

A Database Publication

Volume 6
Number 9
November 1988
£1.50

THE MICRO USER

Top-selling guide
to the BBC Micro, Master,
Archimedes and Z88

MAP

Explore the depths of
the Palace of Magic

PUZZLES

Here's a simple way
to solve word squares

INTELLIGENCE

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expert system

ARCHIMEDES

Do-it-yourself
colour selector

TYPE-IN GAMES

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test for Z88 or BBC

REVIEWS

- BBC Handbook
- System Delta
- Chromalock
- Water Manager
- ...plus all the
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Solving Rubik's Clock is
child's play: Full listing

PLAY IT AGAIN SAM

3

SUPERIOR APPROVED



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Super Joe - Crack Combat Soldier - fights a lone battle against overwhelming odds. All the action and tension of the World's Number One Arcade Game.
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The screen pictures show the BBC Micro versions of the games.



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

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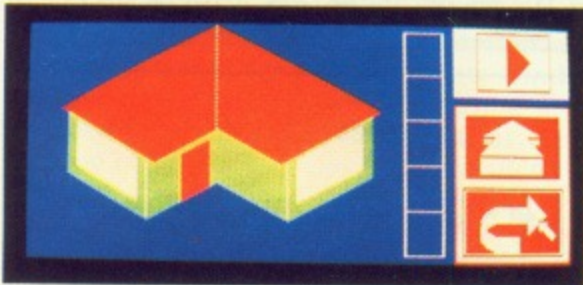
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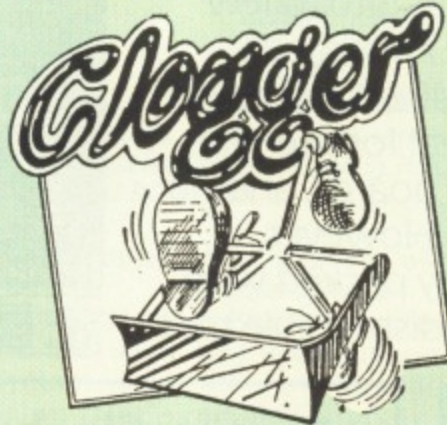


Cover story

Solve the mind-bending Rubik's Clock easily with the listing on Page 65. And we reveal the secrets behind the solution so you can amaze your friends by unravelling the puzzle that even the inventor claims he hasn't solved.

PROFILE OF A GAMES CREATOR

We talk to Gordon Key, author of some of the best games that have appeared in *The Micro User*. On



Page 90 he recalls previous programs. He also describes his latest game – Clogger – which will be launched at the November Electron & BBC Micro User Show and exclusively previewed on a FREE disc that will be included with your December issue of *The Micro User*.



No waiting

A new speedy service for readers buying *The Micro User* special offers ... starts this month.

All orders of £100 or more will be delivered by overnight courier and at no extra cost!

Among our special offers this month are a FREE magazine subscription when you subscribe to the monthly tape and disc (see Page 91), a substantially reduced MicroLink dual speed modem (see Page 20) and a new compilation of Ten of the Best educational games (see Page 114).

For details on how to order, turn to the form on Page 135.

MICRO USER CLASSIFIEDS

The best bargains in the world of the BBC Micro come from fellow readers of *The Micro User*. Turn to Page 71 to find just what you're looking for – from cheap modems to complete computer systems.



For full details on how the checksums work, see the Get-it-Right article on Page 28 of the February 1988 issue of *The Micro User*.



The Type-it-in symbol indicates that the feature contains at least one full length listing for you to key in on your micro.

NEXT MONTH

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NEWS *beat*

Multi-tasking comes with new Risc OS

RUMOURS have finally become reality: Enhancements to the Archimedes' operating system mean that the machines now offer collaborative high speed multi-tasking – the ability to run effectively more than one program at a time.

The new Risc operating system allows multi-tasking programs to be run simultaneously within windows, and information, pictures and text can be transferred between applications instantaneously by dragging icons.

The Risc operating system offers significant advances and new opportunities both for end users and software developers", claims David Bell, Acorn's microsystems products manager.

"The speed and processing power of the Acorn 32 bit Risc technology makes it possible to deliver a powerful multi-tasking environment in an affordable desktop computer".

Three multi-tasking applications, worth around £100, are being bundled with the operating system. These can be used to create text, line diagrams and high quality illustrations – which can then be printed directly or incorporated into another application –



Acorn's managing director Harvey Coleman (left) with corporate communications manager Michael Page unveiling Risc OS for the Archimedes at the recent PC Show

without having to stop other programs.

The machines have also been made easier to use, with the windowing system now having a more intuitive "feel". Other features include a calculator, alarm clock and an electronic mail system for network users that allows messages to be sent or received while programs are running.

A particular time saver is a magnify utility which allows users to take a close look at part of a screen without needing to pause to zoom a

cific aspects of BBC B and Master micros.

Programs written for the existing operating system – which will remain available – are provided for by Risc OS. A modified loader file caters for the small proportion of applications which require it.

Risc OS occupies four rom chips while the applications and utilities take up two discs. Extensive documentation is included.

The package will be available from April 1989, when existing users will be able to upgrade for around £50, with a special price to educational users of £29 for an introductory period.

Acorn's marketing director Ian Laurence sees the package as one of the most important additions yet to the range of Archimedes software.

"People who use Archimedes systems for running businesses, controlling engineering processes, designing, making music and many other applications will be able to generate all their printed material requirements on the same machine", he said.

Arcing back into the black

ACORN computers is operating in the black again for the first time since its £3.2 million loss last year.

Following 12 straight months of losses the company reported a profit of £1.05 million for the first six months of this year. Net income for the year totals £710,000.

Two factors have contributed to the turnaround, said Acorn chairman Elserino Piol: "Higher margins were achieved by concentrating on mainstream products, notably the Archimedes range.

"The company also had the benefit of a lower cost base following withdrawal from the custom systems market last November".

Sales for the six months were £20.5 million, up from £17.1 million for the preceding six months.

The company still owes the banks £1.8 million – but this is the lowest level of debt for three years. At the end of 1987 the figure was £4.7 million.

Managing director Harvey Coleman said the Archimedes was penetrating existing markets as well as generating opportunities in new markets.

"In education it is now broadly recognised that the ideal computer platform on which to develop the cross-curricular materials of the 1990s needs to have the affordable power which the Archimedes machines offer", said Coleman.

"The Master series continues to sell in good numbers because the merits of its comprehensive specifications are widely recognised and the machines are also seen as putting their users on the path to the future".

Acorn says its new products – especially those using the Unix operating system due to be launched early next year – will open up further opportunities.

"The successes we have enjoyed, encouraging as they are, are merely the first steps toward our target of a consistently profitable future", said Elserino Piol.

Shades fever strikes

Shades, the most famous of all the interactive on-line computer games, is enjoying an unprecedented boom in popularity.

The latest army of fans to enter the mystical world are drawn from the ranks of MicroLink subscribers.

Within days of what has been described as "the ultimate

adventure multi-user game" being introduced onto the system, record log-on times were being recorded.

"Our subscribers appear to be suffering from Shades fever", says Derek Meakin. "In fact, we find a substantial number of businessmen on MicroLink are even giving up their lunch times to play".

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Drive Select Translation Cable

When used with above, interface links in external drive can stay set to '0', saves hassle when moving a drive from a Beeb. £9.00.

DFS Utils

A quick and easy to use program that will transfer all or selected files from DFS to ADFS and ADFS to DFS.
DFS Formatter included £20.00
DFS Reader only £13.00

Monitor Switch Box

Archie/BBC. Plug both a BBC and an Archimedes into an Acorn Archimedes colour monitor. £10.00.

Archimedes <-> BBC RS423 link kit including file transfer software. £15.00.



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demonstration.

NEWS *beat*

Arc in control

WHAT is claimed to be the first expansion card to exploit the potential of the Archimedes' 16 bit wide expansion backplane data bus has been released by Intelligent Interfaces (0789 415875).

The 16 bit Parallel Expansion Card makes the most of the Archimedes' capacity for high-speed digital input and output and offers engineers and scientists greater flexibility from the micro.

Software supplied on disc extends the operating system and presents a simple low level interface for assembler programmers, and more than one card can be fitted – two in a 300 series or up to four in a 400 series Archimedes.

The card is particularly suitable for control applications.

New BBS system

A SOPHISTICATED bulletin board software package that works on BBC B, Master and Compact micros is the latest offering from Orion Computer Services.

EBBS will work with most popular modems and the software allows a user without any programming knowledge to set up a system.

The software will allow

Bigger backplanes

BACKPLANES are essential additions to an Archimedes 310 or 305 for users wishing to add expansion cards – and expansions are essential for users wishing to add a considerable range of hardware to their micros.

Now IFEL (07555 7286) has come to the rescue with the release of a four-slot model, double the number supplied on a standard backplane. Four

Archimedes DTP package makes show debut

ACORN'S presence at this year's PC Show was dominated by products for the Archimedes – notably the company's own desktop publishing package and enhanced Risc operating system, neither of which will be available until next year.

On this occasion there were also many third party suppliers – sharing the limelight on what – at 250 sq metres – was Acorn's largest ever stand.

They displayed a wide range of new hardware and software for the machine, including business, Cad and

music packages.

Visitors to Earls Court had to go elsewhere to find products for their BBC Micros and Masters, but – although a fair number of attractive packages were on offer – they were not overwhelmed.

In fact the Z88 – with a collection of interesting new software – was better served for new products than the BBC Micro and Master.

A full report on what the PC Show had to offer owners of Acorn machines will be carried in next month's issue of The Micro User.

Egyptian order

TAKING the art of pyramid selling to new heights, Acorn has secured a substantial order with the Egyptian Government's education department.

As the first stage in a pilot project to introduce computers into Egyptian schools, the department has ordered 600 Master series micros.

And to mark the start of the project Britain's Secretary of State for Education and Science, Kenneth Baker, visited Egypt as the guest of the Minister of Education, and presented him with an Acorn Archimedes 440.

Acorn's managing director Harvey Coleman, who accompanied Kenneth Baker at the presentations, is optimistic that the deal will be the first of many.

"We will continue to develop links with the Egyptian authorities with a view to a long term commitment to the country's educational computing needs", he said.

Barbarian winners

CARDIFF Arms Park will be the scene of a bicentenary match of epic proportions when Rugby giants the Barbarians and the Australian tourists clash in November.

Joining the crowds – and going behind the scenes to meet the teams – will be Richard Williams from Bury who landed first prize in Superior Software's recent competition in *The Micro User*.

Superior sponsored the competition to celebrate the launch of the BBC Micro version of Barbarian. There was a staggering number of correct entries, but Richard's was the first drawn, and in addition to his day out in Cardiff he'll be taking away four Superior games.

Second out of the sack was D. Acreman from Cambridge, who will be receiving a copy of *The Martini A-Z of Fencing* and three superb games from Superior.

The 30 runners-up prizes of a game of their choice will be going to: R. Pallett, Cowplain; E.A. Cook, Llanfrechfa; I. Summers, Dartford; R.J. Attwood, Reme; O. Simkin, Headington; M.D. Tucker, Chippenham; R. Swift, Kegworth; E. James, West Bridgford; C. Parsons, Creigvau; S. Martin, Vale; D. Browne, Horsham; M. Fletcher, Chalgrove; B.E. Browne, Horsham; S. Donnelly, Bangor; J. Saunders, Mansfield; E. Wong, Tasmania; W. Bush-Harris, Brighton; R.J. Waters, Colchester; M. Hazelwood, Paignton; J.M. Browne, Horsham; A. Allen, Felixstowe; P. Southall, Cheam; I. Macdonald, Alloway; O. Love, Gosforth; D. Littlechild, Iver; S. Remordina, Reading; M. Walker, Stamford; D. Brown, Basingstoke; M. Stuart, Borehamwood; and G. Pearce, Pontypridd.

All the Fax

AN Archimedes version is now available of the Fax*file organiser from Mewsoft (01-267 2642), price £23.95.

Also new from Mewsoft is an A4 Forms Designer for the BBC Micro with shadow ram, Master and Compact. Price £10.95, it requires Epson CRT graphics.

Archimedes Podule

A plug in podule which accepts up to 7 ROMS or RAM chips (each chip can be up to 128K bytes). Optional battery back-up for the RAM. Includes a full-feature RAM filing system (fully ADFS compatible) allowing storage of files up to a possible 896K bytes, as if they were on disc. Easy to install and comes with a full manual. NB: requires prior installation of a podule backplane. £49.00 + VAT or £59.00 + VAT with battery.

Speech System

Used in conjunction with the TMS 5220, the Speech System (Speech ROM and Text to Speech ROM) enables BBC B users to easily produce the entire range of English speech and intonation from their machines. NEW PRICE: £25.00 + VAT (+£5.75 for the 5220 if required).

Accelerator

The most comprehensive BBC BASIC compiler, with full floating point arithmetic. Can compile to an intermediate G code, which ensures that the object code is compact, but utilities are also provided to convert G code to faster machine code. NEW PRICE: £30.00 + VAT.

Mega-3

Recently released version of Inter-Word, Inter-Sheet and Inter-Chart, all on one 128K chip. BBC: £85.00 + VAT (ask for details of exchanges).

SOFTWARE FOR THE BBC MICRO & ARCHIMEDES

Wordwise Plus

A 40 column word processor with a flexible and simple BASIC type programming language for user specific programs. On ROM for the BBC, disc for the Archimedes. BBC: £49.00 + VAT. Archimedes: £20.00 + VAT.

Spell-Master

A 128K spelling checker on ROM, with a 57,000 word dictionary. Can check as you type in Wordwise, Interword or View, allows creation of user dictionaries & dictionary browsing. Crossword, anagram and fuzzy checking features. A completely new version for the Archimedes, with extra features. BBC, Archimedes and Z88: £51.30 + VAT.



Computer Concepts Ltd

Inter-Word

A full WYSIWYG word processor on ROM. Features include ruler controlled margins and tabs, simultaneous on screen display of printer highlights and text alignment, multi column printing, multi file operation, 40/80/120 column screen modes. BBC: £49.00 + VAT. Archimedes: £39.00 + VAT.

Inter-Sheet

An easy to use spreadsheet on ROM. Features include 255 rows x 64 columns with individually adjustable width, full range mathematical functions, selective printing, lockable boxes/rows/ columns, 40/80/132 column screen modes, auto step on. BBC: £49.00 + VAT. Archimedes: £39.00 + VAT.

Inter-Chart

A comprehensive chart and graph plotting program on ROM. Features include bar graphs, pie charts and line graphs (up to 16 in memory at once, overlay/print in any combination) auto/manual labelling, accepts data from file/keyboard. BBC: £32.00 + VAT. Archimedes: £25.00 + VAT.

Inter-Base

A database on ROM, based around a powerful programming language. Features of the card index program include menu operation, variable field length & number of fields per record, unlimited records, full conditional search & sort, fast search via indexes. BBC: £60.00 + VAT.

NEWS *beat*

BBC Micro owners will have the opportunity to see the full range of Computer Concepts' software and hardware Risc developments for the Archimedes and the PC at the show.

Visitors will be able to see Riscard, the company's 32 bit Risc processor board – effectively a computer on a card – and to check current progress on Impulse which is their new multi-tasking, multi-processor parallel operating system designed to support Computer Concepts' own application software. The company's word processor/DTP package will also be demonstrated.

On sale for the first time will be the Fax Pack modem, a plug in card that gives the Archimedes the power to communicate with any similarly equipped Archimedes or Group 3 fax machine anywhere in the world.

Features include auto dial and answer, and the ability to scale, crop and scroll faxes on-screen. There is also an option of a 200 dpi, A4 width hand scanner, which allows any printed document to be digitised and saved in a suitable fax file format.

Computer Concepts will also be selling its latest software for the BBC Micro – including the new version of Inter-Base, for Archimedes and Z88.

★ ★ ★

WITH offerings for both the BBC Micro and Archimedes, Coltonsoft is intent on making its presence felt at the show.

Most prominent will be Pipedream, which will be up and running on the Archimedes. The package combines word processing, database and spreadsheet facilities and allows all three activities to be carried out in the same window of a document, eliminating the need for cutting and pasting.

Pipedream is not a new product, but the show provides an ideal platform for Coltonsoft to demonstrate its versatility – the package is built into Cambridge Computer's Z88, and file transfer between the portable and the Archimedes is now

THE 20th Electron and BBC Micro User Show, set to take place at the New Horticultural Hall, Greycoat Street, London on November 11 to 13, promises to offer something for everyone.

More than 50 exhibitors will be in attendance, many of them launching new products for the Electron, BBC Micro and Archimedes. And there'll be bargains galore for pre-Christmas shoppers.

A highlight of the November show will be the

Wonderful World of the Archimedes, which will give visitors a chance to assess the power and versatility of Acorn's flagship machine.

And the show will also be the platform for the announcement of the recipients of this year's Micro User Innovations Awards. All the finalists will be on hand to demonstrate their novel applications – and visitors will be able to have their say in picking the final winners.

Archimedes will star at the big show

very easy to achieve.

A complementary package, Pipedream Spell Check, will also be on show. Spell Check offers an 80,000 word dictionary and a 40,000 words per minute checking speed.

Included are a "check as you type" option and full dictionary searching facilities.

★ ★ ★

AFTER a hectic summer catering to the demands of Electron users, Pres is gearing up for a new product launch at the November show – time permitting.

"We expected a quiet period during which we could get on with designing new products", said Pres boss John Huddleston.

"Instead we've been working

flat out to meet demand for existing products while still maintaining a heavy programme of new product development.

"But we're very encouraged that people appreciate our strategy of upward compatibility to the BBC Micro range in the design of our products".

Interest has been particularly keen in the company's AP7 battery backed ram, Advanced Games Compendiums and Music 5000 synthesiser, all of which will be on display at the show.

However, Pres is not content with resting on its laurels: Work continues on the Advanced Basic Editor+, Advanced File Manager and the 1MHz Bus unit. "The AFM is currently being documented and should

be ready for launch at the show", said Huddleston.

★ ★ ★

NOVEMBER marks Watford Electronics' 16th anniversary, an event the company is celebrating with the launch of its Aries range of PC AT and XT machines.

Also on demonstration at the show will be Watford's state of the art, IBM compatible, high resolution monochrome and colour monitors.

Watford will not be neglecting BBC Micro and Archimedes users, however. More new products will be on display here, including the Wapping Editor, Archimedes Digitiser and the Arc 20Mb and 40Mb Winchester drives.

As usual, Watford's staff will be on hand to answer any technical queries and there will be a number of special Christmas offers.

★ ★ ★

THERE will be no shortage of choice on the Impact Games stand, which will offer a comprehensive range of titles for all Acorn machines.

All the latest releases will be there, plus a wide range of titles at bargain prices – and visitors spending more than £4 will be entitled to choose from a wide range of unique free helpsheets, solutions and maps.

Impact will also be showing its own range of software,



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HUNT FOR THE GRAIL

MICRO User readers will be taking part in a treasure hunt to find the secret hiding place of a £5,000 "replica" of the legendary Holy Grail.

The nationwide quest has been organised by Mandarin Software (0625 878888) to mark the launch of *Lancelot*, a graphic adventure game based on the legend of King Arthur.

Hand-crafted from sterling silver and gilded inside with 22 carat gold, the 7in high goblet is encrusted with semi-precious stones. It is hidden at a secret location somewhere in the UK.

To find the prize, entrants will have to survive a two-stage contest based on clues contained in the new three-adventure *Lancelot* package.

Contest creator and Arthurian expert Pete Austin said: "All people need to do is study the *Lancelot* game carefully and the clues – plus their answers – will become obvious". Price £14.95.

They're on show at the show

including three volumes of *Cheat It Again, Joe* – collections of "cheats" for some 20 games including such classics as *Elite*, *Citadel* and all the *Repton* series.

Loaded before the main game, the cheats provide options such as unlimited lives, immortality and access to higher levels. "They will give games players a lot more fun and will allow them to see far more than ever before" says Impact's Mark Botterill. "Citadel is an absolute doddle to complete and even I have now achieved *Elite* status".

The cheats have been designed to work with both original and compilation versions wherever possible and require no technical knowledge or typing. Prices are £2.99 on BBC Micro or Electron cassette, £4.99 on BBC Micro 5.25in disc.

In more original vein Impact will be launching *Clogger* – a new disc-only arcade adventure with 18 levels priced at £4.99 for the BBC Micro, £6.95 for the Master Compact version – and *Quazer*, Impact's first release for the Archimedes.

Quazer is a superfast action shoot-'em-up which shows off the speed, graphics and speed capabilities of the Risc technology. Price £9.50.

FIVE spectacular new releases will make their debut at the show, courtesy of Superior Software.

A confident Superior is

inviting visitors "to come along and see the best games at the best show ever" and is claiming that the new range includes "some of the most impressive games ever released for the range of Acorn machines".

Superior is aiming to put out two or three games each month as a run up to Christmas, and promises that more games than ever before are in the pipeline.

ARMADILLO Systems, making its first visit to the show, will be displaying a trio of products for the Archimedes.

Pride of place goes to the A616 16 bit sound sampling package. This, says Armadillo director Milton Wynne is "designed for the more discerning user who demands both performance and quality in software and hardware".

The package comes complete with Midi in, through and out, stereo 16 bit (CD) quality sampling with four times oversampling at the output stage, producing excellent sound quality.

The board is a double card which will fit either the Archimedes 300 or 400 series and the software provides everything necessary to start using samples as a Midi "instrument" – using a Midi keyboard – within minutes.

Also on show will be Armadillo's A448b 8 bit sound sampling package, an updated version of its 8 bit sampler. The new version includes a stereo facility and an optional Midi interface. Armadillo's trans-

form module – Spectre Fourier analysis software – completes the round up.

The software is supplied with a harmonics editing and 3D display package which allows any function to be applied to a waveform.

COMPUTER music pioneer Hybrid Technology is planning to launch a major new music package for the BBC Micro at the show.

The Music 5000 Synthesiser Junior is a low-cost entry level version of Hybrid's well established Music 5000 Synthesiser and has been specifically designed for those new to computer music making.

It uses powerful rom-based icon driven graphic music software which includes an easy-to-use music editor, mixing editor and desk, sound designer and qwerty music keyboard.

The Junior can be upgraded to full Music 5000 specification with the addition of an Ample rom, giving complete compatibility with the Music 4000 Keyboard and the other components of the Hybrid Music System.

Both the Junior and the full Hybrid Music System will be on continuous demonstration at the show.

CONCENTRATING on keeping micro users in touch, Beebug will be demonstrating its new communications package – Hearsay – written specifically for the Archimedes.

Hearsay is easy to use, fully exploiting the Archimedes' WIMP environment, and no technical knowledge is required: That said, there are enough advanced features to make it equally valuable to experienced users.

Ideal for use with Prestel, Telecom Gold, MicroLink and bulletin boards, Hearsay emulates VT220, VT100, VT52, Ansi (IBM), Viewdata (Prestel), Tektronix, TTNS and Teletype terminals.



BASED on the perennial TV series, *A Question of Sport* is now a program for the BBC Micro from *Elite* (0543 414188).

"We successfully fought off competition from Domark, Gremlin Graphics, Prism and British Telecom to acquire the licence", said *Elite*'s Gill Birch.

"The computer game will

include all the features which have made the TV programme so popular – including the picture board, what happened next, and home-and-away.

"There are a host of sports stars from whom to choose your teams and you can even confer with your partners". Price £14.99 on cassette, £19.99 on disc.

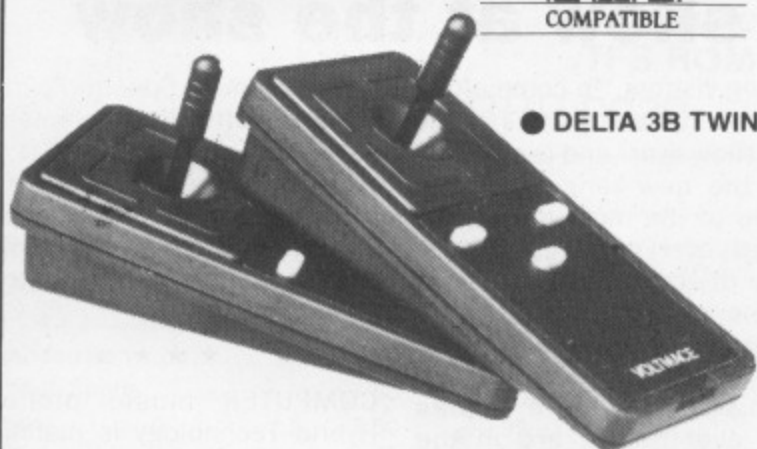
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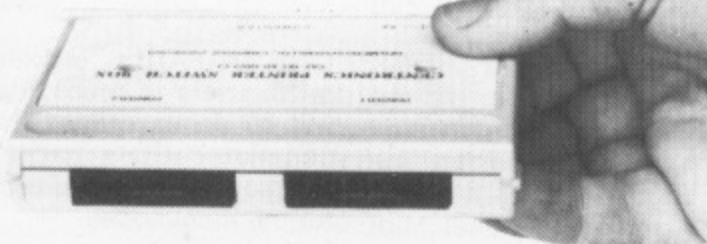
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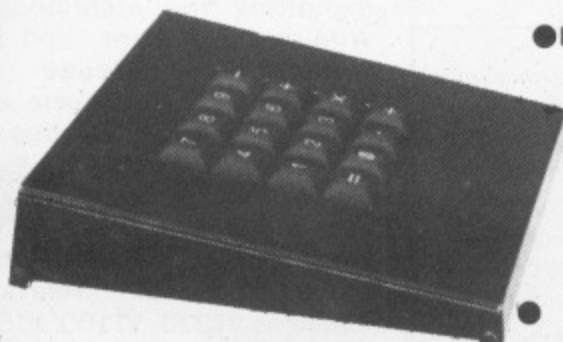
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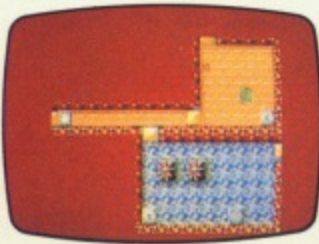
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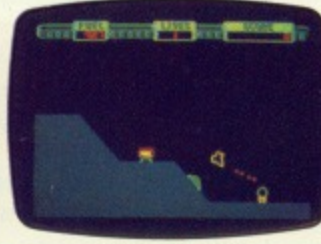
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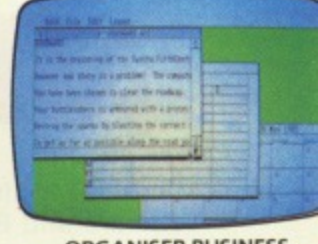
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Linking different micros

I AM thinking of connecting my BBC Micro to a friend's computer of a different make. To do this I thought I could put a wire link between our houses, which are about 500 yards apart.

Would I need to use two modems and, if so, would I need to put a voltage on to the wire? Also would standard terminal software be suitable to run the system? — **Nigel Uprichard, Wickham, Newbury, Berks.**

● *The RS232 standard is nominally rated at 50 yards. However if you get special twisted pair cable this can be pushed up to approaching 1000 yards at low baud rates like 300 or 1200. If this will not work you can get high power line drivers to increase the range to what you want.*

However these alternatives are expensive and a cheaper solution is, as you suggest, a modem at each end of the line. Any terminal software can be used providing one end is capable of being made to run in the data originator mode and the other as data receiver. Conventionally, when you contact another micro you are the data originator because you rang it up.

Video problems

I WOULD be most grateful if you could spare a minute's help on the subject of your video digitiser programs in the May and June 1987 and February 1988 issues of *The Micro User*.

I have typed in the software and it gives correct results with Get it Right! and I've bought the assembled digitiser board from Musbury Consultants. But I am unable to get any picture display on my TV/monitor. Incidentally my video camera works perfectly when plugged directly into the TV aerial socket.

Also, please could you confirm that the program as written is suitable for the Master as indicated, and what should the effect be on the screen when S is pressed if no digitiser board is connected? — **Dr. L.M. Fenton, Uxbridge, Middlesex.**

● *Your problem is your video source. If it works when you plug it in the aerial socket of a TV set then it must be producing UHF modulated video.*

The Body Build digitiser — and all similar video devices — requires a composite video signal like the one produced at the video out socket of the BBC Micro. There must be some way of extracting

this signal from your camera, and your manual should give details.

The program will work on the Master and when you press S you will see nothing on the screen unless the digitiser is connected and a source of composite video is connected to the board.

Manual confusion

I HAVE (in order of priority) a shelf of *The Micro User*, BBC Micro and an NEC 8023BE-N dot matrix printer.

The NEC handbook refers to the LPRINT statement, this means absolutely nothing to me and even less to the micro. Could you please explain how to send characters to my printer? — **A.M. Knights, Beccles, Suffolk.**

● *All the commands that are given as LPRINT send data directly to the printer. The BBC Micro uses a different method — VDU 1,X where X is the byte to send to the printer. Also a VDU 2 turns the printer driver on and VDU 3 turns it off. So if your manual says:*

```
LPRINT CHR$(27);CHR$(14)
```

then you need to write:

```
VDU2,1,27,1,14,3
```

To send text to the printer you just need:

```
VDU2  
PRINT"My text"  
VDU3
```

Gamer's keyboard

PLEASE could you tell me how to connect a Sirius keyboard to a BBC Micro so it could be used for playing games. Also, the Z and X keys on my micro behave erratically after about 30 minutes of game playing even though I have recently given the keyboard a very good clean. Could you tell me what is wrong? — **Robin Weston, Kibworth, Leicestershire.**

● *It is not possible to connect any other machine's keyboard to the BBC Micro for playing games as most of this type of software looks*

Turn to Page 20 ►

On the agenda...

- Linking up micros
- Picture display that disappears
- Talking to your printer
- A change of keyboards
- The cure for gibberish
- Cassette interface fault
- Pseudo-random numbers
- Double stepping disc drive

◀ From Page 19

directly at the hardware.

It sounds as though you have given the Z and X keys a bit of a bashing and it could be that the key contacts are intermittent. In this case the cure would be to replace the keys. However a crack might have developed in the PCB tracks near the keys and if so you should scrape back the green solder mask and solder in a wire to bridge the gap.

Misspelling bits

I HAVE a BBC B that is not working properly. The problem is that in Mode 7, when I type in COMPUTER, for example, the screen displays CKIPQPAR. When I type in CHAIN it reads CHAIJ.

The computer understands the instruction and carries it out as normal, but I do not really know what I'm are typing in, as it appears differently on the screen. Sometimes some of the characters start flashing. All the other modes are perfectly all right: It is just Mode 7 that has gone wrong.

Recently I had my operating system upgraded from 0.1 to 1.2. I thought this might be the cause of the problem, but I have eliminated that. Could you please tell me what is wrong with my computer. Is there a chip that I should replace? –

Stephen Clarke. Malvern, Worcs.

● If you write down the binary value of the Ascii codes for what you are typing against what you

get you will see that it is bit 2 that is not behaving correctly. Here are the values for your example:

	Bits	Bits	
C	0011	0011	C
O	1111	1011	K
M	1101	1001	I
P	0000	0000	P
U	0101	0001	Q
T	0100	0000	P
E	0101	0001	A
R	0010	0010	R

Mode 7 is handled by a different chip than the other modes and so comes under suspicion. This chip is IC5, the SA5050, which is fed by IC15, a 74LS273. Either chip could be faulty, but a more likely explanation is that a pin is bent underneath and not making contact with the socket.

Remove both ICs and see that they are seating correctly. The likely culprit is pin 7 or 6 on IC15 or pin 6 on IC5.

Faulty cassette interface

THE cassette interface on my BBC Micro failed recently, allowing no input or output. But what is more strange is that the Record then Return message and the block numbers have disappeared – the only thing working is the cassette relay. Escape still aborts saving. Do you think that

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this problem lies in the operating system rather than the cassette interface? — **Simon Adams, Epsom, Surrey.**

● If the messages have disappeared along with the function of the cassette I would suspect the problem is in the 6850 ACIA — the device that converts between serial and parallel. It looks as if the software is not getting the usual response from this chip and is waiting until it does. In effect the micro is hanging at this point and you are never getting into the save routine.

Micro telepathy

MY school has several BBC Micros and I have written a very simple program that creates random pictures in eight-directional symmetry. When I ran this on seven of the micros simultaneously four drew totally different patterns, but the three in the corner astounded me by coming up with identical pictures — they even grew in the same way.

They are not connected at all, so naturally it gave me a surprise. Does anyone know of any other cases of machine telepathy? — **Mark Edwards, Faulkland, Bath.**

● I am surprised at your telepathic micros: Not that three drew the same picture, but that four drew different ones. You see when you ask for a random number the BBC Micro — like all com-

puters — generates, not a random number, but a pseudo-random one. This means that it is a number in a set sequence but with no recognisable pattern.

When you first switch the micro on, the seed number is always the same so the sequence of numbers generated is identical. What must have happened with the four micros is that either they have a different version of Basic fitted or they had run a program previously that called on the random number routine.

One good way to seed the random number generator to ensure you get different sequence is to use the command:

```
T=RND(-TIME)
```

at the start of your program. This will ensure that if you have 20 micros running they should all produce a different picture sequence.

Two step

I WOULD like to know if there is a link, or some other component, on my 80 track disc drive which I could adjust to make it double step, and behave like a 40 track drive. Alternatively, is there a software patch I could use to make it double step? — **Allan Brown, Thame, Oxfordshire.**

● The October 1985 Body Building article shows how to achieve double-stepping with hardware.

Have you any hardware problems with your BBC Micro? If so, write to Mike Cook, The Micro User, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP, giving full details of your system and the problem.

Unfortunately, Mike cannot send you personal replies, but as many questions as possible will be answered on the pages of The Micro User.

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PROGRAM **Library** **No.21**

Compiled by Steve Turnbull

THE problem of program legality comes up from time to time as I go through your entries to the Library. This month's Dancing cursor is a case in point: It directly accesses a hardware memory location – but this method is actually the best way on this occasion.

The routine is interrupt-driven and its load and execution addresses are set up so that it will always run in the I/O processor whatever second processor you may be using. So despite the fact it doesn't use an operating system call, it is permissible as a program for the Library.

Other programs this month are an implementation of the Shell sort, a quick string reversal program and, from one of our more regular contributors, a routine that tells you how much memory you've used – and got left – when programming in Basic.

Title: Dancing cursor
Language: 6502
Author: Sam Dudley

Here's a quickie to brighten up your screen display: Using the screen sync interrupt it continuously re-programs the position of the cursor within the character. The end result is that the cursor keeps moving up and down –

in fact it's much easier to spot so would find a use on a complicated form-filling page.

The 6845 CRT chip registers 10 and 11 control which character rows the cursor starts and finishes. So you

can alter the overall shape of the cursor by modifying these. The technique can be used for more intricate re-programming so that even more interesting effects can be produced.

```

10 REM Dancing cursor
20 REM by Sam Dudley
30 PROCinit:PROCassem
40 PROCos("SAVE dance FFFF+FNhe
x4(code)+ FFFF+FNhex4(P%))
50 CALL init:END
60 DEF PROCinit
70 evtv =&0220:code =&0900
80 reg =&FE00:val =&FE01
90 oswrch=&FFEE:osbyte=&FFF4
100 oscli =&FFF7:ENDPROC
110 DEF PROCassem
120 FOR LX=0 TO 2 STEP 2
130 PX=code:COPT LX
140 .init SEI
150 LDA evtv+0:STA oldvector+1
160 LDA evtv+1:STA oldvector+2
170 LDA #entry MOD256:STA evtv+0
180 LDA #entry DIV256:STA evtv+1
190 LDA #0:STA dir:STA pos
200 CLI:LDA #14:LDX #4:JMP osbyte
210 .entry
220 CMP #4:BNE oldvector
230 PHP:PHA:TXA:PHA:TYA:PHA
240 BIT dir:BPL cursor_up
250 .cursor_down
260 DEC pos:BNE set_cursor
270 LDA #0:STA dir:BEQ set_cursor
280 .cursor_up
290 INC pos:LDA pos
300 CMP #15:BNE set_cursor
    
```

```

310 DEC dir
320 .set_cursor LDX #10
330 LDY pos:JSR vdu23
340 INX:INY:JSR vdu23
350 PLA:TAY:PLA:TAX:PLA:PLP
360 .oldvector JMP &FFFF
370 .vdu23 STX reg:STY val:RTS
380 .dir BRK:.pos BRK
390 J:NEXT:ENDPROC
400 DEF PROCos($&700):LOCAL X%,Y%
410 Y%=7:CALLoscli:ENDPROC
420 DEF FNhex4(H%)=RIGHT$("0000"+
STR$H%,4)
    
```



10 = 00	150 = B814 7	290 = 8674 1
20 = 00	160 = 9895 F	300 = 4F 9
30 = 597F F	170 = B005 B	310 = 5503 D
40 = 81CF A	180 = E04D A	320 = E1C7 0
50 = A04B 8	190 = 9347 F	330 = E29D C
60 = 40D7 D	200 = 2EFC 8	340 = 25CE 9
70 = 2C81 5	210 = F1E5 5	350 = 9ADF 3
80 = 39D4 D	220 = A731 B	360 = C0E4 E
90 = 5C3E 0	230 = A5E9 8	370 = A6EF 5
100 = B5E 2	240 = 813F D	380 = 236A D
110 = B623 A	250 = 5F6C 5	390 = 953B C
120 = AAB9 F	260 = 2D4E 0	400 = 61B0 4
130 = 7CBB D	270 = 2DC E	410 = FB84 6
140 = 19D6 8	280 = 6A28 A	420 = B6AB C

Title: String reversal
Language: Basic
Author: Jeremy Bull

Although this is really a solution in search of a problem it's always an entertaining programming test to see how efficiently it can be done.

Here's a very fast technique – using an absolute minimum of string handling – which will reverse any string at a rate of about .002 seconds per character.



```

10 REM String Reversal
20 REM by Jeremy Bull
30 DIM b%256
40 REPEAT
50 INPUT "Enter the string:'s$
60 PRINT FNreverse(s$)
70 UNTIL FALSE:END
80 DEF FNreverse($b%)
90 LOCAL C%,K%,L%,TX
100 LX=LEN$b%-1:K%=LX
110 FOR C%=0 TO LXDIV2
120 TX=b%?C%:b%?C%=b%?K%
130 b%?K%=TX:K%=K%-1:NEXT:=Sb%
    
```

10 = 00
20 = 00
30 = 978A A
40 = BFBA 4
50 = 6FF7 6
60 = 7FF 3
70 = DADE D
80 = D539 6
90 = A50C B
100 = 3791 1
110 = AA2E A
120 = 3C8 6
130 = A0B3 7

Title: Memory status display
Language: 6502
Author: Andrew Moulden

If you get tired of printing the values of various memory pointers such as TOP and LOMEM during program development and then doing time-wasting calculations to see how much memory is left, you will find this little utility very useful. Type in the program, run it and the machine code will be saved under the filename STATUS. Typing any of the commands:

```
*STATUS
*/STATUS
CALL 8900
```

will execute the machine code, which displays the values of variables like Page and Oshwm and also the length of the current program, free memory and so on.

10 = 00	210 = B9BC 2		
20 = 00	220 = BB5A 0		
30 = 414E E	230 = DF40 9		410 = ESCE B
40 = 30B4 D	240 = 1EBC C		420 = 8504 5
50 = 437F C	250 = 7EFA D		430 = F6C C
60 = 2249 D	260 = 9F9D 4		440 = 2165 9
70 = E847 E	270 = 58C8 0		450 = 2C83 6
80 = 99C 4	280 = CF87 9		460 = 89D1 1
90 = C18C 4	290 = 2E9D E		470 = CD9C 4
100 = 5739 9	300 = CC2F 0		480 = 75B1 1
110 = 42A3 E	310 = C3C0 1		490 = 69C8 C
120 = BFF2 9	320 = C989 B		500 = 1298 F
130 = 1FC8 E	330 = 6FB8 0		510 = 8D66 3
140 = 84D5 2	340 = 7AA8 6		520 = FD2E 3
150 = 8B46 2	350 = EC6A D		530 = FF3A E
160 = 1787 8	360 = A99B A		540 = 885A 2
170 = 97B7 9	370 = 8E29 9		550 = 6F7C A
180 = 2EB5 8	380 = 6CCD F		560 = CF94 4
190 = C8C6 1	390 = 3B49 9		570 = 98E E
200 = 670D C	400 = 7684 A		580 = AEE4 A

```
10 REM Memory Status Display
20 REM by Andrew Moulden
30 ptrlo=&F8:ptrhi=&F9
40 asci=&FFE3:newl=&FFE7:byte=&F
FF4
50 FOR pass=0 TO 2
60 P%=&900:[OPT pass AND 2
70 LDA #text DIV 256:STA ptrhi
80 LDA #text MOD 256:STA ptrlo
90 LDY #0:JSR print:LDA 24:JSR
hex
100 LDA #0:JSR hexp:LDA 19:JSR h
ex
110 LDA 18:JSR hexp:LDA 1:JSR he
x
120 LDA 0:JSR hexp:LDA 7:JSR hex
130 LDA 6:JSR hexp:TVA:PHA
140 LDA #131:JSR byte:TVA:JSR he
x
150 PLA:TVA:TXA:JSR hexp
160 LDA 3:JSR hex:LDA 2:JSR hexp
170 LDA 2:SEC:SBC 18:PHA
180 LDA 3:SBC 19:STA wb1:JSR hex
190 PLA:PHA:JSR bytes
200 LDA 19:SEC:SBC 24:STA wb3
210 JSR hex:LDA 18:STA wb2:JSR b
ytes
220 CLC:PLA:ADC wb2:PHA
230 LDA wb1:ADC wb3:STA wb0:JSR
hex
240 PLA:JSR hexp:LDA 6:SEC:SBC 2
:PHA
250 LDA 7:SBC 3:JSR hex:PLA:JSR
hex
260 JMP newl
270 .hex PHA:AND #240:LSR A:ROR
A
280 ROR A:ROR A:JSR dig:PLA:AND
#15
290 .dig CLC:ADC #48:CMR #58
300 BCC pdigit:CLC:ADC #7
310 .pdigit JMP asci
320 .bytes JSR hex:LDA #255
330 .loop INX:LDA t2,X:JSR asci
340 BNE loop:BEQ print
350 .hexp JSR hex
360 .print LDA (ptrlo),Y:PHP:JSR
asci
370 INY:PLP:BNE print:LDA #255
380 .loop INX:LDA t3,X:JSR asci
390 BNE loop:RTS:.wb0 BRK
400 .wb1 BRK:.wb2 BRK:.wb3 BRK
410 ]:text=P%:RESTORE
420 FOR i=0 TO 9:READ i$
430 IF i MOD 2=0 OR i>5 i$=CHR$13
+i$
440 SP%=i+CHR$0:P%=P%+LEN($ (P%+
)))+1
450 NEXT
460 t2=P%:SP%=" bytes"+CHR$0:P%=P
%+7
470 t3=P%:SP%=" &"+CHR$0:P%=P%+
5
480 NEXT:PRINT"Saving..."
490 *SAVE $.STATUS 900 A69
500 VDU11,7:PRINT"Saved..."
510 PRINT"Type */STATUS to execut
e."
520 END
530 DATA PAGE, " TOP ",LOMEM
540 DATA " HIMEM ",OSHWM," VART
OP"
550 DATA Variable space
560 DATA Program length
570 DATA Total bytes used
580 DATA Total bytes free
```

Title: Shell sort
Language: Basic
Author: Phil Bender

One of the most common methods of sorting a list of numbers or strings into order is the Bubble sort, but it's very inefficient and the time taken for it to work increases exponentially as the number of items goes up. A much more efficient method is the Shell sort which will order 100 random integers in about six seconds.

It works by dividing the set in half and swapping items that are out of order between the halves. The halves are then divided and swaps made between these and so on until the gap between the swaps is reduced to one. At which point the items are in order.

The time taken in a Shell sort

increases by a factor of about three for each doubling in the number of items – much better than the Bubble sort.

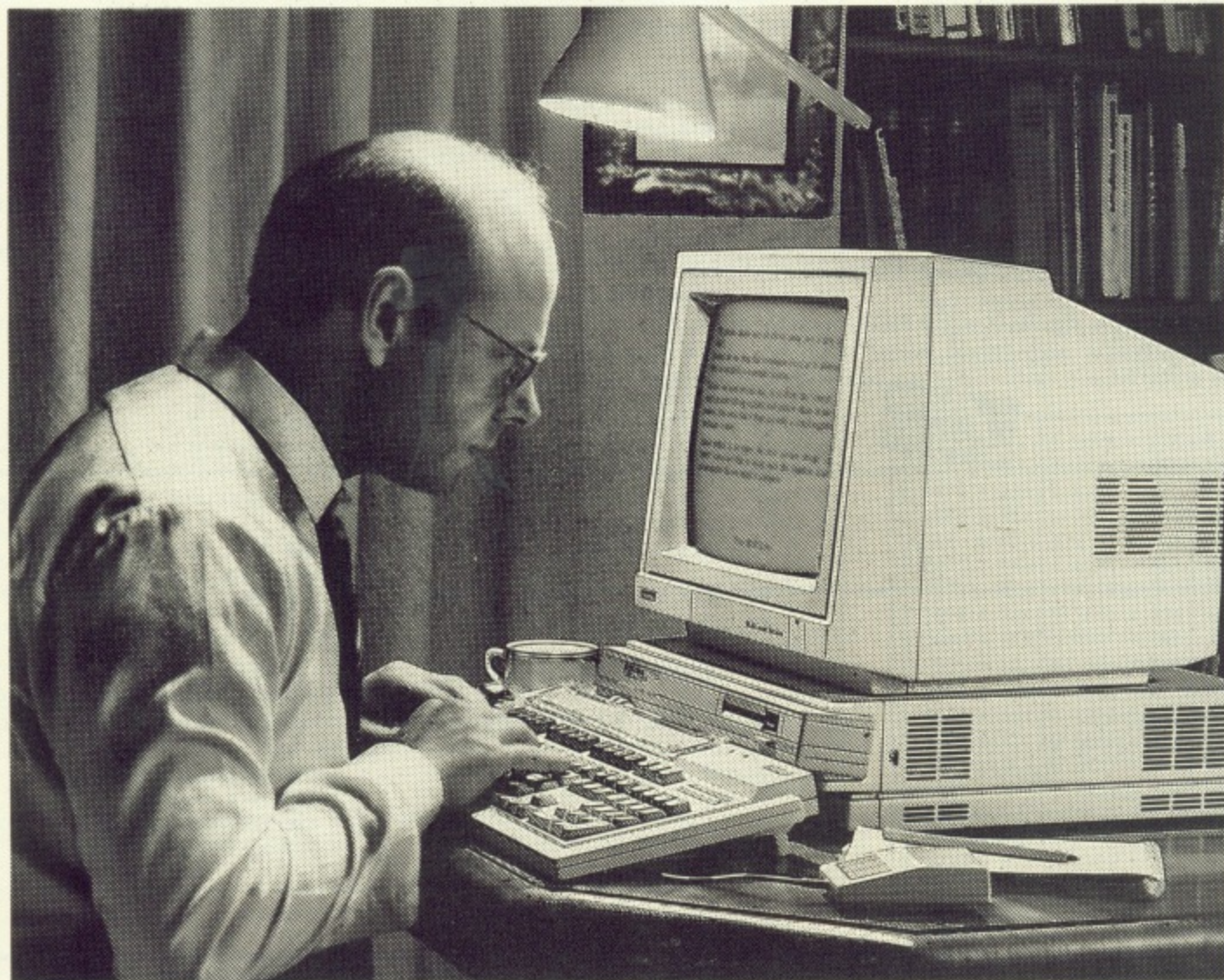


10 = 00	90 = 7A34 F	170 = 87F9 2
20 = 00	100 = 7E36 9	180 = 4078 6
30 = F056 6	110 = A838 5	190 = BCA0 4
40 = 1EB4 9	120 = C4EF F	200 = 10F 6
50 = 5C29 3	130 = 5E2C B	210 = 17B1 9
60 = 9EBC 9	140 = 6F9D C	220 = ED0F 6
70 = 173E 4	150 = 929E D	
80 = A64F D	160 = 727 5	

```
10 REM Shell sort
20 REM by Phil Bender
30 INPUT"Number of items ",items%
40 DIM A$(items%)
50 FOR JX=1 TO items%:A$(JX)=RND
:NEXT
60 SOUND&11,-8,220,1
70 TIME=0
80 PROCshell
90 PRINTTIME/100
100 RUN
110 DEF PROCshell
120 LOCAL G%,J%,K%,T%,gap%
130 gap%=1
140 REPEAT gap%=gap%+gap%
150 UNTIL gap%>items%:gap%=gap%-1
160 REPEAT gap%=gap%DIV2
170 FOR KX=1 TO items%-gap%:JX=KX
180 REPEAT GX=JX+gap%
190 IF A$(JX)>A$(GX) TX=A$(JX):A$(
JX)=A$(GX):A$(GX)=TX ELSE JX=1
200 JX=JX-1:UNTIL JX=0
210 NEXT:UNTIL gap%=1
220 ENDPROC
```

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Get ahead — get a logo

*Bruce Goatly helps you draw a design
which will improve your image*

LAST month Peter Davidson showed you a quick way to use the FontStyle package to design your own letterhead. But a picture is worth a thousand words, so for the more ambitious here's a simple program to let you produce a logo to enhance your image. You can then print it directly, or as part of a FontStyle document.

First type in the listing, check it with Get it Right! and save it. When you run it you'll see a large rectangle occupying most of the screen, with flashing crosshairs in the bottom left corner. This is your graphics cursor, which is moved with these keys:

Z	Left
X	Right
*	Up
?	Down

Pressing Return prints a white point on the



screen at the cursor position, while Delete prints a black point — which is the same as removing a white one. Remember that white on the screen will print out black. Straight vertical, horizontal and diagonal lines can be drawn by holding down Return or Delete with combinations of the direction keys.

For other straight lines you can use the Draw option: Press D and choose the colour you require for the line — if you press Delete — for black — you can rub out an unwanted line. Then move the cursor to where you want the line to finish and press D again to draw the line.

To fill an area with a solid colour press F, then Return to fill a black area with white or Delete to fill a white area with black. Pressing H instead of F puts hatching in the area to give a stippled effect. The choice of white or black does not affect the pattern but should be the same as the boundary colour, as with the Fill option.

Because of the way the program works, you may need to use Fill or Hatch several times for oddly-shaped areas. You can stop a filling process by pressing Escape.

To save a design as a screen image press S and entering a filename or load one by pressing L. If you have not saved the current screen you will be asked for confirmation before loading another.

To clear the design area press C, which first checks that you mean it and then, if the screen has not been saved, that you really mean it.

You can get a hardcopy of the design on an Epson-compatible printer capable of double-density graphics by pressing P. The data is read from the screen, converted suitably and sent to the printer as 12 lines of graphics. This takes a couple of minutes because of the calculations involved.

As it is set up, the program will print the design at the left edge of the paper. You can change this

MAIN VARIABLES

X%,Y%	Coordinates of crosshairs
cr%	Cursor currently plotted flag
exit%	Leaving program flag
safe%	Currently loaded screen un-edited flag
buf	Buffer to hold star commands
t	Time delay
FS	File name

with the Indent option, selected by pressing I and entering a number, in tenths of an inch, to move the design to the right. The maximum indent allowed is 56.

To store the design in a form in which it can be quickly printed out by FontStyle, press @ and give a filename. The graphics data will be spooled to tape or disc instead of being sent to the printer. Any indent you have set will be included in the data.

When you want to leave the program, press Q: You will be warned if the design has not been saved and given a last chance to save it. For added security, users of versions of the BBC Micro that clear to Mode 7 on pressing Break – unfortunately not the Master or the Compact – can make use of the message programmed into function key 10, which tells you that the screen data can still be saved after an accidental Break.

The most effective way to use your design is from within FontStyle, using the GF command, which takes a graphics file from disc and sends it straight to the printer without processing it. So, to print a logo at the top left of your letterhead and your address at the top right, use GF LOGO followed by PA to pause printing while you wind back the paper. Then restart printing to put the address alongside your stunning new logo.

ROUTINES

c	Draw the crosshairs
clear	Wipe all data from the screen
data	Output the screen data to currently selected channel
error	Tidy up when an error has occurred
fill	Perform a fill either solid or hatched
finish	Tidy up prior to exiting program
getkey	Scan the keyboard for a key press and call appropriate routine
indent	Set up the logo indent from left hand side
init	Initialise the program variables
line	Draw a line on the screen
load	Get a logo screen from disc
movecurs	Move the cursor on screen
oscli	Perform a star command
pr	Print text in various colours and formats
print	Output hard copy of the logo
quit	Exit the LogoPix program
save	Backup screen to disc
setscr	Draw the main screen
spool	Output disc copy of the logo
spot	Place a black or white blob on the screen
v	Output a byte of data, exclusively to printer if selected
wait	Delay for a given amount of time
check	Make sure he really means it
getcol	Find out which colour to use
in	Input a string

```

10 REM LogoPix
20 REM by Bruce Goatly
30 REM (c) The Micro User
40 MODE4
50 PROCsetscr
60 PROCinit
70 ON ERROR PROCerror
80 PROCc
90 REPEAT
100 PROCgetkey
110 UNTILexit%
120 PROCfinish
130 END
140 DEFPROCsetscr:GCOL 0,1
150 MOVE60,156:DRAW1216,156
160 DRAW1216,960:DRAW60,960:DRAW60,156
170 VDU&FF17;&55AA;&55AA;&55AA;&55AA;
180 VDU5:MOVE530,996:PRINT"LogoPix"
190 GCOL2,0:MOVE530,996
200 PRINTSTRINGS(7,CHRS255)
210 VDU4,23,1,0;0;0;0;
220 PROCpr(6,2,28,"Return white"):PROC
pr(6,15,28,"Delete black")
230 PROCpr(1,29,28,"Draw"):PROCpr(1,34
,28,"Quit")
240 PROCpr(1,2,29,"Fill"):PROCpr(1,8,2
9,"Hatch")
250 PROCpr(1,15,29,"Clear"):PROCpr(1,2
2,29,"Indent 00")
260 PROCpr(1,33,29,"Print"):PROCpr(1,2
,30,"Load")
270 PROCpr(1,8,30,"Save"):PROCpr(1,14,
30,"@ Spool")
280 ENDPROC
290 DEFPROCinit:inx=0:*FX4,1
300 VDU29,80;176;:X%=0:Y%=0
310 safe%=TRUE:*FX213,180
320 exit%=FALSE:*FX214,2
330 REM The next line won't work on a
Master or Compact
340 *KEY10PRINTCHRS12""Type *SAVE <f
ilename> 5A80 79C0""to save logo"iM
350 DIM buf&100:ENDPROC
360 DEFPROCgetkey:PROCc
370 IFINKEY-51 PROCline:ENDPROC
380 IFINKEY-98ORINKEY-67ORINKEY-73ORIN
KEY-105 PROCmovecurs
390 IFINKEY-74 PROCspot(1,X%,Y%)
400 IFINKEY-90 PROCspot(0,X%,Y%)
410 IFINKEY-68 PROCfill(0)
420 IFINKEY-85 PROCfill(1)
430 IFINKEY-83 PROCclear
440 IFINKEY-38 PROCindent
450 IFINKEY-17 PROCquit
460 IFINKEY-82 PROCsave
470 IFINKEY-87 PROCload
480 IFINKEY-56 PROCprint
490 IFINKEY-72 PROCspool
500 PROCc:PROCwait(.1):ENDPROC
510 DEFPROCmovecurs
520 LOCAL IX:IX=8:IF INKEY-1 IX=32
530 IFINKEY-98:X%=X%-IX:IFY%<0X%=X%+11
20
540 IFINKEY-67X%=(X%+IX)MOD1120
550 IFINKEY-73Y%=(Y%+IX)MOD768
560 IFINKEY-105Y%=Y%-IX:IFY%<0Y%=Y%+76
8
570 ENDPROC
580 DEFPROCwait(t):t=TIME+t*100
590 REPEAT UNTIL TIME>t:ENDPROC
600 DEFPROCc:GCOL3,1:cr%=NOTcr%
610 MOVEX%-12,Y%:PLOT1,24,0
620 MOVEX%,Y%-12:PLOT1,0,24:ENDPROC
630 DEFPROCspot(c%,x%,y%):GCOL0,c%
640 PLOT69,x%,y%:PLOT65,4,0
650 PLOT65,0,4:PLOT65,-4,0
660 safe%=FALSE:ENDPROC
670 DEFFNcheck(m$)
680 COLOUR0:COLOUR129:VDU7
690 PRINTTAB(23,30)m$: OK?";
700 REPEATAX=INSTR("YyNn",GETS)

```

Turn to Page 28 ►

*A picture
is worth
a thousand
words*

◀ From Page 27

```

710 UNTILAX>0:COLOUR1:COLOUR128
720 VDU7:PRINTTAB(23,30)SPC17;:=AX<3
730 DEFPROCdata:LOCALBX,CX,RX,SX,YX
740 PROCv(27):PROCv(65):PROCv(8)
750 FORRX=11TOSTEP-1
760 IFin%FORRX=1TOinX:PROCv(32):NEXT
770 PROCv(27):PROCv(76):PROCv(24):PROC
v(1)
780 FORCX=0TO139:YX=0:JX=1:FORBX=0TO7
790 YX=YX+(JX*POINT(8+CX,64*RX+8*BX))
800 JX=JX+JX:NEXT
810 PROCv(YX):PROCv(YX):NEXT
820 PROCv(10):NEXT
830 PROCv(27):PROCv(65):PROCv(12)
840 ENDPROC
850 DEFPROCv(BX):IFP%VDU1
860 VDUBX:ENDPROC
870 DEFPROCline
880 REPEATUNTILNOTINKEY-51:*FX21
890 colX=FNgetcol
900 COLOUR0:COLOUR129:VDU7
910 PRINTTAB(23,30)"Draw to...?";
920 oxX=X:oyX=YX
930 REPEATPROCc:PROCmovecurs:PROCc:PRO
cwait(.1):UNTILINKEY-51
940 COLOUR1:COLOUR128:VDU7:*FX21
950 PRINTTAB(23,30)SPC15;
960 GCOLOR,colX:MOVEoxX,oyX:DRAWX%,YX
970 MOVEX%+4,YX:DRAWoxX+4,oyX
980 MOVEoxX+4,oyX+4:DRAWX%+4,YX+4
990 MOVEX%,YX+4:DRAWoxX,oyX+4
1000 REPEATUNTILNOTINKEY-51:*FX21
1010 safeX=FALSE:ENDPROC
1020 DEFPROCindent
1030 oldinX=inX:inX=VALFNin(" ",2,29,29)
1040 IFinX>56 inX=oldinX
1050 PRINTTAB(29,29)LEFT$( "00",2-LENSTR
sinX)STRsinX
1060 REPEATUNTILNOTINKEY-74:*FX21
1070 ENDPROC
1080 DEFPROCclear
1090 IFFNcheck("Clear")VDU24,0;0;1120;7
68;16:safeX=TRUE
1100 ENDPROC
1110 DEFPROCquit
1120 IFFNcheck("Quit")exitX=TRUE:IFNOTs
afeXIFNOTFNcheck("Data unsaved")PROCsave
1130 ENDPROC
1140 DEFPROCfinish:*FX4
1150 PROCoscli("FX6,10"):*FX21
1160 PROCoscli("FX213,101"):*KEY10
1170 VDU23,1,1;0;0;0;26,12:*FX214,7
1180 PROCc:ENDPROC
1190 DEFPROCprint:P%=TRUE
1200 COLOUR0:COLOUR129
1210 PRINTTAB(23,30)"Printing...";
1220 VDU7,2:PROCdata:VDU3,7
1230 COLOUR1:COLOUR128
1240 PRINTTAB(23,30)SPC15;:ENDPROC
1250 DEFPROCspool
1260 FS=FNin("filename:",7,23,30)
1270 P%=FALSE:VDU7:COLOUR0:COLOUR129
1280 PRINTTAB(23,30)"Spooling...";
1290 COLOUR1:COLOUR128:VDU28,0,31,39,31
1300 *FX3,2
1310 PROCoscli("SPOOL "+FS):PROCdata
1320 PROCoscli("SPOOL"):*FX3
1330 CLS:VDU26,29,80;176;
1340 VDU7:PRINTTAB(23,30)SPC15;
1350 ENDPROC
1360 DEFPROCfill(MX):LOCAL CX,IX,VX
1370 IX=8:VX=8:CX=FNgetcol

```

```

1380 bordX=CX:xX=X%:yX=YX
1390 REPEAT:REPEAT:REPEAT
1400 x1X=X%:y1X=YX
1410 IF MX CX=-(X%MOD16=Y%MOD16)
1420 REPEAT
1430 PROCspot(CX,x1X,y1X)
1440 CX=CX+EORMX:x1X=x1X+1X
1450 UNTILPOINT(x1X,y1X)=bordX OR x1X<0
OR x1X>112
1460 IX=-IX:UNTIL IX>0
1470 YX=YX+VX
1480 UNTILPOINT(XX,YX)=bordX OR YX<0 OR
YX>760
1490 IFYX>0XX=xX:YX=yX-8:VX=-VX
1500 UNTILVX>0:XX=xX:YX=yX
1510 safeX=FALSE:ENDPROC
1520 DEFPROCpr(revX,xX,yX,pS)
1530 COLOUR0:COLOUR129:PRINTTAB(xX,yX)L
EFT$(pS,revX);
1540 COLOUR1:COLOUR128:PRINTRIGHTS(pS,L
ENpS-revX);
1550 ENDPROC
1560 DEFPROCsave
1570 FS=FNin("filename:",7,23,30)
1580 VDU28,0,31,39,31
1590 PROCoscli("SAVE "+FS+ " 5A80 79C0")
1600 CLS:VDU26,29,80;176;
1610 safeX=TRUE:ENDPROC
1620 DEFPROCload
1630 IFNOTsafeXIFNOTFNcheck("Load data"
)ENDPROC
1640 FS=FNin("filename:",7,23,30)
1650 VDU28,0,31,39,31
1660 PROCoscli("LOAD "+FS+ " 5A80")

```

```

1670 CLS:VDU26,29,80;176;
1680 safeX=TRUE:ENDPROC
1690 DEFPROCoscli($buf):LOCALXX,YX
1700 XX=buf:YX=XXDIV256:CALL&FFF7
1710 ENDPROC
1720 DEFFNin(mS,LX,xX,yX)
1730 PRINTTAB(xX,yX)m$STRINGS(LX,CHRS25
5);
1740 RS="" :PRINTTAB(xX+LENm$,yX)RS;
1750 VDU23,1,1;0;0;0;:*FX21
1760 REPEAT REPEAT AX=GET
1770 UNTIL(AX>31 AND AX<128)OR AX=13
1780 IFRS>"IFAX=127VDUAX,255,8:RS=LEFT
S(RS,LENRS-1)
1790 IFAX<>127IFAX<>13IFLENRS<LX RS=RS+
CHRSAX:VDUAX
1800 UNTILAX=13:VDU23,1,0;0;0;0;
1810 PRINTTAB(xX,yX)SPC(LENm$+LX);
1820 =RS
1830 DEFFNgetcol:COLOUR0:COLOUR129
1840 VDU7:PRINTTAB(23,30)"Colour? (Ret/
Del)";:*FX21
1850 REPEATRX=GET:UNTILRX=13ORRX=127
1860 COLOUR1:COLOUR128:PRINTTAB(23,30)S
PC17;
1870 IFRX=13colX=1:PRINTTAB(33,30)"Whit
e";ELSEcolX=0:PRINTTAB(33,30)"Black";
1880 PRINTSPC12;:ZX=INKEY100
1890 PRINTTAB(33,30)SPC5:=colX
1900 DEFPROCerror:CLOSE#0:*FX3
1910 VDU3,7,23,1,0;0;0;0;:*FX5,1
1920 COLOUR1:COLOUR128
1930 PRINTTAB(23,30)SPC17;:IFcrXPROCc
1940 IF ERR=17 ENDPROC
1950 VDU28,23,31,39,30:COLOUR0
1960 COLOUR127:REPORT:ZX=INKEY100
1970 COLOUR1:COLOUR128:CLS
1980 VDU26,29,80;176;:ENDPROC

```



10 = 00	320 = 8AD 2	630 = 6607 C	970 = 680B F	1310 = 9B6E 0	1650 = 86FA 0
20 = 00	330 = 0 2	640 = C6FA E	980 = A3CF 2	1320 = 8595 E	1660 = 4EC8 E
30 = 00	340 = 7D9A C	650 = 39E4 9	990 = A234 1	1330 = 3F53 1	1670 = 3F53 3
40 = BA9F F	350 = D6B1 1	660 = 9FC3 2	1000 = DBDF 3	1340 = E411 8	1680 = 1B61 2
50 = F7FC 1	360 = A3E3 B	670 = 3F75 1	1010 = 9FC3 C	1350 = ED0F C	1690 = B8B1 6
60 = DEBB 1	370 = 6B15 D	680 = 3EA7 5	1020 = 1BFA 4	1360 = CECB D	1700 = B38A 0
70 = 9621 9	380 = DED4 1	690 = C7B4 B	1030 = 804F B	1370 = 94AB 0	1710 = ED0F 1
80 = 2966 B	390 = 4EDC 3	700 = ADF 4	1040 = E679 B	1380 = 7A9B 8	1720 = B58F A
90 = BFBA 1	400 = 6C81 D	710 = 3604 9	1050 = F38 2	1390 = 505 1	1730 = B7C7 B
100 = 1AD6 C	410 = 6FDD F	720 = 1BF8 6	1060 = 2DDE 8	1400 = ED14 E	1740 = EE33 0
110 = 9762 F	420 = 87AD 7	730 = 47B4 7	1070 = ED0F 5	1410 = 9923 0	1750 = 6DE7 8
120 = 62F4 E	430 = A2FD A	740 = 8459 E	1080 = 4623 B	1420 = BFBA B	1760 = 5254 4
130 = FD2E 5	440 = 876F E	750 = A878 1	1090 = 7D70 A	1430 = 2F4E 7	1770 = FB2 E
140 = F20C 7	450 = 9E72 5	760 = E57F 5	1100 = ED0F 2	1440 = 8B8C 0	1780 = BC6B 5
150 = D50 F	460 = DD4A 7	770 = C305 C	1110 = 19BA B	1450 = 2EA6 F	1790 = 5F4E 2
160 = 1250 2	470 = FA60 A	780 = 4208 9	1120 = 1EF1 B	1460 = 2256 7	1800 = 43BE 8
170 = E3F0 9	480 = E29C 9	790 = B1C4 B	1130 = ED0F 1	1470 = 745F C	1810 = 90D9 1
180 = 4F40 E	490 = 3A84 6	800 = 376F 6	1140 = F1DA 8	1480 = 44E3 9	1820 = 8BCF 0
190 = 9B2D B	500 = 4479 6	810 = 5C44 F	1150 = 92C4 B	1490 = 2C8E D	1830 = 13A7 1
200 = 2AEF 3	510 = 996D 3	820 = 8BF9 E	1160 = F540 C	1500 = F878 6	1840 = E215 F
210 = 1C7D 1	520 = 9C20 B	830 = 7C5F B	1170 = F243 3	1510 = 9FC3 A	1850 = 798A A
220 = 84D E	530 = 7887 3	840 = ED0F 6	1180 = B74F 7	1520 = 7061 F	1860 = EB7C 8
230 = F769 A	540 = 946F E	850 = 877C 1	1190 = 7466 8	1530 = F673 5	1870 = 9C70 8
240 = 16A 3	550 = 1ABA 3	860 = 8766 D	1200 = B631 2	1540 = 2F11 3	1880 = 1E4D E
250 = D277 4	560 = 735E 7	870 = 961E C	1210 = 68DB B	1550 = ED0F E	1890 = 2DB9 E
260 = 6C27 A	570 = ED0F 5	880 = DBDF 4	1220 = 8113 3	1560 = 7A2C 2	1900 = 95CF B
270 = E43C D	580 = CE48 8	890 = EA98 3	1230 = E3B0 5	1570 = EEAA C	1910 = 8104 5
280 = ED0F 6	590 = E9A6 8	900 = 3EA7 1	1240 = 2C04 3	1580 = 86FA 6	1920 = E3B0 6
290 = 735 2	600 = E74A E	910 = 7E0C D	1250 = 10D 5	1590 = C02A C	1930 = 1EAB 5
300 = FCE9 8	610 = 4118 1	920 = 7015 E	1260 = EEAA 3	1600 = 3F53 3	1940 = E65 9
310 = A193 7	620 = 5DB9 8	930 = D9F9 8	1270 = EE8E 9	1610 = 1B61 5	1950 = 3F50 8
		940 = 3F5D D	1280 = 4624 D	1620 = 24A1 E	1960 = 588D C
		950 = C9B2 C	1290 = 3394 9	1630 = C798 C	1970 = 7272 2
		960 = 6691 9	1300 = 5670 7	1640 = EEAA 9	1980 = E3D9 A

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NOT too long ago it was considered to be good value if you could pick up an arcade game for £1.99 – nowadays Alternative Software is churning out three-game compilations at the same price.

A sporting theme is in evidence on Triple Decker volume four, with Cricket, Golf and Fishing as the pastimes on offer.

Howzat represents the next step up from the old fashioned, pencil, paper and dice game that was popular when I was a lad – everything is still reliant upon random numbers, but the game is acted out on the screen to add extra interest.

Players' names for the two teams involved may be typed in manually, or you may choose to use the pre-programmed English and Australian teams.

A rapidly drawn aerial view of the pitch and players is displayed for your entertainment – the grass is green and the stick-men are black. These graphics are hardly state of the art, but adequate for the purpose.

From this point onwards life becomes very straightforward: The bowler bowls, the batsman hits out and you are asked whether or not you wish to run. Howzat is a very simple game, yet enjoyable.

Game number two of the compilation is **Golf**, for up to five players. The aim is to complete the nine hole course in the least number of shots, though I doubt whether many people will have the stamina to complete a single – incredibly boring – round.

Using any of the eight compass directions you guide a white dot along a map of the hole, eventually reaching the large black dot at the far end. All of this excitement was far too much for me, so I loaded up number three – **Fishing**.

You are provided with such vital information as weather conditions and water speed and depth, from which you must make the correct choice of hook, bait and weights. Out on the well-drawn river bank you decide whether to cast near or far and at what depth.

With your bait in the water you can settle back and wait. Within seconds your float will begin to twitch, hand hovering



above the spacebar you poise, ready to strike. The float goes under completely and bang... you're into your first fish. And for the ridiculous sum of 66p you couldn't find a better game.

Volume five comprises two space games and a karate program. Offering number one is titled **Starfight** and represents shoot-'em-ups at their most basic.

The screen displays the view from your cockpit as you orbit the planet M101/3. A small blip appears and begins to increase in size as it approaches – using four badly chosen keys you must blast the blip.

An on-screen rangefinder counts down as the alien ship homes in on your position – the further away the target, the more points you score if you hit it. When the rangefinder reaches zero you lose your one and only life. Starfight is an uninspiring game made worse by the terrible choice of control keys.

Skramble, as you might expect, is a horizontal scrolling zap

and blast game. A continuous stream of alien ships and missiles fly smoothly from right to left across the screen – all you have to do is shoot them. Blasting the aliens is quite easy – they fly in perfectly straight lines and don't fire back.

The alien plan is to defeat you through sheer strength of numbers – after a couple of minutes flying time you will find yourself struggling to find a clear path through the alien swarm. Shooting them doesn't help, as this merely converts the alien into a fireball that continues on its original course.

Good use of colour and smooth animation make Skramble a worthy part of this collection.

Game number three brings you back down to earth with a bump... a kick and a nasty looking punch. **Karate Warrior** is a fine-looking game that has one major failing – it can only be played by two players.

As with all martial arts games, your success is dependant upon your ability to string together a winning combination of kicks and punches. The usual selection of 16 moves has been reduced slightly – to a grand total of four.

The two single-colour warriors perform their ritualised combat with flicker-free ease; it is such a pity that the micro is unable to defend itself. Karate Warrior could have easily been a good game.

In spite of their varied quality you will have to search far and wide to find better products at this price.

Jon Revis



Starfight



Fishing

Sound	5
Graphics	6
Playability	7
Value for money	9
Overall	7

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On the other hand you could try using a computer simulation.

Although it's not the ideal way to learn, it does have a couple of advantages over the conventional method: You can't annoy your partner if you do something stupid – and even more important, your opponents can't gloat over the inevitable whitewashes in the early stages.

You bid each hand according to the Acol system, and the experts among you will no doubt be pleased to learn that Colossus Bridge 4 supports the Blackwood, Baron and Stayman conventions and the strong two club and take out doubles.

You can opt to play without having to bid, to adopt a weak or strong no-trump convention, and to set your response rate to fast, medium or slow. These can be changed at any time.

Colossus has a tutorial and game as separate programs, so you must make your choice before loading the one you require. It's options make it user friendly and, if required, these can be changed between hands at the press of a key.

When using either the tutorial or the rubber you play a hand in two distinct stages: The bidding and the play. Your hands during the bidding, and dummy's during play, are displayed graphically, sorted in suit order.

Bidding is simply a matter of typing in a value followed by a letter to indicate the suit – such as 2D for two diamonds.

The tutorial program uses 10 preset hands specially



chosen to illustrate the game's various aspects, its strategy and conventions.

At the bidding stage your bid is only accepted if you make the recommended one – make an error and you'll stare vacantly at the screen until you guess, sorry choose, correctly.

The same applies during the play of the cards, when again you must get it right before the game continues.

At the end of each hand there's an explanation of the particular facet of bidding or play that it was designed to convey.

This package has several other features. You can recap the bidding, view the play to earlier tricks, peep at other hands, claim remaining tricks, or exit a hand at any time to rebid and replay it or move on to the next.

There is also a save/load game option, an autoplay feature and a facility to have a card recommended – both extremely useful for the learner.

With clear, concise instructions and excellent presentation Colossus also includes a guide to the recommended bidding for certain point counts and hand distribution, but no help regarding what card to play under what circumstances. To compensate, it does include a free 125-page



paperback book – Begin Bridge published by Elliot Right Way. And very useful it was too when I found myself in trouble. A quick glance often provided all the help I needed – and my silicon opposition never found out.

I'm not really in a position to assess whether this plays a good game or not. But my wins and losses have been sufficiently evenly distributed to make me keep playing.

As Bridge tutors go, Colossus Bridge 4 seems to do the job it set out to do.

David Andrews

Sound	n/a
Graphics	7
Playability	10
Value for money	7
Overall	8

Cheat It Again Joe ... making things easy

Price: £2.99 tape, £4.99 disc

Supplier: Impact Software, Neepsend House, 1 Percy Street, Sheffield, S3 8AU.

Tel: 0742 769950

AFTER I started the Hac-Man column I began receiving, at regular intervals, copies of The Pokes Disc, a collection of pokes and cheat routines for many of the best-selling BBC Micro games.

These offered exceptional value for money: Priced at the level of a budget game, they offered help – in the form of pokes, passwords, hints and tips – for almost every possible aspect of many of the top games.

This enterprising venture was the brainchild of Mark Gidley, a highly talented individual who also devised all the pokes.

Cheat It Again Joe is, in effect, an updated version of Mark Gidley's Pokes Disc, with Impact Software's marketing muscle behind it. It comes as two volumes – with a third being released soon – on either tape or disc, and each is available separately. However, the two really complement each other, and I would certainly recommend buying them together.

When I first heard that Cheat It Again Joe was under development, my feelings were mixed. Certainly, this sort of product could raise a number of problems, both legal and moral. When I received my copies, however, I was glad to see that Cheat It Again Joe avoids any such transgressions. The cheat routines are themselves encrypted and give nothing away to anyone who manages to disentangle them.

In common with its Pokes Disc predecessors, Joe offers exceptional value for money to fans of many of the major titles released in the last couple of years. For a mere £3,

tape owners receive a generous selection of pokes for 20 top titles. However, disc drive owners fare even better: For an extra £2 they get pokes for the disc versions of 20 games, plus all the pokes from the cassette.

Cheat It Again Joe is certainly rather unusual, in that – to the best of my knowledge – it is the first offering of its kind released by a major company.

In the business software field many of the industry-standard databases, spreadsheets and the like benefit from software add-ons that make them more powerful or easier to use. So why not produce software add-ons for games?

I have often received letters saying that routines featured in my column have drawn old games out of the cupboard and given them a new lease of life: Joe offers further helpings of the same.

The collection seems to have been designed with the novice user – or at least the novice hacker – in mind, and a

Alerion ... bird without wings

Price: £14.95 (Archimedes only)
 Supplier: Dabs Press, 76 Gardner Road, Prestwich, Manchester, M25 7HU.
 Tel: 061-773 2413

VERTICAL scrolling shoot-'em-up games have been available for a long time on 16 bit micros and have reached the stage where new ones invoke yawns of boredom. But in the Archimedes field only two have become available, the first – from a group of students – was certainly a creditable effort. Now we have a professional one from Dabs Press.

Booting up the game is the same as for any BBC Micro – Shift+Break – but if, like me, you usually sit with your finger on the Shift key waiting for something to happen, you are out of luck. When you take your finger off the program starts to load.

An option screen is loaded which gives you a choice of a demo, changing the key selections and playing the game itself. Each can be selected either with mouse or keyboard.

The second option shows the default settings and a representation of the keyboard; you use the mouse to click the keys you want, and if you choose the same key twice the program defaults to the standard.

Selecting the play option causes a fairly duff title screen to load followed by the main game code. During the time between games you are presented with the high score table a



Targeting on ground bases

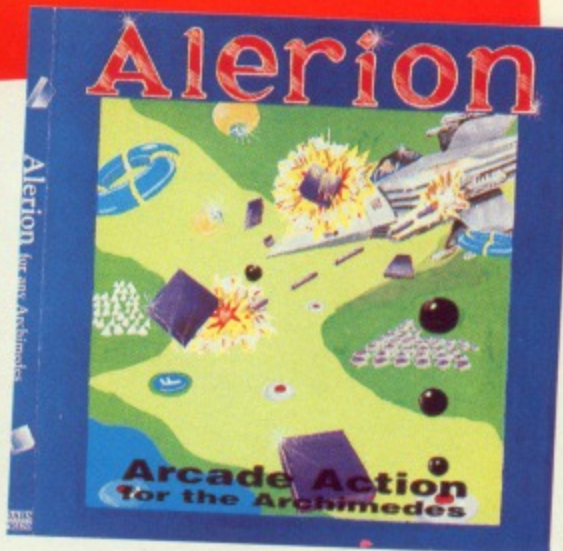
list of all the targets and a page of information about spikes, H and F bases. You have to dodge the first, the last H base you fly over becomes the start point for your next life, and landing eight shots on an F base gives you one FAC – a jamming system that makes your ship invisible.

Pressing Return takes you into the game proper. The default keys are fairly standard: Z/X for left/right movement,] and / for accelerating up the screen and slowing down to move back. Pressing Return gives you very strange air-to-air missiles and the Alt key produces air-to-ground shots – crosshairs are positioned a third of the way up the screen from the ship itself and that's where any ground fire will hit if you use it. Pressing the spacebar activates the FAC when you've hit the F bases enough times.

You have a plan view of the terrain as it scrolls from the top of the screen and the landscape slowly unfolds. Strange objects move down at you while others move from side to side. These are dangerous and have to be eliminated with the air-to-air shots – but just keeping Return pressed satisfies that.

The real problems come in the form of ground-based rocket launches that literally erupt from the terrain and begin to fire black missiles at you. They aren't very accurate, but at first, what with dodging them plus everything else going on, you'll soon succumb and lose a life.

The launchers can be dealt with by your ground missiles –



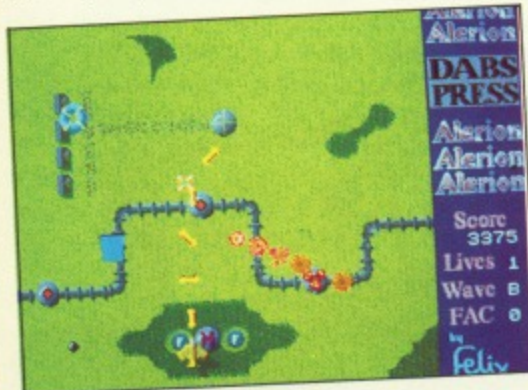
but you can't fire both types of missiles at once. One thing I noticed was that not all the ground bases fire until I knocked out one of the others, so there's no point in gratuitously hitting every base, as it only activates others. There are several levels, but they are all strung together without a break. At higher levels there are vicious floating balls that home in on you.

My main disappointment with the game is its scoring system: The highest valued objects – Flippers – appear on the first level only. This means that to get a high score you just hit everything in sight without going over an H base. Then when you do get killed you restart at the start of level 1 with another set of Flippers to knock out.

The sound is fairly good with plenty of digitised explosions and there is some speech too, telling you when you've flown over an H base or moved to the next level. But there's nothing spectacular and no music.

Lazarus

Sound	7
Graphics	6
Playability	9
Value for money	8
Overall	8



Locking on to an H base

great deal of thought has been put into making the system easy to use. The tape or disc is loaded in the usual way: CHAIN™ and Shift+Break respectively. Once the first part has finished loading, the micro presents you with a list of names of the games featured in that volume.

Using the cursor keys moves a highlight bar up and down the screen and pressing Return selects the game. Alternatively, pressing spacebar presents another page of game titles.

When you've selected a game the micro tells you about the cheat facilities provided for it and another press of the spacebar brings up a request for the version of your game.

In some cases, such as Superior's Repton 2, Joe caters for both the original stand-alone game and a compilation version. The disc version of Joe caters for all four versions of Repton 2 – the original tape, the original disc, the Superior Collection tape and the Superior Collection disc. Once

the version is selected the appropriate poke routine is loaded and you are prompted to insert the tape or disc. Follow the on-screen instructions and the game will load, apparently normally, but with all the promised modifications in place.

As one who can claim to specialise in this sort of thing, I know how long Mark must have spent devising the pokes in these compilations, and the result is very worthwhile.

Hac-Man

Sound	N/A
Graphics	N/A
Playability	9
Value for money	10
Overall	9



The day Daniel's dad brought his office printer home.



My dad's firm is always busy so he has lots of LC-10 printers at his office.

In fact, he sometimes has so much work to do that he keeps a personal computer in his study so he can bring work home.

But when he's really busy, he brings home one of those Star printers too.

Of course, I know exactly how to use them because we have the colour version at school.

It can print documents in six different colours.

So I'm not surprised WHAT MICRO? called the LC-10 the 'Best Budget Dot Matrix Printer' on the market.

What's more it's a lot less expensive than other printers but much better quality.

(My friend, Philip, even has one for his Commodore.)

For a start the front control panel is child's play.

The six different fonts give you so many different style options when you print things.

It's pretty fast too with a draft elite speed of 144 cps and high density near letter quality at 36 cps.

There's also the LC-10's special feature called 'push-tractor' which gives the lowest tear-off position of the paper.

And you can park continuous paper and automatically load single sheets – and I think that's unique for this sort of printer.

You know, if I keep my paper round going for a few more weeks I'll soon have enough to buy my own LC-10.

And then for a small fee, dad can borrow mine.



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LC10MU11



Making the right connections

Andrew Moore presents a game of cunning between you and your BBC Micro or Z88

BRIDG-IT is a compulsive two-player strategy game from the same family as Reversi, Connect-4 and Go. It's a satisfying pastime and, as your Z88 or BBC Micro is always available as a willing opponent, you can play it anywhere at any time. As with all good tactical games the rules are very simple. The board consists of a rectangle of black pegs interlaced with white ones and the two players each use one colour.

A turn consists of joining two adjacent pegs of your own colour without cutting across an opponent's connection. Black wins by connecting the left-hand side of the board to the right, and White must connect the top to the bottom. As an example the board in the diagram – which is only one quarter the size of a real board – shows a position where the black player can win by joining the middle two black pegs.

The traditional way of implementing games of strategy is to use something like the Minimax principle. On the program's turn it has to look at each possible move it could make and for each of these consider each of the opponent's responses and so on, down to several levels of search.

In a game like this, with many possible moves at each stage, the number of positions which need to be checked multiplies to huge numbers and as well as resulting in rather a long and complex program.

The delightful thing about Bridg-It which separates it from similar games is that there is a relatively simple algorithm for the machine to quickly decide which moves might be useful. In fact in this implementation, the details of board layout and checking to see if someone has won proved harder to implement than the tactics.

The program was developed on a Z88, and a key feature of the design is the isolation of the machine-independent parts from the areas of the program such as display and input which have to be altered for the BBC Micro. This means that all the parts of the program which would only run on one of the machines are hidden away from the main body of the program.

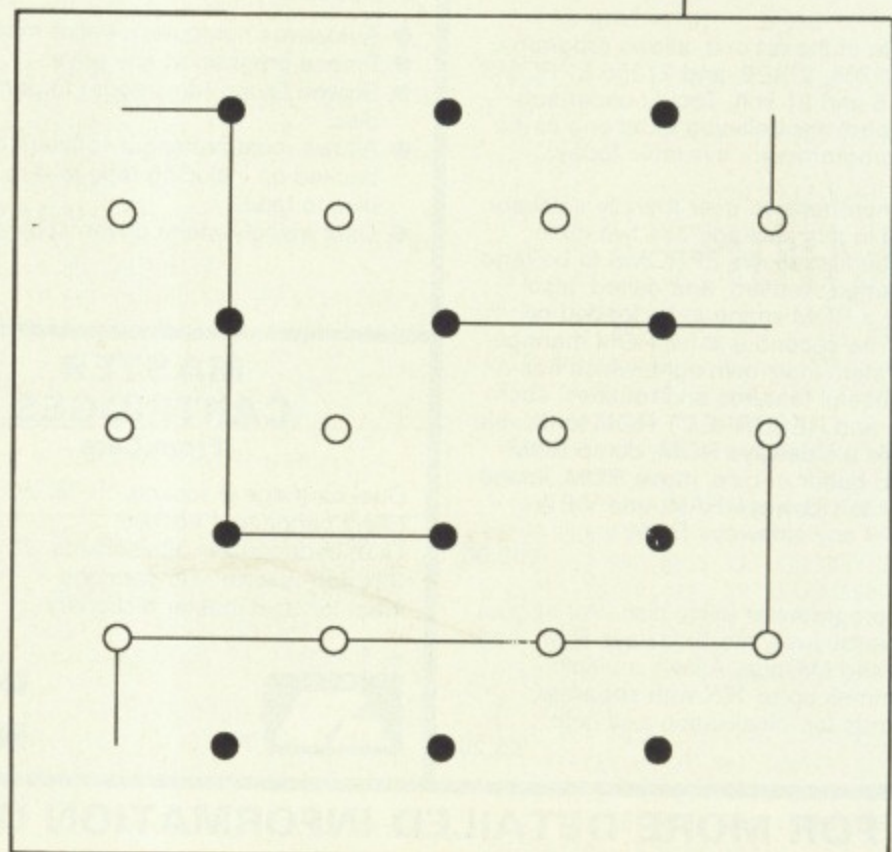
As well as providing the usual helpful software modularity, this means that when the software is

to be converted to the other machine, you immediately know what bits need to be changed, what they should be changed to, and that the rest of the program can be left unaltered. In this case the machine independent parts of the program – about 80 per cent – are in the lines below 1000 with the dependent sections above.

Type in Listings I and II if you are going to run the game on a Z88 or Listings I and III if you're using a BBC Micro. Notice that the MODE statement and relocation routine have been put in the first few lines of the BBC Micro version. Save the program before you run it.

When you play you are offered two levels of

Turn to Page 37 ►



A position where the black player can win

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◀ From Page 35

difficulty. Choosing "hard" and letting the machine go first makes for an extremely difficult game. You are the black player and your goal is to connect the left side of the board to the right. When it is your turn, a cursor will appear, and you can move it with the arrow keys. Place it between

the two black pegs you wish to join and press Enter or Return.

So, have fun with Bridg-It whether it's on a BBC Micro or the portable. If you enjoy sitting on the train with your Z88 looking extremely industrious, but occasionally don't have anything very productive to do, this might provide a perfect brain-stretching solution.

Listing I: The main part of the program

```

10 REM Bridg-It
20 REM by Andrew Moore
30 REM (c) The Micro User
40 DIM BD%(15,7):DIM CN%(15,7):PROCIN
IT
50 REPEAT:PROCUSERGO:R=FNMYGO:UNTIL R
>0
60 IF R=1 THEN AS="You win. Bleagh" E
LSE AS="I win. Hee hee"
70 PROCMESS(AS+". Play Again? [Y/N]")
:IF FNYES RUN
80 END
90 DEF PROCINIT:PROCTITLE:PROCUDC
100 FOR X=0 TO 6:FOR Y=0 TO 7:PROCAT(3
+4*X,Y+Y,0):PROCAT(1+4*Y,1+X+X,1):NEXT Y
:NEXT X
110 X1=-1:Y1=0:X2=0:Y2=7:YOURGOS="You
start, then."
120 PROCMESS("You'd prefer an Easy gam
e? [Y/N]"):IF FNYES THEN DIFF=4 ELSE DIF
F=20
130 PROCMESS("Can I go first ? [Y/N]"):
:IF FNYES THEN PROCGO(0,7):X1=0:Y1=7:YOU
RGOS="It's your turn now."
140 ENDPROC
150 DEF PROCUSERGO:PROCMESS(YOURGOS)
160 IF X1 >= 0 THEN LX=X1:LY=Y1 ELSE L
X=7:LY=4
170 REPEAT:PROCGETDXDY(LX,LY):LX=(LX+D
X) MOD 15:LY=(LY+DY) MOD 8:UNTIL K=13
180 IF (LY=7 AND ((LX AND 1)=1)) OR BD
%(LX,LY)>0 THEN VDU 7:PROCMESS("Illegal
Move. Try again"):GOTO 170
190 BD%(LX,LY)=1:PROCDJ(LX,LY,1)
200 ENDPROC
210 DEF FNYES:REPEAT:A=(INKEY(1) AND 3
1):UNTIL A=&E OR A=&19 :=(A=&19)
220 DEF PROCDJ(X,Y,P):IF (X AND 1)=1 T
HEN 240
230 IF P=2 THEN PROCAT(1+2*X,2*Y,3):EN
DPROC ELSE FOR Z=2*X TO 2*X+2:PROCAT(Z,2
*Y,2):NEXT Z:ENDPROC
240 IF P=1 THEN PROCAT(1+2*X,2*Y+1,3):
ENDPROC ELSE FOR Z=2*X TO 2*X+2:PROCAT(Z
,2*Y+1,2):NEXT Z
250 ENDPROC
260 DEF PROCCHOOSEMOVE:X1=LX:Y1=LY
270 IF LX/2=6-LY THEN X1=LX+2:ENDPROC
280 IF LX/2=7-LY THEN X1=LX-2:ENDPROC
290 IF LX+2*LY<13 THEN X1=LX+1-2*(LX A
ND 1) ELSE IF (LX AND 1)=0 THEN X1=LX-1:
Y1=LY-1 ELSE X1=LX+1:Y1=LY+1
300 ENDPROC
310 DEF PROCGO(X,Y):BD%(X,Y)=2:PROCDJ(
X,Y,2):ENDPROC
320 DEF PROCSEEJOIN(X,Y,D):IX=X:IY=Y:R
X=X:RY=Y:DA2=1-(D AND 2)
330 IF (D AND 1)=1 THEN IX=X+DA2:RX=2*
IX-X ELSE RY=Y-DA2:IF ((X AND 1)=0 AND D
=2) OR ((X AND 1)=1 AND D=0) THEN IY=RY
340 BLOCKED=TRUE:IF IX<0 OR IY<0 OR IX
>14 THEN ENDPROC ELSE IF RY>7 THEN ENDP
ROC
350 B=BD%(IX,IY):IF B=0 THEN BLOCKED=F
ELSE ELSE BLOCKED=( (B=1)=((IX AND 1)=(D
AND 1)) )

```

```

360 JOINED=B>0
370 RC=FNLABELOF(RX,RY):ENDPROC
380 DEF PROCFINDWIN(X,Y,C,D):PROCSSEEJO
IN(X,Y,D):IF BLOCKED THEN ENDPROC
390 IF JOINED AND (RC=0) THEN PROCCONN
ECT(RX,RY,C):ENDPROC ELSE IF RC=C OR RC=
0 THEN ENDPROC
400 IF NOT WON THEN WON=JOINED:WINX=IX
:WINY=IY
410 ENDPROC
420 DEF PROCCONNECT(X,Y,C):LOCAL D:CN%(
X,Y)=C:D=0
430 PROCFINDWIN(X,Y,C,D):D=D+1:IF D<4
THEN 430
440 ENDPROC
450 DEF PROCFOCUS(X,Y,P):XA=X:XB=X:YA=
Y:YB=Y
460 IF P-(X AND 1)=1 THEN XA=X-1:XB=X+
1 ELSE IF P=1 THEN YB=Y+1 ELSE YA=Y-1
470 LA=FNLABELOF(XA,YA):LB=FNLABELOF(X
B,YB)
480 IF LA=0 AND LB>0 THEN PROCCONNECT(
XA,YA,LA)
490 IF LB=0 AND LA>0 THEN PROCCONNECT(
XB,YB,LA)
500 IF LA>0 AND LB>0 AND LA <> LB THEN
WON=TRUE
510 ENDPROC
520 DEF FNLABELOF(X,Y):IF X=-1 OR Y=-1
THEN=1 ELSE IF X=15 OR Y=8 OR ((X AND 1
)=0 AND Y=7) THEN=2 ELSE=CN%(X,Y)
530 DEF PROCSWAPMOVES:T=X1:X1=X2:X2=T:
T=Y1:Y1=Y2:Y2=T:ENDPROC
540 DEF PROCRANDOMGO:REPEAT:X1=RND(15)
-1:Y1=RND(8)-1:UNTIL Y1<7 OR ((X1 AND 1)
=0):ENDPROC
550 DEF FNMYGO:PROCMESS('I'm thinking.
'):WON=FALSE:WINX=-1
560 IF X1 >= 0 THEN PROCFOCUS(X1,Y1,2)
:IF WINX >= 0 THEN PROCGO(WINX,WINY) :=2
570 PROCFOCUS(LX,LY,1):IF WON THEN=1 E
LSE IF WINX >= 0 THEN PROCSWAPMOVES:X1=W
INX:Y1=WINY:PROCGO(X1,Y1) :=0
580 PROCCHOOSEMOVE:IF RND(DIFF)=3 THEN
PROCSWAPMOVES
590 YOURGOS="It's your turn."
600 REPEAT:IF X1<0 THEN CANGO=FALSE EL
SE CANGO=( BD%(X1,Y1)=0 )
610 IF NOT CANGO THEN PROCRANDOMGO:P
ROCSWAPMOVES:YOURGOS="Your go. You are d
oing well."
620 UNTIL CANGO:PROCGO(X1,Y1) :=0

```

Listing II: The Z88 specific part of the program

```

1000 REM Z88 Machine dependent part of
Bridg-It
1010 DEF PROCTITLE:CLS:VDU 1,127,1,ASC"
S",1,ASC"T",1,ASC"U":PRINT "BRIDGE-IT"
1020 VDU 1,ASC"U":PRINT "by Andrew Moor
e"
1030 PRINT TAB(0,4);"YOU: LEFT TO RIGHT
":PRINT " ME: TOP TO BOTTOM":VDU 1,ASC"T
"
1040 ENDPROC
1060 DEF PROCUN(N):VDU 1,130,63,65+N:END
PROC
1070 DEF PROCUDC:RESTORE:FOR N=65 TO 74

```

```

:READ AS:VDU 1,138,61,N
1080 FOR I=1 TO 8:VDU 93+ASC(MIDS(AS,
I)):NEXT I:NEXT N
1090 ENDPROC
1100 DATA ?a?#####,####?E?#,?a?##M##,##
##?E?#,?a?##+##,##+##?E?#,##M#####,####
##,##+#####,##M###M##
1110 DEF PROCGETDXDY(X,Y):VDU 1,67:PRIN
T TAB(1+X+X+20,Y);:K=GET:VDU 1,67
1120 DX=0:DY=0:IF K=255 THEN DY=7 ELSE
IF K=254 THEN DY=1 ELSE IF K=253 THEN DX
=1 ELSE IF K=252 THEN DX=14
1130 ENDPROC
1140 DEF PROCMESS(SS):PRINT TAB(55,3);S
$:SPC(35-LEN(SS)):ENDPROC
1150 DEF PROCAT(U,V,C):PRINT TAB(20+U,I
NT(V/2));:IF C<2 THEN PROCU(C):ENDPROC
1160 IF U=30 OR U=0 OR V=15 THEN ENDP
ROC ELSE IF C=3 AND V=14 THEN PROCU(8):EN
DPROC
1170 IF (V<14) AND ((U AND 1)=1) THEN P
ROCU(C+(U AND 2)/2-1):ENDPROC
1180 IF 2*(V AND 1)-(U AND 2)=0 THEN K=
1 ELSE K=0
1190 IF BD%(U/2-K,INT(V/2))=2-(V AND 1)
THEN PROCU(9) ELSE PROCU(6+(V AND 1))
1200 ENDPROC

```

Listing III: The BBC Micro specific part of the program

```

1 IFPAGE<&E00 GOTO1200
2 MODE1
3 *FX4,1
1000 REM BBC Machine dependent part of
Bridg-It
1010 DEF PROCTITLE:COLOUR 129:COLOUR 2:
CLS
1020 PRINT TAB(8,3);"BRIDG-IT by Andrew
Moore";
1030 COLOUR 0:PRINT TAB(0,24);"You: Lef
t To Right";
1040 COLOUR 3:PRINT TAB(23,24);"Me: Top
to Bottom";
1070 DEF PROCUDC:VDU 23,240,&3C,&7E,&FF
,&FF,&FF,&FF,&7E,&3C
1080 VDU 23,241,0,0,0,&FF,&FF,0,0,0
1090 VDU 23,242,&18,&18,&18,&18,&18,&18
,&18,&18:ENDPROC
1110 DEF PROCGETDXDY(X,Y):PRINT TAB(6+2
*X,6+2*Y+(X AND 1));
1120 DX=0:DY=0:IF FNK(-58) THEN DY=7 EL
SE IF FNK(-42) THEN DY=1
1130 IF FNK(-26) THEN DX=14 ELSE IF FNK
(-122) THEN DX=1
1140 IF FNK(-74) THEN K=13 ELSE K=0
1150 ENDPROC
1160 DEF PROCMESS(SS):COLOUR 2:PRINT TA
B(0,28);S$:SPC(38-LEN(SS));:ENDPROC
1170 DEF PROCAT(U,V,C):PRINT TAB(5+U,6+
V);:ISWHITE=(C=1 OR ((X AND 1)+C=3))
1180 COLOUR (-3 * ISWHITE):VDU 240+C+(C
>0):ENDPROC
1190 DEF FNK(K):IF NOT INKEY(K) THEN=0
ELSE REPEAT:UNTIL NOT INKEY(K):=-1
1200*KEY0 *TAPEIMFORIX=0 TO TOP-PAGE ST
EP 4:IX!&E00=IX!PAGE:N.IMPAGE=&E00:MO.I
MDELETE1200,1210:MRUNIM
1210*FX138,0,128

```

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Letters

Crashing converter

SINCE you started features on the Z88 I have been a regular reader of *The Micro User* and am finding the Basic Editor published in the April edition very handy. But I have never developed much interest in programming despite having BBC Micros at work, so I was stumped when I found that the checksum converter listed in the same issue crashed at line 250 on the Z88.

I had already taken out the reference to Mode 7 in line 40. Can you please tell me what changes to make in order to make use of this valuable routine, and will the short checksums in your February issue run on the Z88? – **Bill Fleming, Northfield, Birmingham.**

● The checksum converter was written for the BBC Micro, which uses a 6502 processor. The Z88 uses a Z80, so while both Basics are externally similar, internally the machines are completely different. This means that if a BBC Micro program uses machine code – as the ones you mention do – it will not work on a Z88. Also, as calculating checksums relies on how Basic is stored, the calculations would, in any case, be different.

A final point, which we have mentioned in Letters previously, is that creating Basic from checksums is impossible. Did you say the April issue?

Testing the buffer

FIRSTLY, can I congratulate you on your excellent coverage of the Z88. I await each new issue of *The Micro User* with eager anticipation as to what hints, tips and new commands will be revealed. What all of us Z88 owners are dying to know is where all of this information is coming from – a mole at Cambridge Computer perhaps?

Now to my problem, I am writing a special terminal program in Basic to drive an amateur packet radio interface and, thanks to your articles, I have worked out how to get data from and output it to the RS232 port. My problem is how to test if the output buffer is full and if the input buffer has data in it to avoid the program hanging at the BGET and BPUT statements. – **Denis Pibworth, Woodley, Reading.**

● To use the serial port – :COM.0 – at the device level, you need to use operating system calls and

the information regarding this is only available in the form of technical notes.

To get them you should write to Peter King, Cambridge Computer Ltd, Bridge House, 10 Bridge Street, Cambridge CB2 1UE asking for a copy. Peter will send you a pair of non-disclosure documents which you must sign and return with a requested cheque for about £50 which covers the various costs involved.

Ever-open files

I AM generally very pleased with my Z88, but perhaps you could answer a question about its operation. Occasionally, as I try to refile a Pipe-dream document after editing, or as I try to erase a Pipedream file using the Filer command Erase, the micro returns with a beep and the message In Use.

Can you explain why this happens, and what I can do about it? I can find no useful information in the manual. – **R. Barnard, Altrincham, Cheshire.**

● The error message *In Use* normally means that the file you are trying to delete or save to is still open and being used by another application.

However the Filer associated with 2.2 and 3.0 versions of the machine contains a bug which manifests itself when you are cataloguing files if you pre-empt out of the filer on a page wait. The file that is next to be shown has been opened by the operating system to determine how big it is and when it was created but it is not closed when the pre-emption takes place. So from then on it is always *In Use* – open.

The only solution is to perform a Soft Reset – with the card flap closed press the reset button twice. All suspended applications are lost and all currently opened files are closed, including the rogue file.

We are receiving a large number of questions about the Cambridge Computer Z88. Some of them are dealt with here, and we will be answering more over the next few months.

So if you have any questions about the portable micro don't hesitate to send them to:

Letters, The Micro User, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP.

We cannot give personal replies but will try to answer your question on the Letters pages.

WE have received lots of questions about the Z88, and answered several in the letters pages of recent issues of *The Micro User*.

Here Matthew Soar, consultant to Cambridge Computer, replies to some of your more technical queries.

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GAMMA PLOT

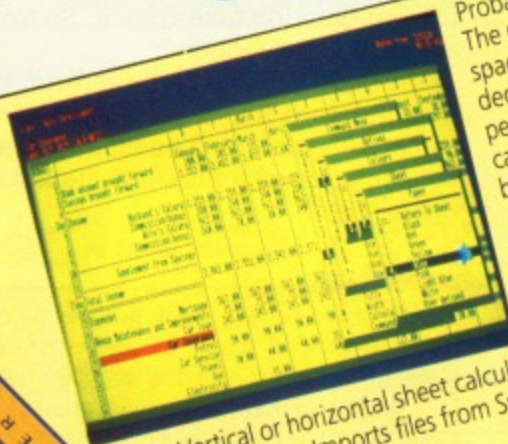
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Magic with words



Product: Z88 Spell-Master
 Price: £59
 Supplier: Computer Concepts, Gaddesden Place,
 Hemel Hempstead, Herts, HP2 6EX
 Tel: 0442 63933

FOLLOWING its release early last year, Computer Concepts' Spell-Master has rapidly become one of the most used pieces of software on the BBC Micro – and now it's available for the Z88. A spelling checker is basically a large dictionary together with software to compare words in the text with those in the rom very quickly.

This simple approach means that it will accept *their* even though *there* was intended, or *man* when *main* is the required word. Nevertheless a spelling checker does pick up most typing mistakes and aids the correct spelling of infrequently used words.

Z88 Spell-Master comes on a 128k rom cartridge which adds two extra options to the Z88's Index: An application, QuickEdit – selected by Q – and a pop-down WordFinder, entered with W. QuickEdit is a text editor in which loaded files can be checked for spellings.

The BBC Micro version works within View, Wordwise or Inter-Word, checking the spelling of words as they are typed. Disappointingly Z88 Spell-Master will only do this within QuickEdit. So if you want to check a PipeDream document it has to be saved to a file and loaded into QuickEdit. After checking it has to be saved once more and re-loaded into PipeDream.

QuickEdit ignores PipeDream embedded commands within text, so at least you can check files in Pipedream internal format. But it does mean that if you've used more than one of PipeDream's columns the text is not very intelligible, as all of

column one precedes all of column two and so on. Also replacing words with ones of a different length may cause text to go outside the set columns.

As with virtually all spelling checkers, Spell-Master allows you to build up your own user dictionary – additional words which are not in the main dictionary but ones that you want to be recognised as correctly spelt.

So what can QuickEdit do? As far as spell checking is concerned somewhat more than on the BBC Micro. There are diamond commands to check all text, check from the cursor onwards, check a word, check a marked block or check as you type. When it doesn't find a word in the dictionary it gives options to ignore the word, add it to your user dictionary or browse through the dictionary as on the BBC Micro version.

And there are two additional options: You can enter the correct word or words which then replace an incorrect word in the text – particularly useful if, for example, you've run two words

Turn to Page 43 ►

John Allen corrects a common mistake

MOVING DICTIONARIES

Transferring a user dictionary from the BBC Micro to the Z88:

- Download the user dictionary to the BBC Micro Spell-Master editor, using the Edit user dictionary option.
- Remove the first two lines of header information using the editor.
- Use the Save text from editor option to save the dictionary in Z88 format.
- Transfer the file to the Z88. I used last month's BBC Link II program, although any link program between the two machines will do.
- Load the file into QuickEdit using the FUL option.

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◀ From Page 41

together. Or you can make a guess at what the word might be.

Such options in spelling checkers are always open to ridicule, but so far I've found that one of the guesses listed is usually correct. This sort of facility is present in the BBC Micro version as *FUZZY, and it's interesting to see that, like *FUZZY, the Z88 version won't cope with *ph* which sounds like *f*. For example, take the word *philosopher*, Spell-Master provided no guesses for *filosofer* or even *philosofer*. As QuickEdit is also a text editor, it can in some circumstances be used as a substitute for a word processor, provided that you don't want to use highlight codes such as underline, effects like centring or to print out directly. Large amounts of text can be entered using the Check as you type option, the text then being loaded into a word processor for the addition of the highlights and effects before printing.

Text can be saved with Returns at the end of each line and these files can be loaded as plain text into PipeDream or read into View. Alternatively text can be saved in straight Ascii form – the file only contains Returns which have been explicitly typed – and this is a file format which is easy to load into Wordwise or Inter-Word. Indeed

this facility may well make Z88 Spell-Master a worthwhile purchase, and gives a measure of compatibility between machines, since it costs less than buying View Professional for the BBC Micro.

WordFinder, like QuickEdit, allows you to browse through the dictionary and make guesses. It covers the same sort of options that you get with the star commands on the BBC Micro. The difference between WordFinder and QuickEdit is that with the former you enter the information on the keyboard, rather than it being derived from the text. It can be used, for example, within PipeDream if you're not sure how to spell a word.

Additionally, WordFinder will solve anagrams – provided that the result required is only one word – and search through the dictionary using wildcards, using # in place of single unknown letters and * in place of a group of letters.

WordFinder only takes into account the dictionary on the Spell-Master rom it does not use any of the words in your user dictionary – unlike QuickEdit.

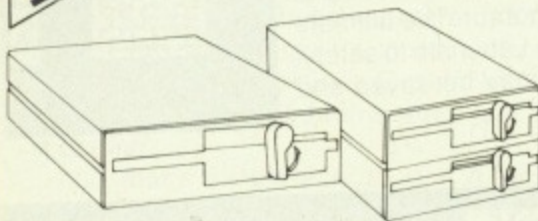
I'm disappointed that it doesn't link up directly with PipeDream: If a link is not possible at least it would have been nice if QuickEdit were a basic word processor with highlights, limited effects and the ability to drive a printer. Nevertheless, it's one of the best roms yet for the Z88 and since it's been in my machine I've found it very useful.

Wordfinder will solve anagrams ... and search through the dictionary using wildcards

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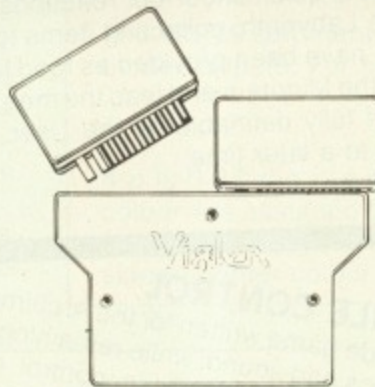
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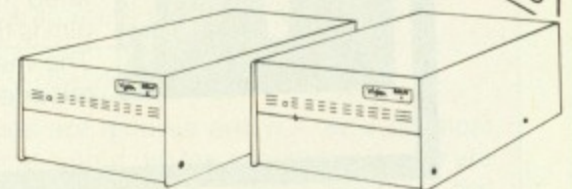
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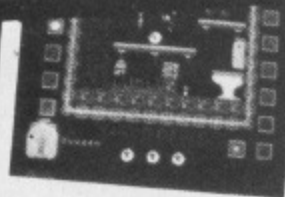
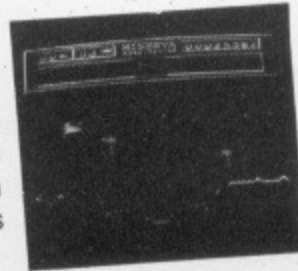
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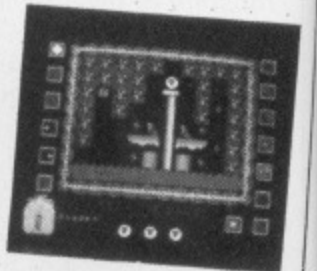
ORION

Skillfully manipulate Orion, the latest air to air combat interceptor, to defend your planet against the tide of marauding aliens. Shoot them down before its too late! Score points by saving your men before they are changed into mutants - otherwise they will turn against you. Contains Baiters, Pods which explode into Swarms and waves of Bombers. Orion is a fast and furious scrolling 'shoot em up' game based on the all time arcade classic.



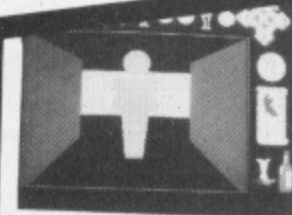
HOVERBOD

Hoverbod is a traditional maze adventure in the style of the classic Manic Miner, yet it is of stupendous proportions. Hoverbod, the yellow sperical droid, has been banished from the planet Zingle and goes in search of some stolen treasure. The player must guide him through the perils which befall him and help him puzzle his way through the eight different levels to the final quest level. But beware ... the Ibbles and Squibbles start to materialise !!!!



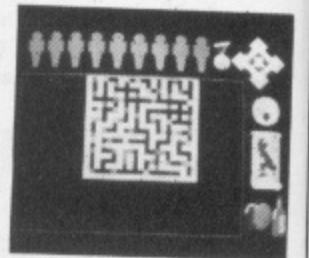
FREDDY'S FOLLY

An enchanting game using animated graphics. Just watch the little men load the canon and pull it along. Notice the celebration when they win! Colourful fun for all the family. Sir Freddy is sneaky and envious of your castle so plans to bomb it with a fleet of balloons. You built a battlement to shoot down Sir Freddy in his balloon. Sir Freddy then hired several Gun ships to shoot your canon crew. Defend your castle and shoot down the balloons and the invading ships.



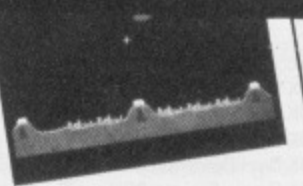
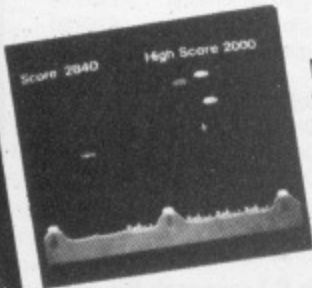
MINOTAUR

The Minotaur maze game is aimed at a market for children or adults who want a game where quick shoot-out reactions are not necessary. Theseus walks around the Labyrinth, collecting items to assist in the search of the ill fated men which have been provided as food for the Minotaur. The ultimate aim is then to kill the Minotaur and lead the men out of the Labyrinth to safety. The maze size is fully definable by the User. Games may be saved and reloaded for use at a later time.



MISSILE CONTROL

Missile Control is a classic arcade game written for the Archimedes to make full use of the advanced graphics and sound, while remaining faithful to the original concepts of the game. The Player is in control of the missile launches and must do the utmost to protect the cities from the incoming missiles. On each subsequent attack further planes, satellites or 'smart' missiles attack the target cities.



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Please send me: ORION HOVERBOD FREDDY'S FOLLY
 MINOTAUR MISSILE CONTROL
 No
 Name
 Address
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Over the rainbow

CHOOSING the right colour for your Archimedes programs is usually a matter of trial and error, but with this little utility you can easily select and view what's available before starting to program. Although you could use the palette on the desktop for making your selection, you can't tell what red, green and blue values are needed to create the colours in your own program. What is needed is an easy way of displaying colours plus their elements.

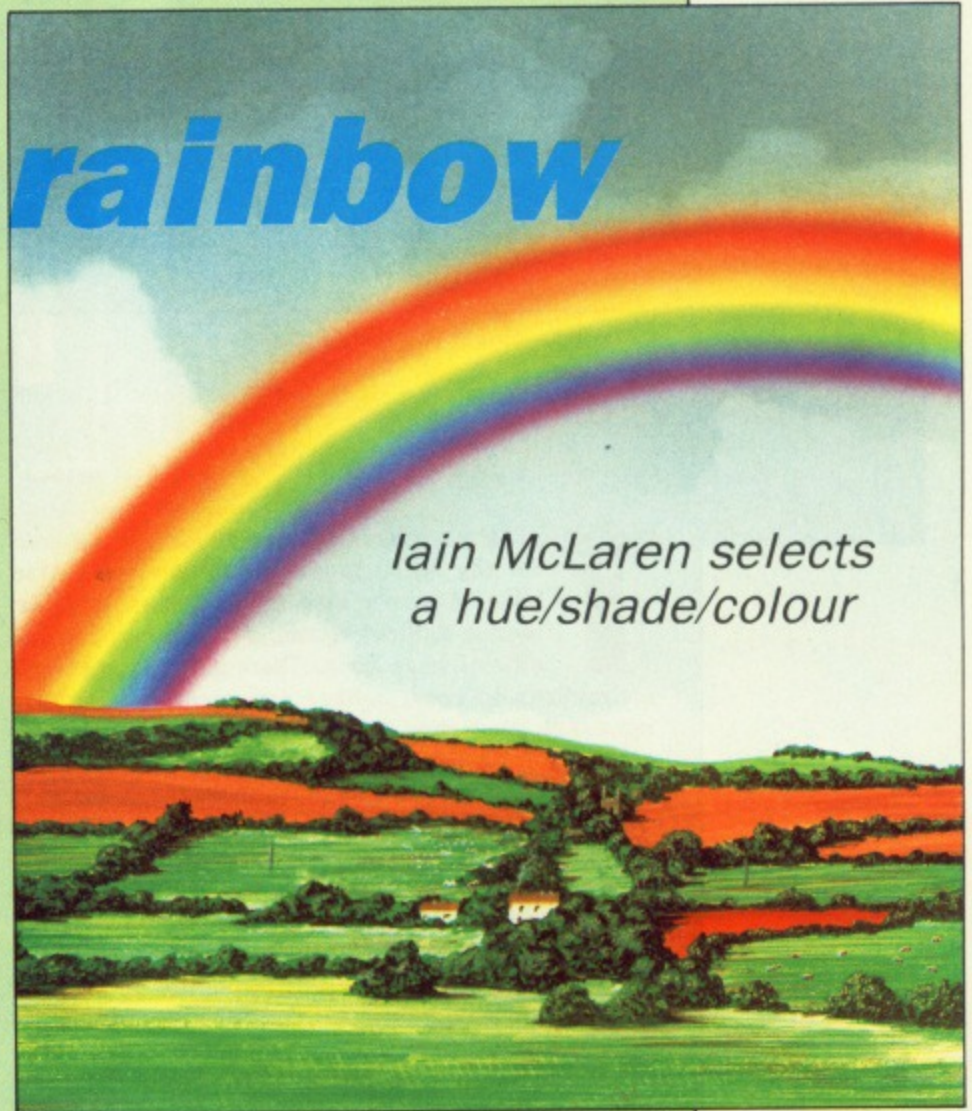
Type in the listing and ensure it is correct using Get it Right! The program displays the red, green and blue - RGB - values in the middle of the screen along with a positive step value. By clicking the three mouse buttons you adjust the appropriate colour by the step amount. When a satisfactory one has been presented you can read off the RGB values from the screen and enter them into your own program.

ColourSet runs in Mode 8, but the colour values found will be right for any mode - except the 256 colour ones which are a special case and need the TINT command as well.

The whole of the screen background displays the desired colour, so when a bright one is being chosen the text colour changes from white to black. Interestingly, because of your eye's response to colour we only need to check the brightness of red and green for the colour change, not blue.

The increment value is contained in A\$ and is set to either plus\$ or minus\$. Since there are only 16 levels for each colour, the on-screen step value could be 16, but the program responds too fast at this speed, so an increment of two is a satisfactory compromise. To shift between positive and negative incrementing just press the spacebar.

And that's all there is to it - a simple utility which is all you need to get just the right shades into your program.



Iain McLaren selects a hue/shade/colour

COLOUR SELECTION

Two VDU19 commands are used to adjust the background and screen border colours. For each the parameters are used as follows:

VDU19,l,p,r,g,b

If p is 0-15 the r, g and b values are ignored and it - as a physical colour - is assigned to the logical colour, where p is 16 the r, g, b are assigned to logical colour l. Finally in the case of p being 24 the screen border colour is assigned the r, g, b values.

```

10 REM > $.ColourSet
20 REM by Iain McLaren
30 REM (c) The Micro User
40 MODE8:OFF:COLOUR 129:CLS
50 plus$="+2":minus$="-2":A$=plus$
60 red%=0:grn%=0:blu%=0:@%=3
70 REPEAT WAIT
80 COLOUR FNbright(red%,grn%,blu%)
90 VDU19,0,24,red%,grn%,blu%
100 VDU19,1,16,red%,grn%,blu%
110 PRINTTAB(35,14)"Red = "red%AND&F0
120 PRINTTAB(35,15)"Green = "grn%AND&F0
130 PRINTTAB(35,16)"Blue = "blu%AND&F0
140 REPEAT WAIT
150 PRINTTAB(35,17)"Step = "A$
160 IF INKEY-99 THEN
170 IF A$=plus$ A$=minus$ ELSE A$=plus$
180 REPEAT UNTIL NOT INKEY-99
190 ENDIF
200 MOUSE XX,Y%,Z%
210 UNTIL ZX>0
220 IF ZXAND4 red%=FNrng(red%+EVALAS)
230 IF ZXAND2 grn%=FNrng(grn%+EVALAS)
240 IF ZXAND1 blu%=FNrng(blu%+EVALAS)
250 UNTIL FALSE
260 END
270 DEF FNrng(V%):IF V%<0 =0 ELSEIF V%>255 =255 ELSE =V%
280 DEF FNbright(R%,G%,B%):IF R%>160 OR G%>112 =0 ELSE =7

```



10 = 0 0	110 = 539A 4	210 = B724 8
20 = 0 0	120 = 6086 E	220 = 326E 3
30 = 0 0	130 = 9B0D 3	230 = C16B C
40 = 47A1 1	140 = D94C 1	240 = 3A2E 3
50 = CEF9 E	150 = 85D 6	250 = 226C 0
60 = CAD8 C	160 = 4E98 0	260 = FD2E 7
70 = D94C 0	170 = 94AA 2	270 = 207F E
80 = DC3F 2	180 = D856 2	280 = DACB 5
90 = D57B E	190 = 8E1 3	
100 = 7A2B 5	200 = 800 4	

Worlds ahead

Phil Tayler investigates a program which leaves you bereft of words

*Product: Worlds Without Words
Price: £25
Supplier: 4Mation Educational Resources, Linden Lea, Rock Road, Barnstaple, Devon EX32 9AQ.
Tel: 0271-45566*

THERE have been many text-only adventures, so why not a graphics-only one? This was Mike Matson's idea as he began work on *Worlds Without Words*, a program unlike any other I have seen. There are no on-screen instructions to read, neither are words required for input. Any interaction is by moving a pointer to specific areas of the screen using any one of a number of devices – Concept keyboard, touch screen or mouse.

The cursor keys are available by default, but the range of other input media makes the program accessible to children with a range of physical handicaps, while children with reading or language difficulties will find no restraint either.

The adventure revolves around the arrival on Earth of a spaceship with a strange being on board, but with no details of its identity or purpose – which leaves plenty of scope for discussion and class decisions.

The support materials are excellent and the most hesitant teacher will be able to use them with confidence. Included in the package is an hour-long music cassette, an imaginative poster by Rodney Matthews, a book of three short stories and two manuals.

Although there are no built-in difficulty levels

from a menu – indeed there is no menu at all – teachers could use this adventure in a number of ways, depending on the method by which it is introduced.

For instance, much discussion could precede using the software, and initial hints could be given. Alternatively it could be introduced with little or no explanation to children whose natural enthusiasm, initiative and curiosity would be sufficient.

There are several main problems to explore, although the path followed through them can be varied by the input made in an earlier screen. For instance, the Spinning Cubes problem can be solved in four ways, each solution branching to a different section of the adventure.

Another complete departure between this and any other adventure is the absence of any specific finishing point. Again, the key to the program's potential within schools is its flexibility. A very useful feature, which ought perhaps to be

*Product: Book Builder
Price: £14.95
Supplier: HS Software, 56 Hendrefoilan Avenue, Sketty, Swansea SA2 7NB.
Tel: 0792 204519*

YOUNGSTERS in school, no matter what age, will be familiar with word processors, and many will be seeking other outlets for their computer creativity. HS Software has come up with a novel and entertaining package to help in this sphere. It is said to be suitable for children aged seven and upwards.

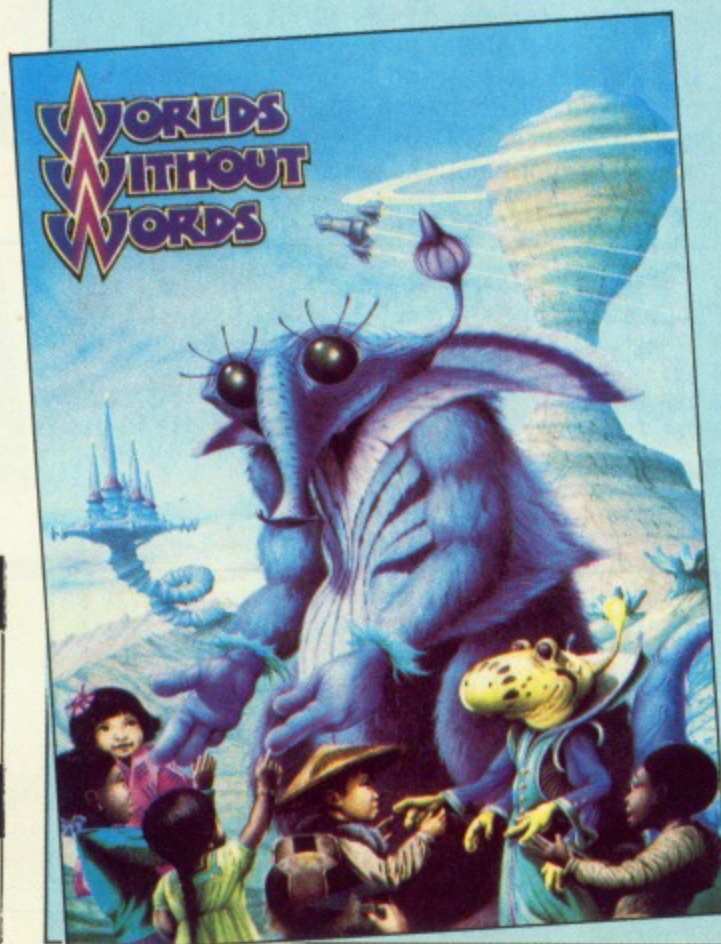
At its basic level, Book Builder is a kind of sprite designer and animator. In the section called *Make a Picture* a simple to use grid system is employed. Position a cursor and press a function key and a blob of colour is put in that space on the grid, and also on to an actual-sized sprite.

When producing animation, a clever system allows children to create one version of the sprite and then just make the required alterations to get a second position.

The first picture is best saved on the program disc, which has lots of free space. If it fills or if several groups are taking their turn with the program, it could lead to a lot of disc swapping, which most seven-year-olds don't find too easy. When I spoke to HS, they said that they would include two copies of the disc with the package which should go a long way towards solving that problem.

The next task is to incorporate the sprites into pages, and again the process is straightforward. You place the sprite at its start and end positions and the program automatically moves it between them.

You can put text on to a page – and make it

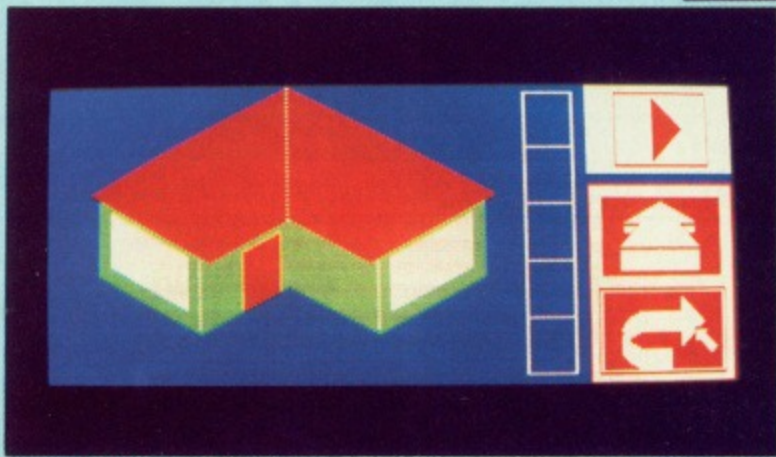


Points for

- Many input devices
- Language-free
- Immensely flexible

Against

- Requires teacher input

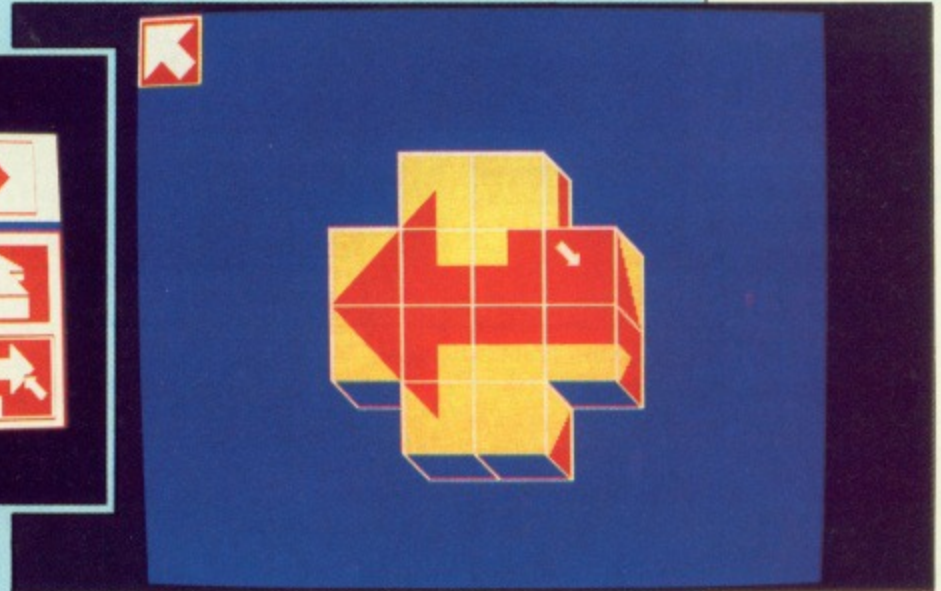


Moving to the next frame

standard, is the facility to dump most screens to an Epson or Integrex printer – superb if you want to use the software as part of a project or display.

The Face Processor is an immensely complex and powerful section in which you can select from a wide menu of eyes and mouths and place in a sequence of up to 250 frames. This sequence can then be played back at a variety of speeds. The possibilities are enormous, including the design of a series of images to relay a message such as *I am hungry* or even a sequence for lip reading.

The philosophy here is vital to the whole concept – Worlds Without Words, being a series of



Solving a problem

starting points rather than an end in itself.

There are other equally open-ended activities such as the robot designing module. Here a robot must be constructed which can negotiate an obstacle course within its environment. This could lead on well into projects concerning modelling, control technology and the like.

This program has vast possibilities and is truly educational. I am sure that it will greatly influence the way in which we look at software for schools.

Building bricks

Rog Frost examines new creative software

move – but Book Builder makes no claim to be a word processor, so the child will have to ensure that the text can fit into the space allocated. Text can become cartoon style speech by linking it to a sprite with an arrow. It can also have built-in questions, where question marks are displayed on the screen and the reader has to type in the correct letters.

The order in which a page is put together governs the sequence in which items appear when the page is read. Complex pages with lots of pictures, words and questions can be assembled and the sections automatically displayed one after another or a *Press Space* prompt can be incorporated – the style is left to you.

Groups of up to 10 pages can be strung together to make a book. This feature allows for different groups of pupils to produce work on a common theme and then view them all in sequence. Once again, whole books can be saved on the disc.

The well-written manual, which comes with some planning grid sheets, warns that the more limited memory of the BBC B may prove a problem. My experience with children is that this is not the case and that complex pages can be built up. Indeed, I have been using the program on my Electron with an AP4 disc interface and it works perfectly.

Perhaps the weakest part of the program is the printout facility. This consists of a shaded

graphics screen dump for Epson-compatible printers. Black and white just cannot do justice to the eight colour – plus flashing combinations – Mode 2 screen. In fact, good screen colour combinations appear as very similar shades, and all impact is lost. As colour printers get cheaper, perhaps HS would like to consider an alternative colour print routine – although flashing inks are hard to get hold of.

Book Builder is a well-produced and well-liked piece of software which deserves to take its place as a creative tool for children of all ages.



Points for

- Creative addition for English skills
- Well written manual

Against

- Needs a lot of involvement from the teacher

Stimulating simulation

A package for environmental science studies evaluated by Ian Dickinson

Program: Water Manager
 Price: £16.10
 Supplier: Cambridge Software House, The Town Hall, St. Ives, Huntingdon, Cambridgeshire PE17 4AL.
 Tel: 0480 66805

WATER Manager is a decision-making package based on the activities of a water authority. It will be of use in the areas of project work in geography and environmental sciences in the middle and upper secondary age range. The point of the exercise is to ensure that the supply of water to a given locality is the correct amount necessary to survive.

One of the objects is therefore to spend and invest money wisely. The simulation would work as an intensive stand-alone exercise, but to obtain the full potential of the package, it is best used with small groups – possibly competing with each other.

Often, computer simulations do not introduce other wider aspects of a given topic. Water Manager does and it can open the door to a whole wealth of related criteria, not only the more obvious aspects of environmental studies. For example, it can be used in economics, information technology in the form of spreadsheets,

history and so on – depending on the teacher's approach and experience.

The software comes on a single 40 track disc although it was not labelled with the track format. The program is split into two main parts: Brief descriptions of the water cycle and basic information on what type of services have to be managed and the simulation itself.

You as the manager have to control the water resources efficiently and supply the town and village under your responsibility for as long as possible.

At the start of the game – and for subsequent years – you are shown a colourful moving graphics picture of the area under your control and the movement of the water cycle. From this point on you have to make decisions on how much to spend on the various aspects.

However, it is not always a question of simply trying to balance the books and keep the people happy. In an attempt to be as realistic as possible, various random events occur – a flood is forecast, the river levees had better be adequate or you will pay the price and so on.

You must make decisions on how to manage the natural and economic resources at your disposal. At any point you can ask for a situation report to see how things are progressing and it can be printed to be analysed later.

The actual decisions are taken by giving the program new values to work on. One annoying little thing here is that when the input has to be in the form of letters, lower case will not be accepted: This should be changed.

You have the option of saving and re-loading a game, which is useful if the program is to be used as part of an on-going project and is a feature that is often overlooked. A backup copy of the disc can be made so there are no worries about saving to the original disc.

The documentation comes in a well presented A5-sized booklet of 15 pages. The software itself is easy to use and self-explanatory, and the booklet suggests various approaches which may be useful. It also includes three experiments dealing with the production of salt by evaporation, a demonstration of how an aquifer stores water and a *working* water-treatment works.

A useful supplement to the program is an information pack supplied by the Anglian Water Authority. It contains various small posters and pamphlets relating to the different aspects of water management and treatment. More packs can be obtained from the AWA if needed.

Overall, the software is very useful as both a tool for environmental sciences and an introduction into other areas of interest – positively encouraging pupils to make decisions about water management and related aspects.

This package should find a home in any school or geography department software library and can be recommended if one of your aims is to stimulate active participation.

Points for

- Ideal as an on-going project
- Easy to use
- Comes with information pack

Against

- Doesn't accept lower case

WATER MANAGER SITUATION REPORTS FOR YEAR 1

Water Resources:	
River flow:	95141 cubic m. per day
Factories and farmer need in total:	5000 cubic m. per day
Reservoir contents:	75% full
Reservoir capacity:	15 million cubic m.
To pump 1000 cubic m. per day costs:	£8160 per year
Water Supply:	
Town's consumption:	23174 cubic m. per day
Village's consumption:	310 cubic m. per day
Water lost through burst pipes:	4634 cubic m. per day
To pump 1 cubic m. per day to the town costs:	£74 per year
To pump 1 cubic m. per day to the village costs:	£112 per year
Sewers and Sewage Treatment:	
Sewage Works capacity:	26000 cubic m. per day
Sewage flow:	25921 cubic m. per day
Length of sewers needing repair:	15000 m.
Cost of repair:	£250 per m.
Cost of extending Sewage Works:	£1 million
Land Drainage:	
Length of Sea Wall needing repair:	7000 m.
Cost of repair:	£2000 per m.
Length of Flood Bank needing repair:	8000 m.
Cost of repair:	£800 per m.



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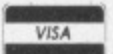
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The book of the micro

Steve Turnbull evaluates the latest addition to his library

Product: *The Complete BBC Computer User Handbook*
 Price: £14.95
 Supplier: *Watford Electronics, Jessa House, 250 High Street, Watford, WD1 2AN.*
 Tel: 0923 37774

BOOKS on how to program in Basic are available by the busload, ones on the BBC Micro are ten-a-penny. So I didn't greet the prospect of yet another on the Acorn series of micros with much enthusiasm, just how different could it be to the ones we already have? Well, my jaded palate has been very pleasantly surprised by this new book from Watford Electronics.

The introduction describes it as "intended...to plug the gap between beginner and expert" and it certainly seems to do it. The first chapter covers the uses of a micro and works through game playing, comms, control applications to music, desktop publishing and programming. In each it describes how a micro can help – although it doesn't say much about the drawbacks in each area.

From there the authors move to how to set up your system for maximum comfort, including health and safety considerations – there's even a diagram of the ideal set-up. Moving on, hardware, compatibility and useful roms are gone into in a fair amount of honest detail – and Watford Electronics products are not always the ones recommended.

There is a chapter on the Archimedes which examines the hardware and software compatibility with the earlier machines, plus detail on its unique features. The only problem here is that some of the popular myths about the 32 bit micro are set out as enthusiastic facts.

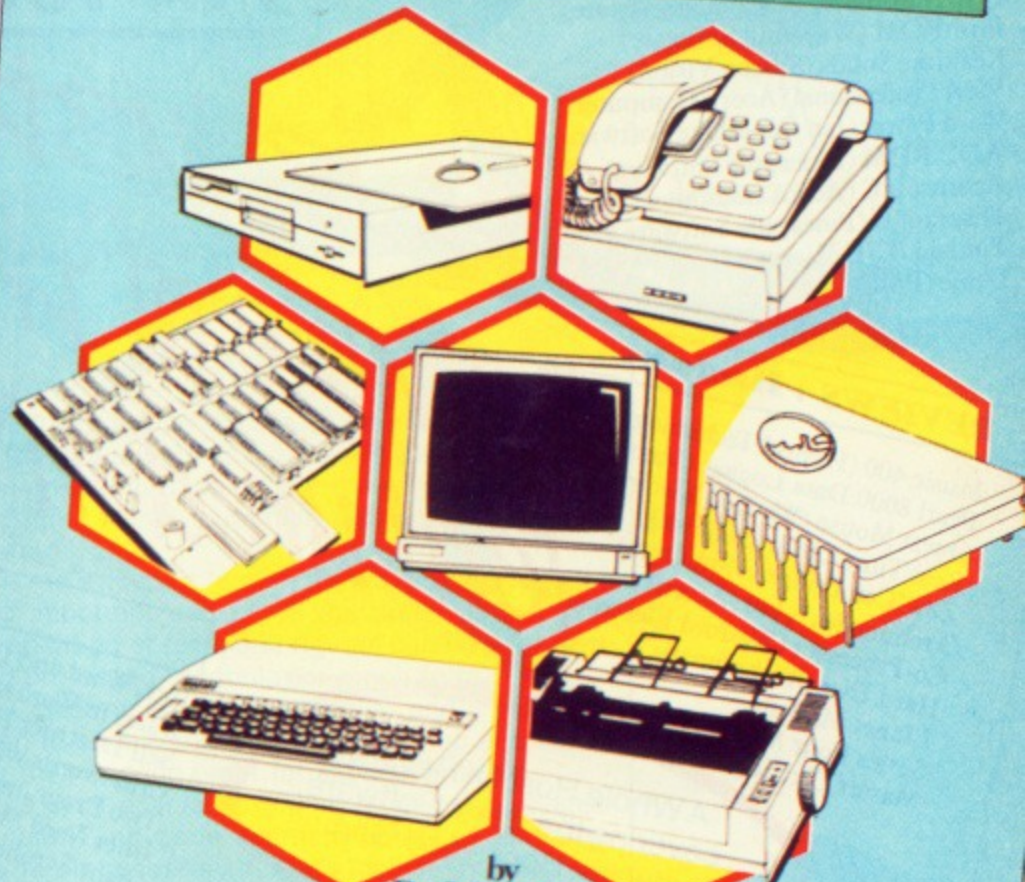
The next three sections cover organising yourself for work on a micro, tips on programming and how to debug successfully. For me these were the most enlightening parts of the whole book: No matter how experienced a programmer you are, you'll find things here you've never thought of – although they're obvious when pointed out.

The final few chapters deal with commercial software, using your micro for work, computer law and how to sell your own programs. Each one has sufficient depth to make it interesting even to the expert, but is simple enough for the beginner to understand.

The author's style throughout is friendly and

The Complete BBC Computer User

• H A N D B O O K •



by
 Dr. John Lockley
 & Douglas Tate

interesting with jargon kept to a minimum and explained where it does crop-up. Each chapter is composed of short sections seldom more than a page in length which are self-contained and easy to absorb. There are plenty of examples and short routines to demonstrate points as they are made – this is a book you can read sitting at your micro.

All in all it's excellently written, well produced and the perfect complement to your BBC Micro.

GENERAL FEATURES

ARM Wrestling
 Archimedes (Acorn launch)
 Overview of Computer Education
 C Programming
 Now C Here (Part 1)
 Comms Problems

Intelligent Modems
 Exploring Assembler
 Introduction to Assembly Language
 Animation
 Colouring your Beeb Pt.2
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 Realtime Solids (Silicon Vision)
 View Professional (Acorn Computers)
 Word Power (Ian Copestake Software)
 ADU ROM (Pineapple Software)
 Acornsoft C (Acorn Computers)
 Diagram II (Pineapple Software)
 Fontaid (CJE Micros)
 Genie (PMS)

PROGRAMS : Utilities

ADFS Menu for View
 Animated Titling
 DFS Utilities: *FREE and *MAP
 Epson Character Definer
 Function Keys
 IBM to BBC Transfer Utility Pt.1
 MIDAS Universal Disc Front End
 Machine Code Cross Referencer
 Mode 7 Menu Generator
 Overlaying Techniques
 Procedure and Function Analyse
 RAM (Vectored Entry into)
 ROM Controller (Improvements)
 ROM Filing System Image Gene
 Screen Dump for Mode 0

This is just a small sample of the items featured in Volume 6

REVIEWS : Hardware

Music 400 (Hybrid Technology Ltd)
 Pearl 8000 Data Logger (Innovations)
 Quest Mouse (Watford Electronics)
 Real Time Clock (Solidisk)
 Z88 (Cambridge Computers)
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Big alpha for Delta

Don Turnbull puts a five-pack
suite of software to the test

Product: System Delta Accounts
Price: £280 or £64.95 each
Supplier: Minerva, 69 Sidwell Street, Exeter EX4
6PH.
Tel: 0392 37756

THE System Delta Accounts packages are a set of programs that cover Order Processing/Invoicing, Sales Ledger, Stock Management, Purchase and Nominal Ledger. They take full advantage of the Archimedes' environment and are presented in a straightforward way, but ideally require a basic knowledge of these aspects of business management.

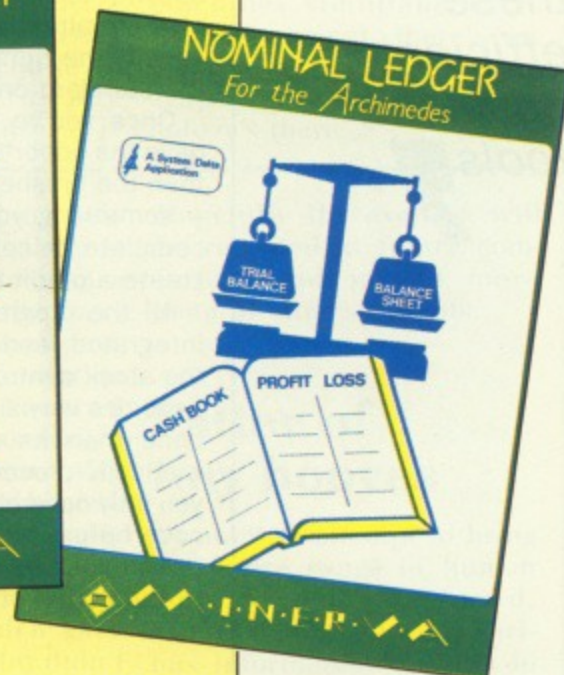
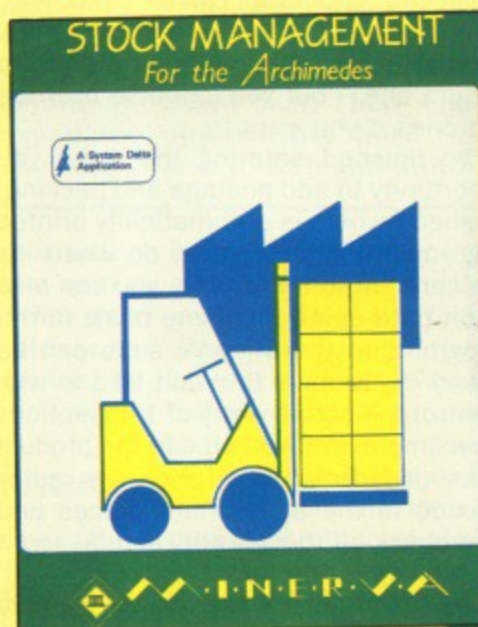
Much time and attention has been given to them to ensure that these very professional business packages are right. It's not unreasonable to assume that Minerva's System Delta output is aimed, in part at least, at companies and individuals who can see the advantages of moving away from time-consuming manual book-keeping methods to easier and more flexible micro-based systems.

However, the presentation of these particular products is such that even a novice in business matters could successfully run the parts he understands and gradually improve his ability to use more and more of the elements provided.

Very often the key to successful utilisation of a new system is the accompanying manual, and those supplied with each of these packages are very good indeed. This is a real plus point for tackling a micro business system for the first time and it's good to see Minerva making progress on this front. The only area of difficulty lies in the fact that the manual is for the BBC Micro version plus an amendment sheet for the Archimedes, so anyone unfamiliar with the earlier machines could find the references confusing.

Moving on to the software, as you might expect in a suite of utilities like this, there are actions and operations which recur throughout – making comprehension much easier once you have been through the process the first time. The principal elements common to all the packages are:

- Entering the system. Insert disc, boot and respond to the request for the date by entering your own figures or accepting the current – default – date conveniently provided by your Archimedes. You are then given the chance to clear out old data and taken to the main menu.



- In all the packages the main menu offers a calculator for your own quick sums and a command line for access to the star commands.
- They all allow you to browse files in any direction and jump to specific entries
- Editing of individual files also follows a regular pattern.
- There's a report feature that forms a very useful and important part of all the units. Almost any compilation of facts and figures can be extracted and presented in tabular or graph form.
- A close down line is provided and it must be used to enable the program to tidy up and leave the files in good order for subsequent use.

We can't possibly examine all of the packages in detail, and given the many points of similarity it's hardly necessary. So let's look at one program in detail.

Order Processing and Invoicing

From the main menu selecting the first item – Orders/Invoices – reveals a screen showing the date, order or invoice number and the main working area. The document itself can be larger than the work area and as you move around it – using the cursor keys – hidden sections appear

Turn to Page 54 ►

◀ From Page 53

and screen update is extremely fast. Using Shift with the cursor you can scan through all the invoices in the file.

On the default invoice all the usual invoice/order conventions are observed: Date, number, discount rate and so on. Although it has a very practical layout and simple modifications will customise it for your own use – you can devise your own invoice – which becomes the default – complete with its own discount tables.

You can start a new invoice either from the main menu or by pressing Control+A elsewhere. The system takes you logically through the name and address sequence – you can have both account and cash customers and with the former the program will find the address for you. You can also set up an overall discount or discount code to be entered automatically on each line.

Complex discount structures can be a problem, but with this system you can have a great variety of them already set up, only requiring a code to specify the right one – but you can also override the standard ones if you want to.

Once you've finished entering the order you have the opportunity to add postage and packing, then the finished invoice is automatically printed – something you'll always want to do when it's complete. In contrast to an invoice, you can also create a credit note using the same basic form.

All the programs in the Minerva suite can be integrated, and if you have this unit tied in with the stock control the actual entry of transactions becomes very simple. You just type in the product code then its description and price are automatically placed in the appropriate places and you only need check off the quantity and discount code before moving to the next entry.

Account and Cash files are two useful adjuncts to the action of raising invoices and orders. The

former holds the frequently used addresses and the other keeps track of one-off addresses, perhaps for use in a mailshot.

There are other very useful files in this versatile package: Archive keeps track of all transactions that have passed through the system even after invoices have been removed. Linking to the Stock Management system allows stock levels to be updated whenever something has been ordered and provides much more sophisticated and versatile stock control.

It's also possible to integrate the Order/Invoice package with the Sales Ledger. A restriction here is that where more than just a few small accounts are to be handled – and linked with other ledgers – twin disc drives or a hard disc become a necessity.

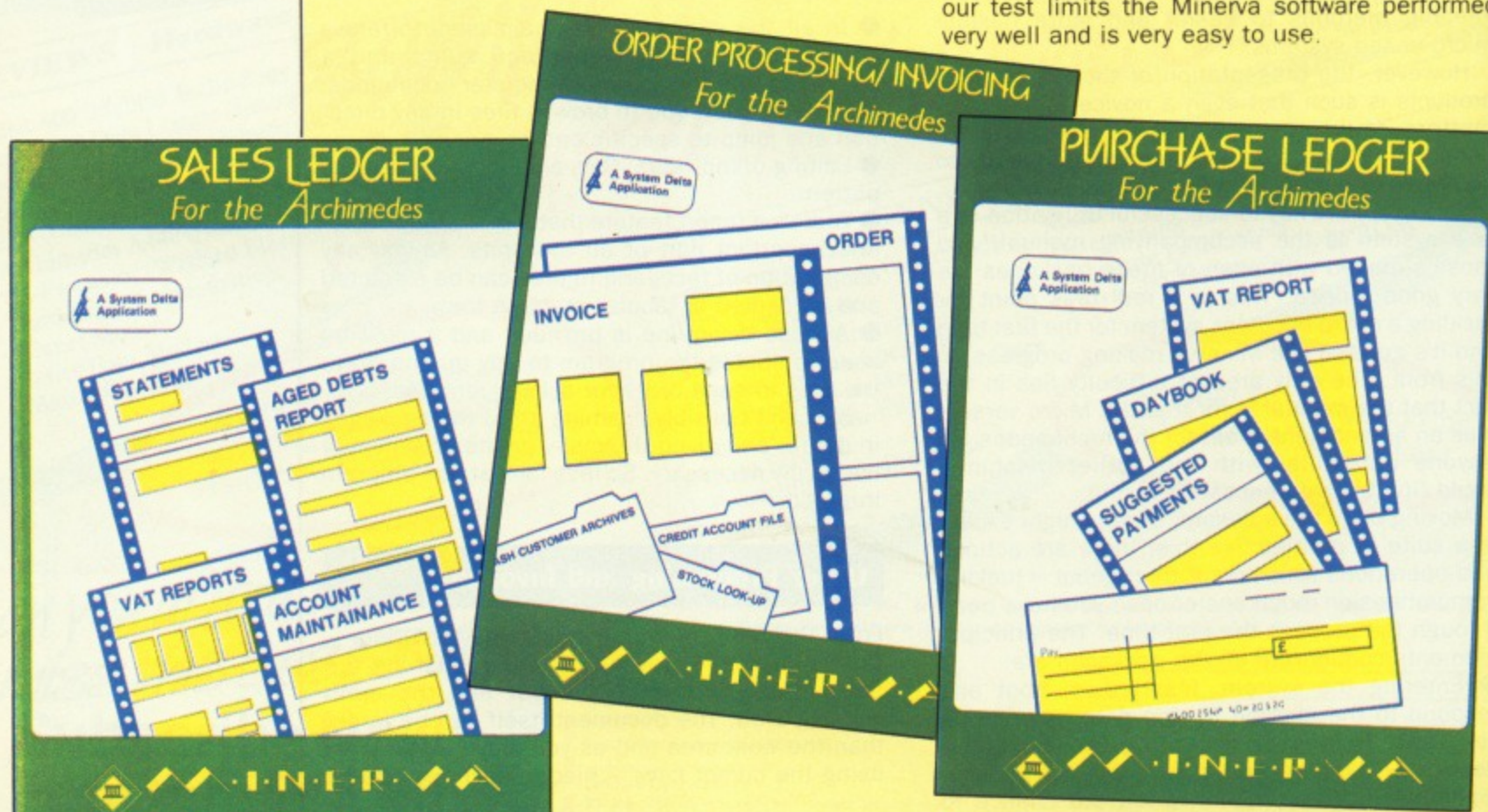
Although supplied individually the units are designed to work together and with the System Delta Plus – reviewed in the December 1987 issue of *The Micro User* – where the business environment in which they are used requires it. As with other Minerva packages they represent a very useful addition to the growing library of Archimedes programs.

Recent promises from Acorn's new chief executive that the company plans to break into the business market, if realised, mean Minerva can look forward to seeing much wider use of these fast, efficient and well-constructed business tools.

Current government plans enable headmasters to control school finances and purchases directly. With the majority of educational establishments already equipped with BBC Micros it is quite possible that these packages will be taken up more rapidly by schools than by the business community at large.

The majority of powerful business packages for micros can only be fully appreciated by running them within the office environment where they are to be used on a day-to-day basis. But within our test limits the Minerva software performed very well and is very easy to use.

Minerva
can look
forward to
much wider
use of
these
efficient
business
tools



Online Magic

ANOTHER new service for MicroLink subscribers is the Shades multi-user game. It's similar to standard computer adventure games, where the player wanders a fantasy land killing gnomes, gathering treasure and rescuing maidens, but with the added advantage that the user can talk, co-operate with or slay other players. By dint of determined playing, people can build up points and status in the game, acquiring skills and magic as they go.

And as it's available from many other Telecom Gold systems, there can be some strange characters about.

MUG meetings

TALKING of strange characters, the first of what promises to be many meetings was finally arranged between regular MicroLink bulletin board users. It was interesting to put faces to regular correspondents, and the conversation flowed freely into the night, unhindered by connect charges or telephone bills.

More are planned, most in London but with some interest being shown in more northerly venues. Everyone who attended the first agreed it was a success, and some of the later events will probably go down in MicroLink folklore.

As mentioned in previous news pages, the best way to find out when the next one will happen is to ask on the CHATTER or MUG sections of the MicroLink bulletin board (key BB at the > prompt), or send a message to MAG95816. As it doesn't take long to arrange such things by electronic mail, and as anyone can suggest a time and place, out-of-town MicroLinkers who would

Strike? What strike?

AS the rest of the country got used to empty doormats during the recent postal strikes, MicroLink and its users were making the most of the situation. Electronic communications, quicker than snail mail at the best of times, came into its own.

Three things happened to enhance this. Firstly, the allocation of personal telex numbers is well underway. Before this, all telex users had to share a communal number with their mailbox ID being quoted - non-

standard and prone to confusion. Now they can have an individual number with their own answerback code, enabling them to use MicroLink exactly as they would a telex machine. There have been some delays in the introduction of this service, but the users say it's worth the wait.

Secondly, there's a bounty of £10 payable to any MicroLink subscriber who recruits a new user. There's quite an opportunity here for any latent salespersons - it

doesn't take long to set up a demonstration at work or home, and everyone knows that electronic mail (email) really gets going when all your friends are on it.

Lastly, MicroLink has announced the availability of a fax service for all subscribers and offers the chance to send text from a computer to up to 50 fax machines simultaneously. At the moment, there's no mention of fax reception or graphics, but the technology's there.

like to take the opportunity to meet some fellow users are welcome to mention that they're passing through London. We'll do our best to be there!

Show business

MICROLINK was at the recent PC Show in Earl's Court, London, sharing a stand with several other tentacles of the Database empire. As well as the chance this afforded for users to meet some of the MicroLink officials, the hot news from the various new product launches was available on the system within

hours of it happening. Subscribers were among the first people in the UK to read a detailed account of the many new Amstrad computers, followed up by information gathered from Amstrad technical staff themselves.

People at the show also took advantage of the computers and modems liberally sprinkled about the place to post items of news on the bulletin board, which gave those who couldn't (or didn't want to) go the chance to find out what was happening and get questions relayed to the exhibitors. Useful, and organised entirely by subscribers.

Hopefully the exercise will be repeated at future computer (and maybe more general interest) events.

Patter of tiny hooves

IN another attempt to bring the entire range of human activity to the keyboard, MicroLink is offering various information services to the data-hungry. For the sports fan who is not satiated by the meagre coverage of the Olympics on television, newspaper and radio, a link to a computer in Seoul provides results as they happen. There could well be a serious use here, for people who want to record results in computer-readable form.

Turfnet should be a more durable service. It provides accurate tips and data on form for those who enjoy a flutter on the horses. MicroLink is quick to point out that the information available in this way is 24 hours ahead of that published in the sports pages of the national press, and consequently better able to cope with weather changes or equine sickness.

Bits...

BY special arrangement with MicroLink and Telecom Gold, a business sent a telex to 2,500 addresses in only three goes: Two of 1,000 addresses and one of 500. This might well be a record, and certainly beats typing the thing in thousands of times on a conventional machine....

FOR those not totally converted to the pleasures of the modem and with a memory capable of remembering the

days when there was a reliable postal service MicroLink now offers an online postage rate calculator. By keying in the weight of a package and the class (first, second, surface or airmail), the cost of postage can be obtained. Since at that point the user is logged on to MicroLink anyway, it is a simple matter to also send an Email message to the recipient warning him that sometime in the next six months a package will arrive...



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GOVERNMENT, NHS AND EDUCATIONAL ORDERS ACCEPTED

Innovations to the rescue

BBC Micro users have put the time since the last Innovation Awards to good use to judge from the number of entries received for this year's contest. Unsurprisingly, the majority of entries came from BBC Micro rather than Archimedes users, but there was no shortage of novel ideas and applications in both categories – some of which are briefly highlighted here.

In a category by itself is Mike Topping's robotic feeding aid designed for the severely disabled, the elderly and people in hospital – an invention he developed entirely on his BBC Micro. Controlled by touch, body pulses, head, foot or even eye movement, Mike's invention employs a computer-driven robot arm to select food from a plate and spoon it into the user's mouth.

Disabled himself, Mike was made redundant some eight years ago and has put his time to good use – graduating in Computer Science from Keele University and committing himself to his robot arm brainchild.

The user can treat the arm as an extension of himself, which Mike sees as its main feature. "My intention through it all is to help other disabled people worse off than me to get over the indignity of having to be fed by others", he says.

The prototype equipment used either a BBC Micro or Master, and the language used to program the robot is Acornsoft Forth. Mike chose the BBC Micro to develop his project because it is the main computer used in special education.

And while numerous different interfaces between user and robot can be used, Mike – prompted by the constraints of time and cost – used Concept and expanded keyboards in his prototype. The original cumbersome configuration of micro and peripherals has now been condensed into a single, easily portable box about 10in square containing a BBC Euro Board.

Considerable interest has already been shown in Mike's project and he's optimistic of finding a sponsor to take his idea further.

Using a BBC Micro to drive an ancillary piece of equipment occurred to several entrants, including Jonathan Pickard from Harrogate who's successfully hooked a BBC Micro to a Ricoh photocopier. The micro is in complete control – the copier can only be activated by a signal from an intelligent interface, which also translates pulse signals from the copier to the computer so that it can count the number of copies going through the machine.

The result? No unauthorised use of the copier and an accurate record of work done – 16k of battery-backed sideways ram is used to store transaction information, along with passwords.

The combination is currently in use at Harrogate Grammar School – and the profit margin on copying has dramatically increased as a result.

The BBC Micro has a place in the medical world



Handicapped Peter Higginbottom can now feed himself with this robotic arm, an Innovation Awards contender

too. P.J. Whyer, from High Wycombe drew on the power of a BBC Master to release staff from some of the chores attendant on data handling in hospital pathology departments.

It's essential to have detailed and accurate records of blood and blood products with which a patient may have been transfused – but the time spent on providing this information could be more usefully used on investigative work.

Existing software is geared to the demands of American users and is thus unsuitable, so Mr Whyer designed a versatile system to cope with British requirements – one capable of handling 18,000 patients. Patients' blood samples are given a laboratory number, and any patient's details – such as blood group and antibody status – can be instantly accessed from the file by number or name.

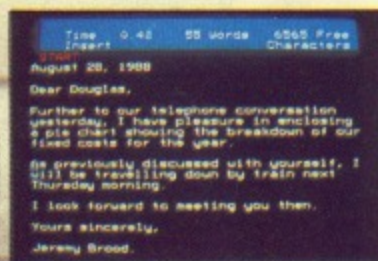
The blood and blood products file presently may contain 30,000 entries with similar instant access, but the only limit on entries is disc size. Printed reports are produced for issue to the wards, together with identifying compatibility labels to attach to the blood. A continuous record of the associated laboratory work is concurrently made.

The system uses a BBC Master 128 with 20Mb Winchester hard drive and a medium definition colour monitor. The colour provides an added safety factor and immediately displays potential incompatibility – a situation which can be lethal.

THE winners of the 1988 Micro User Innovation Awards will be selected and announced at the November Electron & BBC Micro User Show in London. Entrants concerned that their submissions might not have arrived in time thanks to the recent postal dispute can relax – the closing date has been extended to October 28 to catch last minute entries.



BBC version



Word processor

C64 version



Database

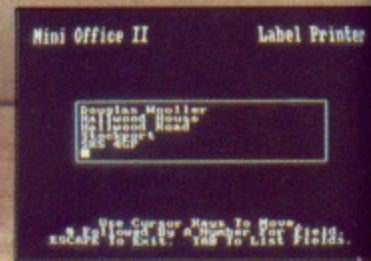
Amstrad version



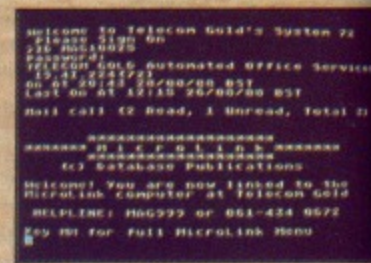
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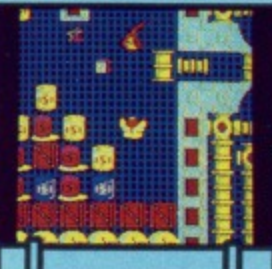
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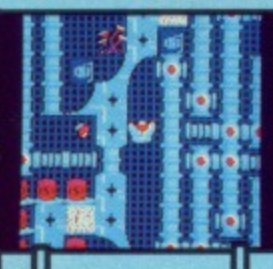
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pipeline



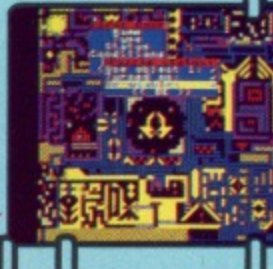
Beware of the fast-moving flame



Trapped near a pipeline complex



The Character Designer



The Level Designer

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The screen pictures show the BBC Micro version of the game.



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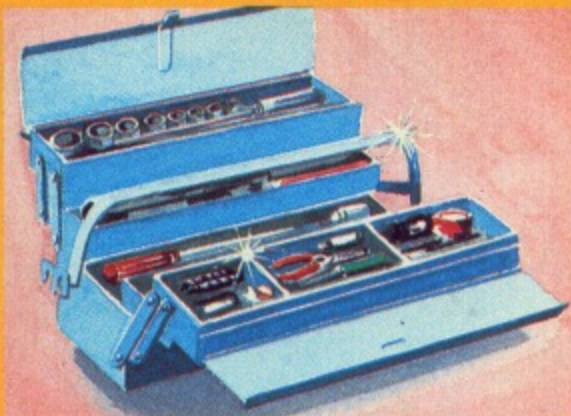
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ACORN USER February 1988

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MICRO USER January 1988

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A & B December 1987 & January 1988

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September 30 to October 6

T/SWR13

Files

Trace

More in the study of sideways rom and ram programming. Errors created in other roms can be trapped and acted upon within your own sideways ram software. T/SWR13 demonstrates how the *disc full* and *cat full* errors generated by the DFS can be trapped and used to prompt for a disc change.

T/SPK00

Equidemo

Equate

This is the first in the next section of the Opcodes series which looks at the functions and uses of the Acorn speech chip. These first two programs are intended for

standing. A printer is essential.

Beasty

Blobs from outer space or monsters from the marsh? It doesn't matter. Your job is to destroy anything that moves in this well written and colourful arcade action game from the June edition of *The Micro User*. Ten speed levels with up to ten initial targets leads to manic adrenalin levels.

October 7 to 13

T/SWR14

Buffer

The guide to using sideways ram continues with a look at interrupts. An interrupt can be generated by any hardware in the micro system and when this happens, and the Mos does not

Look no further for an explanation. This genetic problem solver is easy to use and gives clear, concise answers to monohybrid crossing. Could this be the start of biological computing?

Scroller

First seen in the June edition of *The Micro User*, this handy utility may be used in your own programs. Scroller will let you enter text then scroll it across the screen smoothly. Provisions for pausing, flashing, double height, and so on are fully provided.

October 14 to 20

T/SWR15

Sounds

The sideways ram programming series takes a look at multiple

view or run programs. Let this software ease your stress by taking care of the mundane typing and eye stress needed on densely packed discs. Index is an easy to use utility of particular value to Econet users.

Plobak

Three dimensions are generally better than two. However, trying to get your mind around 3D plotting routines can be a nightmare. This program gives some insight into how this may be achieved. With careful programming the data in this program may be used for any other shape. Plobak was first published in the June edition of *The Micro User*.

October 21 to 27

T/SWR16

Help

Trace

More from the series explaining how to use sideways ram. When a multiple command interpreter is used in a SWR facility, it is easy to forget the exact syntax of all the new commands. It is often useful for a SWR program to respond to the *HELP command by explaining the format of its new commands. The multiple command interpreter is introduced in this module.

T/SPK03

Branch

Another module in the Opcodes course explaining how to get the most out of your Acorn speech system. T/SPK03 looks at the use of the READ and BRANCH instructions, vital when attempting to utilise the speech facility from machine code.

D/Info

Another seven data files to accompany the Datascope system.

T/Insce

B/Insce

Keep track of your property with this dedicated database. With particular reference to your house insurance, this program allows records of your possessions and associated details to be stored, thus enabling easier evaluation of your belongings, helping when the insurance renewal demands arrive.

Chess1

Chess2

Telesoftware goes oriental with this game from the far east - Chinese chess. Play against your friends or even the computer in this interesting graphical game from the May edition of *The Micro User*.



Guide

B B+ M

Software is currently transmitted for a period of one week. Files are available from Friday afternoons to the following Thursday evening, with the exception of the Issues teachers' notes which, due to their topical nature, are available from the Wednesday morning to the following Tuesday evening during the week of transmission. The details are provisional only.

use and modification throughout the series and allow virtually any word to be created and spoken.

!Boot

Dscedit

Dscimag

DscopeM

Scope1

Scope2

Datascope is a suite of six programs to turn your micro into a real time, digital storage oscilloscope monitoring signals applied to the A to D port. A two part comprehensive instruction file is included giving application examples, circuit details and so on. Several example data files will be broadcast in the coming weeks.

Decode7

D/intro

These programs have been devised to unravel the mystery of Mode 7 Teletext page creation. The hidden control and graphic codes which make up a Teletext screen may be sent to a printer for examination and better under-

recognise its type, it is offered to the paged roms for action. If they also fail to recognise it, it is sent to the user via the IRQ2 vector. T/SWR14 explains how to deal with interrupts and offers a 15.75k sideways ram parallel printer buffer as an example.

T/SPK01

Beware

Pence

Clock

Tone1

This second module in the Opcodes speech series examines the speech synthesiser commands. A detailed study is made of the Texas instruments TMS 5220 speech synthesiser. The four programs with the main module provide important backing to this instruction.

Scopedata

Example data files to accompany last week's Datascope software.

Gencale

The answers to many problems are concealed within our genes:

command interpreters - the method of allowing a sideways ram program to respond to any of a series of different star commands. The multiple command interpreter should accept commands shortened with a dot and/or prefixed with an optional character. T/SWR15 explains the principles involved.

T/SPK02

Reverse

The third module in this Opcodes speech series looks carefully at the Texas Instruments TMS6100 phrom chip. In particular the arrangement of data within it and various ways of manipulating this to achieve the desired results.

ScopeD

More data files to accompany the previously broadcast Datascope software.

Index

T/Index

All fingers and thumbs can lead to frustration when trying to work your way through directories to

B B+ M  A

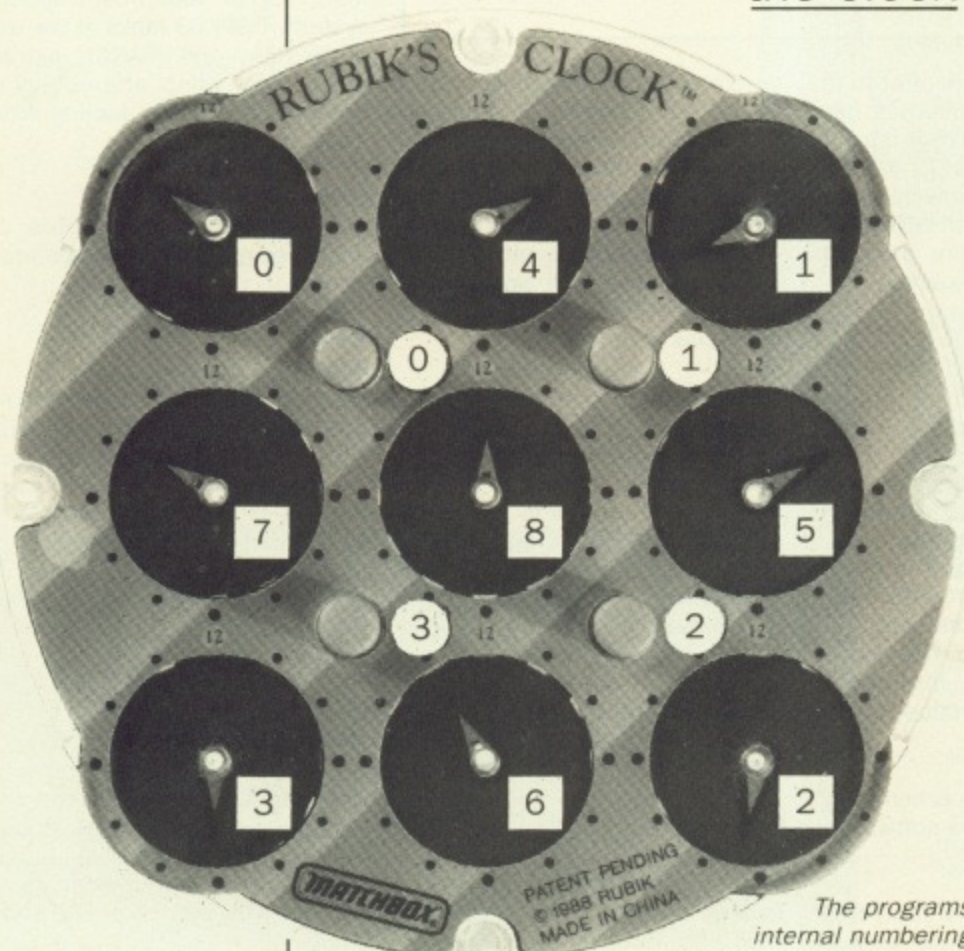
PROFESSOR Rubik's puzzles – the Cube and Magic – have kept thousands of people enthralled for hours. Now another mind-bending device – Rubik's Clock – has been unleashed on sanity. Many people have declared it impossible, and reports even stated that the professor himself couldn't solve it.

Now, with the help of *The Micro User*, you can crack the puzzle with this easy-to-use listing by following the on-screen instructions. For the more mathematically inclined, we give the algorithm for you to follow.

Rubik's Clock consists of nine dials on the two faces giving a total of 18 clocks. The object is to turn the thumb wheels at the corners to make all

Rubik, your time is up

*Christopher Stop shows
an easy way to beat
the clock*



The programs
internal numbering
on the dials and buttons

the dials point to 12. It sounds simple but another four buttons alter the mechanical linkage between the 18 dials. To further complicate matters, while you're working on one side the dials on the other move in a different way.

But the puzzle is obviously soluble because it is in the solved position when new. As there are no slipping mechanisms in the gearing, the reverse of all the moves up to that point will restore the dials. But, as we'll see, it can be solved far more easily than that.

So if you've been tearing your hair out with frustration trying to solve the puzzle simply type in the listing, correct any of your typing mistakes using Get it Right! and, when you run it, your micro will take you step by step to the solution. You should note that the program only just fits in a BBC B with disc drive, so leave out the spaces after the line numbers and don't add any extra code.

You don't need to understand how the program or puzzle works to solve it, but perhaps you want to learn more about the puzzle and discover the program's underlying algorithm. Let's start by looking at the exact effect of the thumb-wheels and buttons on the dials on both sides of the clock. In the form that programmers will understand, if you consider the button closest to the thumb-wheel you are about to turn, the mechanical linkage can be summarised as follows:

```

IF the button is down
THEN all dials at the corner
next to any down button
will turn, and everything
else on the same side
will remain as it is.
ELSE all dials in a square of
four around an up button
will turn, everything
else on the same side
will remain as it is.
    
```

Although the rule always works for both sides of the puzzle, don't forget that buttons which are up on one side will be down on the other side, and vice versa. So, a move will affect the two sides in different ways. Another result of this rule is that the corner dials always move together on both sides of the puzzle, whereas for the inner dials, the clock faces on each side can move individually. This has a bearing on the overall solution, as we'll see later.

Having established this rule, we now know how the puzzle will react to any combination of buttons and wheel turns. So how is it solved? The first point is not to try and solve it as a whole – it is too complicated. Instead, it must be broken down into several easier stages. It's similar to doing a jigsaw – you don't just jump in and look at random for any pieces which will fit together, you find the corners, then build the edges and finally complete the middle. The latter stages are made easier by what has already been accomplished.

Incidentally, the same also applies to computer programming. If you have a big, difficult problem, break it down into simpler pieces and PROCedure-ise it. True, you'll have more problems to solve, but at least you'll be able to handle them.

So how can Rubik's Clock be broken into easier stages? Try the sequence of moves shown in Figure 1 to rotate a corner. You should find that

the top right corner dial has advanced one position and nothing else has been affected. As the puzzle is symmetrical, applying the equivalent moves but 90° around affects only the next corner, and so on. So, we can move any corner to any position without spoiling anything else. This means we can break the problem down and solve the whole puzzle in the two stages shown in the algorithm given in Figure II.

But solving the five inside dials on each side is still difficult, so this must be further divided into simpler sub-problems. The algorithm up to now tends to solve the puzzle from the centre outwards and can be extended as shown in Figure III.

Remember, that at each stage, everything achieved up to that point must be preserved. Also, notice that the algorithm reflects the earlier observation that the corner dials are *solid* and so need to be solved from one side only.

So what we need to discover now is how to rotate the centre dial on one side only – for the first two stages – and how to rotate the four dials adjacent to the centre while (possibly) corrupting only the corners – for the next two stages.

Rotation of the centre dial on one side only can be achieved by the simple sequence shown in Figure IV and control of the dials adjacent to the central dial can be achieved by the sequence in Figure V. This final sequence was the part of the

solution which took me the longest to work out, but once you see it it's obvious.

The moves shown advance the middle right dial on a upper side by one position while corrupting only the top right corner. Because the puzzle is symmetrical, the equivalent moves can be performed but with the whole puzzle turned over or rotated through 90°, thus giving control over a different clock face.

Hence, the whole puzzle can be solved using the five stage algorithm shown in Figure III while operating with the three basic sets of moves in Figures I, IV and V.

This solution sequence is coded into the program, with the extension that to operate on all the dials, you don't have to rotate the whole puzzle through 90° as suggested. Instead, the program automatically works out the equivalent buttons and dials, while you keep the puzzle upright.

To support this, the program internally numbers the buttons and dials as shown on the page opposite. This is preferable to a simple, linear numbering system, because it allows the buttons for the same sequence applied to different dials to be calculated by simple modulo 4 arithmetic.

For example, take any dial directly adjacent to the middle dial and call it n – that is $n=4,5,6$ or

Turn to Page 65 ►

- Rotate the whole clock until the required corner is top right
- Ensure all buttons are up
- Turn the top left wheel forward one position
- Push the top right button down
- Move the top left wheel backwards one position

Figure I: Rotating a corner

- Solve the five inside dials on each side without worrying about the corners
- Solve the corners by the sequence described in the text

Figure II: Solution algorithm 1

- Solve the central dial on the top
- Solve the central dial on the back
- Solve the four dials adjacent to the centre on the top
- Solve the four dials adjacent to the centre on the back
- Solve the corners

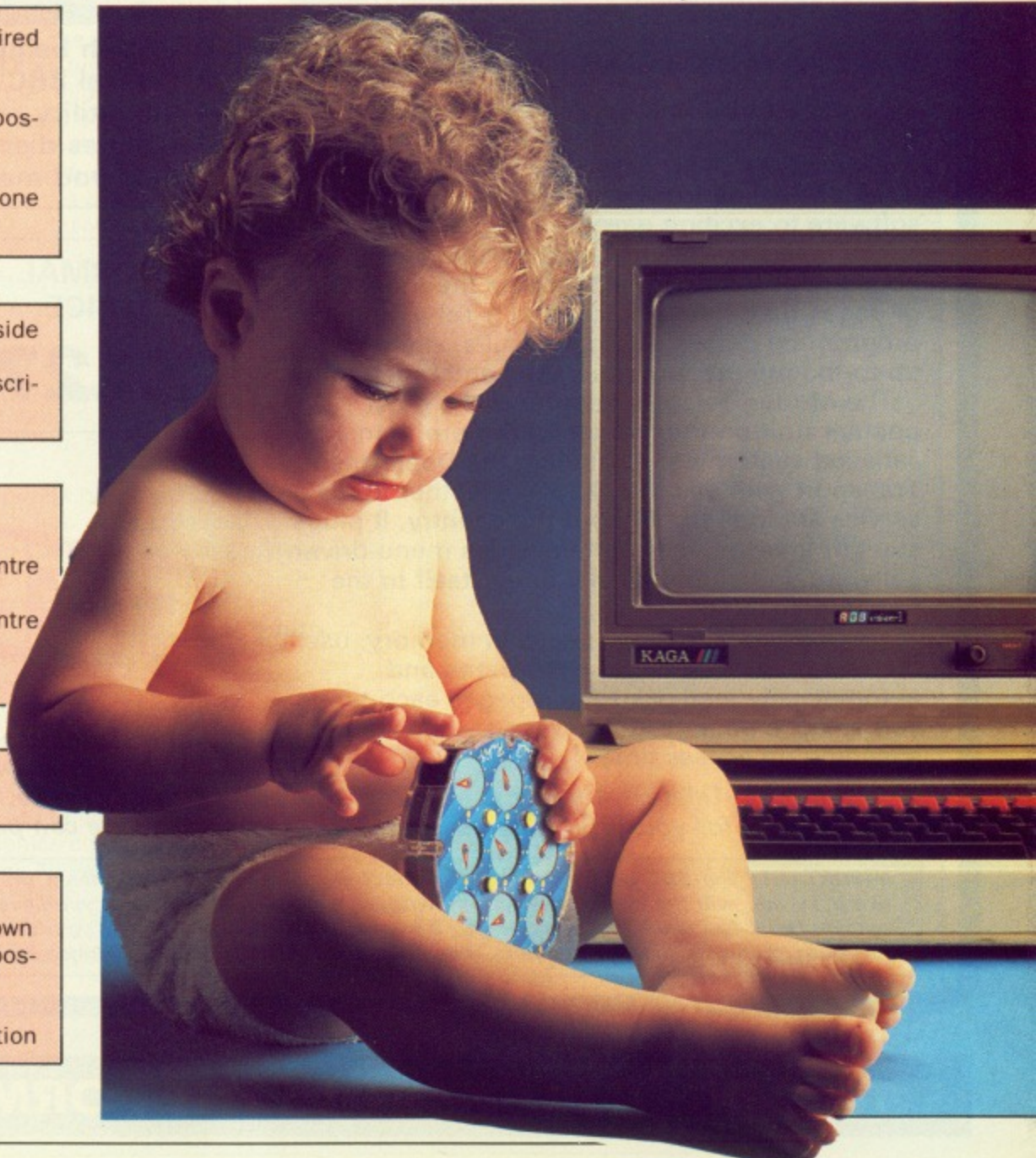
Figure III: Solution algorithm 2

- Ensure all the buttons are up
- Turn any corner dial

Figure IV: Rotation of the centre dial

- Ensure the top two buttons are up
- Ensure the bottom two buttons are down
- Turn the top left wheel forward one position
- Push the top right button down
- Turn the top left wheel back one position

Figure V: Control of the dial on the right of the centre one



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◀ From Page 63

7. Then the two buttons on either side of that dial are always $n \text{ MOD } 4$ and $(n+1) \text{ MOD } 4$. If the dials were linearly numbered, the rule would be much more complicated. Knowing this and the solution sequence, the program listing should be quite

easy to follow. However, to help anyone wanting to tinker with it, a list of the main procedures is shown.

So with this puzzle wrapped up, I suppose we can now look forward to the next Rubik problem. In the meanwhile, you can amaze your friends with your ability to solve Rubik's Clock.

MAIN PROCEDURES

init	Initialises arrays defining the position and names of the dials and buttons. Also defines characters for a clock hand and envelopes.
drawscreen	Draws the graphics screen and defines a text window in the leftmost eight columns.
start	Tells you how to hold the puzzle at the start.
solve-central	Asks you if the central dial is already solved. If not, PROCsolve-central-2 is invoked to actually solve it.
solve-central-2	Takes you through the sequence of moves to solve the central dial.
all-up	Causes all buttons to be labelled as having to be in the up position.
solve-middle(D%)	Asks you if the D%th dial – which must be one of the dials directly adjacent to the central one – is already solved. If not, PROCsolve-middle-2 is invoked to actually solve the specified dial.
solve-middle-2(D%)	Takes the user through the sequence of steps to solve the D%th dial, where D% must specify one of the dials directly adjacent to the middle one.
set-middle-buttons(B%)	Labels the setting of the three buttons which remain unaltered during the sequence to solve a dial adjacent to the middle one. The other button – which is altered during the sequence – is handled separately in PROCsolve-middle-2.
solve-edge(D%)	Asks the user if the D%th dial – which must be one of the edge ones – is already solved. If not, PROCsolve-edge-2 is invoked to actually solve the specified dial.
solve-edge-2(D%)	Takes the user through the sequence of moves to solve the D%th dial, where D% specifies an edge dial.
set-edge-buttons(B%)	Labels the setting of the three buttons which remain unaltered during the sequence to solve a corner. The other button – which is altered during the sequence – is handled separately in PROCsolve-edge-2.
done	Invoked when the puzzle has been completed.
turn-over	Instructs the user to turn the puzzle over.
ok(D%)	Prints "OK ?" on the specified dial using inverse printing at the graphics cursor.
solving(D%)	Prints "SOLVING" on the specified dial.
solved(D%)	Prints "SOLVED" on the specified dial. It also shows the clock hand pointing upwards.
turn(D%)	Prints "TURN" on the specified dial.
set-but(B%,up%)	Prints " UP " or "DOWN" – depending on the parameter up% – on the specified button. All the other PROCedures to show button positions – such as PROCall-up – work by calling this PROCedure. The text is displayed using inverse printing at the graphics cursor.
vert(T\$)	Prints the text string T\$ vertically.
circ(X%,Y%,R%)	Draws a circle of radius R% centered on X%,Y%.
wait	Waits for you to press a key.
FNask-dial(D%)	Ascertains whether the specified dial is already solved and returns the result TRUE or FALSE depending on the response.
delay	Creates a small delay, and is used by FNask-dial to time the flashing of "OK ?" on the appropriate dial.

```

10 REM Rubik's Clock Solver
20 REM by Christopher Stops
30 REM (c) The Micro User
40 MODE 1
50 PROCinit
60 PROCdrawscreen
70 PROCstart
80 PROCwait
90 PROCsolve_central
100 PROCturn_over
110 PROCwait
120 PROCsolved(8)
130 PROCsolve_central
140 FOR M%=4 TO 7
150 PROCsolve_middle(M%)
160 NEXT
170 PROCturn_over
180 PROCwait
190 FOR M%=4 TO 7
200 PROCsolved(M%)
210 NEXT
220 FOR M%=4 TO 7
230 PROCsolve_middle(M%)
240 NEXT
250 FOR E%=0 TO 3
260 PROCsolve_edge(E%)
270 NEXT
280 PROCdone
290 END
300 DEF PROCinit
310 DIM dx%(8),dy%(8),d$(8),bx%(3),by%
(3)
320 bd%=170
330 ld%=427
340 dg%=341
350 dx%(0)=ld%
360 dy%(0)=bd%+2*dg%
370 dx%(1)=ld%+2*dg%
380 dy%(1)=bd%+2*dg%
390 dx%(2)=ld%+2*dg%
400 dy%(2)=bd%
410 dx%(3)=ld%
420 dy%(3)=bd%
430 dx%(4)=ld%+dg%
440 dy%(4)=bd%+2*dg%
450 dx%(5)=ld%+2*dg%
460 dy%(5)=bd%+dg%
470 dx%(6)=ld%+dg%
480 dy%(6)=bd%
490 dx%(7)=ld%
500 dy%(7)=bd%+dg%
510 dx%(8)=ld%+dg%
520 dy%(8)=bd%+dg%
530 bx%(0)=ld%+dg%/2
540 by%(0)=bd%+3/2*dg%
550 bx%(1)=ld%+3/2*dg%
560 by%(1)=bd%+3/2*dg%
570 bx%(2)=ld%+3/2*dg%
580 by%(2)=bd%+dg%/2
590 bx%(3)=ld%+dg%/2
600 by%(3)=bd%+dg%/2
610 FOR R%=0 TO 8
620 READ d$(R%)
630 NEXT
640 VDU 23,224,24,24,60,60,126,126,24,
24
650 VDU 23,225,24,24,24,24,24,24,24,24
660 VDU 19,1,4;0;

```

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Handling the inputs

Mike Cook experiments with his Experimenter's Board

LAST month we looked at how to handle output commands to the Body Build Experimenter's Board; now we will tackle the input side. The techniques discussed, although aimed specifically at the Experimenter's Board, apply equally to all types of input to your BBC Micro. The board's inputs are handled by the B side of the micro's VIA – normally described as the user port.

Four bits of this – those labelled 0 to 3 – are buffered through voltage comparators and the rest – 4 to 7 – are directly accessible and could be used as outputs if required. The advantage of using a voltage comparator on an input is that signals with a slow rise time can be handled.

However, before you can use the comparators you have to feed in a reference voltage for them to work with. If the input is above this it will be treated as a logic 1, otherwise it's logic 0. So the first thing to do on the board is to connect the 2.4 volt reference voltage to the comparators. This is

done by connecting a wire between the Rf out and the Rf in terminals.

The memory address corresponding to the B side of the VIA is &FE60 and before we look at it we have to configure the bits to be inputs. This is done by another memory location in the VIA, the data direction register – DDR. As the name implies, this controls the direction of the data flow. Note this is relative to the micro: If it's out of the micro it's an output, otherwise it's an input.

Each bit in the DDR controls the corresponding bit on the user port – for example, bit seven in the DDR controls whether bit seven of the user port is to be an input or an output – and if the DDR contains a logic 1 we have an output and a logic 0 indicates an input. This is easily remembered as a 1 looks very much like an I for input and a 0 looks very much like an O for output. Then remember that life is never easy and so it is the other way round!

To configure the port with all the bits as inputs we have to store a bit pattern of all zeroes into the DDR. Put simply, we store the value zero into address &FE62. Having done that all we need to do is to look at memory location &FE60 to see the states of the inputs. We can isolate any single bit we want by using the AND operation: The resultant bit pattern will only contain a logic 1 when both numbers have a logic 1 in the same position.

In this way we can remove, or mask out, unwanted bits and leave only the one we want. Then if the resulting number is zero Basic will treat it as FALSE and any other number will be treated as TRUE. We take one number from the input port and AND it with another containing just a single logic 1 in the place we want to look at. The result can be used as a Boolean value that indicates TRUE or FALSE which can be used to direct the flow of our program.

Let's illustrate this by writing a simple port monitoring program. As usual it's in both Basic and Forth, shown in Listing I and II respectively:

```

10MODE 1
20PRINT TAB(0,3);"USER PORT INPUT
MONITOR"
30PRINT"Beeb Bodybuilding Course"
40PRINT"Nov 88 By Mike Cook"
50?&FE62=0
60REPEAT
70AX=?&FE60
80PRINT TAB(0,11);
90FOR BX=0 TO 7
100PRINT"Input on Bit ";BX;" is ";
110PX=2^BX
120IF PX AND AX THEN PRINT" 1 " EL
SE PRINT" 0 "
130NEXT
140PRINT:PRINT:PRINT
150PRINT"HEX'SPC(5)"VALUE IS ";AX
;SPC(2)
160PRINT"DECIMAL VALUE IS ";AX;SPC
(3)
170UNTIL FALSE
    
```

Listing I: Port monitor from Basic

```

SCR # 3      3 H
0 ( INPUT MONITORING WORDS )
;
2 : CONFIG.IN FF FE61 C! ; DECIMAL
3 : S.PRINT ." is " IF ." 1"
4   ELSE ." 0" THEN CR ;
5 : B.PRINT DUP ." Hex value is "
H. CR
6 ." Decimal Value is " . ;
7 : TITLE 7 MODE ." Beeb Body Buil
ding Course " CR
8 ." User Port Monitor " CR ." By
MikeCook " ;
9 : P.HEAD ." Input on Bit " . ;
10 : P.TAB 31 EMIT EMIT EMIT ;
11 : ?BIT BIT.POS AND ;
12 : MONITOR CONFIG.IN TITLE BEGIN
13 -99 ?KEY NOT WHILE 6 0 P.TAB
14 B.IN.READ 8 0 DO DUP I P.HEAD
15 I ?BIT S.PRINT LOOP CR B.PRINT R
EPEAT ;
    
```

Listing II: Port monitor from Forth

```

10MODE 7
20?&FE62=0
30PRINT TAB(12,3),"STEADY HANDS"
40PRINT CHR(134);"BEEB BODY BUIL
DING COURSE Nov 88"
50PRINT TAB(1,11),"Move the loop
back to the start"
60REPEAT
70REPEAT
80LX=?&FE60
90UNTIL (LX AND 1)=0
100PRINT TAB(0,11),CHR$(130);"GO -
-----";SPC(18)
110PRINTSPC(37)
120REPEAT
130LX=?&FE60
140IF (LX AND 4)=0 THEN VDU 7
150UNTIL (LX AND 2)=0
160PRINT TAB(0,11),"FINISHED !!!!!"
170PRINT"Move the loop back to the
start again"
180UNTIL FALSE
    
```

Listing III: Basic steady hands

BASIC: Line 50 initialises the port to be all inputs and line 70 reads the value into a variable A%. We then have to examine each bit of this number and print a zero or one depending on its value. This is done by a loop going from zero to seven indicating the bit number. A number – P% – corresponding to just a single logic 1 in the position of the bit number is calculated in line 110, this raises two to the power of the bit number. Then the mask and port value are ANDed in the IF statement and depending on the result, a one or zero is printed. This is repeated for all eight bits.

Finally the number corresponding to the inputs is printed in hexadecimal and then decimal.

FORTH: The program in Forth, unlike the Basic one, is not stand alone: It relies on a word that we defined last month BIT.POS. This is one reason for the power of the language, you never have to repeat yourself, I said you never have to...

The word MONITOR defines the whole program so lets look at that. First we configure the port, you can see the CONFIG.IN definition stores &FF in the DDR. Note we do not need the & to specify hexadecimal numbers as the definition is preceded by the word HEX.

The title is then printed and, although string handling is not one of Forth's strong points, it is simple enough. However as we have not got the equivalent of Basic's TAB command to print anywhere on the screen, one is defined in line 10. Note that in true tradition the position to be TABed to is passed on the stack, making things very flexible, so we can use this word later on.

Now in line 13 we look to see if the spacebar is being pressed: If not, we do all the statements between the WHILE and the REPEAT, then look at the spacebar again. Line 14 reads in the value at the port and sets up a loop to be executed eight times. The number we are looking at is on the stack and as any stack operation will use it up we need to duplicate it first.

The word I places the loop counter on the stack for P.HEAD to print. Then on line 15 we again put the loop counter on the stack and send it to ?BIT which will work out the bit position and AND it with our value. Finally S.PRINT will print a zero or one depending if it is passed a true or false flag. After the loop is completed B.PRINT prints the value in hexadecimal and decimal.

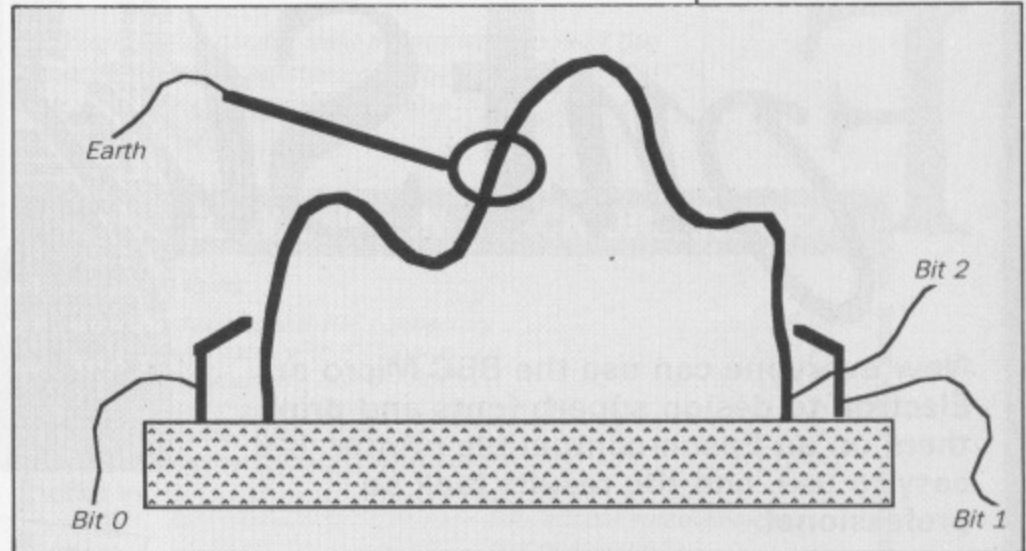
One thing to note as you compare the Basic and Forth programs is that no named variables are used in the Forth version. That is not to say that Forth can't handle variables – it can – but most of the time they are simply not necessary. All the values the program needs to work with are on the stack, so when they aren't being used they don't occupy any storage space.

If you run these programs you will see that each bit appears to have a logic 1 on it. This normally happens if no input signal is connected to a logic input – we say it floats high – and in order to see some change we need to feed in logic 0 signals. This is done by attaching a wire to an earth terminal – marked E – and touching it to one of the B side inputs on the same screw connector as CB1 and CB2.

As you touch the input with the earthing wire you will see the hexadecimal and decimal numbers change and also the display of the single bit you are touching. The bit will only change when the display is updated. Note this is much faster in Forth than Basic due to the extra speed of the language. In Forth the display feels much more responsive.

Now with these simple inputs we have all the makings of the game of steady hands – very popular when I showed it at a recent Electron and BBC Micro User show in the Horticultural Halls in London. All you need to do is to take a wire coat hanger. Unravel it and fix each end in a block of wood. Now attach a wire between it and input 2

The Body Build Experimenter's Board was first described in the August 1988 Micro User and enables you to learn about interfacing in a relatively painless way. It contains many components which can be interlinked to enable a wide variety of experiments to be performed.



The steady hands game

on the board. At each end wrap insulation tape and position a short length of thick wire. Attach each end wire to input bits 0 and 1.

Finally make a loop of thick wire and attach it with some flexible wire to the earth connector. You can get an idea of the setup from the illustration above. You can test it is working by running the port monitoring program, touch each of the three wires with the earth loop and you should see the appropriate bits go to a logic 0.

A better way to drive the game is shown in Listings III and IV again in Basic and Forth. Each program instructs you to put the loop at the start position. Then when it reaches it you are instructed to GO: Any slight touching of the sides will result in the computer beeping. Note the beeps are stored up in the sound buffer, so if you spend a long time touching the main wire you will get an even longer series of beeps. When the end is reached you can re-trace the loop without fear of being beeped:

BASIC: Lines 70 to 90 hold the program until the earthing loop touches the start connector – bit 0 – then GO is printed in green and the starting message erased. Lines 120 to 150 monitor the inputs giving a beep if bit 2 is a zero and ending the loop if bit 1 is a zero. You are then prompted to go back to the beginning.

Turn to Page 69 ►

```

SCR # 4      4 H
0 ( STEADY HANDS GAME )
1 : BLEEP 7 EMIT ;
2 : TO.START BEGIN B.IN.READ 0 ?BIT
T NOT UNTIL ;
3 : ?END B.IN.READ 1 ?BIT NOT ;
4 : ?BLEEP B.IN.READ 2 ?BIT NOT IF
BLEEP THEN ;
5 : S.TITLE 7 MODE ." Steady Hands
  CR ." By Mike Cook " ;
6 : P.START 4 0 P.TAB ." Move loop
  to the start " ;
7 : STEADY CONFIG.IN S.TITLE
8 P.START TO.START BEGIN ." GO ---
  ---- "
9 BEGIN ?BLEEP ?END UNTIL
10 CR ." FINISHED !!! " CR
11 CR ." Move back to start " TO.ST
ART
12 S.TITLE CR CR AGAIN ;
13
14
15

```

Listing IV: Forth steady hands

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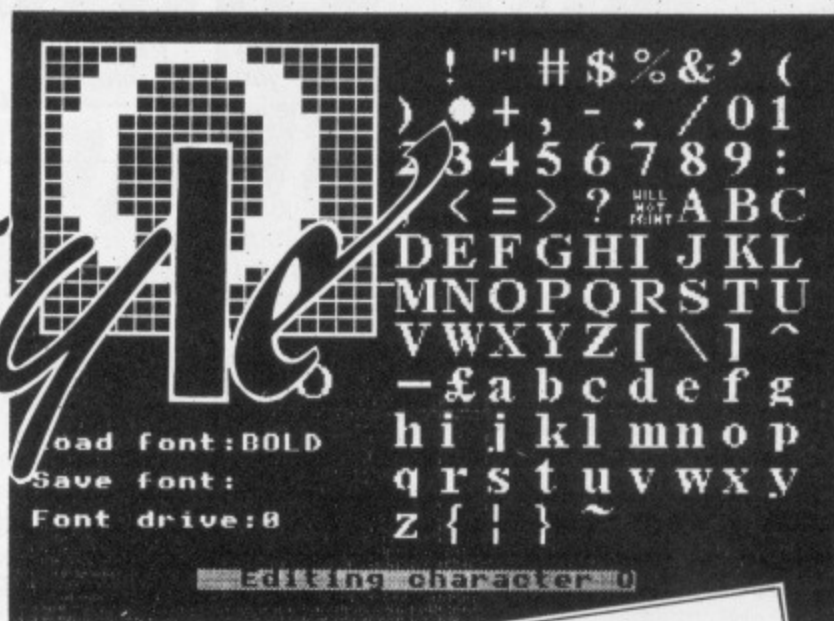
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Font editor

```
<foOLDE>
<dh><ex2><ce>We're Moving!
<ex1><nh><foBOLD>
Dear John,

As you know we've been planning to move house and the time has come at
last! So from 15th August 1988 we will be at:
<foOLDE><ex2><ce5><dh>The Vicarage
Coppice Green
Hathersage
West Yorks
HG23 5BT
<foBOLD><ex1><nh>
I hope to see you soon. We'll be having a party as soon as we're
settled in.
<dt15>
@All the best
```

Source file

```
FontStyle
F font name OLDE
M left margin 8
U vertical spacing 9
A page length (text lines) 9
G form length (inches) 60
D paging OFF
J font drive 0
C justification ON
M condensed OFF
Paragraph-end Returns 1
L line length 64
R draft mode ON
X text drive 0
H type height Hrm
E expanded x1
```

Printer menu

COMMANDS:

```
enter
We're Moving!

Dear John,

As you know we've been planning to move house and the time has come at
last! So from 15th August 1988 we will be at:

The Vicarage
Coppice Green
Hathersage
West Yorks
HG23 5BT

I hope to see you soon. We'll be having a party as soon as we're settled in.

All the best

Graham Bartholomew
```

Example output

TO ORDER PLEASE USE THE FORM ON PAGE 135

◀ From Page 67

FORTH: Steady is the name of the game, so let's look at that. After configuring the inputs and printing the title TO.START holds until we are at the start then the message GO is printed. Line 9 defines the simple loop that first sees if we need to beep using ?BLEEP and then sees if we are at the end with ?END. When we are at the end we print the appropriate message and go back to the start again.

Note that in ?END and ?BLEEP we need to do something when the appropriate bit is a zero, which is a logical false therefore we need the NOT word to inverse the logical value of the top of the stack.

You might like to rewrite the steady hands program to time the length of the run and even keep the name of the highest score. Look at the two examples and note how, in contrast to the Basic program, the Forth one reads as a list of instructions we have to perform. The details of how those instructions are carried out are hidden from initial view in the other word definitions. In this way it is often much easier to see what is going on in Forth than in Basic.

This is especially true if you use long and meaningful word names and in Forth there's no restriction on what the names can be. It's possible to redefine anything at all to suit your own

needs. If you redefine a word you will get a warning when you compile it. All references to the word made after redefinition go to the new word, while all those made before go to the old word. In this way redefining a system word does not cause any problems.

● *Well that's inputs: Next month we'll look at the timers and shift register contained in the VIA and see how we can generate some noise, musical and otherwise.*

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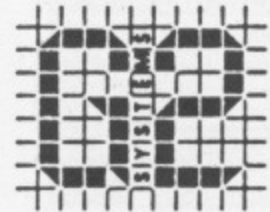
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Video action

Mike Cook mixes signals and colours his pictures

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Producer: Wild Vision, 6 Jesmond Rd, Newcastle upon Tyne, NE2 4PQ
Tel: 091-281 8481

THE Chromalock from Wild Vision is a plug-in card for the Archimedes that permits genlocking and PAL encoding. Having said that — and that it works — what more is there to say? Perhaps a few words of explanation for those unfamiliar with the technical terms.

The BBC B can send its signal into a colour TV set or monitor because a PAL encoded composite video signal is produced. This is relatively easy to do because of the limited colours — fully saturated primary and secondary ones. However, to perform the same PAL encoding on the possible 4096 colours of the Archimedes requires much more complicated circuitry. Therefore it was omitted from the Archimedes, and those that need it can buy the circuit separately.

So what? Why would you want a PAL encoded signal? Well, first of all it allows you to use a composite colour monitor or, with the addition of a cheap UHF modulator, lets you use a colour TV set. However at the price of the Chromalock it is cheaper to buy an analogue RGB monitor.

The advantage comes in that you can use PAL encoded output to produce titles and animated graphics for use in a television studio or your own video recordings.

Now for the genlock bit. If you take two video signals, say one from the micro and one from a camera, you can't just mix them together. It's rather like trying to jump between two speeding cars on the M1; you will only be successful if the cars are doing exactly the same speed and are alongside each other.

In effect a genlock alters the speed and timing of the Archimedes video signal so that it matches another video signal exactly. In this way you can mix the video from a live camera or pre-recorded tape with that from the Archimedes.

And there are a great many things you can do with such a system. For example, you can record titles, superimpose labels and incorporate computer graphics. Suppose you were making a video to explain how a computer works, after showing the actual hardware you could fade to an animated graphic of the data flow through the central processor.

The Wild Vision Chromalock is a single Euro-card size board with a full panel which plugs into one slot. A short lead connects the normal RGB output from the Archimedes into the podule. In addition there are two BNC connectors one for the incoming video and the other for the outgoing video.

Not only is the Archimedes locked to the incom-

ing video, but the two signals are mixed. We had great fun at the office putting up derogatory captions and then pointing the camera at a chosen victim.

There is a key-in facility which allows a certain intensity of a colour to operate a high speed switch between the incoming video and the micro's output. This is technically known as inserting, and is useful for removing any background video, thus making the computer's output clear and uncluttered.

This switch can also be operated by using the supremacy bit from the Archimedes VIDC chip, which requires the connection of a wire soldered directly to the micro's board.

The Chromalock can be used in local or remote mode. In the latter the external video signal provides the timing and colour burst signals for the output. In the local mode these are supplied by the computer. For economy in this mode the colour burst signal is not locked to the line sync signals, which can produce the dot crawl effect familiar to anyone using a BBC B on a colour TV set. Of course, with a properly generated signal to lock on to, this is not a problem.

The system works quite well and the picture quality is high — certainly very much better than the output of the BBC B. My only slight reservation was that there was a marked deterioration in picture quality when Acorn's input/output podule was fitted in the Archimedes at the same time. This pointed to regulation problems, with the Archimedes not being able to supply enough current to power both modules, though possibly our Archimedes was at fault.

While this podule is not cheap it does perform well and its price compares very favourably with commercial units which do the same job. And for those wanting different features or only the genlocking facility, a wide range of units are available from Wild Vision.

The name of this product has now been changed to the Chroma 305 and it is part of the Chroma 300 Series Video Genlock System.

Units are available for BBC B, B+, Master and Archimedes. You can also obtain professional versions.



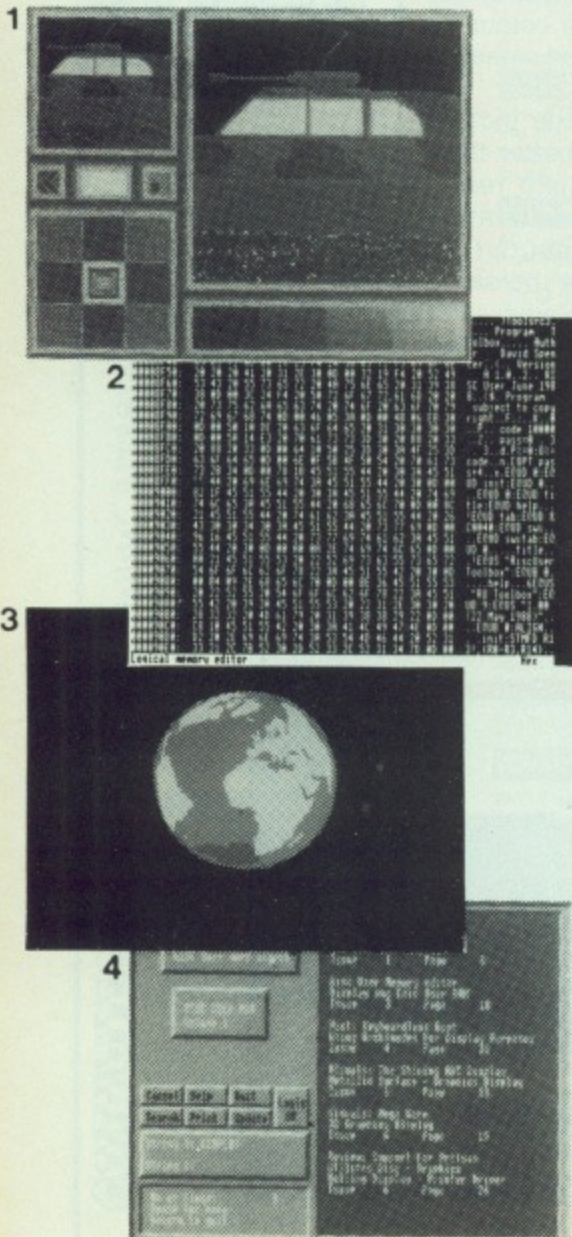
Mixing micro and video signals

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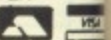
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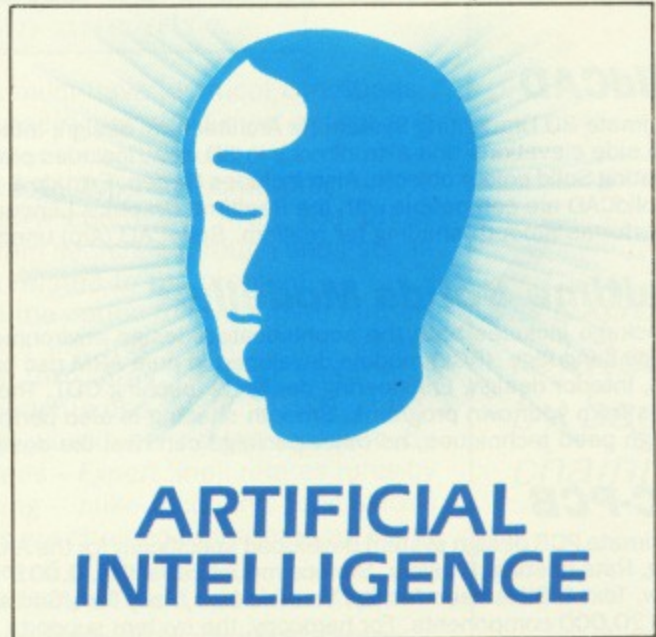
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BBC Micro expertise

Francis Botto shows how to create your own expert system



ARTIFICIAL intelligence is possibly the fuzziest term in the computer dictionary. No one can agree about its actual meaning, which makes for interesting debate if it doesn't drive you round the bend first. Here we present an expert system – but is it artificial intelligence? Most AI gurus say such systems aren't intelligent, but there are those who believe they are – it all hinges on your definition.

Expert systems are an attempt to emulate the knowledge and – more important – the *reasoning* of a human expert. In other words they're designed to share an expert's knowledge and experience with others, like you and me.

For example, you mightn't know much about micro repair, but with the help of an appropriate expert system, you could be suitably advised. So this type of software is not only for specialists or boffins, quite the opposite in fact, as it is of most use to the less informed. As you'd expect, expert systems often serve as learning aids as well as helping to optimise your skills.

The fact that human experts of all kinds share a universal process of reasoning when solving problems makes possible the idea of an expert shell where the knowledge base can be created according to a particular need.

Within an expert system, the computations that use the knowledge base in a meaningful way are the same for any subject from car maintenance to micro repair. These computations are collectively called the inference engine – a very exotic bit of jargon – which can be applied to many different subjects.

Expert shells are very popular and the program shown – Expert Shell – is one for the BBC Micro. It's the cheapest one you'll come across, so type it in and use Get it Right! to check you've made no typing mistakes. The program is quite sophisticated and incorporates the up-to-minute computational technique of backward chaining. It allows you to enter your own knowledge base, so you can build a system to meet your particular needs.

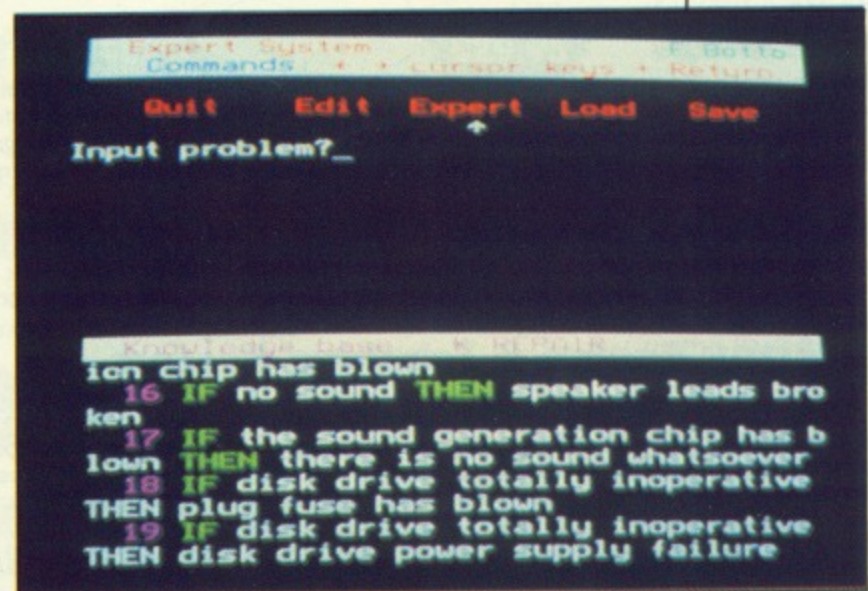
The shell given can accommodate up to 300 IF..THEN rules, which are continually shown when the program is running – so you can see what's available. If you are using an Archimedes you can

extend this up to at least 3000 by changing line 40 to:

```
40 MaxRules%=3000:NumRules%=0
```

You'll have to pinpoint a particular application before you start developing your expert system. This might be a headache if you can't think of one, but my advice would be to pick a subject that interests you – like high-tech or micros.

On the monthly disc there's the beginnings of a knowledge base concerning micro breakdowns. The way to extend it is to scan through past issues of *The Micro User* reading Mike Cook's



Problem Solved pages and each time he mentions a micro failure and its subsequent cause or cure, record the appropriate rules. Eventually you'll have a micro repair expert which will have lots of knowledge which it never forgets.

The process of collecting rules in this manner – to construct a knowledge base – goes under the sci-fi heading of *knowledge engineering*. The simplest type of rules that can be entered are those involving a single fact and conclusion. For

Consulting the Expert

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instance, under fault diagnosis, if you know that when the screen is fuzzy then the monitor lead is incorrectly plugged in you can write:

```
IF screen is fuzzy THEN the
monitor lead is incorrectly
plugged in
```

Selecting the option *Edit* and, when prompted for a rule number, just pressing Return the program automatically brings up the next free rule. Type in the IF condition followed by Return and then the conclusion. You don't have to worry too much about style: Any leading or trailing spaces are taken out and all letters are converted to lower case.

You'll now see that your new rule is included in the scrolling list at the bottom – you can always press Control+Shift to stop it.

To change an existing rule enter its number when prompted and it will be printed in the window. Then type in the modified rule as before; you can use the cursor and copy keys if you only want to make minor changes.

Any single fact might have a number of conclusions: *Screen is fuzzy* could be the result of a number of things, like a video circuit blowing, a monitor fault, a damaged socket and so on. Expert Shell can cope with any number of alike facts and will list the possibilities, but its input

parser can't handle a situation like this:

```
IF screen is fuzzy THEN ...
IF fuzzy screen THEN ...
```

So related rules must have identical conditions.

To make an enquiry use the *Expert* option and type in your problem – again due to the primitive parser you have to type in something which exactly matches a condition. After you press Return the program searches through and lists all the conclusions related to the problem.

You then have the option to investigate further, and this is where the true power of the expert system comes into play. Rather than just regurgitating conclusions of IF...THEN statements – which would be pretty moronic by anyone's standards – Expert Shell relates rules by backward chaining – alike facts and conclusions of different rules are chained together in an effort to get to the root of a problem.

For example, if you entered two rules like:

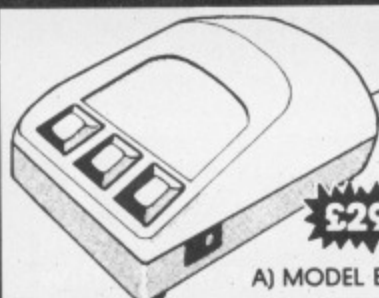
```
IF screen snowy THEN video circuit fault
IF video circuit fault THEN short circuit
```

clearly, the conclusion of the first rule is the same as the fact of the second. A program which did not backward chain would mindlessly ignore one of these but Expert Shell allows you to select

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Expert Shell relates rules by backward chaining

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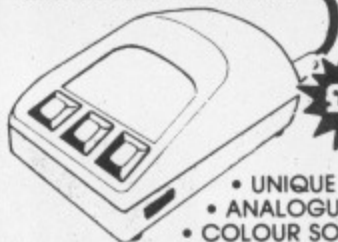
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FEATURE

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an item from its initial list and backward chains through the whole knowledge base.

When going through this problem analysis the program lists each item in the chain, indenting further to the right the deeper it gets. In order to

make your own knowledge base really useful you should always try and put tests and checks into the conclusions.

So put on your knowledge engineer hat and get typing — and if you produce an interesting knowledge base send it to us and we'll consider publishing it for you.

```

10 REM Expert Shell
20 REM By Francis Botto
30 REM (c) The Micro User
40 MaxRules%=300:NumRules%=0
50 DIM rule$(2,MaxRules%),buf&100
60 BX=0:XX=19:file$=""
70 spc$=STRING$(4," ")
80 ON ERROR IF ERR=17 ELSE REPORT:PRI
NT" at line ";ERL:END
90 REPEAT MODE7
100 VDU23,1,0;0;0;0;
110 PROCscreen
120 option=FNcommand
130 VDU23,1,1;0;0;0;
140 VDU28,0,13,39,5,12
150 IF option=2 PROCedit
160 IF option=3 PROCinference
170 IF option=4 PROCload
180 IF option=5 PROCsave
190 UNTIL option=1
200 CLS:END
210 :
220 DEF PROCscreen:VDU26,12
230 VDU26,12,151,157,129
240 VDU13,10,151,157
250 PRINTTAB(3,0)"Expert System"
260 PRINTTAB(31,0)CHR$130"F.Botto"
270 PRINTTAB(3,1)CHR$132"Commands:";
280 PRINTCHR$129"[ ] cursor keys + Ret
urn"
290 PRINTTAB(0,3)CHR$129SPC3"Quit"SPC4
"Edit"SPC2"Expert"SPC2"Load"SPC3"Save"
300 IF file$="" file$="Unnamed" ELSE file$=
file$
310 VDU31,0,14,151,157,133:PRINT"Knowl
edge base - "file$
320 VDU31,XX,4,ASC"":ENDPROC
330 :
340 DEF FNcommand
350 REPEAT IX=0
360 IF INKEY-122 IF XX<36 IX=+1
370 IF INKEY-26 IF XX>4 IX=-1
380 IF IX<>0 VDU31,XX,4,32:XX=XX+IX:VD
U31,XX,4,ASC""
390 PROCdisplay_rules
400 UNTIL INKEY-74
410 REPEAT UNTIL NOT INKEY-74:*FX15
420 PROCsound
430 IF XX>3 IF XX<9 =1
440 IF XX>11 IF XX<16 =2
450 IF XX>17 IF XX<24 =3
460 IF XX>25 IF XX<30 =4
470 IF XX>32 IF XX<37 =5
480 =0
490 :
500 DEF PROCedit
510 INPUT"Rule number:"CS
520 IF CS="" CS=STR$NumRules%
530 CX=VALCS:IF CX>NumRules% CX=NumRul
es%
540 CLS:IF CX<NumRules% PRINTFNrule(CX
) ELSE PRINT"Rule:";CX
550 INPUTLINE"IF ",IS,"THEN ",TS
560 IS=FNS(FNC(IS)):TS=FNS(FNC(TS))
570 IF IS="" OR TS="" ENDPROC
580 rule$(1,CX)=IS:rule$(2,CX)=TS
590 IF CX=NumRules% NumRules%=NumRules
%+1
600 ENDPROC
610 :
620 DEF PROCinference
630 INPUT"Input problem",AS
640 AS=FNS(FNC(AS)):IF AS="" ENDPROC
650 VDU28,0,24,39,5,12
660 PRINTCHR$130"Problem:"CHR$131AS
670 PRINTCHR$129"Possible leads..."
680 FOR SX=0 TO NumRules%-1
690 IF FNinstr(rule$(1,SX),AS)=1 PRINT
SPC1rule$(2,SX)
700 NEXT
710 INPUT"Which to investigate furthe
r",AS
720 AS=FNS(FNC(AS)):IF AS="" ENDPROC
730 PROCbacktrack(AS,0)
740 PROCspace:ENDPROC
750 :
760 DEF PROCbacktrack(AS,DX):LOCAL LX
770 IF FNinstr(rule$(1,LX),AS)=0 THEN
800
780 PRINTSPCDX"-rule$(2,LX)
790 PROCbacktrack(rule$(2,LX),DX+1)
800 LX=LX+1:IF LX<NumRules% THEN 770
810 ZX=INKEY50:ENDPROC
820 :
830 DEF FNC($buf):LOCAL LX,BX
840 FOR LX=0 TO LEN$buf-1:BX=buf?LX
850 IF BX>ASC"A"-1 IF BX<ASC"Z"+1 BX=B
X+32
860 buf?LX=BX:NEXT=$buf
870 :
880 DEF FNinstr(AS,BS)
890 IF LENAS<LENBS =0
900 =INSTR(AS,BS)
910 :
920 DEF FNS($buf):LOCAL LX
930 IF ?buf=32 REPEAT $buf=$buf+1:UN
TIL ?buf<>32
940 LX=LEN$buf:IF LX>0 IF buf?(LX-1)=3
- 2 REPEAT LX=LX-1:UNTIL buf?(LX-1)<>32:bu
f?LX=13
950 =$buf
960 :
970 DEF PROCload
980 VDU28,0,24,39,5,12:*CAT
990 INPUT"Knowledge base title",fs
1000 IF fs="" ENDPROC ELSE VX=OPENIN fs
1010 IF VX=0 PROCerror("Not on this dis
c"):ENDPROC
1020 INPUT#VX,NumRules%
1030 FOR rule=0 TO NumRules%-1
1040 INPUT#VX,rule$(1,rule)
1050 INPUT#VX,rule$(2,rule)
1060 NEXT:CLOSE#VX:file$=fs:ENDPROC
1070 :
1080 DEF PROCsave
1090 VDU28,0,24,39,5,12:*CAT
1100 INPUT"Knowledge base title",fs
1110 PRINT NumRules%-1" rules"
1120 VX=OPENOUTfs
1130 PRINT#VX,NumRules%
1140 FOR rule=0 TO NumRules%-1
1150 PRINT#VX,rule$(1,rule)
1160 PRINT#VX,rule$(2,rule)
1170 NEXT:CLOSE#VX:ENDPROC
1180 :
1190 DEF PROCdisplay_rules
1200 BX=BX+1:IF BX=NumRules%+1 BX=0
1210 VDU28,1,24,39,15
1220 PRINTTAB(0,9)FNrule(BX)
1230 VDU26:ENDPROC
1240 :
1250 DEF FNrule(RX)=CHR$133+RIGHT$(spc$
+STR$RX,3)+CHR$130+"IF"+CHR$135+rule$(1,
RX)+CHR$130+"THEN"+CHR$135+rule$(2,RX)
1260 :
1270 DEF PROCsound:LOCAL SX
1280 FOR SX=100 TO 150 STEP 50
1290 SOUND 1,-5,SX,2:NEXT:ENDPROC
1300 :
1310 DEF PROCerror(e$):PROCsound
1320 PRINTe$:PROCspace:ENDPROC
1330 :
1340 DEF PROCspace
1350 PRINT"Press space...";
1360 REPEAT UNTIL GET=32:PRINT:ENDPROC

```



10 = 00	240 = 40E0 A	470 = 77FC D	700 = 2C83 1	930 = 30E0 5	1160 = E22 9
20 = 00	250 = 38A8 7	480 = 459A 3	710 = 460D E	940 = E6FC B	1170 = BE6B C
30 = 00	260 = 302B 0	490 = 9719 1	720 = C56E 4	950 = DEEC C	1180 = 9719 C
40 = F18B B	270 = 926C 7	500 = C824 6	730 = FBA4 2	960 = 9719 3	1190 = 79BE 3
50 = 34EE 6	280 = C5FF 4*	510 = F75E 4	740 = DD1D 0	970 = 503A 5	1200 = 8745 B
60 = C400 C	290 = E823 F	520 = F695 0	750 = 9719 5	980 = 34F6 8	1210 = F12D A
70 = 7F80 B	300 = 23DC 7	530 = ED11 E	760 = 2D03 5	990 = 44C7 C	1220 = 3688 E
80 = 63B8 5	310 = DE65 5	540 = DE48 C	770 = B4F3 9	1000 = 151C D	1230 = EF20 D
90 = 2F32 3	320 = 31BA 2	550 = 71C9 2	780 = 406C C	1010 = 4836 7	1240 = 9719 6
100 = 1E64 7	330 = 9719 1	560 = 5175 D	790 = EC7F F	1020 = F33E 5	1250 = 99A7 7
110 = 9538 0	340 = A5D6 4	570 = DC98 0	800 = DCF1 3	1030 = AAE9 C	1260 = 9719 6
120 = 6233 F	350 = 6F4E B	580 = C445 D	810 = 993F 8	1040 = 2501 C	1270 = 6F31 6
130 = 59B7 7	360 = 9C79 A	590 = 518E 9*	820 = 9719 C	1050 = FD83 7	1280 = 1488 F
140 = E198 3	370 = 9FBC A	600 = ED0F 4*	830 = C9F7 3	1060 = CA74 6	1290 = FC7 2
150 = BAB9 6	380 = B555 8	610 = 9719 B	840 = 9B70 C	1070 = 9719 1	1300 = 9719 0
160 = C660 D	390 = 7A8A E	620 = 6309 1	850 = 18B9 9	1080 = EB7 F	1310 = 9EF2 0
170 = 8382 C	400 = 34E6 E	630 = 3926 8	860 = CB48 4	1090 = 34F6 7	1320 = 187A 7
180 = 656E 3	410 = CF6 0	640 = C56E 7	870 = 9719 7	1100 = B909 6	1330 = 9719 6
190 = 6E19 C	420 = 536B 4	650 = E1FC E	880 = 7589 1	1110 = 99D1 6	1340 = 6B8B 8
200 = 8215 1	430 = A2D4 1*	660 = 5969 0	890 = 4A9C E	1120 = A00E D	1350 = 87F F
210 = 9719 0	440 = BA75 6	670 = 63F 1	900 = 1629 1	1130 = A5C3 3	1360 = DD18 0
220 = B028 F	450 = A2D0 7	680 = 39F4 3	910 = 9719 9	1140 = AAE9 F	
230 = 13DF 1	460 = 7BD8 0	690 = B3F2 2	920 = 8A57 A	1150 = D6A0 9	

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FEATURE

Check your Leaky Listing corrections

HERE are the corrections that you should have made to the Leaky Listings on Page 119 of last month's issue of *The Micro User*. You may think that we put the first error in the first line when we mised the brackets from around the 10:

```
DIMWS(N),S%10
```

but there is no mistake here - it reserves 10 bytes of memory and has a completely different meaning to a DIM with brackets which reserves array elements.

However there is a mistake before that - we set N to five when, in fact, there are six items of data to be read in. Either the five needs changing to a six or an item needs leaving out. This is not a fatal error, but PRINTER would never be used.

The next mistake is in line 50 where we seed the random number generator. A negative value should be used so the line should read:

```
50 XX=RND(-TIME)
```

Again, this error wouldn't stop the program working, but each time you ran it after switching on you'd get the same sequence of words. Another annoying, but non-fatal, error is in line 60 where C% should have been set to zero - the program as it stands only gave nine guesses at letters.

A more major - but easily spotted - mistake is in line 170 where G% should be G\$. Finally, the AND in line 200 should have been an OR.

If you think we missed something out of line 220:

```
220 IFR% PRINT...
```

you're wrong. You don't need an actual condition following an IF statement and it's taken as an implied =TRUE. So line 220 could have been written:

```
220 IFR%=TRUE PRINT...
```

Now let's look at ways in which the program could be improved. First, the presentation could be much better: Although there are no graphics you could make use of colour, lay the screen out better and switch the cursor off. Also indirection operation in line 150 would have been better written as:

```
SX?(P%-1)
```

and all the variables could have had much more meaningful names.

The prompt and input from the request for another go is very poor - it only accepts Y and you have to press Return. We're sure you'll all have improved that as you made your changes to the program.

One final point: The program counts the number of guesses, rather than the number of mistakes as you would when you draw the gallows in Hangman. So our Leaky Listing had a Leaky Specification. Remember, it's important to specify your program well: No matter how well it's written, if the ideas behind it aren't good it won't be much use.

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Wordsquare solver

Geoff Turner shows how you can unscramble puzzles easily

WORDSQUARES are a popular pastime and often form a basis for competitions. A number of programs are available to help you to produce this type of puzzle — there's one in the December 1985 issue of *The Micro User* — but here's a routine that helps you solve them.

While the puzzles themselves are relatively easy to do, there always remains a nagging doubt

that one or two words may have been missed — particularly when they are written perhaps upside down and diagonally across the square.

This program works by listing all possible words from the wordsquare in the way in which we would normally read them — left to right. Type in the listing and make sure you have not made any typing errors using Get it right! To use it, you have to enter a copy of the wordsquare into the micro.

You are first asked for the dimension of the puzzle — the number of letters either across or down. The program will accept any square up to 20 characters wide, which should be large enough for the majority of puzzles.

A grid of dots representing the square is then displayed and you must then enter an exact copy of the puzzle on to the screen.

The data is entered one horizontal row at a time, and a chance to correct any wrongly entered row is given before proceeding to the next row. It is important that the data is entered correctly, so it's worth taking care to check each line thoroughly before proceeding to the next.

After the final line is entered and confirmed the program begins to unscramble the square. It does it by assembling a string from each possible line of text, first of all reading from left to right across each line of the square. This string of characters is then displayed at the top of the screen, ready to be examined.

You can then check the string for any of the

```

P R I N T J S O O K U O T O G
R L I F F A T L O G J L O F H
O Z O U U B E H P Y A T V L K
C R I T D Y P R Y V H R A S K
L V L E Q A G E D L P E P E O
E E Y G L K K A B A J P N B Y
A M E R Z N F B V M T E L D E
R T L E I V D U N W E A H A S
E N D P R O C S J D U T N H N
L Q X O X J V O G W E J X J D
S Y N R R S S G Y L R F V V J
G L P T G C L A D W K F F Q E
H I R T L Y B M I D S S N N K
I D S I X R P E A Q H Z E K W
E R K S Q T G C E U X T N S L
    
```

A sample wordsquare containing 20 Basic words

```

OTO
TOG
PRINT
RINT
INTJ
NTJS
JSOO
SOOK
OOKU
OKUO
KUOT
UOTO
OTOG
PRINT
RINTJ
INTJS
NTJSO
TJSOO
JSOOK
SOOKU
OOKUO
OKUOT
KUOTO
UOTOG
    
```

```

TA
AE
ER
RD
DA
AT
TA
AN
NJ
JJ
TAE
AER
ERD
RDA
DAT
ATA
TAN
ANJ
NJJ
TAER
AERD
ERDA
RDAT
DATA
ATAN
    
```

Sample output

ALEXANDER
 ALLENBY
 BLUCHER
 BRADLEY
 BULLER
 CAESAR
 CLIVE
 CROMWELL
 DAYAN
 DE GAULLE
 EISENHOWER
 FOCH
 FRENCH
 FREYBERG
 GIAP
 GIRAUD
 GORDON
 GRANT
 HAIG
 HANNIBAL
 HINDENBURG
 IRONSIDE
 JODL
 JOE

```

E M I L S P O M P E Y G R A N T
N L B I G I A P B R O V N H R R
R A E L L U A G E D D O A J E A
S C L O U T F M I U R K P W D H
S T N G T C O R A A G U O I N U
T N T O A G H R E R H H L L A Q
U O N O T R I E U Y N Z E S X P
M M A N J G O B D E
    
```

hidden words before proceeding to the next line. Alternatively, the option is given to split the line. If you opt for this the program will break the line into all possible words contained within it and list them on the screen.

As an example, consider a wordsquare which contains the names of various computers. The program may extract the following:

DHRACORNGI

Readers of this magazine would have no difficulty at all in quickly spotting ACORN within this line of text. However if this had not been spotted, and the option was taken to split the line, the program would list the following words:

Length	Words
2	DH HR RA AC CO OR RN NG GI
3	DHR HRA RAC ACO COR ORN RNG NGI
4	DHRA HRAC RACO ACOR CORN ORNG RNGI
5	DHRAC HRACO RACOR ACORN CORNG ORNGI
6	DHRACO HRACOR RACORN ACORNG CORNGI
7	DHRACOR HRACORN RACORNG ACORNGI
8	DHRACORN HRACORNG RACORNGI
9	DHRACORNG HRACORNGI
10	DHRACORNGI

Every possible word contained within the original string would be listed, so it's a simple matter to pick out any hidden words. The program repeats this for all rows – left to right – before moving on to the second direction – right to left.

The process is repeated:

- Left to right
- Right to left
- Top to bottom
- Bottom to top
- Diagonally left to right upwards
- Diagonally left to right downwards
- Diagonally right to left upwards
- Diagonally right to left downwards

until all possible words have been listed on the

PROCEDURES

setup_square	Data entry routine
clear_line	Erases a line entered in error
left	Reads left to right strings
right	Reads right to left strings
down	Reads top to bottom strings
up	Reads bottom to top strings
left_down	Reads diagonally left down strings
left_up	Reads diagonally left up strings
right_up	Reads diagonally right up strings
right_down	Reads diagonally right down strings
split_line	Splits a string into all possible words
reset	Resets counter in split_line

MAIN VARIABLES

Letter%(X,Y)	Array to store square data
D%	Dimension of square
D\$	Line of text read from square
N%	Length of diagonal lines of text
X%,Y%	Horizontal and vertical offsets when reading diagonal lines
LD%	Length of D\$

screen. Once all these have been listed you'll hopefully have extracted all the previously hidden words from the square.

Note that when you're reading diagonally, the length of the words will vary from one letter to the maximum determined by the dimension of the square. However the program will ignore the one letter words from the four corners, as these do not need to be analysed.

The program was originally written on an Archimedes, but has been adapted to be compatible with other Acorn micros. However, the program and variables occupy most of the available memory on the Model B so any unnecessary spaces should be avoided in order to prevent a *No Room* error. You should not put a space after the line numbers – in the listing we used LISTO 1 for clarity, but there are no spaces in our copy.

```

10 REM Wordsquare unscrambler
20 REM By Geoff Turner
30 REM(c) The Micro User
40 ON ERROR GOTO 1880
50 MODE 1
60 DIM Letter%(20,20)
70 COLOUR 2
80 PRINTTAB(9,3);"WORDSQUARE UNSCRAMB
LER"
90 PRINTTAB(9,4);STRINGS(22,"=")
100 PRINTTAB(12,6);"By Geoff Turner"
110 PRINTTAB(12,7);STRINGS(15,"=")
120 COLOUR 3
130 PRINTTAB(3,11);"Enter the dimensio
n of your square."
140 PRINTTAB(10,14);"Maximum 20 letter
s !"
150 COLOUR 1
160 PRINTTAB(12,19);"DIMENSION = ";:IN
PUT"D%
170 IF D%<2 OR D%>20 THEN SOUND 1,-15,
50,5:PRINTTAB(24,19);SPC(10):GOTO 160
180 VDU 23,1,0;0;0;0;
190 PROCsetup_square
200 PROCleft:PROCrigh:PROCdown:PROCup
210 PROCleft_down:PROCleft_up:PROCrigh
t_up:PROCrigh_down
220 CLS:PRINTTAB(10,15);"ANALYSIS COMP
LETE"
230 END
240 DEFPROCsetup_square
250 CLS:COLOUR 1
260 FOR line%=1 TO D%:FOR column%=1 TO
D%
270 PRINTTAB(line%,column%);"."
280 NEXT:NEXT
290 FOR line%=1 TO D%
300 COLOUR 2:PRINTTAB(0,line%);">:COL
OUR 3
310 FOR column%=1 TO D%
320 REPEAT:*FX21,0
330 G=GET:UNTIL G>64 AND G<91
340 PRINTTAB(column%,line%);CHR$(G);
350 Letter%(column%,line%)=G
360 NEXT
370 SOUND 1,-10,100,5

```

Turn to Page 84 ►

UTILITY

◀ From Page 83

```

380 COLOUR 2:PRINTTAB(DX+3,Line%);"Cor
rect ? (Y/N)"
390 *FX21,0
400 REPEAT:GS=GETS:UNTIL GS="Y" OR GS=
"N"
410 IF GS="N" THEN PROCclear_line:line
%=line%-1
420 PRINTTAB(0,Line%);SPC(1);TAB(DX+3,
Line%);SPC(16);
430 COLOUR 3:NEXT
440 ENDPROC
450 DEFPROCclear_line
460 COLOUR 1:FOR IX=1 TO DX
470 PRINTTAB(IX,Line%);"."
480 NEXT
490 PRINTTAB(DX+3,Line%);SPC(16);
500 ENDPROC
510 DEFPROCleft
520 CLS:FOR line%=1 TO DX
530 COLOUR 2:PRINTTAB(0,0);"LEFT TO RI
GHT"
540 DS="":FOR column%=1 TO DX
550 DS=DS+CHR$(Letter%(column%,line%))
560 PRINTTAB(19,0);DS:NEXT
570 PROCsplit_line:NEXT
580 ENDPROC
590 DEFPROCright
600 CLS:FOR line%=1 TO DX
610 PRINTTAB(0,0);"RIGHT TO LEFT"
620 DS="":FOR column%=DX TO 1 STEP -1
630 DS=DS+CHR$(Letter%(column%,line%))
640 PRINTTAB(19,0);DS:NEXT
650 PROCsplit_line:NEXT
660 ENDPROC
670 DEFPROCdown
680 CLS:FOR column%=1 TO DX
690 PRINTTAB(0,0);"TOP TO BOTTOM"
700 DS="":FOR line%= 1 TO DX
710 DS=DS+CHR$(Letter%(column%,line%))
720 PRINTTAB(19,0);DS:NEXT
730 PROCsplit_line:NEXT
740 ENDPROC
750 DEFPROCup
760 CLS:FOR column%=1 TO DX
770 PRINTTAB(0,0);"BOTTOM TO TOP"
780 DS="":FOR line%= DX TO 1 STEP -1
790 DS=DS+CHR$(Letter%(column%,line%))
800 PRINTTAB(19,0);DS:NEXT
810 PROCsplit_line:NEXT
820 ENDPROC
830 DEFPROCleft_down
840 NX=1:FOR RX=(DX-1) TO 1 STEP -1
850 PRINTTAB(0,0);"DIAG' LEFT DOWN"
860 XX=0:YX=1:DS="":NX=NX+1
870 FOR CX=1 TO NX
880 DS=DS+CHR$(Letter%(RX+XX,YX))
890 PRINTTAB(19,0);DS
900 XX=XX+1:YX=YX+1
910 NEXT:PROCsplit_line:NEXT
920 NX=DX:FOR RX=2 TO (DX-1)
930 PRINTTAB(0,0);"DIAG' LEFT UP"
940 XX=1:YX=0:DS="":NX=NX-1
950 FOR CX=1 TO NX
960 DS=DS+CHR$(Letter%(RX+XX,YX))
970 PRINTTAB(19,0);DS
980 XX=XX+1:YX=YX+1
990 NEXT:PROCsplit_line:NEXT
1000 ENDPROC
1010 DEFPROCleft_up
1020 NX=1:FOR RX=(DX-1) TO 1 STEP -1
1030 PRINTTAB(0,0);"DIAG' LEFT UP"
1040 XX=0:YX=DX:DS="":NX=NX+1
1050 FOR CX=1 TO NX
1060 DS=DS+CHR$(Letter%(RX+XX,YX))
1070 PRINTTAB(19,0);DS
1080 XX=XX+1:YX=YX+1
1090 NEXT:PROCsplit_line:NEXT
1100 NX=DX:FOR RX=(DX-1) TO 2 STEP -1

```

```

1110 PRINTTAB(0,0);"DIAG' LEFT UP"
1120 XX=1:YX=0:DS="":NX=NX-1
1130 FOR CX=1 TO NX
1140 DS=DS+CHR$(Letter%(RX-XX,YX))
1150 PRINTTAB(19,0);DS
1160 XX=XX+1:YX=YX+1
1170 NEXT:PROCsplit_line:NEXT
1180 ENDPROC
1190 DEFPROCright_up
1200 NX=1:FOR RX=2 TO DX
1210 PRINTTAB(0,0);"DIAG' RIGHT UP"
1220 XX=0:YX=DX:DS="":NX=NX+1
1230 FOR CX=1 TO NX
1240 DS=DS+CHR$(Letter%(RX-XX,YX))
1250 PRINTTAB(19,0);DS
1260 XX=XX+1:YX=YX+1
1270 NEXT:PROCsplit_line:NEXT
1280 NX=DX:FOR RX=(DX-1) TO 2 STEP -1
1290 PRINTTAB(0,0);"DIAG' RIGHT UP"
1300 XX=DX:YX=0:DS="":NX=NX-1
1310 FOR CX=1 TO NX
1320 DS=DS+CHR$(Letter%(RX-XX,YX))
1330 PRINTTAB(19,0);DS
1340 XX=XX-1:YX=YX+1
1350 NEXT:PROCsplit_line:NEXT
1360 ENDPROC
1370 DEFPROCright_down
1380 NX=1:FOR RX=2 TO DX
1390 PRINTTAB(0,0);"DIAG' RIGHT DOWN"
1400 XX=0:YX=1:DS="":NX=NX+1
1410 FOR CX=1 TO NX
1420 DS=DS+CHR$(Letter%(RX-XX,YX))
1430 PRINTTAB(19,0);DS
1440 XX=XX+1:YX=YX+1
1450 NEXT:PROCsplit_line:NEXT
1460 NX=DX:FOR RX=2 TO (DX-1)
1470 PRINTTAB(0,0);"DIAG' RIGHT DOWN"
1480 XX=DX:YX=0:DS="":NX=NX-1
1490 FOR CX=1 TO NX
1500 DS=DS+CHR$(Letter%(RX+XX,YX))

```

```

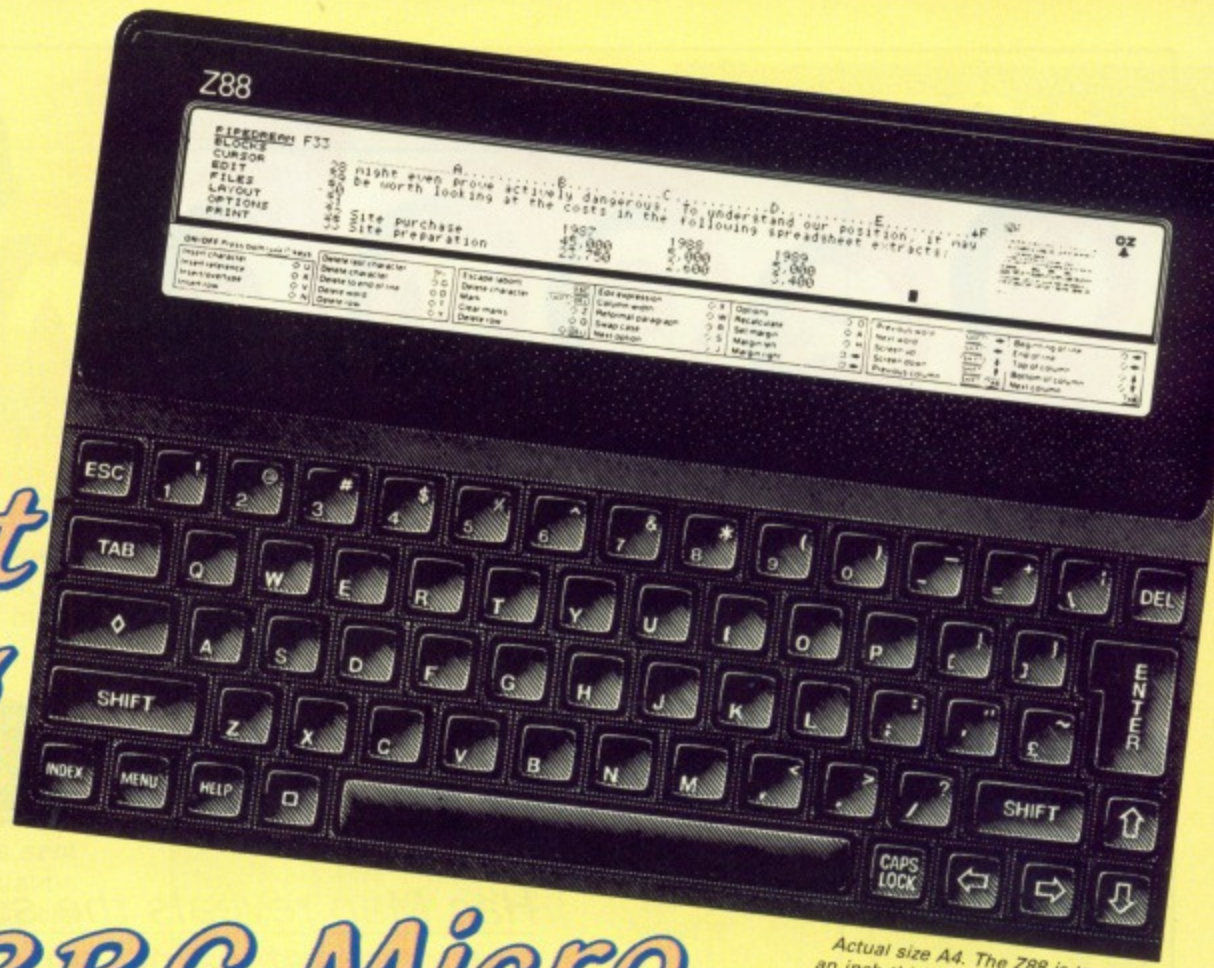
1510 PRINTTAB(19,0);DS
1520 XX=XX-1:YX=YX+1
1530 NEXT:PROCsplit_line:NEXT
1540 ENDPROC
1550 DEFPROCsplit_line
1560 PRINT:COLOUR 1
1570 PRINTTAB(0,2);STRING$(40,"-")
1580 PRINTTAB(0,29);STRING$(40,"-")
1590 COLOUR 2
1600 PRINTTAB(8,31);"SPLIT LINE (Y/N) ?
";
1610 *FX21,0
1620 REPEAT:GS=GETS:UNTIL GS="Y" OR GS=
"N"
1630 PRINTTAB(8,31);SPC(20);
1640 IF GS="N" THEN CLS:ENDPROC
1650 COLOUR 1
1660 PRINTTAB(4,31);"PRESS SHIFT KEY TO
CONTINUE";
1670 VDU 28,8,28,30,3
1680 COLOUR 3
1690 LDX=LEN(DS)
1700 count=0
1710 FOR LX=2 TO LDX
1720 FOR QX=1 TO (LDX-LX+1)
1730 PRINT MID$(DS,QX,LX)
1740 count=count+1
1750 IF count=25 THEN PROCreset
1760 NEXT:NEXT:COLOUR 2
1770 SOUND 1,-10,200,5:VDU26
1780 PRINTTAB(3,31);"PRESS RETURN KEY F
OR NEXT LINE";
1790 *FX21,0
1800 REPEAT:G=GET:UNTIL G=13
1810 CLS
1820 ENDPROC
1830 DEFPROCreset
1840 REPEAT:UNTIL INKEY(-1)
1850 REPEAT:UNTIL NOT INKEY(-1)
1860 CLS:count=0
1870 ENDPROC
1880 CLS
1890 COLOUR 3
1900 REPORT
1910 PRINT " at line ";ERL

```



10 = 00	330 = A7D2 D	650 = 85CD 9	970 = 1112 D	1290 = F811 3	1610 = 2B9A 3
20 = 00	340 = 6AD9 5	660 = ED0F 2	980 = 7D93 6	1300 = 4A69 7	1620 = 36B6 B
30 = 00	350 = 472 0	670 = A9FD B	990 = 3258 E	1310 = 1E76 0	1630 = E9C0 A
40 = 8089 9	360 = 2C83 F	680 = DB34 D	1000 = ED0F E	1320 = 8713 6	1640 = 8930 0
50 = 7054 B	370 = 9E9C C	690 = 3199 4	1010 = 75FC B	1330 = 1112 7	1650 = 3337 1
60 = 63DC 4	380 = F0EE 9	700 = 5B76 C	1020 = 524B 2	1340 = E2C 2	1660 = A495 1
70 = 354 3	390 = 2B9A 2	710 = 235B 3	1030 = 31AD C	1350 = 3258 3	1670 = 939D 6
80 = 31E4 1	400 = 36B6 8	720 = C4EC 9	1040 = D07C 5	1360 = ED0F 2	1680 = 1375 2
90 = 9431 3	410 = 8C2F 0	730 = 85CD 9	1050 = 1E76 8	1370 = 9DFF 9	1690 = EB78 E
100 = 78A7 1	420 = 3D5D 6	740 = ED0F C	1060 = 8DD5 F	1380 = 7E56 2	1700 = 7588 9
110 = 26ED 2	430 = BECF A	750 = 958C 4	1070 = 1112 A	1390 = E021 9	1710 = 2970 E
120 = 1375 4	440 = ED0F 2	760 = DB34 B	1080 = D735 9	1400 = 3602 5	1720 = CA42 4
130 = 21EC E	450 = 788 C	770 = C58C 8	1090 = 3258 E	1410 = 1E76 1	1730 = B7E4 C
140 = AD65 D	460 = D002 E	780 = 5581 1	1100 = 7ED3 B	1420 = D1E 9	1740 = 8391 C
150 = 3337 6	470 = 629 2	790 = 235B 2	1110 = 31AD 2	1430 = 1112 4	1750 = 70E5 C
160 = 13F5 B	480 = 2C83 C	800 = C4EC 0	1120 = 7EB 1	1440 = 7D93 6	1760 = 607 E
170 = 565E F	490 = 1778 A	810 = 85CD D	1130 = 1E76 A	1450 = 3258 A	1770 = B9F9 5
180 = 4515 2	500 = ED0F 7	820 = ED0F D	1140 = 8713 1	1460 = A79E 2	1780 = CC3F B
190 = FACD E	510 = 68C6 4	830 = C7D8 B	1150 = 1112 5	1470 = E021 5	1790 = 2B9A 3
200 = 1F86 B	520 = CF70 6	840 = 524B 6	1160 = 7D93 5	1480 = 4A69 C	1800 = 2215 9
210 = 7F1A 0	530 = C640 8	850 = 2ABA 0	1170 = 3258 F	1490 = 1E76 0	1810 = 7A16 2
220 = A59A 2	540 = F647 E	860 = 3602 D	1180 = ED0F 4	1500 = 4A96 5	1820 = ED0F 9
230 = FD2E 6	550 = 235B 1	870 = 1E76 C	1190 = 19 B	1510 = 1112 D	1830 = 469E 3
240 = 2D54 3	560 = C4EC 2	880 = 8DD5 9	1200 = 7E56 E	1520 = E2C 3	1840 = 568B 6
250 = AC68 1	570 = 85CD 6	890 = 1112 0	1210 = F811 E	1530 = 3258 C	1850 = 326 1
260 = 4A8 0	580 = ED0F A	900 = 7D93 F	1220 = D07C A	1540 = ED0F 1	1860 = 1506 7
270 = 580A 6	590 = E053 6	910 = 3258 A	1230 = 1E76 6	1550 = 32B5 D	1870 = ED0F 0
280 = 24BD 1	600 = CF70 6	920 = A79E 2	1240 = D1E 5	1560 = E272 F	1880 = 7A16 B
290 = 28E9 E	610 = 25B0 2	930 = 2ABA 3	1250 = 1112 0	1570 = 42FA 9	1890 = 1375 5
300 = F74D 0	620 = C86A 8	940 = 7EB 2	1260 = D735 8	1580 = C270 A	1900 = 8FD9 2
310 = 4081 D	630 = 235B 5	950 = 1E76 E	1270 = 3258 6	1590 = 354 7	1910 = 310F 3
320 = 9F9F 9	640 = C4EC A	960 = 4A96 C	1280 = 7ED3 3	1600 = 22DB 5	

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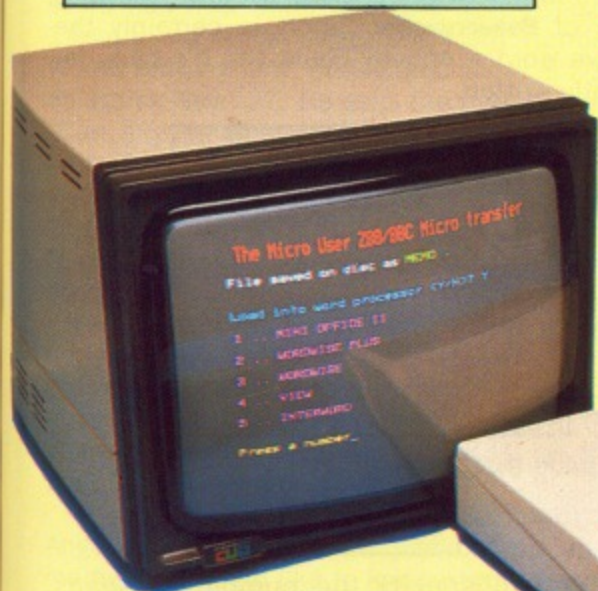
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

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Going for Uridium

Hac Man reveals the secrets of the smoothest game on a BBC Micro

RECENTLY I received a letter from Angus Hughes who seems destined for great things. He is one of three university students who produced the BBC Micro version of the sideways scrolling shoot-'em-up – Uridium – on which Audiogenic's Psycastria was based. Angus' letter is crammed full of survival hints and snippets of information that I'm sure will be of interest to fans of the game.

There are two sorts of alien attack wave, stationary and follow-the-leader. Always attack the unmoving waves from behind and of the five aliens in a wave only four will fire. Mines will be launched only when there are fewer than five aliens remaining, and a maximum of three will be launched at any one time. In addition, no aliens will be launched while mines are active.

After you are prompted to *Land now*, no further waves of aliens appear but mines continue to be launched. The master runway is at the right-hand side of each dreadnought and can be identified by its leading arrows.

Your ship can fly left or right at four different speeds. At the three higher ones it can rotate on to its side to enable it to fly through small gaps. There are 14 completely different levels, each of which is about nine screens long, making a total of 126. Points scored for destroying alien ships rise every two levels and you lose a life if you don't complete or Quit the bonus screen before the countdown reaches zero.

Angus then goes on to ask "Have you noticed...?": Your bullets do not pass through high barriers on the surface of the dreadnought. For rapid firing, a pair of bullets is fired when the button is depressed and another pair when it's released. The ship's bullets are closer together when the craft is on its side – you must fire accurately to shoot the tiny destructible features on the dreadnought's surface.

Both vertical and horizontal inertia acts on your ship – which moves an extra pixel vertically after the key has been released. The shadow is faithfully etched on the surface of the dreadnought and follows the movement of your ship. You can fly underneath the aliens and when

you fly below the dreadnought you can see your ship through holes in the middle.

No operating system routines are used at all. The BBC Micro's whole memory – with the possible exception of about two bytes – is used, and all sound and printing routines are purpose-written. The screen display is a true multi-mode. The upper screen – scoreline – is in Mode 1 while the lower is in Mode 2. However, the lower part is hardware-scrolled independently of the scoreline.

Each level is possible and Angus has reached level 11 without cheating, scoring 100475.

Soft soap

Daniel Simms of Ackworth, West Yorks has sent in a short routine to allow extra lives on the disc version of **Bonerunner**. Short is certainly the operative word – nobody could say it's been inefficiently written.

```
10 REM Bonerunner disc e
  xtra lives cheat
 20 REM by Daniel Simms
 30 REM (C) The Micro User
 40 REM
 50 MODE 5:*BONE2
 60 ?&3527=n:REM where n is
  the no. of lives (1-255)
 70 *BONE2LD
```

Daniel adds that the line:

```
65 ?&353F=n
```

allows you to specify the number of soaps required to complete a level. Set *n* to 1 to complete each level after collecting and delivering just one bar of soap.

At a risk of being at odds with the overall theme of this column, I like Bonerunner as difficult as it is – well, almost as difficult. However, on my travels through Bonerunner Castle, I have occasionally come across a chamber from which I

Get the itch

Tommy Gilkhurst of Ardglass, Co. Down, Northern Ireland, has a suggestion that will be useful to players of *Spellbinder*. He says that adding Fleas to the end of any spell makes it more powerful.

have emerged with the thought "That was easy".

Sometimes there seem to be many different ways to complete a screen, because so many skeletons are sitting around just waiting to be boiled up. Most of the chambers are so fiendishly designed that the only skeletons on offer are the 25 required to complete that level — many of which start off as monsters — but there are exceptions. Can any reader come up with a list of screens in which it is possible to collect more than five bars of soap?

Anarchy passwords

Kevin Dunnill of Billingham, Cleveland has sent me the complete set of passwords for Atlantis Software's budget priced shoot-'em-up **Anarchy Zone**. They are:

2	WATT	10	JILT	18	TRIO	26	SE15
3	EASY	11	SILK	19	FLEX	27	KELP
4	DUNE	12	CULT	20	LOBE	28	RENT
5	TACK	13	POLE	21	DAZE	29	MOLE
6	BILL	14	NERD	22	LOSS	30	DUEL
7	BURP	15	PALL	23	DUNG	31	BABE
8	BAIT	16	FEND	24	PACE	32	DUDE
9	WICK	17	CITY	25	WRAP	33	<AD>

Reaching high

I'm reluctant to publish high scores because they are so open to abuse, either by inventing one or by using a cheat facility to get a top score. Even screenshots or dumps can be faked easily."

But in the June 1988 column I did note a high score for **Zarch** — 71,469 by R. Johnson from Guildford. However, this undoubtedly impressive score has now been well and truly smashed by 14-year-old Anish Aggarwal from Handsworth Wood, Birmingham, whose best score is 296,948 on attack wave 27. He asks the natural question: "Can anyone beat this?". Well, can anyone do better?

Anish has also sent in four pages of hints for Zarch — unfortunately I don't have enough space to print them this month, but I'll try to fit them in soon.

I've only played Zarch three times and predictably enough, on my first attempt I was compared unfavourably to a piece of lichen, rising to just above Pathetic on the high-score table at the end of my third attempt. I don't think I'll be challenging for Anish's crown just yet.

As the last word on Zarch for this month, Martin Angove of Caerphilly has just bought an Archimedes and would like to know what I recommend as a good first game. Need you ask?

Magic pokes

Here is a set of invulnerability pokes for the Master Compact and BBC Micro tape and disc versions of Superior's arcade adventure **Palace of**

Magic. I wrote them when the game was first released, but filed them away, intending to revive them when the accompanying competition had closed. Instead, with so much good material coming all the time from you I forgot all about them.

So here they are at last; with the map in this issue you have all the keys to the palace.

```

10 REM Palace of Magic in          150 DEFPROCload
vulnerability                      160 !&A00=&208D27A9:!&A04=
20 REM Tape version                &8D0AA902
30 REM by Hac-Man 1988             170 !&A08=&0EA90221:!&A0C=
40 REM (C) The Micro User         &F42004A2
50                                  180 !&A10=&A01FA2FF:!&A14=
60 FOR IX=0 TO 2 STEP 2:P         &FFF7200A
X=&900:[OPT IX                      190 !&A18=&04A20DA9:!&A1C=
70 JSR &A00 : LDA# &A9 :          &4CFFF44C
STA &4661 : LDA# 0 : STA &46       200 !&A20=&4D4F502E:!&A24=
62 : \ invulnerability            &080D0032
90 JMP (&A3C)                      210 !&A28=&98488A48:!&A2C=
100 J:NEXT:MODE 7:*FX 15,0        &03CAAD48
110 PRINT"Please insert Pa         220 !&A30=&CA8DFE29:!&A34=
lace of Magic tape, hit a ke     &68A86803
y and press play...":A%=GET      230 !&A38=&602868AA:!&A3C=
120 PROCload:CALL &900           &524D63A0
130 END                             240 ENDPROC
140

```

Palace of Magic invulnerability for BBC Micro tape

```

10 REM Palace of Magic in          80 LDA# &A9 : STA &4461 :
vulnerability                      LDA# 0 : STA &4462 : \ invu
20 REM BBC Micro disc ver         lnerability
sion                                90 JMP &63A0
30 REM by Hac-Man 1988           100 J:NEXT:MODE 7:*FX 15,0
40 REM (C) The Micro User        110 PRINT"Please insert Pa
50                                  lace of Magic disc and pres
60 FOR IX=0 TO 2 STEP 2:P         s any key...":A%=GET:*LOAD
X=&900:[OPT IX                    POM2
70 LDA# 96 : STA &9B4 : J         120 CALL &900
SR &970

```

Palace of Magic invulnerability for BBC Micro disc

```

10 REM Palace of Magic in          lace of Magic disc and pres
vulnerability                      s any key...":A%=GET
20 REM Master Compact ver         80 *MOUNT
sion                                90 ?&C42D=&8D:*RUN POM2
30 REM by Hac-Man 1988           100 ?&192B=&36:!&1B66=&60A
40 REM (C) The Micro User        A00A9:CALL &1900
50                                  110 ?&4661=&A9:?&4662=0:CA
60 MODE 7:*FX 15,0              LL &63A0
70 PRINT"Please insert Pa

```

Palace of Magic invulnerability for Master Compact

Bonus cheat

John McIver of Garforth, Leeds, has sent me details of a cheat mode built into Audiogenic's **Saracoid**. This fun shoot-'em-up was only released as a bonus title on the Power Pack II compilation. However, it is a game worth seeking out, especially for Galaforce fans.

John says that the cheat can be activated when

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◀ From Page 87

the title page – with the message *SARACOID* by *DEAN LESTER* – is being displayed on the screen. Press G then L in rapid succession. The micro will now come up with the message *CHEAT MODE, WHICH SCREEN*. Enter a number between – 1-30 – and press Return. You will start on that level with eight lives. Thank you John.

Incidentally, if the name Dean Lester sounds familiar, he is also known for *Ziggy*, also published by Audiogenic.

Feel the Force

Ben Porter of Walthamstow, London, has a tip that will be of passing interest to owners of the disc version of Domark's *Star Wars* who also have a disc drive with an independent power supply. It has the effect of making the game absurdly easy to complete. I don't own a copy of the game, so I haven't been able to check the accuracy of this tip, but here goes anyway.

Ben says you should load the game as normal, and turn off your disc drive as soon as it has finished loading. You will be transported into the *Death Star* automatically. Just press fire to de-

stroy it. Apparently you can do this over and over again – ideal for those who want to save the universe with the minimum of effort.

More ransacking

In response to the August column in which I detailed the cheat facilities built into Peter Scott's *Ransack*, Stewart Roberts of Long Eaton, Nottingham, has sent in a routine that allows true infinite lives, as opposed to the mere 230 provided by the game's cheat mode. However, it only applies to the disc version of the game. Put the disc into the drive and type:

```
*LOAD RANSAC1
?2610=96
CALL 2348
```

When the Basic prompt reappears, enter:

```
?7415=234
?7416=234
?7429=234
?7430=234
?7431=234
CALL 7325
```

The rest of the game loads, and you now have infinite lives.

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Living happily with the mouse



*Mike Cook shows how to
move control away from
your micro keyboard*

THE Archimedes has a very important alternative input device – the mouse. And you can incorporate its use into your own programs very easily. One way is to let the mouse control your software by using control buttons – a command appears in a rectangle and to activate it you move the mouse pointer over to the rectangle and click.

The rectangle then inverts to indicate what you have selected and when you release the button the appropriate command is carried out.

This may seem quite a complex sequence to code, but it is quite simple if you tackle it the right way.

The listing shows how this can be done. It will draw a circle, and selecting any of the four control rectangles will move its position. It may not be the most exciting routine in the world, but it illustrates the use of the mouse in a Basic program.

The breakdown shows exactly how the program works and you should have no problem following it. So there you have it: You can now use mouse controls in your own software. If you write any interesting routines we'd love to see them.

PROGRAM BREAKDOWN

- | | |
|-------------------|--|
| 60 to 100 | Draw the rectangles and print the text inside them. |
| 140 to 170 | Constitute the main loop of the program: In each loop a procedure PROC_MOUSE is called to see if any control is being called for. |
| 210 | Reads the state of the mouse buttons and returns if nothing is being pressed. If any is being pressed we test to see if it is in any of our defined functions by a routine which returns a logic variable TRUE or FALSE, depending on whether the mouse is pointing at a control. This function is at the heart of the program and can easily be incorporated into your own routines. The function is passed the size of the rectangle using exactly the same numbers used to draw it. |
| 370 to 390 | Test to see if it is within the bounds of the rectangle. If it isn't FALSE is returned otherwise the rectangle is inverted – line 410 – and the program waits until the mouse button has been released. Then the rectangle is inverted again, leaving it in its original state and a TRUE value is returned from the function. |
| 250 to 280 | Test each control rectangle. |
| 290 to 320 | Perform the appropriate action. The testing and conditional actions have been separated for simplicity but they could easily be combined. |

```

10 REM > MOUSE
20 *POINTER
30 MODE1
40 VDU 23,1,0,0,0,0,0,0,0,0
50 MOUSE ON
60 PRINTTAB(4,22);"LEFT  RIGHT  UP    DOWN"
70 RECTANGLE 114,274,158,64
80 RECTANGLE 338,274,188,64
90 RECTANGLE 626,274,96,64
100 RECTANGLE 850,274,158,64
110 PRINTTAB(0,27);"Mouse Handling Example By Mike Cook"
120 XR%=640
130 YR%=750
140 REPEAT
150 PROC_MOUSE
160 CIRCLE XR%,YR%,80
170 UNTIL FALSE
180 END
190 DEF PROC_MOUSE
200 LOCAL MX%,MY%,BX
210 MOUSE MX%,MY%,BX
220 REM EXIT IF MOUSE NOT DOWN
230 IF BX=0 THEN ENDPROC
240 REM SEE IF POINTER IS IN A RECTANGLE
250 GUP=FN_MBOUND(626,274,96,64)
260 GDOWN=FN_MBOUND(850,274,158,64)
270 GLEFT=FN_MBOUND(114,274,158,64)
280 GRIGHT=FN_MBOUND(338,274,188,64)
290 IF GRIGHT THEN XR%=XR%+4
300 IF GLEFT THEN XR%=XR%-4
310 IF GUP THEN YR%=YR%+4
320 IF GDOWN THEN YR%=YR%-4
330 ENDPROC
340 DEF FN_MBOUND(RX,RY,RW,RH)
350 LOCAL XT,YT
360 XT=FALSE
370 IF MX%>RX AND MX%<(RX+RW) THEN XT=TRUE
380 IF MY%>RY AND MY%<(RY+RH) THEN YT=TRUE
390 IF (XT=FALSE) OR (YT=FALSE) THEN =FALSE
400 MOVE RX,RY
410 PLOT &62,RW,RH
420 PROC_MUP
430 MOVE RX,RY
440 PLOT &62,RW,RH
450 =TRUE
460 DEF PROC_MUP
470 REM WAIT UNTIL MOUSE BUTTON IS RELESED
480 LOCAL TX%,TY%,TB%
490 MOUSE TX%,TY%,TB%
500 WHILE TB%<>0
510 MOUSE TX%,TY%,TB%
520 ENDWHILE
530 ENDPROC

```

Key to success

Pete Davidson interviews the creator of many of the best games which have appeared in The Micro User

GORDON Key originally became interested in micros purely as a hobby while working for the AA. His fascination started at the time when the Sinclair ZX81 was just becoming popular. "I nearly bought one, but fortunately couldn't afford it at the time" jokes Gordon who later went on to buy a Commodore Vic 20 and then a Jupiter Ace. Neither of these machines particularly impressed him and in 1982 he splashed out on a BBC B which really started to accelerate his interest.

"I did produce a couple of programs for the Vic 20 but it was a terrible machine to program. The BBC Micro was so friendly that I found myself writing more and more.

"About five years ago I saw an advertisement in *The Micro User* offering to evaluate programs and help programmers with any problems. I sent them a fairly simple game entitled Quadline based on the Connect 4 idea. The Editor contacted me and

a few months later it was printed as a listing in the magazine.

Although just programming for pleasure, Gordon was delighted that the program was going to be put to good use. Following the interest from *The Micro User* he subsequently sent further programs in Basic, including Harbour Command, Tipaka, Pendragon and several others, all of which appeared in this magazine.

Most of his ideas at that time came from existing games which he modified. But as he progressed and his programming skills developed he started to produce better and better games.

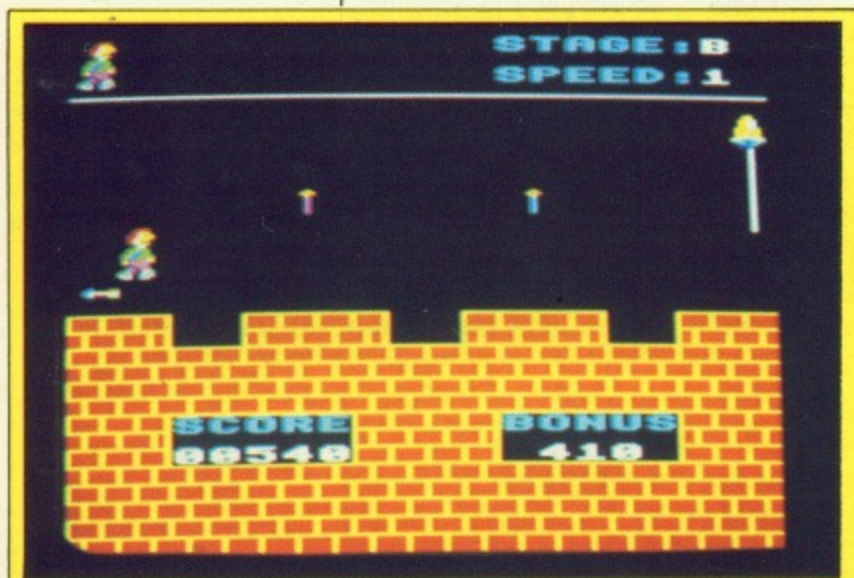
"A couple of years ago Database published two of my games on its discs. One was called Christmas Lights which appeared on the Christmas disc and the other – one of my favourites – was Quazimodo's Quest which featured a hunchback scaling the ramparts of a castle".

Gordon also became more adventurous and started using more and more machine code. He wanted to produce magazine games that were as good as commercial ones. One of his creations which received great acclaim was Dino. It also brought in the first complaint he had received.

"Someone actually wrote to the magazine protesting that one of the game characters – named Jenny Greenteeth – was a relative. I hope not for his sake, as Jenny Greenteeth is actually a witch from an old wife's tale invented to frighten children from going too near rivers".

Next came Hunkie Egg, then McBrolly followed closely by his first horizontally scrolling game, Dune Hunter, which he admits himself was really very good and exceptional for a magazine game.

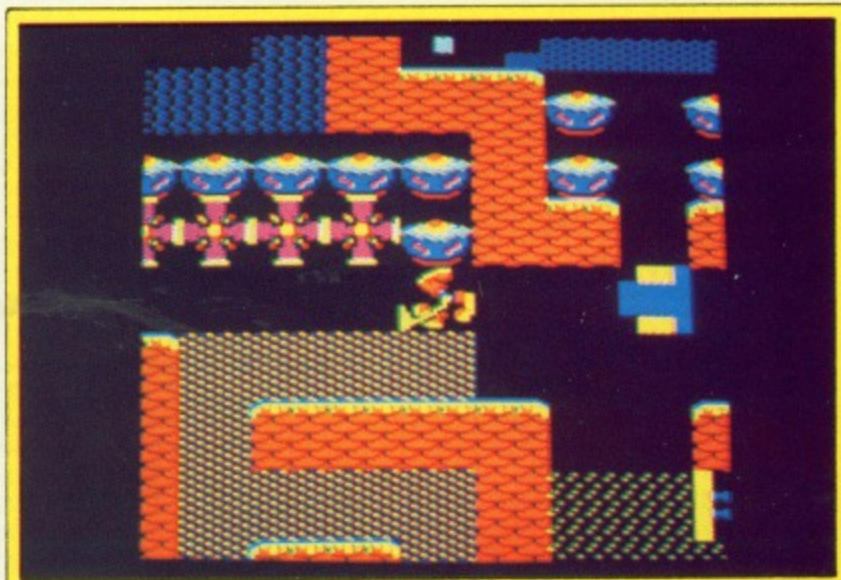
"I wanted to produce something that would astound anyone who typed it in. It included four-way scrolling, multi-levels, commercial quality graphics and music. It was at this stage that I



Quazimodo's Quest: One of Gordon's favourites



Dune Hunter: Exceptional for a magazine game



Clogger: Action from next month's free disc

came up with the ideas for Clogger".

Clogger's central character is so unusual that it is hard to imagine how anyone could dream it up. It's a three-legged being with no head, a shovel and great big boots.

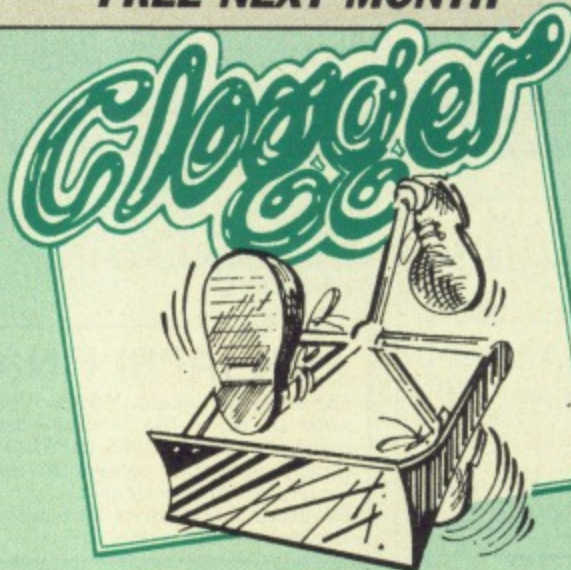
Gordon says that as a youngster he was fascinated by large shiny army-style boots, and would draw all kinds of creatures wearing them. The natural choice of character for Clogger was a bulldozer, but Gordon adapted it to a bootdozer as he thought it was more amusing.

There were a lot of technical problems: The scrolling routine had to be extremely fast as so many of the objects can be pushed around. Memory started to get very tight, and some ingenious techniques had to be used to allow the pictures to be created.

"To do everything I wanted it was going to be an extremely long magazine listing. Comments from friends led me to believe that it would justify a full commercial launch so a few months later I showed it to Mark and Steve Botterill at Impact. They thought it was fabulous and said they would be delighted to publish it. Its launch is at the November Electron and BBC Micro user show".

Gordon has now set up in business restoring old buses but he has also bought an Archimedes and is learning ARM assembly language. He also has ideas for further BBC Micro programs and intends to convert Clogger to the Electron. So watch out for more from this new master programmer of Acorn machines.

FREE NEXT MONTH



The December 1988 issue of *The Micro User* will feature a free cover disc giving exclusive previews of Impact Software's latest releases.

There's a demo version of Clogger by Gordon Key complete with three full screens and, in addition, three sets of pokes from the Cheat It Again, Joe discs so that you can make your games easier to play.

So make sure you get your copy of *The Micro User* for the very best in BBC Micro entertainment and games.

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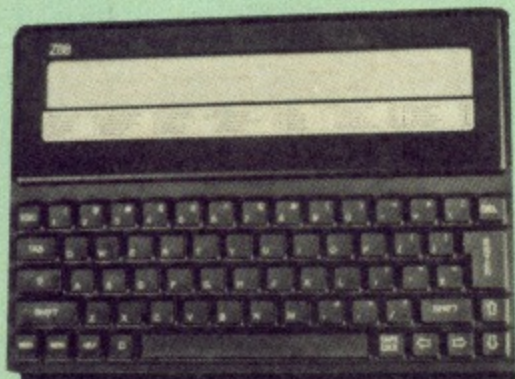
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(65C102 replaces the original Acorn 6502 2nd Processor)

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B. This is a complete package, with its own power supply, ready to interface with your BBC Micro.

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CO-PRO Adaptor



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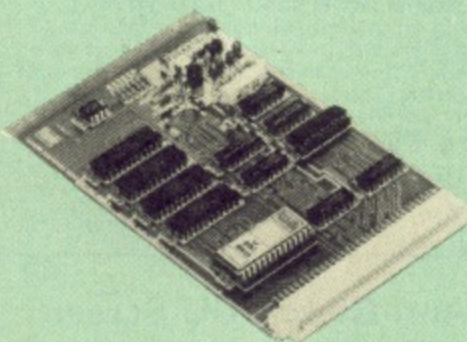
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.

Master owners may use Co-Pro to add a second Co-processor externally.

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Archimedes Real-Time Digitiser



Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Once captured, Video images can be stretched, squashed, rotated, stored on disk, printed, or used by applications software.

Applications include desktop publishing, graphics, animation, image analysis and recognition, medical imaging, automatic inspection and measurement, databases, interactive video, remote transmission of pictures via a modem, movement detection ... or anything else you can think of!

SPECIFICATION

SOFTWARE

All the driver software for the digitiser is contained in a ROM on the podule. Facilities provided include:

- Grabbing of images to the screen or dumping to memory.
- Continuous grabbing and display for previewing or camera alignment.
- 'Hot key' grabbing - pressing a (configurable) key combination grabs and displays an image on the screen while another program (e.g. paint software such as Artisan) is running.
- Scaling (zoom/shrink) any section of an image to any size in X and Y directions, with optional X/Y flip, window clip and logical (AND/OR/XOR) plotting.
- Rotation and scaling to any angle and size, rotating about any point, with optional window clip, and logical (AND/OR/XOR) plotting.
- Very versatile matrix printer screendump facility for Epson FX, LQ and EX compatible printers - pictures can be printed to ANY size (including multiple sheets) at any orientation, using any available printer density and one of six internal sets of dot patterns, or with user definable patterns (pattern editor supplied). The screen-dump can also be used for general purpose graphics screen printing.
- Pixel value lookup tables: pixel values can be passed through a user defined lookup table to allow contrast enhancement, thresholding pseudo-colouring etc.
- Smoothing and noise spot removal to enhance image quality.
- Creation of sprites from all or part of a digitised image.
- Saving and loading of digitised images in compressed format.
- Combination of pictures by adding, averaging, subtracting, multiplication etc.
- Much faster versions of the Arthur *ScreenLoad and *ScreenSave commands.

Software facilities are accessed via operating system star (*) commands and SWI calls. High resolution screen modes using MultiSync type monitors are supported.

UTILITY DISK

A disk is included, containing sample pictures, examples and utility programs including the following:

- Colour image grabbing using colour filters with monochrome or colour cameras, including colour balance adjustment and scaling facilities.
- Pattern editor for 2 colour display modes and printer screendumps.
- 512 line interlaced display for non MultiSync monitors.
- Thresholding to create two colour images.
- Capture and replay of animated sequences.
- Several example programs illustrating the use of digitiser software.

RESOLUTION

Images are digitised to 512 (h) x 256 (v) pixels, and then scaled to fit the Archimedes' screen. It is possible to digitise to 512 x 512 pixels if the picture is stationary for about 0.1 second. 512 x 512 images can either be displayed on a MultiSync monitor, or on a normal monitor using interlacing.

Pictures are digitised to 64 levels of grey (6 bits). Note, however, that it is only possible to display all 64 levels on a monochrome monitor, or a colour monitor which has a composite (CVBS) input. For this reason, the Philips CM8533 monitor is recommended instead of the standard Archimedes monitor. It is also possible to connect both a colour and a monochrome monitor at the same time.

Any 2,16 or 256 colour graphics mode can be used to display digitised pictures. In two colour modes, grey levels are represented using dot patterns, which may be redefined if required (a pattern editor is supplied).

SPEED

Video fields are captured in real time (1/50th sec.), and then transferred to Archimedes' memory or the screen. The grab/display rate is dependant on the screen mode and picture size, up to 25 fields per second for quarter screen images, or 12.5 per second for fullscreen (Mode 9).

HARDWARE

The digitiser is a single width podule, with a BNC socket on the rear panel for the video input, which may optionally be terminated via a link. There is 128K of on-board memory to store the digitised image, and a 32K ROM on the podule contains all the driver software.

Automatic video level control and black level clamping circuitry is used to ensure that the optimum contrast is obtained from a variety of video sources. A filter is included to avoid patterning effects when using colour sources.

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- Comprehensive manual

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The above is only a taste of the superb features of this software, surely capturing previously unknown performance from the BBC Master computer. BBC B owners will need to fit at least one block of sideways RAM, Shadow screen memory and a disc drive. A trackerball or a mouse is also required.

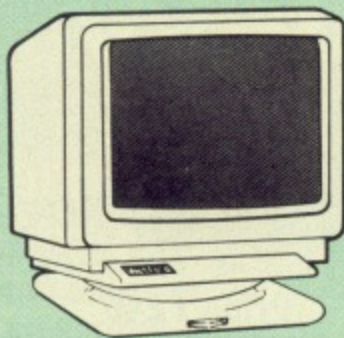
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- BNC Lead for Zenith or Phillips **£3**
- Skart Monitor Lead **£5**
- RGB lead for TAXAN Monitors **£3**
- Archimedes Colour Monitor Lead **£7.50**

By placing your monitor on one of our professional swivel bases (see monitors drawing on the left), you gain the freedom to adjust the monitor viewing angle to suit your needs and thus alleviate eye strain and reduce back stress. The front mounted adjustable control dial makes adjusting the monitor viewing angle very simple.

for 12" Monitors **£7** (carr. £2.50)

for 14" Monitors **£10** (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. Hundreds of these screens are in daily use in various branches of one of the leading High Street banks.

£12

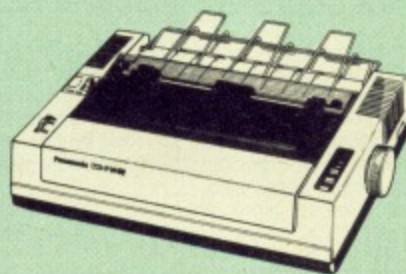
TAXAN KP-815 PRINTER

80 column, Bi-directional, 160 CPS, (NLQ 24cps); Friction & tractor feed + paper roll holder as standard; Epson FX compatible.

Offer Price £155

Taxan KP915 132 Column Printerr (carr £7)	£275
RS232 Interface	£49
RS232 Interface with 2K Buffer	£69
RS232 Interface with 16K Buffer	£89

Panasonic KX-P1081



Attractively finished in BBC beige. Bi-directional, logic seeking. Has IBM and Epson RX compatible command calls. Speed: 120CPS draft mode, 24 CPS NLQ mode. Character width range from 5 cpi to 17 cpi. Upto 40 downloadable characters. Functions include, Proportional spacing, Justification, centering and left & right ranging.

(Price includes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£145** (carr. £6)
Optional RS232 Interface: **£39**

Panasonic KX-P3131 Daisy-Wheel Printer

Low-cost, high performance; Bi-directional, Logic seeking, Proportional spacing, 10, 12 & 15 CPI, Speed 17CPS. 6K Buffer.

Only **£255** (carr. £7)

Tractor Feed	£90
Daisy Wheel (various)	£12
Ribbons: Standard £4.50 ; Long Life £7	
Extra 32K Printer Buffer (internally fitted)	£13

RS-232 GENDER CHANGERS

Male to Female	£6.95
Female to Male	£6.95
Male to Female	£6.95

Panasonic KX-P4450 LASER PRINTER

Latest technology at affordable price. Prints 11 pages a minute. Two A4 size paper bins, Serial & Parallel ports, 512K Buffer - expandable to 1.5Meg, 15 Character LCD Display, Diablo 630, Epson FX-286, IBM Proprinter, HP Laserjet emulations, 5K pages per month duty cycle.

ONLY £1,649

NEC P2200 PINWRITER

24 pin; 80 column; 168CPS - 56CPS LQ; Epson LQ compatible, 7K Buffer; 7 resident FONTS, Friction & Tractor feed, front load single sheet feed, etc.

Price: £269

FREE Price includes a Free BBC Cable.	
Cut Sheet Feeder	£65
Additional Font Cartridge	£25
NEC P2200 Pinwriter Ribbon	£6

NEC PINWRITER P6/P7 Plus

The Ultimate matrix Printer for Business.

Some of the features are:

- Print Speed, 265cps in Draft and 90cps in letter quality.
- Inbuilt Tractor & Friction feed.
- A paper park & low tear of facility.
- 20 inbuilt FONTS as standard.
- A Font cartridge facility.
- 8K byte Printer Buffer as standard.
- 24 Pin Printhead
- Colour Option available

P6 Plus 80 columns	£439
P7 Plus 136 columns	£545
Cut Sheet Feeder	£125
Colour Option	£74
Serial Interface	£73

EPSON PRINTERS

EX800	£415	LQ850	£469
EX1000	£569	LQ1050	£599
FX850	£315	LQ2550	£899
FX1000	£425	LX800	£179
GQ3500 Laser	£1249	SQ2500	£975
LQ500	£285		

Star LC10 **£192** LC10 Colour **£239**

PLOTTERS

Hitachi 672 Colour Plotter	£475
Plotmate Plotter A4S	£379
Plotmate Plotter A3M	£549

CUT SHEET FEEDERS for

EX800 **£149**; EX1000/LQ2550 **£210**; FX800 **£149**; FX1000 **£179**; LQ/LX800 **£139**; LQ500 **£75**; LQ850 **£135**; LQ1050 **£175**.

TRACTOR FEED for

EX800/1000 **£85**; LQ800 **£44**; LQ850 **£69**; LQ1050 **£85**; LQ2500 **£195**

ACCESSORIES

- EX800/1000 Colour Option **£55**
- EX800/1000 Colour Ribbon **£18**
- LQ2500 Colour Option **£65**

(Securicor Carriage on Printers **£7**)

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.			
RS232	£32	RS232 + 2K Buffer	£52
IEEE 488	£40	RS232 + 8K Buffer	£79

Universal Printer Sharers/Changers

Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spagetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments.)

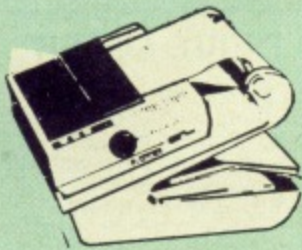
Connects	Serial	Centronics
2 to 1	£22	£23
3 to 1	£30	£32
5 to 1	£40	£42

(Cables extra at £6 each. Please specify type required when ordering)

INTEGREX COLOUR JET PRINTER

- Colour Jet 132 Printer **£515**
- Paper Roll **£6**
- Screen Dump Software **£10**
- Colour Cartridge **£14**
- Black Cartridge **£8**
- 100 A4 OHP transparencies **£55**
- 8K Serial Interface Optional **£99**

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

80 Column version **£23 (carr. £2.50)**
 132 Column version **£26 (carr. £2.50)**

PRINTER LEADS

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 1 meter	£7
IBM Parallel Lead 1 meter	£7
Double Ended 36 way Centronic Lead	£9
RS232 Leads (Various)	P.O.A.

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	-	£3.50
BBC Master	-	£4.00
Archimedes Micro pair	-	£9.00
IBM PCs pair	-	£9.95
Brother HR15/20	£3.00	£5.00
DMP2000	£3.75	£4.75
EX/LQ800	£4.50	£4.50
EX/LQ1000	£7.50	£5.00
RX/FX80/85/800/MX80	£3.90	£4.95
RX/FX100/1000	£5.75	-
Kaga/Taxan KP810/815	£4.90	£4.00
LC10 (Black)	£4.25	£5.00
LQ500/800	£3.75	£5.00
LQ1050/LQ2500	£8.50	£5.50
LX80/86/800	£3.80	£4.50
M1009/GLP	£3.80	£3.75
Panasonic KX1080/81	£4.00	£4.75
SQ2500	£23.00	£5.50
Star NL10	£3.75	£4.50
Olivetti Ink Jet Cartridges (set of 4)	£9	

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

- 1,000 Sheets 9 1/2" x 11" Fanfold Paper **£7**
- 2,000 Sheets 9 1/2" x 11" Fanfold Paper **£12**
- 1000 Sheets 9 1/2" x 11" NCR 2 Part Fanfold **£19**
- 1,000 Sheets 15" x 11" Fanfold Paper **£9**
- 1000 Sheets true A4 Fanfold Paper **£11**
- 2000 Sheets true A4 Fanfold Paper **£19**
- Teleprinter Roll (Econo paper) **£4**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

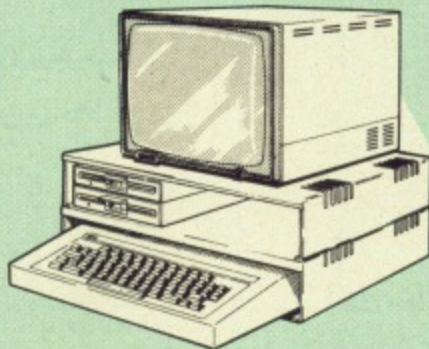
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£5.00
1,000 90 x 36mm (Twin Row)	£4.90
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

PLINTHS FOR BBC MICRO, MASTER & PRINTERS

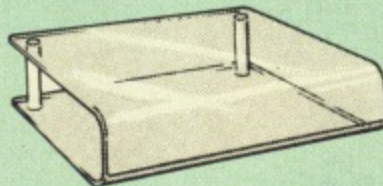


Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of coolingslots it has elegant cutouts on the sides. This allows access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	£12 (carr. £2)
Double BBC Plinth	£20 (carr. £3)
Printer Plinth	£12 (carr. £2)
Single Master Plinth	£13 (carr. £2)
Double Master Plinth	£24 (carr. £3)

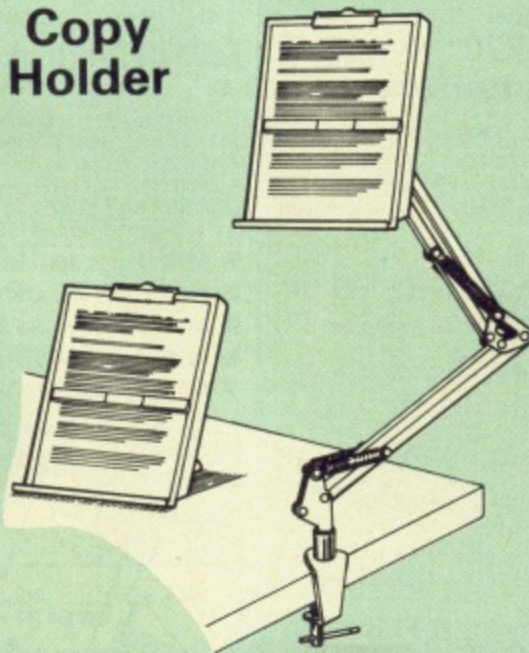
Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand. The printer sits on top and the fanfold paper rests neatly underneath, thus occupying the same space as the printer footprint.

Only: **£16 (carr. £3)**

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£10 (carr. £2)**
 Angle poise **£14 (carr. £3)**

MEGABUFFER 256



This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only **£149 (carr £2)**

OKIMATE COLOUR PRINTER

The first ribbon transfer printer in its price range which offers fully versatile colour or black printing. A 24 element print head produces more than 100 shades with exceptional clarity. Ideal for use with Quest Paint or AMX Super Art.

Only: **£119**

BBC Screen Dump	£10
Colour Ribbon	£6
Black Ribbon	£6

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities - he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

£5.95 (No VAT)

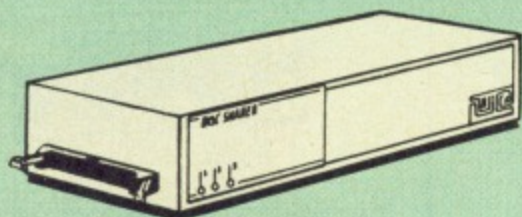


CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Continued

NEW

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price: **£65** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

WATFORD'S & ACORN'S SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for six years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. (P.S. Watford's highly sophisticated DFS is fully compatible with Acorn standard DFS). (while Acorn's 1770 DFS is fully compatible with Watford's Mk II DDFS)

- Complete Disc Interface Kit including DFS ROM and fitting instructions **£48**
 - Acorn's 0.90 DFS Kit complete **£49**
 - DFS Manual (Comprehensive) (no VAT) **£6.95**
- (P.S. Our DFS manual is the only comprehensive Manual available for the BBC micro and covers both Acorn & Watford DFSs).
- Watford's sophisticated DFS ROM only **£16**
 - We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only **£12**
 - DNFS ROM only **£17** ● ADFS ROM only **£25**

NEW

Watford's MkII 1770 Double Density DFS Interface

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features:

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBP has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00**.

- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

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**

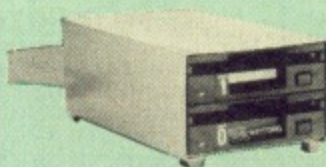
Special 40/80 Disc Drive/DDFS Mk II Offer



- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both, Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£125** (£6 carr)
 (Offer valid while stocks last)

3 1/2" DISC DRIVE OFFER



These top quality 3 1/2" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- CLS35 400K Unit **£69**
- CLD35 800K Unit **£126**

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.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

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

£4

FLOPPY HEAD CLEANER KIT

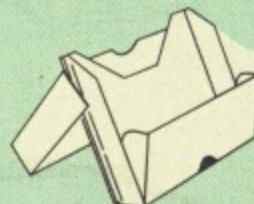
The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3 1/2" & 5 1/4", please specify.

£6

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- M35 – holds upto 50 5 1/4" discs **£6.00**
 - M85 – holds upto 95 5 1/4" discs **£8.00**
 - M25* – holds upto 25 3 1/2" Discs **£5.50**
 - M50 – holds 50 3 1/2" Discs **£7.50**
 - M10 – holds upto 10 Data Cartridges **£15**
- * Not lockable



PLASTIC LIBRARY CASES

Holds up to 10 5 1/4" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5 1/4" Discs.



Protection at Only: **£2**

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 capacity in single density mode. That within the brackets is the capacity in double density mode. 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). All our 80 track drives are already fitted with a 40-80 select switch.

All our Disc Drives 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.

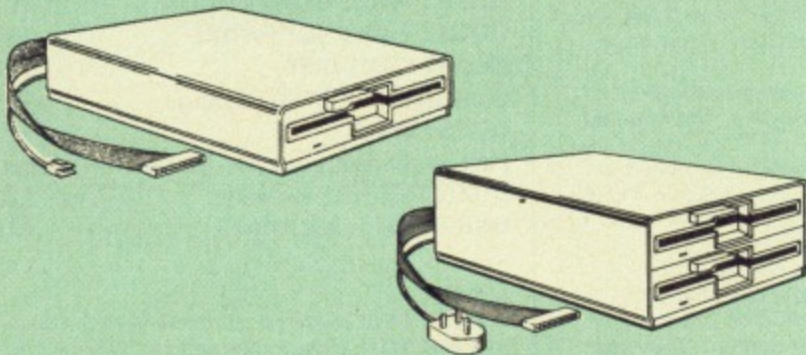
Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to 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. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today!)

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double 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, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 4th page of our advert for the Plinths). P.S. All our 5 1/4" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £82	CLD 400 £168	CS 400S £92	CD400 £188
800K (1.44M)		CLD 800S £162		CD 800S £182

● TWIN Disc Drive Case, complete with Power Supply & Cables £43
Securicor carriage on Disc Drives £5 to £6

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

Suffix S = 40-80 Switchable

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5 1/4" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5 1/4" Disc Drives to BBC Compact
Single £9 Twin £12

Special Cable to connect both 3 1/2" and 5 1/4" Disc
Drives simultaneously to the BBC Compact £13

3M - DISKETTES

3M - SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

- 10 x 5 1/4" S/S D/D 40 Track Diskettes (744) £6.00
- 10 x 5 1/4" D/S D/D 40 Track Diskettes (745) £7.50
- 10 x 5 1/4" S/S D/D 80 Track Diskettes (746) £11.50
- 10 x 5 1/4" D/S D/D 80 Track Diskettes (747) £11.75
- 10 x 5 1/4" 1.6M D/S D/D High Density Discs for IBM XT and AT £19
- 10 x 3 1/2" S/S D/D 40/80 track Discs £10.00
- 10 x 3 1/2" D/S D/D 40/80 track Discs £11.75
- 10 x 3 1/2" High Density Diskettes £37

TOP QUALITY 3 1/2" & 5 1/4" DISKETTES

To complement our range of Quality Discs and Disc Drives, WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

- 10 x M3 3 1/2" D/S D/D 80 Track Discs £11
- 10 x M9 3 1/2" Double Side High Density £34
- 10 x M4 5 1/4" S/S D/D 40 Track Discs £5
- 10 x M5 5 1/4" D/S D/D 40 Track Discs £7
- 10 x M7 5 1/4" D/S D/D 80 Track Discs £9
- 10 x M8 5 1/4" D/S H/D Hi-Density Discs £14
- 3" Double Sided Discs £3 each

Special BULK OFFER on 5 1/4" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48



WATFORD'S WINCHESTER DRIVES

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS - that's why we have bundled it with each Winchester drive, along with a full user guide and full utilities including file copy, 1000K save routines, Format and Verify - in fact all you need and more.

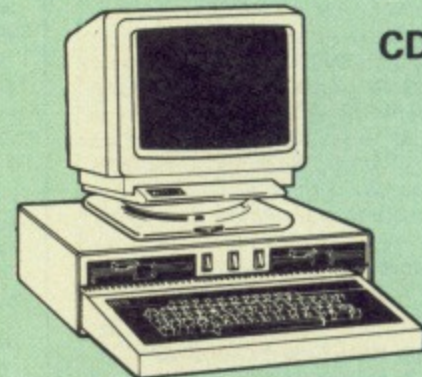
Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working - just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBC B (with 17 X disc interface).

- 10 Megabyte £350; ● 30 Megabyte £420

CDP800S

CDPM800S



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £192

CDPM 800S for Master £196

DP35-800 for BBC/Master £165

(For DP35-800S spec. see Page 8 of our advert)

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued

NOMINATED
FOR

1987

QUEST MOUSE



QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and its RUBBER COATED STEEL BALL is smooth and easy to use on virtually any work surface. This also eliminates any directional bias that one encounters on the most well-known mouse for the BBC. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package

With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87

"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."

"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87

"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87

"... Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package..."

"... you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias - a pleasure to use."

"What we have here is probably the best art package there is for the BBC Micro . . ."

"Quest Paint is a major leap forward in BBC programming. . ."

"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87

"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest . . ."

"... this package represents excellent value for money. If you are interested in art then this program is for you to buy".

"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".

"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".

"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".

"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".

"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus . . ."

"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".

"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program". The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:

"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Lt. Col. C.G. Holton, HQ 1 (BR) Corps, BFPO 39, writes:

"As ever your service is superb and the Quest Mouse proves every bit as good as the adverts claim".

Beeblet User Group, New Zealand Oct '87:

"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

Some of the features are:

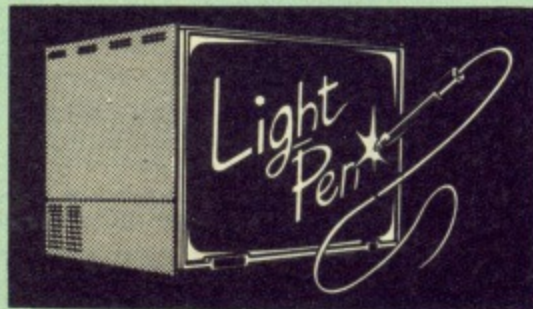
- Pick filenames off the screen for loading and saving.
- Rotate a cutout to any angle and Distort it to any four sided shape.
- Has Built in Font editor.
- Default brushes and patterns on startup.
- 16 x 16 font available on start up.
- Ability to reset patterns, fonts and brushes to default at any time.
- ROM based enhanced Epson and compatible printer dump.
- ROM based enhanced extended picture routine.
- Ability to create and abort extended pictures.
- Improved disk access speed for extended pictures.
- User definable sideways RAM driver for incompatible sideways RAM systems.
- Ellipses at any angle on Master 128 (or B with GXR ROM).

QUEST MOUSE & QUEST PAINT	£54
QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT	£82
QUEST MOUSE ONLY	£25
QUEST PAINT SOFTWARE	£32
QUEST FONT DISC	£12
ConQuest 32K ROM Package	£29
QUEST MAT	£3
Part-exchange your old Mouse for a New QUEST MOUSE for only	£23
GXR ROM for BBC Micro	£22

N.B.

1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN



Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £21

(Price includes FREE software Disc and Operating Manual)

RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible)
RB2 including Quest Paint

£52
£78

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Software Pack for Compact	£40
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

**THE NEW Mk III
AMX MOUSE**

ONLY: £59 Inc. Super Art package
(carr £1.50)
(Please specify for BBC, Master or Compact)

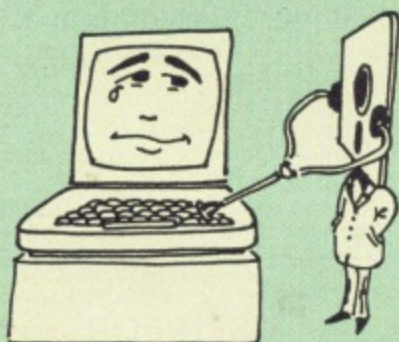
FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX UTILITY Package	£11
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse	£32

We are giving away absolutely FREE, our PAGE-FONT disc with every purchase of STOP PRESS from us.

PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker **£12**

AMX DESIGN (ROM)	£55
AMX 3D ZICON Disc	£19
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£15

DIAGNOSTICS DISC

The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. 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.

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**

**BEEB
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 ROMs 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.

£109 (Carr. £3)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)

A combination of the 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 Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out. The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)

**OFFICE
MASTER**

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

**OFFICE
MATE**

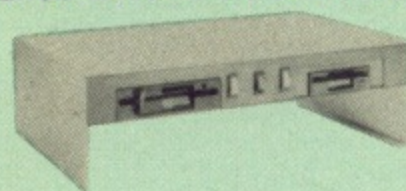
- DATABASE
- BEEBCALC SPREADSHEET
- BEEBLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

Disc Drives DP35-800S


A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. For ease of access, the switches are front mounted. DP35-800S has its own power supply, independent of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

Launch Offer: **£165** (carr. £7)

Continued 



ARIES CORNER

B-32 Shadow RAM Card

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, Interword 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 6502 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.

● Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£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-B20 and the Aries-B32

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 a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price: Aries B-12 **£40**
Aries B-12C **£5**

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 'GPIB' 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.

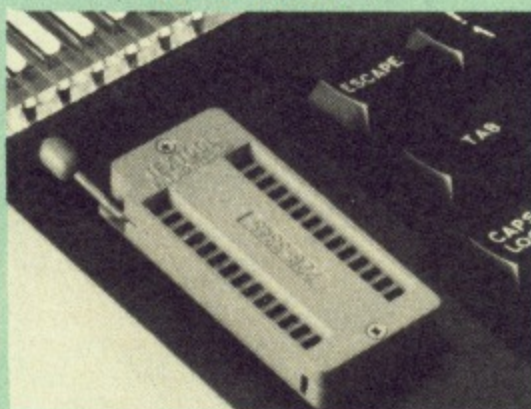
£238 (Carr £3)

EXTERNAL ROM BOARD for BBC MASTER

This external Beige finished, free standing cased unit with its own Power Supply allows you to plug-in upto 12 ROMs and 16K Sideways RAM.

Only **£78**

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

● 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.

● 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+ and Master compatible.
ONLY £16 (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

- Complete System **£11**
- Spare Cartridges **£2.50**
- Spare Rack **£1.50**

ROM Cartridges for the BBC Master
Twin **£8**; Quad **£12**

16K DISC RAM

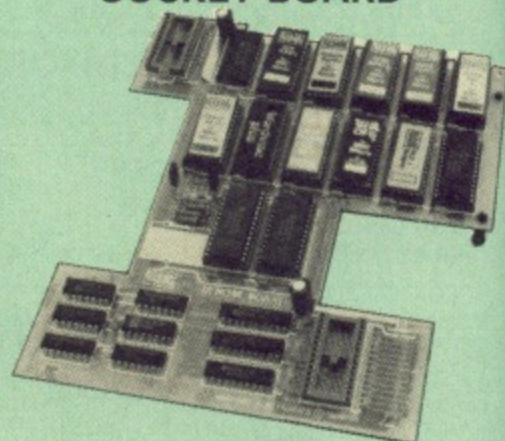
Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector. Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- Supplied complete with Battery Backup.
- 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.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£35** (carr £2)

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

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.

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:

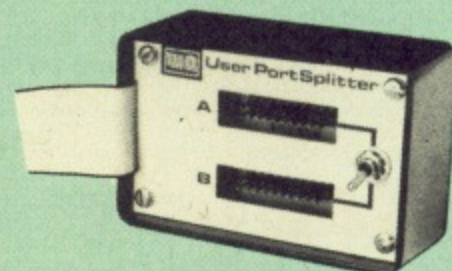
- Increase your BBCs capacity for ROMs from 4 to 16.
- No soldering required.
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish" allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: **Only £32**
Battery backup fitted **£36**
Battery Backup only **£3**
(carriage £2)

● Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: **£8**

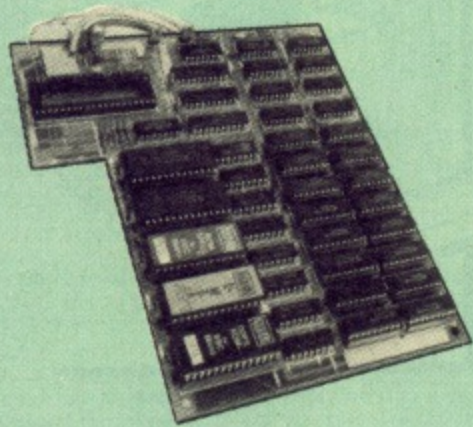
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£22** (carr £2)

ROM/RAM CARD



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+ or Master).
- 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.
- Accepts any 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-SPELL, 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, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM£48
- ROM/RAM card with 64k dynamic RAM£65
- ROM/RAM card with a massive 128k dynamic RAM£109
(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit£17
- 16k Dynamic RAM for Upgrade£17.50
- Battery backup£3
- Read and Write protect switches£2 each
- Complete ROM-RAM board
All options installed£115

P.S.

Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £5 less

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, 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 TELE-SOFTWARE 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 Registration to MicroLink.

SPECIAL OFFER

Price: **£82**
(carr £3)



(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

REPLICA 3

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The NEW Modem from Watford

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- 80 column terminal with split screen facility.
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The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution - Buy a Watford APOLLO!

Only: **£82** (Carr £3)

Price includes, the Modem, Comm Software
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We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every **WORDWISE PLUS** package bought from us.

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The most comprehensive
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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.
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- Epson printer codes function key option.
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- BBC B, B+ and Master compatible.

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EPSON NLQ ROM



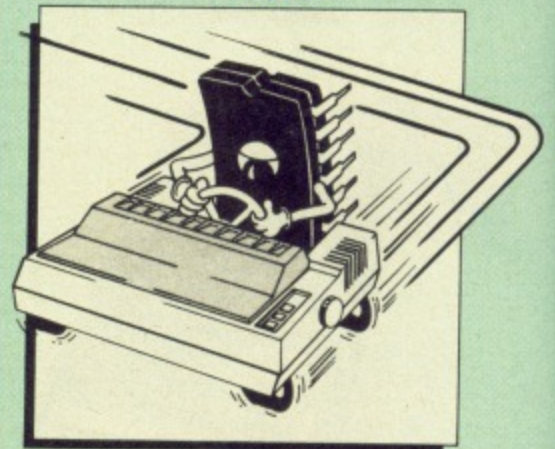
Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM £7

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

ROM-SPELL



Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

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

Price still only: £25

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 full Mode 7 graphics. Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

The Micro User Feb. 1985.

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro ... it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:

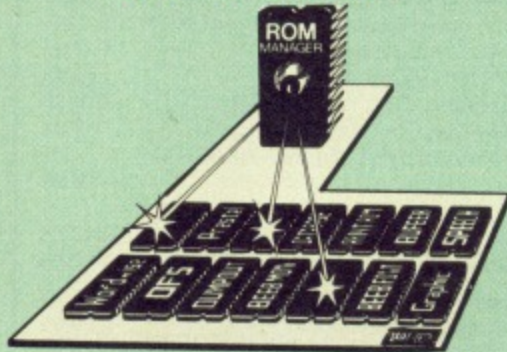
GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1081/82, Mannesman Tally and compatibles.

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ROM MANAGER

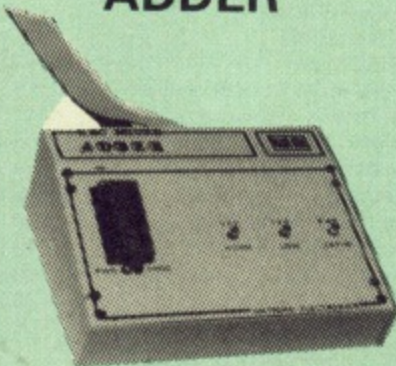


Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.

"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

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Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.

The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.

The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

- Two ultra fast programming algorithms or standard slow algorithm.
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- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
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- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

£75 (£3 Carr)

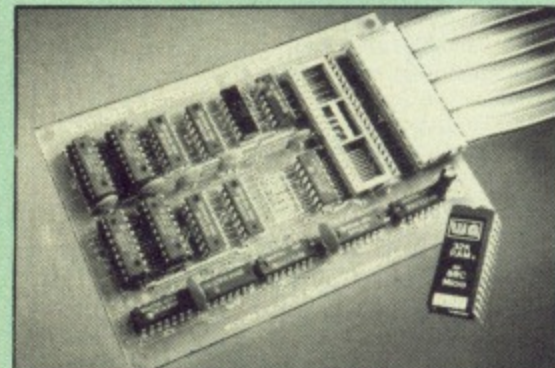
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EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by 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)**
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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 Plus 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.

- 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.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89 (carr £2)**

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NEW

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It features information about:

- Memory Organisation
- Slow data bus
- Detailed circuit description
- Keyboard controller
- Screen display
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- Serial Processor
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- Machine operating System
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- Disc Filing Systems
- ANFS
- Terminal Emulator & Editor
- View internal format
- Detailed differences between Model B, B+, Master 128K and Compact
- Comprehensive appendix on 65C12 instruction set

At the rear of the manual there are pull out circuit diagrams for the Master 128K. A worth-while addition to any Master owner's library.

All this for just £19 (NO VAT)

THE COMPLETE BBC COMPUTER USER HANDBOOK

"Why has no-one written a book like this before? It's long overdue".

If you own a BBC-B, BBC B+, Electron, Master 128, Master Compact or Archimedes then this book is for you. It shows you how to get the most from your computer, and how to make the computer work for you. Although some sections are machine specific, most of the information, programs, hints and good solid experience are for the whole range of BBC machines. The general style and level means that both beginner and expert will feel satisfied with the quality and quantity of the material.

GENERAL - Uses and abuses of computers.

HARDWARE - How to design your own work station. Hardware additions (disc drives, ROMs, printers, 2nd processors, etc). DIY alterations.

HARDWARE RUNNING BBC-BASIC - All BBC machines are described with their differences. Compatibility between the various BBC machines. Networks. The Archimedes and its advantages.

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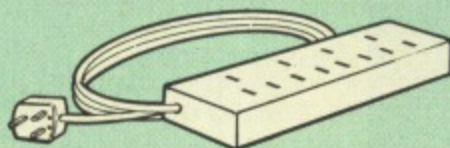
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B B+ III Table



The Mad Hatter offers solutions to your adventure problems

Logical thinking

Hobbit Mountain Maze			
07	Dragon's Desolation	N D	08 03
08	Dale Valley	N S NW	09 07 10
09	Front gate	S W N	08 10 24
10	Ravenhill	N SE E	11 07 09
11	Empty place	S NW W	10 12 13
12	Empty place	S N E	11 15 16
13	Empty place	E D SE	14 17 11
14	Empty place	S NW W	18 19 13
15	Empty place	N SW W	Repeat 12 17
16	Empty place	W NW NE	12 18 20
17	Empty place	U NE D	13 20 15

LOGICAL maps have certain advantages over pictorial ones in adventure games, and the particular one I want to illustrate here, from *The Hobbit*, has to do with the way adventure writers try to confuse you by pretending you've moved when you haven't. I've never been able to think of an adequate pictorial representation of this but the comment *Repeat* on a logical map is something I find perfectly acceptable.

So look at the one on this page before I tell you how to finish off Smaug, who is rather annoyed that you have pinched some of his jealously guarded treasure. Readers of the book will guess that it's meant to be the Arkenstone.

I am going to leave you to find your way to the side door in the mountain, but you should notice that a move counter is at work in this part of the game. After a certain number of moves a keyhole appears in there and at this point you *must* have Thorin with you. You tell him UNLOCK DOOR and then the correct input is GO THROUGH DOOR and off you trot a-burgling.

If you take too long locating the side door, you'll find that the keyhole has vanished. I would recommend that you save at the Dragon's Desolation then map the area carefully. Once you have explored it and found the door go back to the saved position, take the shortest route and wait for the keyhole to appear.

One last point concerning the map: The descriptions given are the shortened ones which appear when you visit the location for the second – and any subsequent – time.

Now for **Smaug**: After taking the treasure move

Hatter's Helpline

Aaron Haynes has trouble with the dragon in **Twin Kingdom Valley**. The wooden staff is the answer. The long-promised full treatment of this adventure will begin in the New Year.

Once again the resourceful Barbara Gibb has come to the aid of a reader, this time Jonathan Lee in trouble in **Ten Little Indians**. The silver figurine is in the utensil store beyond various rooms from the green bathroom. However, Barbara warns he *must* open the passage to the back stairs first – the suit of armour is a help here.

She also notes that the black figurine is hidden in the river mud; make sure you don't carry too much or linger too long here. Finally, it isn't actually necessary to open the gates: From the

country road you ENTER GATEHOUSE, go UP to the tower and then, provided you have the rope, you can get down to the gravel drive.

May I again remind readers that I cannot answer individual letters unless they have included a stamped self-addressed envelope. Complaints via a second letter to the editor will not make the slightest difference – it's cheaper to include the sae the first time. Overseas readers should remember that the International Reply Coupon system serves the same purpose. If you don't do either of those things, you'll eventually get an answer to your problems in this column – that is more or less guaranteed – but don't hold your breath while waiting.

UP, which puts you High up on the Lonely Mountain. From there move SW, SE, D, S and E to Lake Town. Here you have something of a choice. My colleague Pendragon of *Electron User* actually **carried** Bard. If you try this, don't have too much else about your person and make sure you eat some lunch.

Asking Bard to move in a particular direction also works most of the time, but the prime objective is to get Bard with his bow and arrow to the Dragon's Desolation. Here you must DROP BARD – if you're carrying him – and the treasure for safety's sake, and say to Bard N, N AND SHOOT DRAGON. Then if you wear the ring and toddle along after him, you should be just in time to give Smaug the last rites.

On the way home, don't forget to pick up the treasure and make your way to Running River. From there you must proceed as follows: S, S, WEAR RING, W, WAIT, WAIT, W, WAIT, WEAR RING, W, N, W, SW – thus thwarting the Pale Bulbous Eyes. After that you should realise where you are and how to get home.

Provided you have got the golden key from the Misty Mountains and you remember to deposit the treasure in the chest at Bag End I believe that you will have obtained top marks.



Deeper into the Dungeon

Shake, Rattle and Roll was a hit record in my extreme youth – and a little shaking is what we have to cure in this section of **Dungeon Adventure**. The funny thing is that my predecessor on this column, a shrinking little violet yclept Alice, was so flummoxed by this problem that she got her pretty little self all in a tizzy.

Stuart Booth and I showed you how to obtain the sword by stopping the rolling stone in last month's issue of *The Micro User*. From there move NE from the Junction in the U-shaped passages and you will find yourself in a tall cavern with openings all around.

Here lurks a carnivorous jelly. Unless you have the solution to this particular problem, you'll get very little further – with ease, at any rate – in *Dungeon Adventure* even though you have worked out what the teleport system involves.

Remember that poor old corpse? Dump it here to occupy the Jelly's attention and nine directions are placed immediately at your service. Stuart

and I now part company concerning the order in which things are done – so I am going to follow his directions for the most part, unless I say otherwise.

From the Jelly Cavern move SE to get the hammer from the deserted tool room and then return. After that, go W, W, W, and W to the neat panelled room. Here, go S into the cupboard and take the stick and rub the blue collar. Leaving the cupboard, go W from the neat panelled room and S past the vampire. Provided you are carrying either the cross or the crucifix, you'll have no trouble with this haemodeficient creature.

Here you'll find the lower chamber and the skeletons. Wave the staff and the wand and then drop them – you'll need them later. Return E enough to confront the vampire and this time throw the cross at it, which will utterly destroy the bloodless thing once and for all, but after that pick up the cross again.

More next month.

Trading in Elite

Before I begin to deal with the second mission in **Elite**, you might like to ponder the following use of tactics. On completing the first mission at Orrarra in Galaxy Two, I looked for my favourite planetary configuration – a poor agricultural feudal system near a rich industrial corporate state or democracy. The search via the long range chart revealed Biabete, the feudal one, and Vezaees. So I quickly made my way there, trading as I went.

What I do is this: Buy a full load of computers at

Vezaees then do a straightforward trading run to Biabete, destroying any attacking ships I encounter on the way. Once there, I stock up with a maximum of 20 tons of furs and go bounty hunting outside the safe area of Biabete.

With only 20 tons in your hold, you can scoop up another 15 tons of cargo from the ships you destroy before needing to leave the system. If the

Turn to Page 110 ►

Problem Corner

Gollum is in trouble with two games, neither of which I have solutions to. In *Valley of the Kings*, by MP Software, how does he get out of the first pyramid and into the second?

In CDS's *Castle Blackstar*, how does he use the broomstick and get at the vase behind the grating in the forest – and where is the orb?

ADVENTURING

◀ From Page 109

furs you are carrying are destroyed in combat, at least you will have kept the financial loss to something more or less acceptable.

Attacks can be relatively few to begin with, so keep using the jump button to trigger the arrival of other ships. Take every opportunity to blast asteroids, since they count towards your score, but do keep a good look out for innocent traders. These innocents normally appear in the same way that asteroids do, suddenly registering on your radar screen at maximum laser range. Avoid them at all costs unless you enjoy having Fugitive status. I find it a bore needing to destroy all those police Vipers – and it has a considerable effect by delaying your return to squeaky-clean innocence.

An innocent ship will usually be a Python or Cobra MkIII, but occasionally a Fer de Lance turns out to be innocent too. As a rule of thumb I'd recommend the following: If a ship appears and then attempts to flee when you try to head for it, let it go. It's innocent and is frantically running for the planet you have recently left, so if you fly in the opposite direction your condition will very soon revert from yellow to green.

The moment my ship is damaged when I am in the Biabete system, I start to think of heading for Vezaees. I hit the hyperspace button at once if I lose my fuel scoops, otherwise I might stay until I have lost two items of equipment. On the other

hand, if I suffer damage in the trading journey towards Biabete I think seriously about cancelling the bounty hunt and making instead a pure trading run back to Vezaees.

The overall aim is straightforward enough – maximise your score while trading profitably and do everything you can to minimise your losses. As each *Right on Commander* accolade approaches the pressure increases and you may need to exercise judicious use of the energy bomb option so as not to waste time. Don't be greedy when bounty hunting – 30 or 40 kills are quite enough before hyperspacing to Vezaees.

Deadly status is awarded after you have achieved a total of eight *Right on Commander* messages; at the time of writing my own total is 16, which means the second mission is not too far away.

I have to report – and I'm intensely frustrated on your behalf – my BBC B power supply needs attention, so until it is fixed I can't proceed further. How do I know? Well, I used my borrowed Master-plus-Second Processor equipment to see what happened. Result: I am Elite for the umpteenth time, but the second mission was not triggered – there has to be a crucial status flag involved here.

Fortunately, I did save my position before I needed to use the new hardware configuration, so be patient, persevere and until next month, happy adventuring.

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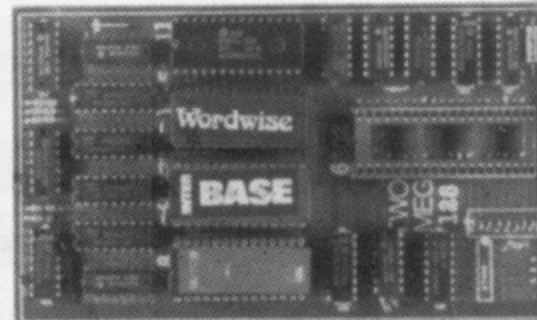
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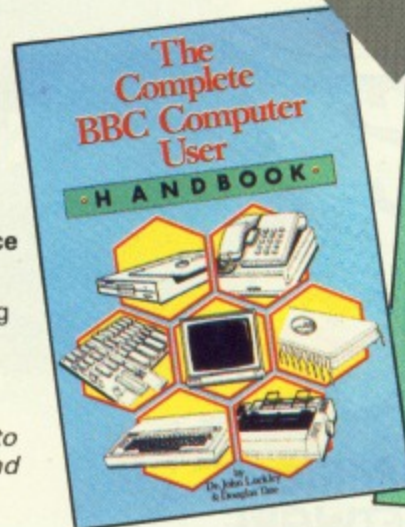
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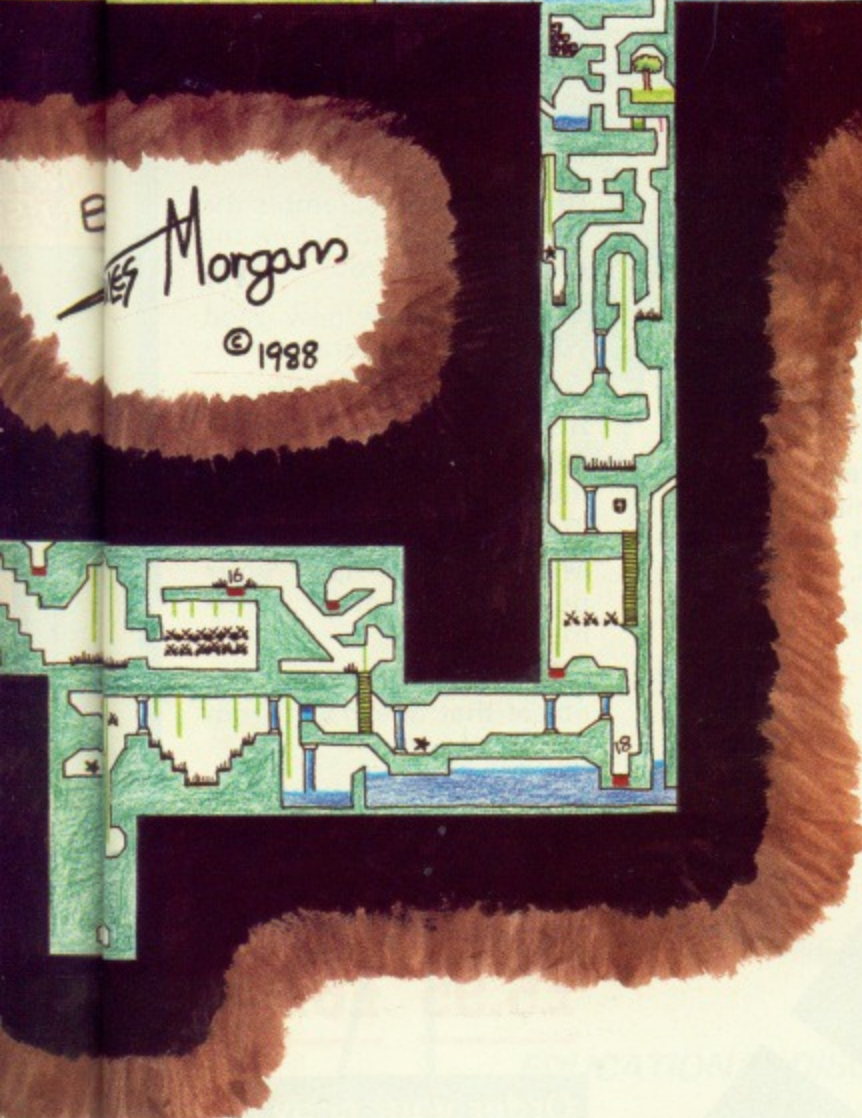
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
Lots of people have asked for help with Palace of Magic from Superior Software. So here's the complete map of the game, plus the key to all the objects you can use. And if you use the cheat programs in the Hac-man column on Page 86 you have all the keys needed to solve it.



E
Morgans
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PALACE OF MAGIC KEY


★ Top hats (energy)

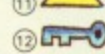
- ① Transporter pad. Press the spacebar and you're home!
- ② Place object 18 on the pad, and the raindrop will do the rest
- ③ Place object 7 here 



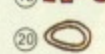
Place object 14 here to get through the wall



Imp: Give him object 11, and he will give you a sword. You then have exactly one and a half minutes to obtain the boot (Object 15). The sword allows you to kill 



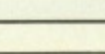
Allows you to jump twice as high



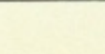
○ Extinguish the firepit with object 18 full of raindrops from the west tower



○ Give the guardian object 20



○ Give the vicar object 5



○ Give this guardian object 22

○ Give the evil princess object 17

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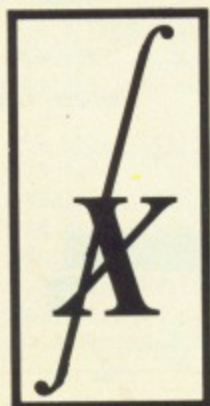
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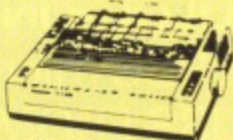
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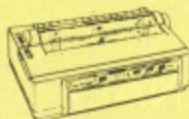
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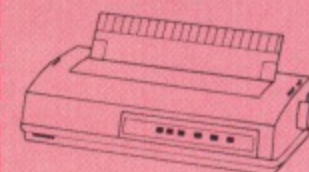
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PRINTERS

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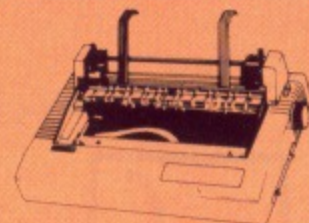
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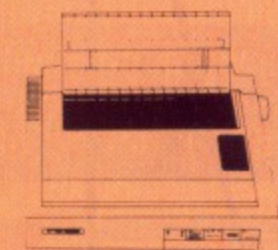
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PRINTERS

SPACE ESCAPE

Can you recover the blueprints in Ali Harwood's fast action adventure?

SUPREME command has given you – drone unit Z19 – the perilous mission of recovering and returning the stolen blueprints of Earth's defence system. They are in the form of eight files – shown on the screen as BP – and previous agents who failed have reported back that they are scattered all over a far off space complex. As you start your mission you are teleported into the complex and on your travels you will find keys which in turn open padlocks.

You can then explore further, but watch out for the deadly space flies which will kill you upon impact. Fortunately, as you are an extremely advanced drone you have three life systems, and a new one turns on automatically when you are killed.

Like any good drone you lap up all the oil you can get, but keep away from the spikes – they create havoc with your paint job. Transporters are a welcome sight – they give your feet a rest and show you a brand new piece of the complex. Even

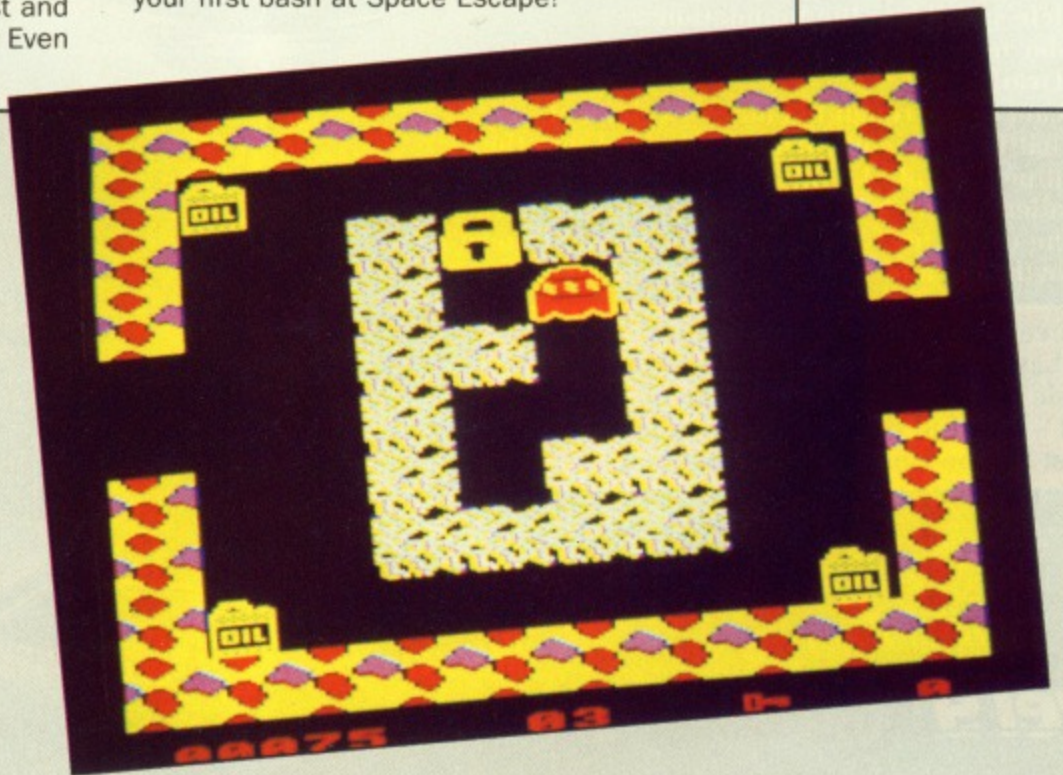
more so if it is the homing transporter which will send you back to Earth.

The listing should be typed in and checked for typing errors using Get it right! It is vital that you save the program before running as some initialisation lines are deleted when it is run – using the method described in the February 1988 Letters. Before loading the game you must set Page to &2000 by typing:

PAGE=&2000

The keys you use are displayed on the title page and if you're lucky enough you may even hit the big time and get your first score on to the high score table. That's not too difficult because the bottom score is zero – but it sounds quite flashy.

So it's time to give your typing fingers a rest, get your adrenalin in gear and hit the spacebar for your first bash at Space Escape!



```

10 GOTO1780
20 REM SPACE ESCAPE
30 REM By Ali Harwood
40 REM (c) The Micro User
50 REM -----
60 MODE$=VDU23,1,0;0;0;0;
70 HIMEM=HIMEM-&1000
80 PROCinit
90 REPEAT
100 PROCtitle
110 PROCgame
120 UNTIL0
130 DEFPROCinit
140 *fx4,2
150 *fx15
160 *fx229,1
170 FORA=0TO&D00STEP4:A!HIMEM=A!&1250:
NEXT
180 DIMscore(7),name$(7),xalien%(9),ya
lien%(9),line%20
190 FORA=0TO7:READname$(A),score(A):NE
XT
200 map%=&1250:sprite%=&900
210 ENDPROC
220 DATAAli Harwood,2700,Ravin' mad,20
00,Pal !!,1750,Thanks to,1500,Terry Blun
t,1250,His routine,1000,From Feb 88,500,
Is used,0
230 DEFPROCdouble(dx,dy,dm$)
240 VDU31,dx,dy:FORd=1TOLENDm$:?&70=AS
CMID$(dm$,d,1):A%=&A:X%=&70:Y%=&0:CALL&FF
F1
250 VDU23,159,?&71,?&71,?&72,?&72,?&73
,?&73,?&74,?&74,159,10,8,23,159,?&75,?&7
5,?&76,?&76,?&77,?&77,?&78,?&78,159,11
260 NEXT:ENDPROC
270 DEFPROCtitle
280 FORA=1TO3:VDU19,A,0;0;:NEXT:CLS:CO
LOUR2:PROCdouble(4,3,"SPACE ESCAPE"):COL
OUR1:PRINTTAB(3,7)"By Ali Harwood"TAB(3,

```

```

10)"(c) Micro User":COLOUR3
290 PRINTTAB(0,15)"Z/X'SPC7"left/right
""*/?'SPC10"up/down""RETURN'SPC9"pause
""ESCAPE'SPC10"quit""S/D'SPCS"sound on
/off"
300 COLOUR1:PRINTTAB(4,30)"Press SPAC
E":VDU19,1,2;0;19,2,3;0;19,3,6;0;:*fx15
310 IFINKEY400=32CLS:ENDPROC
320 CLS:FORA=1TO3:VDU19,A,0;0;:NEXT:PR
OCdouble(4,3,"High Scores"):PRINT""
330 FORA=1TO8:COLOUR1:PRINT";A;". ";:C
OLOUR2:PRINTname$(A-1);:COLOUR3:PRINTTAB
(20-LENSTR$score(A-1));score(A-1):NEXT
340 COLOUR1:VDU19,1,2;0;19,2,3;0;19,3,
6;0;:*fx15
350 IFINKEY400:GOTO280

```

```

360 DEFPROCgame
370 PROCsetup
380 REPEAT
390 IFdisplay%PROCdisplay
400 IFandroid%PROCandroid
410 PROCstatus
420 PROCkeys
430 IFalien%PROCmovealiens
440 IFhome%PROCchome
450 UNTILdeath%
460 PROChighscore
470 ENDPROC
480 DEFPROCsetup

```

Turn to Page 119 ▶

Lancelot

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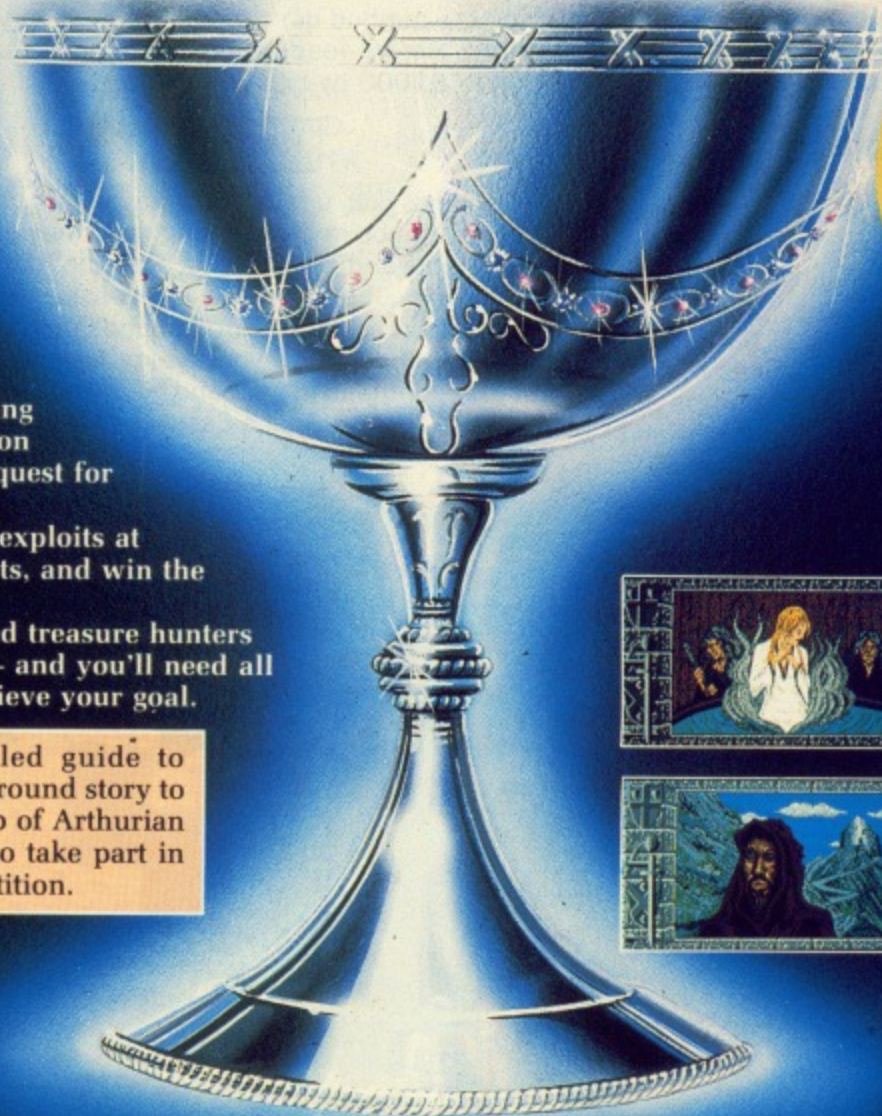
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Screen shots from Atari ST version



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◀ From Page 117

```

490 FORA=0T0&D00STEP4:A!&1250=A!HMEM:
NEXT
500 xpos%=12:ypos%=120:xpos0%=12:ypos0
%=120:xand%=3:yand%=5:prints%=0:mappos%=
0:death%=0:display%=1:android%=0:score%=
0:lives%=3:key%=0:home%=0
510 ENDPROC
520 DEFPROCdisplay
530 alien%=0:FORA=1T03:VDU19,A,0;0;:NE
XT:CLS:display%=0:FORx=0T09:FORy=0T09:AX
=? (map%+mappos%+y+x*10)-65:IFA%=-19G0T05
60
540 X%=x*4:Y%=y*24:IFA%=1xalien%(alien
%)=x:yalien%(alien%)=y:alien%=alien%+1
550 CALLSprite%
560 NEXT,:X%=xpos%:Y%=ypos%:AX=0:CALLS
prite%:VDU19,1,1;0;19,2,3;0;19,3,5;0;
570 ENDPROC
580 DEFPROCstatus
590 COLOUR1:VDU31,14,31:IFkey%VDU129EL
SEVDU32
600 PRINTTAB(1,31)STRING$(5-LENSTR$scor
e%,"0");score%TAB(9,31)STRING$(2-LENSTR
$lives%,"0");lives%TAB(18,31);prints%;
610 ENDPROC
620 DEFPROCkeys
630 IFINKEY-82:*fx210
640 IFINKEY-51:*fx210,1
650 IFINKEY-113death%=1:ENDPROC
660 IFINKEY-73PROCup:ENDPROC
670 IFINKEY-105PROCdown:ENDPROC
680 IFINKEY-98PROCleft:ENDPROC
690 IFINKEY-67PROCright:ENDPROC
700 IFINKEY-74PROCpause
710 no%=no%+1:IFno%>100:energy%=energy
%+1:no%=0
720 ENDPROC
730 DEFPROCpause
740 CLS:PRINTTAB(0,5)"SCORE:""LIVES:
""BLUE""PRINTS:""COLOUR2:PRINTTAB(8,
5)STRING$(5-LENSTR$score%,"0");score%TAB
(8,7)STRING$(2-LENSTR$lives%,"0");lives%
TAB(8,11)prints%
750 COLOUR3:PRINTTAB(0,20)"Press SPACE
"
760 REPEATIFINKEY-2ANDINKEY-66ANDINKEY
-87ANDINKEY-38lives%=99:COLOUR2:PRINTTAB
(8,7)"99"
770 UNTILINKEY-99:CLS:display%=1
780 ENDPROC
790 DEFPROCleft
800 IFxand%=0ANDyand%<>4ANDyand%<>5END
PROC
810 IF(yand%=40Ryand%=5)ANDxand%=0PROC
leftnew:ENDPROC
820 IFFNcheck(-1,0):ENDPROC
830 xand%=xand%-1:xpos%=xpos%-4:andro
id%=1
840 ENDPROC
850 DEFPROCright
860 IFxand%=9ANDyand%<>4ANDyand%<>5END
PROC
870 IF(yand%=40Ryand%=5)ANDxand%=9PROC
rightnew:ENDPROC
880 IFFNcheck(1,0):ENDPROC
890 xand%=xand%+1:xpos%=xpos%+4:andro
id%=1
900 ENDPROC
910 DEFPROCup
920 IFyand%=0ANDxand%<>4ANDxand%<>5END
PROC
930 IF(xand%=40Rxand%=5)ANDyand%=0PROC
upnew:ENDPROC
940 IFFNcheck(0,-1):ENDPROC
950 yand%=yand%-1:ypos%=ypos%-24:andro

```

```

id%=1
960 ENDPROC
970 DEFPROCdown
980 IFyand%=9ANDxand%<>4ANDxand%<>5END
PROC
990 IF(xand%=40Rxand%=5)ANDyand%=9PROC
downnew:ENDPROC
1000 IFFNcheck(0,1):ENDPROC
1010 yand%=yand%+1:ypos%=ypos%+24:andro
id%=1
1020 ENDPROC
1030 DEFPROCandroid
1040 android%=0:X%=xpos0%:Y%=ypos0%:AX=
0:CALLSprite%:X%=xpos%:Y%=ypos%:CALLSpri
te%:xpos0%=xpos%:ypos0%=ypos%
1050 ENDPROC
1060 DEFPROCdelete(dx,dy)
1070 X%=dx*4:Y%=dy*24:AX=? (map%+mappos%
+dy+dx*10)-65:IFA%=-19ENDPROC
1080 CALLSprite%:(map%+mappos%+dy+dx*1
0)=46
1090 ENDPROC
1100 DEFFNcheck(x,y)
1110 x=x+xand%:y=y+yand%:AS=CHR$(map%+
mappos%+y+x*10)
1120 IFA%="C"=1
1130 IFA%="D"=1
1140 IFA%="E"=FNspikes
1150 IFA%="F"=FNkey
1160 IFA%="G"=FNpadlock
1170 IFA%="I"=FNoil
1180 IFA%="J"=FNtransporter
1190 IFA%="K"=FNprints
1200 =0
1210 DEFFNspikes:PROClooselife:=1
1220 DEFFNkey:IFkey%=1
1230 PROCdelete(x,y):score%=score%+5:F
ORS=-10T00:SOUND1,S,30,1:NEXT:key%=1:=0
1240 DEFFNpadlock:IFkey%=0:=1
1250 PROCdelete(x,y):score%=score%+15:F
ORS=-10T00:SOUND1,S,100,1:NEXT:key%=0:=0
1260 DEFFNoil:PROCdelete(x,y):score%=sc
ore%+10:FORS=-15T0-10:SOUND1,S,100,1:NEX
T:=0
1270 PROCdelete(x,y):score%=score%+10:F
ORS=-15T0-10:SOUND1,S,100,1:NEXT
1280 DEFFNtransporter:PROCdelete(x,y)
1290 IFmappos%=100mappos%=200:xand%=4:y
and%=6:xpos%=16:xpos0%=16:ypos%=144:ypos
0%=144
1300 IFmappos%=400mappos%=500:xand%=4:y
and%=6:xpos%=16:xpos0%=16:ypos%=144:ypos
0%=144
1310 IFmappos%=2300mappos%=2700:xand%=4
:yand%=4:xpos%=16:xpos0%=16:ypos%=96:ypo
s0%=96
1320 IFmappos%=2500home%=1
1330 score%=score%+20:display%=1:FORS=-
15T00:SOUND1,S,255-(15-S)*5,1:NEXT:=1
1340 DEFFNprints:FORS=-15T0-10:SOUND1,S
,100-S*2,1:NEXT:score%=score%+100:prints
%=prints%+1:PROCdelete(x,y):=0
1350 FORS=-15T0-10:SOUND1,S,100-S*2,1:N
EXT:score%=score%+100:prints%=prints%+1:
PROCdelete(x,y)
1360 DEFPROCrightnew
1370 xpos%=0:xpos0%=0:xand%=0:display%=
1:mappos%=mappos%+100
1380 ENDPROC
1390 DEFPROCleftnew
1400 xpos%=36:xpos0%=36:xand%=9:display
%=1:mappos%=mappos%-100
1410 ENDPROC
1420 DEFPROCdownnew
1430 ypos%=0:ypos0%=0:yand%=0:display%=
1:mappos%=mappos%+600
1440 ENDPROC

```

```

1450 DEFPROCupnew
1460 ypos%=216:ypos0%=216:yand%=9:displ
ay%=1:mappos%=mappos%-600
1470 ENDPROC
1480 DEFPROClooselife
1490 lives%=lives%-1:IFlives%<0death%=1
1500 SOUND0,-15,4,3:SOUND0,-10,4,6:FORd
elay=0T03000:NEXT
1510 ENDPROC
1520 DEFPROCmovealiens
1530 FORA=0T0alien%-1:X%=xalien%(A)*4:Y
%=yalien%(A)*24:AX=1:CALLSprite%:IFyalie
n%(A)=0PROCnotup:GOTO1570
1540 X%=xalien%(A)*4:Y%=yalien%(A)*24
1550 IFyalien%(A)<9ANDRND(2)=1yalien%(A
)=yalien%(A)+1:GOTO1570
1560 yalien%(A)=yalien%(A)-1
1570 X%=xalien%(A)*4:Y%=yalien%(A)*24:AX
=1:CALLSprite%:IFxalien%(A)=xand%ANDyali
en%(A)=yand%PROClooselife
1580 NEXT
1590 ENDPROC
1600 DEFPROCnotup
1610 IFxalien%(A)=9xalien%(A)=0ELSExali
en%(A)=xalien%(A)+1
1620 yalien%(A)=9
1630 ENDPROC
1640 DEFPROChome
1650 CLS:COLOUR3:IFprints%<6PRINTTAB(0,
10)"YOU ENTERED THE""HOME TRANSPORTER
""WITHOUT GATHERING""ALL THE BLUE PRI
NTS"
1660 IFprints%=6PRINTTAB(0,10)"... SPAC
E ESCAPE ...""... IS COMPLETED ...""
'SPC2'CONGRATULATIONS'SPC1'YOU HAVE CO
MPLETED'SPC3'YOUR MISSION"
1670 *fx15
1680 death%=2:IFINKEY600
1690 ENDPROC
1700 DEFPROChighscore
1710 IFscore(7)>score%ENDPROC
1720 B=7:FORA=6T00STEP-1:IFscore(A)<scor
e%B=A
1730 NEXT:FORA=6T00STEP-1:score(A+1)=s
core(A):name$(A+1)=name$(A):NEXT:score(B
)=score%:name$(B)=""pos%=B:CLS:FORA=1T0
3:VDU19,A,0;0;:NEXT:PROCdouble(0,3,"Cong
ratulations"):PRINT"
1740 FORA=1T08:COLOUR1:PRINT";A;". ";:C
OLOUR2:PRINTname$(A-1);:COLOUR3:PRINTTAB
(20-LENSTR$score(A-1));score(A-1):NEXT
1750 VDU31,2,8+pos%*3,ASC">","19,1,2;0;1
9,2,3;0;19,3,6;0;23,1,1;0;0;0;:*fx15
1760 ?&70=Line%MOD256:?&71=Line%DIV256:
?&72=12:?&73=0:?&74=255:X%=&70:Y%=0:AX=0
:CALL&FFF1:name$(pos%)=$line%:VDU23,1,0;
0;0;0;
1770 ENDPROC
1780 IFPAGE<>&2000PRINT""Type PAGE=&2
000 before loading"CHR$7:END
1790 PRINT""Please wait.";
1800 PROCdata
1810 PROCcode
1820 VDU23,129,224,160,191,163,224,
0,0
1830 !(PAGE+4)=&F4:RESTORE1780:I%=2+!&1
C AND&FFF:REPEATI%=I%-1:UNTILI%?-1=&0D:
?I%=&FF:!!&12=I%+1:RUN
1840 DEFPROCdata
1850 RESTORE2460
1860 A=&E00:REPEATdone%=0:READB$:SA=FNd
ecode0(B$):A=A+LENQ$:UNTILdone%
1870 A=&1250:REPEATREADB$:SA=FNdecode(B
$):A=A+LENQ$:UNTILB$="done"
1880 ENDPROC

```

Turn to Page 121 ▶

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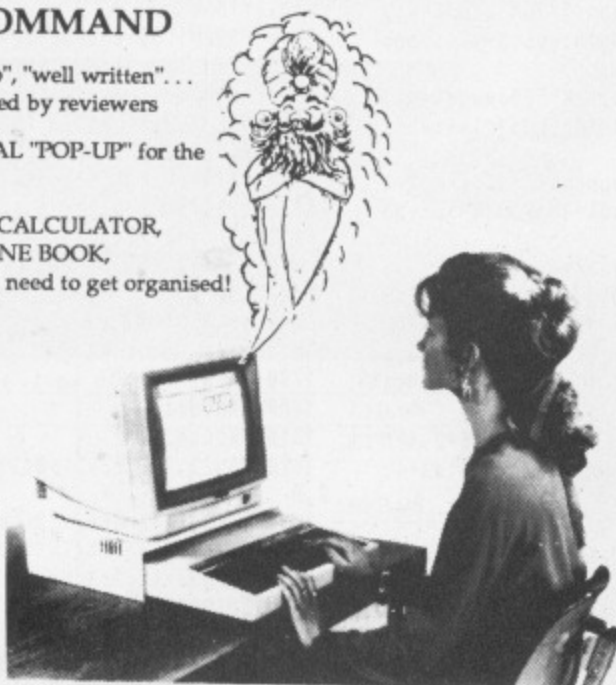
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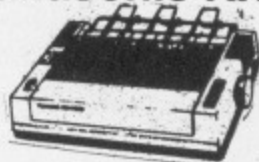
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```

1890 DEFFNdecode(D$)
1900 QS="":FORQ=1TOLENDS:WS=MIDS(D$,Q,1
):W=VALMIDS(D$,Q+1,1):IFW>1ANDW<10QS=QS+
STRINGS(W-1,WS):Q=Q+1
1910 QS=QS+WS:NEXT
1920 =QS
1930 DEFFNdecode0(D$)
1940 QS="":FORQ=1TOLENDS:WS=MIDS(D$,Q,1
):Q=Q+1:IFWS=""GOTO1980
1950 IFWS="*done%=1:GOTO1970
1960 WS=WS+MIDS(D$,Q,1):QS=QS+CHRSEVAL(
"&"+WS)
1970 NEXT:=QS
1980 WS=CHRSEVAL("&"+MIDS(D$,Q,2)):Q=Q+
2:R=0:FORE=0T03:IFMIDS(D$,Q+E,1)=""R=E:
E=3
1990 NEXT:W=VALMIDS(D$,Q,R):Q=Q+R:QS=QS
+STRINGS(W,WS):GOTO1970
2000 DEFFNxtable320:FORA=0T031:?PX=A*32
0MOD256:PX=PX+1:NEXT:=pass
2010 DEFFNytable320:FORA=0T031:?PX=A*32
0DIV256:PX=PX+1:NEXT:=pass
2020 DEFFNxsprite:FORA=0T011:?PX=(A*96+
&E00)MOD256:PX=PX+1:NEXT:=pass
2030 DEFFNysprite:FORA=0T011:?PX=(A*96+
&E00)DIV256:PX=PX+1:NEXT:=pass
2040 DEFPROCcode
2050 addr=88E:xlen=88D
2060 ylen=88C:sprv=88A
2070 temp=888:stor=886
2080 FORpass=0T02STEP2
2090 PX=8900
2100 [OPTpass
2110 .sprite PHA
2120 LDA#0:STAsstor+1
2130 TYA:AND#7:STAsstor
2140 TYA:LSRA:LSRA:LSRA:TAY
2150 TXA:ASLA:ROLstor+1:ASLA
2160 ROLstor+1:ASLA:ROLstor+1
2170 ADCstor:ADCxtable320,Y:STAsstor
2180 LDA#858:ADCstor+1:ADCxtable320,Y:S
TAaddr+1
2190 PLA:TAX
2200 LDA#4:STAxlen
2210 LDA#24:STAxlen
2220 LDAsprite,X:STAsprv
2230 LDAsprite,X:STAsprv+1
2240 LDAaddr:AND#F8:STAtemp:STAsstor
2250 LDAaddr+1:STAtemp+1
2260 .loop1 LDxlen:.loop2 LDY#0
2270 .loop3 LDA(sprv),Y
2280 .eorpos
2290 EOR(addr),Y:STAsstor,Y
2300 INY:CPY#8:BNEloop3
2310 CLC:LDAaddr:ADC#64:STAsstor
2320 LDAaddr+1:ADC#1:STAsstor+1
2330 CLC:LDAsprv:ADC#8:STAsprv
2340 LDAsprv+1:ADC#0:STAsprv+1
2350 TXA:SEC:SBC#8:TAX:BNEloop2
2360 CLC:LDAtemp:ADC#8:STAtemp:STAsstor
2370 LDAtemp+1:ADC#0:STAtemp+1:STAsstor+
1
2380 LDAsprv:CMP#0:BEQjump1
2390 DECxlen:BNEloop1
2400 .jump1 RTS
2410 .xsprite OPT FNxsprite
2420 .ysprite OPT FNysprite
2430 .xtable320 OPT FNxtable320
2440 .ytable320 OPT FNytable320
2450 JNEXT:ENDPROC
2460 DATA0000031010212143524392858687*
877*9660000030C30F0F07080F1E871E870F00*0
F6*874330*002*03C0F0F0E010F1E871E870F00
*0F6*1E2CC0*003*00

```

```

2470 DATA808048482C2CA41C92161E*1E7*966
000*002*020100000106080009060001030200*0
010*010A060009030703010800010A02010200*0
05*0808090604
2480 DATA0401080C080102010402040308*009
*0A0408*003*0E*002*080406*002*08*004*C1C
1E0E0F0F070B8DCDCECCA860E0*F07*E0C10F*0
F3*0690F0
2490 DATAF0F080070F*0F3*07*832*C1E0F010
0E0F38*382*70*F03*E0*012*512838381C*1C2*
383870*F03*70*F04*906677*FF4*33D1E0*F010
*ECF2B1D8F4
2500 DATAF572F2F9F4*722*F4F99080F8F772*
723*7330F473B1*D82*B172E4C8C4F4FFF9B1F8F
6ECF2733131B1*D82*00*802*F8FBF472313172E
4F4F7F4E4727231*B12*F2ECC8C80050F5F6E8C8
8080B07372E4D8FDF67372*E43*E4
2510 DATAF47331*002*6030001040201080700
0102000*0010*90*502*A020B0*702*F07090D09
09010*108*A0405090A0*902*E0D0C0A0D06030*
006*00
2520 DATA00*006*C00020C000E000C000*0029
*0110011001000112211221122112211221
2530 DATA1221122152255AA548800CA55A8008
A55A8008A44A800880088008804884AA5522152
A54A*0026*10*304*30
2540 DATA303070*7012*3000F0*F02*C0*804*
F0*F03*C0*802*C0*C04*E0*F02*00*F03*30*10
4*F0*F03*70*302*70*704*F0
2550 DATAF0F0000080*C07*E0*E012*C0*003*
010316343C*789*3C34160301*005*0F*F04*C38
6C3
2560 DATAF0*F02*C386C3*F04*0F*005*0C86C
2C2860C00080C840C08000C86*C22*860C00*002
6*00
2570 DATA00*102*30307060506070*402*50*5
04*4040706070*003*F0F0B010F0A050A0F0*002
*D0*503*D0*002*F0A0F0*005*80B0F0A050A0F0
*002*40*403*60*002*F0A0F0*004*00
2580 DATA000080*8016*683C96C3E170302161
*E12*2020E1E161213070E1C3963C686121E1F04
B96*782*F0*872*E1*E14*6978964BF0E1216168
4878F02D96E1
2590 DATAE1F01E1E78*784*69E1962DF078486
861C3963C78E0C04868*782*4B4B78786848C0E0
783C96C361*005*3060C0*C02*E0B0808090*906
*C07000*005*F0*004*00
2600 DATAF0*002*E0*102*E0*102*E000F0*00
6*F0*005*F0*002*70*402*70*403*00F000*005
*C06030*302*70D01010D0*502*D0*104*E0*002
*FE+
2610 DATAC9CCFC.5ICC.C.C3.C3.C3C.CC.C
C.C.C3C.C.C.C.C.C.C.C.C.CC.CC.CC.CC.CC
.C4C4.C6.6ICCC.6CC.IC.5CC..IC.4CC.C.I

```

```

C..ICC.C..IC..CC..C..ICJCC.KC.3IC6..C4
2620 DATAC4..C51.6ICC.8CC.D6.CC.G.D..D.
CC.D.3DD.CC.D6.CC.8CC1.6IC5..C4D4..D5.6I
D3.D.3ID.DD.D6.DD.3ID.3DD.ID..ID.DD.D6.D
DID.3ID.D3.7D5..D4
2630 DATAC4..C5FCC.5CC.CG.5CCI.EC.4CC.I
.CG.4CI.I.EC.3C.I.I.CG3..I.I.IC3J..I.I.
FC9CCD9DD1.4IIDDDID5.IDD.5D..DD.EEKE.4D.
3E.5D.E.3D..DDID5.ID3I.4IID9DD
2640 DATAC9CCFG.4IC4.7C9.C.3CD3C.5CD3C.
.C.C6.CC.8C3.5IC9C3E9EE.IE.E.3E3.E.4GEE.
3E..E.EE.E.3EE..E.E.EEFE..E.E.IE.E.EE.KE
E..E.EE.6E.E9EE
2650 DATAD9DDE.6IDD.E.6DD..E.5DD.9D.4E.
4D.5E..DD.6E.DDB.6ED5..D4D4..D6FD..D5FG.
5D4.6D4.D4.3DD.D4.3DD.6D3FG.5D4ID..D8..D
4
2660 DATAD4..D5B.5CIDD.5CI.DD.IC..CI.D.
6I.ID.6I.IDD..IC.CI.DD.5CI.DD.6CID9DDC9C
C.3E.4CC.E.E.E..CC.E.E.E..C..E.E.E.5E.E.
E.3C.E.E.E..CC.E.E.E..CC.E.3E..C9CC
2670 DATAE9EE.8EEC4..B.EECB.6E.C4.B..E.
5C4EE.B..C..CEE.3BC4EE.7BE5..E4D4..D5.8D
D.DI..ID.DD.DDIID.D..ID4I.5IDD1.3DD.6D3
IDD..DDIDD.8D9DD
2680 DATAC9CCFC.4CFC6G.6GCC.3DGD..C.4GF
G.7DGD.3C.8CCG.6GCCFC.4CFC5..C4E4..E7.4E
5IE.4E3.3IEIE.E.IE.9.IEIEIE.IE.6E3.5FE5
IE..E7..E4
2690 DATAE4..E5.8EEIEI..IEIEIEIE..IEIEE
.IE..E1.EE.IE..E1.EEIEFEKEIEIEIE.4EIEE.8
E9EEC9C9C9C4.4B.9.6C9C9C9C9C4
2700 DATAE9EE.8EE.3CCGC.EE..C3FC.EE..C3
IC..E..G13C..E..C4..EE.8EE.8E5..E4D4..D6
I.4IIDDDI.4IDD.I.DI..B.D.3ID1.3D.4ID1..D
D.4IDI.DDI.4IDBDDII.6D9DD
2710 DATAC9CC.7KCC.D..D.3CC.ID.ID..C.3I
D.ID.C.4ID.3CC.4ID..CC.5ID.CC.8C5..C4C4.
.C5.5G.ICC.4C.IICC.3C.II.C.3C.II.FC..C.I
I.FFC3.II.F3CC.II.F4CCII.F4.C9CC
2720 DATAD9D9D4I7D3ID56D3ID.6DDIDB.5DDI
D..D6ID..D6FG..D8..D4E4..E5.8EE.5IE.EEIE
IE.4E.9.4IEIEIE.E..IE.4EEIE.3IE.EE.8E5JE
5
2730 DATAD9DD..GF5DD..GF5DD..GF5D.3GF5D
.3GF5DD..GF5DD..GF5DD..GF5D9DDC5JC7..G.C
7..C5.C.4C.CC.8CC.8CC.C.4C.C5..C7.4C7..C
4
2740 DATA.3E..E.7E.E.6E..E.5E..E4..E..E
E.3EE..E.3E.EE.E..EE..EE.3EE..E..E.EE..E
.4EE..E.3.E3..E3.E3.4E5.6E4.6E4.6E4.6E4.
6E4.6E5.4E3.E8.
2750 DATAC9CCC.F.F.F.CC.C.F.F.FCCI.C.F.
F.C..I.C.F.F.C3I.G.F.CC.3I.C.FCCI.3I.C.C
C.I.3I.C6..C4D4..D6.7DD.D..D.B.DDB.D..D.
.D.4D..D.D.5DB.D3.D.3D..DD.BD.3D.DD..KD.
3BD9DD,done

```



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10 = 57D1 1	160 = 704 5	310 = 47C4 D	460 = CC68 9	610 = ED0F 4	740 = 17C2 E
20 = 0 1	170 = BF0B D	320 = 50F8 6	470 = ED0F 6	620 = 5A41 7	750 = 34FC 6
30 = 0 1	180 = 65B4 4	330 = A633 C	480 = 2AA8 F	630 = C78B 7	760 = AFDC 4
40 = 0 1	190 = 3745 D	340 = 3B56 C	490 = 48A3 5	640 = 5096 3	770 = FDEB 9
50 = 0 1	200 = C308 2	350 = 9F14 4	500 = 1FE7 6	650 = 994D 0	780 = ED0F 6
60 = E8B6 A	210 = ED0F 3	360 = 74F3 E	510 = ED0F D	660 = 270A 7	790 = 68C 8
70 = D82D 4	220 = A38B 5	370 = 81CC 5	520 = C225 0	670 = 80EF F	800 = 6113 C
80 = DEBB 2	230 = BD90 F	380 = BFBA 8	530 = AD21 8	680 = 4019 5	810 = F3E4 9
90 = BFBA 8	240 = 76D2 C	390 = B884 F	540 = 4E41 C	690 = 4D8B D	820 = E62C 1
100 = 5255 2	250 = 9D6 9	400 = 430B 3	550 = D821 E	700 = 7A93 6	830 = 4527 E
110 = 9E04 B	260 = E531 0	410 = C271 C	560 = A6A5 7	710 = AD 9	840 = ED0F A
120 = 53CE 8	270 = F931 6	420 = B0B6 0	570 = ED0F F	720 = ED0F 5	850 = E053 9
130 = 344C 3	280 = CA6C 2	430 = 7491 B	580 = A2F0 0	730 = D189 F	860 = E919 8
140 = EC1A C	290 = 8000 C	440 = 1916 3	590 = 8372 8		
150 = 11AA F	300 = F944 C	450 = 7B4A F	600 = ACCB 2		

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870 = E488 1	1160 = D318 A	1480 = 4923 F	1800 = FCB7 1	2120 = AA54 9	2440 = 2EAE D
880 = D625 8	1170 = A9E8 E	1490 = 2F90 C	1810 = F56C 9	2130 = 2DAA 5	2450 = A98C 2
890 = B518 0	1180 = 7ECF 8	1500 = 8FB8 7	1820 = A08F 1	2140 = 8EE1 5	2460 = 2B71 F
900 = ED0F 4	1190 = E5F8 3	1510 = ED0F 2	1830 = 6783 3	2150 = 7E29 B	2470 = 3802 0
910 = 958C B	1200 = 459A 4	1520 = AAB4 C	1840 = 1640 D	2160 = 37F5 5	2480 = B19 1
920 = D660 E	1210 = C689 9	1530 = B6BC F	1850 = 2ACB 6	2170 = 31B1 9	2490 = E995 6
930 = AAC1 0	1220 = 5BBC B	1540 = 31E1 2	1860 = 75F4 A	2180 = 72A3 E	2500 = 56A6 F
940 = B37F D	1230 = 2D41 E	1550 = F499 5	1870 = BAB7 8	2190 = 1311 8	2510 = 6854 D
950 = BF94 9	1240 = 71DA 3	1560 = 38B0 D	1880 = ED0F 3	2200 = 80B2 A	2520 = B04B 2
960 = ED0F 2	1250 = 9A52 7	1570 = AD53 5	1890 = 5D61 F	2210 = 7B43 E	2530 = 649A B
970 = A9FD 2	1260 = 3AD6 B	1580 = 2C83 0	1900 = FC87 C	2220 = 82FE A	2540 = 853 D
980 = 5E6A 0	1270 = 390B 6	1590 = ED0F A	1910 = 9FBB 3	2230 = 515A 2	2550 = 7137 0
990 = 29A 6	1280 = 1A7F 8	1600 = 6723 9	1920 = DE9C A	2240 = 82ED 2	2560 = 769B 7
1000 = E531 3	1290 = AFFC 8	1610 = 844D B	1930 = A2B3 0	2250 = 4783 6	2570 = AEF6 F
1010 = 6F8B 2	1300 = 561A B	1620 = D0D3 D	1940 = 30F8 5	2260 = D8E1 8	2580 = A810 8
1020 = ED0F A	1310 = 52D3 D	1630 = ED0F 7	1950 = EB9D 7	2270 = 3990 8	2590 = 4085 5
1030 = EE40 6	1320 = 8AFC 3	1640 = BB1C C	1960 = DD10 0	2280 = 1EB7 F	2600 = 448 E
1040 = 1F43 0	1330 = C6BE C	1650 = 7CE0 C	1970 = 80A8 7	2290 = 1E7C 6	2610 = 1EE8 0
1050 = ED0F 3	1340 = F183 C	1660 = A699 2	1980 = A40C B	2300 = E79C 2	2620 = CD42 6
1060 = D9D2 6	1350 = 50F7 8	1670 = 11AA 3	1990 = DF72 1	2310 = E323 1	2630 = 4B3A 2
1070 = C344 2	1360 = 8118 1	1680 = A223 0	2000 = D496 C	2320 = 4DE3 1	2640 = 1612 F
1080 = F2D6 9	1370 = C221 C	1690 = ED0F D	2010 = 7212 4	2330 = A665 A	2650 = D094 1
1090 = ED0F E	1380 = ED0F 9	1700 = 7FAA C	2020 = F2EF 7	2340 = 78AA 9	2660 = 431A 9
1100 = 70B 5	1390 = F4FD 8	1710 = 96A9 7	2030 = DDFA 6	2350 = DB41 5	2670 = 85D5 3
1110 = A336 5	1400 = 892E 3	1720 = 2711 8	2040 = 1F9B F	2360 = 57BA 2	2680 = 9C9 2
1120 = 8DAA F	1410 = ED0F D	1730 = EC71 5	2050 = 77B0 1	2370 = C6AB 1	2690 = B594 1
1130 = DC87 B	1420 = 3C55 9	1740 = A633 9	2060 = C5F6 C	2380 = E471 E	2700 = 1B58 E
1140 = 8DDD B	1430 = 4BFD 1	1750 = 50AB 4	2070 = 9FE1 4	2390 = 400A 2	2710 = D24A 3
1150 = F838 6	1440 = ED0F 5	1760 = 483 1	2080 = C134 1	2400 = FAC8 5	2720 = CDE8 B
	1450 = B7F9 4	1770 = ED0F F	2090 = C92F C	2410 = A2D4 8	2730 = D6DA 9
	1460 = 5E74 A	1780 = 4E5C D	2100 = 5BBE 2	2420 = 2F06 0	2740 = 59DD C
	1470 = ED0F 9	1790 = 1AD6 0	2110 = 575F 8	2430 = F28E B	2750 = 699D 7

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FEATURE

◀ From Page 65

```

670 ENVELOPE 1,128,-4,0,0,10,0,0,80,0,
0,-1,126,126
680 ENVELOPE 2,1,5,-8,0,4,5,7,126,0,0,
-1,126,126
690 ENDPROC
700 DATA "top left ","top right ","bot
tom right ","bottom left ","top middle "
,"middle right ","bottom middle ","middl
e left ","central "
710 DEF PROCdrawscreen
720 FOR Y%=0 TO 1023 STEP 8
730 MOVE ld%-dg% DIV 2,Y%
740 PLOT 21,1279,Y%
750 MOVE ld%-dg% DIV 2+4,Y%+4
760 PLOT 21,1279,Y%+4
770 NEXT
780 GCOL 0,1
790 FOR C%=0 TO 8
800 PROCcirc(dx%(C%),dy%(C%),128)
810 NEXT
820 GCOL 0,2
830 FOR B%=0 TO 3
840 PROCcirc(bx%(B%),by%(B%),64)
850 NEXT
860 GCOL 4,0
870 PRINT TAB(17,0) "RUBIK'S CLOCK"
880 VDU 28,0,31,7,0,30
890 ENDPROC
900 DEF PROCstart

```

```

910 PROCvert("Hold the puzzle with eit
her face up in front of you.")
920 ENDPROC
930 DEF PROCsolve_central
940 IF FNask_dial(8) THEN PROCsolve_ce
ntral_2
950 PROCsolved(8)
960 ENDPROC
970 DEF PROCsolve_central_2
980 PROCsolving(8)
990 PROCcall_up
1000 PROCturn(0)
1010 PROCvert("Set all buttons up, then
turn the "+d$(0)+"dial until the "+d$(8)
)+"dial points to 12.")
1020 PROCwait
1030 PROCcall_up
1040 PROCturn(0)
1050 PROCsolving(8)
1060 ENDPROC
1070 DEF PROCcall_up
1080 FOR B%=0 TO 3
1090 PROCset_but(B%,TRUE)
1100 NEXT
1110 ENDPROC
1120 DEF PROCsolve_middle(D%)
1130 IF FNask_dial(D%) THEN PROCsolve_m
iddle_2(D%)
1140 PROCsolved(D%)
1150 ENDPROC
1160 DEF PROCsolve_middle_2(D%)

```

```

1170 PROCsolving(D%)
1180 PROCset_middle_buttons(D%)
1190 PROCset_but(D%,TRUE)
1200 PROCturn(D%+3)
1210 PROCvert("Set buttons as shown, th
en turn the "+d$((D%+3) MOD 4)+"dial unt
il the "+d$(D%)+"dial points to 12.")
1220 PROCwait
1230 PROCturn(D%+3)
1240 PROCvert("Change the "+d$(D% MOD 4)
)+"button to be down.")
1250 PROCset_but(D%,TRUE)
1260 PROCset_but(D%,FALSE)
1270 PROCwait
1280 PROCturn(D%+3)
1290 PROCvert("Now turn the "+d$((D%+3)
MOD 4)+"dial until the "+d$(8)+"dial po
ints to 12.")
1300 PROCwait
1310 PROCset_middle_buttons(D%)
1320 PROCset_but(D%,FALSE)
1330 PROCturn(D%+3)
1340 PROCsolving(D%)
1350 ENDPROC
1360 DEF PROCset_middle_buttons(B%)
1370 PROCset_but(B%+3,TRUE)
1380 PROCset_but(B%+1,FALSE)
1390 PROCset_but(B%+2,FALSE)
1400 ENDPROC
1410 DEF PROCsolve_edge(D%)
1420 IF FNask_dial(D%) THEN PROCsolve_e

```

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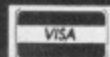
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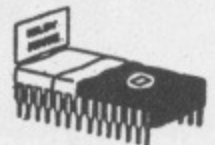
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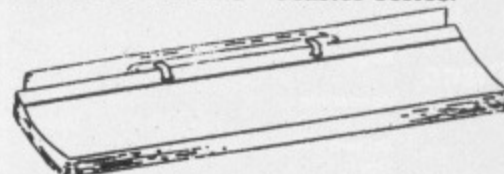
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```

dge_2(D%)
1430 PROCsolved(D%)
1440 ENDPROC
1450 DEF PROCsolve_edge_2(D%)
1460 PROCsolving(D%)
1470 PROCset_edge_buttons(D%)
1480 PROCset_but(D%,TRUE)
1490 PROCturn(D%+3)
1500 PROCvert("Set the buttons as shown
then turn the "+d$((D%+3) MOD 4)+"dial
until the "+d$(D%)+dial points to 12."
)
1510 PROCwait
1520 PROCturn(D%+3)
1530 PROCvert("Change the "+d$(D%)+but
ton to be down.")
1540 PROCset_but(D%,TRUE)
1550 PROCset_but(D%,FALSE)
1560 PROCwait
1570 PROCturn(D%+3)
1580 PROCvert("Now turn the "+d$((D%+3)
MOD 4)+"dial until the "+d$(8)+"dial po
ints to 12.")
1590 PROCwait
1600 PROCset_edge_buttons(D%)
1610 PROCset_but(D%,FALSE)
1620 PROCturn(D%+3)
1630 PROCsolving(D%)
1640 ENDPROC
1650 DEF PROCset_edge_buttons(B%)
1660 PROCset_but(B%+1,TRUE)
1670 PROCset_but(B%+2,TRUE)
1680 PROCset_but(B%+3,TRUE)
1690 ENDPROC
1700 DEF PROCdone
1710 PROCvert("You have now solved Rubi
k's Clock!")
1720 SOUND 1,2,100,30
1730 ENDPROC
1740 DEF PROCturn_over
1750 PROCvert("Now turn the puzzle over
to the other side.")
1760 ENDPROC
1770 DEF PROCcok(D%)
1780 MOVE dx%(D%)-64,dy%(D%)+16
1790 VDU 5
1800 PRINT "OK ?"
1810 VDU 4
1820 ENDPROC
1830 DEF PROCsolving(D%)
1840 MOVE dx%(D%)-112,dy%(D%)+16
1850 VDU 5
1860 PRINT "SOLVING"
1870 VDU 4
1880 ENDPROC
1890 DEF PROCsolved(D%)
1900 MOVE dx%(D%)-16,dy%(D%)+112
1910 VDU 5,224,10,8,225,10,8,225,10,8,8
,8
1920 PRINT "SOLVED"
1930 VDU 4
1940 ENDPROC
1950 DEF PROCturn(D%)
1960 MOVE dx%(D% MOD 4)-64,dy%(D% MOD 4
)-50
1970 VDU 5
1980 PRINT "TURN"
1990 VDU 4
2000 ENDPROC
2010 DEF PROCset_but(B%,up%)
2020 MOVE bx%(B% MOD 4)-64,by%(B% MOD 4
)+16
2030 VDU 5
2040 IF up% PRINT " UP " ELSE PRINT "DO
WN"
2050 VDU 4

```

```

2060 ENDPROC
2070 DEF PROCvert(T%)
2080 PX=INSTR(T%, " ")
2090 REPEAT
2100 PRINT LEFTS(T%, PX-1)
2110 T%=RIGHTS(T%, LEN(T%) - PX)
2120 PX=INSTR(T%, " ")
2130 UNTIL PX=0
2140 PRINT T%
2150 ENDPROC
2160 DEF PROCcirc(X%,Y%,R%)
2170 FOR S%=-R% TO R% STEP 4

```

This is one of hundreds of programs available FREE for downloading on **MicroLink**. In addition to these many BBC Micro programs in the MicroLink library will also run on the Electron.

```

2180 Z%=SQR(R%*R%-S%*S%)
2190 MOVE X%+S%,Y%+Z%
2200 DRAW X%+S%,Y%-Z%
2210 NEXT
2220 ENDPROC
2230 DEF PROCwait
2240 PRINT
2250 PROCvert("Any key to cont...")
2260 SOUND 1,1,150,1
2270 *FX 21 0
2280 GX=GET
2290 CLS

```

```

2300 ENDPROC
2310 DEF FNask_dial(D%)
2320 *FX 21 0
2330 AX=152
2340 XX=0
2350 PROCvert("Is the "+d$(D%)+dial at
12?")
2360 SOUND 1,1,250,1
2370 REPEAT
2380 REPEAT
2390 PROCcok(D%)
2400 PROCdelay
2410 PROCcok(D%)
2420 PROCdelay
2430 UNTIL (USR(&FFF4) AND &01000000)=0
2440 GS=GETS
2450 UNTIL INSTR("YyNn",GS) <> 0
2460 CLS
2470 IF INSTR("Yy",GS)=0 THEN =TRUE ELS
E =FALSE
2480 DEF PROCdelay
2490 NX=TIME
2500 REPEAT UNTIL TIME-NX>10
2510 ENDPROC

```



10 = 0 0	430 = 27EB A	850 = 2C83 8	1270 = 4B77 4	1690 = ED0F A	2110 = EEDB 4
20 = 0 0	440 = 4DF5 C	860 = AD7A 4	1280 = 3A85 5	1700 = D5E6 5	2120 = 9168 6
30 = 0 0	450 = 930B 2	870 = 6F49 8	1290 = 1F04 B	1710 = E060 C	2130 = 8ADC A
40 = 7054 4	460 = 3F45 7	880 = DB8A 4	1300 = 4B77 3	1720 = 1DD3 7	2140 = C9A2 0
50 = DEBB 7	470 = F961 E	890 = ED0F 5	1310 = 80EB F	1730 = ED0F 1	2150 = ED0F 4
60 = 9418 C	480 = 1040 0	900 = 9328 0	1320 = 3E82 E	1740 = D317 3	2160 = BCAB D
70 = 9D5F A	490 = A5C2 9	910 = 4BE2 D	1330 = 3A85 C	1750 = B91E 2	2170 = 7768 2
80 = 4B77 0	500 = E1CF F	920 = ED0F A	1340 = 8D1A F	1760 = ED0F 9	2180 = D029 C
90 = F9AE A	510 = C095 A	930 = FA9A D	1350 = ED0F A	1770 = 8935 2	2190 = B679 0
100 = 2CD5 4	520 = B77E C	940 = E4EB 3	1360 = 56BE 5	1780 = 2625 E	2200 = F0A0 4
110 = 4B77 0	530 = 1E92 B	950 = A16E 9	1370 = 6D10 4	1790 = EC10 4	2210 = 2C83 1
120 = A16E 8	540 = 8141 C	960 = ED0F F	1380 = 6CC0 0	1800 = 49BF 6	2220 = ED0F 2
130 = F9AE 9	550 = B9B8 3	970 = D669 0	1390 = F71C D	1810 = FC31 0	2230 = D51B 5
140 = CA90 0	560 = FA20 0	980 = FA9E 7	1400 = ED0F C	1820 = ED0F 5	2240 = FF3E 4
150 = CDB9 A	570 = 341B C	990 = 2A10 3	1410 = 78AF 0	1830 = 77EB 7	2250 = 5958 4
160 = 2C83 8	580 = C5F3 3	1000 = BC25 5	1420 = 12F9 1	1840 = B525 8	2260 = CCBE 8
170 = 2CD5 B	590 = 1B0D 2	1010 = 458C C	1430 = 9684 1	1850 = EC10 D	2270 = E01E 9
180 = 4B77 B	600 = C686 F	1020 = 4B77 B	1440 = ED0F 6	1860 = 548B 8	2280 = C401 B
190 = CA90 B	610 = 560F C	1030 = 2A10 E	1450 = 34CF 4	1870 = FC31 E	2290 = 7A16 7
200 = 815 0	620 = FD7E 2	1040 = BC25 0	1460 = 8D1A 5	1880 = ED0F A	2300 = ED0F 9
210 = 2C83 2	630 = 2C83 2	1050 = FA9E 8	1470 = D48B F	1890 = 4A74 3	2310 = D8D9 6
220 = CA90 2	640 = C711 5	1060 = ED0F F	1480 = D23A 2	1900 = 14E2 D	2320 = E01E B
230 = CDB9 4	650 = 3377 6	1070 = BCDE C	1490 = 3A85 A	1910 = E361 6	2330 = FD8 5
240 = 2C83 5	660 = 5100 F	1080 = DADD E	1500 = 2364 D	1920 = 6150 D	2340 = D854 1
250 = 1DC8 6	670 = B266 9	1090 = 1FBF 1	1510 = 4B77 4	1930 = FC31 3	2350 = 8A9D 9
260 = 4BFC C	680 = AD1 1	1100 = 2C83 B	1520 = 3A85 7	1940 = ED0F 5	2360 = 226C 3
270 = 2C83 7	690 = ED0F E	1110 = ED0F F	1530 = 79BE 9	1950 = 3D76 1	2370 = BFBA 9
280 = 4B8A F	700 = 2DB7 0	1120 = C329 7	1540 = D23A C	1960 = 660B 1	2380 = BFBA F
290 = FD2E 0	710 = 48E8 5	1130 = FDA3 F	1550 = 3E82 6	1970 = EC10 A	2390 = 1FFB A
300 = 40D7 1	720 = 18AD 3	1140 = 9684 2	1560 = 4B77 1	1980 = 95E7 E	2400 = 561E 5
310 = 8844 2	730 = 642D 2	1150 = ED0F 0	1570 = 3A85 4	1990 = FC31 3	2410 = 1FFB C
320 = EC08 7	740 = 4047 7	1160 = 776 8	1580 = 1F04 7	2000 = ED0F D	2420 = 561E F
330 = BA62 A	750 = F237 2	1170 = 8D1A 3	1590 = 4B77 2	2010 = 166C 4	2430 = 8D0A 8
340 = A8DF F	760 = 9924 A	1180 = 80EB 0	1600 = D48B C	2020 = 8FFE 0	2440 = 506B 2
350 = 6D83 9	770 = 2C83 B	1190 = D23A 8	1610 = 3E82 6	2030 = EC10 8	2450 = 911F 0
360 = 4021 C	780 = 619B 5	1200 = 3A85 8	1620 = 3A85 0	2040 = 440E 7	2460 = 7A16 3
370 = 9EDF F	790 = 2C68 2	1210 = 246A 9	1630 = 8D1A 6	2050 = FC31 5	2470 = 6563 5
380 = 4354 7	800 = 6BA1 1	1220 = 4B77 3	1640 = ED0F 6	2060 = ED0F 8	2480 = 5869 3
390 = 9B40 2	810 = 2C83 9	1230 = 3A85 0	1650 = 9784 F	2070 = B70D 6	2490 = 41A1 2
400 = 16E1 7	820 = 51F8 A	1240 = 9BC9 F	1660 = 8078 6	2080 = 9168 E	2500 = 6739 B
410 = A363 2	830 = DADD 1	1250 = D23A 6	1670 = 1BA4 2	2090 = BFBA 0	2510 = ED0F A
420 = 5341 A	840 = 8E24 0	1260 = 3E82 6	1680 = 6D10 A	2100 = 2529 5	

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Colour screen dump needed

I HAVE been trying to dump a screen from software that has no facility within it. I need to do this to help a three-year-old boy who is seriously handicapped physically and unable to speak.

Even so, with the use of paddles through an ADC and specialist software he achieved some wonderful colour screen pictures. If these could be reproduced on his Epson EX800 colour printer they could be used to monitor his progress.

If you could offer any advice or guidance to help me solve this puzzle and help this courageous little lad advance as much as possible, then I could pass this on to his parents to give all fresh heart and renewed confidence for the challenges ahead. — **T.E. Mayell, Sidcup, Kent.**

● Assuming your software will actually save a screen, you can reload it when you want to print the picture. Has any reader got a suitable colour dump for this printer?

Splitting the port

I HAVE a Multiprom Eprom programmer and a mouse which both use the user port. I have to plug and unplug these

items continuously and am afraid of eventual damage to the micro's pins. Can you suggest a way of connecting both at the same time — perhaps by switching one of the user port lines — or alternatively do you have a design for a splitter? — **D.J.L. van den Bergh, Johannesburg, South Africa.**

● Watford Electronics supply user port splitters for £22.

Compact capers

I READ with interest in the August issue your reply to H.D. Smith's request for a software solution to Control+Break to initialise roms.

I have a Master Compact, and use several rom images that require the above treatment to initialise them. So I thought great, I'll try your answer to the problem and include it in my !BOOT file after the loading of the rom images.

This promptly caused what appeared to be a Control+Break, but removed all the rom images at the same time. Any normal star commands

were rejected, and *ROMS revealed a lot of empty space where the images had once been. What you appear to have found with this command is a cold start up command — it wipes out everything. This in itself I have found to be useful as some commercial software does not leave the sideways ram the way it found it.

So how about solving the original problem for rom initialisation: Is the Master Compact in some way different in this respect, or have you or I got it wrong? — **S.L. Uphill, Totton, Hants.**

● The method works perfectly on BBC Micros and Master 128s but on the Compact you don't need to use this dirty method anyway. You can force roms to initialise when you use the *SRLOAD command by adding the parameter I to the end. So you don't need to generate a hard break.

Keep track of functions

I DO quite a bit of programming, and find it useful to know where the functions and procedures are defined within the listing. So I wrote a program that lists the line numbers of all the definitions.

Not satisfied with having to load a long index procedure into each program I write, I compacted the whole thing and put it on to a function key as follows:

```
*K.Ø P=PA.:REP.:N=P?1*256
+P?2:P=P+3:REP.:P=P+1:U.?
P=2210R?P=130RP>TOP:IF?P<
>221U.P>TOP EL.P=P+1:P.RI
." "+STR$(N),5);" ";M.
"FNPROC",ABS(?P=242)*3,2+
ABS(?P=242)*2);:REP.:P=P+
1:VDU?P;:U.?P=13:P.:U.P>T
OP:ØM
```

The routine works by reading

Win a tenner

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through the memory — beginning at PAGE — and recording each line number in the variable N.

It then reads through the line for the DEF token — &DD — and prints everything after it until it reaches a Return — CHR\$13. It stops when it reaches TOP. — **Nicholas Sayers, Canterbury, Kent.**

£10 Prize letter

Pick up a new font

IF YOU have a copy of Zarch for your Archimedes you may have noticed the text font used to display things like scores. If you would like a copy of this font for your own use, this is how you get it:

Type in the FontSave program shown here and store it on a disc.

Insert your Zarch disc.

Kill off the SoundDMA module with *RMKILL SoundDMA.

Type *RUN Zarch

When the error appears change discs, type *MOUNT and run the FontSave program.

Answer the prompts with the following:

Filename: Chars

First character: 48

Last character: 126

After about 1.5 seconds a file containing currently defined text fonts will be

Turn to Page 128 ►

Book bonanza

MY 14-year-old son's school has just started introducing Archimedes A310s to pupils for Information Technology training, so he needs a user friendly book.

The standard reference manuals are too expensive and complicated, so please can you advise some suitable books? We have a BBC B which he uses for games and simple graphics. — **B.A. Brown, Eastleigh, Hants.**

● The problem with recommending books is that people

are very different — what one person finds concise and informative another will find dry and dull. There are so many writing styles from the American gee whizz to the English dry academic it is hard to choose.

You best bet is to go to a good bookshop, have a look at what they have on offer and see which suits you best.

It's also worth looking at The Complete BBC Computer User Handbook from Watford Electronics — it's reviewed on Page 51 of this issue.

◀ From Page 127

saved to your disc. This is the Zarch font and to load it you need only type *PRINT Chars – or whatever you called it.

Note that this is a normal text font and is different from the anti-aliased fonts used on the Welcome disc. These instructions assume the Arthur prompt is being used, not Basic or the Desktop. – J. Horsnell, Manor Park, London.

Setting markers

HERE is a routine for use in a Wordwise Plus segment which will surround the current paragraph with markers. To use it move the cursor to the paragraph to be marked and press Shift and the appropriate function key.

After a short delay markers will appear around the paragraph.

For this routine to work correctly paragraphs must have a blank line between them and should start with a T15 command or similar.

```
AS=GLTS
DELETE MARKERS
.top
REPEAT
CURSOR AT 0
CURSOR UP
AX=ASC(GCTS)
UNTIL AX<65 OR AX>122
AX=ASC(GCTS)
IF AX<65 OR AX>122 THEN G
OTO marker
GOTO top
.marker
CURSOR AT 0
CURSOR UP
FKEY 3
.bottom
REPEAT
CURSOR AT 0
CURSOR DOWN
AX=ASC(GCTS)
UNTIL AX<65 OR AX>122
AX=ASC(GCTS)
IF AX<65 OR AX>122 THEN G
OTO marker2
GOTO bottom
.marker2
CURSOR AT 0
CURSOR UP
FKEY 3
CURSOR TOP
FIND AS
DISPLAY
```

– Robert Smallshire, Cradley Heath, West Midlands.

Econet improvement

REGULAR users of Econet know only too well how inconvenient it is when the micro defaults to DFS when you press Break. A solution lies in the eight option links on the lower right hand corner of the keyboard PCB.

The documentation says that only bits 0 to 5 are used. However when bit 7 is set on a machine with a DNFS the default filing system becomes the NFS.

Bit 7 is the link furthest away from the right hand side of the keyboard.

Before you get the soldering iron out it might be a good idea to check that this works with your version of the DNFS – it has been tested on the 3.60 issue. Type:

```
*FX255 127
```

When you press Break you should find that the network has been selected. This

effect is cancelled by Control+Break but note that with this command the bits are inversed so it would appear that all but bit 7 are set. – Andrew Fletcher, Abergavenny, Gwent.

Elite gets frozen out

I HAVE access to two BBC B's and the only difference between them is that one has an Econet chip fitted.

When I load Elite on the micro without Econet it works fine, but if I try to load it on the other the screen freezes.

Could you please tell me if there is a way of disconnecting Econet without breaking into the micro? – Andie Crossland, Crosby, Merseyside.

● Although there is no way to disable Econet fully, you will probably find that if you

enter:

```
?&224=&A6
```

before loading games they will work. You should use:

```
*EXEC !BOOT
```

to load the games, as Shift+Break would disable the patch.

No luck

DO you have any details on how to implement the *VIEW, *REMOTE and *NOTIFY utilities on the Econet network – Filestore Level III – using Archimedes 310s? I have tried them all, under both the Arthur and the 6502 emulator without success. – John Reddy, Computer Sales Manager, The Educational Company of Ireland, Dublin.

● Sorry, no idea. Can any reader help?

A fraction of the whole

WHEN you're using Wordwise or Mini Office II you sometimes need to print fractions. When you're in Mode 7 pressing the curly brackets and the back slash keys gives the fractions quarter, half and three quarters on the screen.

The following embedded commands added to the start of your word processor file will program Epson compatible printers to print out corresponding symbols. Owing to the small size the detail is restricted but the characters are recognisable. On Mini

Office II use CC in place of OC.

```
OC27,58,0,0,0
OC27,38,0,92,92,139
OC0,1,2,244,8,16,43,80,133,8,1
OC27,38,0,123,123,139
OC0,1,2,244,8,18,36,74,21,2,0
OC27,38,0,125,125,139
OC136,1,170,84,8,18,36,74,21,2,0
OC27,37,1,0
```

– A.S. Day, Leatherhead, Surrey.

Moon Patrol mastered

I'VE typed in Moon Patrol from the October issue and it checks out perfectly with the checksums. But when I run it

on my Master I get Syntax error at line 290. Does this program work on the Master? – J.Gower, London.

● It does work on the Master, but you need to set PAGE=&1900 before running it. The best way to do this – if you're using discs – is to add a line at the start of Patrol:

```
1 IF PAGE<>&1900 THEN
PAGE=&1900:CHAIN"PATROL"
```

Tape users have a choice: You can either always remember to type PAGE=&1900, or have a little program on the tape just before PATROL called MoonPatrol:

```
10 PAGE=&1900
20 CHAIN"PATROL"
```

Then just CHAIN"MoonPatrol" to play the game.

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 letters pages.

Comms international

MY brother, who lives in Italy, has an Amstrad PCW8256 which uses 3in discs and I

have a Master 128 with a 5.25in disc drive. Is there any hardware or software which either one of us could use to enable us to communicate by text on disc? — **H.W. Kennett, Sheerness, Kent.**

● You have both hardware and software problems: Both the disc sizes and formats are different. Although not impossible, it would take a lot of work to sort the situation out. Apart from that there's the time delay while it's in the post.

A better solution is for you both to get modems and communicate electronically using a system like MicroLink.

Saving pictures

I AM puzzled by the Timpaint art program on the Master Welcome disc. I have tried saving pictures, but all it does is bring up the Disc changed error message. I think this is because I need to type:

```
*MOUNT 0
```

to use my own discs. But I must do this before I load my Welcome Disc, so when I load that the effect of the command is erased.

Could you please suggest a way to save the pictures? — **Simon Khoury (age 10), BFPO 39.**

● You should be able to copy the art program to your own disc and save the screens on the same one. That would eliminate the need for disc changing.

Spare page of memory

ACORN has cheated Basic users out of a page of memory and as, far as I know, no one has mentioned it before. I'm referring to the page at &700 which is only used by Basic in immediate mode for editing programs, sending OS calls from the keyboard, and the like.

Once in a running program this is a very useful spare

£10 Prize letter

ON the ATPL Sidewise board the sideways ram is located at position 15 — the highest priority socket. Any language rom image in this position will assume control at switch-on and this can sometimes be a nuisance.

There's a simple modification you can do which will change the priority of the sockets.

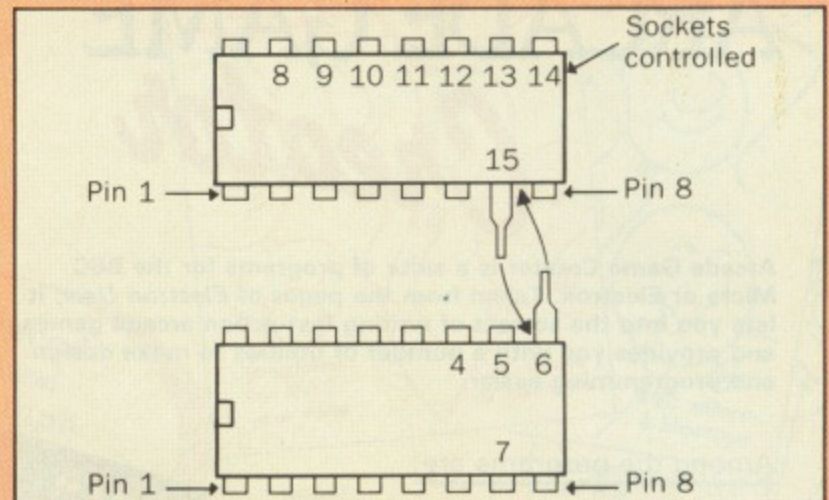
Each output pin of IC1 and IC2 — 74LS138 — selects a socket on the board and only one of these can be selected at a time. Sockets 15a and 15b are treated as one and selected by pin 7 of IC1.

The numbers in the diagram here indicate the socket which each output controls and to change the order or priority is simply a matter of swapping two of these connections.

To swap sockets 15 and 6, for instance, simply lift pin 7 — selects rom 15 — of IC1 and pin 9 — selects rom 6 — of IC2 out of their IC sockets.

Solder a short wire to each pin and insert the opposite end into the IC socket pos-

High priority problem



74LS138 IC modifications on ATPL board. These ics are normally in DIL sockets

ition for the other pin. Ensure that there are no short circuits.

Sockets 15a and 15b now become 6a and 6b while socket 6 changes to 15.

Rom images can still be loaded by:

```
*LOAD <filename> 8000
```

as before. A switch may be connected to the link position S6 to prevent writing to the ram.

In the absence of any other

method, the ram can be cleared by using a file full of &FF from disc. Run the following program:

```
10 FORX=&3000TO&7000STEP4
20 !X=&FFFFFFFF:NEXT
30 *SAVE BLANKS 3000 7000
```

Now the ram may be blanked by typing:

```
*LOAD BLANKS 8000
```

— **Martin Pickering, Sandbach, Cheshire.**

page of memory for assembling short bits of code, indirection string workspace and even high score tables in games.

I've made frequent use of this on programs that run on everything from an Electron to a Master Turbo. If you are very careful and don't use CALL with parameters, you can also use the page at &600.

Finally, if you want to be really naughty you can handle any resident integer — @%-Z% — directly, bearing in mind that the memory location of the four bytes of the integer can be calculated from:

```
&400+(ASC"char"-64)*4
```

where char is the integer you want to use.

This makes for very quick — albeit dirty — parameter passing from Basic to machine code and vice-versa, and is

useful for finding high byte and low byte values much faster than MOD and DIV. — **Terry Blunt, Crowthorne, Berks.**

Vuppy re-visited

I APPRECIATED Peter Harris's article on the Vuppy View printer driver in the September 1988 issue of The Micro User but there's a slight problem that can be easily solved.

My printer is set to auto feed but when I used the driver I found I was getting an extra line feed for every one intended.

Removing the lines LDA#10 and JSR oswrchr from the printer driver program eliminated the extra feeds and the driver now works very well.

While on the subject of

View, readers may be interested to note that other files — including those created on other word processors and spooled Basic listings — can be loaded into View for later editing by using the READ command. — **George McGrattan, Ardrossan, Ayr.**

Finding the quest

IN the October issue of The Micro User there's a review of our adventure the Taroda Scheme. Unfortunately the supplier mentioned, Pres, only provides the Electron version, not the one for the BBC Micro.

To get this version please contact Heyley Software direct on 061-427 5266. — **Hugh Roberts, Heyley Software, 24 Ley Hey Road, Marple, Stockport, SK6 6QP.**

Write your own arcade smashes using the

ARCADE GAME Creator

Arcade Game Creator is a suite of programs for the BBC Micro or Electron. Taken from the pages of *Electron User*, it lets you into the secrets of writing fast-action arcade games, and provides you with a number of utilities to make design and programming easier.

Among the programs are:

- A Mode 5 sprite editor for designing your own multi-coloured characters.
- A selection of fast print routines that will move sprites both in front or behind other objects on the screen.
- Map generators that will squeeze a Mode 5 screen into 8 bytes!
- Scrolling maps.
- Score update and printing routines.
- ... and much, much more.

To accompany the Arcade Game Creator we are also making available the six back issues of *Electron User* (February to July 1988) in which the series appeared. Clearly written without any jargon, they take you step-by-step from the basics of game design, right up to producing fully-fledged programs.

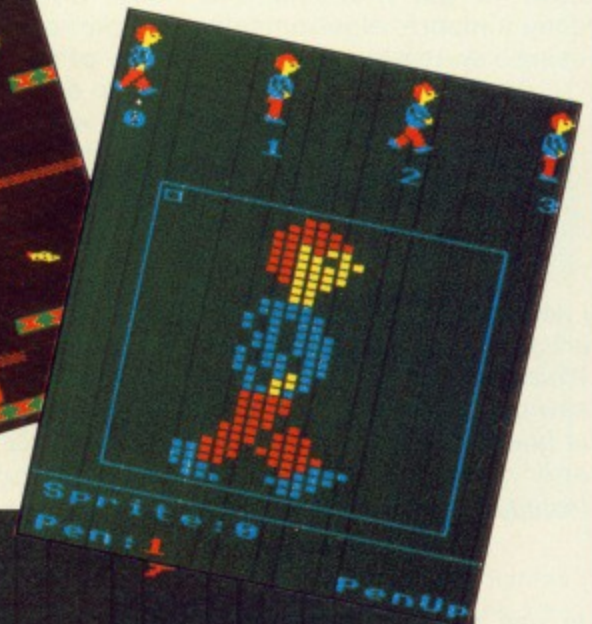
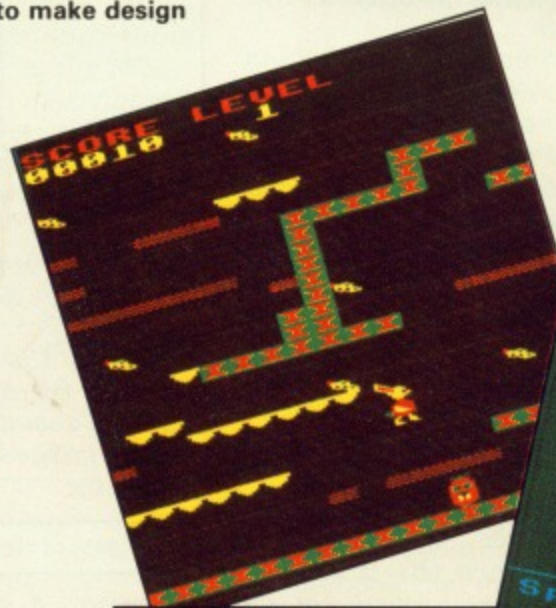
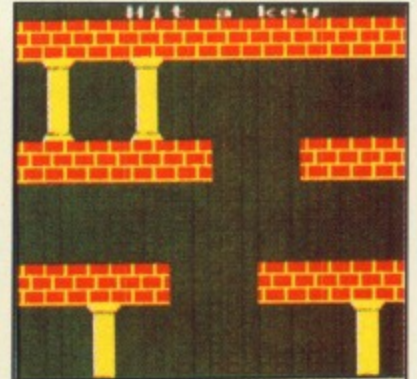
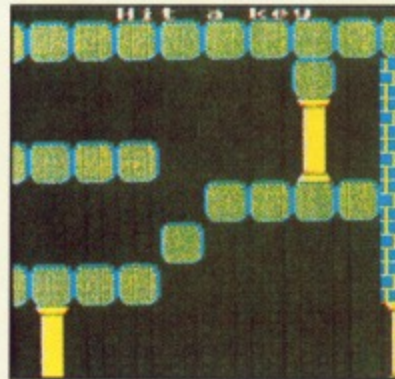
If you thought Electron programs would not work correctly on a BBC Micro, you're in for a surprise. In addition to the Arcade Creator suite of programs, all the following programs in the *Electron User* bundle will also work on your BBC Micro.

Features: Printer benchmark test, using View for Programming, Pascal tutorial, a home brew kit, Viewsheets tutorial, machine code beginners' tutorial, entertaining 10-Liner programs, Rainbow art package, machine code maths routines and a car route database.

Arcade games: Randall Rabbit, Bomb Alert, Navigator, Super Digga, Shove Penny, Go Pig and Keyboard Gremlins.

Educational games: Odd One Out, Hiss, Dozer, Disorder, Lion's Lair and Tilley the Train.

If you are an aspiring games programmer, this is an offer you simply cannot afford to miss!



Arcade Game Creator

- Tape + magazine bundle£9.95
- Disc + magazine bundle£10.95

The *Micro User* team has been through all these programs in detail, ensuring they work correctly and make the best use of the BBC Micro's greater power.

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TO ORDER PLEASE USE THE FORM ON PAGE 135

4 exciting compilations of the very best programs from the pages of *The Micro User*

TEN of the **BEST!**

We've brought together the most popular listings which have been published over the last year and created four packages each devoted to a particular subject area. There's entertaining games, handy utilities, clever graphics utilities and powerful ram and disc utilities – all ready for you to put to use without the need for any typing in! You can also list and adapt nearly all the programs – an excellent way to improve your programming skills.

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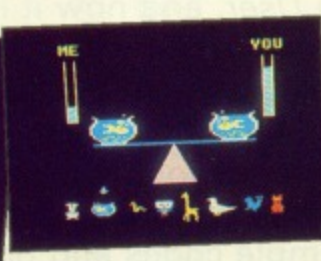
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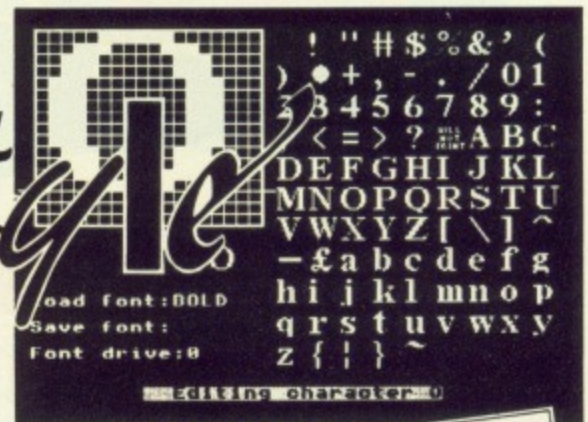
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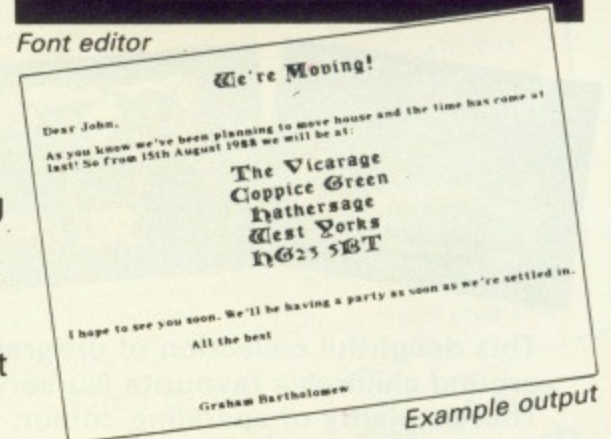
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(see page 114)

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(see page 58)

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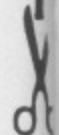
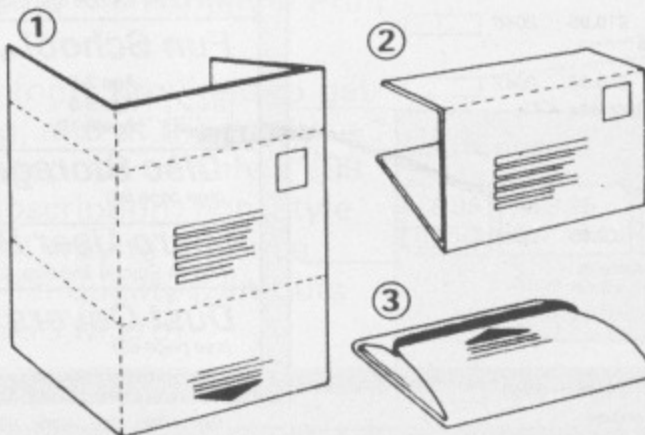
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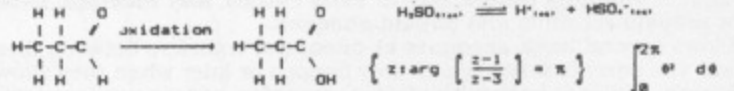
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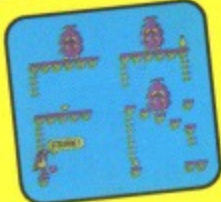
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