the protection.

However look at the disc filing system and see how it is organised. Look at the instructions provided by the disc controller and see what the computer's filing system does.

Then you will be in a position to be able to make changes to this procedure which will render the system useless.

For example, try altering the sector length as described in the February 1986 Micro User.

printer

```
1470 JMP oswrch
1480 .printer
1490 .pound CMP #96    \ Pound si
gn?
1500 BNE send
1510 LDX #poundata     \ If so...
1520 BCS transmit     \ ... send
command
1530 .send JSR osasci  \ Print ch
aracter
1540 .out PLA          \ Restore
1550 TAX               \ all
1560 PLA               \ the
1570 PLP               \ register
s
1580 .mspace
1590 .reply RTS        \ Exit
1600 .vdu2
1610 LDA #96           \ Restore
1620 .b(11) STA pound+1 \ pound tr
apping
1630 LDX #0            \ Reset fl
ags...
1640 .reset LDA #7F
1650 .b(12) AND base,X
1660 .b(13) STA base,X
1670 INX
1680 INX
1690 CPX #limit
1700 BCC reset         \ ... unti
l end of index
1710 LDA #2            \ Enable p
rinter
1720 JMP oswrch
1730 .base             \ Start of
data
1740 J
1750 NEXToptX
1760 ENDPROC
1770 :
1780 REM Start of data.
1790 REM Each set of data consists o
f
1800 REM a header string plus numeri
c
1810 REM data with &FF as a terminat
or.
1820 :
1830 REM Enter driver filename
1840 REM and number of pairs of
1850 REM set/cancel commands.
1860 :
1870 DATA RX80,15,&FF
1880 :
1890 REM Enter print pound sequences
```

```
1900 REM Use &FF as terminator.
1910 :
1920 DATA Print pound,27,82,3,35,27,
82,0,&FF
1930 :
1940 REM Set/Cancel commands follow.
1950 REM All commands
1960 REM terminated by &FF.
1970 :
1980 DATA Set Underline,27,45,1,&FF
1990 DATA Cancel underline,27,45,0,&
FF
2000 DATA Set bold,27,71,&FF
2010 DATA Cancel bold,27,72,&FF
2020 DATA Set emphasised,27,69,&FF
2030 DATA Cancel emphasised,27,70,&
F
2040 DATA Elite type,27,77,&FF
2050 DATA Back to pica size,27,80,&
F
2060 DATA Enlarged type,27,87,1,&FF
2070 DATA Normal type,27,87,0,&FF
2080 DATA Condensed,15,&FF
2090 DATA Cancel condensed,18,&FF
2100 DATA Superscript,27,83,0,&FF
2110 DATA Cancel superscr,27,84,&FF
2120 DATA Subscript,27,83,1,&FF
2130 DATA Cancel subscr,27,84,&FF
2140 DATA Italic,27,52,&FF
2150 DATA Normal,27,53,&FF
2160 DATA US char. set,27,82,0,&FF
2170 DATA None,&FF
2180 DATA English char. set,27,82,3,
&FF
2190 DATA None,&FF
2200 DATA Banner type: enlarged+emph
asised,14,27,69,&FF
2210 DATA Cancel banner,20,27,70,&FF
2220 DATA Titling 1: italic+underlin
e+enlarge+emphasised,27,52,27,45,1,27
,87,1,27,69,&FF
2230 DATA Cancel titling,27,53,27,45
,0,27,87,0,27,70,&FF
2240 DATA Titling 2: italic+enlarged
,27,52,27,87,1,&FF
2250 DATA Cancel titling 2,27,53,27,
87,0,&FF
2260 DATA Initialise with US chrs.+p
ica+no skip over,27,64,27,82,0,27,80,
27,79,&FF
2270 DATA None,&FF
```

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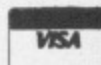
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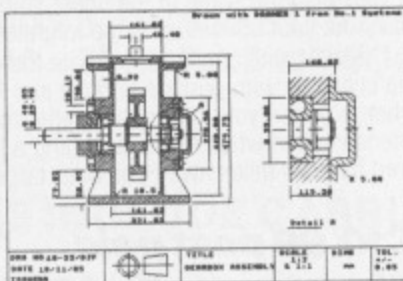
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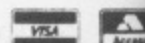
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From Page 21

```

10REM*****
20REM* ROYAL WEDDING *
30REM* by Gordon Key & *
40REM* David McLachlan *
50REM* (c) The Micro User *
60REM*****
70MODE7:PRINTTAB(12,10)"Please wait."
80VDU23;8202;0;0;0;
90VDU21:*FX5
100PROCcode:PROCcode2:*FX21
110*KEY0FORTX=0TOTOP-PAGE STEP4:TX!
&1100=TX!PAGE:NEXTMPAGE=&1100!MO:IMR
UNIM
120*KEY1DELETE 3320,5110!MDELETE 1
0,160!MO:IMRUNIM
130*KEY2 DELETE 2510,2720!MDELETE 1
70,240!MO:IMRUNIM
140VDU6:PRINTTAB(6,12)"Deleting Assembler Code":VDU21
150*FX130,0,129
160END
170IFPAGE<=&1100 THEN 210
180VDU6:PRINTTAB(12,14)"Relocating":VDU21
190*FX130,0,120
200END
210VDU6
220MODE 2
230CLEAR
240PROCtitle
250VDU6
260*FX21
270A=GET
280ONERRORIFERR=17THENCLEAR ELSE EN
D
290MODE 7
300HIMEM=&3000
310AZ=EVAL(FNinst)
320IF gcX<>111 PROCgrid(0)
330CLEAR
340PROCplay
350END
360DEFPROCplay
370REPEAT
380NX=FNget
390PROCmove
400UNTIL0
410ENDPROC
420DEFPROCmove
430IFAZ=FALSE ORTIME<EX ENDPROC
440VDU19,AZ,7;0;AZ=AZMOD11+1:VDU19
,AZ,4;0;TIME=0
450ENDPROC
460DEFFNget
470LOCAL hX
480NX=0

```

```

490get=0:IF HX>=500 VDU7:get=6ET:IF
get<>13 AND get<>67 THEN 490
500IF get=67 HX=0 ELSE IF get=13 PR
OCsolve(5)
510IFINKEY(-67)AND0XMOD4NX=0X-1:hX=
1:IX=-67
520IFINKEY(-98)AND0XMOD4<>3NX=0X+1:
hX=2:IX=-98
530IFINKEY(-105)AND0X>3NX=0X-4:hX=3
:IX=-105
540IFINKEY(-73)AND0X<12NX=0X+4:hX=4
:IX=-73
550IFINKEY(-74)ANDSX PROCsolve(5)
560IFINKEY(-97)PROCshuffle
570IFhX PROCs(hX-1):REPEAT:PROCdel(
1):UNTILNOTINKEYIX
580*FX21
590=NZ
600DEFPROCdel(dX)
610LOCALTX
620FORTX=0TODX*5:PROCmove:NEXT
630ENDPROC
640DEFPROCps(hX)
650PX=PX+2:IFPX=8:HX=HX+1:PX=0:HX?D
X=0
660hX=hX*2^PX:HX?DX=HX?DX OR hX:SOU
ND&10,-15,4,1:SX=TRUE
670CALLMX,NX,0X
680ENDPROC
690DEFPROCsolve(dX)
700LOCALhX
710REPEAT
720hX=(HX?DX AND3*2^PX)DIV2^PX
730NX=0X+(1-(hX>1)*3)*(1+(hXAND1)=
1)*2)
740CALLMX,NX,0X
750PROCdel(dX)
760SOUND&10,-15,5,1
770PX=PX-2:IFPX<0 HX=HX-1:PX=6
780UNTILHX=-1
790SX=FALSE
800ENDPROC
810DEFPROCshuffle
820LOCALfX,gX,hX
830FORTX=0TOD40
840gX=fX
850fX=FALSE:REPEAT
860REPEAT
870PROCmove
880hX=RND(4)
890UNTILhX<>gX
900IFhX=1AND0XMOD4:NX=0X-1:fX=2
910IFhX=2AND0XMOD4<>3:NX=0X+1:fX=1
920IFhX=3AND0X>3:NX=0X-4:fX=4
930IFhX=4AND0X<12:NX=0X+4:fX=3
940UNTILfX
950PROCps(hX-1)
960NEXT
970ENDPROC

```

```

980DEFFNpic1
990VDU22,2,23;8202;0;0;0;
1000PROCdim
1010PROCgrid(3)
1020RESTORE 3190
1030GCOL0,7
1040FORLX=1 TO 105
1050READ XZ,YZ
1060IF XZ=0 AND YZ=0 READ XZ,YZ:MOVE
XZ-100,YZ
1070DRAW XZ-100,YZ
1080NEXT
1090FOR LO=0 TO 420 STEP 420
1100RESTORE 3240
1110READ XZ,YZ:MOVE XZ+LO-100,YZ
1120FOR LOOP=1 TO 6:READ XZ,YZ:PLOT
1,XZ,YZ:NEXT
1130NEXT
1140GCOL 0,7
1150RESTORE 3190
1160FOR LZ=1 TO 69
1170READ XZ,YZ
1180IF XZ=0 AND YZ=0 READ XZ,YZ:MOVE
XZ+320,YZ
1190DRAW XZ+320,YZ
1200NEXT
1210PROCc(340,570,50,24,2,1,3):PROCc
(340,570,25,24,2,1,1):PROCc(552,390,8
5,12,1,2,7):PROCc(552,130,75,12,1,2,7
):PROCc(760,570,50,24,2,1,3):PROCc(76
0,570,25,24,2,1,1):PROCf(550,5,1):PRO
Cf(270,900,4)
1220PROCf(415,900,4):PROCf(685,900,4
):PROCf(835,900,4):PROCf(270,850,4):P
ROCf(690,850,4):PROCf(350,850,4)
1230RESTORE 3250
1240FOR QX=1 TO 8:READ Z:GCOL 0,Z
1250FOR BX=1 TO 4:READ A,B,C:PLOT A,
B,C
1260NEXT:NEXT
1270FOR X=1 TO 20
1280MOVE 1110,200
1290GCOL 0,1:XZ=RND(200)+1000:YZ=RND
(200)+200:DRAW XZ,YZ:PROCc(XZ,YZ,30,1
2,2,1,2)
1300NEXT
1310FOR X=1 TO 25:XZ=RND(200)+1000:Y
Z=RND(200)+200:PROCc(XZ,YZ,30,12,2,1,
2):NEXT
1320seagull$=CHR$(230)+CHR$(231):fla
p1$=CHR$(234)+CHR$(232):flap2$=CHR$(2
35)+CHR$(233)
1330VDU5:GCOL0,7:MOVE 1024,896:PRINT
seagull$
1340GCOL0,8:MOVE 1024,896:PRINTflap1
$
1350GCOL0,15:MOVE 1024,896:PRINTflap

```


Game of the month

From Page 109

```

2$
13606COL 0,7:MOVE 1000,736:PRINTseag
ull$
13706COL 0,15:MOVE 1000,736:PRINTfla
pl$
13806COL 0,8:MOVE 1000,736:PRINTflap
2$
1390gc%=111
1400=FALSE
1410DEF PROCf(X%,Y%,C%)
1420Y%=Y%
14306COL 0,C%
1440REPEAT
1450PLOT 77,X%,Y%
1460Y%=Y%+4
1470UNTIL POINT(X%,Y%)
1480Y%=Y%
1490REPEAT
1500PLOT 77,X%,Y%
1510Y%=Y%-4
1520UNTIL POINT(X%,Y%)
1530ENDPROC
1540DEFFNpic3
1550VDU22,2,23;8202;0;0;0;
1560VDU20,1,1,0,0,0,:VDU26,1279;1023
,:VDU19,3,4,0,0,0,:6COL 0,129:CL6:6CO
L 0,7
1570gc%=0:RESTORE 3270
1580FOR LOOP=1 TO 2
1590FOR LOOP2=1 TO 24
1600READ A,B,C,:PLOT A,B,C
1610NEXT
1620READ D:6COL 0,D
1630NEXT
1640=FALSE
1650DEFFNpic2
1660VDU22,2,23;8202;0;0;0;
16706COL 0,135:CL6
1680PROCdim
1690PROCgrid(0)
1700PROCc(450,700,200,24,1,1,1)
1710PROCc(840,700,200,24,1,1,1)
1720MOVE 270,620:DRAW 645,50:PLOT 85
,1025,620
1730DRAW 650,660:PLOT 85,270,620
1740LX=4900?:LX=3:LX?1=4:LX?2=16:LX?
3=16
1750CALL (LX+&C2)
17606COL 0,4
1770PROCwriteword(200,800,"Andrew")
1780PROCwriteword(565,550,"&")
1790PROCwriteword(300,300,"Sarah")
1800gc%=111
1810=FALSE
1820DEF PROCwriteword(x%,y%,word$)
1830LX!4=x%:LX!6=y%
1840FOR 1%=1 TO LEN(word$)

```

```

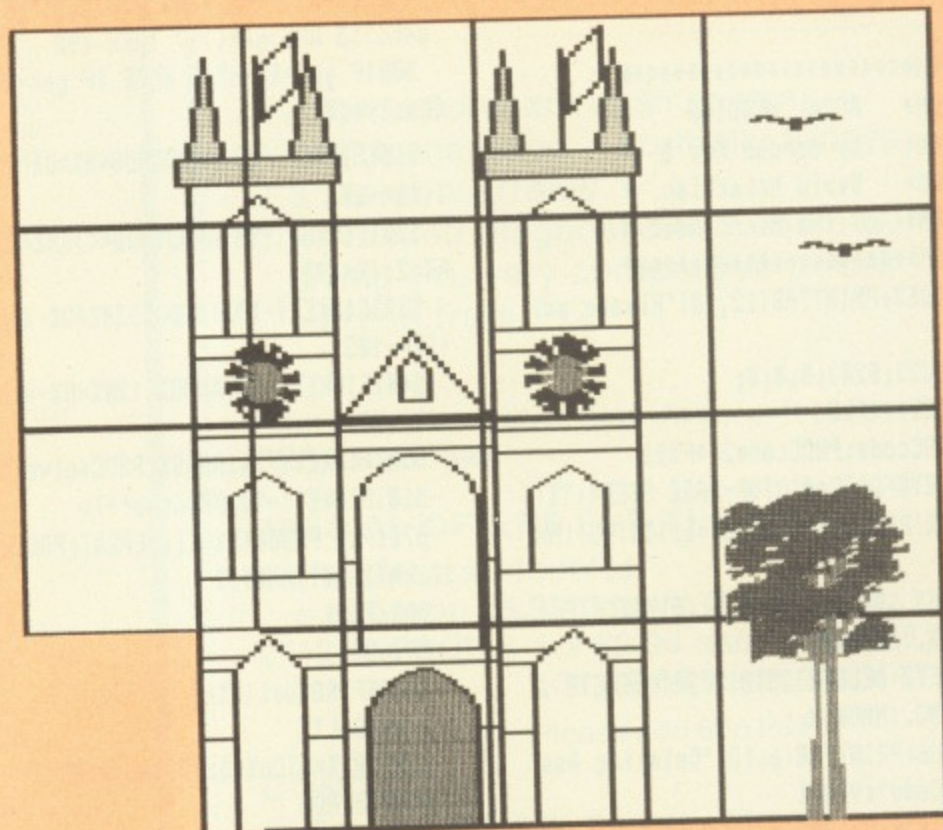
1850LX?&0C=ASC(MID$(word$,1%,1))
1860CALL (LX+&15)
1870NEXT
1880ENDPROC
1890DEFFNpic4
1900VDU22,2,23;8202;0;0;0;
1910PROCdim
1920VDU19,15,7;0;
1930COLOUR143:CLS
1940FORTX=1TO12
19506COL 0,TX
1960VDU19,TX,4;0;
1970IX=TX*2
1980PROCc(640+475*c(IX),512+375*s(IX
),100,24,1,1,TX)
1990MOVE640+475*c(IX),512+375*s(IX):
DRAW640,512
2000VDU19,TX,7;0;
2010NEXT
2020VDU19,4,4;0;
2030EX=10:gc%=0
2040=4
2050DEFFNpic5
2060LOCALFX
2070REPEAT
2080FX=FALSE
2090CLS:gc%=0
2100PRINTTAB(0,5)"Please enter the r
equired filename"
2110PRINT"or a '*' command"
2120INPUT$DX
2130IFLEFT$(DX,1)<>"*"DX="LOAD "+$
DX+" 3000":VDU22,2,23;8202;0;0;0;VDU

```

```

28,0,31,4,25 ELSEFX=TRUE
2140XX=DXMOD256:YX=DXDIV256:CALL&FF
7
2150*FX21
2160IFFX PRINT""Please press space"
:REPEATUNTILGET=32:UNTILFALSE
2170UNTILTRUE
2180=FALSE
2190DEFPROCc(X%,Y%,RX%,FIX%,STX%,TYX%,CO
LX)
22006COL 0,COLX
2210IF STX=2 AND FIX=24 FIX=23
2220LOCALTX
2230MOVEXX,YX
2240FORTX=0TO FIX STEP STX
2250MOVEXX,YX
2260IF STX=2 DRAW XX+c(TX)*RX,YX+s(T
X)*RX
2270IF STX=2 PLOT85,XX+c(TX+1)*RX,YX
+s(TX+1)*RX
2280IF STX=1 AND TYX=1 PLOT85,XX+c(T
X)*RX,YX+s(TX)*RX
2290IF TYX=2 MOVE XX+c(TX)*RX,YX+s(T
X)*RX:DRAW XX+c(TX+1)*RX,YX+s(TX+1)*R
X
2300PLOT85,XX+c(TX)*RX,YX+s(TX)*RX
2310NEXT
2320ENDPROC
2330DEFPROCgrid(gc%)
23406COL 0,gc%
2350FORXX=0TO1279STEP320
2360MOVEXX,0
2370DRAWXX,1024

```




```

2380NEXT
2390FOR Y%=0 TO 1023 STEP 256
2400MOVE0,Y%
2410PLOT0,0,4
2420PLOT0,1,1280,-4
2430PLOT0,1,0,4
2440NEXT
2450IF GC%<>0 MOVE 1279,0: DRAW 1279,
1023: DRAW 0,1023
2460GCOL0,128
2470VDU24,0;0;320;256;CL6:VDU26
2480H%=-1:P%=6
2490O%=12:S%=FALSE
2500ENDPROC
2510DEFPROCtitle
2520AX=0:VDU23;8202;0;0;0;
2530COLOUR135
2540CLS:VDU19,2,4;0;
2550PROCbig("ROYAL",7,8,2)
2560PROCbig("WEDDING",6,13,1)
2570PROCdel(100)
2580PRINTTAB(2,19)"By Gordon Key &"
2590PRINTTAB(2,22)"David McLachlan"
2600PROCdel(200):PROCgrid(0):AX=FALSE:
PROCshuffle:PROCdel(100):PROCsolve(
1):PROCdel(200)
2610CLS
2620PRINTTAB(1,1)"TO MOVE BLOCKS USE
":PRINTTAB(1,3)"THE FOLLOWING KEYS"
2630COLOUR 2:PRINTTAB(3,8)"Z.....L
eft"
2640PRINTTAB(3,11)"X.....Right"
2650PRINTTAB(3,14)":.....Up"
2660PRINTTAB(3,17)"/.....Down"
2670PRINTTAB(3,20)"Tab.....Shuffle"
2680PRINTTAB(3,23)"Return..Reset"
2690COLOUR 1:PRINTTAB(2,28)"Any key
to start"
2700VDU21,19,2,2;0;
2710*FX130,0,130
2720END
2730DEFFNinst
2740VDU22,7:VDU23;8202;0;0;0;
2750FORTX=2T023:PRINTTAB(0,TX)CHR$15
7CHR$132TAB(38)CHR$156:NEXT
2760VDU28,2,23,37,2
2770CX=65
2780FOR p=1 TO 2:PRINTTAB(3,p)CHR$14
1;CHR$129;"R O Y A L W E D D I N G"
2790NEXT
2800PRINT':RESTORE 3310
2810REPEAT
2820READA$:UNTILLEN$>5
2830REPEAT
2840PRINTTAB(4);CHR$(CX);CHR$(VAL(RI
GHT$(A$,3)))STRING$(8,".")LEFT$(A$,LE
N(A$)-3)

```

```

2850READA$
2860CX=CX+1
2870UNTIL A$="E"
2880PRINTTAB(4)"Escape ...To return
to menu"
2890PRINT'TAB(3)CHR$129"Please sele
ct a letter"
2900*FX21
2910REPEAT
2920TX=GET AND &DF
2930UNTIL TX>64 AND TX<70
2940="FNpic"+STR$(TX-64)
2950ENDPROC
2960DEFPROCdim
2970DIMc(24),s(24)
2980TX=0
2990FORT=0T02*PI STEP2*PI/24
3000c(TX)=COS(T):s(TX)=SIN(T)
3010TX=TX+1:NEXT
3020ENDPROC
3030DEFPROCbig(A$,X%,Y%,c%)
3040VDU31,X%,Y%
3050COLOURc%
3060LOCALa%,b%,d%,A%
3070FORa%=1T0LENA$
3080?D%=ASC(MID$(A$,a%,1))
3090SOUND1,2,?D%,1
3100X%=D%MOD256:Y%=D%DIV256:AX=&A:CA
LL&FFF1
3110FORb%=0T01
3120VDU23,b%+130
3130FORc%=0T03:FORd%=0T01
3140VDUDX?(c%+b%*4+1)
3150NEXT:NEXT:NEXT
3160VDU130,10,8,131,11
3170NEXT
3180ENDPROC
3190DATA 0,0,330,855,340,855,365,980
,390,855,490,855,515,980,540,855,550,
855,550,820,540,820,540,770,490,770,4
40,805,390,770,340,770,340,820,540,82
0,330,820,330,855,550,855,0,0,340,770
,340,630,390,630,390,770
3200DATA 0,0,390,630,490,630,490,770
,0,0,490,630,540,630,540,770,540,0,34
0,0,340,630,340,600,400,600,0,0,480,6
00,540,600,0,0,340,500,540,500,0,0,34
0,475,540,475,0,0,340,325,390,325,390
,425,440,455,490,425,490,325,540,325,
390,325
3210DATA 0,0,340,225,405,225,0,0,475
,225,540,225,540,210,490,210,440,250,
390,210,340,210,390,210,390,120,340,1
20,390,120,390,0,490,0,490,120,540,12
0,490,120,490,210,0,0,540,520,760,520
,752,520,650,630,552,520
3220DATA 0,0,650,600,632,580,632,540

```

```

,672,540,672,580,650,600,0,0,540,505,
760,505,0,0,540,480,760,480,0,0,540,2
30,565,230,565,390,565,230,737,230,73
7,390,737,230,760,230,760,215,540,215
,0,0,540,340,565,340
3230DATA 0,0,745,340,760,340,760,130
,725,130,725,0,575,0,575,130,540,130,
540,0,760,0
3240DATA 440,855,0,125,0,-10,10,0,0,
-70,-10,0,10,0
3250DATA8,4,345,900,1,40,10,1,0,65,1
,-40,-15,8,4,770,900,1,40,10,1,0,70,1
,-40,-10,15,4,770,900,1,50,40,1,0,70,
1,-50,-40,15,4,350,900,1,45,40,1,0,70
,1,-45,-40,7,4,390,934,5,390,938,4,81
0,934,5,810,938,1,4,1085,0,1,0,40,4,1
093,0,1,0,100
3260DATA1,4,1130,0,1,0,70,4,1100,0,1
,0,250,1,1,25,0,1,0,-250,1,-6,0,1,0,2
50
3270DATA4,0,80,5,440,430,85,0,430,4,
0,590,5,440,590,85,0,940,4,80,1023,5,
560,640,85,560,1023,4,720,1023,5,720,
640,85,1200,1023,4,1279,940,5,840,590
,85,1279,590,4,1279,430,5,840,430,85,
1279,80,4,1200,0,5,720,380,85,720,0,4
,560,0,5,560,380
3280DATA85,80,0,3,4,0,660,5,290,660,
85,0,900,4,100,1023,5,520,750,85,520,
1023,4,790,1023,5,790,740,85,1140,102
3,4,1279,860,5,1000,640,85,1279,640,4
,1279,360,5,980,360,85,1279,120,4,110
0,0,5,760,260
3290DATA85,760,0,4,490,0,5,490,270,0
5,140,0,4,0,160,5,280,380,85,0,380,0
3300DATA6,134,16
3310DATA Westminster Abbey132,Royal
couple132,Union Jack132,Souvenir ball
oon132,Load own picture132,E,1,4,6,9
3320DEFPROCcode
3330scrnpoint=&80
3340varpoint=&70
3350FORTX=0T02STEP2
3360PX=&110
3370NX=PX
3380LOPTTX
3390LDA&601:STAVarpoint
3400LDA&602:STAVarpoint+1
3410LDA&604:STAVarpoint+2
3420LDA&605:STAVarpoint+3
3430LDY00
3440LDA(varpoint+2),Y:AND#15
3450TAX
3460LDApointer1,X:STAscrnpoint+2
3470LDApointerh,X:STAscrnpoint+3
3480LDA(varpoint),Y:AND#15

```


Game of the month

From Page 111

```

3490 STA(varpoint+2),Y
3500 TAX
3510 LDA pointerl,X:STAscrnpoint
3520 LDA pointerh,X:STAscrnpoint+1
3530 LDX #0
3540 .loop1
3550 LDY #160
3560 .loop2
3570 LDA(scrnpoint),Y
3580 STA(scrnpoint+2),Y
3590 LDA #0
3600 STA(scrnpoint),Y
3610 DEY:BNE loop2
3620 DEX:BEQ out
3630 CLC:LDA scrnpoint
3640 ADC #&80:STAscrnpoint
3650 LDA scrnpoint+1
3660 ADC #2:STAscrnpoint+1
3670 CLC:LDA scrnpoint+2
3680 ADC #&80:STAscrnpoint+2
3690 LDA scrnpoint+3
3700 ADC #2:STAscrnpoint+3
3710 SEC:BCS loop1
3720 .out
3730 RTS
3740 .pointerl
3750 ]:PX=PX+16:[OPTTX
3760 .pointerh
3770 ]:NEXT
3780 DX=&A00
3790 FOR YX=0 TO 3
3800 FOR XZ=0 TO 3
3810 AX=&3000+YX*160+YX*&1400-1
3820 pointerl?(XZ+YX*4)=AX MOD 256
3830 pointerh?(XZ+YX*4)=AX DIV 256
3840 NEXT
3850 NEXT
3860 ENVELOPE1,0,0,0,0,0,0,0,126,-4,-
3,-3,126,100
3870 ENVELOPE2,1,0,0,0,0,0,0,63,43,0,
-63,63,126
3880 VDU6,23,230,0,0,112,29,7,1,1,0
3890 VDU23,231,0,0,14,184,224,128,128
,0
3900 VDU23,232,1,3,0,0,0,0,0,0
3910 VDU23,233,0,0,0,3,0,0,0,0
3920 VDU23,234,128,192,0,0,0,0,0,0
3930 VDU23,235,0,0,0,192,0,0,0,21
3940 ENDPROC
3950 DEFPROC code2
3960 OSWORD=&FFF1
3970 OSWRCH=&FFEE
3980 FOR passX=0 TO 2 STEP 2
3990 PX=&900
4000 [
4010 OPT passX

```

```

4020 .width NOP
4030 .depth NOP
4040 .xstep NOP
4050 .ystep NOP
4060 .xpos NOP:NOP
4070 .ypos NOP:NOP
4080 .xstore NOP:NOP
4090 .ystore NOP:NOP
4100 .pattern NOP
4110 ]
4120 $PX="12345678"
4130 PX=PX+8
4140 [ OPT passX
4150 .start LDX # pattern MOD 256
4160 LDY # pattern DIV 256
4170 LDA # &8A
4180 JSR OSWORD
4190 LDA ypos
4200 STA ystore
4210 LDA ypos+1
4220 STA ystore+1
4230 LDY # 0
4240 .outer_loop LDA xpos
4250 STA xstore
4260 LDA xpos+1
4270 STA xstore+1
4280 LDA pattern+1,Y
4290 LDX # 0
4300 .inner_loop ASL A
4310 BCC noprint
4320 PHA
4330 TXA:PHA
4340 TYA:PHA
4350 JSR write
4360 PLA:TYA
4370 PLA:TXA
4380 PLA
4390 .noprint PHA
4400 CLC
4410 LDA xstore
4420 ADC xstep
4430 STA xstore
4440 LDA xstore+1
4450 ADC # 0
4460 STA xstore+1
4470 PLA
4480 INX
4490 CPX # 0
4500 BNE inner_loop
4510 SEC
4520 LDA ystore
4530 SBC ystep
4540 STA ystore
4550 LDA ystore+1
4560 SBC # 0
4570 STA ystore+1
4580 INY
4590 CPY # 0

```

```

4600 BNE outer_loop
4610 CLC
4620 LDA xstore
4630 ADC xstep
4640 STA xpos
4650 LDA xstore+1
4660 ADC #0
4670 STA xpos+1
4680 RTS
4690 .write LDA # 5
4700 JSR OSWRCH
4710 LDA # &19
4720 JSR OSWRCH
4730 LDA # 4
4740 JSR OSWRCH
4750 LDA xstore
4760 JSR OSWRCH
4770 LDA xstore+1
4780 JSR OSWRCH
4790 LDA ystore
4800 JSR OSWRCH
4810 LDA ystore+1
4820 JSR OSWRCH
4830 LDA # &E0
4840 JSR OSWRCH
4850 LDA # 4
4860 JSR OSWRCH
4870 RTS
4880 .definer LDA # 23
4890 JSR OSWRCH
4900 LDA # &E0
4910 JSR OSWRCH
4920 LDA # 0
4930 LDX width
4940 .define_row SEC
4950 ROR A
4960 DEX
4970 BNE define_row
4980 LDY depth
4990 .send_rows JSR OSWRCH
5000 DEY
5010 BNE send_rows
5020 .send_blanks
5030 LDY # 0
5040 LDA # 0
5050 .blank JSR OSWRCH
5060 DEY
5070 BNE blank
5080 RTS
5090 ]
5100 NEXT passX
5110 ENDPROC

```

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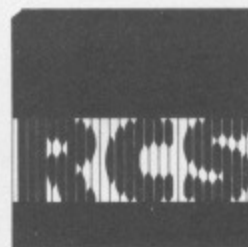
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IT is very rare in the computer business that a standard is agreed upon. What usually happens is that equipment manufacturers go their own sweet incompatible ways until one manufacturer is more successful than the others and comes to dominate the market.

This creates a de-facto standard which attracts all the attention and quality software. Rivals then produce compatible hardware and the market settles down.

This happened with printers. First the way of transferring data from the computer to the printer was standardised by the most successful printer manufacturer at the time, namely Centronics.

Then, as they became more sophisticated and were able to produce more than just a simple type face, the printer command system adopted was Epson's.

The same thing is happening today concerning the latest computer peripheral, the mouse. The BBC Micro market is dominated by the AMX. It has all the best software, much of which is available separately from the little hardware rodent and therefore it has set a de-facto standard.

However this is of little comfort to those who have invested in some other form of input device. Nevertheless salvation is at hand for those of you who have dead mice or, as the manufacturers call them, track balls.

A track ball is simply a mouse on its

SALVATION'S AT HAND FOR A DEAD MOUSE...

MIKE COOK
shows how to
convert track
balls to AMX
standard in Part
39 of his course

back. The ball is moved directly instead of moving the whole box. This has the advantage of using less desk room than the mouse and it also imparts a totally different feel to the graphical input device.

Some people prefer the feel of a track ball to a mouse, others don't. However

in order to give you the choice I will look at ways of converting various track balls to the AMX standard.

Track balls that are suitable for conversion are those that plug into the user port. There is a type that plugs directly into the analog input port and simulates a joystick, but this is unsuitable for mouse conversion because the motion of the ball is translated into electrical resistance.

Most track balls and mice work by translating the motion of the ball into rotation of slotted discs which are then used to interrupt a light beam. As the disc rotates the beam is interrupted and produces a series of pulses at a light detector. The principles of this system are shown in Figure I.

In order to tell in which direction the disc is rotating we need to use two detectors. These are arranged so that the slots do not pass the detectors at the same time, instead there is a stagger. You can see what I mean if you look at Figure II.

Detector A is uncovered just before B when the movement is clockwise but B is uncovered before A when the movement is anti-clockwise. This means that the pulses coming from detector A are out of phase with those coming from detector B.

In the jargon we say that the two signals are out of phase by 90°. This is because we view one cycle of a waveform as being equivalent to one cycle of rotation. As a whole cycle of rotation is 360° one quarter of a cycle is 90°. You can see the two signals produced in Figure III.

If we take one signal as our standard we can say the other signal lags by 90° for clockwise rotation and leads by 90° for anti-clockwise rotation. So in order

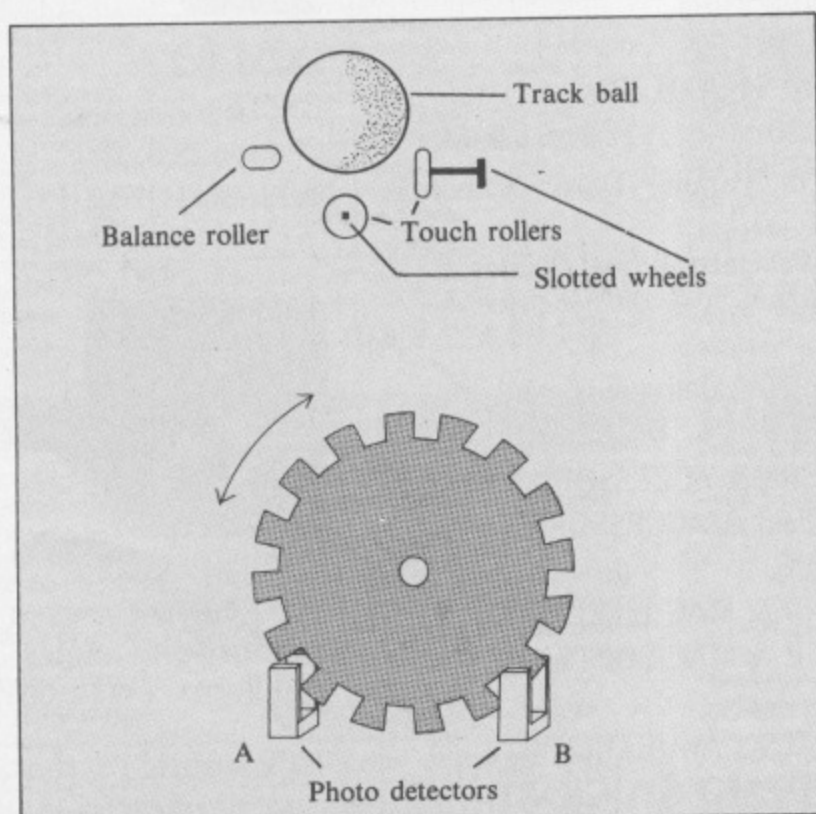


Figure I: Principles of a mouse/trackball

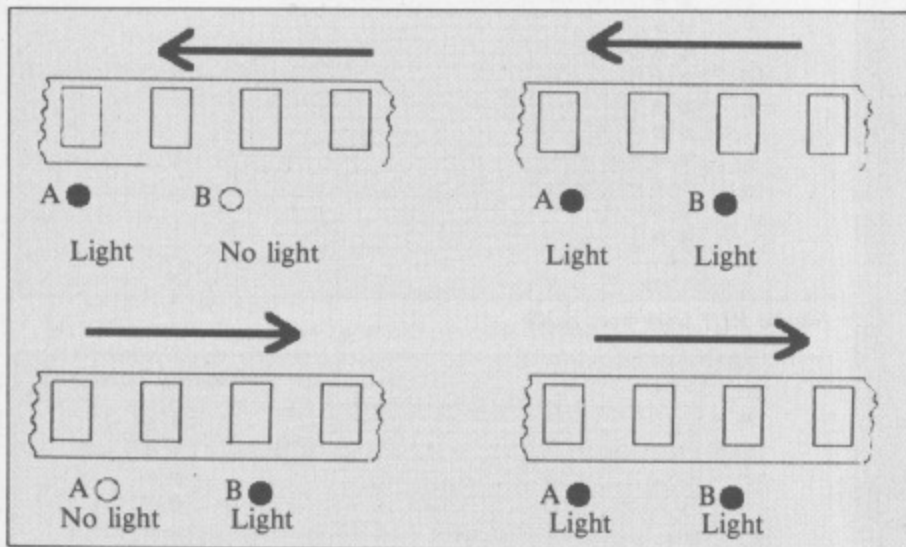


Figure II: Direction detection

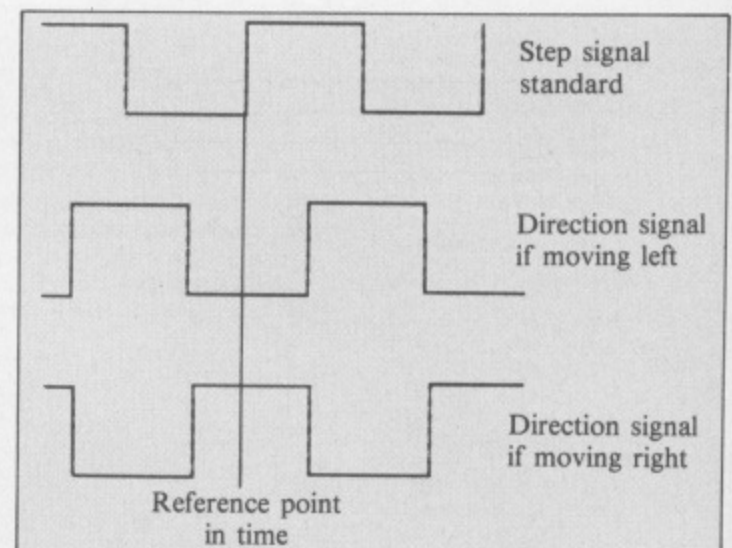


Figure III: Signals produced by movement

to see which way our mouse is going we determine whether we have a lagging or leading signal.

We can do this in hardware and this is the approach taken in the Atari track ball. If we use one signal to trigger a latch on its rising edge we can sample the other signal with the latch. Thus the output of the latch will always be high or low depending upon the direction of motion. This is shown in Figure IV.

A latch by the way is a circuit that takes a snapshot of a logic line. When it is triggered by a transition from logic zero to logic one on its clock input, whatever logic level is on its data input at the instant is transferred to its output.

Outputs of latches are inevitably labelled Q, for no adequately explained reason. The outputs produced by such an arrangement give you a step - movement has taken place - and a direction signal.

In the February 1985 edition of *The Micro User* we saw how this arrangement could be used by software to determine a cursor position, and in January 1985 we saw how it could be used to simulate a variable resistance type joystick.

Well I thought that to use an Atari trackball with the AMX mouse system I would have to design a circuit to recreate the out-of-phase signals from the step and direction signals. I duly did this but, fortunately before I built the prototype, I realised that it was simply unnecessary.

You see, what the software has to do with the two signals is very similar to what the hardware latch does. What happens is that on the rising edge of the reference signal an interrupt is generated.

The interrupt service routine then

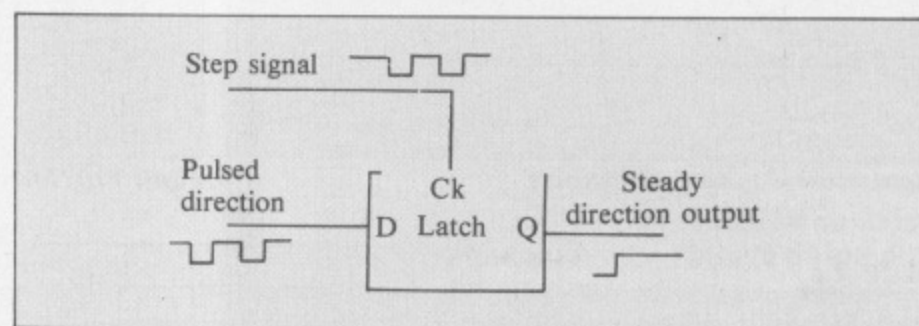


Figure IV: A hardware direction detector

looks at the other signal at that instant to find out in which direction the mouse is going. Therefore it does not matter that the direction signal is not pulsing as it is only sampled at the instant the step signal makes a transition.

This means that the signals should be directly compatible if we can get them from the trackball into the user port on the same pins as those used by the AMX mouse.

Well, it turns out not to be quite that simple as the direction signal for left to right movement from the trackball is the inverse of that needed by the AMX

software. This is simply remedied by inverting the direction signal with a transistor.

Finally the AMX mouse has three push buttons and the trackball only one. Actually it has two but they are wired together inside to act as one. You could rewire the inside, but that would be messy.

The simple solution is to provide three extra push buttons. Figure V shows the pinout of the AMX mouse

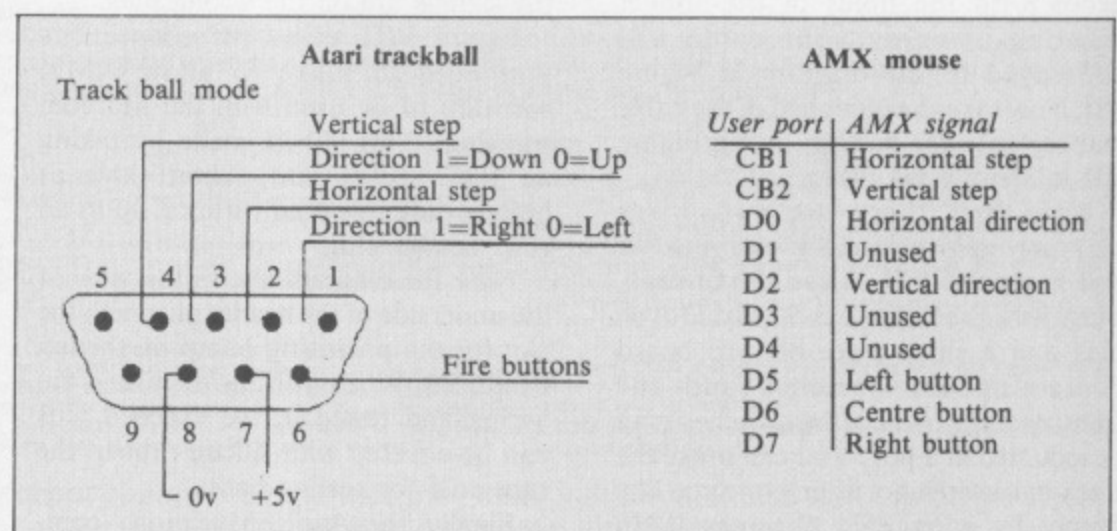


Figure V: Pinout of trackball and mouse

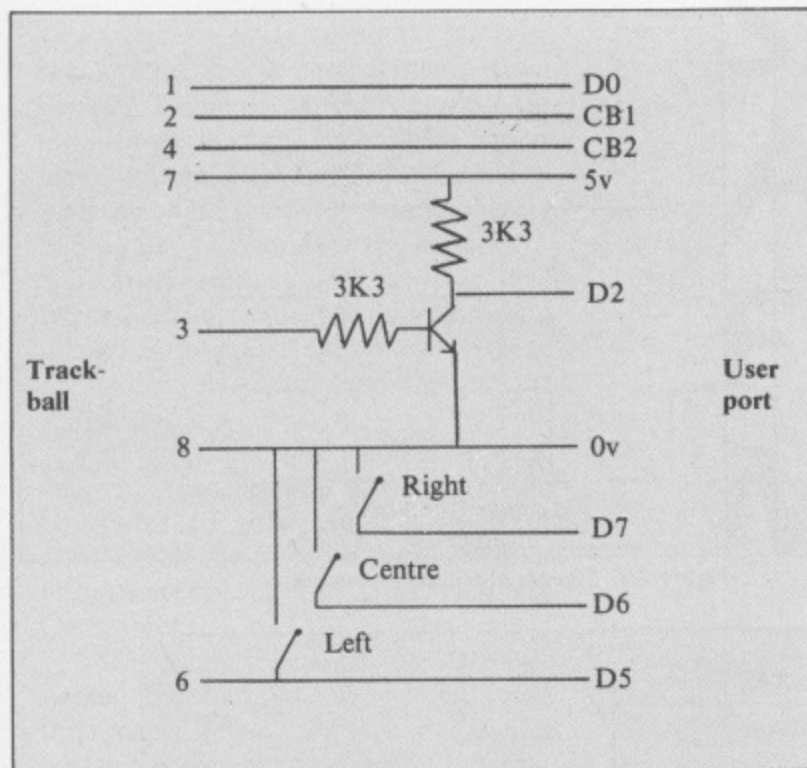


Figure VI: Atari trackball to user port interface

From Page 117

and the Atari trackball, and Figure VI shows the complete interface circuit.

I did consider laying out a printed circuit board for the interface with plugs and sockets, but when I priced it up it was just too expensive for what it was. Therefore the best solution is to make one out of plugs and wires.

Take a 20 way IDC – insulation displacement connector – and attach it to a length of ribbon cable by squeezing it together in a vice. You should make sure that the bump on the socket is pointing down the length of the cable when you crimp the two together so that when you wrap the cable around the strain relief clip the bump points away from the cable.

In this way when you lay it on the bench with the holes in the socket pointing upwards your cable will correspond to the diagram in Figure VII. Now take the other end of the cable and separate the strands, using Figure VII to identify the wires.

Note that there are two wires carrying +5V and eight carrying 0V and you only need to use one of each. Then wire them up to a 9 way D-type plug and a small piece of vero board containing the switches and the transistor. If you like, the switches may be mounted in a box. You can make the track ball switch act as any one you like simply by wiring pin 6 across it. In Figure VI this is shown going to the most used AMX mouse button – the

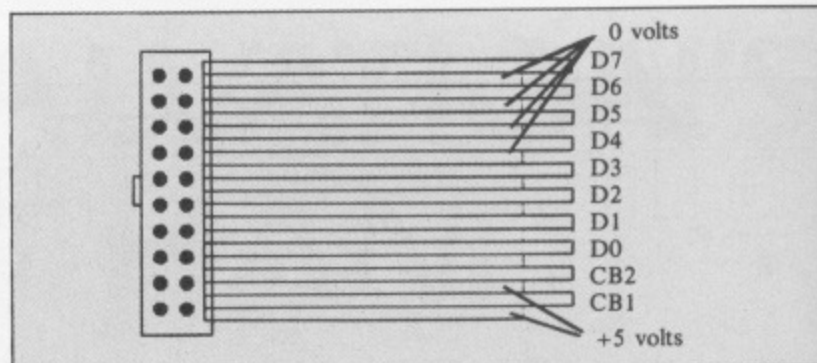


Figure VII: User port cable

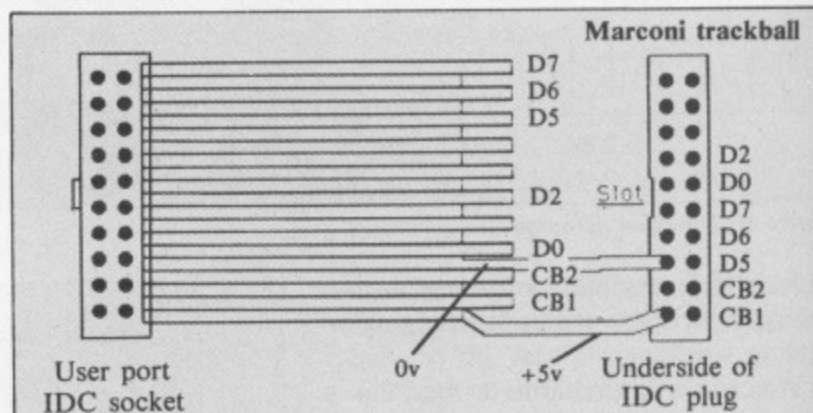


Figure VIII: Marconi trackball to user port interface

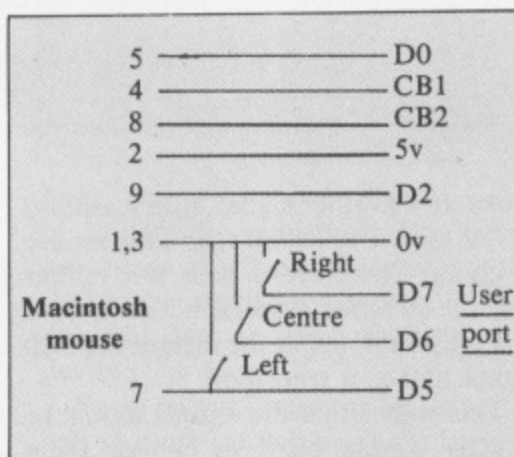


Figure IX: Macintosh mouse to user port

one on the left.

There is another make of trackball on the market by Marconi that has three buttons and plugs into the user port. This is electrically compatible with the AMX mouse, the only difference is that the signals are on the wrong pins.

Figure VIII shows the connections you need to make to allow AMX software to be used with the Marconi trackball. This is best made by taking an IDC socket and ribbon cable as before, only this time wiring it up to an IDC header plug.

Note the diagram shows the view of the underside of the header plug with the slot for the polarising bump on the left hand side. When you have finished the wiring and tested it, the exposed pins can be covered with silicon rubber, the type sold for sealing baths.

Finally the Apple Macintosh computer comes with a mouse and that can be converted to the AMX standard in a

similar way as the Atari track ball. There is no need to invert the direction line as the signals are compatible. However you do need to add the extra mouse buttons as it only has one at present. The circuit needed is shown in Figure IX.

All the components to construct these interfaces are available as Body Build Pack 33. These packs are also available ready assembled for those of a less dexterous nature. Note that the extra switches can be mounted in a box, but are provided assembled on a strip of vero board.

So it is possible, if not for the mouse to come to the ball, then at least for the ball to come to the mouse. This will allow you to use your existing equipment with the new software without mutilating the plug and so making it unusable for its original purpose.

Body Build Pack 33: Pack 33a Atari to user port. 1 off 20 way IDC socket; 1 length 20 way ribbon cable; 1 length vero board; 3 push switches and tops; 1 9 pin D-type plug; 1 transistor; 2 resistors; kit price £10; assembled £15.

Pack 33b Marconi to user port. 1 off 20 way IDC socket; 1 length of 20 way ribbon cable; 1 20 way IDC plug; kit £5; assembled £10.

Pack 33c Macintosh Mouse to user port. Same as pack 33a without transistor or resistors; kit £9.50; assembled £14.50. All prices include P&P and VAT.

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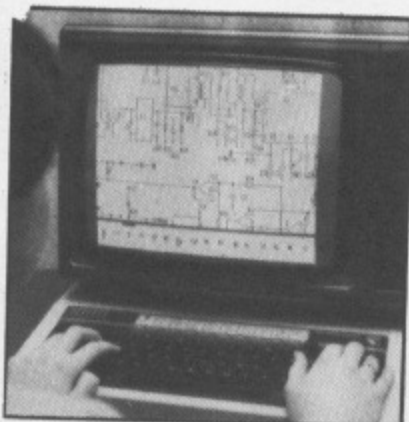


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IT is often the case that, when creating complex screens, the program which does the drawing is too large to permit the use of the highest definition mode.

This typically happens with the Hershey Characters package from Beebugsoft which seems to necessitate the use of Mode 4 where Mode 0 would be better.

One solution to this problem is to insert *SPOOL PLOTS after the line selecting the low definition mode, and to insert *SPOOL at the point the drawing is completed.

The effect of this will be to save a trace of the PLOT commands on file. A quick look at the picture in high definition may then be taken by typing MODE 0:EXEC PLOTS, but a better arrangement is to run the following program.

```
10 AX=OPENIN"PLOTS"
20 MODE 0
30 REPEAT
40 VDU BGETAX
50 UNTIL EOFAX
60 CLOSE AX
70 AX=BET
80 END
```

Line 70 could be replaced with a call to a screen printing routine or a *SAVE command to save the screen to file.

However in many cases it may be found that the spool file is a more compact representation of

the screen than the save file.

I hope you will be able to publish this hint as I am sure many of your readers, like me, have found the store limitations a particular problem with many graphics programs. — M.J. Pickett, Twyford.

Take a tip, Dr Who

HERE are some tips for Dr Who and the Mines of Terror by Micropower.

First some general tips — Sphinx has to be carried up ladders and the robots cannot go up ladders, so when pursued find a ladder quickly.

On jumps which seem impossible — for example, when getting the oxygen from the Mendroy — let yourself fall off the end for a fraction of a second before jumping!

Now here are some specific tips:

- If you want to speed the game up in the areas which you move automatically — for example, the lift — pick up the spool found out in space, and drop it in the apparatus that suspends objects in air five floors up from the lift bottom and second right.

- To remove the dustbin lid objects you need to carry the electronic screwdriver.

- To get to the greenhouse — shown on blueprint — avoid the robot which is immediately on your right, on the sixth screen up.

- Keep Z and : depressed until the screen scrolls down to meet you. Then go right and up the ladder.

- The cloth found in the greenhouse disables robots if they run over it, but can only be used once.

- To enter one of the escape capsules which are to the left of the top left CSC unit, go up on the three ladders and before you reach the top jump off left.

- To escape press U when carrying the detonator — if you have it, drop it quickly and use the escape pad activator.

Finally remember your score doubles every time you reach a CSC unit starting at 128 points. — J Trevor, N. Lines.

Snap on the Master

BACK in 1984 I bought your Micro User Education Special volume 1. I have used all the

programs extensively and found them all to be really good.

I recently got a BBC Master and find that the program Snap does not work properly.

It does run, but the graphics are all mixed up. Could you advise me how to alter it as it is our son's favourite? — David Frankl, Burnham.

- The problem is that the program reads the character definition directly from the ROM, and this definition is in a different place in the Master.

This happens with several large character routines, and it can be overcome by using Oslow. If you change line 1210 and add the other lines as follows, Snap should work on any BBC Micro.

```
1 PROCcode
1210 M1Z=481:7480=C1:CALL START
2480 PROCcode
2490 M1Z=481:7480=C1:CALL START
2500 DEFPROCcode
2510 DIM P1 50:START=P1
2520 OPT0
2530 LDY480
2540 LDY480
2550 LDA480
2560 JSR4FF1
2570 RTS
2580 J
2590 ENDPROC
```

Rules for Wordwise Plus

USERS of View will be aware of the value of the rulers for the formatting of text.

When text is previewed in Wordwise Plus there is no such indication to show the extent of the paper, and it is often necessary to do a test printout to see the exact effect of margins and indents.

However by including OS"FX155,(col+48)" as an embedded command at the start of your document, where col equals the value of the fore-

ground colours in Mode 2 — in other words 1=red, 2=green and so on — the text is previewed against a background of 80 narrow vertical lines.

It is a matter of opinion as to whether it makes the text any easier to read but it certainly aids the setting of margins, tabs and line lengths as the character positions can be counted.

Although values other than 48 can be used — 9, 16 and 112 — 48 is chosen because the characters are centered on the vertical lines.

— Gary Crawford, Crawley Down, West Sussex.

- This is certainly an aid to seeing how a document will be laid out.

I prefer OS"FX155,4" which gives blue lines at the left of the text.

Readers without Wordwise Plus can try this FX call directly in any mode except 7.

An interesting effect can be created in Mode 6 using VDU 19,0,4,0,0,3:*FX155,0.

JP101 screen dump

I GOT an Acorn/Olivetti JP 101 spark jet printer through a special offer in The Micro User and am having difficulties in finding a program which will enable a screen to be dumped to the printer.

Could anyone help me obtain a suitable program for the JP101 and BBC B and has anyone successfully written a screen dump program for converting a program from another printer? — Paul Franklin, Leeds LS11.

● We now have a screen dump for the JP101 from one of our regular writers. Hopefully it will appear in the magazine soon.

Time saver

HERE is a real time saver if you are about to type in the data on Cavern Quest (Micro User, May 1985). Type in:

```
*KEY0 DATA0
*KEY1 DATA1
*KEY2 DATA2
*KEY3,0
*KEY4,1
*KEY5,2
```

You press either of the first three keys for the start then tap out the other keys in succession to complete the line. — Jack Alexander, Poynton.

● This is a useful tip when you are typing in anything with a lot of repeated text.

NLQ printing

DO you know of a program compatible with Mini Office II that can provide NLQ printing on an Epson FX80? — Mark Brown, Dereham, Norfolk.

● Most NLQ ROMs should work with Mini Office II word processor if you include the star commands in the text as embedded commands.

We tried the Watford NLQ ROM and found it could be used with the spreadsheet and word processor.

With the spreadsheet the ROM should be enabled with either *NLQ80 or 100 and

Writing to the CMOS RAM

I WAS interested to read in The Micro User that there are 10 bytes in the Master 128 CMOS RAM which are available for the user.

The Welcome guide only says that you can use *FX 162 to write to the CMOS RAM, so I started to experiment and discovered the following:

● *FX 162,x,y does write the value of y to the byte x, where it seems that x can take any value 1 to 49 inclusive.

● Writing to bytes 18 to 49 does not seem to affect the start-up options.

£10 Prize letter

● *FX 161,x,1 can be used to read the values stored, where the value is returned in the y register — so you need a very short piece of machine code to get the value.

After accidentally resetting the CMOS RAM several times and needing to use either *CONFIGURE or the Panel program to reset the values I decided to write a program which would store my preferred values — including my own user bytes if necessary — and then

reload them after any mishaps or battery replacement.

The program reads the CMOS RAM and inserts them into new data lines 1001 to 1049 using the keyboard buffer.

When it has completed this it inserts a new line 5 so that if the program is saved the next time it is run it will insert the old values into the CMOS RAM.

If you want to set it up with an alternative set of values then delete the new line 5 and run it again while you have your new set of values in RAM. — A.T. Torlesse, Romsey, Hants.

```
10 PROCassy
20 NX=1000
30 NX=NX+1: REM NEW LINE
NO
40 IF NX=1050 PROCnew:EN
D: REM ENDS ROUTINE AFTER B
YTE NO 49.
50 A$=STR$(NX): REM INSE
RTS NEW LINE NO.
60 PROCfillbuffer
70 A$="DA. ": REM INSERT
S DATA.
80 PROCfillbuffer
90 YX=NX-1000: REM SETS
BYTE NO, INITIALLY 1.
100 PROCread
110 A$=STR$(?&70): REM GE
T NEXT BYTE
120 PROCfillbuffer: REM A
ND INSERT IN KEYBOARD BUFFE
R.
130 A$=CHR$13
140 PROCfillbuffer
150 A$="0.30"+CHR$13: REM
INSERT GOTO 30.
160 PROCfillbuffer

170 END
180 REM*****
190 DEFPROCassy: REM ROUT
INE TO SET Y REGISTER INTO
&70 AFTER *FX CALL.
200 FOR pass=0 TO 2 STEP
2
210 PX=&71
220 [OPT pass
230 JBR &FFF4
240 STY &70
250 RTS
260 1
270 NEXT
280 ENDPROC
290 REM*****
300 DEFPROCread: REM GETS
NEXT BYTE FROM CMOS RAM
310 AX=161
320 YX=1
330 CALL &71
340 ENDPROC
350 REM*****
360 DEFPROCfillbuffer: RE
M FILLS KEYBOARD BUFFER WIT

H A$
370 AX=153
380 YX=0
390 FORchar%=1 TO LEN(A$)
400 YX=ASC(MID$(A$,char%,
1))
410 CALL &FFF4
420 NEXT
430 ENDPROC
440 REM*****
450 DEFPROCnew: REM WRITE
NEW LINE 5 GOTO 500
460 A$="50.500"+CHR$13
470 PROCfillbuffer
480 ENDPROC
490 REM *** START OF NEW
PROGRAM
500 AX=162: REM PERFORM *
FX 162,X,Y TO LOAD DATA INT
O CMOS RAM LOCATIONS 1 TO 4
9
510 FOR YX=1 TO 49
520 READ YX
530 CALL &FFF4
540 NEXT
```

*NLQTYPE from the spread-sheet menu.

However if a printout is split over pages then a new page is not thrown correctly, giving 1 character of rubbish.

This can be disabled by *FX6,12. Before exiting to Mini Office main menu switch off the ROM with *NLQOFF.

The NLQ ROM works with the word processor very well.

Insert *NLQ80 or 100 followed by *NLQTYPE at the start of the text and *NLQOFF at the end of text.

The alternative VDU codes 129 and 193 will work but give unpredictable results and are best avoided. The other codes for underline, proportional type and enlarged type all work.

It is important that the length of a line plus the length of any

left margin is less than the NLQ line width setting — 80 or 100.

If it's equal to it then you get double line spacing and greater than that causes the line to overflow on to the next one down.

The word processor sends out two control characters at the start of a document. Hence two weird symbols are printed if NLQ is enabled. This won't

USE THE CAPITAL CURE

occur if the NLQ commands are inserted in the text.

However if NLQOFF is missing or printing is abandoned mid way the two symbols will be printed next time unless a *NLQOFF is given from the word processor menu.

Room at the top

I AM having a problem trying to obtain one of the features of my Juki 6100 printer from within View.

With cut sheets I normally use the printer's automatic paper loading facility. This is very handy but loads the paper in such a way as to give a top margin of approximately six lines.

Since I can alter View's top margins and header to zero this is generally satisfactory, but there are occasions when I would like to print nearer to the top of the paper, retaining consistency with where I start and finish printing each page.

The printer can perform a negative line feed, but try as I might with Acornsoft's Printer Driver Generator - altering, for example, the extended character set - all I can do is obtain an ordinary line feed which is just the opposite of what I want. - S. Gill, Halifax, West Yorkshire.

● Are there any Juki 6100 owners out there who can help?

Swapping numbers

NO doubt many of your readers know how to interchange the numerical values stored in two variables - an important method in any sort routine.

Using Basic the coding would be something along the lines:

```
10 A=3
20 B=7
30 Dummy=A
40 A=B
50 B=Dummy
```

where A and B initially contain 3 and 7 respectively and are to be interchanged.

The variable Dummy is used as an intermediate store. When executed A will finally contain 7

ONE of the problems people have when first introduced to computers is that most of them treat capitals and lower case as different characters.

I have come up with the small program below to rectify the problem on a BBC Micro.

After it has been run the computer does not mind whether you type in capitals, lower case or a mixture of both.

This means you can type in a program like this:

```
10 For Loop=1 to 20
20 Print Loop
30 Next loop
```

However, when you list it it will

£10 Prize letter

appear as follows:

```
10 FOR LOOP=1 TO 20
20 PRINT LOOP
30 NEXT LOOP
```

In other words the computer treats everything as capitals. A disadvantage of this is that you can no longer have Basic keywords as variables in lower case.

Anything in inverted commas will be treated normally. For instance, Print "Hello" will print Hello normally.

To overcome our variables

problem anything enclosed in set brackets and will be printed out normally, so you could have:

```
10 (print)=10
20 Print (print)
```

These brackets will not be printed out while the program is listed. Deleting of these brackets will not work correctly, so take care.

The program works quite simply. It intercepts OSWORD 0, where most languages take their input from.

If anyone knows how to solve the deleting of {and} correctly I would be interested to hear. - Julian Rockey, Shrewsbury, Shropshire.

```
10REM
20REM
30REM
40*1
50FORIX=0TO1:PX=4900: COP
TIX*2
60.intercept:PHP:CMPO: B
EQinput:PLP:JMP(oldiv):.inpu
t
70PHA:TXA:PHA:CLI
80STX:70:STY:71
90LDY00:LDA(70):Y:STA:7
2:INY:LDA(70):Y:STA:73
100INY:LDA(70):Y:STA:74:
INY:LDA(70):Y:TAX:INY:LDA(
70):Y:STA:71:STX:70
110LDY00:STY:75
120.rep:JSR&FF00
130CMP#127:BEQdel
140CMP#21:BEQdelln
150CMP#13:BEQignore
160CPY:74:BEQskipw
170.ignore
180PHA:JSR&FF03:PLA:.skip
```

```
nr
190CMP#34:BEQinv.inhere
200CMP#123:BEQswitchoff
210CMP#125:BEQswitchon
220CMP#13:BEQret
230CMP#27:BEQesc
240CPY:74:BCCoklen:LDA#7:
JSR&FF0E:JMPrep.oklen
250LDX:75:BNEnotlet
260CMP#97:BCCnotlet
270CMP#123:BCCnotlet
280AND#&DF:.notlet
290CMP:70:BCCrep
300CMP#71:BEQok:BCSrep
310.ok
320STA(72):Y:iny
330JMPrep
340.ret:STA(72):Y:INY
350PLA:TAX:PLA:PLP:CLC:RT
S
360.esc:PLA:TAX:PLA:PLP:S
EC:RTS
370.del:TYA:BEQrep
380LDA#127:JSR&FF0E:DEY:L
```

```
DA(72):Y:CMPO:34:BNErep:LDA
&75:EOR#1:STA&75:LDA#34:JMP
rep
390.del:n:TYA:BNEokdel:n:
JMPrep.okdel:n
400LDA#127:.delrep:JSR&FF
EE:DEY:BNEdelrep:JMPrep
410.inv:LDA:75:EOR#1:STA&
75:LDA#34:JMPinhere
420.switchoff:LDA#1:STA:7
5:JMPrep
430.switchon:LDA#0:STA:75
:JMPrep
440.oldiv:EQU#0
450:J:NEXT
460REM!&90=&A00:7&92=10:7
&93=32:7&94=255:XZ=&90:YX=0
:AX=0
470?oldiv=?&20C:oldiv?1=&20
D
480?&20C=0:7&20D=9
490?oldiv=?&20C:oldiv?1=?&2
0D
```

and B will be holding 3.

You may be interested to know of at least two other methods which interchange variables but do not make use of a Dummy variable:

Method 1

```
10 A=3
20 B=7
30 A=A+B
40 B=A-B
```

50 A=A-B

Method 2

```
10 A=3
20 B=7
30 A=A*B
40 B=A/B
50 A=A/B
```

The methods however fail for values which have a wide variation in magnitude and contain a large number of

figures. This is due to rounding errors. - P.McDonald, Scunthorpe, South Humberside.

● We have often seen people put A=B:B=A and then wonder why they obtained the wrong result.

It's pleasing to see that people are thinking of other ways around the old problem of swapping numbers.

Drastic remedy

I HAVE OS 1.20, Basic 1, Addcomm, Graphics extension and Wordwise plus.

When I type in a program beginning with the line numbers 1000, 1010, 1020 and so on, press Break, and do an OLD LIST the computer lists the program with the line numbers 232, 1010, 1020 and so on. — R.J. Smallshire, Warley, West Midlands.

● This is due to the way the

BBC Micro works and nothing to do with your extra ROMs.

As Break is rather drastic it should be avoided and Escape used wherever possible.

Pressing Break appears to clear the program from memory. One of the things it does is to put 255 in memory location Page+1.

The line number 1000 is stored in hexadecimal notation as 3 in memory location Page+1 and 232 in location Page+2 ($100=2 \times 256 + 232$), so on pressing Break the 3 is overwritten by the 255.

Old does its best to restore the

program, but as it did not know what number was in Page+1 it puts 0, leaving the first line number as the lo byte only.

Cheating cheapens

I AM disgusted, infuriated and frustrated by your Elite Cheat program.

You have effectively destroyed the heart and soul of an ingenious and magnificent challenge.

A status reserved for the

toughest, most dedicated, skilful and resourceful is now available to any old novice.

You have elevated unworthy cheats to a select group of dedicated and privileged expert combateers.

Ultimately you have made cheap the Elite rating and the game itself. To be Elite now means nothing as far as superior status is concerned.

Your efforts have erased the hard work of the truly Elite commanders. Maybe the game should be renamed Harmless Cheats. — Nicholas Dorgu, Preston, Lancs.

And finally, with tongue firmly in cheek . . .

Surviving the evening's workout

Dear Trev,

Sorry it's been so long since I've put pen to paper, but I honestly haven't had the energy. I never realised that pens weigh so much.

Wasn't it Dylan Thomas who wrote "Don't go gently in that good night" (as Roland, landlord of the Ram and Buffer is always quoting to persuade me to have one or two for the road?)

Well I want to go gently. I have no objection to old age and decrepitude creeping up on me. In fact after what I've just experienced I'd rather welcome it.

Of course the signs were there. How long has it been since I've seen my toes (and why should I want to? After all they're hardly my best feature). And I must admit that I've not been able to get as near the keyboard as I used to.

The most galling sign is that I haven't been able to hurl an empty Boddington's can as far as in former times, a fact which Buster has observed and made use of. I'll swear it's that cat that got my tape version of Elite (which does sound like the name of a cat food when you think of it).

It was Hilda from the Bellringers who really put the boot in. It was one of the Bellringers' monthly muesli tasting parties. She stood there resplendent in her "Pull the other one Thatcher" and "Bellringers do it standing up" badges, looking at me with the same sort of contempt that I reserve for Nigel's Electron.

"Your man needs something doing to him", she observed to A. in a frighteningly cutting voice. "Look at him, he makes a bean bag seem sleek".

Of course that was only one of the random factors. The other was the appearance of an advert in The Micro User

stating that, for a limited period only, Central Processors would be doing a special offer.

The idea was that Beeb owners take their micro in for a service at a reduced rate and while it was being done they could have a test drive of the new Master 128.

It seemed like a good idea but it was a mistake to let Andrea pick it up for me. I should have realised something was up when she agreed to do it, saying that "You won't be able to carry it, will you?"

As soon as I got home from work I rushed upstairs to the back bedroom and there it was in all its glory. A BBC Master. Have you seen one of them yet? I know the adverts try to make them sound boring but they're really quite good fun. Except for this one.

You know that the Master (or Boss as I soon learnt to call it) can start up in any of the sideways ROMs? Well A. had seen to it that this one only had one sideways ROM to start it up. The screen boasted "Flab Beater — the wimp workout".

That was it, there was no other software. As I stared at the screen, appalled, A. crept up behind me and said "You don't get your Beeb back until you're in shape".

What could I do? I know when I'm beaten — most of the time in fact. I pressed the I key for the item on the menu labelled "Start here, softie". All I got was a message saying "You'll have to press harder than that", and that is what I've been doing all week.

I had to enter all the details about myself (supervised over by A. in one of her "there is no alternative" moods) and watch while the micro mocked me. "Well, Bunter", it began and then detailed a course of action that would make Daley Thomson weep.

And I had to do them. I couldn't fake it even though I tried. Instead of my five mile

run I slipped off to the Gay Hacker, our local full-duplex pub, the only place where I wouldn't look out of place in the gear I was wearing (the Seb Coe/Stamley Livingstone look).

On my return however A. had attached some nasty looking wires to the micro which promptly took my heart rate and told me I hadn't done my jog. Curse Cook and his bits of kit. Worse was that it also acted as a lie detector and gave me an electric shock when I fibbed. Just mention a Master to me now and I start salivating.

The only good thing about the whole program was that if you were obedient it let you play a game where you had to avoid having sand kicked in your face. I was good at it, almost as if I'd been doing it all my life (which A. says I have been).

However enough is enough and eventually I cracked. This was when I found out that A. had mixed up pounds and kilos and I'd been killing myself for no reason.

By now I was fit enough to pick up the Master on my own and take it back to the shop whose manager is probably wearing a badge that says "Master dealers walk painfully".

However there have been some benefits. My wrists have stopped aching after long sessions, the keyboard is nearer and my effective can hurling range has improved much to Buster's disgust (though I think he's more annoyed that they're empties than anything else).

Do you realise that Charles Atlas really stands for catless? Now you know why.

Cheers,

Bob

PS: A. had to be carried home from the bellringers sober. Apparently she'd hurt her back on a big pull. I pealed with laughter.

Squashed characters

WITH regard to your otherwise excellent Squashed Character Set article, published in the May 1986 issue of The Micro User, I would like to point out that Robin Nixon is incorrect when he states that the utility will not work in Modes 0, 1 or 3.

By manipulation of the video ULA, accessed through *FX154, it is possible to have an 80 column display in each of the above modes.

To effect this, replace lines 190, 270, 280 and 300 as follows:

```
190 MODE 1 : REM or MODE
  0 or 3
270 ?&30A=79
280 ?&34F=0
300 *FX154,153
```

Although this will make little difference in Modes 0 and 3 the advantages in Mode 1 will be considerable, giving an 80 column display and four colours. — E.J. Golder, London SW18.

Borrowed memory

I WISH to use the function keys to store some fairly lengthy strings, but find that the memory allocated to them is insufficient.

I understand from page 501 of the User Guide that just one

page of memory is reserved for them at &B00.

If one does not want to have any user defined character definitions is there any way in which one can "borrow" page &C00? — Mike Webber, Ilford.

● The keys are accessed in memory by offsets — a distance measured from &B00. These offsets are stored in one byte and so cannot be greater than 255, meaning the definitions must be in page eleven (&B).

Any way round this problem would probably be longer than using a slightly different approach in your program. For instance define the key before use and use just one, constantly redefining it.

Smudged Hexer

I AM finding Mike Bibby's series of articles on machine code very interesting and educational.

I have a few queries however. On line 50 of the Hexer program the print has smudged. Is it £%=4 or @%=4?

What is the purpose of lines 40, 50 and 60? — P. Chyioke.

● Here are the lines you're interested in:

```
40 VDU 23;8202;0;0;0;
50 @%=4
60 *FX 202,32
```

Line 40 simply turns off the

cursor while line 50 sets the field width for numbers to four characters in width, giving a tidy layout when examining memory.

Line 60 ensures that Caps Lock is chosen.

Triple splash

FOLLOWING the request in the May 1986 issue of The Micro User for a "splash" sound, we have taken the best three readers' efforts and put them in this short program. Thanks to the authors, who are acknowledged in REM statements.

```
10 REM MARK LANE
20 SOUND 8,-15,132,6
30 SOUND 8,-12,132,3
40 A=GET
50
60 REM K.A.WHEAL
70 ENVELOPE 1,129,0,-10,-
  1,1,0,2,6,-1,0,-1,126,74
80 SOUND 8,1,7,14
90 A=GET
100
110 REM MICHAEL SMITH
120 ENVELOPE 1,2,2,21,15,
  0,0,1,-1,-2,-11,-1,126,112
130 SOUND 8,1,101,4
140 A=GET
150 RUN
```

be executed by *RUNning it, but do not know the theories behind this.

Apart from this, the course has been consistently well written and explained, and the ideas behind 6502 assembly language have already become much clearer to both me and my friend. — Stewart Yorke, 14, Fareham writing for himself and Glenn Broadway.

● You've probably come up against one of the features of *SAVE — you always have to save one more byte than you intended.

Take the following program for instance:

```
10 PX=&900
20 [
30 NOP
40 NOP
50 NOP
60 RTS
70 ]
```

The code generated runs from &900 to &903. However, if you use:

```
*SAVE "FILE" 900 903
```

you'll find that the last byte at &903 is not saved. As this last byte is often the final RTS, this can be vital, for it will be missing if you then *LOAD or *RUN the file.

The rule is to always *SAVE one more byte than you think you have to.

Save one for luck...

MY friend and I have been following with interest your machine code series.

Storing and running on an assembly language/machine code program seems a fairly hit and miss affair. Sometimes, after running the code and receiving messages like:

```
0000
0000 A9 41
```

typing CALL&00 would get the desired effect, sometimes garbled messages like OSCLIO-SCLIN, and sometimes nothing.

We have also successfully, or so it seems, *SAVED what I assume is the machine code (assembled?) version, which can

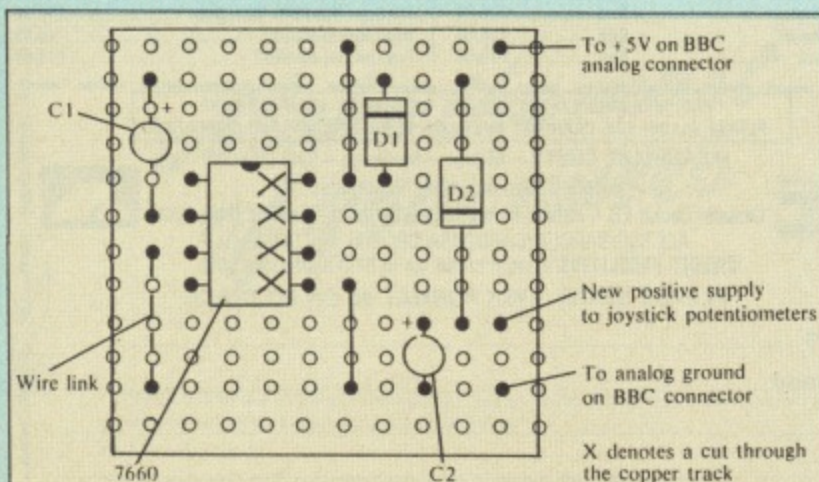
ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

Joystick circuit

A FEW minor errors crept in to Figure IV in the Joystick article published in the June issue of The Micro User. This is the correct version — the main differences being that the diodes' polarities are marked, and some soldered joints changed.



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h**

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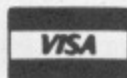


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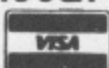
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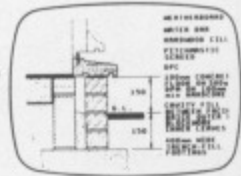
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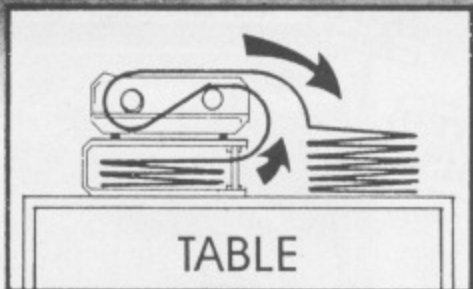
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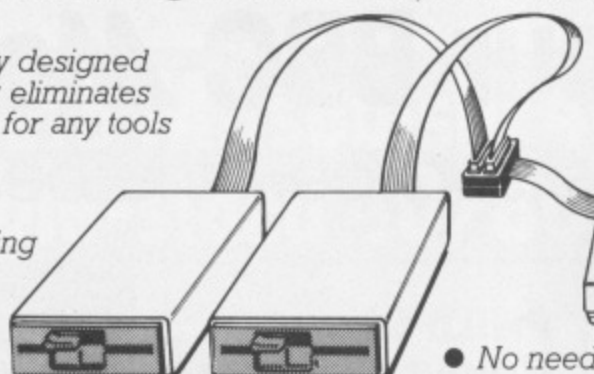
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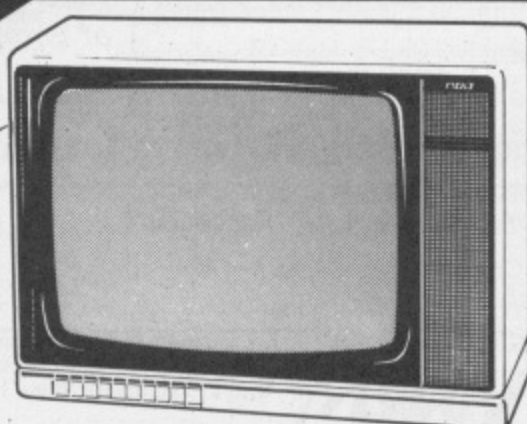


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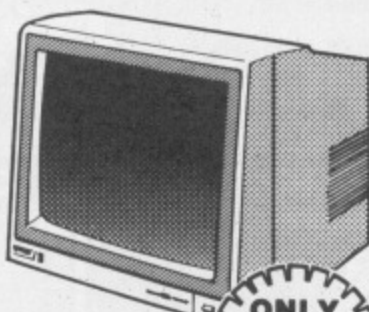
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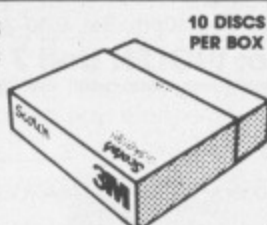
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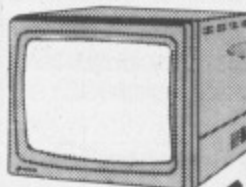
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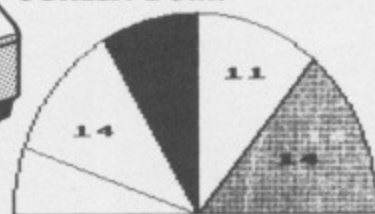
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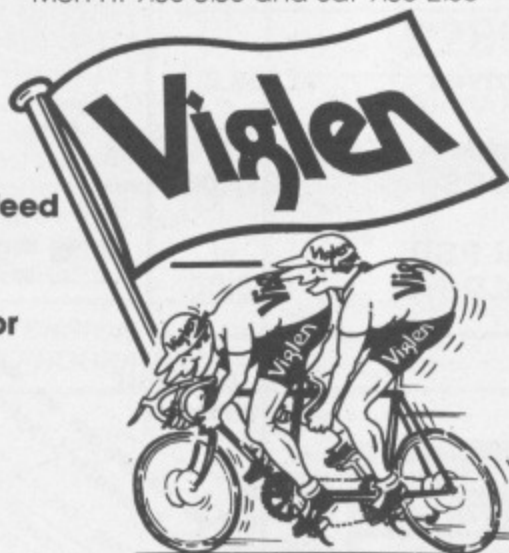
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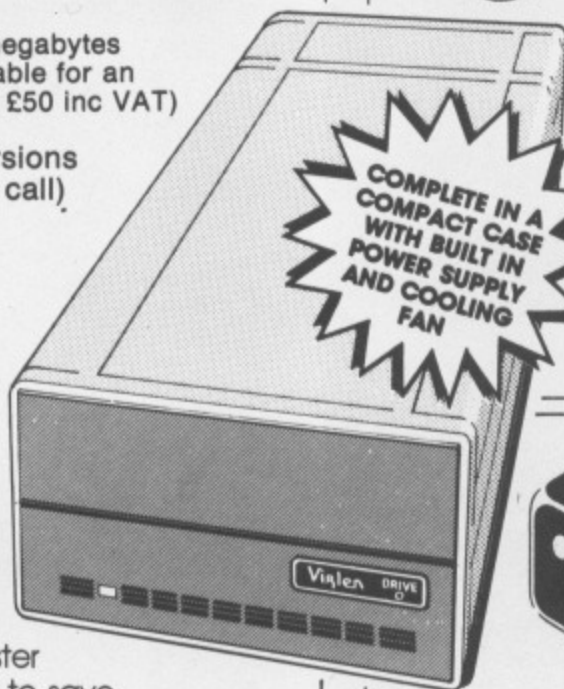
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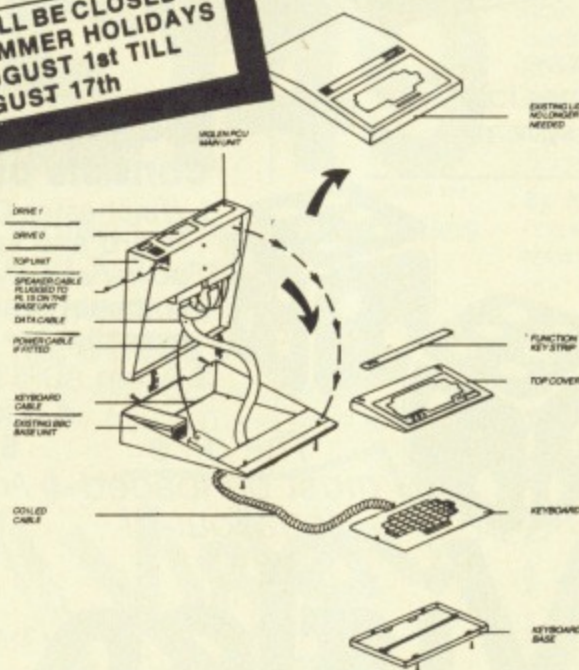
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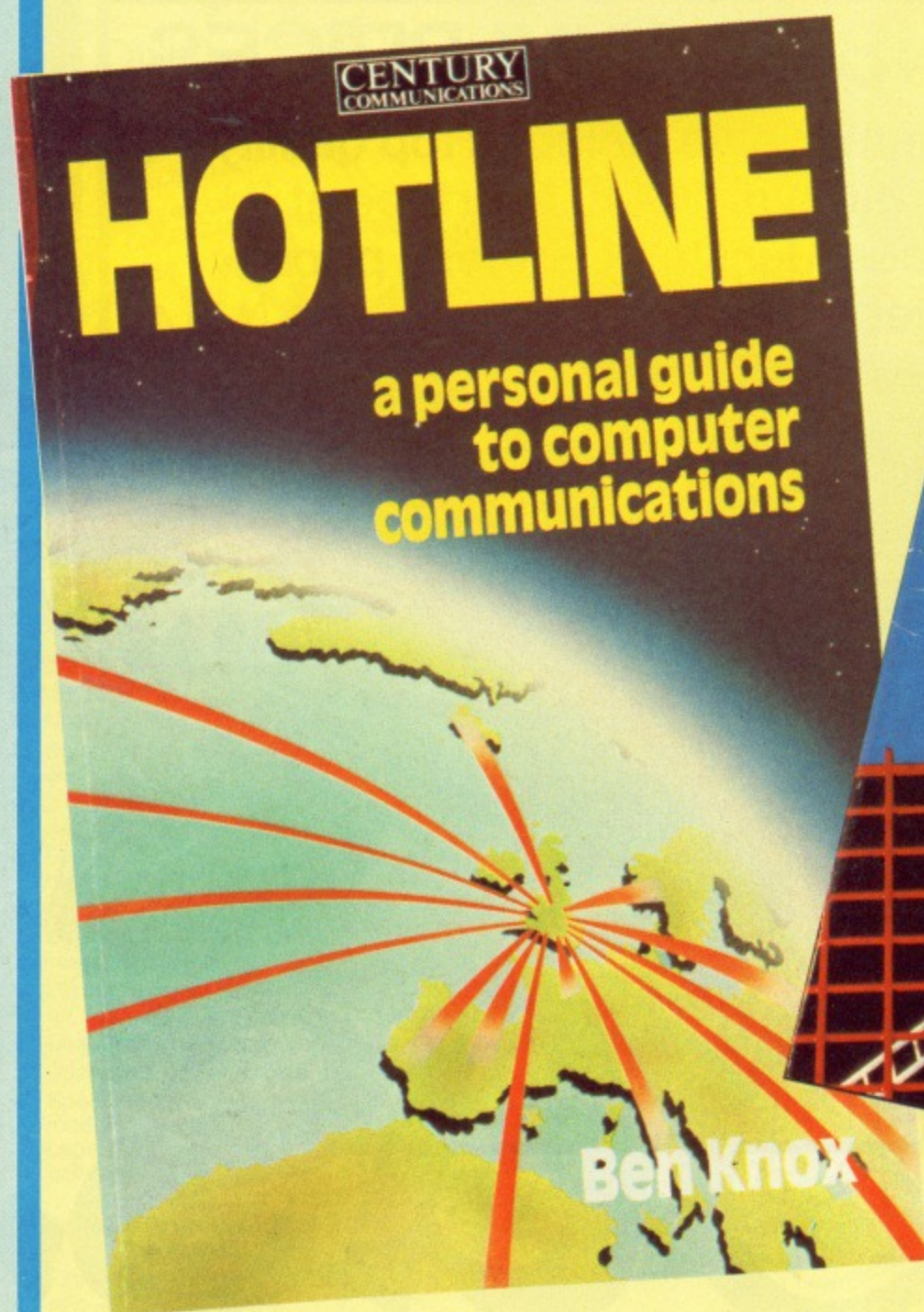


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AUGUST: Harbour Command, protect a Cornish town. Fruit Machine, a gambler's favourite. Mouse Organ, AMX mouse music utility. Flash, alternative flashing colours. String Formatter, prevent end of line word splitting. M/C Games, random number and key detection routines.

SEPTEMBER: Ball Lightning, tame the lightning. Quarters, game of skill. 6502 Games, a simple arcade game. Variable Lister, track your variables. Smiley Hunt, AI's game. Error handling, the vital routines.

OCTOBER: Karate, superb martial art action. Solitaire, all-time favourite. Scroller, text scroll utility. Case, an ON PROC command. Disc Scan, search for disc files. Adventure, avoid the vampire.

NOVEMBER: Whodunnit, solve the murder. Gloop Gulp, zany arcade action. Basic Analyser,

take the drudgery of debugging. Wordwise F/keys, get the most from your word processor. Side-ways, sideways screen clear. New Modes, Modes 8, 9 and 10. Disabler, prevent star command clashes.

DECEMBER: Wizard's Castle, recover a diamond from the necromancer's lair. Squares, 'join the dots' strategy. McBase, powerful database. Alphabet Train, early spelling. Basic Analyser, the vital cross reference tables. Wordsquare Creator, to create your own puzzles. Dumper, how your programs affect memory. Subhunt, the final listing. Plus the listings from Body Building and Adventures.

JANUARY 1986: Megaroids, exciting space action. Claustrophobia, alone in a maze. Can you get out of the maze in one piece? Fives, mind bending noughts and crosses. Music Editor, translate musical notation.

Wordsquare Solver, the program to help you solve them. Find and replace, find and replace any item of text in a Basic listing. Discopy, copy and/or rename files. S-sound, sounds into electronic effects. Alice, another baffling problem.

FEBRUARY: Tipaka, can you escape the Logan King's castle in

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MARCH: Morris Miner, collect the keys and escape the mine before your time runs out in this levels and ladders spectacular. Poster Puzzler, a sliding block simulation to provide hours of fun for the whole family. Quicksort, a fast machine code sort routine that uses and teaches recursion. Character Sets, a program to create and display your own fonts. 8271, four programs to complement the last article in the series. Sound Sampler, two programs from the Body Building course. Eleusis, another mind bending puzzle from Alice.

APRIL: Ghouls of Azzod, can you escape from Azzod manor with its monsters, moving floorboards and venomous plants? Mousetrap, you'll need skill,

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MAY: Cavern Quest, can you collect the diamonds before your oxygen runs out, avoiding the falling boulders as you go? 4-Site, a mindbending 3-dimensional adaptation of noughts and crosses needing foresight. Catalog II, disc operations achieved quickly with a single key press. Taming the Tube, turning the 6502 second processor on and off by software. Character Sets, creating slim characters for use in Modes 2 and 5. Alice, another intriguing puzzle from our adventurer.

JUNE: Pendragon, alone in a sugar factory, can you keep the evil yellow perils away from the sugar cubes, while positioning the four diamonds? Spacebase, as commander of a solitary spacebase you must defend Earth from the invading hoarde of aliens. Rainbow, whether doodling or

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JULY: Royal Wedding, celebrate the most exciting royal event of the decade with this superb sliding block puzzle. Dual Catalog, feel restricted with the Acorn DFS maximum of 31 files? This utility to provide 56 on one side of a disc will solve your problems. Viewgen, what you see is what you get with this printer driver generator for View. PLUS digitised picture of Andrew and Sarah (disc only).

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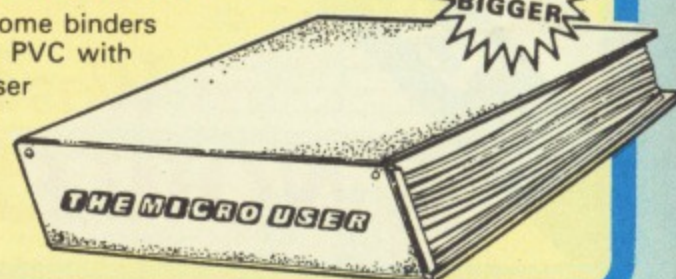
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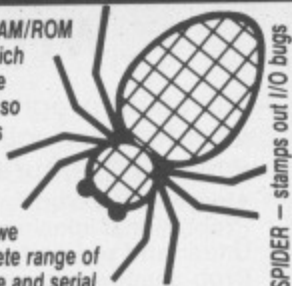
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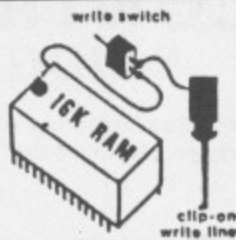
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Advertisers Index

| | | | |
|---------------------------------|----------|-------------------------------|-------------|
| 21st Software | 70 | Minic Business Services | 145 |
| Abbadish Computer Systems .. | 113 | Miracle Technology | 14 |
| Access Software | 105 | Morley Electronics | 74 |
| Advanced Tech. | 114 | Number One Systems | 108 |
| AGF | 129 | Opus | 53, 79, 137 |
| Alligata Software | 147 | P&H Electronics | 126 |
| B & S Computing | 128 | Paul Fray | 146 |
| Beebug | 92 | Pineapple Software | 119 |
| Beebugsoft | 2, 3, 35 | Printerland | 105 |
| C & F Associates | 113 | Qual-Soft | 50 |
| Centec Electronic Systems | 129 | Qwerty Software | 145 |
| Chalice | 82 | RCS | 115 |
| CJE Micros | 66 | Reflex Magnetics | 19 |
| Coastal Tape | 145 | SP Electronics | 145 |
| Comlex | 120 | Select Software | 128 |
| Computer Concepts | 22, 23 | Shards Software | 129 |
| Comtec | 108 | Silicon City | 108 |
| CP Micro Systems | 107 | Slippery Slug | 47 |
| Datastore | 128 | Software Services | 129 |
| Derrick Daines | 113 | Solidisk Technology | 6-10 |
| Design People Software | 107 | Speedy Soft | 95 |
| Disking | 73 | Superior Software | 148 |
| Doctor Soft | 95 | Technomatic | 36-44 |
| Flora Electronics | 146 | Terrell Electronics | 146 |
| Goto Computers | 105 | Twillstar | 80, 81 |
| GPD Systems | 113 | Ultron | 145 |
| HSV Computer Services | 106 | Viglen | 130-136 |
| Jaysoft | 87 | Vine Micros | 100 |
| John Penn Discount Software .. | 146 | Watford Electronics | 54-65 |
| Keyzone | 108 | Weserve | 16 |
| Kosmos | 119 | | |
| Leigh Computer Systems | 145 | | |
| Linear Graphics | 47, 49 | | |
| Logic Sales | 120 | | |
| Mancomp | 119 | | |
| Manor Court | 95 | | |
| Micro Fix | 146 | | |
| Micronet | 127 | | |
| Micro Resources | 90 | | |
| Microworld | 24-29 | | |
| Mighty Micro | 107 | | |

BUSINESS INDEX

| | |
|---------------------------|----|
| Carson Developments | 15 |
| Clares | 12 |
| Context Computing | 15 |
| HI Voltage | 2 |
| Micro Media | 7 |
| Microdis | 16 |
| Microman Computers | 4 |
| Minerva Systems | 15 |



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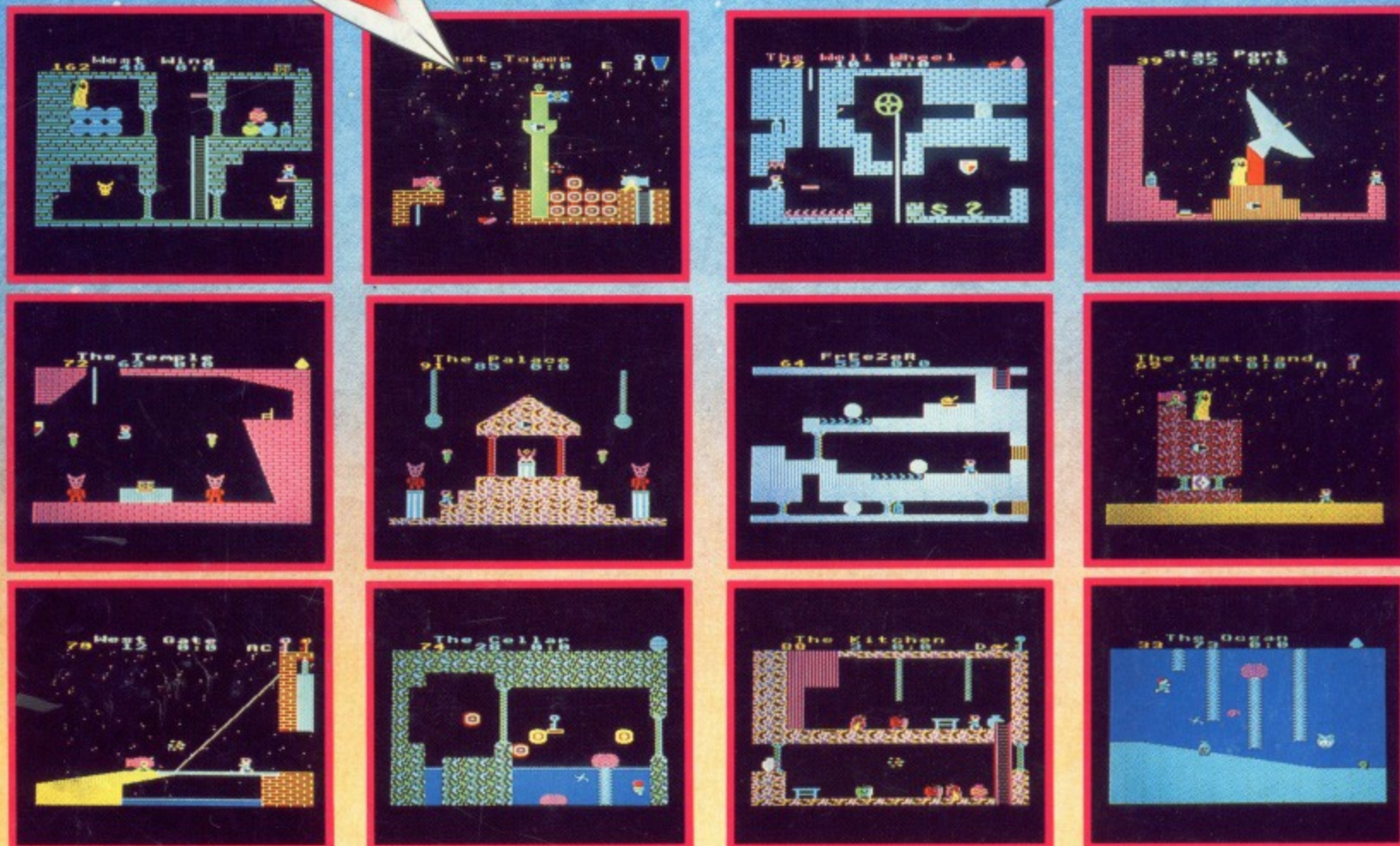
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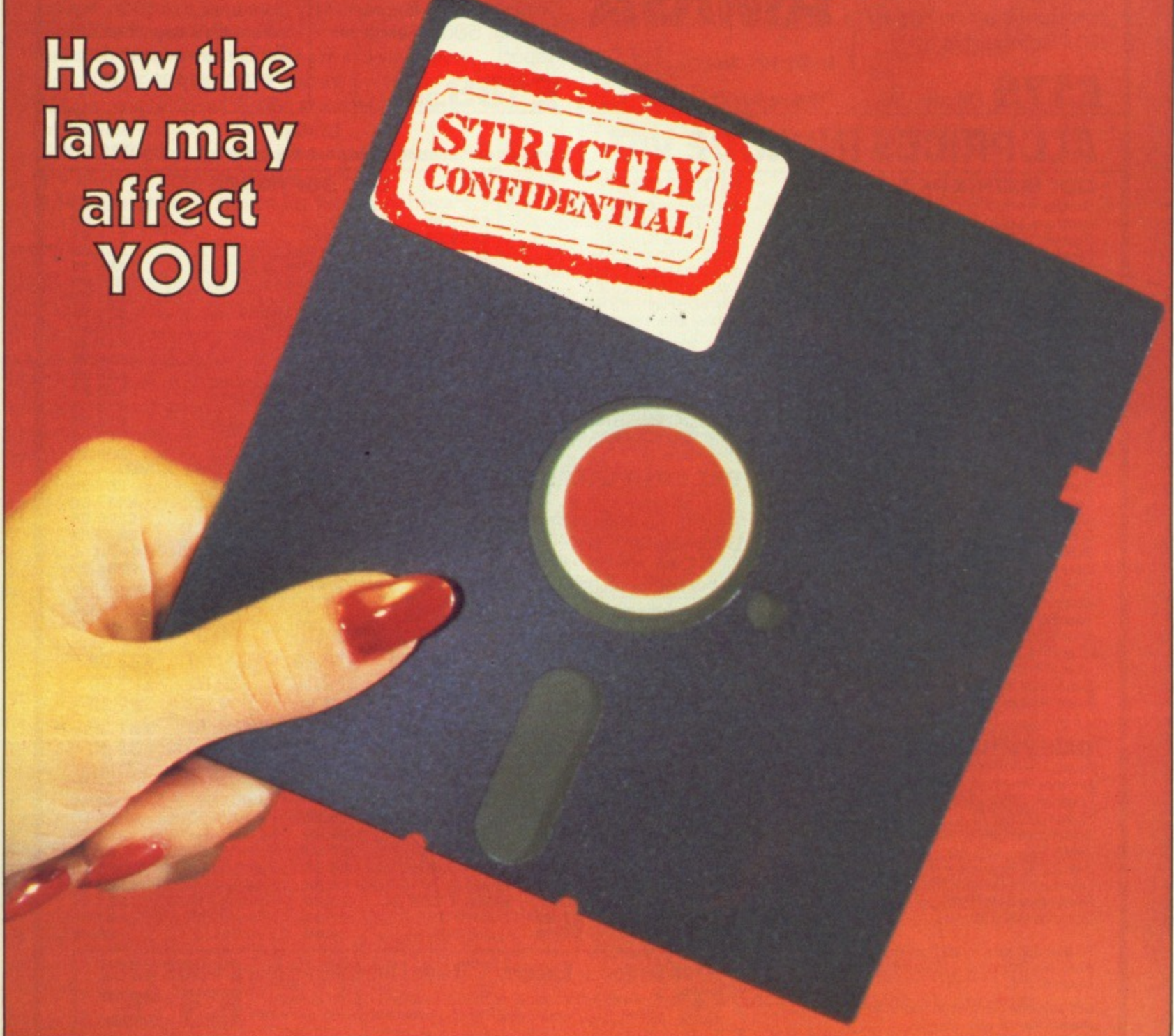
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The Data Protection Act:

Should YOUR business be registered?

AFTER a busy month of talking to various groups of computer users I realised that the questions I was being asked were remarkably similar. I certainly would not have expected these three points to be of such universal concern.

- Can you help us make sense of the Data Protection Act?
- What is the minimum system that is practical in a business environment?
- What is the best source for buying hardware and/or software?

COLLECTORS of trivia may like to know that when the Data Protection Act (DPA) was passing through Parliament it was estimated that 80,000 computers would need to register. The intention was obviously that only those storing potentially controversial or critical personal information would need to do so.

As a result of the lemon that is now in force the number is likely to be somewhere between 500,000 and 1,000,000. What is more, with three weeks to go before the law came into force only 30,000 computers were registered.

Much of this discrepancy is because many small users decided they had better things to do with their time and £22 than register, although the natural tardiness of human nature accounts for part of the difference.

Even Electron users may need to register under this law, which came into force on May 11. The reason is that once HMG had interpreted the EEC directives, massaged the most complicated series of compromises since Salt 1 in order to bamboozle every freedom of information activist into thinking they had scored a few tactical points, wrapped the whole shooting match in legalese and ensured the exemption of State-run computers, even school teachers keeping their pupils' test marks on computer became liable for registration.

Explaining why we are stuck with this nightmare is one thing, but more important is offering guidance as to what compliance entails. Fortunately the DPA has little effect on most organisations' working practices, but the following should minimise the disruption while providing individuals their rights under this law.

- Some responsible member of the organisation must be the registered Data Protection Officer under the DPA.
- Any one who believes there is information about

JO STORK discusses how the new law could effect BBC Micro users

them held on the computer may request printed copies of such data as pertains to themselves or their next of kin.

- Any one who believes there is information about them held on the computer may demand changes to any erroneous data pertaining to themselves or their next of kin.

- Data on the micro may only be accessed by a very short list of nominated persons.

- No data may be passed to other organisations unless it fulfills the following four qualifications – firstly, that organisation is one to which the original organisation is constitutionally affiliated, for example a football club to its league or a small business to its parent company, or it is the designated auditors of the organisation.

- Secondly data passed is so “massaged” that all possibility of identifying the individuals to which the data pertains has been removed.

- Thirdly all people to which the data refers are notified that such a transfer has taken place, and finally an exact copy of the data passed is made available for examination by any person to which this data refers.

- Any one person with data recorded who can show just cause may veto transfer of data provided that veto does not place the organisation or individual holding the data outside the DPA or any other law, and that it does not hinder the organisation or individual holding the data from carrying out its stated objectives.

- All data held – whether printed or in computer readable format – is treated as highly confidential.

- Recipients of any such information must sign for its receipt and return it to the organisation when so requested, unless that data pertains to themselves or their next of kin.

- Where dispute arises between the individual's rights or wishes and the organisation's requirements, the Data Protection Officer should be the arbitrator as defined under the DPA.

Since no one anticipated that so many computers would need to register, the whole administrative machinery that was set up is unable to cope with the



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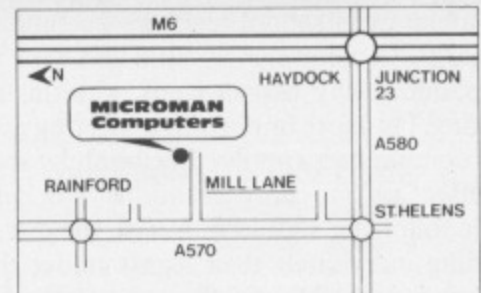
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From Page 3

numbers that have come within the law. Consequently many micro users are ignoring the DPA on the basis that they are highly unlikely to be caught.

No doubt a few highly publicised test cases will be brought to try and dissuade users from continuing to do so. My recommendation however is that since the points listed earlier are hardly onerous, holders of personal information on a BBC Micro should register.

What system?

IT is virtually impossible to give hard and fast rules as to what is the minimum system that is practical in a business environment. However there are five points to consider and once we have dealt with these the minimum system will have chosen itself. I shall discuss them in order of precedence.

Firstly, what is the smallest operating system that can handle the task? Micro manufacturers are faced with a legion of compromises before they have a marketable product – if they provide too few facilities the more expert users will complain and if they provide too many then the more inexperienced may find the system difficult to use.

An attempt to overcome this problem has been the creation of icon-based systems such as Gem or Windows. Unfortunately the reasons why a minimal system can not employ such facilities are that they need a considerable amount of memory and they take a fair percentage of the CPU's resources.

Cycle-stealing, as it has become known, is now a major problem with many mainframe computers. As processor power climbed and memory prices tumbled more of the available resources were used in servicing the system overheads and less in doing the useful work the computer was originally bought for.

As software features of only marginal worth were added the productivity actually dropped. Sadly there have been many cases where larger computers were got to replace early models but both supplier and user soon discovered that the older, albeit over-loaded, equipment was actually doing the more useful work.

This situation has not yet arisen with micros, but the first danger signals are evident. Micro software which needs a minimum of 384k to run is now commonplace, though mercifully Acorn is still free from these.

You are by now familiar with my persistent urging to refrain from getting more application software than you need. Do not forget that this principle equally applies to operating systems.

Secondly how much space is needed for the on-line Help facilities? Users are notoriously bad at using operation notes. While part of the reason is that these are frequently so badly written, it is also true that there is something about human nature which stops a person sitting at a keyboard from going to a book or vice versa.

The result is that we must accept that any system worth its salt requires lengthy sections consisting of Print statements offering the operators guidance for

every option they may be faced with.

Since these statements need to be called at the time when the option has to be made, approximately 25 per cent of a program's size in the systems which I design is usually taken up with such instructions. If the disc handling is suitable – see below – then randomly accessing a Help file is a way of saving RAM.

Obviously the precise percentage of RAM given to operator assistance will vary depending on whether you are writing a spreadsheet or an invoicing system – the former needs much less.

By now you should be getting some idea as to the memory requirements of a minimal system. However this can change drastically after the third factor is considered. Let's examine what the minimum file handling requirements are. Different applications have different file requirements. As a general guide this table shows the minimum values likely to prove satisfactory in all but the smallest of systems:

| File | Record Size | Number of Records |
|----------------|--|-------------------|
| Stock file | 75 characters | 2,000 records |
| Customer file | 100 characters | 400 records |
| Sales file | 70 characters + 25/item line | 1,500 records |
| Supplier file | 100 characters + 25/item line | 250 records |
| Nominal file | 50 characters | 500 records |
| Personnel file | 600 characters | 30 records* |
| Payroll file | 90 characters + 40/week held on-line | 60 records* |
| (Help file) | 80 characters | 100 records) |

Minimum file handling requirements

These dry figures do not tell the whole story. For a start the number of records for personnel and payroll represent the minimum number, since if less staff are involved it is not really practical to computerise these tasks. Also most applications should open more than one file simultaneously. For example, stock recording requires the Stock file and Supplier file for goods inward while needing the Stock file and Customer file for goods outward.

If you produce a table such as this it should not come as a surprise to discover that the system will require three randomly accessed files occupying over 200 Mbyte of disc storage on line at any one time, excluding the program itself.

Our fourth consideration is how long it takes to enter the data for one transaction and the time required for its processing. If the micro is used for less than 10 hours per week this is a less critical calculation than if someone is going to spend the greater part of their working day at the keyboard. Nevertheless it is still vital to establish some ratio between data entry time and processing time.

Arguably the most important mistake in configuring a system is to have the processing done in double-quick time when the data entry is very slow. Stuffing whole

From Page 5

files into memory is a sure-fire way of getting this ratio wrong.

There is considerable pressure to purchase as much raw computing power as you can afford. In fact, except for the sorting of files and spreadsheets, most commercial tasks do not need particularly powerful processors. Business applications are almost invariably Input/Output-bound – that is, restricted by the keyboard, printer or discs.

This is just as well because after a few days of living with a system which can process at very high speed the average operator will begin to feel that he has lost control of it and is being driven by the silicon.

The next most frequent mistake is the exact reverse, in other words having such a snail paced processor that the operator becomes frustrated at the lengthy waits that are necessary between inputs.

If the bulk of the work is going to involve frequent sorting, spreadsheets or considerable mathematical activity you may need all the power you can get for the money. If you can afford a Winchester disc and/or cache memory, you can get away with far less processor power.

Nevertheless with memory so cheap and co-processors hardly expensive, Winchesters are not cost-effective if you don't require the file handling capacities and facilities they provide. Having ample memory is still the cheapest way of providing processing speed, provided the memory can be rapidly filled with the data to be manipulated.

On the other hand if the task is a typical 40 characters of input followed by a file access and a simple Debit-Credit-Plonk then a relatively slow processor and much reduced memory will be little or no handicap.

Finally, is the keyboard suitable for the application? Time and again users forget this question, because it is very much a matter of personal preference. Some operators prefer keyboards which are quite sharply angled whereas others want them virtually flat, and some prefer keys to be relatively stiff while others want them extremely light to the touch.

Although this may not be of such importance to the non-typist it is a major concern to those who carry out several hours of word processing at a stretch.

As a general rule I reckon there are four minimum requirements assuming you are prepared to live with some inefficiencies in display format or graphics handling. First you need 16k memory – including Helps – available for the program. Few require more than this, since splitting and chaining into smaller modules is often more efficient.

You also need a random access filing system capable of handling a maximum record length of 1k characters, 5,000 records per file and three files simultaneously, a processor capable of recalculating a 500 cell spreadsheet of average complexity in less than 10 seconds and finally a keyboard which suits the operator's typing abilities and style.

This brings us to the obvious supplementary question – can a BBC Micro be regarded as a practical

proposition? The sad fact is that despite the claims of many software houses who are peddling their wares, the smaller models are not ideal buys unless you are prepared to add a certain amount of chippiness to them. If you want a micro for a small business there are many better machines available.

Yet while the processor power/memory/disc handling/memory/keyboard mix of the BBC Micro is far from ideal for business it is certainly capable of doing a useful job of work. I have few such reservations regarding the newer and larger models, although Acorn's pricing policy may make them unattractive to new buyers.

Where to buy?

IN the nearest major shopping centre to where I live three of the four major chains supplying micros are worse than useless as far as commercial systems are concerned. The reason is nothing to do with the range of hardware offered, the software available or the prices they charge.

It is simply because they employ youngsters with little or no computer experience. Indeed the primary qualifications for employment behind their counters would appear to be ownership of a trendy suit and a score of over 5,000 at Pacman.

However if I travel 30 miles in the opposite direction the chains would be the ideal place to buy a system, as the staff are more mature and have a genuine understanding of a commercial user's needs.

The problem is that novices to computing find it difficult to judge between good, bad and indifferent retailers. For their benefit I offer the following two questions which may be used as an acid test of a dealer's competence – Can you show me? and How many have you personally supported?

I am never concerned if the actual fingerwork during a demonstration is less than slick, since I rarely have difficulty in telling the difference between an operator who is somewhat unpracticed and a piece of software which is awkward to use.

Similarly it only takes a couple of supplementary questions about an organisation's conversion to a computerised system and the manager will know whether the vendor is waffling or offering genuine support.

If you are not completely satisfied with the answers to these two questions, you should hunt for another supplier.

This leaves a final potential supply of equipment or software and the mail order suppliers offer some exceptional bargains and while potentially a much riskier source, there is no denying that much merchandise which never comes within a country mile of most High Streets, is available by post.

For the younger user who is fully clued up about computing, scouring the advertisements of this magazine can be a highly rewarding activity. It is the older, less confident businessman who must apply considerable care before sending off an order. This is when having an objective friend or advisor becomes really invaluable.

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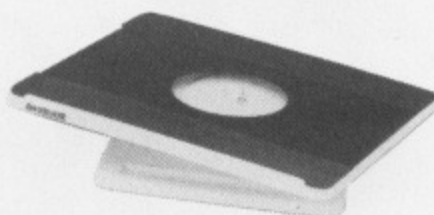
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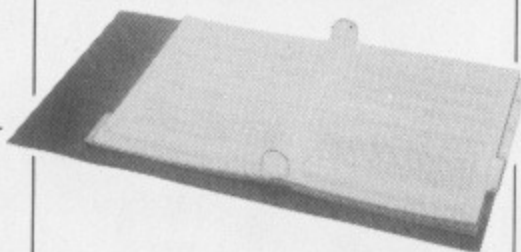
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| Red Brown Blue | 2.50 | 2.10 |
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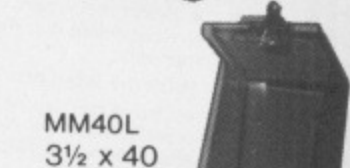
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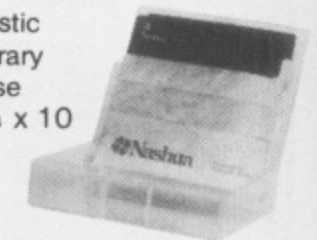
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Some of the features of the new Mini Office II

With the word processor you can...

- ★ Select most features by menu or embedded commands. ★ Transfer records from database for personalised circulars. ★ Choose from three methods of display: 20 column (double size characters), 40 column, 80 column (20 and 80 columns only on 'B' Plus and 6502 Second Processor).
- ★ Centre, indent, tab, justify and merge text. ★ Insert, copy, move or delete blocks of text.
- ★ Select two editing modes: insert or overwrite. ★ Search and replace globally or selectively. ★ Check typing speed in words per minute. ★ See on-screen real-time clock, plus word and character count.

With the database you can...

- ★ Select five field types (Alpha, Decimal, Date, Integer, Formula).
- ★ Perform all arithmetic functions.
- ★ Search over multiple fields.
- ★ Mark individual records. ★ Use flexible printout routine. ★ Pass records to the word processor. ★ Carry out powerful multi-field record sorting.

With the spreadsheet you can...

- ★ Total rows and columns, with easy selection of criteria. ★ Copy formulae either absolutely or relatively. ★ Print out all or part of the spreadsheet.
- ★ Move directly to a specific location. ★ Select movement of cursor.
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With the label printer you can...

- ★ Design any style of label with the versatile editor. ★ Select label size and sheet format. ★ Read directly from database files.

With the graphics pack you can...

- ★ Enter data directly or take from spreadsheet. ★ Use icon type menus.
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- ★ Take advantage of the extra memory of the BBC B Plus and 6502 Second Processor.

- ★ Features that were not in the original Mini Office.

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When it was launched in October, 1984, Mini Office was acclaimed as the most innovative software of the decade, creating new standards in serious programming and at a price everyone could afford.

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Which is why there has been so much speculation throughout the industry about what the much-rumoured Mini Office II would be like. After all, how do you beat a best-seller?

The answer is – by making it even better! And the new Mini Office II is certainly that ... in every respect.

While still retaining upward compatibility with the original Mini Office, it is packed with a host of new features that have been made possible by the tremendous strides made in programming techniques in the last 12 months.

The result is the most comprehensive suite of business programs ever produced for the BBC Micro – and still the best value ever.

And it comes with a no-nonsense easy-to-follow guide to business computing that will take you step by step through all the many features, showing you how to use their huge potential to the full.

It's a word processor...

Mini Office II Word Processor

Word Processor menu

Edit text
Preview text
Print text
Clear text
Search & Replace
Catalogue
Select Mouse
40 character mode
Merge text
Save text
Load text
Mini Office II Menu

Use cursor keys to choose then press RETURN

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It's a database...

Mini Office II Database

Database menu

Edit data
Load/Save/Print
Search data
Sort data
Calculate
Edit structure
Select Mouse
Clear data
Clear all markers
Toggle markers
Hardware options
Mini Office II Menu

Use cursor keys to choose then press RETURN

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It's a spreadsheet...

Mini Office II Spreadsheet

Spreadsheet menu

Edit spreadsheet
Load spreadsheet
Save spreadsheet
Save graphics data
Print spreadsheet
List formulae
New spreadsheet
Alter screen display
Catalogue
Select Mouse
Mini Office II Menu

Use cursor keys to choose then press RETURN

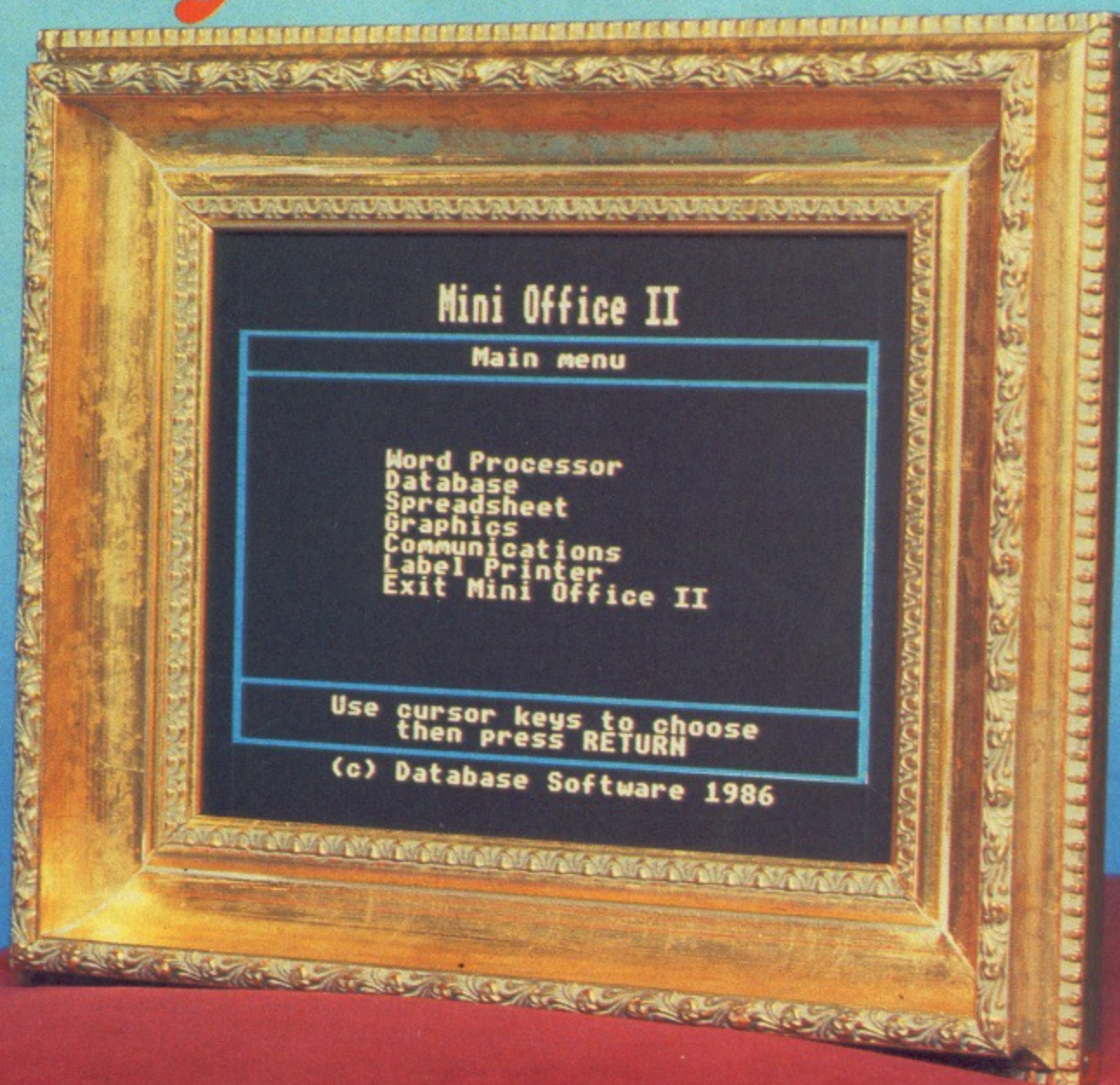
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ON PAGE 143



et... It's a graphics pack... It's a comms pack... It's a label printer...

Mini Office II Graphics

Graphics menu

- Bar chart
- Line graph
- Pie chart
- Load data
- Save data
- Edit data
- Clear data
- Select Mouse
- Review data
- Catalogue
- Mini Office II Menu

Use cursor keys to choose then press RETURN

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Mini Office II Communications

Communications menu

- MicroLink/I.Gold (1200/75)
- MicroLink/I.Gold (300/300)
- MicroLink/I.Gold (1200/1200)
- Customised protocols
- Select Mouse
- Mini Office II Menu

Use cursor keys to choose then press RETURN

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Mini Office II Label Printer

Label Printer menu

- Load file
- Append file
- Catalogue
- Edit format
- Load format
- Save format
- Print labels
- Storage media.....Disc
- Select Mouse
- Mini Office II Menu

Use cursor keys to choose then press RETURN

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odule or £14.95 (cassette), £16.95 (5¼" disc), £19.95 (3" disc)

The making of a one man business

WHEN I started Firebourne I did hardly anything with the computer the way you are supposed to. Software wasn't carefully evaluated and matched to my needs — to be frank I hardly knew what my needs were, let alone what they would be.

Peripherals were bought piecemeal and plugged into the micro I already used as an "adult toy". Yet somehow it has all come together, providing everything I need now and for the foreseeable future. Obviously, somewhere along the way I did something right. With hindsight, and in the light of the activities of the business, perhaps that was the choice of a BBC B as my electronic toy.

Firebourne has to do the same things as most businesses — generate invoices, keep the books, placate the VAT officer and send letters. Its particular business is marketing and promotion consultancy, so most of the output is reports, plans and text for promotional material.

The differences from most small businesses are that the number of transactions is relatively small, and there is no stock to keep under control. These are two major factors in keeping administration straightforward, and are perhaps the reason why I've been able to break the rules and get away with it. For all that, the system I have could cope with a business much more elaborate than mine.

Taking the hardware first, the BBC B is standard except for the addition of a Watford Electronics ROM board. An ordinary Acorn DFS controls Cumana dual double-sided 40/80 track disc drives. The monitor — essential for any business application — is a green screen Samwoo. Finally, the printer is a Juki 6100 daisywheel. It's all in daily — and often nightly — use, and has performed consistently well.

The BBC's strengths, apart from its performance, are its versatility and wide base of users. That shows in the range of peripherals available and the ease with which they can be used. The drives, monitor and printer were all just plug-in-and-go purchases. I bought 40/80 track drives "just in case" and the forethought has paid off in that I occasionally have to read 40 track discs without the option. Apart from that I work exclusively in 80 track format.

The dual drives are a bit of a luxury. However, they do have an unquantifiable benefit which I would describe as the absence of irritation thanks to not having to swap discs repeatedly. To know it is to loathe it!

The monitor was chosen quite carefully in that I actually saw several models demonstrated displaying Mode 0 text, not just 80 column, but BBC 80 column. I

was not impressed by the ones I saw until I realised the dealer was not aware of the interlace control given by the BBC's operating system. Once I'd switched off the interlace with the *TV command most of the display sprang into sharpness and I was able to make my choice.

The printer was one of the easier decisions. I knew that dot matrix printers were fast and that NLQ was at that time becoming available on machines I could afford. However there were two reasons why dot matrix was not suitable for my needs. Firstly, Firebourne operates in areas where presentation is considered very important. Secondly, it is sometimes to my advantage to be able to output camera-ready typescript for printing.

Where standards are anything above the typographically awful, even good NLQ still has that "N" woefully evident to eyes as critical as my clients.

So it had to be daisywheel, and the Juki performed admirably. It enables me to produce crisp-looking letters, plans that inspire confidence because they really look good, and copy that keeps me friends with my typesetter because he can read it without going dotty.

The presentation aspect is important because it conveys quality and reliability and offices filled with back-up staff. There's no need for any client to as much as suspect that (just between you and me) I actually work from an "office" at home. With no other staff.

Of course hardware alone is not enough — you need software too. That's where the wide user base of the BBC scores again, with loads of cheap (in a business context) effective packages on the market. My main requirement is for word processing, and I was lucky enough to be able to try out a friend's Wordwise (Computer Concepts) for a few days. I was impressed by how easy it was to use, and using visible embedded codes between markers seemed to come naturally to me.

Although I could see the attraction of the so-called "what you see is what you get" type of word processor on balance I liked the easy to read Mode 7 edit screen and the completely clean preview screen. When Wordwise Plus became available I snapped it up.

To save time I use a variety of standard forms — analogous to the stationery pad on machines like the Macintosh — for documents like invoices, statements, reports, schedules and sales letters. The details are quickly entered from the keyboard or from disc file.

The real benefit, though, is WTCTCPLYGWW (Whatever They Call That Clever Programming Language You Get With Wordwise Plus). I loathe

Like many small businessmen, Ken Knowles works from home on his own. Not for him the luxury of a secretary or a filing clerk to do his bidding. In their place he has his BBC Micro to ensure that Firebourne — his marketing and promotion company based in Reading — runs smoothly.

Here he outlines how he came to grips with his machine and ensured it became the only real back-up he needs in his day-to-day operations.



several short routines into the segments using a !BOOT file — for example a stationery/standard forms menu that lets me select and load my choice from disc quickly and easily with a total of just two key presses.

Supporting the word processing function I have Romspell (Watford Electronics) installed. I can spell, but I don't type very accurately. Once I'd realised that was going to lead to too much proof reading and reprinting, a spelling checker became essential. Now I run all output through it as a matter of routine.

When clients need it I can supply text for catalogues, for example, on disc so that it can be phototypeset directly. There's no need for the text to be re-keyed, and no need for proof reading — valuable time and money savers.

On the financial side I use a spreadsheet — Ultracalc 2 from BBC Soft — which is quite sufficient to allow me to make useful cash flow forecasts, for example, and keep my books to the satisfaction of the VAT officer. I stress that it's no more than the books I'm keeping, with a few key reporting facilities; it's not an accounting system.

I considered using an accounting package but couldn't find one good enough and cheap enough to suit my way of business. For example, to help get my fees promptly out of big companies, I try to make sure that invoices go to the right person in the right department. The problem is that this tends to generate long addresses, and getting round accounting packages that use fixed or insufficiently flexible formats for things like addresses is more trouble for me than the package is worth.

As an experiment I did buy a very cheap commercial package just to get the feel of working with one. I am still recovering from the shock of seeing my very first input, 45th qwerty 1066, being accepted as a valid date. Error response within the program seemed to be confined to ON ERROR RUN, which at least gave me

plenty of chances to get the date right. It did not inspire confidence and would not have endeared me to the VAT

How does the BBC Micro compare with other systems? Dedicated word processors like the CPT range can be wonderful, there's no doubt. The Macintosh is great fun to use — no small recommendation for a business tool. But they can all be crippling expensive for small companies, and even if affordable their cost-effectiveness is low compared with the BBC Micro.

People like you and me, business people rather than operators, who use these and machines like the IBM clones are often impressed by the speed of the BBC Micro. Not the CPU clock rate, but the fact that mostly all you need to do is switch on and go with software that's amply powerful and easy to use.

You'll notice that all the BBC Micro's software I've mentioned is ROM based. Until you've experienced the irritation of loading a DOS, then loading the word processor or other application, discs whizzing about like mad, you can't fully appreciate the convenience of sideways ROM.

So the BBC Micro works for my business by being a versatile piece of hardware that connects easily to any peripheral I envisage using. The machine runs a wide range of cheap general purpose software which is easy to adapt to my specific requirements without the need to run back and forth to the dealer for help.

That Firebourne exists at all is made possible by my BBC Micro's system. No book-keeper. No office typist. In fact, no office.

Quite simply, if I had needed to employ and house another person to do this work with a conventional typewriter, Firebourne would not have survived its early days, and could only be operating now with dramatically reduced profit. And that, after all, is what business is about.

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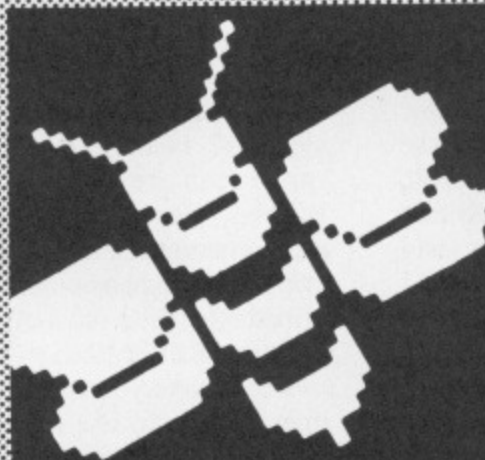


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WE have already used Mini Office II to create a simple spreadsheet using the three elementary operations of entering text, values and formulae. The values are the numbers – the raw data that the spreadsheet will work on. The text labels this data and the formulae tell the spreadsheet what to do with it.

These operations are the same for all spreadsheets, and most of what will follow in the next few months will also be generally applicable. So don't be put off if you don't have Mini Office, as you'll still be able to follow what I'm talking about.

While the spreadsheet program does the work of storing the text and numbers and doing the calculations you have to decide where everything appears on screen. You can't just tell it to multiply 4 by 5, you have to put 4 in a cell, 5 in another cell and use a formula to get it to multiply the contents of the two. You've also got to supply a cell for the answer to appear in.

While it sounds complicated it's actually quite easy and common sense. Yet paradoxically, just because a spreadsheet can be created so easily they often come to grief. This is a result of their not being planned or thought through beforehand.

Probably everyone who's used a spreadsheet has had the experience of suddenly realising halfway through that they've left something out, or they're faced with a vast array of unlabelled numbers and can't find the result they want.

If the required number is the result of a formula this is solved by having the cursor roam around the spreadsheet until the required formula appears in the status area. A better way is not to let the thing happen in the first place.

So despite the fact that the spreadsheet program is designed to do away with paper and pencil I am now about to tell you to use them. But not to do the sums, just to design the layout of the spreadsheet itself before you start typing. A bit of thought as to where figures are going to be along with proper labelling saves a lot of heartache. Forethought saves time.

Some spreadsheets have very sophisticated commands that allow you to help correct mistakes in its structure, but it's better if the problem is avoided from the start. I promise you won't regret the time spent planning, nor will you regret labelling everything that appears.

Let's see how to create a simple spreadsheet using the data in Figure I.

This summarises the results of three boys – Tom,

| | TOM | DICK | HARRY |
|-----------|-----|------|-------|
| ENGLISH | 50 | 70 | 60 |
| COMPUTING | 60 | 50 | 40 |
| MATHS | 60 | 40 | 70 |

Figure I: Exam marks

It's back to pencil and paper...

Says NIGEL PETERS, as he continues his exploration of spreadsheets

Dick and Harry – in three exams. What we want to know is the average mark each boy got in all three exams and the average mark for each exam. Of course we could just use our calculator, but from the grid-like way the data is held a spreadsheet seems to be called for. This is what we'll use, creating the spreadsheet shown in Figure II.

While it's easy to see how the numbers in Figure II correspond to the data in Figure I there are some things to take note of. The numbers haven't just been chucked in haphazardly with Tom's English mark in A4, his maths in D1 and his computing result hidden away at F6.

It could be done this way and the formulae and figures could be combined to get a result, but it would be hard work and all too prone to error. You'd be chasing your data all over the place.

However it's obviously better to have the data more sensibly organised, as is the case in Figure II. Here all of Tom's marks are held in one column, column B. Dick's marks are in column C while Harry's are in D.

The data isn't just structured into columns, it's also structured in rows. We could have Tom's English mark

| | A | B | C | D | E | F |
|---|-----------|-------|-------|-------|-------|---------|
| 1 | | TOM | DICK | HARRY | TOTAL | AVERAGE |
| 2 | ENGLISH | 50.00 | 70.00 | 60.00 | | |
| 3 | COMPUTING | 60.00 | 50.00 | 40.00 | | |
| 4 | MATHS | 60.00 | 40.00 | 70.00 | | |
| 5 | TOTAL | | | | | |
| 6 | AVERAGE | | | | | |

Figure II: The basic grid



Figure III: Screen options

From Page 13

in cell B2 while Dick's English mark is stored in cell C3. Yet although possible, it would be a silly way of doing it.

Again Figure II shows a better way. Here all the English marks are held on row 2, the computing on row 3 and the maths on row 4. It's easier to understand and the simpler things are, the less likely that you'll make a mistake. Also the easier it is to track down any mistakes you have made.

So it's a good idea to think about the way that numbers will appear on the spreadsheet. A good structure saves time, trouble and tears. And labels with a good structure make things even easier.

Notice that in Figure II I haven't given a label to

every separate figure. Instead I've given meaningful labels to the rows and columns and I can then use these as map references to get the name of any particular bit of data. Hence it's easy to see that the contents of cell B3 are Tom's computing results and D4 is Harry's maths figures. Row 5 will hold the totals of each of the lads' results while column E will hold the total marks for each subject.

It may seem a bit odd using the label TOTAL in each case, but its cross reference shows the difference. Hence E2 holds the sum of all the English marks, while C5 holds the total of all Dick's marks.

So far so good. We've got our data and thought up a structure to hold it and the results of our manipulations. However if you've tried entering it into your Mini Office II spreadsheet you may have come across a problem.

At the beginning each column is only seven character spaces wide and our label COMPUTING has eight characters. Don't panic. All you have to do is change the default values for the screen layout. Spreadsheets vary in how much and how easily you can change their layout. With Mini Office II it's quite easy to change the layout of the grid. All you do is select the:

Alter screen display

option on the main spreadsheet menu and you are confronted with the menu shown in Figure III.

As you can see, there are all sorts of options which you can explore at your leisure. For the moment let's concentrate on the parts that apply to our problem. What we want to change is the column width which is originally set to 7. Let's change it to 10 to give us lots of room. This is done by using the cursor keys to select the column width option, and pressing Return.

The program then asks you how wide you want it, so you enter 10 and again press Return. Then to get back to the main menu you select the spreadsheet menu option at the top of the list.

This takes you back to the main spreadsheet menu and choosing the Edit spreadsheet option allows you to get on with the job of entering the data. Try it out on your spreadsheet, attempting to get as close a copy of Figure II as you can.

Once we've done that we can move on to getting our spreadsheet to do our sums for us. Again our data is structured so that it's no problem getting it to do it.

To get the total of all the English marks it's easy to see that we add together the numbers in cells B2, C2 and D2 with the results going into E2. So the formula we put into cell E2 after remembering to press the red function key \mathcal{F} is:

$$B2+C2+D2$$

Now cell F2 is to be used to hold the average of the

| | A | B | C | D | E | F |
|---|-----------|----------|----------|----------|----------|---------|
| 1 | | TOM | DICK | HARRY | TOTAL | AVERAGE |
| 2 | ENGLISH | 50.00 | 70.00 | 60.00 | B2+C2+D2 | E2/3 |
| 3 | COMPUTING | 60.00 | 50.00 | 40.00 | B3+C3+D3 | E3/3 |
| 4 | MATHS | 60.00 | 40.00 | 70.00 | B4+C4+D4 | E4/4 |
| 5 | TOTAL | B2+B3+B4 | C2+C3+C4 | D2+D3+D4 | *** | *** |
| 6 | AVERAGE | B5/3 | C5/3 | D5/3 | *** | *** |

Figure IV: The formulae used

| | A | B | C | D | E | F |
|---|-----------|--------|--------|--------|--------|---------|
| 1 | | TOM | DICK | HARRY | TOTAL | AVERAGE |
| 2 | ENGLISH | 50.00 | 70.00 | 60.00 | 180.00 | 60.00 |
| 3 | COMPUTING | 60.00 | 50.00 | 40.00 | 150.00 | 50.00 |
| 4 | MATHS | 60.00 | 40.00 | 70.00 | 170.00 | 56.67 |
| 5 | TOTAL | 170.00 | 160.00 | 170.00 | *** | *** |
| 6 | AVERAGE | 56.67 | 53.33 | 56.67 | *** | *** |

Figure V: The resulting spreadsheet

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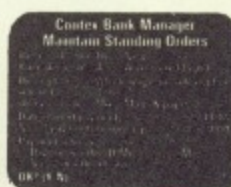
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From Page 14

English marks. We could use the formula:

$$(B2+C2+D2)/3$$

but I prefer to use the simpler:

$$E2/3$$

as there's less chance of things going wrong should I put a bracket in the wrong place. Either way the result is the same — the average English mark is stored in F2.

The same process is followed for the average of all Tom's marks. The values in cells B2, B3 and B4 are totalled and held in B5. Then this value is divided by 3 and held in B6. I leave it to you to figure out the other

formulae. If you want to check your results Figure IV shows the formulae, while Figure V shows what actually appears on the screen. I've just added the asterisks to make the display easier to read.

If you find that Tom has cheated at his computing it's easy to change the value in cell B3 to, say, 30 and see the results ripple through all the other results. Figure VI shows what happens.

So that is a working spreadsheet. Of course in real life there'd be many more children and subjects. Also the teacher might want to extract a lot more information from it, rather than just our simple averages. But even in this basic form it shows the aspects of a well designed spreadsheet. It holds all the details in a structured, informative way and could be saved as a record of the class results.

However it's more than that. It's a model for the situation. Once you've got the spreadsheet set up you could use it for any class or set of subjects. The names and data may change, but the formulae and structure of the spreadsheet would stay the same.

● You'll come to appreciate that these spreadsheets are powerful things and, as yet, we've hardly scraped the surface. More next month when we'll look at ways of making formulae easier to enter.

| | A | B | C | D | E | F |
|---|-----------|--------|--------|--------|--------|---------|
| 1 | | TOM | DICK | HARRY | TOTAL | AVERAGE |
| 2 | ENGLISH | 50.00 | 70.00 | 60.00 | 180.00 | 60.00 |
| 3 | COMPUTING | 30.00 | 50.00 | 40.00 | 120.00 | 40.00 |
| 4 | MATHS | 60.00 | 40.00 | 70.00 | 170.00 | 56.67 |
| 5 | TOTAL | 140.00 | 160.00 | 170.00 | *** | *** |
| 6 | AVERAGE | 46.67 | 53.33 | 56.67 | *** | *** |

Figure VI: B2 is altered

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